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The Role of Merak Vessel Traffic Service (VTS) in the Implementation of Traffic Separation Scheme (TSS) in Sunda Strait

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ABSTRACT

Merak Vessel Traffic Service (VTS) is pivotal in Indonesia's critical maritime traffic network, particularly within the bustling Sunda Strait. This waterway holds immense strategic importance, serving as the primary link between Java and Su-matra Islands and intersecting with the vital Indonesian Archipelago Sea Lane. The Indonesian Government implemented a Traffic Separation Scheme (TSS) in July 2020 to enhance safety and navigation. Despite three years of TSS implementation, concerns persist regarding compliance and safety within the Sunda Strait. This research employs qualitative methods to address these concerns, chiefly in-depth interviews with VTS operators. The overarching objective is to gain profound insights into the intricacies of TSS implementation and the array of challenges it faces. The findings reveal several significant challenges. These include the lack of robust law enforcement and insufficient socialisation efforts regarding TSS regulations, concerns related to weather conditions impacting maritime operations, limitations in VHF radio modulation affecting communication, and issues surrounding vessel compliance with directives from VTS operators. In light of these challenges, future recommendations should prioritise strengthening law enforcement mechanisms, intensifying educational initiatives, improving communication technology, enhancing weather monitoring capabilities, and exploring ways to strengthen vessel compliance with VTS instructions.

Keywords: *VTS, TSS, Sunda Strait, Implementation Challenges.*

1. INTRODUCTION

Following the United Nations Convention of the Law of the Sea (UNCLOS) 1982, ratified by the Indonesian Government in Law No. 17/1985, Indonesia must provide an International shipping route through Indonesian waters as an archipelagic country. This passage is known as the Indonesian Archipelagic Sea Lane (IASL). According to the Indonesian government rule Number 37 in 2002, Indonesia has three IASLs: IASL I pass through the South China Sea, Karimata Strait, Java Sea, and the Sunda Strait. The Sunda Strait is the most congested lane in Indonesia. It has high traffic density for national and international waterways, including crossing passage for the busiest ferry lane between Java and Sumatra Island [1]. Because of its high traffic density, there will always be a risk of collision and incident in the Sunda Strait [2]. One fatal accident was the collision between the Ro-ro ferry Bahuga Jaya and MT Norgass Chantika.

Furthermore, the Koliot coral reef is within the passage and is considered dangerous for shipping because of MV. Hanjin Aqua was grounded in this coral in 2015. In addition, because of its strategic location, monitoring in the Sunda Strait can be difficult [3]. For those reasons, the Indonesian Government proposed that IMO establish a Traffic Separation Scheme in the Sunda and Lombok Strait. It made Indonesia the first archipelagic country to have TSS [4]. The location of TSS in the Sunda Strait can be seen in Figure 1.

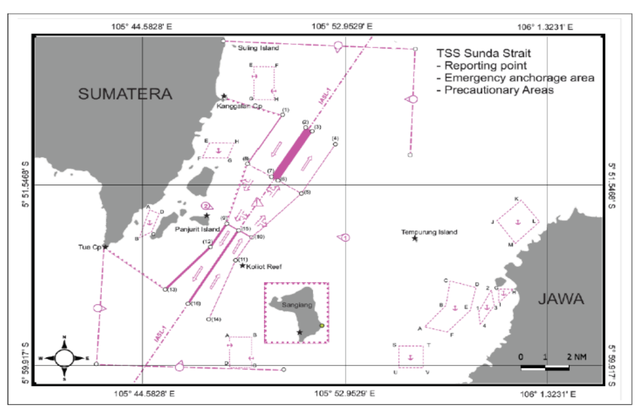

Figure 1: Traffic Separation Scheme in Sunda Strait (Source: This picture adapted from [5])

A TSS represents a pivotal component of the IMO strategic navigation systems, meticulously devised to bolster safety and mitigate the potential perils of maritime collisions within crowded and confined water passages [6]. Its significance is most pronounced in regions where ships must traverse narrow channels, bustling harbours, or the convergence of multiple shipping routes. The core objective of a TSS is to enhance maritime safety by curtailing the likelihood of vessel collisions, particularly in areas with a dense influx of marine traffic. Additionally, it optimises sea traffic flow, thus fostering efficiency and averting congestion or bottlenecks within these vital water routes [7]. Rule 10 of the COLREG outlines the guidelines for vessel conduct when navigating traffic separation schemes, which the IMO has formally endorsed. To ensure these schemes' safe and effective implementation, a Vessel Traffic Service (VTS) is indispensable. The VTS plays a pivotal role in the oversight and management of traffic within these designated Traffic Separation Schemes (TSS), actively monitoring and coordinating the movements of vessels to uphold safety and streamline maritime traffic in these critical areas.

Vessel Traffic Service (VTS) is a shore-based station that aims to improve safety, increase efficiency in vessel traffic, improve life safety, and protect the sea environment [8]. Merak VTS contributes to the Sunda Strait's traffic safety and gives mariners valuable service [9]. Merak VTS has an important role in implementing the TSS for providing information and advice to the vessels passing through TSS. However, after three years of TSS implementation, there are still contraventions in TSS. Figure 2 shows the number of infringements from the start of TSS in July 2020 until June 2023.

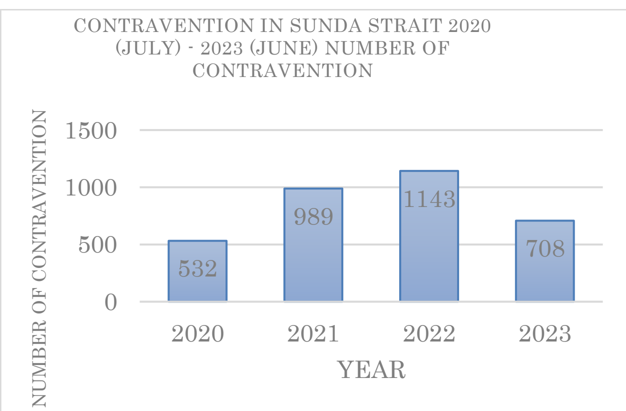

Figure 2: Contravention in TSS Sunda Strait

The number is still high despite the effort that Merak VTS has made. This paper aims to analyse the difficulties and challenges of TSS implementation by delving into the experiences and perspectives of the VTS operators in Merak VTS.

2. METHODOLOGY

2.1 Data Collection

This research adopts a qualitative approach, primarily focusing on qualitative interviews as its methodological tool. The research participants are drawn from the pool of VTS operators at Merak VTS. There are 12 operators, all of whom hold a general radio certificate. Among these 12 operators, five individuals possess nautical degrees. Furthermore, the entire team has accumulated valuable working experience in Vessel Traffic Services (VTS), ranging from two to eight years. This collective expertise in VTS and their qualifications make them relevant participants for his research. These operators engage in in-depth interviews with open-ended questions, encouraging them to share their insights and perspectives regarding the complexities and challenges associated with TSS (Traffic Separation Scheme) implementation. The qualitative interviews serve as a vital means to gather rich and nuanced data directly from the individuals responsible for managing and overseeing maritime traffic within the Sunda Strait. These interviews encompass a wide range of topics, providing a holistic view of the intricacies of TSS implementation in this strategically significant maritime corridor. Subsequently, the collected data from these interviews will be analysed using the SHELL Model. This structured framework will be applied to comprehensively examine and understand the multifaceted factors contributing to the challenges and difficulties faced in TSS implementation. By combining the qualitative approach, participant insights, and the analytical power of the SHELL Model, this research aims to provide a well-rounded and in-depth exploration of the issues at hand, ultimately contributing to a more profound comprehension of TSS dynamics within the context of the Sunda Strait.

2.2 SHELL Model

The SHELL method (Software, Hardware, Environment, and Liveware) is useful for understanding the human factors involved in a system. This model allows researchers to construct it gradually, step by step, by depicting the relationship between various components. Thus, the SHELL model can more in-depth analyse the interaction between humans, technology, and the system's environment [10]. SHELL analysis analyses various factors that affect human work in a specific environment. In the difficulties and challenges of implementation of TSS in the Sunda Strait, the researcher used the SHELL Model to understand various contributing factors according to the interview results with Merak VTS Operators.

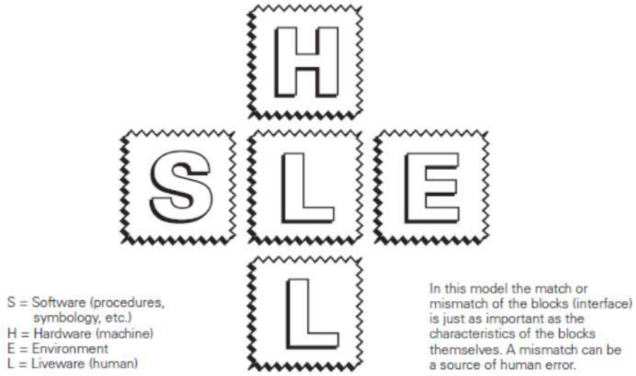

Figure 3: SHELL Model [10]

3. RESULTS AND DISCUSSION

The Traffic Separation Scheme (TSS) in the Sunda Strait was officially established in July 2020 under the jurisdiction of the Ministry of Transportation of Indonesia. Within this designated TSS area falls the responsibility of the Merak Vessel Traffic Service (VTS). Consequently, VTS operators are tasked with the critical roles of continuous monitoring and providing essential services to all vessels operating within the TSS. This means that VTS operators play a pivotal role in ensuring the safety and orderliness of maritime traffic within this strategically important waterway. Their responsibilities include tracking vessel movements, offering navigational assistance, disseminating traffic and weather information, and facilitating communication among vessels. Establishing the TSS in the Sunda Strait has conferred upon the Merak VTS operators a central role in maritime traffic management and safety within this region. Their duties extend to all vessels navigating within the TSS, and they act as a crucial link between vessels, promoting safe and efficient passage while safeguarding against potential accidents and incidents.

Based on interviews with Merak VTS operators, their responsibilities encompass providing essential traffic information to vessels entering the TSS (Traffic Separation Scheme). This information covers traffic details, navigation data, and weather updates. As vessels approach the precautionary area, the operators promptly notify them about Ro-ro ferries scheduled to cross the TSS. Conversely, for Ro-ro ferries planning to traverse the TSS, the operators furnish information about other vessels due to pass through the area. This proactive communication allows Ro-ro ferries to prioritise their navigation within TSS effectively. In cases where a ship lacks a TSS chart, the operators extend their assistance by offering course directions and distance guidance.

It's worth noting that the Sunda Strait experiences strong currents, which can pose challenges for smaller vessels manoeuvring within TSS. In such instances, the operators take measures to ensure safety. They inform nearby vessels to maintain a safe distance from those encountering manoeuvring difficulties.

Additionally, when a deep-draught vessel enters TSS, operators broadcast this information and request that other vessels prioritise and maintain a safe distance from it. Despite the diligent efforts of VTS operators to maintain clear traffic flow within TSS, instances of non-compliance persist. These infractions include vessels crossing the Inshore Traffic Zone (ITZ) and deviating from their assigned tracks. For example, when a ship appears to be heading toward ITZ in contravention of regulations, operators promptly advise it to correct its course. In cases where the vessel does not adhere to VTS advice, Merak VTS takes further action by notifying the harbour master at its destination. This serves as a warning and may result in an inspection by the harbour master.

As revealed in the interview, the challenges and difficulties encountered in implementing TSS can be analysed using the SHEL model. This model provides a structured framework for understanding the interplay of various factors within the system that will be described below:

1. Software (Procedures and Policies): One of the prominent challenges in TSS implementation lies in the software aspect. This includes the established procedures and policies governing vessel navigation within the TSS. Despite clear guidelines, there are instances of vessels deviating from their assigned tracks, leading to non-compliance issues. The interview highlights that operators must constantly advise vessels to correct their courses when they stray from the designated routes. In addition to the challenges highlighted earlier, two additional critical issues impact the effective implementation of TSS: the lack of law enforcement for vessels that violate the rules and insufficient socialisation regarding TSS and its regulations. These issues further compound the challenges faced by VTS opera-tors and mariners in the region
2. Hardware (Equipment and Technology): In the hardware aspect of TSS implementation, the technology and equipment utilised by VTS operators hold significant importance. These operators are responsible for providing essential navigational assistance, including instructing course direction and distance information to vessels within the TSS. However, notable challenges within this hardware domain affect their operations. Firstly, there are instances where the VHF radio modulation used in the VTS station encounters limitations in reaching vessels within the TSS. This can impair communication between vessels and VTS operators, potentially leading to operational disruptions and a lack of real-time guidance. Furthermore, there are situations where vessels need access to TSS charts, indicating a notable gap in navigational resources resources. The absence of these charts can leave mariners without essential

reference materials, potentially compromising their ability to navigate safely within the TSS. Additionally, the challenging maritime environment of the Sunda Strait, characterised by strong currents, compounds the hardware-related challenges VTS operators face. These powerful natural forces interact with the technology and equipment operators utilise, further complicating their efforts to provide effective navigational assistance.

3. Environment (Physical and Natural Factors): The physical environment of the Sunda Strait presents a significant challenge. Strong currents in the strait can impede the manoeuvrability of smaller vessels within the TSS. This environmental factor directly affects vessel navigation and maintaining a clear traffic flow. Operators must consider these natural conditions when providing assistance and issuing safety advisories to ensure safe passage.
4. Liveware (Human Elements): The human factor, represented by VTS operators, plays a pivotal role in TSS implementation. The operators are responsible for relaying critical information, including traffic updates, weather conditions, and notifications of vessels crossing the TSS. Their expertise is essential in managing vessel traffic and ensuring safe navigation. However, despite their efforts to maintain order, there are still instances of vessels contravening regulations and failing to follow VTS advice. Operators take corrective action by notifying the harbour master at the vessel's destination.

4. CONCLUSIONS

This research highlights the implementation of the Traffic Separation Scheme (TSS) in the Sunda Strait, under the purview of Merak VTS operators, involves a complex interplay of software (procedures and policies), hardware (equipment and technology), the physical and natural environment, and the human element. While significant efforts have been made to manage vessel traffic and enhance safety within the TSS, several challenges persist. The challenges include non-compliance with established procedures and policies, limitations in hardware (such as VHF radio communication and access to TSS charts), the formidable maritime environment characterised by strong currents, and vessels deviating from prescribed routes. Additionally, there needs to be more robust law enforcement and socialisation efforts, contributing to difficulties in achieving full compliance and awareness among mariners. Recommendations for addressing these challenges and improving TSS implementation:

1. Enhance Law Enforcement: Strengthening law enforcement mechanisms to address non-compliance is crucial. This includes imposing penalties and consequences for vessels that violate TSS regulations. Cooperation between VTS operators and relevant maritime authorities is essential for effective enforcement.
2. Intensify Socialisation and Education: Invest in comprehensive socialisation and educational campaigns to raise awareness among mariners about the importance of TSS and its regulations. Training programs and information dissemination can help bridge the knowledge gap.
3. Technology Upgrades: Address hardware-related issues by upgrading communication technology, ensuring that VHF radio systems are reliable and can cover the entire TSS area. Additionally, it provides vessels with access to electronic TSS charts to enhance navigational resources.
4. Real-time Environmental Monitoring: Implement real-time monitoring of environmental factors, such as strong currents, to provide timely information to mariners. This can aid in safer navigation within the TSS.
5. Continuous Operator Training: Invest in ongoing training and development for VTS operators to enhance their skills and preparedness in managing complex situations within the TSS.

Future research could focus on behaviour studies to investigate the underlying reasons for vessel non-compliance with TSS regulation, exploring the psychological and decision-making factors that influence mariners' actions. In addition, there can be research about legal and policy aspects to examine the effectiveness of existing legal frameworks and policies related to TSS implementation and propose potential amendments or improvements.

By addressing these recommendations and conducting further research, stakeholders can work towards achieving safer and more effective TSS implementation in the Sunda Strait, ultimately benefiting maritime traffic and ensuring the protection of this critical waterway.

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