Migration Letters

Volume: 20, No: 5, pp. 764-771

ISSN: 1741-8984 (Print) ISSN: 1741-8992 (Online)
www.migrationletters.com

Comparative Analysis of Regulatory Frameworks Implementation on The Vessel Traffic Service Surabaya to Increase Maritime Regional Safety and Security in The Surabaya West Access Channel

Syaiful Anwar[1]

Abstract

The Surabaya West Access Channel has an average of ship that sails across Madura straits from 2008 - 2013 is 20,582 per year and there is a total of 47 accidents recorded from 2015 – 2018 and piracy crimes occurred for 13 cases from 2013 – 2018. The Vessel Traffic Service (VTS) is established to reduce these risks by performing the function of providing information service, navigational assistance, and traffic organizational service. This study aims to list the requirements of IMO A.857 and IALA V – 128 for the VTS then conduct a comparative analysis and score the level of implementation of regulations in the VTS Surabaya. The final result of scoring is the implementation of rules from IMO A.857 which gains 81%, which is higher than the implementation of IALA V–128 which only gains 67% of compliance. Several recommendations were made directed to the policymakers to elevate the efficiency of work of the VTS Surabaya.

Keywords: *Surabaya West Access Channel, Vessel Traffic Service, comparison, regulation, maritime safety, maritime security.*

Introduction

Ships are the main transportation mode for economic trade activity which covered 90% of the goods of world trade (UNCTAD, 2020). With a total of sea area 7.9 million km2, Indonesia makes sea trade activity one of its important sectors (ASIAN Development Bank, 2016). One of the busiest sea areas in Indonesia is around the Tanjung Perak Port which is the second busiest port after the Tanjung Priok Port in Jakarta, with the average of ships that sail across the Madura straits from 2008 - 2013 being 20,582 per year (Sumarsono et al., 2018). The Surabaya West Access Channel (SWAC) itself is an area located in the Madura Strait that separates the city of Surabaya located in East Java, with Madura Island with a length of 39.65 nautical miles (nm) or 73.5 km (Ministry of Transportation of The Republic of Indonesia, 2016). Its average width is about 200 m with a depth of around 10 – 20 m, and it was designed for the capacity of 27,000 voyages every year (VTS Surabaya, 2015).

[1] The Republic of Indonesia Defense University, Indonesia, morolawe7760@yahoo.com.au

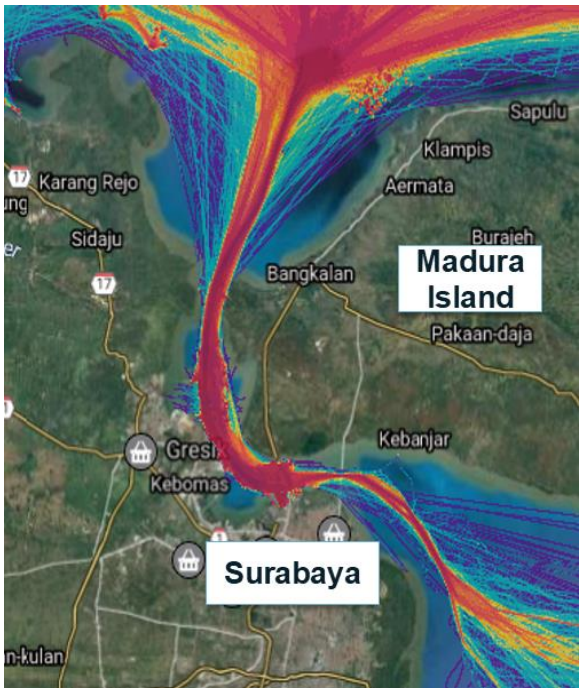

Figure 1. Dense shipping activity in the SWAC area (colored in red)

The dense traffic caused a high risk of accidents happening in this area was caused to collision, hull leakage, overload, and bad weather condition (Khomsin and Ardi, 2017). Based on the VTS Surabaya log report, between 2015–2018 seven accidents happened specifically because of collisions. Besides the risk of accidents, the high level of shipping activity in the SWAC area makes the risk of crimes that threaten maritime security possible, one of which is piracy. Indonesia is the country with the highest number of piracy cases in Southeast Asia with a total of 261 cases during 2015 – 2019 (ICC International Maritime Bureau, 2020). In the SWAC area itself, 13 cases of piracy were recorded from 2013 – 2018 (Saputra, 2019).

Table 1. Piracy cases in Southeast Asia

Location	**2015**	**2016**	**2017**	**2018**	**2019**	**Total Cases**
Indonesia	108	49	43	36	25	261
Philippines	11	10	22	10	5	58
Malaysia	13	7	7	11	11	49
Singapore Straits	9	2	4	3	12	30
Malacca Straits	5	-	-	-	-	5
Thailand	1					1

The high risk of accidents and piracy threatens the safety and security of the vessels that sail in the SWAC area. Therefore, to reduce these kinds of risks from happening, there must be a system to actively monitor the waterways area and one of the systems is called the Vessel Traffic Service (VTS) which can be defined as a service implemented by a competent authority, designed to improve safety and vessel traffic and the protection of the environment (IMO, 1997). The service should be able to interact with the traffic and respond to situations developing in the VTS area. The VTS was established to improve the safety of navigation, especially in areas where there is a concentration of a large number of vessels (Gucma et al., 2016). In Tanjung Perak Port, the VTS was built by the Ministry of Transportation of The Republic of Indonesia and was operated since September 22nd, 2015. It is aimed to serve its main functions to provide information, navigational assistance, and traffic organization service (Jeong and Park, 2013). To serve its full function, therefore there should be an operational standard that complies and is integrated with international regulations. In the operation, the VTS should comply with

regulations from IMO and the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) (Juszkiewicz and Kotkowska, 2013). It is one of the frameworks specifically stated in the IMO Regulation A.857 and IALA Recommendation V-128. In reality, the implementation of these regulations may not be realized completely. Therefore, this study aims to assess the level of implementation of these international framework regulations in the VTS Surabaya. The outcome is the recommendations that can improve the performance in minimizing the risk of accidents and crimes from being happened.

2. Method

A qualitative approach was used in this study. The methodology started with problem identification and continued with a literature study that resulted in the listing of regulations from the IMO and the IALA. The benchmarking with the existing regulations operated in the VTS Surabaya was carried out through field survey and data collection based on the Standard Operation Procedure Book that has been used as the regulatory framework of the VTS Surabaya since 2015. The result of the benchmarking was then made into scoring. The illustration of the method flowchart can be seen in Figure 2.

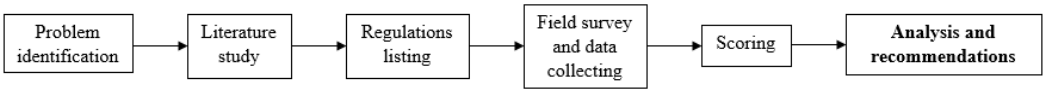

Figure 2. Methodology flowchart

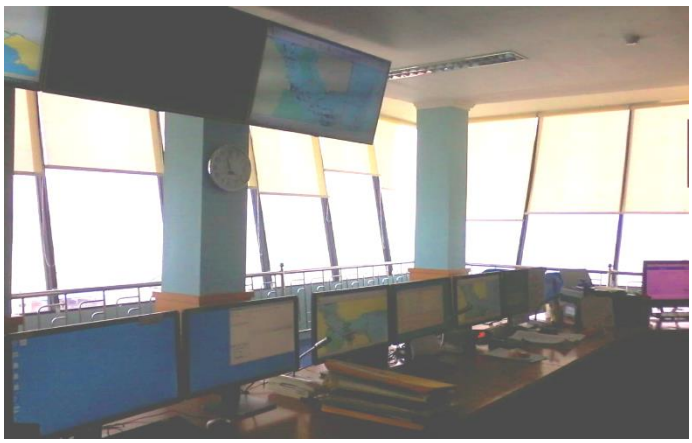

Figure 3. The VTS Station Surabaya

2.1 IMO Regulation A.857

The International Maritime Organization (IMO) is a specialized branch of the United Nations with the primary task to develop and maintain a regulatory framework for the maritime sector including safety and security, legal matters, environmental concerns, technical cooperation, and the efficiency of shipping. The IMO has conducted more than 40 conventions and protocols and well adopted over 700 codes, one of them being regulation A.857 concerning the VTS (Tarelko, 2012). The IMO Regulation A.857, associated with the SOLAS Regulation V/8-2, was set in a general assembly meeting in November 1997. The regulation states that the governments who are planning and implementing the VTS shall follow the guidelines developed by the IMO.

Recently, vessels that need to participate in the VTS system have changed. Ships are larger and faster, and the traffic conditions are diversified in ports and coastal areas. Therefore, VTS operations have been developed as a means of providing important information for navigation and the tasks have been extended as maritime traffic situations have become increasingly complicated. Some tasks that will need to be able to develop

are the ability to predict traffic situations and then support decision-making in emergency cases (Kim et al., 2013). Nine topic categories are discussed in the IMO Regulation A.857 regarding the compatibility of the VTS station that should be provided.

(1) The purpose of VTS is to improve the safety and efficiency of navigation, the safety of life at sea, and the protection of the maritime environment from the possible effects of traffic.

(2) The responsibility and liability of competent authority are to establish a regulatory policy concerning VTS requirements that is consistent with the international and national regulatory framework.

(3) The responsibility of the VTS operator is to provide mariners with full details of the requirements to be met and the procedures to be followed in the VTS area such as the categories of vessels, radio frequencies for reporting, areas of work, the times, and geographical positions for submitting reports to the station.

(4) VTS services serve three main functions as to provide information service, navigational assistance, and traffic organization service. Information service is provided by broadcasting information at fixed times and intervals or when deemed necessary by the VTS or at the request of a vessel, and may include for example reports on the position, identity, and intentions of other traffic, waterway conditions, weather, hazard, or any other factors that may influence the transit of the vessel. Navigational assistance is normally rendered at the request of a vessel or by the VTS when deemed necessary and is important in difficult navigational or meteorological circumstances or cases of defects or deficiencies. Traffic organization service is particularly relevant in times of high traffic density or when the movement of special transports may affect the flow of other traffic to prevent congestion and dangerous situations for the vessels.

(5) Communication and reporting should enable the exchange of information between vessels and the VTS station. The initial report required from a ship entering the system is generally limited to the ship's name, call sign, IMO identification number if applicable, and position, the intended movement of the ship through the area covered by the system, any operational defects or difficulties affecting the ship, and the general categories of any hazardous cargoes on board.

(6) Operating procedures whether it is internal or external, routine or contingency, should be laid down in handbooks or manuals and be an integral part of regular training exercises and adherence to procedures should be monitored.

(7) The database should have the capacity to retain, update, supplement and retrieve data once collected.

(8) Rules for participating vessels aside to have reported to the VTS station, vessels should also report any indications of danger and carry the relevant publications of rules and regulations.

(9) The area of work for VTS should be in a sea area with high density, traffic carrying hazardous cargo, conflicting and complex navigation patterns, a high record of maritime accidents and casualties, and an area with a dangerous environment.

2.2 IALA Recommendation V-128

The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) is a non-governmental and non-profit organization founded in 1957 seeking to harmonize Aids to Navigation (AtoNs) and aims to ensure the safety of vessel movements and also the protection of the marine environment (IALA, 2021). The IALA publishes several guidelines, handbooks, and recommendations that are updated regularly. Within the VTS domain, its primary influence is publishing the VTS Manual which includes guidelines for the education of VTS operators, supervisors, and managers (Praetorius,

2014). Specifically, the IALA Recommendation V-128 regulates operational and technical performance requirements for VTS equipment. The equipment that is regulated is radar, Automatic Identification System (AIS), communication, Hydrometeo equipment, Closed Circuit Television (CCTV), and data system (IALA, 2007). The more detail of the regulations are as follows:

(1) Radar performance is rated by several indicators including the performing functions, target coverage, detection performance and disturbance, accuracy, and availability to perform its function.

(2) The Automatic Identification System (AIS) of vessel data should be presented to the operator as one unambiguous target using the best available target data and not fuse with other data from radar detection.

(3) Communications system between vessels and the VTS station should be done in adequate VHF channels, able to do communication in long-distance, equipped with Radio Direction Finder (RDF) installation, VTS station should be able to communicate with allied service, and available for 24/7 fully operated.

(4) Hydrometeo equipment should be accurate and available for VTS stations and not depend on the weather and meteorological information from external parties.

(5) CCTV equipment should be capable of identifying the type and possibly the name of the vessels at a minimum range of 3.2 nautical miles.

(6) VTS data system can control the displayed information, is equipped with long-range sensor data, capable of transferring data in an emergency, have a database of participating vessel's information, and can store and replay information if needed.

The regulations from the IMO and the IALA that have been explained before are used to produce a list of requirements needed to be fulfilled for the VTS system. The list is used as a tool for data collection. Field surveys and data collection were conducted in the VTS Surabaya using the regulations list that has been made. The list is used as the parameter of the VTS standard that is applied to the VTS Surabaya. Scoring is done by giving a score to three criteria which are rules implementation, topic implementation, and sub-topic implementation. The range of scores is made from 0 – 3 with criteria as follows:

- 0: Not implemented (0% of implementation)
- 1: Less implemented (less than 50% of implementation)
- 2: Implemented, but not fully (minimum 50% of implementation)
- 3: Implemented fully (100% of implementation)

3. Results

Rules implementation score is given to each of the IMO A.857 and the IALA V – 128 which is taken from the average score of the topic implementation score. The topic implementation score is given to each topic in both the IMO A.857 and the IALA V – 128. For the IMO A.857 scoring is categorized into 9 topics and for the IALA V – 128 scorings are categorized into 6 topics that have been explained previously.

The result of the benchmarking process between the compliance of the VTS Surabaya with regulations of the IMO and the IALA is the scoring which served in the percentage graphs. The total score is obtained by dividing the score by the maximum score, which is 3 for full implementation, then multiply by 100% to obtain the percentage.

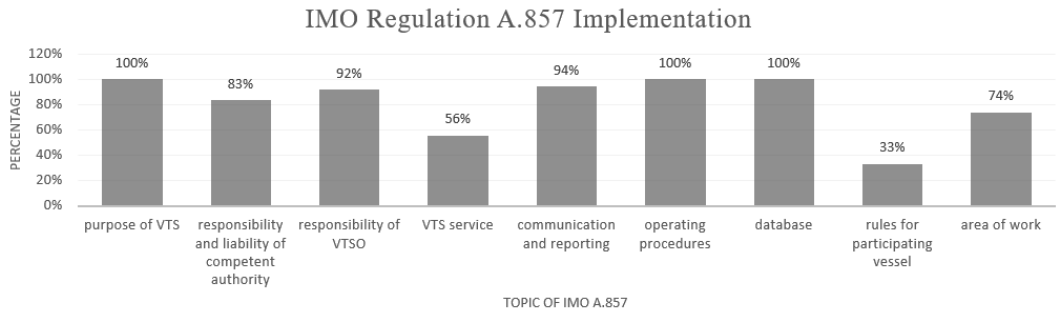

Figure 4. Graph of the IMO Regulation A.857 implementation percentage

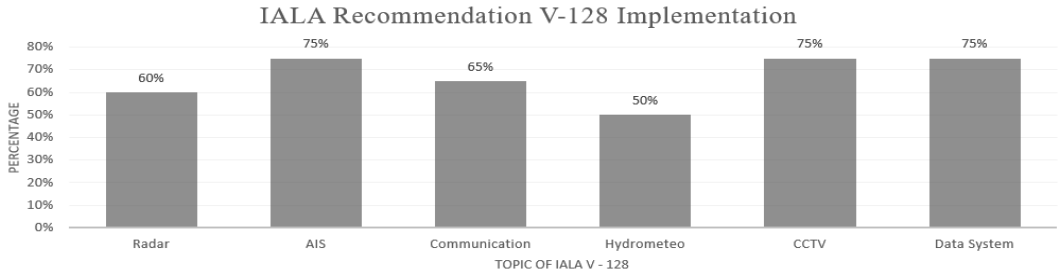

Figure 5. Graph of the IALA Recommendation V-128 implementation percentage

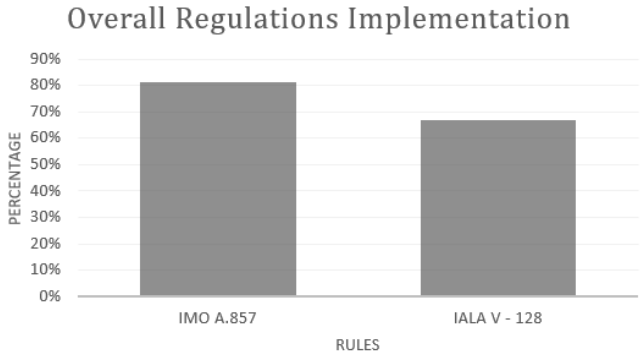

Figure 6. Graph of the IALA Recommendation V-128 implementation percentage

From Figure 4, it can be seen that the highest implementation of the IMO A.857 came from the implementation of VTS purpose, operating procedures, and database which results in 100% of implementation. On the other side, the lowest implementation was from rules for the participating vessel which results in 33% of implementation. From Figure 5, the highest implementation of the IALA V–128 came from the high compliance of AIS, CCTV, and Data System which results in 75% of implementation. On the other side, the lowest implementation was from Hydrometeo equipment which results in 50% of implementation. From the overall calculation, the implementation of rules for the IMO A.857 which obtained 81% is higher than the IALA V – 128 which obtained only 67%.

Based on the scoring assessment, several recommendations can be proposed to elevate the performance of the VTS Surabaya conducting its function, they are:

(1) Establish written standards for shore- and off-shore-based equipment to regulate and assess the performance of equipment. Good performance of equipment leads to optimum performance function of the VTS to reduce the number of accidents.

(2) Provide an online and offline database of a training module to provide operators and staff to access learning material effectively. In addition, also establish an assessment of the performance of the VTS operators and staff to elevate the working performance.

Good performance from staff and operators can make the surveillance of traffic run effectively to prevent accidents from being happened.

(3) Upgrading the navigational assistance function, therefore it can be available and functioning on daily basis, not only in an emergency condition. Navigational assistance for every ship can reduce the chance of missing the direction of the movement of the ship, therefore reducing the chance of collision.

(4) Establish a traffic organization service function to prevent accidents and minimize the risk of collision in a high-density area.

(5) Make records of a database of IMO numbers and records of the speed of each ship that entered the work area of the VTS to ease the process of identification and risk assessment of collision.

(6) Oblige the masters of the vessel to do a report and alert the VTS for any observed or potential danger to reduce the risk of an accident and crime attack.

(7) Propose a new radar service to add the advanced function of giving information on Closest Point of Approach (CPA), Time to Closest Point of Approach (TCPA), and collision alert to minimize the risk of collision in the VTS area.

(8) Record information for the type of capability of radar (distance accuracy, azimuth degree, the height of the target, etc.) to standardization for radar function to perform effectively. Radar performance is vital for visualizing the movement of a ship.

(9) Install Radio Direction Finder (RDF) to locate the location of the radio signal therefore it can be easier to provide immediate help if some accidents happened.

(10) Hydrometeo equipment better is provided to provide accurate information on weather conditions and the level of the wave to minimize the risk of accidents.

Those recommendations could be implemented into reality by the policymakers either by enabling the installation of the new equipment or by evaluating and revising the regulations that have been stated in the standard operating procedure of the VTS Surabaya to comply with the standard from IMO and IALA.

4. Conclusions

The requirements from the IMO A.857 regulates the purpose of the VTS, responsibility, and liability of competent authority, the responsibility of the VTS operator, VTS service, communication and reporting, operating procedures, database, rules for the participating vessel, and area of work. The requirements from the IALA V–128 regulate VTS equipment such as radar, AIS, communication, Hydrometeo, CCTV, and data system. The highest rules implementation of the IMO A.857 is gained for the topic of the purpose of the VTS, operating procedures, and database system which each of them gained 100% implementation. Meanwhile, the lowest implementation is from the topic of rules for the participating vessel which gained 33% of implementation. On the other side, the highest rule implementation of the IALA V–128 is from the compliance of CCTV and data system equipment with the IALA regulation which each of them gained 75% of implementation. Meanwhile, the lowest implementation is from the topic of Hydrometeo equipment which gained 50% of implementation. The final result of scoring is the implementation of rules from the IMO A.857 which gained 81%, which is higher than the implementation of the IALA V–128 which only gain 67% of compliance. The scoring results then were used to make several recommendations for increasing the percentage of compliance for the existing regulations of the VTS Surabaya with the regulations from IMO and IALA. Further evaluation and revising process need to be done by the policymakers and authority of the VTS Surabaya regarding the existing regulations to meet the recommendations that this study has proposed.

Acknowledgments

This study is supported by the Indonesia Defense University.

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