Vol. 4 No.4 https://www.ijosmas.org e-ISSN: 2775-0809

Implementation of Integrated Maritime Surveillance System (IMSS) Technology for the Indonesian Navy in Increasing the Security of the Jurisdictional Marine Area

Fitriana Cahyani Ardi[1*]
[1]Politeknik Angkatan Laut
Ciledug Raya Street No.2, Seskoal, South Jakarta, Indonesia 12230
*Corresponding Author: fcardi06@gmail.com

Abstract *- The territorial waters under the jurisdiction of the Indonesian Navy are strategic assets that require effective and integrated protection to maintain national security. In recent decades, technological developments have opened up new opportunities to enhance maritime monitoring and address complex security challenges at sea. This study aims to investigate the implementation of the Integrated Maritime Surveillance System (IMSS) Technology as a solution to improve the security of the Indonesian Navy's territorial waters. IMSS is a system consisting of a sensor network, data analysis software, and an integrated control centre, designed to monitor and supervise maritime activities in the waters. This research method involves analysing literature and case studies on the implementation of IMSS in other countries that have similar maritime security challenges. This research also involved interviews with authorities in the Indonesian Navy and experts in maritime technology. The research results show that the implementation of the IMSS can provide significant advantages in improving maritime monitoring, threat detection, and rapid response to security incidents in the territorial waters of the Indonesian Navy's jurisdiction. With the integration of advanced sensors such as radar, sonar and thermal cameras, IMSS can effectively track and identify illegal activities such as drug smuggling, fishing theft and suspicious foreign vessel movements. In addition, the use of data analysis and artificial intelligence (AI) software in IMSS enables fast and accurate processing of data, as well as filtering of relevant information to guide the operational actions of the Indonesian Navy. IMSS can also enhance cross-agency and international cooperation through more effective exchange of information with partner countries. In order to implement IMSS, challenges such as initial investment costs, infrastructure availability, and personnel training must be overcome. However, the long-term benefits gained through improved maritime monitoring and security of the Indonesian Navy's jurisdictional waters may outweigh the costs of implementing and maintaining the IMSS system.*

Keywords*: Integrated Maritime Surveillance System (IMSS), Indonesian Navy, Marine Security.*

I. INTRODUCTION

In this era of globalization, maritime security has become a very important issue for many countries. Many countries with large sea areas, such as Indonesia, face various challenges in maintaining security and stability in their waters.[1] Therefore, it is important for countries with large sea areas to develop an integrated and sophisticated maritime surveillance system to enhance security and safety in their jurisdictional waters. Indonesia, as the largest archipelagic country in the world, has a vast sea area and is rich in natural resources. However, with the vast territory of Indonesia's seas, maintaining security and stability in these waters is a complex challenge. In recent years, Indonesia has faced maritime security threats such as illegal fishing, piracy, human trafficking, drug smuggling, and various other forms of cross-border crime.[2][3] Therefore, it is important for Indonesia to develop and implement advanced technology that can enhance their maritime surveillance and water security.[4] The ocean is one of the most valuable natural resources for countries, including Indonesia. The territorial waters under the jurisdiction of the Indonesian Navy which includes the territorial sea, exclusive economic zones and archipelagic waters are strategic assets that require effective and integrated protection.[5][6] Maritime security is very important to maintain national sovereignty, protect marine

resources, and prevent threats to political and economic stability. The Indonesian government, through the Indonesian Navy, has realized the importance of increasing surveillance and security in its maritime jurisdiction.

In recent decades, technological developments have opened up new opportunities to enhance maritime monitoring and address complex security challenges at sea. To achieve this goal, the Indonesian Navy has adopted the Integrated Maritime Surveillance System (IMSS) technology. IMSS is a system that integrates various maritime surveillance technologies and assets to enhance monitoring, detection and response to security threats in the sea.[7] The Integrated Maritime Surveillance System (IMSS) technology is a promising solution in enhancing the security of the Indonesian Navy's territorial waters. IMSS is a system consisting of a sensor network, data analysis software, and an integrated control centre. This system is designed to monitor and supervise maritime activities in waters more effectively.[8][9] Through the use of advanced sensors such as radar, sonar and thermal cameras, IMSS can detect and track various types of ships and objects at sea.[10] The data obtained from these sensors is then processed using data analysis and artificial intelligence (AI) software to produce relevant information and support decision making.[11] In addition to enhancing monitoring capabilities, IMSS also serves as a means to enhance rapid response to security threats in the sea area. With the integration of advanced communications technology, IMSS enables direct exchange of information between various parties involved, including the Indonesian Navy, the Maritime Security Agency and law enforcement agencies.[12] This enables effective coordination in dealing with threats and maintaining the security of Indonesia's maritime territory.

The application of the IMSS by the Indonesian Navy in enhancing the security of its jurisdictional sea area has had a significant positive impact. First, IMSS enables more effective monitoring of suspicious maritime activities, thereby minimizing the possibility of law violations occurring in Indonesian waters. Second, the IMSS enables a faster response to emergency situations, such as search and rescue (SAR) at sea, which in turn can save human lives and protect national assets.[13] The implementation of the IMSS in the jurisdictional waters of the Indonesian Navy is expected to provide significant advantages in improving maritime monitoring, threat detection and rapid response to security incidents. With the IMSS, potential illegal activities such as drug smuggling, fishing theft, and suspicious movements of foreign vessels can be identified and followed up more efficiently. In addition, IMSS can also facilitate cross-agency and international cooperation through more effective exchange of information with partner countries. Information collected by the IMSS system can be shared with related agencies such as the police, intelligence agencies and other maritime authorities, so that synergy in maintaining the security of water areas can be achieved.[14] However, IMSS implementation is not without challenges. Several factors need to be considered, including the initial investment costs which may be quite high, the availability of adequate infrastructure, as well as the necessary personnel training to operate and maintain the IMSS system optimally. In addition, legal and policy aspects related to data privacy and security are also important factors that need to be considered in implementing IMSS.[15] In an effort to improve the security of territorial waters has become a priority for the Navy. Therefore, this study aims to investigate and analyse the implementation of the IMSS in enhancing the security of the territorial waters of the Indonesian Navy's jurisdiction.

II. METHOD

This study aims to analyse the impact and benefits of IMSS implementation on the security of Indonesia's maritime territory. Taking into account the sustainability of natural resources and the need to maintain regional stability, this research will examine the effectiveness of IMSS in monitoring suspicious maritime activities, preventing security threats, and improving response to emergency situations at sea. The research methodology includes data collection from primary and secondary sources, such as relevant literature, government policies, and available maritime surveillance data. The data collected will be analysed qualitatively to identify strengths, weaknesses, and recommendations regarding the implementation of IMSS. It is hoped that this research will provide a deeper understanding of the implementation of the IMSS and its contribution to enhancing the security of Indonesia's maritime territory. The results of this research can provide valuable insights for the government, the Navy, and related institutions in optimizing the use of IMSS and formulating effective strategies in maintaining the security and sustainability of jurisdictional sea areas.

III. RESULT AND DISCUSSION

A. Human Resources are expected to increase the ability of IMSS crew personnel

The expected condition is the development of the ability of IMSS crew personnel to operate and optimally utilize IMSS technology. IMSS crew personnel are expected to have in-depth knowledge of the IMSS system, including a comprehensive understanding of the function and operation of each technology component involved. They are also expected to have expertise in monitoring and analysing data obtained from IMSS, as well as the ability to respond quickly to situations that require action. To achieve these conditions, the training and education of IMSS crew personnel is very important. Training should cover aspects such as maintenance and operation of IMSS hardware and software, data analysis, vessel traffic monitoring and response actions in emergency situations. Quality education is also needed to ensure IMSS crew personnel have a deep understanding of policies and procedures related to maritime surveillance, maritime law, and cooperation and coordination with other agencies and countries. In addition, the expected conditions also involve increasing the ability of IMSS crew personnel to integrate data and information from various sources into the IMSS system. This involves skills in managing and analysing data obtained from radar, sensors and other information sources, as well as the ability to relate and understand the interrelationships between different data. With this capability, IMSS crew personnel can provide a comprehensive understanding of the ongoing maritime situation, identify potential threats, and take necessary actions to maintain the security of jurisdictional waters. As well as enhancing the capabilities of IMSS crew personnel, it is also important to ensure they have optimal working conditions. Good working conditions include a comfortable and safe work environment, access to adequate equipment and facilities, and adequate support from staff and management. With good working conditions, IMSS crew personnel will be able to focus and perform high in carrying out maritime surveillance duties with IMSS.

B. facilities and infrastructure are expected to be able to have State of Modernization technology

The expected condition is the existence of facilities and infrastructure that have the latest technology to support the implementation of IMSS. The facilities and infrastructure in question include hardware, software and other supporting infrastructure needed for the effective operation of IMSS. In this case, the latest technology includes sophisticated radars with accurate and extensive monitoring capabilities, smart sensors capable of detecting various maritime threats, as well as reliable and integrated communication systems. In addition, supporting infrastructure such as a command and control centre equipped with sophisticated analytical software is also expected. With the existence of facilities and infrastructure that have the latest technology, IMSS implementation can achieve a high level of reliability and effectiveness. Sophisticated radar technology will enable early detection of suspicious ships or objects within jurisdictional waters, enabling the Indonesian Navy to take swift and appropriate action. Smart sensors, which are sensitive to suspicious activity such as the movement of unregistered vessels or other threats, will strengthen IMSS' surveillance and detection capabilities. An integrated communication system will facilitate the real-time exchange of information between monitoring units and the central command, enabling more efficient coordination in dealing with emergency situations or potential threats. In addition, facilities and infrastructure that have the latest technology will also improve the analytical and data management capabilities of IMSS. With state-of-the-art analytical software, data obtained from multiple surveillance sources such as radar and sensors can be thoroughly analysed, enabling the identification of patterns and trends that are important for better decision making. Adequate supporting infrastructure, such as a command and control centre with large data storage capacity, will also support efficient data management and fast access to relevant information.

C. Maintenance and care are expected to optimize the use of IMSS technology

The expected condition is optimal maintenance and maintenance of the IMSS technology. Good maintenance and care involves efforts to maintain operational conditions and optimal performance of all technological components involved in IMSS. This includes routine maintenance, repair and replacement of damaged or worn components. In maintenance and care, regular monitoring, evaluation and testing activities are also carried out to ensure that the IMSS technology continues to function as it should. With optimal maintenance and care, the use of IMSS technology will become more effective and efficient in supporting the improvement of the security of jurisdictional waters. Scheduled routine maintenance will ensure that every technology component in IMSS continues to operate properly, thus minimizing the risk of failure or damage that can disrupt maritime surveillance functions. Timely repair and replacement of damaged or obsolete components will ensure the reliability and operational accuracy of IMSS in detecting, tracking and monitoring vessel movements and activities in Indonesian waters. In addition, optimal maintenance and maintenance will also have an impact on the longer service life of the IMSS technology. By taking proper precautions and maintenance, the risk of damage or technology failure can be minimized, thereby reducing the cost of replacing components or the entire system. In the long term, good maintenance and maintenance

will help maximize investment in IMSS technology and ensure optimal operational continuity over a longer period of time. In addition to maintenance and care carried out by the Indonesian Navy itself, cooperation with manufacturers or IMSS technology providers is also an important factor. IMSS manufacturers or technology providers can provide maintenance and maintenance support through the provision of spare parts, technical fixes and software updates. This support will ensure that IMSS technology is always updated according to the latest developments and continues to meet the needs of the Indonesian Navy in maintaining the security of jurisdictional waters.

D. Contribution

1) IMSS crew personnel are able to carry out, recognize threats in their territory, and are even capable of carrying out law enforcement actions at sea. Then it can also contribute to the implementation of the role of Navy diplomacy through increasing international cooperation in the military field in the form of coordinated patrols, joint exercises, education/courses, seminars/symposiums, exchange of information, defence cooperation, and working together with regional and international organizations according to with the government's foreign policy
2) Can carry out the duties of the Indonesian Navy in the field of defence through various operations in the territorial waters of national jurisdiction in the framework of deterring, preventing and taking action against any form of threat and disturbance to state sovereignty at sea, especially in the territorial waters of the Malacca Strait, Singapore Strait, Natuna Sea, and outermost small islands.
3) IMSS crew personnel can carry out law enforcement and maintain security in the sea area of the national jurisdiction through various operations in the territorial waters of the national jurisdiction in the context of deterring, preventing, monitoring and taking action against every form of criminal act/violation of ratified national and international laws to create conditions sea that is free from threats of violence, security of navigation, pollution of the environment and marine resources and violations of law at sea.
4) Carry out empowerment of maritime defence areas through fostering and empowering maritime potential, both the community and the national maritime service industry in the context of preparing supporting components and reserve components to support national defence efforts.

E. Indicator of Success

1) Increased Capability of IMSS Crew Personnel who carry out phasing steps. The expected capability consists of two factors, namely the professionalism of personnel and work procedures that always follow zero accident procedures. Professionalism here implies that the ability possessed to carry out all types of operations to be carried out in manning IMSS equipment facilities without experiencing errors in work procedures.
2) The facilities and infrastructure that will be fulfilled are capable of having State of Modernization technology in the field of information technology. Capacity building in both KRI, Air Force and Marines through the modernization of defence equipment has been carried out by policy makers in the Indonesian Navy. The technology used has kept pace with the latest developments in military technology so that it has a comparative advantage in strength and capability against threats from state and non-state actors. With the existence of the IMSS, it is hoped that the Indonesian Navy will be able to carry out and control the sea area in an integrated manner. This capability increase is based on an operation orientation which refers to how the development of naval capabilities will always be ready to face a balance of surveillance technology and weapons at both the national and regional levels.

F. Solution to problem

By looking at the development of the strategic environment and the possibility of violations of sovereignty and law that occur in the sea area of national jurisdiction, especially in and through the waters of the Malacca Strait. Then in order to have a deterrent effect and a fast reporting system that utilizes the Integrated Maritime Surveillance System, it will be impossible if it is not supported by a policy that utilizes the IMSS system that has been realized at this time so that it becomes optimal. Then, in order to realize the capability of the Indonesian Navy which is able to overcome national jurisdictional sea security, especially in the Malacca Straits area, the concept of integrated IMSS operational activities is absolutely needed at this time, because in terms of geographical constellation, this area is very vital, as a strategic funnel starting from sea lanes the Indonesian archipelago which is very likely to arise various problems that can cause regional instability. Various interests exist in this area both national and international interests. Prolonged border conflicts, transnational crime, terrorism are some of the threats that need to be watched out for. The capability and existence of IMSS as well as its integration in an integrative manner with other dimensions/agencies are highly demanded in dealing with

the possible threats mentioned above. To support an operation that works in an integrated manner and national jurisdictional maritime security activities, it is necessary to have a policy, which is implemented with several strategies and efforts to be able to overcome all obstacles that will be faced in the future.

1) Policy

In formulating an activity by looking at the strategic environment development opportunities in order to realize an optimal IMSS, a leadership policy is needed that can be followed up in order to create a force capable of supporting national Jurisdiction sea security. The policies are: "Realization of IMSS Technology optimization through fulfilment of human resources in terms of Quantity and Quality, Fulfilment of IMSS Supporting Facilities and maintenance and maintenance of IMSS in order to increase security in the sea area of National jurisdiction to support the Indonesian Navy's Duties"

2) Strategy

Based on the above policies, it needs to be translated into an appropriate strategy so that it becomes a Based on the above policies, an appropriate strategy can be determined in the formulation of a concept for the Indonesian Navy's title of strength in the Indonesian sea area which is manifested in times of peace and times of crisis/war. The strategy drawn up is:

a) Strategy 1: Realizing the operation of the Integrated Maritime Surveillance System (IMSS) through an activity carried out with the SSAT component and other maritime components in the context of optimal security of the national jurisdictional sea area so that the main tasks of the Indonesian Navy can be achieved.
b) Strategy 2: Realizing the professionalism of the IMSS crew members who are able to work in an integrated manner within an IMSS function so that they can detect early maritime security threats that will be faced with the level of technological sophistication and technological advancement in order to achieve the main tasks of the Indonesian Navy.
c) Strategy 3: Realizing sea security development along with other maritime components through the similarity of action patterns and integrated title patterns between the TNI's dimension of strength and other components as well as fostering a defence system and procurement of defence equipment so that sovereignty and legal stability at sea can be achieved in order to achieve the main tasks of the Indonesian Navy.

3) Effort: In order to realize the aforementioned strategy in the face of developments in Indonesia's strategic environment and geographical constellation, steps and efforts are needed which include::

a) Efforts made to support Strategy 1

IMSS radar unit operators carry out system and method capability upgrades. Implementation implements guidance on IMSS preparedness that is useful for the purposes of monitoring and security so that the final result achieved is the fulfilment of the ability to process, collect, supply and master IMSS technology in an integrated and synergistic manner between one IMSS radar unit and other IMSS radar units; Relevant stakeholders strive for government policies to integrate and synergize all monitoring systems owned by observation, communication, surveillance and reconnaissance; carry out coordination to develop the concept of communication standards and procure fast patrol boat elements that are on alert at any time according to the situation; setting up supporting technical institutions dealing with management of information systems at the intra-agency level with coverage throughout Indonesia down to the level of areas that are vulnerable to maritime security. Supporting technical institutions here are able to carry out and operationalize the national information system both at the central and regional levels; creating a roadmap and compiling a model that collaborates so that other institutions can join the system without disturbing the internal system in the existing system, but beforehand it must be with a support and political will from the Government

b) Efforts made to support Strategy 2

Stakeholders develop a fixed procedure for tactical cooperation in order to equalize the procedure for sending and receiving news during the implementation of security operations and ALKI security in an integrated manner by utilizing data from IMSS so that crew personnel do not hesitate in acting and facilitate administrative processes; Preparing technology transfer for increasing human resources includes various efforts: Preparing the ability to accept technology transfer, regulating technology imports, regulating ways of dissemination or dissemination of technology to other sectors and preparing applications in the production sector of other supporting main defence equipment to be installed as the IMSS project in ALKI checkpoints; maintaining the capability of reserve components and supporting components in stages and continuously to ensure the operational readiness of the Indonesian Navy; and carry out an evaluation of the plans for the development of reserve components

and supporting components to obtain results as expected in order to support the implementation of IMSS operations.

c) Efforts made to support Strategy 3
Relevant stakeholders carry out coordination and equalization of vision and mission to form Relevant stakeholders carry out coordination and equalization of vision and mission to form Coordination and Control Centres in other agencies by deploying a centralized communication network system, among others, Developing Standard Operational Procedures for coordinated patrols in security at sea and carrying out periodic joint exercises in the form of integrated Search and Rescue Exercises, Damage Control , marine safety education; make the concept of implementing Military Operations for War in peacetime for 365 days, this is carried out in order to provide a deterrence effect and build the preparedness of elements that have been diversified on each IMSS radar unit; carry out surveillance and security of waters from threats and disturbances of crime in the Malacca Strait such as piracy, illegal logging and illegal fishing, all of which can affect the stability of national security, it is necessary to take steps to secure and deal with the above crimes both preventively as well as prosecution (repressive) by the Indonesian Navy in the next five years

IV. CONCLUSION

Developing the capabilities of IMSS crew personnel and creating optimal working conditions is an important factor in optimizing the use of IMSS technology. With crew personnel who are well trained, have in-depth knowledge, and are able to integrate data properly, and are supported by good working conditions, maritime surveillance with IMSS can be carried out effectively and efficiently. This will contribute to increasing the security of jurisdictional waters and assisting the Indonesian Navy in carrying out its maritime surveillance duties successfully.

Facilities and infrastructure that have the latest technology will make a significant contribution in increasing the security of jurisdictional waters through the implementation of IMSS. With sophisticated radars, smart sensors, integrated communication systems and adequate supporting infrastructure, the Indonesian Navy will have better capabilities in detecting, monitoring and responding to maritime threats in Indonesian waters. Thus, facilities and infrastructure that have the latest technology are important aspects that need to be considered in the implementation of IMSS to support increased security of jurisdictional waters.

Optimal maintenance and maintenance of IMSS technology is an important factor in optimizing the use of IMSS technology. With routine maintenance, timely repairs, and replacement of necessary components, the use of IMSS technology by the Indonesian Navy will continue to operate properly, maintain the reliability of maritime surveillance, and support increased security of jurisdictional waters. With good cooperation between the Indonesian Navy, manufacturers or providers of IMSS technology, and active involvement in maintenance and maintenance, the use of IMSS technology will be more effective and sustainable in the longer term.

REFERENCES

[1] P. Amelia, A. Lathifah, and I. N. A. Yasa, “Analysis of the impact of maritime sector development in supporting Indonesian Navy Ship operations,” *Procedia Comput. Sci.*, vol. 197, no. 2021, pp. 317–325, 2021, doi: 10.1016/j.procs.2021.12.146.

[2] Gita Prissandi, Surya Wiranto, Budiman Djoko Said, Pujo Widodo, Herlina Juni Risma Saragih, and Panji Suwarno, “Reformulation of Regulations in the Context of Structuring the Indonesian Maritime Security Regime,” *Int. J. Humanit. Educ. Soc. Sci.*, vol. 2, no. 6, pp. 1969–1983, 2023.

[3] Widia Aprilia, Rudy Sutanto, Lukman Yudho Prakoso, P. Priyanto, and Agus Adriyanto, “the Efforts of the Maritime Security Agency in Preventing Transnational Crime At the State Frontier Are Viewed From the Strategic Position of the Riau Islands,” *Int. J. Soc. Sci.*, vol. 2, no. 5, pp. 2253–2260, 2023, doi: 10.53625/ijss.v2i5.4962.

[4] H. Firman Sitorus and B. Djoko Said, “Synergy Among the Indonesia Maritime Security Institutions in Conducting Maritime Patrol,” *Nasionalism dan Integr.*, vol. 9, no. 1, pp. 30–41, 2023, [Online]. Available: http://jurnal.idu.ac.id/index.php/DefenseJournalhttp://dx.doi.org/10.33172/jp.v9i1.7890

[5] M. R. Darajati, “Strengthening The Maritime Security System in Realizing Indonesia as The Global

Maritime Fulcrum," *J. IUS Kaji. Huk. dan Keadilan*, vol. 10, no. 2, pp. 420–435, 2022, doi: 10.29303/ius.v10i2.1026.

[6] P. M. Perera, "Integrated maritime picture for effective domain awareness," *Marit. Technol. Res.*, vol. 2, no. 3, pp. 108–113, 2020, doi: 10.33175/mtr.2021.224463.

[7] G. Hake, S. Vander Maelen, and A. Hahn, "Maintaining safety requirements of updated maritime surveillance systems," *IFAC-PapersOnLine*, vol. 54, no. 16, pp. 112–119, 2021, doi: 10.1016/j.ifacol.2021.10.081.

[8] S. J. Poerwowidagdo, "Blue Ocean Strategy In Managing Maritime Security," *J. Pertahanan*, vol. 1, no. 1, p. 13, 2015, doi: 10.33172/jp.v1i1.51.

[9] A. M. Nasution, "the Role of Fishermen in Assisting Maritime Law Enforcement Agencies To Prevent Maritime Security Threats," *J. Pertahanan Bela Negara*, vol. 8, no. 1, pp. 19–40, 2018, doi: 10.33172/jpbh.v8i1.276.

[10] Y. Yin, X. Cheng, F. Shi, M. Zhao, G. Li, and S. Chen, "An Enhanced Lightweight Convolutional Neural Network for Ship Detection in Maritime Surveillance System," *IEEE J. Sel. Top. Appl. Earth Obs. Remote Sens.*, vol. 15, pp. 5811–5825, 2022, doi: 10.1109/JSTARS.2022.3187454.

[11] R. Petrovic, D. Simic, Z. Cica, D. Drajic, M. Nerandzic, and D. Nikolic, "Iot oth maritime surveillance service over satellite network in equatorial environment: Analysis, design and deployment," *Electron.*, vol. 10, no. 17, 2021, doi: 10.3390/electronics10172070.

[12] Z. Yassir, A. Abdelali, and B. Mohammed Laboratory, "A Comparison of AIS, X-Band Marine Radar Systems and Camera Surveillance Systems in the Collection of Tracking Data," *Int. J. Recent Res. Appl. Stud.*, vol. 7, no. 4, pp. 1–5, 2020.

[13] R. A. . Widyastuti, "The Effectiveness of Maritime Surveillance to Handling Drug Smuggling by Sea in Banten Province," *Int. J. Soc. Sci. Res. Rev.*, vol. 6, no. 3, pp. 52–63, 2023.

[14] Z. Ding, G. Kannappan, K. Benameur, T. Kirubarajan, and M. Farooq, "Wide area integrated maritime surveillance: An updated architecture with data fusion," *Proc. 6th Int. Conf. Inf. Fusion, FUSION 2003*, vol. 2, pp. 1324–1333, 2003, doi: 10.1109/ICIF.2003.177391.

[15] M. Iqbal, "Analysis Customs Maritime Surveillance System Based On Movement Phenomenon And Characteristic Of Narcotics, Precursors And Psychotropics (Npp) Smugglings," *J. Perspekt. Bea dan Cukai*, vol. 4, no. 1, pp. 1–19, 2020.