

Implementation Policy Maritime Security in Flight Information Region (FIR) Kepulauan Riau - Natuna

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Abstract. This study discusses the implementation of maritime security in the Flight Information Region (FIR) of the Kepulauan Riau - Natuna, an area that has strategic value both politically, economically, and defense-wise. The management of this airspace was previously controlled by Singapore based on a mandate from the International Civil Aviation Organization (ICAO) since 1946, which poses challenges to Indonesia's sovereignty and security. The Collaborative Governance approach was applied to improve coordination between various stakeholders, including the Ministry of Defense, Ministry of Transportation, AirNav Indonesia, and the National Air Operations Command (KOOPSUDNAS). This study identified several major obstacles, such as overlapping regulations, technological limitations, and lack of participation and coordination between institutions. An in-depth analysis was conducted on the factors that influence the success of collaboration, including trust between stakeholders and institutional design that supports transparent and participatory processes. The results of this study indicate that increasing collaboration and harmonization of roles between institutions is essential to realizing optimal sovereignty and security in the FIR of the Kepulauan Riau - Natuna

1 Introduction

FIR (Flight Information Region) Riau Islands - Natuna is one of the important areas in air traffic management in Indonesia. This FIR covers a fairly large area, including strategic islands such as Natuna, which are located in the South China Sea. As part of air navigation, FIR is tasked with providing flight information services and helping to ensure the safety and efficiency of flight operations in the region. Although geographically separated from the main islands of Indonesia, Natuna has a crucial strategic position, not only for Indonesia but also for international flights passing through its vicinity.

Kepulauan Riau - Natuna is Flight Information Region (FIR) is an important part of Indonesia's air sovereignty, but for decades this area has been controlled by Singapore under the mandate of the International Civil Aviation Organization (ICAO) [1]. This situation poses a serious challenge to Indonesia's state sovereignty and national security. The problem that is the main focus of this study is how the implementation of maritime security in the

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Kepulauan Riau-Natuna Islands FIR can be strengthened through the takeover of full control from Singapore and improved internal management that focuses on collaboration between national institutions [2].

The governance and security policies within the Flight Information Region (FIR) in the Kepulauan Riau - Natuna area. FIR is an airspace division in which flight information and alert services are provided for the safety and security of aircraft operations. The concept of "Collaborative Governance" refers to the cooperation between government bodies, organizations, and stakeholders to achieve common goals, ensuring effective and efficient management of maritime and airspace security. By establishing collaborative efforts, the implementation of policies aims to enhance the safety, sovereignty, and security of the region.

This FIR issue has a broad dimension because it not only covers the technical aspects of aviation but is also related to international diplomatic relations, security, and the economy [3,4]. Amidst existing related studies, this study positions itself as an effort to overcome the sovereignty deficit in strategic airspace for Indonesia, with a focus on implementing policy implementation to optimize security and sovereignty [5]. The urgency of this study lies in the strategic importance of the Riau-Natuna Islands FIR for regional defense and stability, especially amidst the geopolitical dynamics of the South China Sea region that continue to develop.

FIR in this region is not only the lifeblood of civil aviation traffic but also a corridor that is very vulnerable to foreign military infiltration, airspace violations, and other illegal activities. Along with the development of the security situation in the North Natuna Sea which is full of territorial claims by various countries, Indonesia must be able to fully manage its own airspace in order to maintain national integrity. In this context, research on the implementation of maritime security through strengthening the FIR becomes very relevant and urgent.

This study aims to provide a comprehensive analysis of the issue of Indonesian airspace sovereignty, especially within the framework of cross-sectoral collaboration involving various actors from the government, military, and civil sectors. Several prior studies have addressed the management of the Flight Information Region (FIR) airspace in Natuna, which was assumed by the Indonesian Government after prolonged administration by the Singapore Government. The policy enacted several years ago, which assigned the Flight Information Region (FIR) to Singapore over the Kepulauan Riau airspace, was a regrettable decision necessitated by Indonesia's constraints as a developing nation, unable to effectively manage its own airspace in the congested Kepulauan Riau region, characterized by significant international flight traffic [6].

Important aspects examined in this study include the challenges of cross-sectoral collaboration between institutions involved in FIR management, such as the Ministry of Transportation, Ministry of Defense, AirNav Indonesia, and the National Air Operations Command (KOOPSUDNAS). This is done to answer the fundamental question of how Indonesia can improve the security of its airspace through closer and more synergistic cooperation between these various actors. Thus, the purpose of this article is to explore ways to increase the effectiveness of FIR management through cross-sectoral collaboration that strengthens supervision, response to threats, and the formulation of more coordinated and effective policies.

In comparison to other countries, such as the United States and Australia, which have established robust Flight Information Region (FIR) management systems supported by advanced technology and strong inter-agency collaboration, Indonesia faces unique challenges and opportunities in managing the Kepulauan Riau - Natuna FIR. While countries like the U.S. integrate military and civilian airspace control seamlessly, Indonesia's complexity lies in its archipelagic geography, the need for enhanced coordination among various sectors, and the recent transfer of control from Singapore. However, this shift

presents opportunities for Indonesia to strengthen its sovereignty, modernize its airspace management infrastructure, and improve cross-sectoral collaboration to meet international standards.

Recent studies on Flight Information Region (FIR) management and maritime security emphasize the strategic importance of FIR governance in securing national airspace and maritime boundaries. Research highlights the increasing geopolitical tensions in the South China Sea, particularly affecting the Kepulauan Riau-Natuna, and underscores the need for integrated airspace and maritime policies to address sovereignty and security challenges. The integration of FIR management with maritime security strategies is also linked to enhanced surveillance technologies and international cooperation frameworks, which are critical for monitoring illegal activities, enforcing territorial claims, and ensuring safe and secure flight operations. Moreover, contemporary approaches suggest that cooperation between ASEAN states and international bodies can enhance regional stability by addressing both aerial and maritime threats.

Scientifically, this study provides an important contribution by offering a collaborative FIR management model that not only considers technical aviation factors, but also social, political, and diplomatic aspects that play a major role in the strategic airspace management process. By adopting the Meter & Horn Implementation approach, this study also aims to strengthen Indonesia's position in maintaining air sovereignty while increasing transparency and participation of various relevant parties.

This study focuses on analyzing the implementation of security policies related to the management of the Kepulauan Riau - Natuna Flight Information Region (FIR) following the transfer of control from Singapore to Indonesia. Specifically, it examines how key aspects such as policy standards, resource allocation, organizational characteristics, inter-agency communication, attitudes of implementers, and external socio-political conditions influence the effectiveness of policy implementation. By exploring these elements, the study aims to provide a comprehensive understanding of the challenges and opportunities in managing FIR to support Indonesia's maritime security and sovereignty.

2 Research Method

The study utilizes a qualitative approach with a descriptive analytical method to explore the implementation of security policies in the Kepulauan Riau - Natuna Flight Information Region (FIR). Guided by Van Meter and Van Horn's Implementation Theory, the research evaluates FIR management and security policy through six key elements: policy standards and targets, resources, organizational characteristics, communication between organizations, implementer attitudes, and socio-economic and political environmental conditions. Analytical approach to comprehend the execution of security rules in the Kepulauan Riau - Natuna Flight Information Region (FIR). Van Meter and Van Horn's Implementation Theory serves as the primary foundation for assessing the execution of this FIR management and security strategy. The analysis encompasses six primary elements: (1) policy standards and objectives, (2) resources, (3) attributes of implementing organizations, (4) inter-organizational communication and implementation activities, (5) implementers' dispositions or attitudes, and (6) socio-economic and political environmental conditions.

Data were collected through policy document analysis, in-depth interviews with key actors involved in FIR management, and observations of existing infrastructure conditions and dynamics of relationships between related institutions [7,8]. The focus of this study is to explore how each of these elements plays a role in supporting or hindering the implementation of the takeover of FIR control from Singapore, and how related actors collaborate to ensure Indonesia's sovereignty over the region.

Data sources used include primary and secondary data. Primary data were obtained through interviews with key stakeholders, including officials at the Ministry of Transportation, Ministry of Defense, AirNav Indonesia, and personnel from the National Air Operations Command (KOOPSUDNAS). Secondary data were obtained from various official documents such as government regulations, International Civil Aviation Organization (ICAO) reports, FIR policy documents, and relevant literature studies. Data analysis was conducted using thematic analysis methods, which aimed to identify key themes emerging from interviews and documents, especially those related to the six elements of policy implementation proposed [9].

To enhance transparency and replicability, the qualitative approach in this study includes semi-structured interviews with open-ended questions tailored to explore the six elements of policy implementation based on Van Meter and Van Horn's framework. Questions focused on understanding the specific roles and challenges faced by each stakeholder, such as "What are the primary challenges in implementing the FIR policy?" and "How does your organization communicate and collaborate with other institutions involved in FIR management?" Participants were selected using purposive sampling, targeting key stakeholders directly involved in FIR management, including officials from the Ministry of Transportation, Ministry of Defense, AirNav Indonesia, and personnel from KOOPSUDNAS, ensuring diverse perspectives and comprehensive insights into the policy implementation process.

3 Results and Discussion

3.1 Existing Condition of FIR Natuna – Kepulauan Riau

On March 21, 2024, Indonesia officially took over the regulation of airspace in the Kepulauan Riau, Kepulauan Riau, and Natuna regions from Singapore. This takeover was the result of a long negotiation process that began in 1995 and reached an agreement in January 2022, through a meeting between President Joko Widodo and Singaporean Prime Minister Lee Hsien Loong in Bintan, Kepulauan Riau [10,11]. Minister of Transportation Budi Karya Sumadi stated that Indonesia can now regulate the airspace above the Kepulauan Riau and Natuna which was previously managed by Singapore. This agreement expands the Jakarta FIR area to 249,000 km², with a total area of 2.842 million km² [12–14].

With the implementation of this agreement, all aircraft crossing the Natuna and Kepulauan Riau regions now receive navigation services from Indonesia. This not only shows Indonesia's sovereignty in managing its own airspace, but also brings economic benefits. It is estimated that non-tax state revenues will increase by around 250 billion rupiah per year. Better airspace management also allows Indonesia to improve coordination regarding airspace security in Natuna, especially through cooperation with Changi Airport, Singapore.

Singapore's control of the FIR over the airspace in Natuna and the Kepulauan Riau began in 1946, based on the Regional Air Navigation I Meeting (RAN I) in Honolulu in 1973. Singapore took the initiative to manage the FIR because Indonesia was considered technically incapable of managing the airspace at that time. This inability, which was related to technological and infrastructure limitations, meant that Singapore continued to control the area for decades. It was only in 1982, with the adoption of the UNCLOS Convention, that Indonesia gained sovereignty over the sea and airspace above the Kepulauan Riau and Natuna, which should have returned to Jakarta's FIR [15–17].

Although the takeover of the FIR has begun, Indonesia still faces several technical and political challenges. One of the biggest challenges is the limited infrastructure, such as radar

and air control facilities that still need further development to meet international standards. In addition, institutional aspects are also an obstacle; coordination between ministries, the military, and other agencies is often suboptimal, which can slow down or even hinder the implementation of policies related to the sovereignty and security of this airspace.

As part of the latest agreement, there is an area around the Kepulauan Riau that is jointly managed by Indonesia and Singapore, especially to support the operations of Changi Airport. A total of six Indonesian Air Force soldiers, three staff from the Ministry of Transportation, and one other officer are stationed in Singapore to monitor the movement of aircraft entering and leaving Changi Airport. This is done to maintain flight security and safety, especially in areas bordering Singapore's FIR. Although Indonesia has succeeded in increasing its sovereignty, dependence on Singapore still exists, especially regarding technical and infrastructure aspects.

This takeover not only has an impact on the sovereignty aspect, but also has a significant impact on economic revenues. This agreement provides an opportunity for Indonesia to maximize revenue from air navigation services. However, some of the FIR areas previously managed by Singapore are still under joint supervision, especially at altitudes of 0 to 37,000 feet, which makes commercial benefits still largely in favor of Singapore. With this agreement in effect for 25 years, Indonesia must improve its technical capabilities and conduct stronger diplomacy to ensure that the management of the FIR can be fully transferred in the future.

3.2 Implementation of Meter & Horn in Maritime Security.

The findings of the study are explicitly linked to Van Meter and Van Horn's policy implementation theory by analyzing each of the six elements in the context of the Kepulauan Riau - Natuna FIR management. For instance, the study highlights how discrepancies in policy standards and targets, as well as limited resources and infrastructure, align with the challenges identified in the theory. Communication between organizations, another key element, was found to be inconsistent, impacting effective implementation. The study also observes that the attitudes and dispositions of implementers, influenced by socio-political dynamics, play a critical role in shaping cooperation levels. By connecting these findings directly to the theoretical framework, the study provides a deeper understanding of the factors affecting FIR management and offers insights into areas for policy improvement.

The transfer of control of the Flight Information Region (FIR) in the Kepulauan Riau and Natuna areas from Singapore to Indonesia on March 21, 2024, represents a significant advancement in reinforcing national air sovereignty and security. According to Van Meter and Van Horn's policy implementation theory, six critical factors influence the assessment of policy implementation effectiveness [18] policy standards and targets, resources, attributes of implementing organizations, inter-organizational communication and implementation activities, implementers' dispositions or attitudes, and the prevailing social, economic, and political environmental conditions.

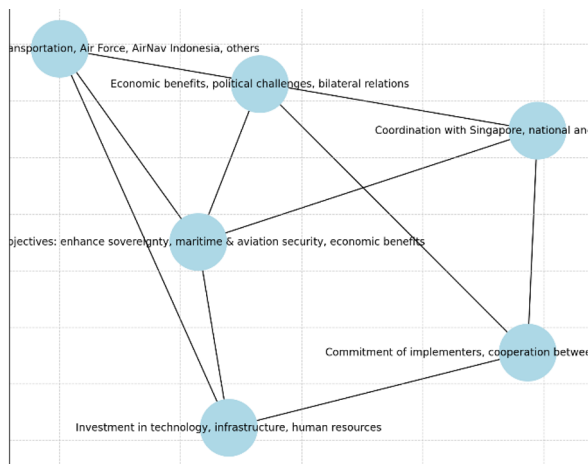


Fig. 1. Netmap Of FIR Management Implementation Policy Maritime Security

The interaction between factors in the implementation of the Flight Information Region (FIR) takeover policy in Kepulauan Riau and Natuna shows a mutually influencing relationship. Policy Standards and Targets are directly related to Resources, where the achievement of policy objectives is highly dependent on adequate resource allocation. The availability of resources such as technology, infrastructure, and trained personnel will affect the Characteristics of the Implementing Organization and the Disposition of the Implementer, because a strong organization and supportive attitude are needed for effective implementation.

In addition, Characteristics of the Implementing Organization and Inter-Organizational Communication also interact with each other, where organizations involved in the implementation of this policy must coordinate effectively to achieve common goals. Good communication is very important, because it can affect the Disposition of the Implementer, strengthening commitment and cooperation between organizations. On the other hand, the Disposition of the Implementer is influenced by the Social, Economic, and Political Environmental Conditions, which include the dynamics of international relations and expected economic benefits. Ultimately, these external factors also impact the Policy Standards and Targets, creating a feedback loop that influences the entire implementation process. Analysis of this FIR takeover using this theory can explain various aspects that influence the success and challenges of implementing the policy.

1. Policy Standards and Targets; The takeover of the FIR has clear policy standards and targets, namely to increase Indonesia's sovereignty over the airspace in Kepulauan Riau and Natuna regions. In addition, other targets are to improve maritime and aviation security and maximize the economic benefits of airspace management. One of the standards applied is increasing non-tax state revenues through air navigation services which is estimated to reach 250 billion IDR per year. These standards and targets also include increasing coordination of airspace and maritime security with Singapore, especially around Changi Airport, although some airspace is still managed jointly. Thus, the standards set out in this agreement are quite clear, but the success of their implementation will depend greatly on the following factors.
2. Resources; In terms of resources, the takeover of the FIR requires significant investment in technology, infrastructure, and human resources. One of the challenges faced by Indonesia is the limited infrastructure, such as radar and air traffic control facilities that

do not fully meet international standards. In addition, adequate human resource training to handle high air traffic volumes is also an important factor. Nevertheless, Indonesia has taken initial steps by placing personnel from the Indonesian Air Force and the Ministry of Transportation in Singapore to monitor flight operations.

3. **Characteristics of the Implementing Organization;** the implementing organization in the management of this involves various institutions [19], including the Ministry of Transportation, the Indonesian Air Force, and other related parties such as AirNav Indonesia. Each of these institutions has a different role in ensuring the success of the policy implementation. However, one of the challenges that arises is the less than optimal coordination between organizations. The involvement of many parties, including ministries, the military, and other related institutions, often requires a complex coordination process.
4. **Communication Between Related Organizations and Implementing Activities;** Communication between related organizations, both at the national and international levels [20], is very important in the management of this FIR. Cooperation between Indonesia and Singapore remains key to maintaining flight safety in the region, especially in areas bordering Singapore's FIR. Although most of the FIR in Kepulauan Riau and Natuna regions are now under Indonesian control, there are areas that are still jointly managed with Singapore to support the operations of Changi Airport. Therefore, effective communication between countries and implementing organizations is essential to maintain smooth operations and avoid potential conflicts or misunderstandings in the management of this airspace.
5. **Disposition or Attitude of the Implementers;** The attitude and disposition of the implementers of this policy play an important role in the implementation of the policy [21]. The implementers, both from the Indonesian Air Force, the Ministry of Transportation, and AirNav Indonesia, must have a strong commitment to the objectives of the policy and be ready to face existing challenges, especially related to infrastructure improvements and current technical limitations. In addition, a positive disposition from Singapore is also needed to ensure a smooth transition in the management of this FIR. So far, the agreement reached through diplomatic negotiations between President Joko Widodo and Singaporean Prime Minister Lee Hsien Loong shows a cooperative attitude from both parties, which is important to maintain stability and security in the region.
6. **Social, Economic, and Political Environmental Conditions;** Social, economic, and political environmental conditions are also factors that influence the success of implementing this policy. From an economic perspective, the takeover of FIR is projected to provide significant benefits for Indonesia, especially in the form of increased revenue from air navigation services. However, from a political perspective, this policy must be implemented amidst the dynamics of bilateral relations with Singapore and other neighboring countries.

The study illustrates the challenges of inter-organizational communication and resource limitations using concrete examples from the management of the Kepulauan Riau - Natuna FIR. One significant challenge observed is the coordination between AirNav Indonesia and KOOPSUDNAS, where differing operational protocols and communication systems have led to delays in airspace monitoring and response actions. Furthermore, limited radar coverage and outdated surveillance technology in remote areas have hampered effective monitoring, highlighting resource constraints. For example, some radar installations still rely on older equipment, causing gaps in coverage that complicate comprehensive air traffic management. These examples underscore the need for improved technological investment and standardized communication procedures to enhance collaborative efforts in FIR management.

Based on the heatmap created, there are six main factors in the implementation of Flight Information Region (FIR) management in Kepulauan Riau and Natuna regions, with varying

assessments of influence. Policy Standards and Targets have a very high level of influence with a value of 5, because clear targets such as increasing sovereignty and economic benefits greatly influence other factors. For example, the relationship with Resources has a value of 3, indicating that although resources are important, their availability does not fully support policy targets. Likewise, policy standards also influence Inter-Organizational Communication with a value of 4, where good communication is essential to ensure proper understanding and implementation between related institutions.

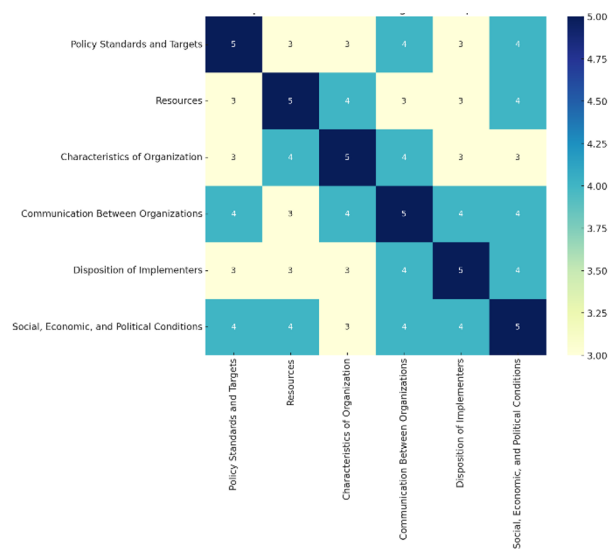


Fig. 2. Heatmap of factor in FIR Management Implementation Policy Maritime Security

The Resources factor itself has a high level of influence with a value of 5, because the availability of technology, infrastructure, and HR training greatly determine the success of the policy. The availability of resources influences Characteristics of the Implementing Organization with a value of 4, indicating that the effectiveness of the implementing organization is highly dependent on infrastructure and technology support. However, the influence of resources on Communication and Implementer Disposition is lower, each with a value of 3, because limited resources can slow down coordination, but do not directly determine the quality of communication or the attitude of the implementer.

Characteristics of the Implementing Organization also has a high influence with a value of 5, because organizations such as the Ministry of Transportation, the Indonesian Air Force, and AirNav Indonesia must have good capacity to carry out their duties. The relationship between organizational characteristics and Inter-Organizational Communication has a value of 4, indicating that an effective organization will improve the quality of cross-sectoral communication. Implementer Disposition is influenced by a value of 3, where a less structured organization will affect the attitude of the implementer in implementing the policy.

The Inter-Organizational Communication factor is considered very important with an influence level of 5. Good communication between national and international organizations, especially with Singapore, plays an important role in maintaining the smooth management of the FIR. Effective communication also affects Implementer Disposition with a value of 4, where good communication will strengthen the motivation and commitment of the implementer. Disposition of the Implementer itself has a high influence with a value of 5, because a positive attitude from the policy implementer is very important to overcome technical and operational challenges. Disposition of the Implementer is strongly influenced

by Social, Economic, and Political Conditions with a value of 4, where political stability and economic support from the external environment will increase the motivation of the implementer.

Finally, Social, Economic, and Political Conditions is also considered very important with an influence level of 5. Political stability and economic benefits from FIR management are the main factors in the success of this policy implementation. Overall, this heatmap shows that the synergy between Inter-Organizational Communication and Resources plays a key role in smooth implementation, while Disposition of the Implementer and Social, Economic, and Political Conditions are the main determinants in overcoming the challenges that arise. Strengthening coordination between institutions and increasing resource allocation are the main keys to the success of this FIR management.

4 Conclusion

Research on the execution of Flight Information Region (FIR) administration in Kepulauan Riau and Natuna indicates that Indonesia's assumption of FIR management from Singapore constitutes a pivotal advancement in reinforcing national air sovereignty. This acquisition affects sovereignty and offers substantial economic advantages, with projected annual state income from air navigation services estimated at 250 billion rupiah. This acquisition enhances the coordination of aviation and maritime security in the Natuna region, however certain FIR areas adjacent to Singapore remain jointly administered to facilitate the operations of Changi Airport. Success in handling this FIR hinges on Indonesia's capacity to enhance infrastructure, technology, and fortify cross-institutional collaboration, which now requires improvement.

The implementation of FIR management, when analyzed through Van Meter and Van Horn's policy implementation theory, involves six key factors that interact with each other, namely policy standards and targets, resources, characteristics of implementing organizations, communication between organizations, disposition of implementers, and social, economic, and political environmental conditions. Clear policy standards and targets, such as increasing sovereignty and economic benefits, have a very high influence on the success of this policy. However, resource limitations, such as radar infrastructure that does not meet international standards and lack of human resource training, are major obstacles in achieving these targets. Good disposition of implementers, stable political support, and effective coordination between institutions are the main supporting factors in overcoming obstacles that arise during the implementation process.

In addition, analysis using a heatmap shows that cross-institutional communication, both at the national and international levels, plays a central role in the successful implementation of this policy. The close relationship between Indonesia and Singapore is very important in maintaining smooth operations in the FIR border area, especially to ensure flight safety around Changi Airport. The disposition of implementers and conducive socio-political conditions are also determining factors in overcoming operational challenges, especially in the transition of FIR management which still requires increased technical capacity and resources. Therefore, the success of the takeover and management of FIR in Kepulauan Riau and Natuna regions is highly dependent on the synergy between organizational communication, adequate resource allocation, and the support of a stable and conducive political environment.

Based on the study's findings, it is recommended that the government enhances cross-sectoral collaboration by establishing an integrated task force that includes representatives from the Ministry of Transportation, Ministry of Defense, AirNav Indonesia, and KOOPSUDNAS to ensure cohesive and efficient communication. Regular joint training exercises and workshops should be implemented to strengthen inter-agency coordination and

understanding of shared objectives. Additionally, developing a centralized information-sharing platform would improve real-time communication and decision-making capabilities among these institutions, helping to address any emerging challenges promptly and reinforcing Indonesia's sovereignty over the FIR.

The study acknowledges several limitations, particularly related to data constraints and potential biases. Due to the sensitive nature of FIR management and national security, access to some critical documents and operational details was restricted, potentially limiting the depth of analysis. Furthermore, while interviews with key stakeholders provided valuable insights, there is a possibility of response bias, as participants may have emphasized positive aspects of their organizations or downplayed challenges to present their roles favorably. Additionally, the reliance on secondary data from official documents may introduce bias, as these sources may not always reflect on-the-ground realities accurately. These limitations suggest the need for future research incorporating a broader range of perspectives and more comprehensive access to classified information.

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