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ABSTRACT

The purpose of this study was to determine the effectiveness of shipping safety in the Singapore Strait Shipping Channel, which is the Working Area of the Class I Navigation District of Tanjung Pinang, Riau Islands, Indonesia. With the increasing number of ships passing through the Singapore Strait, thus requiring Sailing-Navigation Assistance Facilities which are in line with the development of management and technology of Sailing-Navigation Assistance Facilities. The research method uses qualitative descriptive evaluation research methods and formal legality analysis, namely conducting an evaluation in the Singapore Strait in the Working Area of the Class I Navigation District of Tanjung Pinang. Observations by conducting observations in the waters of the Malacca Strait, interviews with Regulators, Operators and Service Users as well as conducting Focus Group Discussions and documentation related to shipping safety. From the three data sources, the findings of the e-Navigation study explain that it is effective to improve shipping safety in the Singapore Strait by implementing Virtual AIS AtoN. Regulations of a technical nature are indispensable for the implementation of e-Navigation in improving shipping safety.

Keywords: Sailing Route, Sailing Safety, Electronic Navigation, Maritime, Singapore Strait

1. Introduction

The International Maritime Organization (IMO), as part of the Vital Shipping Route Protection Initiative, decided in 2004 to hold a high-level conference to discuss the safety of ships crossing the Straits of Malacca and Singapore in cooperation with the three coastal states of Indonesia, Malaysia and Singapore. Singapore has been working with Indonesia and Malaysia to improve navigational safety and environmental protection in the Straits since the 1970s (Beckman, 2008). The result in 2007 was the creation of a framework for cooperation between strait users and littoral states known as the cooperation mechanism, a historic breakthrough as Article 43 of the Law of the Sea Convention (Beckman, 2008; Ho, 2009).

Added, by (Ho, 2009) with the results of the meeting, carried out the formulation of various stakeholders during the meeting, explained the reasons for the success of the cooperation mechanism, and then proposed ways in which the cooperation between the users of the three coastal countries could be continued. Maritime diplomacy based on research by (Suproboningrum & Kurniawan, 2018) conducted by Indonesia-Malaysia-Singapore has

supported and facilitated the success of coordinated patrols in the Malacca Strait. It was also added that an agreement was made through the Singapore Statement, monitoring the sea area in the Malacca Strait from the Indonesian perspective on the Malacca Strait Sea Patrols cooperation in 2011-2013 (Panduwinata et al., 2016).

The Straits of Malacca and the Straits of Singapore as one of the most important shipping lanes in the world both from an economic and strategic point of view. It is the shortest shipping lane between the Indian Ocean and the Pacific Ocean, connecting major economies such as the Middle East, China, Japan and South Korea (Qu & Meng, 2012). Previous research by (Bateman, 2006) explained that the shipping lane in the Singapore Strait is very important and strategically it is at risk from maritime terrorist attacks. Increased insurance premiums for many ships using the Strait. However, very fundamental is the safety of shipping in the Singapore strait in all its dimensions, which embraces the issues of safety and environmental protection. According to (Rusli, 2012).

The increase in the number of ships passing through the Singapore Strait has an impact on traffic regulation, facilities and improvements in integrated technology for shipping safety such as Sailing-Navigation Assistance Facilities, Shipping Telecommunications, Radar, Human Resources as well as National Regulations and International Regulations that support increased shipping safety. at sea. The number of ships passing through the waters of the Malacca and Singapore Straits is based on data from The Mandatory Ship Reporting System in the Straits of Malacca and Singapore which has been carried out by the three coastal countries that handle the Malacca Strait and Singapore Strait consisting of Indonesia, Malaysia. and Singapore. Density levels occur in the Malacca Strait and Singapore Strait as international lanes and are connected to the North Natuna Sea and the Indonesian Archipelago Passage I as a cross-peace shipping lane.

Shipping safety in the Singapore Strait has become an international concern. The Singapore Strait shipping lane is a congested and important channels, that it requires the development of management and technology, Sailing Navigation facilities and infrastructure to overcome navigational hazards caused by shortages, damage, theft and unavailability Navigation Sailing facilities and infrastructure. In relation to navigational issues, sailing ships are very dependent on the need for safety facilities shipping on board or outside the ship, especially e-Navigation which has developed. Implementation of e-Navigation in the Malacca Strait and Singapore Strait by implementing the Marine Electronic Highway (MEH) which has been submitted from the International Maritime Organization (IMO) to the Directorate General of Sea Transportation in 2012.

The International Maritime Organization (IMO) has recommended the application of an Automatic Identification System (AIS) to improve navigational safety in marine traffic areas. Under the regulations, IMO requires AIS to be installed on all vessels with a gross tonnage of over 300 Tons that carry out international voyages, cargo ships with a gross tonnage of over 500 Tons that do not undertake international voyages and all passenger ships regardless of size (Zaman, 2016). Marine Electronic Highway (MEH) is a navigation network assistance intended for ships navigating the Malacca Strait and Singapore Strait with the aim of supporting navigational safety and avoiding the danger of collisions or running aground which can cause pollution in these water areas.

Based on research (Mohd Rusli, 2011; Oei, 2001; Rusli, 2020) the Straits of Malacca and Singapore have solutions available to the littoral States of Malaysia, Indonesia and Singapore under identified International law to improve safe navigation. As important shipping lanes for oil transportation, the Straits of Malacca and Singapore must remain open for international shipping because closing the Straits will hurt the global economy.Based on the data, the number of Sailing-Navigation Assistance Facilities up to January 2020 is a total of 377 Sailing-Navigation Aids Buildings spread across the Tanjung Pinang Class I Navigation District Work Area as a means of shipping safety. There are 15 (fifteen) units of Sailing-Navigation Assistance Facilities installed along the Singapore Strait.

AtoN systems are intended to facilitate safe and efficient movement of vessels through a waterway. Their responsible provisioning requires that systems be designed to meet the minimum requirements for safe and expeditious navigation through special waters in accordance with the type and volume of traffic and the degree of risk (Wright & Baldauf, 2017). Physical AtoN have been used for thousands of years to guide vessels along their routes and provide assurance of safe passage using known landmarks and structures to indicate safe waters. In the modern era technology has provided us with buoys, lighthouses, light ranges, day marks and other devices to accomplish this capability (Wright & Baldauf, 2016).

Other Sailing Navigation Facilities are Coastal Radio Station which is a land station in the shipping mobile service and VTS (Vessel Traffic Service) is a shipping traffic ship that is set to be integrated and implemented by the authorities, while the VTS location is in Batu Ampar Batam, Archipelago Province Riau. Vessel Traffic Services (VTS), which has been operating since 2011, serves to monitor shipping traffic and shipping traffic flow, improve shipping traffic security, increase navigation efficiency, protect the environment, manage general information, manage specific information and assist ships require special assistance and Vessel

Traffic Services (VTS) carry out observation, detection, and tracking of vessels in the coverage area.

The focus of the research in this study is to realize the conditions of shipping safety in the Singapore Strait crossing considering the heavy national and international ship traffic so that efforts are needed to improve integrated shipping safety management. The problem of reliability of Sailing-Navigation aids at sea can cause ship accidents and pollution at sea. One example is the occurrence of ships running aground in the Sunda Strait due to the unavailability of Sailing-Navigation Assistance Facilities at Karang Koliot and ships that ran aground in the Rambu Suar Batu Berhanti area of the Singapore Strait. The management of navigation facilities and infrastructure for shipping safety requires a macro and integrated government policy, and is supported by a set of regulations as a strong legal basis.

According to SOLAS in Chapter V, which functions as a legal umbrella for shipping safety and harmonization of technical standards of facilities and infrastructure for shipping safety aspects (IALA, 2018). The need for safety and human interests is protected, so regulations must be implemented. The improvement of the shipping safety system, especially the management of the e-Navigation integrated navigation facilities and infrastructure system will only be effective if it is applied universally and there is a legal basis that supports the system. As a result of the unavailability of regulations and the lack of an integrated system of Sailing-Navigation aids as the shipping safety facilities and infrastructure needed to support it, the shipping safety system at sea cannot develop. The increasing density of passing ships and actions such as vandalism and theft as well as the limitations of supporting facilities in maintaining the reliability of the Sailing-Navigation Assistance Facility so that it has the potential to cause accidents at sea.

Based on the above background, there are several main problems faced and can be evaluated as follows; (1) Regulations on Electronic Aid-to-Navigation Assistance Facilities (Electronic Aid to Navigation) operating in the Singapore Strait are still implementing the physical form of Sailing-Navigation Assistance Facilities supported by Automatic Identification System (AIS) yet not following technological developments so that they can support e-mail management Navigation, (2) The key to the Marine Electronic Highway (MEH) is precise navigation and will utilize the network of Electronic Navigational Charts (ENCs) together with the Electronic Chart Display and Information System (ECDIS), Differential Global Positioning System (DGPS), Internet Broadband and other maritime technologies.

The Marine Electronic Highway (MEH) in the Singapore Strait should be the backbone where all technology platforms will be integrated starting with ENCs - ECDIS. The extent to

which the precision of navigation in the Marine Electronic Highway (MEH) as the backbone of shipping safety in the Singapore Strait, and (3) Sailing-Navigation Assistance Facilities in the Singapore Strait, especially the type of Beacon Buoys and Beacon Resilent Light Beacons are always hit by ships so that they often drift and break. There is no implementation of the Virtual E-AtoN system that is integrated with Vessel Traffic Service (VTS) and Electronic Chart Display and Information System (ECDIS) as an integrated e-Navigation solution according to technological developments.

Based on this background, the objectives of this research are: (1) Re-analyzing the policy that has been passed on Navigation in e-Navigation that has been implemented with technological developments, (2) Ensuring that the Marine Electronic Highway (MEH) makes a contribution that can improve shipping safety that has been implemented since 2012, and (3) Provide advice and input on the implementation of Virtual Electronic Aid to Navigation which is integrated with Electronic Navigation in accordance with the development of e-Navigation technology.

2. Methods

The research method will use descriptive evaluative qualitative research methods and formal legality analysis, namely evaluating the location that will be used as a research location, namely the Singapore Strait in the Class I Navigation District Work Area Tanjung Pinang, Riau Islands. Because the subject of this research is a navigation aid tool in the Singapore Strait shipping lane. Research informants the sources of data collection from this writing are ten informants, namely from service users, the Class I Navigation District Tanjung Pinang as the Technical Implementation Unit or operator and facilitator and the Navigation Directorate as a Regulator.

The data collection methods used in the research are: (1) Observation (Direct Observation), in the waters of the Singapore Strait which is the territory of the Republic of Indonesia and observing the shipping lanes in the Malacca Strait and Traffic Separation Scheme, (2) In-depth interviews, to the Directorate of Navigation and District Tanjung Pinang Class I Navigation as regulator and service user and can experience the services of Sailing-Navigation Assistance and e-Navigation in the Singapore Strait, (3) Focus Group Discussion (FGD), to the Directorate of Navigation as a regulator and (4) Documentation, with observations directly related to the operation and maintenance of Sailing-Navigation Assistance Facilities and e-Navigation in the Straits of Singapore.

3. Results and Discussions

1. Factual Conditions and the Impact of Factual Conditions on Electronic Navigation and the Virtual Electronic Aid to Navigation Concept

In supporting the implementation of e-navigation and virtual aid to navigation as a support for the development of other electronic navigation-sailing aids technology, it is included in the Regulation of the Minister of Transportation number PM 25 of 2011 concerning Sailing-Navigation Assistance Facilities.

Table 1. Factual Conditions and Impact of Factual Conditions on e-Navigation and the Virtual Electronic Aid to Navigation Concept

No.	Factual Conditions	Impact of Factual Conditions
1.	Can understand shipping safety	Desired Conditions in Shipping Safety
2.	Different understanding of shipping safety	Unwanted Conditions in Shipping Safety
3.	Can understand e-navigation in shipping safety	Desired Conditions in Shipping Safety
4.	Different understanding of e-navigation in data integration	Unwanted Conditions in Shipping Safety
5.	Not meeting the shipping safety aspect, there are still ships running aground and other incidents	Desired Conditions in Shipping Safety
6.	It has fulfilled the shipping safety aspect but there are still human errors, need to communicate and hear suggestions from VTS	Desired Conditions in Shipping Safety
7.	Very important	Desired Conditions in Shipping Safety
8.	Very very important, many interests in the Singapore Strait	Desired Conditions in Shipping Safety
9.	It is already contained in Government Regulation number 5 of 2010 concerning Navigation and Minister of Transportation Regulation number 25 of 2011 concerning Sailing-Navigation Assistance Facilities	Desired Conditions in Shipping Safety
10.	There is already a Regulation of the Minister of Transportation number 25 of 2011 concerning Sailing-Navigation Assistance Facilities, there is no explanation yet but it is at IALA	Unwanted Conditions in Shipping Safety
11.	SBNP Maintenance was carried out in the Singapore Strait in ANF maintenance activities and SBNP placement	Desired Conditions in Shipping Safety
12.	A Joint Hydrographic Survey has been carried out with three coastal countries and Japan	Desired Conditions in Shipping Safety

13.	Can be implemented but only for large boats and not for fishing boats	Unwanted Conditions in Shipping Safety
14.	The SBNP function is used for shipping safety	Desired Conditions in Shipping Safety
15.	It needs to be regulated in the regulations if it will be enforced and socialized	Desired Conditions in Shipping Safety
16.	Need to do for Deployment and Integration not necessary but in procedure	Desired Conditions in Shipping Safety

The factual conditions for the implementation of e-navigation and the concept of virtual electronic aid to navigation are undesirable conditions for realizing the implementation of e-navigation and the concept of virtual electronic aid to navigation, namely; (1) Different understanding of shipping safety; (2) Different understanding of e-navigation in data integration; (3) Not fulfilling the shipping safety aspect, there are still ships running aground and other incidents; (4) The existence of regulations already contained in the Regulation of the Minister of Transportation No. 25 of 2011 regarding Sailing-Navigation Assistance Facilities has not yet been explained but it is at IALA; and (5) Marine Electronic Highway (MEH) becomes the backbone of shipping safety in the Singapore Strait with precision navigation.

2. Factual Conditions and Impact of Factual Conditions on the Implementation of the Marine Electronic Highway (MEH)

Table 2. Factual Conditions and Impact of Factual Conditions on the Implementation of the Marine Electronic Highway (MEH)

No.	Factual Conditions	Impact of Factual Conditions
1.	The implementation of the Hydrographic Survey has been carried out	Conditions that support the Implementation of the Marine Electronic Highway (MEH)
2.	Hydrographic Survey has not been carried out	Conditions that do not support the implementation of the Marine Electronic Highway (MEH)
3.	New Hazards identified	Conditions that support the Implementation of the Marine Electronic Highway (MEH)
4.	Did not find the latest danger	Conditions that do not support the implementation of the Marine Electronic Highway (MEH)
5.	Conducted survey and awarding SBNP	Conditions that support the Implementation of the Marine Electronic Highway (MEH)
6.	Carrying out Broadcasts to provide Information to the Shipping World	Conditions that support the Implementation of the Marine Electronic Highway (MEH)
7.	Broadcast as a navigation information service	Conditions that support the Implementation of the Marine Electronic Highway (MEH)

8.	It is VTS's obligation to broadcast to the Shipping World	Conditions that support the Implementation of the Marine Electronic Highway (MEH)
9.	Passing ships provide information to VTS	Conditions that support the Implementation of the Marine Electronic Highway (MEH)
10.	There are still those who have not mastered the rules	Conditions that do not support the implementation of the Marine Electronic Highway (MEH)
11.	The latest ENC has not been used because it is still in the Hydrographic survey process	Conditions that support the Implementation of the Marine Electronic Highway (MEH)
12.	Still don't know the agency that will issue ENCs	Conditions that do not support the implementation of the Marine Electronic Highway (MEH)

The factual conditions that do not support the implementation of the Marine Electronic Highway (MEH) are; (1) Hydrographic Survey has not been carried out; (2) Did not find the latest danger; (3) There are still those who have not mastered the regulations; and (4) Still do not know the agency that will issue ENCs.

3. Factual Conditions About the Implementation of Virtual E-Aton

The factual conditions that do not support the implementation of the Marine Electronic Highway (MEH) are; (1) Hydrographic Survey has not been carried out; (2) Did not find the latest danger; (3) There are still those who have not mastered the regulations; and (4) Still do not know the agency that will issue ENCs.

Table 3. Topics and factual conditions regarding the Implementation of Virtual E-AtoN

No.	Factual Conditions	Impact of Factual Conditions
1.	Carry out periodic maintenance activities	Conditions that support the Implementation of Virtual E-AtoN
2.	Doing regular activities with Japan	Conditions that support the Implementation of Virtual E-AtoN
3.	Equation as a Navigation-Sailing Aid	Conditions that support the Implementation of Virtual E-AtoN
4.	As a support for shipping safety	Conditions that support the Implementation of Virtual E-AtoN
5.	Application reliability for software and equipment must be upgraded and can be integrated	Conditions that support the Implementation of Virtual E-AtoN
6.	Disagree because in practice it still requires a physical SBNPNP	Conditions that support the Implementation of Virtual E-AtoN

The factual condition of implementing Virtual E-AtoN which is operated as a Sailing-Navigation Assistance Facility in accordance with technological developments reflects the desired conditions but there are no undesirable conditions, to raise attention to aspects of shipping safety with the application of Virtual E-AtoN which is operated as Auxiliary Means Navigation-Sailing in accordance with technological developments.

4. Focus Group Discussion (FGD) Results

The majority of participants understand shipping safety.

Based on E-navigation, the governments of Indonesia, Malaysia, Singapore, in collaboration with IHO, IMO and Worldbank in particular, made a demonstration project that can be considered as an embryo of e-navigation in the Malacca Strait and Singapore Strait. and wind data provided by several sensor stations installed in three coastal countries which in essence can improve shipping safety and protect the maritime environment. The definition of e-navigation according to IMO MSC85,2007 can be explained that "E-navigation is harmonized collection, integration, exchance, presentation, and analysis of maritime information onboard and ashore by electronic means to enhance berth to berth navigation and related services, for safety and security at sea and protection of the marine environment."

Difference between E-AtoN and Virtual E-AtoN. Related to E-AtoN or Virtual E-AtoN is AtoN that is installed but does not use physical, only virtual which will be listed on ENCs but AIS AtoN cannot be called E-AtoN because Sailing-Navigation Assistance Facilities are in the form of visual and electronic. So, it is necessary to get a clearer definition of Virtual aids to Navigation with references to IALA guidelines and other sources. And Virtual AtoN is a breakthrough that can provide the latest navigational hazard markings, where when installing a physical Sailing-Navigation Assistance Facility it still takes 2-3 days for the latest navigation hazard marking.

Information from the Joint Hydrographic Survey activities in the Malacca Strait and the Singapore Strait is currently in the implementation stage. The Joint Hydrographic Survey was conducted by three coastal countries (Indonesia, Malaysia and Singapore) and Japan. Currently still in the process of the Joint Hydrographic Survey survey and carried out in three stages from 2018 and estimated to be completed in 2020.

Based on the MoU between Indonesia, Malaysia, Singapore, Malacca Straits Council and surveyors carried out by three countries with assistance from Japan. Based on the agreement, the data after being made into ENCs can be produced by Indonesia, Malaysia and Singapore and Japan. In the Straits of Malacca and Singapore (SOMS) there are Malacca and Singapore

Strait ENCs (MSSENCs) to carry out the finalization of ENCs which will then be jointly issued. Meanwhile, all Indonesian Marine Maps, either paper charts or electronically, are produced by the Indonesian Navy's Pushidrosal. The data will be shared with the British Admiralty.

From a regulatory point of view, the discussion of Virtual aids to Navigation has been carried out at IMO, which is one part of the NCSR meeting which will then be issued an IMO resolution related to and linked to SOLAS. Seeing that Indonesia is a member of the IMO and of course, is obliged to implement these rules. However, it can also follow the technical rules already contained in the IALA Guidelines. In addition, standards need to be issued because they are related to technological developments. It should be explained that the provisions do not have to regulate giving legal, regulatory or legal effects or provisions can provide guidance, so some are technical in nature so that PM 25 of 2011 concerning Sailing-Navigation aids and PM 26 of 2011 concerning Shipping Telecommunications is technical in nature. related to law enforcement, you can, but you have to distinguish which ones should be enforced or which ones should be guided. And there needs to be trial and error testing to get technical input before it is implemented.

Currently, there is an Indonesian e-navigation study with the big concept of Indoenav which is more specialized in conducting surveillance and maritime communication. It does not mention E-AtoN but it is possible if it is included in an e-navigation plan itself. So that the Regulation of the Director General of Sea Transportation can be discussed whether it is necessary to follow up studies related to the use of e-AtoN so that it can be implemented. All technologies, whether e-electronic navigation, electronic AtoN or Virtual AtoN will all be based on AIS and Satellite. In the future, it will use satellite and can be used for anything related to e-navigation because based on Positioning, Navigation and Timing (PNT) everything related to e-navigation in the form of Virtual AtoN.

5. Documentation Results

Judging from the existing documentation, it can be said that the Class I Navigation District of Tanjung Pinang has carried out its duties in improving shipping safety. As a result of the sinking of the Tanjung Pinang Class I Navigation District, five units of Cardinal Beacon Buoys have been marked at the location where the MV ship sank. Thorco Cloud, so ships can pass safely in the area. The condition was found that the Batu Berhanti Beacon Buoy was often hit by ships and drifted in Singapore waters. Currently, the ship ran aground, namely MV Shahraz and MV Samudera Sakti in the area of the Beacon and Batu Berhanti Beacon, but the Beacon and Beacon Buoy are in good working condition. This condition has been reported by the VTS

Batam operator. The Wavemaster 5 ferry also ran aground at Karang Galang Batam. It can be seen from the location that there are Sailing Navigation Assistance Facilities in the form of Beacon Signs. In the Karang Galang documentation, it is very clear but it still runs aground during the day. Looking at the Indonesian Marine Map Number 349 of 2014, it is very clear that there is Karang Galang.

The implementation of Virtual AIS AtoN owned by VTS Batam belonging to the Class I Navigation District of Tanjung Pinang has given results where the Sailing-Navigation Assistance Facility that has been installed and provided with Virtual AIS AtoN is not hit by a ship. Integration, harmonization and standardization between VTS (AIS, Radar and Radio Navigation) with Ships can be developed and expanded to reach all components including Sailing-Navigation aids as well as those related to shipping safety facilities in supporting shipping safety and the development of autonomous ship technology (Autonomous Ship) with Artificial Intelligence.

This research is in line with previous research which discussed the use of navigation aids. Research (Zaman et al., 2015) shows that ship safety will increase significantly if the ship follows the guidelines for the use of navigational aids that have been set. In addition, according to (Yaacob & Koto, 2018; Zaman et al., 2021, 2020) by using the Automatic Identification System (AIS) receiver, the current condition of ships in the Malacca Strait area can be monitored properly. In addition, the data recorded on the AIS receiver can be used for research to improve navigational safety. This study is also in line with other studies by (Meng et al., 2014) which analyzed the characteristics of ship traffic in the Singapore Strait with the finding that with the limitations of the Automatic Identification System, there are differences in ship density for westbound traffic than for eastbound traffic.

Thus, overall this study supports research conducted by (Zaideen et al., 2017) with potential strategies for navigational safety and protection of the marine environment in the Straits of Malacca and Singapore. This research will assist in setting priorities for future efforts to improve navigational safety for the protection of the marine environment with regard to international and regional initiatives.

4. Conclusion

The factual condition of e-navigation regulations and virtual electronic Aid to navigation in supporting the implementation of e-navigation and virtual aid to navigation as a support for the development of other electronic navigation-sailing aids technology into the Minister of Transportation Regulation number PM number 25 of 2011 concerning Navigation-Sailing

Assistance Facilities reflects the desired conditions and undesirable conditions to realize shipping safety. The factual conditions that reflect undesirable conditions for the implementation of e-navigation and the concept of virtual electronic aid to navigation are different understandings of shipping safety, different understandings of e-navigation in data integration, not fulfilling the aspects of shipping safety, there are still ships running aground and incidents others, there is a regulation that the Minister of Transportation Number PM.25 of 2011 has not explained but is in the IALA, and the application of e-AtoN and Virtual e-AtoN can be implemented but only for large ships and not for fishing boats.

The factual condition of the implementation of the Marine Electronic Highway (MEH) is the backbone of shipping safety in the Singapore Strait with precision navigation. The factual conditions that do not support the implementation of the MEH are that a Hydrographic Survey has not been carried out, not found the latest hazards. There are still those who have not mastered the regulations and still do not know which agency will issue ENCs. The statements above reflect unfavorable conditions for the implementation of the MEH

The factual condition of implementing Virtual E-AtoN which is integrated with Vessel Traffic Service (VTS) and Electronic Chart Display and Information System (ECDIS) as an integrated e-navigation solution according to technological developments. Factual conditions reflect the conditions that support and conditions that do not support. The factual conditions reflect that the implementation of Virtual E-AtoN which is operated as a Sailing-Navigation Assistance Facility in accordance with technological developments reflects the desired conditions.

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