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Evaluating the framework of maritime domain awareness in Japan: opportunities for improvement

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EVALUATING THE FRAMEWORK OF MARITIME DOMAIN AWARENESS IN JAPAN:

Opportunities for Improvement

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Declaration

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

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Abstract

Title of Dissertation: **Evaluating the Framework of Maritime Domain Awareness in Japan: Opportunities for Improvement**

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Considering the entire maritime situation is the first step to secure maritime safety and security. It is now defined as Maritime Domain Awareness (MDA) and many countries and organizations have made an effort to enhance the MDA. This paper is a study of the information sharing platforms for enhancing the MDA, comparing Japan's platform named the MDA Situational Indication Linkage (MSIL) with the EU's platform named Common Information Sharing Environment (CISE) in order for the better improvement of MSIL.

A brief overview is taken at the present states of Japan and the EU in the context of the MDA, and at the system designs and future perspectives. Both MSIL and CISE are expected to play an important role to integrate or exchange maritime information. Both systems seemingly look similar to each other but their progress is completely different. MSIL is a web application using the Application Programming Interface (API) and its concept originated from the scientific aspect. On the other hand, CISE is a virtual private network (VPN) based on the peer-to-peer network and its concept originated from the needs of effective border control. From the comparison between MSIL and CISE, this paper suggests some recommendations for improving MSIL.

Additionally, a survey using a questionnaire targeting the working-level officers engaged in the MDA administrations in Japan Coast Guard was implemented and some answers were collected. These answers were used to elaborate the suggestions through a comparison. The concluding chapter summarizes the findings through the comparison and elaborated suggestions for the better improvement of MSIL.

KEYWORDS: Maritime Domain Awareness, MSIL, CISE, Information sharing

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List of Abbreviations

API	Application Programming Interface
BAOP	Basic Act on Ocean Policy
BPOP	Basic Plan on Ocean Policy
CCA	CISE Cooperation Agreement
CDM	CISE Data Model
CISE	Common Information Sharing Environment
CM	Councillors' Meeting
COJ	Cabinet Office, Japan
CoopP	Cooperation Project
CSG	CISE Stakeholders Group
CSM	CISE Service Model
DGMARE	Director General for Maritime Affairs and Fisheries
EC	European Commission
EEA	European Economic Area
EMFAF	European Maritime, Fisheries and Aquaculture Fund
EMSA	European Maritime Safety Agency
EU	European Union
EUMSS	European Union Maritime Security Strategy
EUROSUR	European Border Surveillance System
GIS	Geographic Information System
HOP	Headquarters for Ocean Policy
IMO	International Maritime Organization
ICT	Information and Communication Technology
IODE	International Oceanographic Data and Information Exchange
JCG	Japan Coast Guard
JODC	Japan Oceanographic Data Center
JRC	Joint Research Centre, European Commission
LDP	Liberal Democratic Party of Japan

LS	Legacy System
MC	Marine Cadastre
MDA	Maritime Domain Awareness
MICH	Marine-related Information Clearing House
MSIL	MDA Situational Indication Linkage
NOPS	National Ocean Policy Secretariat
PT	Project Team
P2P	Peer to Peer
RTS	Responsibility to Share
VPN	Virtual Private Network

Chapter 1 Introduction

1.1 Background

Considering the entire maritime situation is the first step to secure maritime safety and security. This first step has an especially important meaning for the security and the economy (Cheng, 2019). Contrasting their land territory, island countries usually have vast territorial waters and Exclusive Economic Zone. This feature implies that it is necessary for them to efficiently deploy their limited assets in order for their better situational awareness of these areas. The concept aiming to achieve this challenge composes the basis of measures called Maritime Domain Awareness (MDA) in Japan.

The concept of the MDA originated from the United States after the tragic attack of 11th September 2001 (Asahara et.al, 2021; Cabinet Office, Japan [COJ], 2016; COJ, 2015). This attack shocked governmental officials and triggered the discussion on the risk of terrorism targeting citizens, particularly in the maritime domain (Boraz, 2009). This is the beginning of the MDA and the United States defined the MDA as "the effective understanding of anything associated with the global maritime domain that could impact the security, safety, economy, or environment of the United States" (The United States, 2005, p.1). Today, this concept has spread to many countries and organizations, for example the International Maritime Organization (IMO) defined the MDA as the "effective understanding of any activity associated with the maritime environment that could impact upon the security, safety, economy or environment" (IMO, 2010, p.3). The European Commission (EC) also defined similar concepts as Maritime Situational Awareness, which was "the effective understanding of activity associated with the maritime domain that could impact the security, safety, economy, or environment of the European Union and its Member States" (EC, 2009, p.2). This trend involves Japan without exception.

Japan defined the MDA as the "efficient understanding of situations associated with the oceans while bearing in mind how to handle the effective collection,

consolidation, and sharing of diverse information about the ocean that contribute to maritime security, ocean environmental protection, marine industry promotion, and science and technology development" (Japan, 2018, p.26). This concept pursues "efficient" understanding of maritime affairs and implies Japan's ambition to deploy their limited resources as optimum as possible. To achieve this goal and ensure better MDA, the COJ has implemented three specific approaches, which are composed of consolidation of assets, consolidation of information sharing systems and consolidation of international cooperation (Asahara et.al, 2021; COJ, 2018), and one of the remarkable outcomes was observed under the second approach.

The fruit of the second approach, consolidation of information sharing systems, was the launch of a web-based geographic information system (GIS) named MDA Situational Indication Linkage (MSIL) in 2019. The purpose of MSIL is to provide easy access to geospatial information delivered by governmental agencies and relevant organizations under the overall inter-ministerial coordination by the National Ocean Policy Secretariat (NOPS), COJ ("Terms of Use", 2018). In other words, MSIL is just the one specific platform to be utilized as the basic system for various maritime fields including security, policy making, disaster response, environmental research and resource exploring (COJ, 2018). The launch of MSIL itself is the valuable first step for the achievement of integrating and sharing information but this project has to proceed to the second step, developing MSIL and enabling it to be utilized as the basic system for various maritime fields.

1.2 Problem Statement

It is effective for enhancing the MDA to introduce a cross-sectoral information sharing environment (Hassen & Dalaklis, 2021). Although MSIL has the potential to achieve a cross-sectoral information sharing environment, that potential is not demonstrated sufficiently; for example, a project team (PT) under the Councillors' Meeting (CM) in the Headquarters for Ocean Policy (HOP) indicated that much maritime information requested by MSIL users is still remaining unavailable (COJ,

2020a). Another PT also suggested that Japan Coast Guard (JCG), which operates MSIL, should empower the security of MSIL and expand its functions to exchange maritime information among public sectors, private sectors and foreign authorities (COJ, 2020b). Because MSIL was launched only three years ago, these challenges for better MDA are still remaining.

On the other hand, expanding into the world, several examples which are struggling to achieve a cross-sectoral information sharing environment are already existing. There are various ways to establish the environment of information sharing for better MDA but it differs from country to country, organization and regional union. For instance, the United States adopted the approach to restructure their organizations to easily share information. Several European countries also established a national interagency Maritime Information Centre, such as France, Italy and the United Kingdom (Tikanmäki & Ruoslahti, 2017). This approach is recommended by several studies (Tikanmäki & Ruoslahti, 2017; Nimmich & Goward, 2007; Transportation Research Board of the National Academies, 2004) and might display the dramatic effectiveness for improving their MDA. However, Japan adopted the other way similar to the European Union (EU), whose approach is to establish a platform enabling them to collect and share the cross-sectoral information among the maritime authorities in the EU. This system is called Common Information Sharing Environment (CISE).

CISE was first proposed in 2009 (European Maritime Safety Agency [EMSA], 2022a; EC, 2019b; Raptis, 2018; EC, 2017; EC, 2016; EC, 2013; EC, 2011; EC, 2009). Since then, EC has accumulated the know-how through running the test bed called EUCISE2020 and other relevant projects. The objective of CISE is to provide timely and secured access to relative information, which enables national authorities and EU agencies to enhance their maritime surveillance picture (EC, 2014a). This platform is based on the specific network (EMSA, 2022b; EC, 2014a) connecting relevant agencies in the EU and European Economic Area (EEA) but its expected

functions are very close to MSIL. In addition, CISE could have an advantage of accumulating its know-how which might be useful for developing MSIL. Comparing both systems could also contribute to the development of MSIL. Therefore, especially throwing the light on CISE and MSIL, this study considers what challenges exist in these information sharing platforms and how they should develop into better MDA at this moment.

1.3 Aims and Objectives

The timely and efficient collaboration across sectors or borders is paramount and it is recognized that cross-sector and cross-border information sharing has the grave importance for maritime authorities (Riga et.al, 2021; Tikanmäki & Ruoslahti, 2017). It does not have any exceptions to the enhancement of the MDA. To achieve this cross-sectoral information sharing, there are various platforms or organizations enhancing national or regional MDA in the world at this moment. Particularly, Japan has planned to seek international cooperation through the MDA and MSIL is expected to become the basic platform of these cooperation. On the other hand, CISE is an international network and enables public authorities, regional organizations and EU agencies involved in maritime surveillance beyond their border to connect with each other. Furthermore, the CISE project started earlier than MSIL and has experiences, which might help to improve MSIL and make it easier to enhance international cooperation. Seeking possibilities of future international cooperation based on MSIL, this study aims to distinguish CISE from MSIL through comparison and examines future MSILs' challenges to enhance Japan's MDA and international cooperation effectively. Due to the difference of language, this comparison is absent in the literature and it is worth studying this theme.

1.4 Research Questions

To achieve the above aims, this study addresses the following research questions:

- ✓ What are the current states of the EU and Japan in the context of the MDA?
- ✓ What are the similarities and differences between CISE and MSIL?
- ✓ How should MSIL be improved for better framework?

1.5 Research Method

In this study, literature review including governmental reports and databases has been adopted as the basic research method to analyze information sharing platforms and describe the answers of the above research questions. Furthermore, using a quantitative approach based on the questionnaire targeting the working level officers of the JCG who are in charge of the MDA administrations, the answer of how to improve MSIL is more elaborated.

1.6 Expected Outcome

This study had expected the following results:

- ✓ Both CISE and MSIL are defined clearly in the context of the MDA.
- ✓ The EU's know-how gives some recommendations for Japan's MDA system.
- ✓ Better ways to integrate maritime information and enhance the MDA are suggested.

Chapter 2 Political Overviews

The requirements for integrating maritime information have been increasing due to the augmentation of social risks, such as piracy, smuggling, search and rescue, environmental protection, fishery resource management and so on. Furthermore, the Internet provides a huge network connecting almost all the business areas globally and playing a prominent role in the world (Rajamäki et.al, 2019). This connection through the Internet benefits all aspects of society including crimes and other threats against society. The more generalized the Internet has become, the more risky and unexpected crimes can happen. In other words, the Internet make it possible to face more complicated threats and causes the strong requirement for integrating information as much as possible in order to overcome these complicated social threats. In the era of exchanging information fast and ubiquitously, a comprehensive, collaborative and efficient maritime surveillance and data exchange instrument among maritime regions, states, systems and technologies is critically demanded (Mihailović et.al, 2021a).

Riga et.al (2021) said that there are five benefits of deploying an information sharing platform for maritime monitoring, which include as follows:

> (a) minimizing the risk of human errors;
> (b) establishing a standard detection threshold, which can be dynamically adapted each time according to the needs and the occurring incidents;
> (c) expanding the human cognitive area;
> (d) reducing the need for highly experienced and specialized personnel;
> (e) reducing the adaptation and familiarization time for the operational personnel with a minimal impact in their performance (p. 604).

Naturally, MSIL and CISE pursue the above benefits but their approaches are different from each other. In this chapter, the differences between MSIL and CISE are summarized by their political background and their states at this moment are described.

2.1 Japan and the MDA

The MDA in Japan is strongly implemented by the NOPS and relevant agencies, which was based on the Basic Plan on Ocean Policy (BPOP). The BPOP is now in the third phase and it was decided under the Basic Act on Ocean Policy (BAOP), which was a national law and entered into force in 2007 (Japan, 2013; Japan, 2008). The BAOP aims to contribute to the sound development of the economy and society of Japan, improve the stability of the citizens' lives and contribute to the coexistence of the oceans and mankind (Japan, 2018; Japan, 2008). Moreover, it also regulates the six principles to achieve the aim, which are composed of the following: harmonizing development and use of the ocean with conserving marine environment; securing safety at sea; improving scientific knowledge of the ocean; promoting sound development of ocean industries; managing the ocean comprehensively; and leading international partnership with regard to the ocean (Japan, 2018; Japan, 2008). These objectives reflected that seaborne trade occupies 99% of Japan's total amount of trade (COJ, 2015) and Japan is just an oceanic state. In the latest BPOP (Japan, 2018), the MDA is one of the most important measures to achieve the principle of securing safety in the BAOP and also contributes to promoting developments of science and technology, maritime industry and marine environment protection. However, focusing on the former BPOPs, it can be observed that the MDA and information sharing are not always recognized as the important measures in Japan. In the following sections, Ocean policies in Japan and the position of the MDA and several information sharing systems in it are summarized.

2.1.1 The First BPOP (2008 – 2013)

The first BPOP was issued in 2008 when it was the next year of entering into force of the BAOP. The BPOP foresees beyond five years later and it is reviewed every five years under the BAOP (Japan, 2008). Therefore, this first plan was focusing on the ideal situation in 2013 and three main objectives were set out: the first one is the challenge to take initiative in coping with panhuman problems in the sea; the second one is to build the foundation for sustainable use of rich marine resources and spaces; the third one is the contribution in the maritime fields for ensuring the safety and

security of citizens' lives (Japan, 2008). These objectives reflected the challenges of Japan's ocean policy, which was described as that there were no policies from the perspective of how to control the utilization and manage the space of the sea even though there were many policies from the perspective of how to use the space of the sea as the users (Asahara et.al, 2021; Japan, 2008). To overcome this challenge and achieve these objectives, the first BPOP proposed that the government should establish the system integrating maritime information in a user-friendly manner to enhance marine surveys effectively because each governmental agency collected and managed maritime information in accordance with their own objectives (Asahara et.al, 2021; COJ, 2015; Japan, 2008) and there were a few demands for sharing that information (Tsunoda, 2019). Specifically, Japan Oceanographic Data Center (JODC), which was established in 1965 to provide the international service under the framework of International Oceanographic Data and Information Exchange (IODE) (JCG Foundation, 2018; Rinno, 2014; Japan, 2008) and other existing systems were utilized to enhance the integration (Asahara et.al, 2021; Japan, 2008). The main outcomes of this action were the launch of the Marine-related Information Clearing House (MICH) (See section 3.1.1) and the Marine Cadastre (MC) (See section 3.1.2). In addition, it was most remarkable that this action did not focus on maritime safety and security but focused on scientific activities related to oceanographic and hydrographic activities. It implies that the government did not consider this project from the perspective of the MDA and did not intend to utilize the outcomes for enhancing the MDA. In fact, the consideration from the perspective of the MDA was started in 2015.

2.1.2 The Second BPOP (2013 – 2018)

The second BPOP was issued in 2013 to review the outcome of the former plan and set out new objectives reflecting the latest circumstances. The second BPOP proposed that the government should improve and strengthen the MICH and the MC, develop systems for analyzing and visualizing data and increase use of maritime information (Japan, 2013). However, these measures were still based on the scientific

context (Japan, 2013) and not explained in the context of the MDA. Under the security section, the BPOP did no more than propose that the government should investigate the methods of vessel monitoring which included a framework for integrating, managing and providing the information (Japan, 2013). It also referred to the coordination system among the relevant agencies, which should be strengthened in order that the government could respond in an integrated manner (Japan, 2013), but these topics were not described in the relations with the MICH or the MC. The MDA was not a hot topic then but the situation had gradually changed due to the document named 'About Japan's MDA'.

In this document, the concept of the MDA was firstly defined and the NOPS set out the three main objectives which should be achieved by strengthening the capacity of the MDA (COJ, 2015). These objectives were composed of promptly responding to the threats including maritime safety and security incidents and natural disasters; efficiently implementing ocean policies through effective use of maritime information; and contributing to international collaboration and cooperation (COJ, 2015). Particularly, focusing on the information sharing, the document described the basic concept as that the MDA should be realized by providing maritime information in a useful manner and improving the accessibility of maritime information (COJ, 2015). It also proposed the important concept of system structures for information management, which indicated that maritime information and systems should be divided into three layers: the layer that everyone can access; the layer that governmental agencies can access; and the layer that limited governmental sectors can only access (COJ, 2015). Based on these concepts, the NOPS had started considering the new systems including their functions and necessary rules, whose outcome was the next document named 'Actions for Enhancement of the MDA'.

In the next document, three MDA objectives were specifically described as strengthening the system gathering, sharing and providing information; strengthening the assets for gathering maritime information including ocean survey; and promoting

international collaboration and cooperation related to information sharing and ocean survey (COJ, 2016). Moreover, it was proposed that the new system integrating, sharing and providing maritime information would be based on the MC and enrich the maritime information including real-time and global information (Asahara et.al, 2021; COJ, 2016), whose design and operation were entrusted to the JCG under the coordination of the NOPS (Katsura et.al, 2018; COJ, 2016). This was just the first step for launching MSIL.

2.1.3 The Third BPOP (2018 – 2023)

The third phase of the BPOP begun in 2018 when it was just after the completion of the second BPOP. The most remarkable point of the third BPOP is that the MDA was evaluated as the fundamental measures for maritime security (Tsunoda, 2019; Japan, 2018) and it was also stated in the document that it was necessary to establish MSIL (Japan, 2018). Furthermore, following the third BPOP, the NOPS issued the important document named 'The Future Directions to Strengthen MDA Capacity of Japan', which developed the former considerations including the third BPOP and summarized them understandably. In this document, the three main objectives are revised as the three approaches for strengthening the MDA: consolidation of assets (strengthening "the eyes" of the MDA); consolidation of information sharing systems (strengthening "the nerve" of the MDA); and consolidation of international cooperation (strengthening international network of the MDA) (Asahara et.al, 2021; COJ, 2018). These approaches were divided into more specific measures and the development of MSIL was described as one of the specific measures under the approach for consolidation of information sharing systems (COJ, 2018). Specifically, it was suggested to promote the collaboration with other systems and increase the real-time and global information; on the other hand, the concept of system structures for information management succeeded to this document (COJ, 2018). In addition, MSIL was also described as a tool for international collaboration (COJ, 2018; Japan, 2018). Based on these various concepts and political support, MSIL was launched in 2019 but MSIL has also been improved by the suggestions of the PTs under the CM

in the HOP after its launch (See section 3.2). These PTs deal with various themes related to the BPOP and four PTs relevant to MSIL were already held until now (COJ, 2022a).

At this moment, some actions preparing for the fourth BPOP have been observed because the third phase foresaw the timeframe until 2023 (Table 1). In particular, the Liberal Democratic Party of Japan (LDP), which is the largest party in the Diet and in power, suggested that consolidation of the MDA through space technology should be included in the next BPOP to catch unusual things and recognize the situation in a timely manner (LDP, 2022). Furthermore, the party also suggested that the personnel and budgets of the NOPS should be strengthened to strongly lead the national ocean policy in the government (LDP, 2022). These facts imply that the MDA has not been changed as the important policies and the expectation for information sharing systems including MSIL will become more complex.

Table 1. Milestones for MSIL development from 2004 onwards

2004	The launch of "CeisNet"
2005	
2006	
2007	"Basic Act on Ocean Policy" was entered into force. Headquarters for Ocean Policy was established at the Cabinet Secretariat.
2008	The "1st Basic Plan on Ocean Policy" was issued
2009	The update of "CeisNet"
2010	The launch of "Marine-related Information Clearing House"
2011	
2012	The launch of "Marine Cadastre" The launch of "CeisNet for smart phone"
2013	The "2nd Basic Plan on Ocean Policy" was issued The update of "Marine Cadastre"
2014	
2015	COJ issued "About the Japanese MDA" The launch of "Marine Cadastre for Tablets"
2016	COJ issued "Actions for Enhancement of MDA" The update of "CeisNet" and "Marine Cadastre"
2017	Headquarters for Ocean Policy was reorganized into the National Ocean Policy Secretariat at the Cabinet Office.
2018	The "3rd Basic Plan on Ocean Policy" was issued COJ issued "The Future Directions as to Strengthen MDA Capacity of Japan"
2019	The launch of "MSIL"
2020	The launch of "MSIL for smart phone" COJ issued "The Meeting Report on the Enhancement of Utilizing MSIL, 2020" COJ issued "The Report on the Project Team for Enhancing MDA"
2021	MSIL API was partially opened COJ issued "The Report on the Project Team for Ensuring International Collaboration and Enhancing International
2022	COJ issued "The Report on the Project Team for Maritime Security Policy Based on the Current Situation around Japan"
2023	The "4th Basic Plan on Ocean Policy" will be issued COJ will review "The Future Directions as to Strengthen MDA Capacity of Japan"

Note. Edited by Author. Adapted from "History of the Developments in Providing Marine Spatial Data", by Ashara et.al, 2021, p.176. http://hdl.handle.net/1834/41914

2.2 The EU and CISE

The EU is composed of 23 coastal countries out of 28 Member States and 26 are flag states of merchant vessels (Raptis, 2018; EC, 2014c). Actually, 85% of its external borders whose length extends about 142,000 km are coastal and the Member States have over 1,200 commercial ports, over 8,100 flagged vessels which are over 500GT only and 4,300 registered shipping companies (Raptis, 2018; EC, 2014c). Moreover, there are approximately 400 authorities dealing with maritime surveillance information collected from multiple types of sensors and systems within the EU (EC Joint Research Centre [JRC], as cited by Bosilca, 2016). These data shows how important the implementation of CISE is and how huge the benefit from CISE is. In

the following sections, describing CISE from political aspects, the overview of CISE is mainly provided and its status at this moment is summarized.

2.2.1 Proposal of CISE and Substantiation

The first proposal of the establishment of CISE was announced in 2009 by the EC communication (EMSA, 2022; Raptis, 2018; EC, 2016; EC, 2013; EC, 2011; EC, 2009). This communication, which was based on the former communications about maritime border control (See Appendix A) (EC, 2016), set out guiding principles towards its establishment (Rajamäki et.al, 2019). CISE was explained with four key words: Interoperability; Improving situational awareness; Efficiency; and Subsidiarity. Interoperability means that the EU has to find a way to enable the information exchange between sectoral systems (EC, 2016; EC, 2009). Improving situational awareness literally indicated that the information obtained in CISE should improve the situational awareness within the EU (EC, 2016; EC, 2009). Efficiency means that CISE should contribute to avoiding duplications in the collection of information and reducing the financial costs for all actors involved (EC, 2016; EC, 2009); specifically, more than 50% of gathered information was collected solely by Defence communities and the Maritime Safety and Security community (Raptis, 2018; COWI, 2014). Subsidiarity means the enhancement of coordinating the collection and verification of information from all their agencies (EC, 2016; EC, 2009). Additionally, four guiding principles were defined as that: Principle 1 is to interlink all user communities; Principle 2 is to build a technical framework for interoperability and future integration; Principle 3 is to exchange information between civilian and military authorities; and Principle 4 is to specify the legal provisions (Raptis, 2018; EC, 2016; EC, 2011; EC, 2010; EC, 2009). These guiding principles were based on the roadmap towards the maritime CISE proposed in 2010.

That roadmap aimed to make CISE fully operational by 2020 (Mihailović et.al, 2021b) and set out the six specific steps toward the operational CISE. The first step was to identify all user communities based on their functions (EC, 2016; EC, 2010;

EC, 2011) which were defined as Maritime Safety and Security; Fisheries Control; Marine Pollution Preparedness and Response; Marine Environment; Customs; Border Control; General Law Enforcement; and Defence (EC, 2013; EC, 2010). The second step was to designate data sets and implement gap analysis for data exchange to ensure that there is an added value to CISE (EC, 2016; EC, 2010; EC, 2011). The third step was to set the common data classification levels to avoid classifying the data in a different manner (EC, 2016; EC, 2010; EC, 2011). The fourth step was to develop the supporting framework for CISE in order to set up the interfaces between the existing and planned sectoral systems in view of enabling cross-sectoral data exchange (EC, 2016; EC, 2010; EC, 2011). The fifth step was to establish access rights to enable user communities to utilize various data sets and the last step was to ensure respect of legal provisions (EC, 2016; EC, 2010; EC, 2011). To overcome these steps, various precursor projects were implemented under the leadership of the Director General for Maritime Affairs and Fisheries (DGMARE) (See Appendix B).

After the precursor projects, the EC issued a new communication in 2014. This communication proposed that CISE was defined as the voluntary collaborative process in the EU seeking to further enhance and promote relevant information sharing between authorities involved in maritime surveillance (EC, 2019b; EC, 2014b; "CISE Transitional", n.d.b). Promoting the information sharing between maritime surveillance authorities was the key strategic objectives of the EU, especially between civil and military authorities. It also indicated that CISE could benefit the European economy of around 400 million EUR per year (EC, 2014b). To achieve them, the EC asked Member States to continue to work on modernising their maritime surveillance IT set up and proposed two remarkable projects: developing a nonbinding Maritime CISE handbook including best practices and how to apply CISE by 2016; and launching a project to test CISE on a large scale in 2014 under the EU's Seventh Framework Programme for Research (EC, 2014b), which would become the EUCISE2020 project (See Appendix B).

2.2.2 The EU Council Conclusions and the EUMSS

At this moment, the political backbone of CISE is composed of three different EU Council conclusions. The first one is the Council conclusions on a sustainable blue economy, which stated that the council encouraged the EC to continue their effort to establish a full-operational CISE for maritime domain in cooperation with Member States and the relevant EU agencies (EU, 2021a). In this conclusion, maritime security and maritime surveillance were defined as the pre-condition for the successful blue economy in the EU and the council emphasize the needs to exchange know-how and best practices, cooperate and support the development of the European component of the Global Ocean Observation System to achieve blue economy (EU, 2021a). The second one is the council conclusions on maritime security, which expressed that the council welcomed the development of CISE and asked the EC to keep their effort to establish a full-operational CISE (EU, 2021b; EMSA, n.d.a). This conclusion aims to secure a free and peaceful use of the seas (EU, 2021b) and the council particularly highlighted the importance of the current transitional phase of CISE managed by EMSA (EU, 2021b; EMSA, n.d.a). The council also asked the Member States to actively participate in CISE in spite of voluntary-based cooperation (EU, 2021b). Specifically, the above two conclusions were commonly referred to the EU Maritime Security Strategy (EUMSS) Action Plan. This is the third conclusion and it provided CISE with robust policy support and refined development (EMSA, 2022a; EC, 2019a).

The EUMSS Action Plan was based on the four principles of the EUMSS composed of a cross sectoral approach, functional integrity, respect for rules and principles and maritime multilateralism (EU, 2018). The aim of the EUMSS Action Plan was, therefore, to implement cross-sectoral actions mainstreaming maritime security into EU policies, strategies and instruments in a comprehensive and coordinated manner in accordance with the EU Internal Security Strategy and other relevant EU policies (EU, 2018). The importance of the swift implementation of CISE with taking into account its sustainability and existing networks was also highlighted (EU, 2018), which is the common point of the three conclusions. In addition, this conclusion

mentioned supporting the establishment of a large maritime awareness picture at national and EU levels by making full use of the capacity offered by the various EU-wide projects including CISE (EU, 2018). These facts reflected the huge expectation of CISE's benefits for the economy and security and they made robust policy support for CISE. It also means that CISE is one of the important components of the EUMSS and its Action Plan (EMSA, 2021b; EMSA, n.d.a).

2.2.3 The CISE Transitional Phase

The CISE Transitional phase was set up by the EC in 2019, which was based on the result of the EUCISE2020 project (EMSA, 2022c). The DGMARE simultaneously entrusted EMSA with the operation of this phase and the coordination with Member States through two Grant Agreements (EMSA, 2022a; EMSA, 2022c; EMSA, n.d.a) and the JRC collaborated with EMSA (EMSA, 2021b). This phase will last until the end of 2023 (EMSA, 2022c) and its purposes are roughly summarized into five categories. The first one is to maintain and consolidate the CISE network and its interoperable building blocks through further support for Member States and delivery of a new version of the software (EMSA, 2022a; EMSA, 2022c; EC, 2019b; "CISE Transitional", n.d.a; "CISE Architecture", n.d.). The second one is to enhance complementarity of information sharing and interoperability with existing EU maritime surveillance systems through defining an auditing scheme to foster the sharing capabilities among the stakeholders ("CISE Transitional", n.d.a; EMSA, 2022c, EMSA, 2022a). The third one is to define and configure additional data exchange services required in the current CISE network like the realization of the classified network and how to deal with classified information ("CISE Transitional", n.d.a; EMSA, 2022c). The fourth one is to expand the participation in CISE into all Member States of the EU/EEA, and related EU agencies to transform the one specific research project into the EU-wide operational network on a voluntary basis (EMSA, 2022a; EMSA, 2022c). The fifth one is to establish an initial set of services for the next Operational Phase (EMSA, 2022a; EMSA, 2022c). In order to achieve them, the EC and EMSA established a set of governance systems coordinating the

Member States and related EU agencies, which is the CISE Stakeholders Group (CSG).

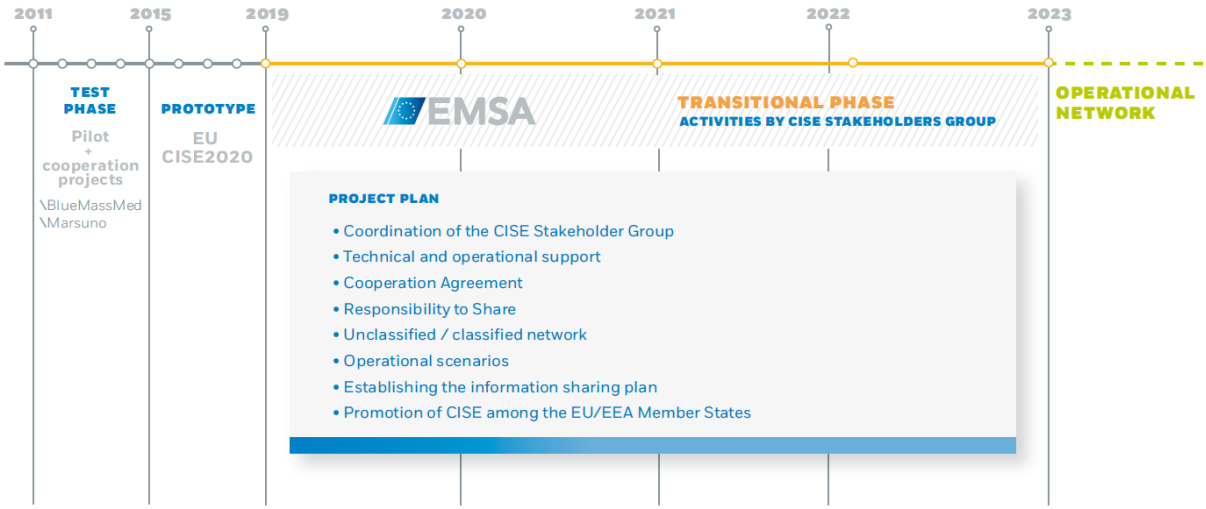

Figure 1. Time table of the CISE project

Note. From "Common Information Sharing Environment: Cross-Border & Cross-Sector Information Sharing for Maritime Surveillance", by EMSA, 2022a, p.2. http://www.emsa.europa.eu/newsroom/latest-news/download/7021/3829/23.html

The CSG is composed of representatives of Member States and EU agencies (EMSA, n.d.c) and responsible for providing necessary guidelines and orientations for this transitional phase ("CISE Transitional", n.d.b). The meetings of CSG are usually held quarterly but at least twice in any twelve-month period ("CISE Transitional", n.d.b). These meetings are coordinated by EMSA providing the chairmanship and secretariat ("CISE Transitional", n.d.b); therefore, EMSA especially plays an important role in implementing the transitional phase. Furthermore, the CSG can set the working groups during the transitional phase ("CISE Transitional", n.d.b) and five working groups, including the Cooperation Agreement, the Responsibility to Share (RTS) and the Security are established (EMSA, n.d.c). The working groups basically work in video teleconferencing or correspondence ("CISE Transitional", n.d.b). These activities are funded by the

DGMARE through two Grant Agreements with a total budget of 6.9 million EUR and additional support is driven through the European Maritime Fisheries and Aquaculture Fund (EMFAF) (EMSA, 2022c). All of these objectives are not completely implemented at this moment when it is the last one year of the transitional phase; therefore, a remarkable outcome will be expected by the end of 2023. The timeline of whole events related to the CISE project is exhibited in Table 2.

Table 2. Milestones for CISE development from 2006 onwards

2006	EC issued "Reinforcing the management of the EU's SouthernMaritime Border"
2007	EC issued "An Integrated Maritime Policy for the European Union"
2008	EC issued "Examining the Creation of EUROSUR" BlueMassMED project began
2009	EC issued "Towards the Integration of Maritime Surveillance: A CISE for EU Maritime Domain" MARSUNO project began
2010	EC issued "Draft Roadmap towards Establishing the CISE for the Surveillance of the EU Maritime Domain"
2011	MARSUNO project was completed CoopP began
2012	BlueMassMED project was completed
2013	
2014	EC issued "Better Situational Awareness by Enhanced Cooperation across Maritime Surveillance Autorities: Next Steps within the CISE for EU Maritime Domain" CoopP was completed EUCISE2020 project began Finantial support of EMFF began
2015	
2016	
2017	
2018	EU issued "Council Conclusions on the Revision of the EUMSS"
2019	EUCISE2020 project was completed CISE transitional phase began EMSA was entrusted through the Grant Agreements
2020	Finantial support of EMFF finished
2021	EU issued "Council Conclusions on a Sustainable Blue Economy: Health, Knowledge, Prosperity, Social Equity" EU issued "Council Conclusion on Maritime Security" Finantial support of EMFAF began
2022	
2023	CISE transitional phase will be completed CISE operational phase will begin
2024	
2025	
2026	
2027	Finantial support of EMFAF will finish

Note. Edited by Author. Adapted from "European Sea Border Surveillance and Ship reporting Systems: case CISE", by EC, 2016, p.16. https://www.ranger-project.eu/wp-content/uploads/2018/03/D2.1.pdf

Chapter 3 Overview of MSIL

MSIL and CISE were contrasted from their political backgrounds and several differences are observed by clarifying each history in chapter 2. From this chapter, MSIL and CISE are contrasted from the technical aspects, i.e. focusing on the information sharing platform itself. Firstly, the technical aspects of MSIL and its features are described in this chapter 3.

3.1 System Design

In 2019, MSIL was launched as the fundamental platform for the enhancement of the MDA which is dealing with world-wide and real-time information (Asahara et.al, 2021). This was the first step for the integration of maritime information in Japan, having been considered since the entry into force of the BAOP (Tsunoda, 2019). The merits of integrating maritime information were to provide a one-stop service and make it easier to manage the data, comparing and contrasting the data and its amount (Rinno, 2014). Moreover, another important point of MSIL is to visualize the maritime information on the maps as the GIS. Almost all maritime information has their geographic information (Rinno, 2014; Yamao et.al, 2009) and visualization of this information helps to understand the situation and utilize the maritime information efficiently (Asahara et.al, 2021). These two concepts, integration and visualization, are the key features of MSIL and other precursor systems before the launch of MSIL. In this section, these systems are summarized with these two key words.

3.1.1 Precursor Systems

Some efforts to integrate maritime information have already existed in some specific fields before Japan started enhancing the MDA. In particular, these activities have been implemented in the scientific field, such as the IODE and the JODC. Under the first BPOP, Japan decided to utilize these frameworks and their know-how for enhancing integration (Asahara et.al, 2021; Japan, 2008) and establish the MICH as the first step of integrating maritime information, which aimed to collect and integrate the metadata of maritime information managed by the respective

governmental agencies and provide them as a search engine (JCG Foundation, 2018; Miyake, 2012; Seta et.al, 2011; Yamao et.al, 2009). It means that the MICH does not aim to provide any data sets or raw data of maritime information (Asahara et.al, 2021). Therefore, the MICH was launched in 2010 and about 2,000 pieces of metadata collected from 200 agencies were registered in it (Miyake, 2012), but it was suggested that the MICH should be popularized and enhance registration of metadata (Seta et.al, 2011).

Focusing on the visualization of maritime information, the first maritime web-GIS service was launched in 2004 and called CeisNet. This service originated from the national action for the mitigation of the damage of oil pollution accidents and aimed to support quick and appropriate response by collecting, managing and providing coastal information through GIS (Ishikawa et.al, 2014). Specifically, CeisNet deals with the information on the location of available equipment, vulnerable nature, sluices of power plants and so on (Rinno, 2014). Due to this specific purpose, CeisNet was originally designed as a software only for public sectors but there were suggestions that it should be open to the Internet because that information is useful not only for oil pollution response but other purposes (Ishikawa et.al, 2014). Therefore, CeisNet was composed of two layers: one layer was open to everyone but another layer was only for public sectors and supposed to share classified information (Ishikawa et.al, 2014). These layers were integrated into one open layer later (Ishikawa et.al, 2014) but this system design became the basic concept of MSIL. In addition, it is important that CeisNet was transformed into a web application based on ArcGIS due to the update of its GIS server (Ishikawa et.al, 2014) because MSIL is also based on ArcGIS. This experience built the foundation of the next GIS service, the MC, and MSIL.

3.1.2 Marine Cadastre

The MC was the former platform of MSIL, which was a web-GIS service launched in 2012 and could display and overlay of various maritime information items on the map (Okano et.al, 2022; Asahara, et.al, 2021; Katsura, 2020; Katsura et.al, 2018; JCG Foundation, 2018; Rinno, 2014). This system was another outcome of the action to integrate maritime information under the first BPOP because the MICH is only the search engine providing the metadata of maritime information and could not visualize the maritime information. Some studies (Yoshikawa et.al, 2013; Miyake, 2012) suggested that it was necessary to introduce the GIS which can display and overlay maritime information; furthermore, some similar systems were already existing in foreign countries including the U.S. and Germany at that time (Tsunoda, 2019; Rinno, 2014). Therefore, the design of the MC was based on the former web-GIS service, CeisNet and the JCG launched and managed the MC (Asahara et.al, 2021; Rinno, 2014), which was also the web application based on the "ArcGIS API for Flex" provided by the Esri (Yoshikawa et.al, 2013). According to the study (Yoshikawa et.al, 2013), the ArcGIS had four advantages: ArcGIS can provide substantial functions to search and display information; its Application Programming Interface (API) source code can be provided for further customizing the application; its visual graphic is not affected by the browsing environment; and it is possible to provide easy operation and various visual graphic. These functions supported the following key features of the MC.

One of the most remarkable points of the MC is to get rid of the burden of users who had to plot the maritime information on the map and make it easier to overlay and compare several kinds of maritime information on the same map (Asahara, et.al, 2021; Rinno, 2014). This function is a basic feature of the GIS but the MC had other useful functions additionally. For example, users could share the same maps with other people through the URL and display their original geographic information through the provided template (Asahara, et.al, 2021; Rinno, 2014; Yoshikawa et.al; 2013). Because of these user-friendly design and useful functions, the MC had recorded about 200,000 accesses per month (Yoshikawa et.al, 2013). On the other

hand, all maritime information was managed in the single server (JCG Foundation, 2018) and it caused the difficulty of dealing with real-time information. Therefore, the MC was transformed into MSIL under the third BPOP and its service was finished in 2019.

3.1.3 MDA Situational Indication Linkage

Based on the know-how from the MC and other precursor systems (Asahara et.al, 2021; JCG, 2021; COJ, 2020a; Katsura et.al, 2018; JCG Foundation, 2018), MSIL had been designed in 2017 and constructed in 2018 (Asahara et.al, 2021). This implied that MSIL was strongly expected to become a hub for connecting and integrating the maritime information (JCG, 2022; JCG, 2021; Terui, n.d.). In fact, MSIL is providing over 200 kinds of maritime information including the real-time information like sea water temperatures (Asahara et.al, 2021; JCG, 2021; Katsura, 2020; COJ, 2020a). Users can visualize them and make their original maps through choosing the information they want to overlay on the map (Asahara et.al, 2021; Katsura, 2020; Terui, n.d.) as well as the MC. The functions already introduced in the MC are also equipped in MSIL, such as sharing the map with the URL, displaying their original geographic information, drawing figures freely on the map and calculating the distance (Okano et.al, 2022; Asahara, et.al, 2021; Rinno, 2014; Yoshikawa et.al; 2013; “MSIL Sosasetsumeisho”, n.d.). According to the User Manual (“MSIL Sosasetsumeisho”, n.d.), metadata, statistics, distribution charts and radar charts are additionally available in MSIL. In 2020, MSIL for smartphone was launched (Katsura, 2020) and has been improved and strengthened.

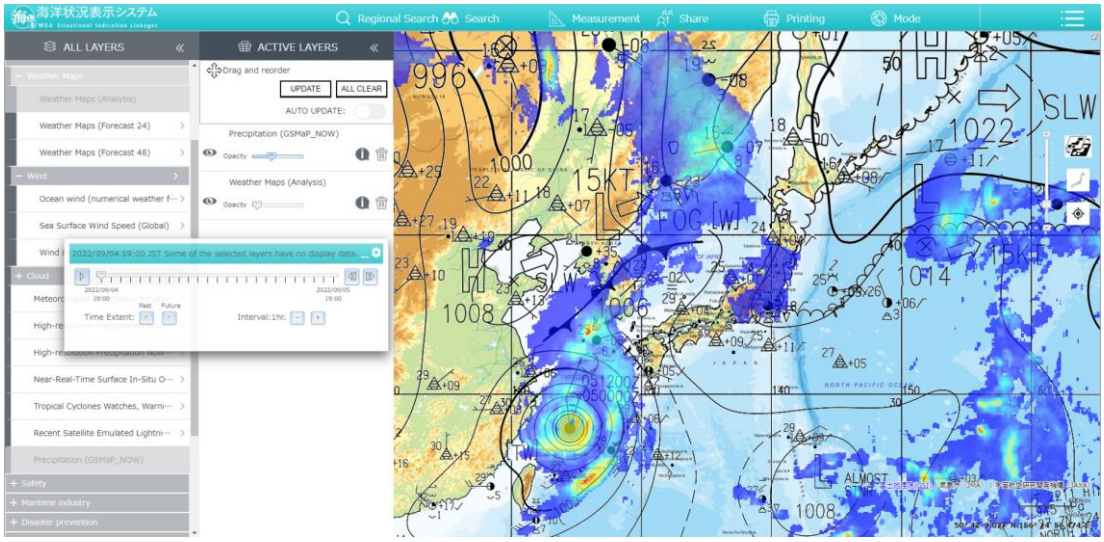

Figure 2. Example of overlaying on MSIL (weather map and precipitation)

Note. Captured by author. (Information of 4th September 2022 19:00 LMT)

Source. MSIL (https://www.msil.go.jp/) accessed on 5th September 2022

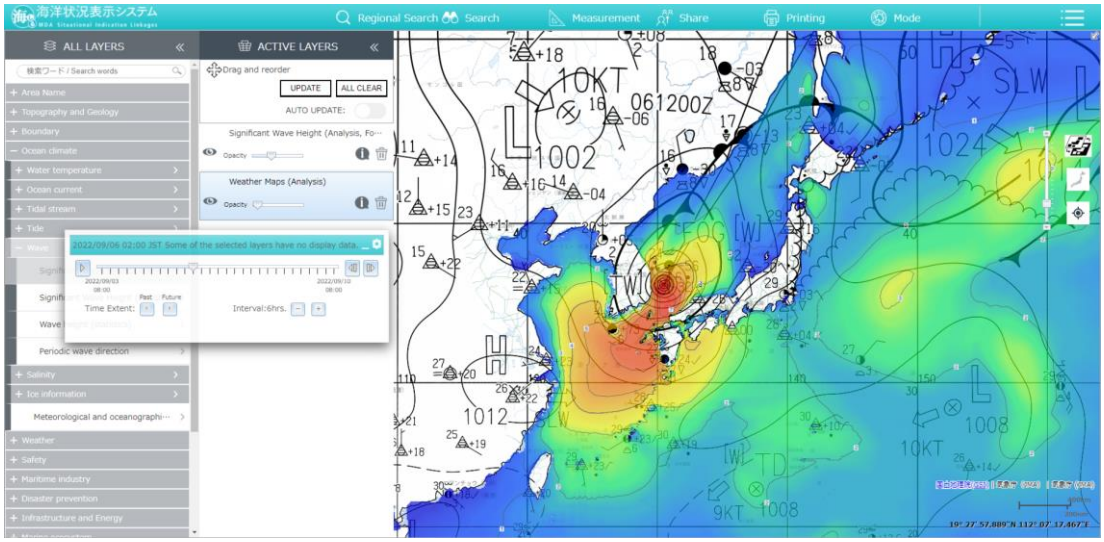

Figure 3. Example of overlaying on MSIL (weather map and wave height)

Note. Captured by author. (Information of 6th September 2022 02:00 LMT)

Source. MSIL (https://www.msil.go.jp/) accessed on 10th September 2022

The differences between the MC and MSIL are roughly distributed into three features: decentralized data management; availability of global information; and availability of real-time information. The MC adopted the centralized system which managed all data in a single server but MSIL adopted a decentralized system using the API connection (Asahara et.al, 2021; JCG, 2021; Katsura, 2020; JCG Foundation, 2018). This decentralized system using the API connection makes it easier to collect the global maritime information and enables MSIL to provide real-time information (Asahara et.al, 2021; COJ, 2020a). Although this decentralized system is subject to the condition of other connecting servers, it can save the time to search or translate the datasets and the resource of MSIL server (Asahara et.al, 2021). Moreover, MSIL is also designed as a web application and based on the "ArcGIS API for JavaScript" provided by the Esri to fully utilize the know-how of the MC and precursor systems (Asahara et.al, 2021). Based on these efforts, MSIL can integrate global maritime information and display them in real time (Asahara et.al, 2021; JCG, 2021; Katsura, 2020; COJ, 2020a; JCG Foundation, 2018). Particularly, the real-time information sharing provides users with a monitoring function which can display plural real-time data on one screen (Figure 5) and support the work related to maritime safety and security (COJ, 2020a). In 2021, the API of MSIL was additionally open to the public (Terui, n.d.) and users can introduce the API connection with MSIL into their own systems.

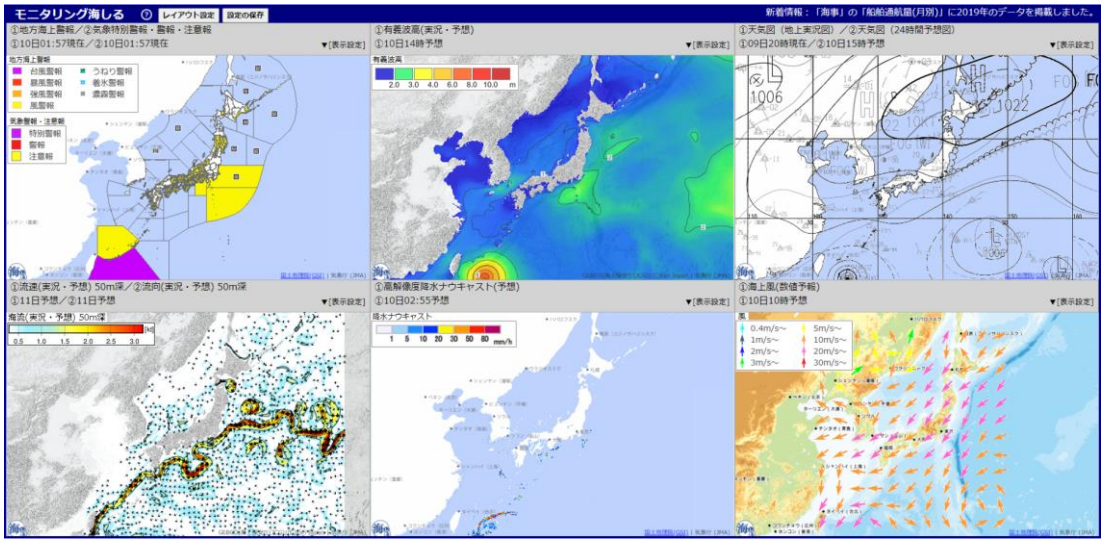

Figure 4. Example of monitoring screen on MSIL

Note. Captured by author. (Displayed warnings, wave height, weather map, sea current, precipitation and wind)

Source. MSIL (https://www.msil.go.jp/) accessed on 10th September 2022

On the other hand, MSIL introduced two systems to keep information security. One is provided on the Internet and everyone can access and the other is only open to governmental agencies (Asahara et.al, 2021; COJ, 2020a). The main difference between them is the amount of available information, for example vessel traffic data is not available in the former system but the latter system can display them and the pictures from the information satellites (COJ, 2022a; Tsunoda, 2019). This design constructing several systems reflected the concept from the COJ's documents (COJ, 2020a; COJ, 2020b; COJ 2018; COJ, 2015); therefore, the former system basically deals with only open sources which can be allowed secondary use on condition the users should follow the contract (COJ, 2020a; "Terms of Use", n.d.). This design enables the government to judge whether the information should be opened or not. The government additionally implied the third layer dealing with highly confidential information which only a few agencies are allowed to access (COJ, 2020a; COJ, 2020b; COJ 2018; COJ, 2015) but MSIL is not introduced in that layer (JCG Foundation, 2018) because MSIL uses the Internet connection (COJ, 2020b).

3.2 Future Progress and Challenges

The enhancement of the MDA through MSIL has been implemented by relevant governmental agencies under the coordination of the NOPS and lots of meetings including the PTs were held under the CM in the HOP. The outcomes of the PTs were summarized in the documents which suggested various challenges of integrating maritime information and several challenges were overcome. However, the other challenges are still remaining or not opened to the public in detail. In this section, the remaining challenges of MSIL and its future vision are described.

3.2.1 Integration Hub of Maritime Information

As MSIL has been expected to be the integration hub of maritime information (Asahara et.al, 2021; COJ, 2020a), there are many requirements for MSIL in the PTs. One of the main requirements is that MSIL should collect and integrate more maritime information (COJ, 2022a; JCG, 2021; COJ, 2020a). This requirement is caused by the concept that MSIL should be the maritime information hub for as many people as possible and satisfy as many purposes as possible. It was suggested that the information provided from the municipalities and the real-time information should be increased and MSIL should generate the information provider's incentive to share their information through promotion activities like workshops or feedback systems (COJ, 2020a). This also means that popularization of MSIL is still a problem, which was indicated by the hearing survey implemented by the PT (COJ, 2020a). That survey also implied that there are needs in some fields not related to the maritime or oceanographic field; therefore, meetings to match users with providers or hackathons to find the new possibilities of MSIL and new maritime information were suggested (JCG, 2021; JCG, 2020a; COJ, 2020a). Because the API key of MSIL was already opened, there will be much potential for innovation through using the API connections if these events are held. Furthermore, considering from the user side, the fact that MSIL cannot work as a database of maritime information but the platform integrating and displaying them is indicated as another weakness (COJ, 2020a). It is indeed useful for users to get datasets from MSIL directly. These

various challenges reflect the difficulty of multipurpose use of MSIL and the ways to realize them are not necessarily clarified (COJ, 2020a).

On the other hand, the government further expects MSIL to be the tool for international collaboration and cooperation (COJ, 2021). It means that MSIL should become not only the national hub but the international hub. Obviously, it is impossible for only Japan to gather enough information for the MDA and international cooperation; therefore, this could affect Japanese security (COJ, 2021). Reflecting this context, the PT proposed that the NOPS should research the needs of foreign countries related to the MDA and MSIL should be strengthened for information sharing with foreign countries (COJ, 2021). To achieve them, they suggested strengthening the NOPS and establishing a research section in it (COJ, 2021) but did not suggest how to improve MSIL specifically and which countries Japan will share the information with. It is understandable to strengthen MSIL for international collaboration but research should be implemented primarily before the improvement of MSIL to clarify the direction of improvement.

3.2.2 Information Management and MSIL

The PT for enhancing the MDA (COJ, 2020b) proposed that relevant agencies should make rules on information sharing and its security to share the information smoothly and continuously. It further proposed that the most important functions of information sharing platforms were to share the information and to coordinate the necessary rule makings to operate the platforms (COJ, 2020b). These suggestions imply that MSIL should have functions to share information and coordinate rule makings but MSIL does not have the above two important functions sufficiently. In fact, the PT requested the information sharing platform dealing with maritime security information in a timely manner (COJ, 2020b) but MSIL do no more than deal with a part of maritime security information like vessel monitoring information only in the second layer available for governmental officials only (COJ, 2022a; Tsunoda, 2019). This fact indicated that MSIL did not have sufficient function of

information sharing and this was caused by the design of MSIL using the Internet (COJ, 2020b). In other words, this limitation cannot be solved unless MSIL is transformed into a closed system without the Internet. This limitation of MSIL also affected civil-military cooperation.

Civil-military cooperation has been emphasized since the second phase began (COJ, 2022b; COJ, 2020b; COJ, 2018; Japan, 2018; Japan, 2013). The latest document also reported that the PT discussed the legislation about the territorial water defences to support and ensure the smooth and seamless civil-military collaboration (COJ, 2022b). However, MSIL does not contribute to this cooperation. There are some considerable reasons. For example, it is suggested that MSIL is not suitable for the confidential layer because it was designed as the web application using the Internet and has a risk of leakage (COJ, 2020b). It is also considerable that another platform dealing with vessel monitoring data has already existed (COJ, 2020b; COJ, 2018) but the PTs have still emphasized the needs of consolidation of civil-military cooperation (COJ, 2022b; COJ, 2022a; COJ, 2018). Therefore, some people already expressed that MSIL was completely rejected as the platform of civil-military information sharing (JCG Foundation, 2018) but the PTs did not clearly deny that solution (COJ, 2020b). Due to its confidentiality, the information on maritime security is not fully opened but it is necessary for MSIL to clarify more detailed information management policy including which information MSIL should deal with and which information they should not, especially on maritime security.

On the other hand, focusing on the function of coordinating rule-makings, MSIL itself does not have that function because the NOPS is in charge of this coordination between ministries and agencies. It means that the JCG is only in charge of the operation of MSIL and the NOPS is only in charge of the coordination between relevant agencies. Coordination and operation of MSIL are completely divided at this moment. To solve this governmental issue, it is, at least, necessary to strengthen the collaboration between the JCG and the NOPS.

Chapter 4 Overview of CISE

The former chapter summarized the technical aspects of MSIL. Therefore, this chapter focuses on the technical aspects of CISE and clarifies its features and differences between MSIL and CISE.

4.1 System Design

4.1.1 CISE Building Blocks

The main features of CISE concept are to connect public authorities and their maritime surveillance systems without any establishment of a new system or application, promote sector-neutral solution and decentralized approach and exchange information voluntarily and spontaneously ("CISE Architecture", n.d.; EMSA, 2022b). To achieve these fundamental concepts, CISE was designed as a decentralized Virtual Private Network (VPN). The decentralized approach implies that CISE is not a new system or application dedicated to the specific purposes and the data storing (EMSA, 2022c; Rajamäki et.al, 2019) but a top-up network connecting the existing systems, which enables each user community to gather and store their own data by their own surveillance systems and security standards (Rajamäki et.al, 2019). In other words, existing surveillance systems would be effectively integrated without any changes in the existing surveillance systems through the CISE network, which spans across the seven relevant sectors and user communities including transport, environmental protection, control of fisheries and borders, general law enforcement, customs and defence (Mihailović et.al, 2021b). This decentralized network is described as several building blocks including a set of interoperability agreements and hardware implementing them (EMSA, 2022c; EC, 2013).

These building blocks are mainly composed of three blocks, Legacy System (LS), CISE Node and CISE Adapter. The LS is the existing Information and Communication Technology (ICT) system which can provide and consume information for maritime surveillance (EMSA, 2021a). The CISE Node is a standard component that dispatches the information (EMSA, 2022c) and has the function to

provide an access point to the CISE network (See Appendix C). The CISE Adapter is a junction to translate information between the CISE Node and the LS (EMSA, 2021a) (See Appendix D). Figure 6 shows the basic structure of the CISE network with three building blocks. User community can control and manage the data distribution policy at each building block including who can receive the data and what kind of information can be received, but the data distribution policy at the Node level is supposed to be shared among others (EMSA, 2022c) in accordance with the principle of the RTS. These technical foundations and interoperability agreements are originated from the precursor projects (Mihailović et.al, 2021a), for example the Cooperation Project (CoopP) made remarkable progress in these technical standards by defining the communication protocol of the CISE (Finnish Border Guard, 2014). At this moment, based on these outcomes, the CISE network has been expanded into 12 CISE Nodes and 25 ICT systems covering all the seven different maritime sectors (Figure 7) (EMSA, 2021a).

Figure 5. Main building blocks of the CISE architecture

Note. From "CISE Architecture", n.d., p.3. http://www.emsa.europa.eu/technical-specifications/dounload/6889/3689/23.html

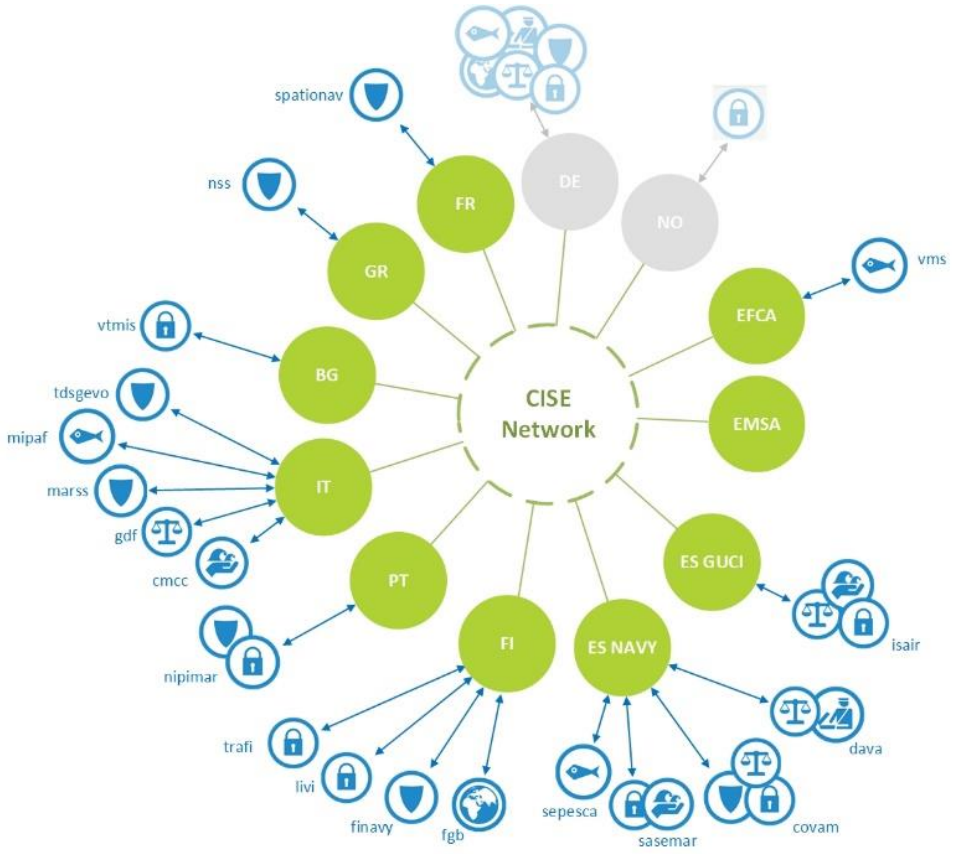

Figure 6. CISE Network diagram as of 5th Aug 2022

Note. From "CISE Network", by EMSA, n.d.b. Copyright 2022 by EMSA. https://www.emsa.europa.eu/transitional-phase/cise-network.html

4.1.2 Communication Protocol

CISE uses its own services and data model vocabulary (Mihailović et.al, 2022). These specific communication protocols are usually explained as the CISE Data Model (CDM) and the CISE Service Model (CSM). The CDM is the common language for information exchange based on the result of the CoopP and driven by five principles, namely sector-neutrality, flexibility, extensibility, simplicity and understandability (Rajamäki et.al, 2019; EC, 2016; "CISE Architecture", n.d.), whose interoperable protocol enables cross-sectoral and cross-border information exchange at EU-wide level. The CDM, which continuously get enhanced through the Andromeda Project (Mihailović et.al, 2022; Andromeda Project, 2020), comprises seven core data entities and eleven associated auxiliary data entities (Mihailović

et.al, 2022; Riga et.al, 2021; Rajamäki et.al, 2019). Figure 13 shows the data entity concept of the CDM. The data exchanging within the CISE network is described and assorted by the CDM.

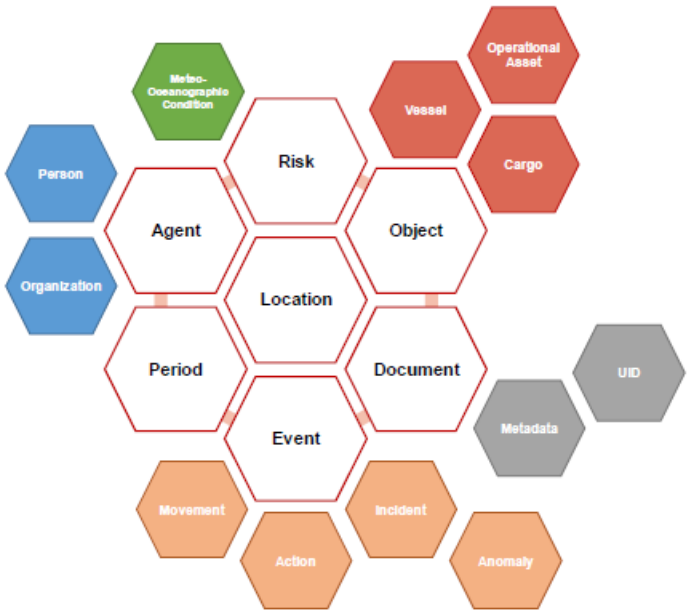

Figure 7. Data entity concept of the CISE Data Model

Note. From "CISE Architecture", n.d., p.7. http://www.emsa.europa.eu/technical-specifications/dounload/6889/3689/23.html

In the CISE network, the data is exchanged through using several communication patterns which are composed of Pull, Push, Pull/Push unknown and Publish/Subscribe ("CISE Architecture", n.d.). 'Pull' means the request for the information to the specific stakeholder and 'Push' means the transmission of the information to the specific consumer ("CISE Architecture", n.d.). If there is no idea about specific stakeholder or consumer, that pattern will be assorted into the Push/Pull unknown ("CISE Architecture", n.d.). Publish/Subscribe means continuous transmitting/consuming of a part of information ("CISE Architecture", n.d.), such as the lists of vessels of their interests (EMSA, 2022f). These communication patterns are the basis of the CSM which describes the communication protocol between the

stakeholders' LSs ("CISE Architecture", n.d.). The CSM has two features: One is oriented to the CISE services which are already defined as the models of the information exchange like Vessel Service, Cargo Service, Incident Service, Risk Service and Anomaly Service (Mihailović et.al, 2022; Mihailović et.al, 2021a; Paladin et.al, 2021; Andromeda Project, 2020; "CISE Architecture", n.d.). Another is driven by the exchange of messages among the LSs and the CISE Nodes (EMSA, 2021a; "CISE Architecture", n.d.). These messages are basically structured by three main parts. Message information including message identification and address; Message payload composed of the data itself; and Message signature composed of the digital signature of the message sender followed by the W3C standard on XML signature ("CISE Architecture", n.d.). Based on these interoperable standards, CISE provides the cross-sectoral or cross-border information exchange between the LSs.

One understandable example is displayed in Figures 14 to 16, which was presented at the CISE workshop (EMSA, 2022f). In that case, Coast Guard A who wants to know about the vessel XYZ publishes the list of vessels of its interest through CISE, and then Traffic Control B who subscribes to the list of Coast Guard A knows its interest in the vessel XYZ (Figure 14). Since Traffic Control B has information on the vessel XYZ, they decide to send that information through a push communication pattern (Figure 15). Moreover, Navy Authority C who subscribes to the list of Coast Guard A also decides to provide the information on the vessel XYZ and Coast Guard A complete necessary information (Figure 16). These information exchanges are supported by the CDM and the CSM.

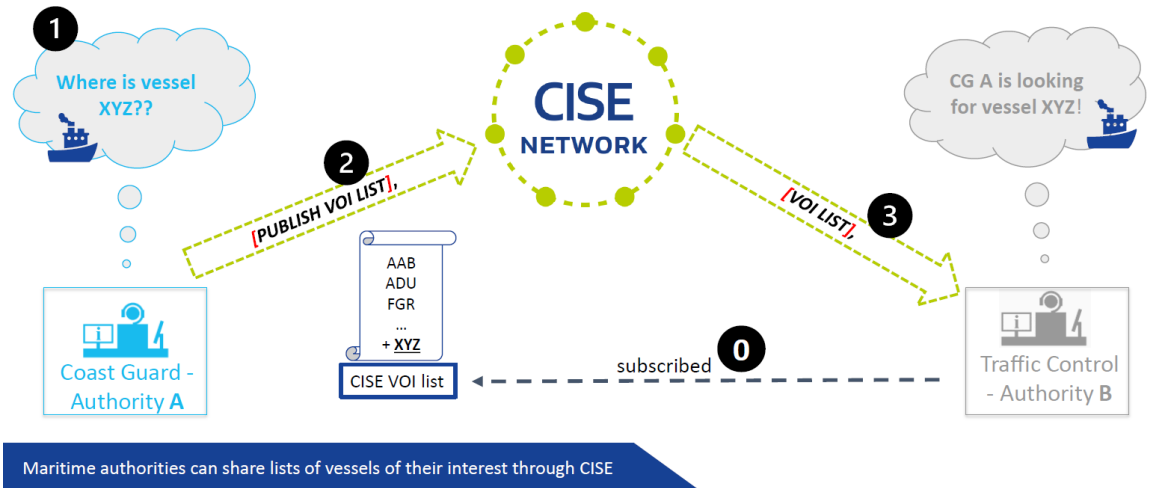

Figure 8. Data seeking through the CISE network

Note. From "Common Information Sharing Environment – How interoperability can enable safer, cleaner, and more secure seas", by EMSA, 2022, p.12. https://www.emsa.europa.eu/meetings-and-workshops/download/7132/4720/30.html

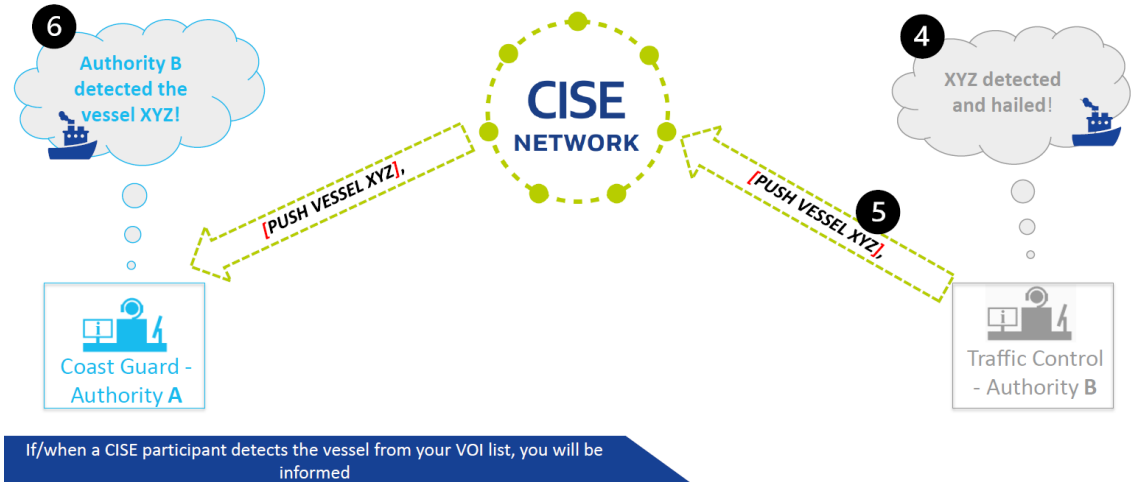

Figure 9. Data providing through the CISE network

Note. From "Common Information Sharing Environment – How interoperability can enable safer, cleaner, and more secure seas", by EMSA, 2022, p.13. https://www.emsa.europa.eu/meetings-and-workshops/download/7132/4720/30.html

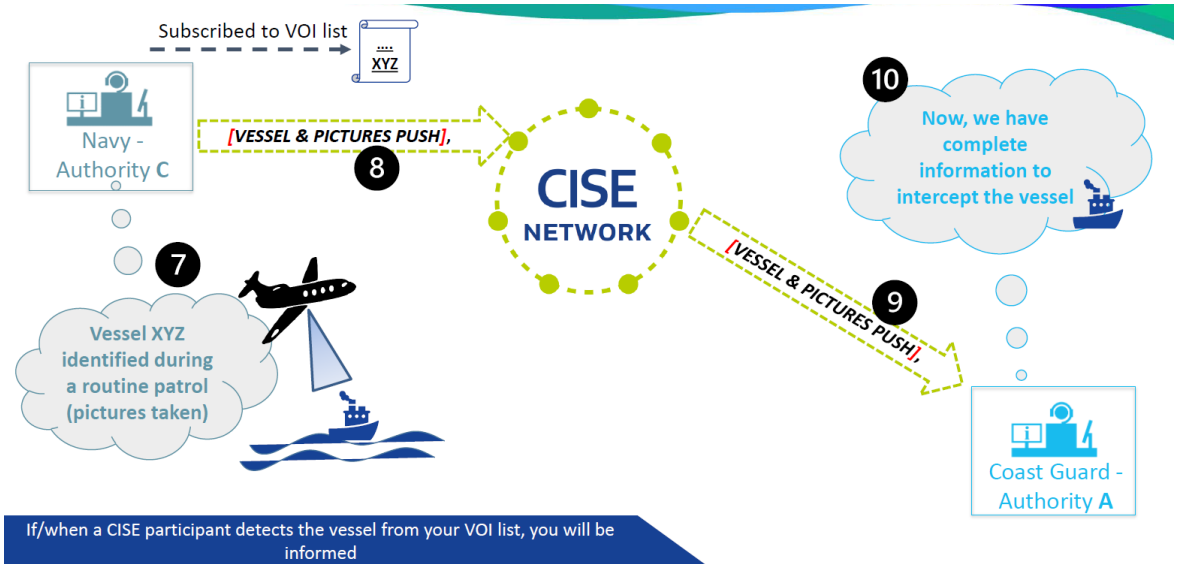

Figure 10. Data accomplished through the CISE network

Note. From "Common Information Sharing Environment – How interoperability can enable safer, cleaner, and more secure seas", by EMSA, 2022, p.14. https://www.emsa.europa.eu/meetings-and-workshops/download/7132/4720/30.html

4.1.3 Estimated Cost

Completing essential facilities and communication environments is usually expensive, especially for the infrastructure of the ICT. According to the practical guide for joining CISE (EMSA, 2022c), the hardware of the CISE Node, deployed in a standard configuration, might cost approximately 10,000 EUR to 15,000 EUR without the cost of the hardware for CISE Adapters. This price will be subject to the system design including how many LSs will be connected and how to connect them with the CISE network. In addition to this hardware and infrastructure cost, Member States should take other costs, software and personnel, into account (EC, 2021c).

Software costs are mainly related to their CISE Nodes and CISE Adapters, but there is a big difference between them due to their functional details. The CISE Node works as the access point to the CISE network and without any remarkable differences among each CISE Node (See Appendix C). However, the details of the CISE Adapter are completely different from each other and depend on their

arrangements and communication protocol. EMSA and the JRC, therefore, provide the technical support only for the software of the CISE Nodes including development, maintenance and operational support in this transitional phase, except the case of using the pilot adapter (EMSA, 2022c). On the other hand, appropriate maintenance of the CISE Adapters is responsible for each Member State even if the maintenance is induced in accordance with their CISE Node update. It should require technical support persons who have some specific IT skills, which is also relevant to the cost of personnel. The practical guide (EMSA, 2022c) also asks Member States to deploy the technical support persons, such as Node Administrator who is in charge of the management of their CISE Nodes and Maritime Centre operator who is responsible for managing and processing the exchanged information there. It means that technical support persons maintaining the CISE Adapter should be taken into account by each Member States. They also need appropriate training to keep their skills and follow up new technology. It is very difficult for Member States to estimate the total cost for introducing and operating CISE accurately, but there is a supportive assistance of the EMFAF.

The council conclusion (EU, 2021b) proposed that they encourage Member States to utilize the EMFAF for their actions listed in the EUMSS Action Plan which emphasized the importance of a sooner implementation of CISE (EU, 2018). The EMFAF provides financial support for introducing the CISE Adapter, hardware and the modernization of the LSs until 2027 (EMSA, 2022c). Member States will consider these financial aspects through weighing the cost and benefits when they join CISE.

4.2 Future Progress and Challenges

CISE has accumulated various know-how through the precursor projects and various EU funded studies. It is expected that if CISE is operated in a fully-fledged manner at each national and EU-wide levels, its profit would be far reaching and enormous at both technical and economic-impact levels (Mihailović et.al, 2021b). In this

transitional phase, it is important to maintain the positive momentum about CISE created by the EUCISE2020 project (EC, 2019b).

However, some studies (Raptis, 2018; EC, 2017) indicated that the lack of a central governance body, which means decentralized and voluntary-based cooperation, could become the project's potential threat. Furthermore, the other studies (EC, 2019a, EC, 2019b) highlighted the issues that still need to be addressed, which includes data protection, improvements in interoperability standards, the consolidation of the results of the EUCISE2020 and the adaptation of the national authorities' systems. In this section, challenges of CISE are provided with three themes: Voluntary-based cooperation, the RTS and Cyber security.

4.2.1 Voluntary-based Cooperation

CISE emphasizes decentralized architecture and voluntary-based cooperation, which means that CISE is not based on legal frameworks (EMSA, 2022c; EMSA, 2021a) but based on a spirit of cooperation (EMSA, 2022c). Therefore, each stakeholder is responsible for gathering and storing its data acquired by its own sectoral systems (EC, 2010) and deciding the distribution policy of its data. That is why CISE is not recognized as a new system which was built upon the collaboration with existing mandatory systems (EU, 2018) and did not hinder the existing or developing systems (EC, 2009). Information sharing through CISE is implemented under these remarkable concepts which underlie CISE and affect its system design and various interoperable agreements. However, it also means that the effectiveness of CISE will strongly rely on the commitment of the Member States as information providers ("CISE Transitional", n.d.a). Several studies (EC, 2019b, EC, 2017; "CISE Transitional", n.d.a) indicated that the situation dependent upon only cooperation without any central body or agreement was a bottleneck for the sustainable governance of CISE. During the transitional phase, EMSA and the JRC set up a pre-operational organization and jointly work as a central body to coordinate the CSG and provide technical support including problem management and so on (EMSA,

2022c). Although it is unclear that EMSA will continue to coordinate the stakeholders after the transitional phase, they already play the key roles for the realization of CISE in this transitional phase. Therefore, EMSA would be pressed to keep this effort for the development of CISE and to be responsible for the administrative work. Considering the increasing necessity for further EU-wide coordination among maritime stakeholders by cross-border and cross-sectoral cooperation (Mihailović et.al, 2021b), the EC should strongly support EMSA to strengthen CISE administrative body.

On the other hand, the administration agreement supporting the operational exchange of information, which was suggested by the review study (EC, 2019b), was successfully accepted at the 6th CSG meeting in February 2021. This administration agreement, called the CISE Cooperation Agreement (CCA), defines the terms for the use of CISE and the rules for the information sharing in the CISE network (EMSA, 2022c). At this moment, the CCA is signed by eight stakeholders (EMSA, 2022d) and several stakeholders are interested in the participation (EMSA, 2022e). The CCA could be a big milestone in the transitional phase, but there is no update of the CISE handbook, which was proposed by the EC (EC, 2014b) and going to include best-practice recommendations and useful information on how to apply Maritime CISE (EC, 2016; EC, 2014b). The progress of the handbook was assessed by the review study which indicated the development of it would be premature (EC, 2019b), but it can enhance the better understanding of and the participation in CISE if it explains what the CCA is and what the RTS is. Because CISE is just the voluntary-based cooperation, appropriate accountability which attracts maritime stakeholders should be necessary.

4.2.2 Responsibility to Share

The RTS is a remarkable phrase that cannot be avoided to understand CISE; however, it is also difficult to appropriately understand its meaning. At the beginning of the CISE project, this phrase was also expressed as the “Care to Share to Be

Aware", which was not based on the principle 'everybody shares everything' but the basis of 'need-to-know' and 'responsibility-to-share' (EC, 2011). These phrases converged upon the RTS in 2014 (EC, 2019a; EC, 2019b), whose outline is described as that stakeholders can use the data through the CISE network but they also have to provide the data (Mihailović et.al, 2021b; EMSA, 2021b). This RTS principle additionally includes the implication that the stakeholder should share the information deemed useful for other legitimate stakeholders to use it even when they do not specifically request that information (EMSA, 2022c; EC, 2014a). If these proactive efforts are implemented appropriately, the RTS principle will foster enhanced commitment from stakeholders to share their own information while fully respecting the voluntary nature of CISE (EC, 2019b) and constitute the basis for reliable and trustworthy information sharing through CISE (Rajamäki et.al, 2019). Although the RTS principle requires these positive efforts to open their information, stakeholders are not obliged to exchange as much information as possible (EMSA, 2021a) because CISE is voluntary-based cooperation and these efforts are not legislated by any regulation but spontaneous cooperation. In other words, only the stakeholder, as the owner of its data, can decide which information will be shared or not shared. 62% of authorities consuming information are also providing information (EC, 2017); therefore, whether the information will be shared or not has a great influence on the decision of other stakeholders.

To overcome this contradiction between the RTS principle and voluntary-based cooperation, the audit scheme to keep the effective implementation of the RTS principle was suggested and its contents has been discussed in the transitional phase. Some materials (EMSA, 2022c; EC, 2014a; "CISE Transitional", n.d.a) indicated that the audit scheme was expected to assess the implementation of the RTS principle through capturing the information exchange and also expected the CSG to enhance further studies. Particularly, these studies are strongly expected to define a methodology of the audit scheme and how stakeholders implement the RTS principle (EMSA, 2022c; EC, 2019b; "CISE Transitional", n.d.a). At this moment, the RTS

Working Group has been supporting this work (EMSA, 2022c) but the outcome is still discussed in the CSG meeting which reported the elaboration of the first draft of the methodology of the RTS principle (EMSA, 2022d). In the latest test campaign, EMSA implemented the first test of the audit methodology supporting the RTS principle but it is still under development (EMSA, 2022g; "EMSA successfully", 2022). Because the endorsement of the RTS principle is vital for further refining the voluntary aspect of information exchanges through CISE and promoting this concept (EC, 2019a; EC, 2019b), that draft will be embodied as soon as possible. It could also help the development of the CISE handbook.

4.2.3 Cyber Security

The EU council highlighted that securing enhanced levels of cyber security across all maritime sectors and gaining efforts to increase resilience to cyberattacks at the EU and Member State levels are necessary (EU, 2021b). The CISE network is, therefore, designed by the highest security standards. Its security plan is based on the EC Information Technology Security Risk Management Methodology, ISO 27001 practices and zero trust approach methodologies (EMSA, 2022c). Additionally, the CISE network will establish the classified network restricted within the EU to treat the personal or sensitive information, which 45% of the CISE prioritized services are exchanging (EC, 2017). The classified network, however, is not actualized at this moment (Rajamäki et.al, 2019) and it was reported to partially exchange the personal or commercial-sensitive information in spite of the unclassified network ("CISE Architecture", n.d.). Although the difference between the unclassified and classified network is the only crypt device which encrypts the information before sending it in the CISE network (Rajamäki et.al, 2019), the above disordered situation will weaken the cyber security of the CISE network.

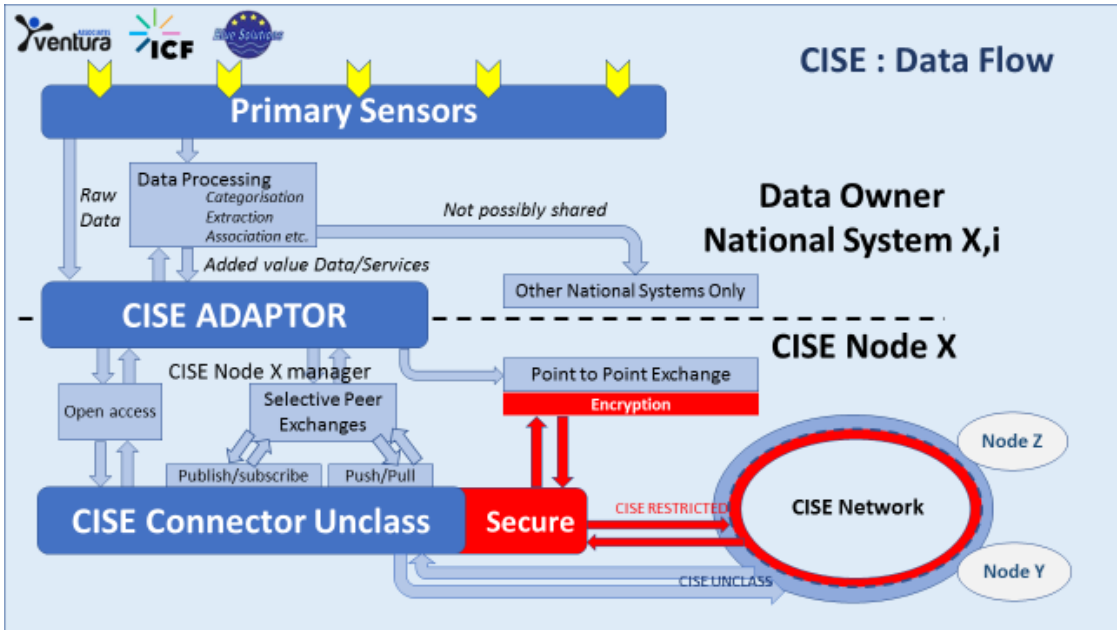

Figure 11. Possibly handling of classified data

Note. From "Study to support the CISE review: official final report", by EC, 2019a, p.119. https://data.europa.eu/doi/10.2771/615634

To improve disordered situations, the review studies (EC, 2019a; EC, 2019b) claimed that 'each stakeholder' should further develop the concrete guidance to securely handle and share personal and commercial-sensitive information and 'Member States' should further involve national data protection authorities. It implies that due to the decentralized architecture, CISE leaves Member States with a significant workload related to cyber security, such as maintaining 24/7 operations of CISE data access and services (EC, 2019a). Therefore, the technical and operational support for Member States is crucial to securely maintaining the existing network in operation and consolidating it (EC, 2019b). If these supports are not appropriately provided by EMSA and the JRC, the risk of cyberattack will increase because the CISE network consists of peer-to-peer (P2P) network through many VPN connections among the CISE Nodes operated by Member States (Rajamäki et.al, 2019). In other words, the augmentation of CISE Nodes and VPN connections means the augmentation of vulnerable targets which requires secure maintenance.

Vulnerability of cyber security caused by the disordered situation of the CISE network consequently affects the civil-military cooperation since it is important for the authorities dealing with confidential information to trust the security of the CISE network. The EUMSS and CISE emphasize the importance of the synergy of civil-military cooperation (EU, 2018; EC, 2014b), but that cooperation is based on the trust which is recognized as the foundations of the information sharing (Tikanmäki & Ruoslahti, 2017). A cyber security study (Sedenberg & Dempsey, 2018) also indicated that stakeholders required to trust other stakeholders to contribute roughly equivalent information in order for successful information sharing. It means that unless authorities dealing with sensitive information can trust the cyber security of CISE and expect almost equivalent information, they will hesitate to share sensitive information. Since the actual information exchanging through the CISE network depends on what information the stakeholders will offer (EC, 2014a), it is obviously difficult for an untrustworthy network with vulnerable cyber security to involve military authorities and enhance civil-military cooperation.

Chapter 5 Discussion

Chapters 2 to 4 provided the details of both the situation and system itself. Based on them, this chapter compares MSIL and CISE to answer the research questions. Furthermore, it also tries to suggest some improvements for MSIL based on that comparison and the answer of the questionnaire.

5.1 Comparison of MSIL and CISE

5.1.1 Similarities

Comparing MSIL and CISE in the political context, there are three similarities between MSIL and CISE. The first one is that maritime security is not the original purpose of them. MSIL originated from the aspect of ocean survey including the IODE (Asahara et.al, 2021, JCG Foundation, 2018) and it aimed to lead the innovation of the maritime industry and science (Japan, 2008). On the other hand, CISE originated from the aspect of border control like the European Border Surveillance System (See Appendix A) and it aimed to efficiently control the migrants from the southern EU border (EC, 2016; EC, 2008). Their objectives are different but both of them had never taken into account maritime security. After Japan and the EU started considering MSIL and CISE in the context of maritime security, both systems are discussed with the civil-military collaboration, which is the second similarity. Although MSIL is not clearly mentioned as the platform for civil-military collaboration, it was discussed as one of the possibilities of it (COJ, 2020b) and CISE is clearly discussed in the context of civil-military collaboration (EMSA, 2022a; EC, 2014a; EC, 2011). The third one is that they have the same challenge to acquire more providers who share maritime information (EMSA, 2022a; Mihailović et.al, 2021b; COJ, 2020a; EC, 2019a; EC, 2017; COJ, 2016; Terui, n.d.). To improve them, integrating and sharing more information is one of the most important priorities. Especially, the amount of maritime information is strongly subject to the effectiveness, efficiencies and usefulness of MSIL and CISE.

In addition, there are two similarities between them in the technical context. The one is that both systems are designed as the decentralized design (EMSA, 2022a; EMSA,

2022c; Asahara et.al, 2021; JCG, 2021; Katsura, 2020; EC, 2019b; Raptis, 2018; JCG Foundation, 2018; EC, 2013; EC, 2011; EC, 2010; EMSA, n.d.a; "CISE Architecture", n.d.). They are different in the way to realize the decentralized design, using the API connection or the P2P network, but the concept to collect, manage and store maritime information by each provider itself is completely the same (Asahara et.al, 2021; EC, 2019a; EC, 2010). It also implies that both of them have the same challenge and weakness as the central body. Because Japan does not have financial and technical support like the EMFAF and the JRC, this challenge can affect MSIL more strongly. Another is the unclear treatment of the third layer of MSIL and the classified network of CISE. These unclear situations may be caused by the less amount of information on them and specific ways to realize them are not expressed obviously. Considering the information security of them, it is understandable that the way to satisfy their demands can be limited and the information on it cannot be opened. However confidential, these sources may not be open, so there should be something considered as the solution for better MDA inside both governments.

5.1.2 Differences

The differences between MSIL and CISE are observed a lot and roughly divided into two main causal factors. The first factor is the difference between their original concepts, which affects various differences including system design, user community and expected capacity. MSIL was based on the concept of integrating maritime information and pursuing usefulness of all users including private sectors (Asahara et.al, 2021; Katsura, 2020; JCG Foundation, 2018); therefore, MSIL is designed as a web application service, available for all people, and expected to promote the innovation of various maritime fields by integrating and providing as much information as possible in a user-friendly manner. On the other hand, CISE was based on the concept of sharing maritime information among public authorities in the EU/EEA (EMSA, 2022b; Mihailović et.al, 2021b; EC, 2016; EC, 2014a; EMSA, n.d.a). Therefore, CISE is designed as a VPN network, available for only stakeholders who have signed the CCA, and expected to promote the EUMSS by

sharing and exchanging maritime information under the RTS principle. This can also be considered as the differences between one-way communication from a provider to users and interactive communication among the participants. MSIL can be categorized as a one-way communication and should make an effort to listen to feedback from users. CISE can be categorized as interactive communication but the RTS principal will not necessarily guarantee the improvement of information sharing unless the RTS audit scheme clearly defines the understandable obligations and rights of the participants.

The second factor is the difference between their governance scale, which especially affects the technical aspects and the governance structure. In other words, MSIL is operated by only the JCG within the national scale but CISE is operated by EMSA and the JRC on the international scale and supported by other projects of the EC and the EMFAF. For example, several studies (Mihailović et.al, 2022; Mihailović et.al, 2021a; Mihailović et.al, 2021b; Paladin et.al, 2021; Riga et.al; 2021; Rajamäki et.al, 2019) were implemented under the support of the EC projects and the EU/EEA member states can get financial support from the EMFAF when they introduce CISE building blocks (EMSA, 2022c). Furthermore, EMSA has collaborated with the JRC (EMSA, 2021b) since the transitional phase was begun. Needless to say, these technical and financial supports have strong advantages over MSIL when they improve their systems. Japan also inaugurated the Digital Agency (DA) in 2021 to enhance digitalization of administrative authorities (The DA, 2021; The DA, n.d.) but it is not a research institution like the JRC and does not provide technical support. This big difference implies that Japan should seriously consider the efficient use of their limited budget and resources to develop MSIL.

Focusing on the governance structures, the EC entrusted EMSA with all the operation of CISE and the coordination of the stakeholders (EMSA, 2022a; EMSA, 2022c; EMSA, 2021b; EU, 2021b; EMSA, n.d.a), but the operation of MSIL was entrusted to the JCG (COJ, 2020a; COJ, 2018; COJ, 2016) and the coordination of

relevant agencies was entrusted to the NOPS. This means that EMSA could display strong governance more easily than the JCG and the NOPS, and the strong collaboration between the JCG and the NOPS is essential to display strong governance for the improvement of MSIL. Hence, the suggestion that the NOPS should be strengthened (COJ, 2021) could be the key element to improve the governance of the MDA and MSIL.

Finally, the geopolitical difference between Japan and the EU is considered as the supplemental causal factor, which affects the original concept and objectives. It is observed that MSIL assumes the practical use for the natural disaster response including tsunami (Asahara et.al, 2021; COJ, 2015; Terui, n.d.) but CISE does not assume that use. It is assumed that the enhancement of exploitation of natural resources by utilizing MSIL is also a unique concept in Japan because they rely on other countries for almost all natural resources (COJ, 2015). Because it is almost impossible to modify these geopolitical features, this aspect is not pursued any further.

5.1.3 Recommendations

Based on the former two sections, this study suggests three recommendations about better utilization of MSIL and better MDA. The first is to strongly popularize MSIL and enrich the contents of MSIL through promotion events like workshops in order to actively seek potential users, information providers and feedback on MSIL. Even though MSIL has been operated by the JCG since 2019, the same time as the start of the CISE transitional phase, and similar suggestions are already indicated (COJ, 2020a, Terui, n.d.), there is no promoting event like the CISE workshops. According to the press archives (EMSA, 2022h), EMSA has already held the workshops eight times. These workshops can make opportunities to popularize MSIL, attract potential users and information providers and acquire feedback. MSIL is the one-stop service for maritime information and deals with over 200 contents already (Asahara et.al, 2021; JCG, 2021; Katsura, 2020; COJ, 2020a) but cannot work sufficiently unless

people know the existence of MSIL as the one-stop service. Moreover, the workshops which provide mutual communication between the JCG as the service provider and the users also enables the JCG to acquire feedback on MSIL, which provides necessary information to formulate and modify it strategically (Rao, 2010). These efforts to popularize MSIL, to acquire feedback and to improve MSIL will make good synergies which can invite further users and information providers. Therefore, the JCG and the NOPS should firstly create the synergies and secondary keep it for better MDA.

The second is to seriously consider the priority of their measures to improve MSIL and cost-cutting like outsourcing in order to efficiently use their scarce budget and resources. According to the Ministry of Finance (n.d.), the annual revenue of Japan has exceeded the annual tax income since 1975, which means that the government can seldom increase the budget. However, every measure to consolidate the MDA costs vast amounts of money, especially expansion of the MDA assets (COJ, 2020b). To alleviate this dilemma, it is important for the JCG and the NOPS to give priorities and redistribute their budgets. Specifically, positive cost-cutting should be taken into account when they implement low priority measures. The workshops, for example, can be considered as one possibility to save the cost because these promotion events are quite suitable for positively seeking the chances of outsourcing whose benefits are to realize better service at a lower total cost, better flexibility, access to the latest technology and the ability to redistribute scarce resources (Kremic et.al, 2006). Particularly, it is extremely meaningful for Japan to actively seek the latest technology and redistribution of scarce resources due to its small governance scale and budget restriction. This idea could also apply not only to domestic companies but also to foreign companies. For instance, Global Fishing Watch, which has been supported by Google (Tsunoda, 2019), shows a good potential for outsourcing. Since MSIL is expected as the platform for international cooperation of the MDA, Japan should have the outlook overseas when they seek outsourcing.

The last is to consolidate the collaboration between the JCG and the NOPS in order to exercise strong governance for improvement of MSIL and better MDA. This collaboration is essential for making Japan's MDA better because they cannot separately implement the administration of MSIL. In other words, the JCG can only operate MSIL within their budget and the NOPS can only administer all the ocean policies and relevant ministries and agencies within their budget. Considering the collaboration between the JCG and other ministries to enrich the contents, the JCG firstly needs the NOPS to support the coordination and the NOPS cannot enjoy the benefit of MSIL unless they cooperate with the JCG. In addition, the more the NOPS is strengthened, the easier the JCG creates collaboration. This was also suggested by the PT (COJ, 2021); therefore, empowerment of the NOPS should be implemented as soon as possible.

5.2 Comparison and Questionnaire

In this study, data sampling was implemented through the questionnaire targeting the working level officers of the JCG who are in charge of the MDA administrations including MSIL in order to analyze the challenge of MSIL and elaborate the suggestion from the comparison of MSIL and CISE. Therefore, this section provides the answers of the questionnaire and tries to find more effective and efficient solutions based on the answers and the suggestions.

5.2.1 Overview of the Questionnaire

The questionnaire was delivered to the officers belonging to the Unmanned Aerial Vehicle and the MDA Group under the administrative division, Guard and Rescue Department and the Marine Spatial Information Service Office under the Hydrographic and Oceanographic Department (See Appendix E and F), and six answers were obtained. The information on respondents is summarized in Table 3. Their experiences varied from on-board services to aviation, international affairs, environmental protection, security intelligence, attachés at foreign embassies and so on. Obtained answers are as follows:

Q1. Do you know about CISE of the EU? Yes: 2 No: 4

Q2. Do you think that MSIL has any challenges at this moment?
Yes: 5 No: 0

Q3. Do you know any updates or improvements of MSIL?
Yes: 6 No: 0

Q4. Do you think that MSIL is beneficial for the mission of the JCG?
Yes: 6 No: 0

Q5. Do you think that MSIL is beneficial for other ministries?
Yes: 5 No: 0

Table 3. Attributes of respondents

Respondent No.	Age	Sex
1	-30	Female
2	30-50	Male
3	30-50	Male
4	30-50	Male
5	30-50	Male
6	50-	Male

Note. Created by the author.

In Question 2, it was indicated as the specific challenges of MSIL to promote international collaboration and popularize MSIL, which was expressed by four out of six respondents. In minority opinions, it was also observed to strengthen the function to exchange data, increase the budgets, collaboration with other national systems and enrich the information integrated in the second layer, only available for governmental officers. In addition, specific actions were observed in the field of international collaboration and enrichment of information in Question 3. The useful functions of MSIL for the JCG missions, in Question 4, are indicated as the social information including the location of fishing gear, which was expressed by three out of six respondents. Moreover, three out of six respondents answered that MSIL may work as the one-stop system for other agencies in Question 5. Finally, Questions 6

and 7 were asking about the problem and countermeasures if MSIL is utilized as the platform for security information exchange, and most respondents worried about the information security. Specifically, possible countermeasures were mainly observed as the way to prepare a new server for ensuring the security but there was an opinion that MSIL was not supposed to deal with confidential information related to security in minority.

5.2.2 Examination of the Results

Examining the answers of the respondents, this study observed several remarkable features of their awareness of challenges. Firstly, popularization of MSIL was highly recognized as the challenge of MSIL and linked with the recommendation. This recognition was also reflected in the specific action including the coordination for enrichment of contents and the improvement of the User interface for its usefulness, which were the answers of Question 2 in minority. However, there was an opinion that the contents of the second layer of MSIL, which is available for governmental agencies only, dealt with the information collected by the JCG and it was necessary to enrich the second layer contents. These answers imply that working-level officers are also aware of the needs to popularize MSIL, but these efforts had tended to be directed toward the general user. Considering that MSIL originated from providing oceanographic data for general users (Asahara et.al, 2021; JCG Foundation, 2018), it is predictable that the JCG has less know-how about internal information providing and the NOPS should take initiatives for the development of the second layer. This is where the NOPS should show their leadership.

Secondly, the answer showed the ambition to seek international collaboration and cooperation; specifically, a respondent answered the development of the new layer for international information sharing. International cooperation was indeed the burning issue, which was the topic of the PT in 2021 (COJ, 2021), and it will be a foothold in acquiring foreign information providers if the new layer is launched. However, the PT also expressed that the government should pay attention to defining

the benefits of interests and the difference between MSIL and foreign systems when they plan new international collaboration (COJ, 2021). Tikanmäki and Ruoslahti (2017) also said that “Cooperation should be based on common objectives and emphasize the benefits of cooperation” (p.398). The roadmap for the maritime CISE has also begun from the first step to define user communities (EC, 2016; EC, 2010; EC, 2011). This roadmap can greatly help the development of the international layer because CISE has much know-how about international MDA cooperation. Furthermore, the PT suggested the consolidation of the NOPS to efficiently investigate the needs and systems of foreign countries. This should be the first step before the launch of the international layer, but if the new layer is firstly developed, its design will be greatly affected by objectives and benefits, and the flexibility should be taken into account.

Furthermore, the respondents’ answers imply the states of MSIL including usefulness and security measures. For example, Coast Guard officers utilize MSIL to access social information like the location of fishing gears and fishing zones, and they think its usefulness for other ministries comes from its one-stop service. It might mean there is a potential to improve MSIL by enrichment of the contents. On the other hand, if MSIL is utilized for security services including high confidential information, they will assume various ideas, such as the use of another server for information security like mirroring server, the use of electronic signature and encryption and setting out more detailed classification of information. These answers also show the undefined situation of the third layer of MSIL and it will probably not be adopted for that layer.

Considering the above examination, three recommendations are not so different from the answers but the aspect of international collaboration is more actively taken into account. Therefore, this study finally suggests four recommendations including the aspect of international cooperation, which is that Japan should firstly investigate the needs of the MDA and foreign agencies.

Chapter 6 Summaries and Conclusion

6.1 Current States in the Context of the MDA

'Knowing the state of the sea at this moment', which is the slogan of MSIL, is a very simple question but answering this question had been impossible until a few decades ago. The MDA is one possibility to answer this question and can bring various social benefits by considering the entire maritime situation. The process of the MDA can be divided into two major parts, acquiring information and sharing information. MSIL and CISE were developed as the information sharing platforms to support the latter part of the MDA and they have been expected to play an important role in integrating or exchanging maritime information as the nerve of the MDA. These systems seemingly look similar to each other but their progress is completely different.

MSIL was launched in 2019 and it was one of the milestones of the BPOP which is composed of the basic principles of Japan' ocean policies and reviewed and approved by the Cabinet every five years. The BPOP is based on the BAOP which was legislated in 2007, and MSIL is a key element of the third phase of the BPOP. During the first phase and the second phase, MSIL was never mentioned because integrating maritime information was treated within the scientific frameworks like the JODC and the IODE at that time. Therefore, MSIL originated from this trend including the MICH and the MC, and has advantages of providing information for general users and visualizing information in a user-friendly manner because the JCG had much know-how about it. However, MSIL has disadvantages of providing datasets and dealing with confidential information due to its system design.

On the other hand, the CISE project began in 2009 when the EC proposed the establishment of CISE by communication. Its objective is to provide access to relative information for better use of maritime surveillance, whose idea originated from the effective border control against the immigrants from the sea. Therefore, CISE has advantages of exchanging datasets and dealing with confidential information because they were the primary objectives. However, CISE has

disadvantages of providing information for general users and visualizing information in a user-friendly manner because they were not the objectives from the beginning.

6.2 Comparing MSIL and CISE

Through the comparison, this study found several similarities. Firstly, maritime security was not the original purpose of MSIL and CISE, which was already mentioned in the former section. Secondly, both systems are discussed with civil-military cooperation. However, the difference in system designs decided their positions in the civil-military cooperation. Although CISE is originally designed as a VPN with the provision of civil-military cooperation, MSIL is originally designed as a web application with the provision of a one-stop service for maritime information; therefore, MSIL is not actively discussed in this context. Thirdly, both systems require more providers who share maritime information because their usefulness depends on the available amount of maritime information. EMSA should define the RTS audit methodology and how stakeholders implement the RTS principle, and the JCG should hold workshops like EMSA and seek the opportunity to get feedback. Fourthly, both systems adopted the decentralized system which was achieved by different types of technology. MSIL adopted the API connection to realize its decentralized structure; on the other hand, CISE adopted the P2P network to realize that. Finally, both systems did not clarify the details of their classified layer. This may be caused by its confidentiality.

On the other hand, the differences were much observed and these differences came from three factors, original object, governance scale and geopolitical difference. The first factor, mentioned in the former section, causes the difference of expectations which is that MSIL should promote the innovation of various maritime fields by integrating and providing as much information as possible in a user-friendly manner, but CISE should promote the EUMSS by sharing and exchanging maritime information under the RTS principle. The second factor causes the difference of governmental support including the JRC and the EMFAF; therefore, Japan should

consider the efficient use of their limited budget and resources to develop MSIL. Additionally, because functions of coordination and operation were divided into the NOPS and the JCG, their strong collaboration is necessary. The last factor causes the difference of demands, which is that MSIL is asked to support natural disaster response and exploitation of minerals, but CISE is not asked that.

6.3 Better Way to Improve MSIL

Finally, based on the comparison and quantitative survey through the questionnaire, this study suggests four recommendations for better improvement of MSIL. The first recommendation is that the NOPS and the JCG should strongly popularize MSIL and enrich the contents of MSIL through promotion events like workshops in order to actively seek potential users, information providers and feedback on MSIL. Even though MSIL is assessed as a good one-stop service, it is not meaningful unless users recognize the existence of MSIL. Furthermore, providing information tends to fall into one-way communication, so it is necessary to actively seek the feedback.

The second recommendation is that the NOPS and the JCG should seriously consider the priority of their measures to improve MSIL and the cost-cutting like outsourcing in order to efficiently use their scarce budget and resources. Japan has been in deficit financing and the government can seldom increase the budget; therefore, it is essential to give priorities and redistribute their budgets. In other words, they should consider where they should invest and where they should not invest.

The third recommendation is that the NOPS and the JCG should consolidate their collaboration in order to exercise strong governance for improvement of MSIL and better MDA. At this moment, they cannot separately implement the administration of MSIL because the NOPS only works as the function of coordination and the JCG only works as the function of operation. This collaboration should display the strong governance when they enrich the contents of the second layer of MSIL.

The last recommendation is that the NOPS should efficiently investigate the needs and systems of foreign countries in order to define the benefits of interests and the difference between MSIL and foreign systems, and the JCG should develop the new layer of MSIL in accordance with these needs and benefits. Considering international cooperation, assuming the objectives, needs and benefits is the most important for successful cooperation. The design of the international cooperation layer should take into account these factors sufficiently.

6.4 Conclusion

This study focused on the two governments and its platforms expected to play an important role in the context of the MDA. These governments and platforms will respectively reach the end of the phase in the next year, 2023. Japan's MDA including MSIL will finish the third phase of the BPOP and proceed to the fourth phase of the BPOP. On the other hand, EMSA and the JRC will finish the CISE transitional phase and proceed to the CISE operational phase. It means that both governments will surely publish some updates related to MSIL and CISE. These materials may give this study another insight. In addition, it would be appreciated if this study could become the opportunity to know both systems and enhance the MDA studies.

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Appendices

Appendix A. Border Management and Information Sharing

The original idea of cross-border and cross-sectoral information sharing was already observed in the communication of the EC titled “Reinforcing the management of the European Union's Southern Maritime Borders” and issued in 2006. At that time, illegal border crossing from Africa to Europe was extremely increasing and, sorely in 2008, over 760 persons illegally crossed the border to Canary Island, Spain every month; furthermore, 8,300 persons crossed the EU border through the Mediterranean Sea every month (European Border and Coast Guard Agency, as cited by the EC, 2016). During this terrible situation, the EC proposed that a permanent Coastal Patrol Network for the southern maritime external borders would make it possible for Member States to pool their civilian and military assets and exchange strategic and tactical information in real time (EC, 2006). In 2007, the EC also expressed the plan to take steps towards a more interoperable surveillance system to bind together existing monitoring and tracking systems used for maritime safety and security, marine environmental protection, fisheries control, external border control and other law enforcement activities (EC, 2007). This idea was further developed as the system named European Border Surveillance System (EUROSUR), which became a precursory initiative of CISE (Mihailović et.al, 2021b; EC, 2016).

The creation of EUROSUR was announced by the EC in 2008. The main objective of EUROSUR was described as using information collected by different systems in a more coherent manner (EC, 2008), and three main phases for actualization of EUROSUR were established. Three phases were composed of interlinking and streamlining existing surveillance systems and mechanisms at Member States level (Phase 1), development and implementation of common tools and applications for border surveillance at EU level (Phase 2) and creation of a common monitoring and information sharing environment for the EU maritime domain (Phase 3) (EC, 2008). In particular, Phase 3 is just the backbone of CISE, which aims to integrate all existing sectoral reporting and monitoring systems in sea areas (EC, 2008). This phase 3 was further divided into the two major steps; first step is integration of

existing report and surveillance systems covering the Mediterranean Sea, Canary Islands and the Black Sea where illegal border crossing became serious problem; and second step is to expand it into the EU-wide integration (EC, 2016, EC, 2008). In this communication, it was proposed that these outlines were elaborated and the concrete proposal for the launch of EUROSUR was made in 2009 (EC, 2008), which was the first proposal of CISE. This fact shows that the concept of the beginning CISE originated from the countermeasures related to maritime border control and did not emphasize the MDA so much.

Appendix B. CISE Precursor Projects

At the beginning of the project when the principles and roadmap steps were established, CISE did not start as an own project or developing concept (EC, 2016). It means that some parts of CISE were already started by the other EU projects, such as the SafeSeaNet, EUROPOL and EUROSUR (EC, 2014b). They already supplemented the function of Maritime Safety, Marine Environment and Border Control defined by the EC communication (EC, 2010). As CISE was supposed not to hinder the existing or developing systems (EC, 2009), the first action of CISE was to establish precursor projects in order to effectively integrate them by reusing the existing standards and their vocabularies (Mihailović et.al, 2021b). Particularly, there are three important projects implemented in relation with the future development of CISE at that time, whose outcomes supported the process of creating CISE (EC, 2016). The first one is the BlueMassMED project implemented from 2008 to 2012, which aimed to catalyse and foster cooperation in maritime information sharing between 37 State partners from 6 Member States bordering the Mediterranean Sea and Atlantic approaches (EC, 2016; EC, 2014b; Secrétariat Général de la Mer, 2012). The second one is the MARSUNO project implemented from 2009 to 2011, whose objective is to render existing monitoring and tracking systems more interoperable between at least three coastal Member States to the Northern European Sea basins (EC, 2016; EC, 2014b; "Final Report", 2011). The last one is the CoopP implemented from 2011 to 2014, which aims to enhance further cross-border and cross-sector operational cooperation between public authorities through defining common data formats (EC, 2016; EC, 2014b; Finnish Border Guard, 2014). These projects were successfully completed and the EC proposed a new communication and the EUCISE2020 project based on their outcomes in 2014.

The EUCISE2020 project was the first practical project to establish the large-scale test bed of CISE, which had been implemented since 2014 (Tikanmäki & Ruoslahti, 2017). The main objective of the EUCISE2020 is undoubtedly to demonstrate the technical feasibility of CISE and achieve pre-operational information sharing among the maritime authorities (EC, 2019a; EC, 2016; Rajamäki et.al, 2019). In fact, based

on the various precursor studies and EU projects, especially on the BlueMassMed, the MARSUNO and the CoopP (EC, 2019b; EC, 2016; EC, 2014b; Tikanmäki & Ruoslahti, 2017), the EUCISE2020 project was accomplished successfully in 2019 with the pre-operational network (Figure 1) which connected nine Member States, consisting of Bulgaria, Finland, France, Germany, Greece, Italy, Norway, Portugal and Spain, and 17 existing surveillance systems ("CISE Architecture", n.d.) during a six-months pre-operational validation phase (EC, 2019b). Rajamäki et.al (2019) said that this fact is the most important outcome of the EUCISE2020 project. Specifically, this pre-operational network for information exchange was based on a set of common software components and interoperability standards, such as communication protocol like the CDM (See section 4.1.2), and it was very meaningful that its feasibility and efficiency was demonstrated (EC, 2019b). In the transitional phase, these protocols are further developed for possible improvement of CISE because several unsolved challenges are still remaining like the classified network exchanging sensitive information.

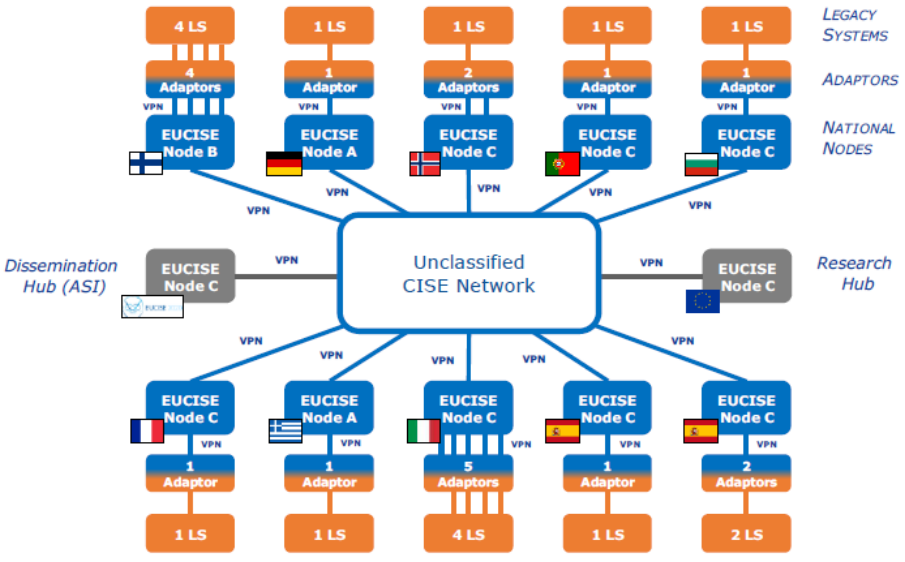

Figure 12. Test network in the EUCISE2020 project

Note. From "CISE Architecture", n.d., p.31. http://www.emsa.europa.eu/technical-specifications/dounload/6889/3689/23.html

The EUCISE2020 project actually examined both unclassified and classified pre-operational networks but only the unclassified network was online and the classified network was no more than tested by Factory Acceptance Test (Rajamäki et.al, 2019). In other words, the classified network was not tested practically and its feasibility was not completely indicated through the pre-operation of the classified network. The classified network will be restricted within the EU-wide level (EMSA, 2022c; Rajamäki et.al, 2019) through adopting a different crypt device from the unclassified network, which encrypts the information before sending it in the CISE's VPN (Rajamäki et.al, 2019) but this network is not online yet at this moment. Furthermore, the EUCISE2020 project was supported by the EU funding scheme named EU Maritime and Fisheries Fund which committed roughly 16.5 million EUR investment in total during 2014 to 2019 so as to support the design, development and examining of CISE at the EU and national levels and facilitate the direct involvement of EMSA (EC, 2019b). If the CISE network aims to involve more Member States or materialize the classified network, it can be not so difficult to necessitate the extra investment. This project strongly supported the development of CISE toward the transitional phase but left some challenges for the next transitional phase.

Appendix C. CISE Node

CISE Node is the main building block of the CISE network, which manages and implements the interoperable communication protocols named the CDM and the CSM (See section 4.1.2) and also manages the access control to the information (EMSA, 2022c; Mihailović et.al, 2021a; "CISE Architecture", n.d.). Because of these interoperable protocols, the CISE Node can be structured by a common software (EMSA, 2022c). In addition, CISE Node can provide an access point to the CISE network and connect the LSs to the CISE network (Mihailović et.al, 2022). The access point provided by the CISE Node can exchange the information through the CISE network, whose connection is established by the point-to-point connection with another CISE Node (EMSA, 2022c; "CISE Architecture", n.d.). In other words, the CISE network is a P2P network using the VPN connection. This also means that the CISE network adopts the decentralized architecture and allows the stakeholders to control the access to their information (EMSA, 2022c). Therefore, when the information is exchanged through the CISE network, a VPN will be established between the CISE Nodes through the Internet to transport the information and IPSEC protocol will be applied for secure communication ("CISE Architecture", n.d.).

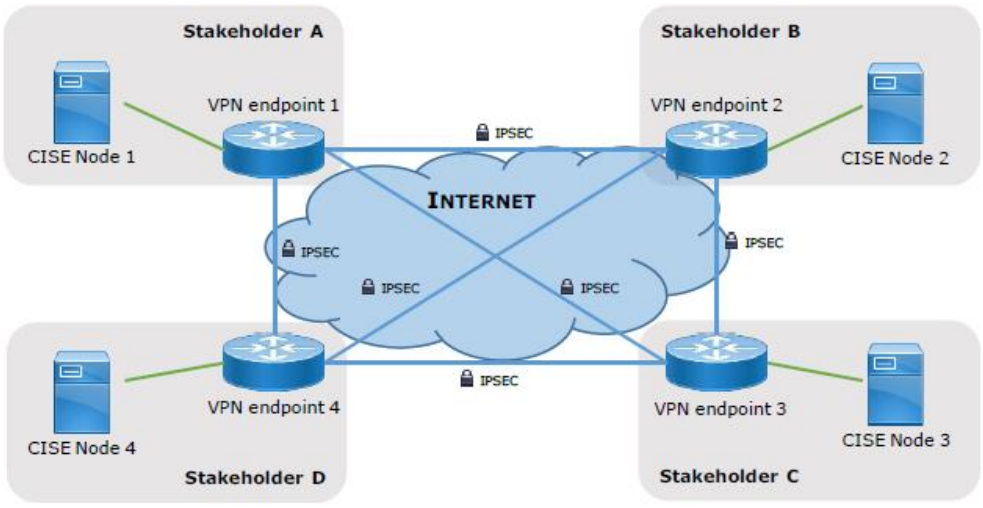

Figure 13. Connection between the CISE Nodes

Note. From "CISE Architecture", n.d., p.29. http://www.emsa.europa.eu/technical-specifications/dounload/6889/3689/23.html

The CISE Node works not only for the junction of the CISE network but for the service provider whose services are composed of Common, Core and Advanced services. Common service provides the fundamental application enabling the connected LSs to exchange their data (Rajamäki et.al, 2019; “CISE Architecture”, n.d.) and manages the interface between the CISE Node and the CISE Adapters (“CISE Architecture”, n.d.). Core service manages the interface between CISE Nodes (“CISE Architecture”, n.d.) and provides some common services to connect other CISE Nodes and secure data transfer, which can be further divided into four services and Administration Console (Figure 9 and 10) (Rajamäki et.al, 2019; “CISE Architecture”, n.d.). Network and Secure Communication Services and Application Security Services are related to managing information exchange between CISE Nodes and ensuring cyber security (“CISE Architecture”, n.d.). Auditing Services implement monitoring the activity and performance of the CISE Node and providing statistics to the node owner (“CISE Architecture”, n.d.). Collaborative Services provide the communication service including email, video and voice conference, file transfer and shared calendar to enhance the communication among maritime surveillance operators (“CISE Architecture”, n.d.). Administration Console literally provides the functions to manage credentials and authorisation rules, see statistics about the services, see and manage the log and create reports on the provided statistics (“CISE Architecture”, n.d.). The last one, Advanced Services unfortunately does not work at this moment because Advanced Services are out of the scope of the CISE Transitional Phase, which anticipates added-value functionalities like Web GIS interface to visualise the information exchanged through the Common Services (“CISE Architecture”, n.d.). If this Web GIS interface is realized, it will become very similar to MSIL.

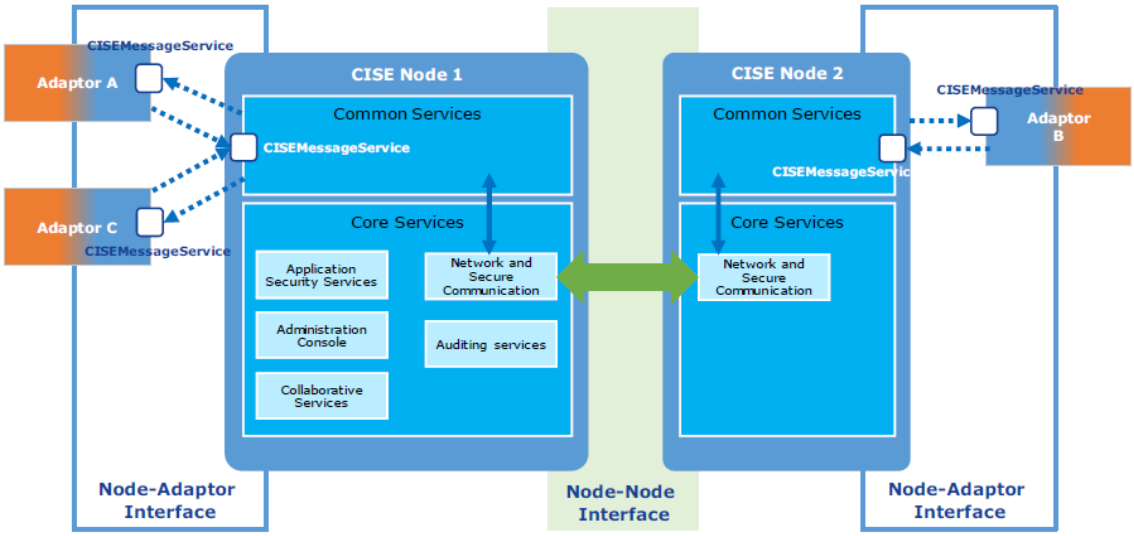

Figure 14. Interfaces and the CISE Nodes

Note. From "CISE Architecture", n.d., p.22. http://www.emsa.europa.eu/technical-specifications/dounload/6889/3689/23.html

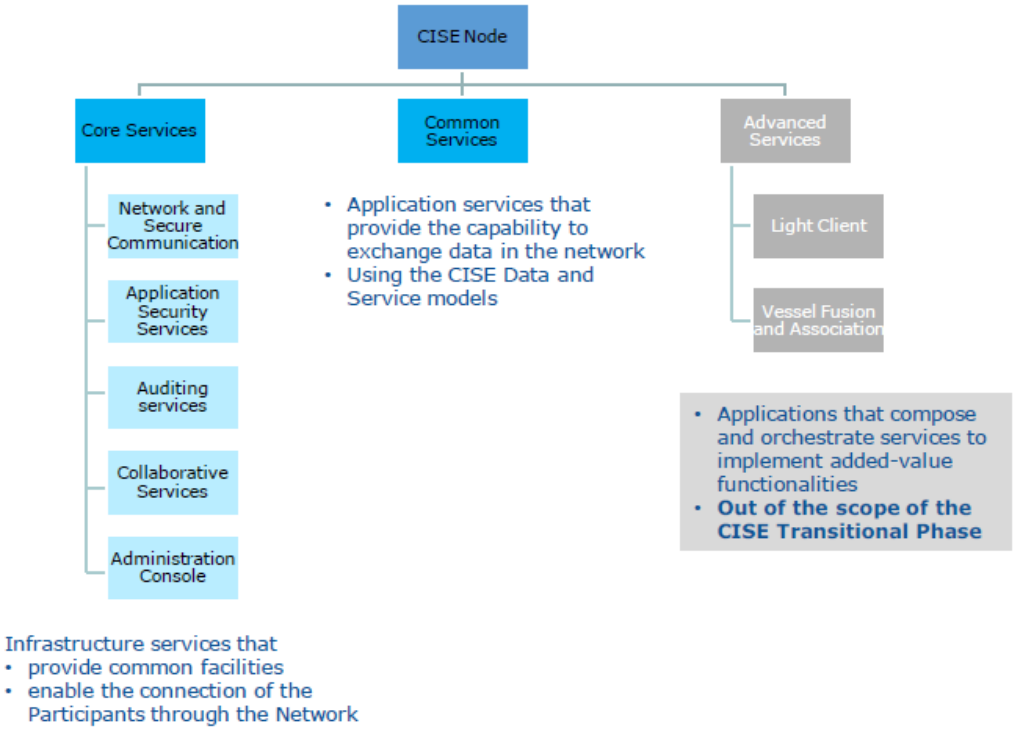

Figure 15. Functionalities of the CISE Node

Note. From "CISE Architecture", n.d., p.20. http://www.emsa.europa.eu/technical-specifications/dounload/6889/3689/23.html

Another feature of the CISE Node is that Stakeholders can choose their arrangement of the CISE building blocks because CISE Node and CISE Adapter can connect plural ICT systems (Figure 11). Therefore, stakeholders are free to customize the arrangement to be suit for their own (EMSA, 2022c). According to the study (Mihailović et.al, 2021b), Single Node models are suitable for small countries due to the easy establishment of the CISE functionalities; on the other hand, these benefits are less expected in larger countries due to their bulkier existing operational infrastructure.

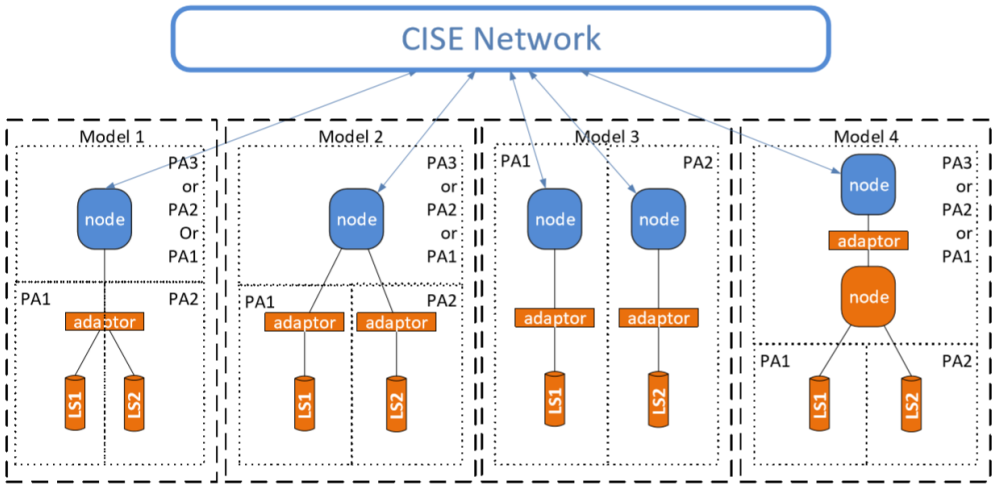

Figure 16. Arrangement of the CISE building blocks

Note. From "Practical Guide for Joining the CISE", by EMSA, 2022c. http://www.emsa.europa.eu/newsroom/latest-news/download/7000/4639/23.html

Furthermore, stakeholders also manage the access rights through defining the Access Rights Matrix, which is enforced when the data is requested and defined by a set of access rules per LS ("CISE Architecture", n.d.). These access rules specify which LS can access the data and which information is available and if the stakeholder does not define the Access Rights Matrix, the access rights are denied by default (EMSA, 2021a; "CISE Architecture", n.d.). This function was also introduced in the CISE Adapter ("CISE Architecture", n.d.). On the other hand, the software of the CISE

Node including the development, the evolutive maintenance, the technical and operational support is provided at no charge by EMSA and the JRC (EMSA, 2022c). In addition, EMSA and the JRC developed the software of the CISE Node called CISE Node version 2 and it successfully worked during the test campaign implemented in June 2022 (EMSA, 2022g; “EMSA successfully”, 2022). The development of the CISE Node is securely implemented.

Appendix D. CISE Adapter

CISE Adapter is one of the building blocks of the CISE network and has a function to translate the CDM and the CSM into the specific formats for each LS, as well as the specific formats into the CDM and the CSM ("CISE Architecture", n.d.; EMSA, 2022c; Mihailović et.al, 2021a; Rajamäki et.al, 2019). This function is essential for connecting the LSs to the CISE Nodes and the CISE Adapter can decide which information should be consumed from and provided to the other participants connected to the network (Data distribution policy) at the Adapter level (EMSA, 2022c) as well as the CISE Nodes. However, the details of the CISE Adapter depend on the communication protocol adopted in each LS connected to the Adapter. It means that many CISE Adapters' details are completely different and unique to each CISE Adapter. These original design and maintenances for each CISE Adapters make it difficult to support Member States from technical aspect, which requires engineering know-how for solving the translational features of each CISE Adapter and many accompanying protocol features of the LSs (Mihailović et.al, 2021b).

In addition, due to the fact that the communication among CISE Nodes, CISE Adapters and the LSs are recognized as outside of the CISE network (Figure 12), Member States should secure the appropriate level of cyber security by themselves ("CISE Architecture", n.d.; Mihailović et.al, 2021b; Rajamäki et.al, 2019). This could be one of the reasons why data protection at the national level is still insufficient (EC, 2019a). EMSA and the JRC also recognized that these technical difficulties make Member States hesitate to join CISE but they did no more than state that technical and operational support for CISE Adapter will be needed (EMSA, 2022c). During the transitional phase, it is responsible for stakeholders to maintain technical and operational support for their CISE Adapters (EMSA, 2022c). Technical support for CISE Adapters, such as providing appropriate know-how or advice, should be considered more seriously to involve more stakeholders.

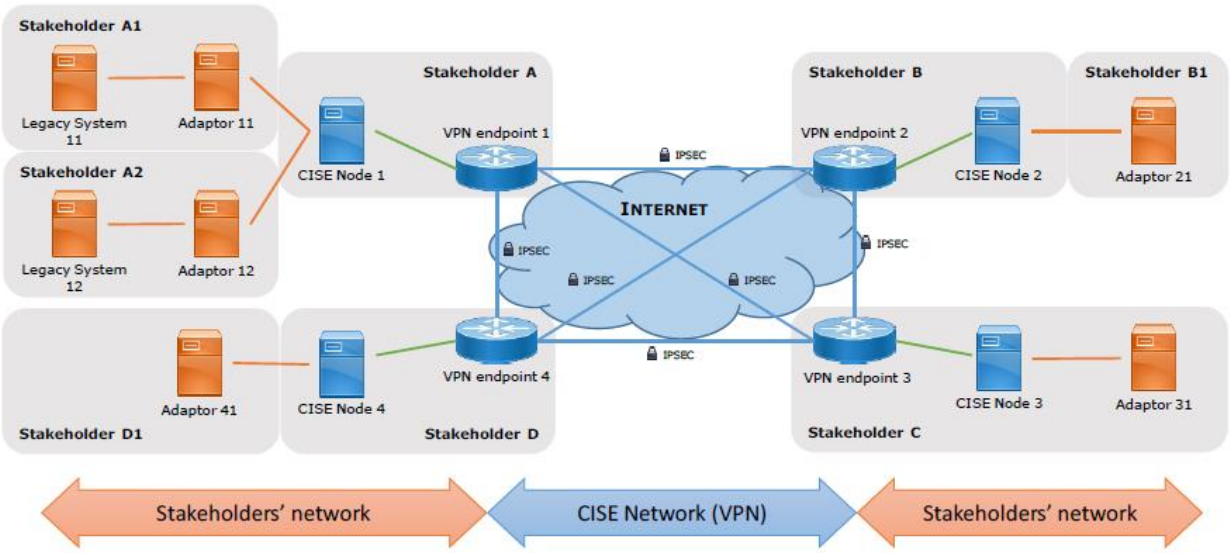

Figure 17. The network between CISE Nodes including Adapters and LSs

Note. From "CISE Architecture", n.d., p.30. http://www.emsa.europa.eu/technical-specifications/dounload/6889/3689/23.html

Appendix E. Organization Chart of the JCG Headquarters

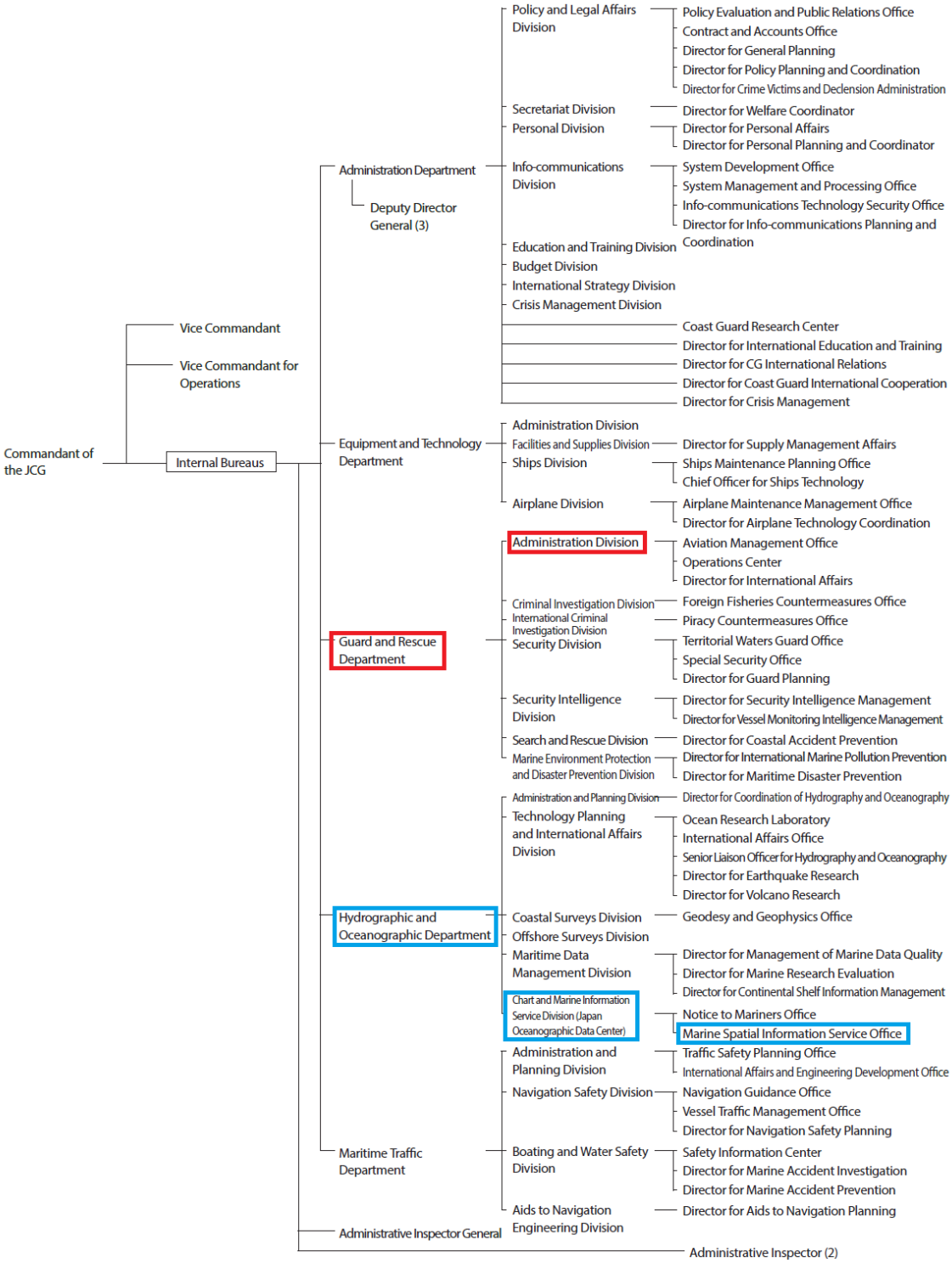

Figure 18. Organizational chart of the JCG Headquarters

Note. Adopted from "Organizational chart of the JCG", by JCG, 2020b, p.1. https://www.kaiho.mlit.go.jp/e/organization/pdf/organizational_chart_of_the_jcg.pdf

Appendix F. Questionnaire

This questionnaire aims to analyze the future challenges of MSIL to develop it.
このアンケートは、日本の MDA の情報共有プラットフォームとなる「海しる」の今後の発展に向けた課題を探るために実施するものです。

1. Please answer the following background information.
   以下の基本情報について回答願います。

   - Gender 性別
     Male 男性 / Female 女性
   - Age (Choose your age group) 年代（該当区分を選択）
     Less than 30 (30 歳未満) / 30 to 50 (30～50 歳) / over 50 (51 歳以上)
   - Working experience (Less than 500 words in Japanese)
     業務経験（500 字以内で記入願います）

   - Professional background (if you have)
     その他専門分野があれば記入願います。

   - Do you know CISE of EU?　EU の CISE をご存じですか？
     Yes はい / No いいえ

2. Do you think that MSIL has any challenges at this moment? If you answer Yes, what is the challenges of MSIL at this moment?
   現状の海しるは改善すべき課題があるとお考えですか？あれば、それはどんな課題ですか？

   Yes はい / No いいえ
   What (Freeform) 具体的な課題

3. Do you know any updates of improvement of MSIL? If you answer Yes, what action is taken to improve MSIL?
海しるの改善のために現在取り組んでいる事はありますか？あれば、それは具体的にどんな内容ですか？

Yes はい / No いいえ

What (Freeform) 具体的な施策

4. Do you think that MSIL is beneficial for the mission of JCG? If you answer Yes, what kind of mission will be benefited?
海しるは海上保安庁の業務に役立つとお考えですか？あれば、それはどんな業務ですか？

Yes はい / No いいえ

What (Freeform) 具体的な業務

5. Do you think that MSIL is beneficial not only for JCG but also for other ministries or organization? Why do you think so?
海しるは他省庁や団体の業務にも役立つとお考えですか？その理由は何ですか？

Yes はい / No いいえ

Why (Freeform) 理由

6. If MSIL deals with confidential information for national security mission, what will become the problem? (Less than 500 words in Japanese)

海しるを安全保障分野で活用するために機密情報を扱うこととなった場合、どんな支障があるとお考えですか？（500 字以内で記入願います）

7. If you have any ideas about countermeasures against the above problems, please write about it. (Less than 500 words in Japanese)
上記の支障について、どのような解決策が考えられると思いますか？（500 字以内で記入願います）

Thank you for your kind cooperation.
ご協力ありがとうございました。