Journal Governance Society
e-ISSN: 3064-2337 p-ISSN: 3064-2329

Vol 2, No 2, August (2025): Page no: 99-122
Available online at
https://journal.austrodemika.org/index.php/jgs

Effectiveness of Stakeholder Collaboration in Jakarta FIR Governance for Airspace Security

Arie Prihandoko Dalirianto[1], Hidayat Hidayat[2], Encep Sopandi[3]

[1,2,3]Universitas Nurtanio, Bandung. Indonesia

Corespodence: dalirianto@gmail.com[1]

Received: August 17, 2025 | Revised: August 25, 2025 | Accepted: August 30, 2025

https://doi.org/10.69812/jgs.v2i2.161

ABSTRACT

Indonesia's airspace security represents a strategic dimension of national sovereignty, given its position as the world's largest archipelagic state with vast airspace intersected by dense international flight routes. The transfer of the Jakarta Flight Information Region (FIR) from Singapore to Indonesia created opportunities for strengthening sovereignty while also posing significant challenges in coordination, regulation, and technological readiness. This study aims to analyze the existing conditions of stakeholders, evaluate the effectiveness of their roles, and propose an ideal governance model for safeguarding Indonesia's airspace. Employing a descriptive qualitative method with a case study approach, the research collected data through literature review, in-depth interviews, and documentation from relevant institutions, analyzed inductively with source and theory triangulation to ensure validity. The findings indicate persistent issues such as overlapping authority, limited radar technology, and weak inter-agency communication, which reduce the responsiveness of cross-agency coordination to airspace violations. Nonetheless, positive developments are observed through the establishment of inter-agency coordination forums and central government commitment to sovereignty reinforcement. The study concludes that an effective governance model requires multi-level collaboration that integrates military, civil, and international diplomatic dimensions supported by modern technology and robust regulation. Recommendations include enhancing inter-agency coordination, developing an integrated radar system, improving human resources through international-standard training, and institutionalizing a sustainable governance framework responsive to global aviation dynamics. This research contributes both academically and practically to public policy formulation in managing Indonesia's national airspace.

Keyword: Effectiveness, Stakeholder, Collaboration, Governance

INTRODUCTION

The security of Indonesia's airspace is a crucial aspect in safeguarding national sovereignty. As the world's largest archipelagic state with an extensive air territory, Indonesia must possess an advanced defense system to protect its

airspace from threats originating both domestically and internationally (Johan, 2010). Indonesia's air defense involves various institutions such as the Indonesian Air Force (TNI AU) and the Ministry of Transportation, which cooperate in monitoring, detecting, and addressing potential threats (Savitri & Prabandari, 2020).

Modern radar and air surveillance systems, such as integrated air defense networks, are essential to detect unauthorized foreign aircraft or other potential threats (Susanto & Keke, 2019). Furthermore, preventive measures involving the supervision of international flight routes are equally important to prevent infiltration or violations of Indonesia's air sovereignty (Putri, 2022; Wardhana, 2016).

This regulatory framework encompasses a wide range of aspects, including aviation procedures that must be followed by airlines, the monitoring of airports and aviation facilities, as well as coordination with international institutions in air defense and disaster management. Through these combined efforts, Indonesia seeks to safeguard its airspace security, which in turn supports national security and the integrity of the state (Prastowo et al., 2023).

The phenomenon underpinning this research is closely related to the growing challenges and complexities in managing Indonesia's airspace, including incidents of airspace violations by unauthorized foreign aircraft, such as the case involving a United States aircraft intercepted by Indonesian Air Force fighter jets (Vindia, 2025). The number of national airspace violations by foreign aircraft recorded between January and June 2023 was significant (Dirgantara & Meiliana, 2023). According to the data, the United States accounted for the highest number of violations, with a total of 11 incidents, consisting of 8 violations committed by military aircraft (indicated in green) and 3 by civilian aircraft (indicated in blue).

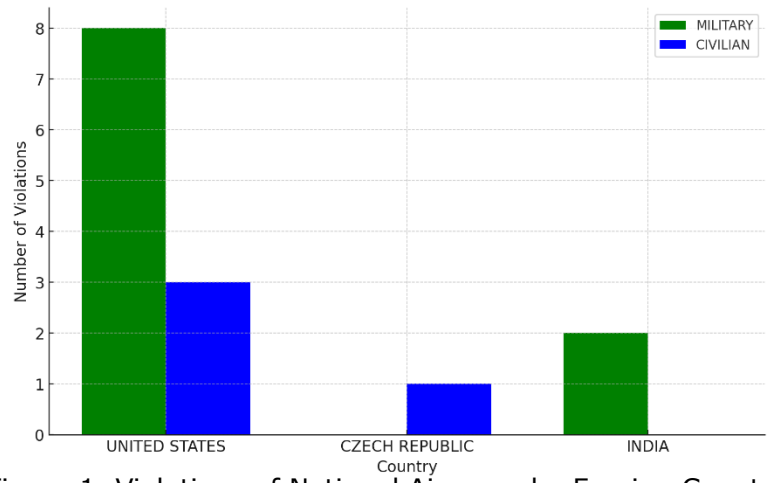

Figure 1. Violations of National Airspace by Foreign Countries (January–June 2023)

The security of Indonesia's airspace has become increasingly critical, considering the vast territorial coverage and the high volume of international flights traversing Indonesian skies. In this context, the Government of Indonesia, in collaboration with AirNav Indonesia and other relevant agencies, plays a pivotal role in ensuring the effective and safe management of the Jakarta FIR (Husna & Riyanto, 2019). The transfer of airspace management previously administered by Singapore to Indonesia, for instance, demonstrates the importance of diplomacy and interstate cooperation in the field of aviation (Amin, 2019; Firmansyah, 2022).

This highlights the major challenges Indonesia faces in enhancing the monitoring and management of its national airspace.

The choice of research topic concerning Indonesia's airspace security relates to the significant gap between what ought to be (das sollen) and the current reality (das sein) in the management of national airspace. Ideally, Indonesia should possess a highly sophisticated air defense system capable of effectively identifying and addressing various threats to its aerial sovereignty.

The presence of advanced radar systems, integrated air defense mechanisms, and strict regulations enforced by civil aviation authorities and AirNav Indonesia are urgent requirements to ensure that foreign aircraft do not enter the airspace without authorization (Risdiarto, 2019; Setiani, 2018). In reality, however, despite considerable efforts to manage Indonesian airspace, many challenges persist.

This discrepancy is also reflected in the dynamics of Jakarta FIR management, which reveal inconsistencies between expectations and the actual implementation of existing policies. While Indonesia should ideally be able to fully manage its airspace without obstacles, in practice, the administration of international airspace often requires complex interstate cooperation and diplomacy (Prianto, 2007; Saptian, 2017).

Therefore, this research is crucial for analyzing the gap between policy expectations and field realities, as well as for examining how stakeholders can collaborate to address these issues in order to safeguard Indonesia's air sovereignty more effectively. The underlying context of this research problem relates to the dependent variable, namely the security of Indonesia's airspace, which is frequently threatened by airspace violations. In recent years, Indonesia has faced numerous airspace intrusion incidents by foreign aircraft, originating both from friendly nations and from states lacking authorization to enter Indonesian airspace.

The disruption of Indonesia's air security reflects the imperfection of the current air defense and surveillance systems, despite the country's possession of advanced radar technology and integrated air defense systems. The inability to detect and respond effectively to such threats, combined with airspace violations by foreign aircraft that may endanger national sovereignty, remains a critical problem that must be addressed (Kusumaningrum, 2019; Prastowo et al., 2023).

The management of national airspace, which requires coordination among multiple institutions, is often hindered by a shortage of trained human resources, the incomplete integration of technology, and policies that are not yet fully effective in monitoring and enforcing regulations (Darwis, 2018; Wiradipradja, 2009). In addition, issues of international diplomacy and interstate cooperation regarding the management of international airspace also significantly influence the effectiveness of Indonesia's airspace governance policies (Ardan, 2022; Wiguna & Putri, 2023).

The lack of clarity in institutional roles and responsibilities, along with insufficient transparency in decision-making processes, may obstruct efforts to strengthen a more efficient and responsive air surveillance system. Therefore, this research focuses on how independent variables such as policy, technology, and inter-agency cooperation affect outcomes in safeguarding Indonesia's airspace. Research on Indonesia's airspace security is particularly significant given the country's geographical position as the largest archipelagic state in the world, with vast airspace crossed by numerous international flights (Dirwan, 2018; Pramono,

2012). Well-secured airspace not only impacts state sovereignty but also aviation safety and the effective management of air traffic.

In the face of threats from airspace violations, whether from unauthorized foreign aircraft or other potential dangers, Indonesia requires more advanced policies and technologies to secure its skies. Accordingly, this research is highly relevant to current needs for strengthening existing air defense systems, improving surveillance procedures, and enhancing coordination among the institutions involved in airspace management.

The policy foundations underlying issues in the governance of Indonesia's airspace can be traced to several important legal sources, including international agreements, national legislation, and government regulations. The 1944 Chicago Convention serves as a key instrument affirming the full and exclusive sovereignty of states over the airspace above their territories. This convention establishes the principle that states have complete authority to regulate and manage the airspace above their territorial boundaries, including Indonesia's (Arsetyo, 2021; Herlambang, 2016).

Other international agreements supporting airspace governance include the 1919 Paris Convention, which also affirms state sovereignty over airspace above land and sea territories, providing a legal foundation that reinforces Indonesia's rights over the airspace above its land and waters. In addition, Law No. 1 of 2009 on Aviation serves as the domestic legal basis governing all aspects of aviation in Indonesia, including airspace management and aviation safety. This law regulates matters concerning commercial aviation, air safety standards, and the responsibilities of government agencies and related authorities in managing Indonesia's airspace.

Government Regulation No. 4 of 2018, which concerns Indonesia's airspace, particularly national sovereignty over land and maritime territories, provides more detailed guidance for managing national airspace in accordance with international rules and standards. In 2022, a foreign aircraft without authorization violated Indonesian airspace and was intercepted by Indonesian Air Force fighter jets, highlighting gaps in airspace surveillance (Dirgantara, 2022).

In previous studies, the first article entitled "Policy Implementation of Maritime Security in the Flight Information Region (FIR) of the Riau Islands–Natuna" examined maritime security issues within Indonesia's FIR in the Riau Islands–Natuna region, which holds strategic significance in political, economic, and defense affairs (Margaretha, 2024). The second article, entitled "Stakeholder Identification Analysis in the Management of the Flight Information Region (FIR) of the Riau Islands–Natuna", discussed the role of stakeholders in FIR management in the Riau Islands–Natuna area (Margaretha & Mahadiansar, 2023). This study emphasized Indonesia's efforts to regain control over Natuna's airspace and highlighted the strategic role of diplomatic measures in the process. The key stakeholders identified include the Indonesian Ministry of Transportation and Singapore authorities.

The third article, entitled "The Return of Indonesia's Political Will: Implications of the Takeover of the Natuna Flight Information Region (FIR) Airspace from Singapore" (Rahmi & Charin, 2023), discusses Indonesia's efforts to regain control over the FIR in the Natuna area, which was previously managed by Singapore. The fourth article, entitled "Strategies for the Realignment of Singapore's Flight Information Region in Indonesia's Airspace" (Supriyadi et al., 2020), focuses on strategies that Indonesia must adopt in order to realign the

control of its FIR with national airspace, which had long been under Singapore's management.

The key stakeholders in this process include national government agencies, international bodies such as ICAO, and local authorities. A study entitled "The Role of Stakeholders in Policies to Safeguard Indonesia's Airspace Security: A Study of Jakarta FIR Governance" is likely to build upon these findings, focusing on how various stakeholders collaborate in the specific context of Jakarta FIR and its role within Indonesia's broader air security policy.

Within the framework of Public Policy, this research aims to explore how Indonesia's airspace management policies can be improved to safeguard national sovereignty and airspace security. The main issue addressed concerns the challenges in monitoring and managing Indonesian airspace, which involves multiple stakeholders such as the Indonesian Air Force (TNI AU), the Ministry of Transportation, AirNav Indonesia, as well as cooperation with neighboring states and international organizations such as ICAO. Existing policies frequently encounter obstacles related to limited human resources, suboptimal technological integration, and the complexities of international diplomacy in the governance of the Flight Information Region (FIR).

In the context of Jakarta FIR, stakeholders such as the Indonesian government and international civil aviation organizations are obliged to comply with and implement these norms, with the aim of creating a safe and coordinated aviation system. This policy framework is further reinforced by national regulations, such as Law No. 1 of 2009 on Aviation, which provides the legal foundation for airspace management and outlines the obligations of all relevant parties to actively contribute to maintaining the security and safety of aviation within Indonesia's airspace.

RESEARCH METHOD

This study employs a qualitative descriptive method with a case study approach to gain an in-depth understanding of airspace security governance, particularly within the Jakarta Flight Information Region (FIR). The research focuses on key variables such as policies, technology, and the role of stakeholders in safeguarding Indonesia's air sovereignty.

The unit of analysis includes major institutions such as the Indonesian Air Force (TNI AU), the Ministry of Transportation, AirNav Indonesia, as well as international organizations such as ICAO. The selection of these objects is based on their urgency and relevance to the effectiveness of public policy in managing airspace. Accordingly, this study is directed toward evaluating patterns of inter-agency collaboration and identifying both institutional and technical gaps (Moleong, 2012).

A qualitative research method was chosen because it enables a comprehensive portrayal of the social dynamics, policies, and coordination among stakeholders (Creswell, 2003). Data were collected from multiple sources through in-depth interviews, literature reviews, and documentation, and subsequently analyzed inductively (Sugiyono, 2006).

The researcher serves as the primary instrument, interpreting narrative data to uncover the underlying meanings of the observed phenomena. In line with the perspectives of Creswell and Sugiyono, this approach emphasizes the search for meaning rather than mere generalization. The research process followed a cyclical pattern, whereby data collection, analysis, and interpretation were conducted iteratively until a solid conclusion was reached.

The data collection techniques included: (1) literature review to establish the theoretical foundation, (2) in-depth interviews with relevant officials and experts, and (3) documentation from agencies involved in the management of Jakarta FIR. Data validity was ensured through triangulation of sources, methods, and theories, thereby enhancing the credibility of research findings. Data analysis was carried out through the stages of reduction, presentation, and thematic conclusion drawing (Creswell, 2009). Through this approach, the study seeks to identify barriers to inter-agency coordination and to propose a more effective model of collaborative governance for airspace security.

Overall, the chosen methodology emphasizes a deep exploration of air security policy practices through the lens of public administration and multi-level governance. The researcher aims to uncover the gap between ideal policy and field realities while presenting recommendations grounded in empirical evidence. By integrating interview results, official documents, and literature analysis, this research is designed to produce a comprehensive understanding of the dynamics of Jakarta FIR management. The expected outcome is a governance model that is responsive, sustainable, and capable of addressing Indonesia's air sovereignty challenges amid the complexities of international relations.

RESULTS AND DISCUSSION

1. Current Stakeholder Conditions in the Governance of the Jakarta Flight Information Region (FIR)

1) Building Trust

The success of Jakarta FIR governance largely depends on the extent to which trust among stakeholders can be built and maintained. Trust serves as the foundation of any form of collaboration, as without mutual confidence, inter-agency coordination would be hindered by suspicion and institutional stereotypes. In the context of Jakarta FIR, building trust means ensuring that the Ministry of Transportation, the Indonesian Air Force (TNI AU), AirNav Indonesia, and ICAO share a common perception of the collective goal: safeguarding aviation safety while simultaneously upholding Indonesia's air sovereignty. Evidence of trust-building is reflected in the official statement made by the Ministry of Transportation during the signing of the agreement on the transfer of the FIR from Singapore to Indonesia.

> "This provides tangible evidence that through cooperation, smooth communication, and mutual trust, Indonesia has finally been able to take over the management of its airspace over the Riau Islands and Natuna. This process demonstrates not only that we are technically prepared, but also that we have the capacity to operate in accordance with international standards. This step clearly strengthens Indonesia's position while affirming our sovereignty in the eyes of the world. More importantly, all of this is the result of collaboration among many parties who have seriously proven that we are capable of standing on our own." (Ministry of Transportation, 2022)

From the perspective of AirNav Indonesia, trust has been built through enhanced service transparency and consistency in the execution of technical duties. In an official press release, AirNav stated:

> "The relationship between AirNav and airlines, as well as other stakeholders, cannot be based solely on technical matters. The most important foundation is trust, because without it, coordination would be difficult to achieve. When trust exists, communication becomes more open and all parties feel more at ease. Pilots, airlines, and regulators can confidently carry out their respective roles. In turn, this ensures greater aviation safety and more efficient operations. Doubts and mutual suspicion are eliminated, as all parties understand the importance of supporting one another. Trust, therefore, becomes the key to safeguarding Indonesia's reputation in the eyes of the world." (AirNav Indonesia, 2025).

From a military perspective, the Indonesian Air Force (TNI AU) emphasizes the importance of public trust and inter-agency confidence in safeguarding national airspace sovereignty. The Chief of Staff of the Indonesian Air Force (Kasau), Air Chief Marshal M. Tonny Harjono, once underscored:

> "The strength of the Indonesian Air Force is not solely about guarding the skies, but also about supporting the vision of national development. Security can only be maximized when there is synergy and mutual trust between the military and civilian sectors. In essence, we cannot work in isolation; collaboration is essential to ensure that development progresses while sovereignty remains protected." (Antara, 2025)

The trust established among these institutions has created existing conditions in which each actor can concentrate on its core role. The Ministry of Transportation (Kemenhub) coordinates regulation and diplomacy, the Indonesian Air Force (TNI AU) safeguards air defense, AirNav ensures the technical smoothness of air traffic services (ATS), and ICAO provides global legitimacy. Without trust, such cross-actor coordination would be prone to friction; however, with mutual confidence as the foundation, the Jakarta FIR can be managed effectively in accordance with international safety and security standards.

Analysis indicates that building trust among stakeholders in the governance of the Jakarta FIR is not merely rhetorical, but rather a fundamental prerequisite for successful collaboration. Trust emerges from open communication, consistent role execution, and mutual recognition as strategic partners. Kemenhub depends on AirNav's technical reports and the military support of TNI AU, while AirNav and TNI AU require regulatory legitimacy from Kemenhub as well as international validation from ICAO.

This reciprocal interdependence underscores that trust serves as the "currency" of coordination: the higher the level of trust among actors, the lower the potential for authority conflicts, and the faster the response to safety challenges or threats to air sovereignty. Thus, the existing condition demonstrates that trust has become the foundation of Jakarta FIR governance. Although challenges remain in technological integration and real-time coordination, the mutual trust among Kemenhub, TNI AU, AirNav Indonesia, and ICAO has enabled a smooth transition of the FIR from Singapore and ensured that airspace violations can be addressed collaboratively.

2) Building Commitment

Commitment in this context is understood as the willingness of each actor—namely the Ministry of Transportation/Directorate General of Civil Aviation (DGCA), the Indonesian Air Force (TNI AU), AirNav Indonesia, and ICAO (through Indonesia's compliance with ICAO standards)—to bind themselves to a shared objective: ensuring safety, efficiency, and the sovereignty of national airspace. Such commitment is articulated through legal instruments, operational procedures, and cross-institutional coordination practices.

In the Jakarta FIR, commitment does not stop at the signing of agreements, but is tested in the implementation phase following Presidential Regulation (Perpres) No. 109/2022 and the service transition in March 2024. This commitment can be observed in four dimensions: (i) formal-institutional commitment (ratification, derivative regulations, and governance frameworks); (ii) operational commitment (AirNav's capacity, interoperability, Air Traffic Flow Management [ATFM], and contingency planning); (iii) defense-security commitment (TNI AU's air policing and rules of engagement); and (iv) international compliance commitment (ICAO procedures).

Table 1. Stakeholder Commitments in the Governance of the Jakarta FIR

Commitment	Main Actor	Form of Statement	Impact
Formal-Institutional Commitment	Ministry of Transportation or DGCA	Ratification of Presidential Regulation (Perpres) No. 109/2022; submission of FIR boundary adjustment proposals to ICAO; drafting of technical implementation rules (Minister Budi Karya Sumadi).	Provides legal certainty; strengthens international legitimacy; serves as the operational foundation for AirNav and a national coordination guideline.
Operational Commitment	AirNav Indonesia	Takeover of FIR services in the Riau Islands–Natuna on March 22, 2024; statement by AirNav CEO Polana that the airspace is now "fully managed by the nation's own."	Ensures smooth air navigation services; demonstrates AirNav's technical capacity; reinforces Indonesia's sovereignty over strategic airspace.
Defense-Security Commitment	Indonesian Air Force (TNI AU)	Statement by RSA Natuna Air Base Commander: airports as vital objects; commitment to safeguard border skies; emphasis on cross-stakeholder responsibility.	Ensures surveillance and protection of strategic infrastructure; fosters civil–military synergy; enhances readiness in addressing violations and potential threats.
International Compliance Commitment	ICAO (through international approval mechanisms)	FIR agreement declared to refer to ICAO regulations; submission to ICAO in accordance with procedures (Leaders' Retreat, January 25, 2022).	Provides global legitimacy; ensures that the FIR transition is internationally recognized; guarantees Indonesia's governance aligns with international civil aviation standards.

Source: Author, 2025

The table above illustrates that the commitments of each stakeholder in the governance of the Jakarta FIR carry distinct yet complementary dimensions and impacts. The Ministry of Transportation establishes the legal foundation and international legitimacy, AirNav demonstrates operational capacity while symbolizing sovereignty, the Indonesian Air Force underscores the collective defense security aspect, while ICAO ensures global compliance that provides international recognition. The combination of these four commitments results in Jakarta FIR governance that is not only legally valid, technically effective, and defensively secure, but also legitimate in the eyes of the international community.

3) Sharing Understanding

In the governance of the Jakarta FIR, shared understanding serves as a foundation to ensure that all actors from different backgrounds—regulators, operators, the military, and international organizations—maintain a common perception regarding objectives, regulations, and operational procedures. This collective understanding prevents miscommunication, overlapping authority, and conflicts of interest.

> "This FIR transition would not have been possible if each party had acted independently. Regulators, operators, and the military must first share a common understanding of the objectives and procedures. Any divergence in direction would inevitably create problems in practice. Therefore, cross-sectoral coordination is imperative and non-negotiable. All stakeholders must sit together, communicate openly, and align their perceptions. With smooth coordination, the transition can proceed without significant obstacles. Ultimately, the key lies in unity and trust among all elements." (Budi Karya Sumadi – 2022).

The Minister of Transportation's statement underscores that the success of the FIR transition is not merely a matter of legal regulations or technical takeover, but also of achieving unity of perception among institutions. Without a collective understanding of objectives and procedures, cross-sectoral coordination would remain weak. By emphasizing coordination, the Ministry of Transportation positions shared understanding as an essential prerequisite for civil–military integration in the governance of the Jakarta FIR.

From an operational perspective, AirNav Indonesia, as the provider of air navigation services, occupies a central role in ensuring that all flight activities run safely and efficiently. Since AirNav interacts directly with airlines, airports, and relevant authorities, developing a shared understanding becomes indispensable to guarantee that every technical decision is interpreted consistently by all parties. In the absence of such alignment, the risk of miscommunication increases significantly, with direct implications for aviation safety.

> "The relationship between AirNav and airlines, as well as other stakeholders, cannot be limited to purely technical matters. What is most important is that all parties must first share a common understanding. If visions and perspectives differ, conflicts will inevitably arise in practice. However, once a shared understanding is achieved, coordination becomes much easier. This, in turn, ensures greater aviation safety. Operations also become more efficient and

> avoid unnecessary waste of resources. Therefore, the key lies in achieving mutual understanding before moving on to other matters." (AirNav Indonesia, 2025).

This statement highlights that shared understanding is not limited to intergovernmental institutions, but also extends to service users (airlines). AirNav views safety and efficiency as unattainable if each actor maintains a different interpretation. By prioritizing a common understanding, AirNav demonstrates a comprehensive collaborative approach that encompasses regulators, operators, and industry actors in aviation.

In the context of defense and security, the Indonesian Air Force (TNI AU) plays a central role as the guardian of Indonesia's air sovereignty, particularly in strategic areas such as Natuna, which constitutes one of the vital points in the realignment of the Jakarta FIR. However, the Air Force recognizes that protecting national airspace cannot be carried out unilaterally. The roles of civilian institutions such as the Ministry of Transportation and AirNav, along with the support of local governments and airport authorities, are equally essential in shaping an integrated defense system. Accordingly, a shared understanding of each actor's responsibilities forms the basis for creating rapid and effective responses to emergency situations.

> "Airspace security is a shared responsibility, not solely that of the Indonesian Air Force. All elements, both civilian and military, must understand their respective roles. In emergency situations, there is no room for error; every actor must respond swiftly in accordance with established procedures. Inter-agency synergy is the key to successfully safeguarding air sovereignty. With discipline, coordination, and a common understanding, every threat can be anticipated. The Air Force is ready to take the lead, but success can only be achieved if all components are fully involved." (RSA Natuna Air Base Commander, 2025).

This statement affirms that shared understanding is equally crucial in the realm of defense and security. The Indonesian Air Force (TNI AU) rejects an exclusive approach and instead invites all civilian and military actors to recognize their respective roles in responding to emergency situations. This reflects TNI AU's orientation toward a multi-actor collaborative model, in which shared understanding serves as the key to enabling a rapid and coordinated response to threats in national airspace.

At the global level, the International Civil Aviation Organization (ICAO) functions as the body responsible for setting international standards, procedures, and norms in air traffic management. Since aviation inherently transcends national boundaries, every civil aviation authority is required to comply with ICAO provisions in order to ensure uniform safety, order, and efficiency worldwide. In the context of the Jakarta FIR, adherence to ICAO standards is vital to guarantee that the transition of the FIR from Singapore to Indonesia is not only legally valid under domestic law.

> "Each State must agree upon the same standards and procedures, since air traffic is transboundary in nature and requires a common understanding." (ICAO Doc. 4444)

ICAO emphasizes that shared understanding is a fundamental principle in international aviation. Since air traffic is transboundary in nature, common understanding becomes a prerequisite to prevent incidents and to ensure smooth coordination between FIRs. For Indonesia, this entails aligning national perspectives with global standards. A comparison among actors shows that the Ministry of Transportation highlights shared understanding at the regulatory and coordinative level, AirNav emphasizes technical understanding with industry stakeholders, the Indonesian Air Force underscores collective understanding in defense and emergency response, while ICAO stresses global understanding across states.

4) Initial Outcomes

Since its official implementation in March 2024, the realignment of the Jakarta FIR, which now covers the airspace over the Riau Islands and Natuna, has demonstrated a number of preliminary results. These outcomes reflect the implementation of institutional, operational, defense, and international compliance commitments that had been prepared in advance. The interim achievements can be observed in three main aspects: the enhancement of air navigation service capacity by AirNav Indonesia, the preparedness of the Indonesian Air Force (TNI AU) in safeguarding national air sovereignty, and the international recognition of Indonesia's sovereignty through ICAO mechanisms.

> "Since the Natuna FIR and its surrounding areas were officially transferred to AirNav Indonesia, we have immediately observed tangible impacts in the field. The number of international flights crossing this region has increased significantly. For us, this serves as an indication that international trust in Indonesia has grown stronger. Foreign pilots and airlines now feel more confident flying through routes that are managed by our own nation. Challenges did arise in the early stages, particularly regarding procedural adjustments and cross-sectoral coordination. However, with open communication and cooperation among all stakeholders, the transition has proceeded smoothly. In fact, the increase in traffic has further motivated us to maintain the quality of services, as every additional flight represents greater responsibility for AirNav. We must ensure that international standards are consistently upheld, and even improved. Ultimately, the FIR transfer is not only a matter of sovereignty, but also a major opportunity to demonstrate Indonesia's capacity in the eyes of the world." (AirNav Indonesia, Press Release, January 10, 2025).

This statement demonstrates concrete results, showing that the FIR transition has had a direct impact on the intensity of air traffic managed by Indonesia. The increase in international flights indicates greater international confidence in AirNav's capacity to manage the FIR, while also contributing additional revenue from navigation service fees.

From the regulatory and policy perspective, the Ministry of Transportation (Kemenhub) holds a central role in ensuring that the governance of the Jakarta FIR is not only legally valid but also delivers tangible benefits for the state. As the principal regulator, Kemenhub emphasizes that the FIR transition is not merely a symbol of sovereignty, but must be followed by positive impacts on the national

economy. Therefore, the most prominent preliminary result from Kemenhub's perspective is the growth in state revenue from air navigation service charges, which simultaneously strengthens Indonesia's position in air sovereignty diplomacy.

> FIR transfer, Indonesia will clearly gain additional revenue from air navigation service charges. Thus, it is not only a matter of technical management, but also an economic benefit that is directly felt by the state. Previously, a portion of this revenue was enjoyed by other parties, but it has now returned to us. More importantly, this also strengthens Indonesia's sovereign position over its own airspace. We are therefore not merely speaking about independence, but truly demonstrating it at the international level." (Director General of Civil Aviation, March 24, 2024).

The preliminary results highlighted by the Ministry of Transportation (Kemenhub) extend beyond technical aspects to include economic and political dimensions. With the additional revenue generated from air navigation charges, Indonesia now enjoys fiscal benefits that were previously received by Singapore. In the realm of defense, the Indonesian Air Force (TNI AU) serves as the front line in safeguarding the sovereignty of Indonesia's airspace, particularly in the strategically vital Natuna region, which directly borders international flight routes. Following the FIR transition.

> "RSA Air Base will certainly continue to safeguard the Natuna border airspace, as this is a highly strategic region. Following the FIR transition, our responsibility has become even greater to ensure that aviation security and safety remain guaranteed. We recognize that this area is not only important for Indonesia but also serves as an international flight corridor. Therefore, surveillance must be tightened and our responses must be swift to any potential threats. Synergy with AirNav, the Ministry of Transportation, and other parties is also key to ensuring smooth operations. In essence, the Indonesian Air Force is ready to be at the forefront, but this effort still requires cross-sectoral coordination." (RSA Natuna Air Base Commander, 2025).

The preliminary results from the defense dimension demonstrate the military's readiness in supporting the FIR transition. The Indonesian Air Force (TNI AU) has reaffirmed its commitment to safeguarding national air sovereignty while ensuring synergy with AirNav and the Ministry of Transportation. As a result, border security is not only maintained but has also become more responsive to potential threats.

Table 2. Interim Outcomes of Jakarta FIR Governance After the Transition

No	Main Actor	Direct Impact
1	AirNav Indonesia	• Increased Intensity Of Air Traffic; • Strengthened International Confidence In Airnav's Capacity; • Higher Revenue From Navigation Services.
2	Ministry of Transportation / DGCA	• Growth In State Revenue From Air Navigation Charges;

No	Main Actor	Direct Impact
		• Strengthened Legitimacy Of Air Sovereignty; • Strategic Fiscal Benefits.
3	Indonesian Air Force (TNI AU)	• Enhanced Defense Readiness At The Border; • Strengthened Civil–Military Synergy; • Improved Responsiveness To Potential Airspace Threats.
4	ICAO	• Global Legitimacy Of The FIR Realignment; • Compliance With International Standards; • Greater Trust From The Global Aviation Community.

Source: Research Analysis, 2025.

The preliminary results following the Jakarta FIR transition indicate that Indonesia's airspace governance now stands on four main pillars: regulatory legitimacy provided by the Ministry of Transportation, the operational capacity of AirNav, the defense readiness of the Indonesian Air Force (TNI AU), and international recognition from ICAO. Together, these pillars demonstrate a complementary synergy, where the benefits gained extend beyond a mere symbol of sovereignty to include increased state revenue, strengthened international confidence, and enhanced border security. Thus, the realignment of the Jakarta FIR serves as tangible evidence that shared commitment among stakeholders can be translated into significant strategic achievements for Indonesia.

2. Effectiveness of Stakeholder Roles in Safeguarding Airspace Security

1) Governance Framework and Regulatory Legitimacy

The effectiveness of stakeholder roles in safeguarding airspace security rests on a multi-level governance architecture. The Ministry of Transportation, through the Directorate General of Civil Aviation (DGCA), holds the regulatory authority, ensuring that domestic regulations are aligned with ICAO international standards. The restructuring of the Jakarta FIR following the 2024 realignment serves as concrete evidence that Indonesia has successfully closed gaps in legal legitimacy while maintaining the confidence of the global community.

The role of the Ministry of Transportation extends beyond regulatory formulation, as it also reinforces Indonesia's presence in international forums, including ensuring that the transition procedures are carried out in accordance with Annex 11 and Doc 4444. In this respect, effectiveness is reflected in compliance, clarity of jurisdiction, and global recognition, even though technical field supervision remains heavily dependent on reports from operators and military units. While regulatory legitimacy has been established, challenges to effectiveness arise from the gap between macro-level policy and micro-level implementation.

Technical supervision in the field continues to face limitations in real-time data, while the need for inter-agency integration is steadily increasing. More measurable oversight mechanisms such as periodic audits, cross-agency key performance indicators (KPIs), and monitoring dashboards constitute areas for improvement. This suggests that although the regulator has succeeded in providing a legal and diplomatic foundation, the quality of operational quality control still requires strengthening so that strategic decisions can be effectively aligned with technical responses in the field.

Figure 2. Node Map within the Governance Framework and Regulatory Legitimacy
Source: Nvivo Analysis by the Researcher, 2025

The node map places the "Governance Framework & Regulatory Legitimacy" as the central axis connecting various key elements. The Ministry of Transportation/DGCA, domestic regulations, ICAO standards, and the restructuring of the Jakarta FIR in 2024 emerge as primary factors shaping legal legitimacy and global trust. In addition, nodes such as periodic audits, cross-agency KPIs, and monitoring dashboards illustrate the need to strengthen oversight mechanisms so that macro-level policies can be effectively aligned with micro-level implementation. The map demonstrates how regulatory, diplomatic, and operational aspects are interlinked to ensure the effectiveness of Indonesia's airspace security.

Furthermore, the node map highlights ongoing challenges, particularly the limitations of technical supervision and real-time data, which remain gaps within the system. The connection between the nodes "Inter-agency Integration" and "Optimization of Effectiveness" underscores that cross-actor synergy is the key to improving the quality of control and monitoring. In other words, the node map affirms that success in safeguarding airspace security is determined not only by the existence of formal regulations, but also by measurable oversight capacity, inter-agency coordination, and the international trust cultivated through compliance with ICAO standards.

2) AirNav's Operational Capacity and Air Traffic Flow Management

AirNav Indonesia holds a strategic position as the provider of Air Traffic Services (ATS), ensuring that separation, sequencing, and alerting functions are carried out safely. The effectiveness of this role was evident during the smooth transition of the Natuna–Riau Islands FIR in 2024, which caused no significant disruptions to international routes. In addition, AirNav has demonstrated its ability to maintain service continuity despite a significant increase in both domestic and international flight volumes.

Indicators of effectiveness can be observed in the low rate of separation violations, the timeliness of NOTAM publications, and successful coordination with neighboring FIRs. However, this capacity faces serious tests during peak demand

periods, such as the Eid al-Fitr travel season, which requires a more prescriptive Air Traffic Flow Management (ATFM) system.

AirNav's operational challenges still include the limited availability of qualified air traffic controllers (ATC), the uneven distribution of CNS/ATM modernization, and the need for interoperability across facilities. Heavy workloads have the potential to reduce safety margins if not accompanied by additional certified personnel and supportive technology. Therefore, capacity improvement must simultaneously address two dimensions: human competence and technological sophistication. AirNav is also required to strengthen collaboration with airlines and airports so that traffic flow management becomes proactive rather than reactive.

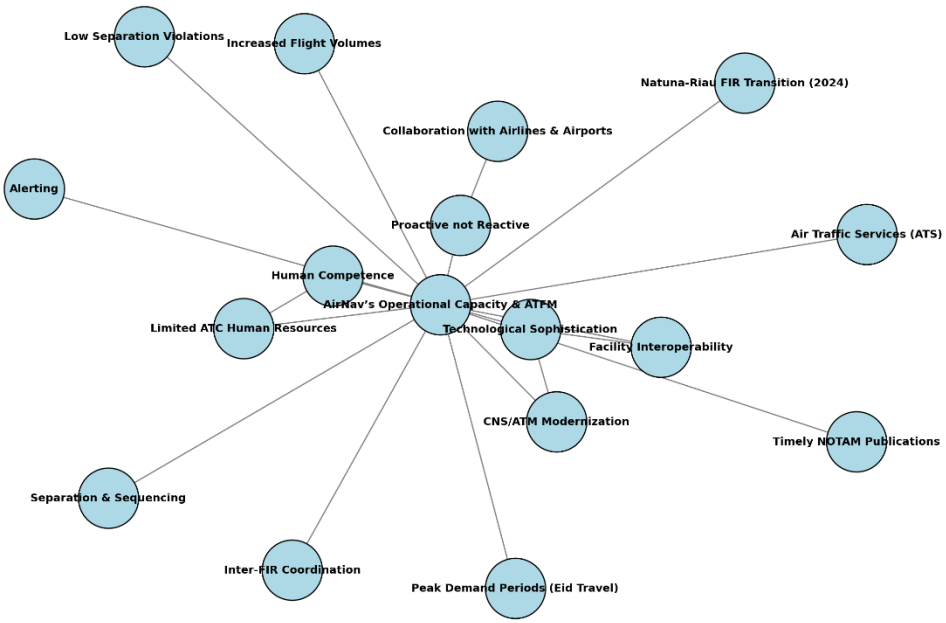

Figure 3. Node Map of AirNav's Operational Capacity and Air Traffic Flow Management
Source: Nvivo Analysis by the Researcher, 2025

The node map illustrates "AirNav's Operational Capacity & Air Traffic Flow Management" as the central axis connected to various operational elements. Nodes such as Air Traffic Services (ATS), Separation & Sequencing, Alerting, and the 2024 Natuna- Kepulauan Riau FIR Transition underscore AirNav's technical role in ensuring the smooth flow of air traffic.

On the other hand, indicators of effectiveness are reflected in nodes such as Low Separation Violations, Timely NOTAM Publications, and Inter-FIR Coordination, which serve as benchmarks for the quality of navigation services. This structure demonstrates that AirNav's success in maintaining airspace safety is largely determined by operational consistency, reliable coordination, and the preservation of safety margins under normal conditions.

The node map also reveals structural challenges that test AirNav's capacity, including Limited ATC Human Resources, CNS/ATM Modernization, and Facility Interoperability. These factors determine whether safety margins can be preserved when facing Increased Flight Volumes or Peak Demand Periods (such as Eid travel). The linkage between the nodes Human Competence and Technological Sophistication highlights that effectiveness can only be achieved when human capacity development runs in parallel with technological modernization.

Meanwhile, the connections Collaboration with Airlines & Airports and Proactive not Reactive emphasize that traffic flow management requires a collaborative and anticipatory working pattern rather than merely reactive measures. Thus, this node map underscores the importance of balancing technical aspects, human resources, and cross-actor collaboration in maintaining AirNav's operational effectiveness.

3) Defense Readiness and the Role of the Indonesian Air Force (TNI AU)

Airspace security cannot be separated from the role of the Indonesian Air Force (TNI AU) as the front line in safeguarding sovereignty. Its effectiveness is evident in responses to airspace violations, where air policing procedures include detection, identification, and interception. Data recorded 14 airspace violations during the first semester of 2023, underscoring the importance of a rapid chain of command and seamless communication with Air Traffic Control (ATC).

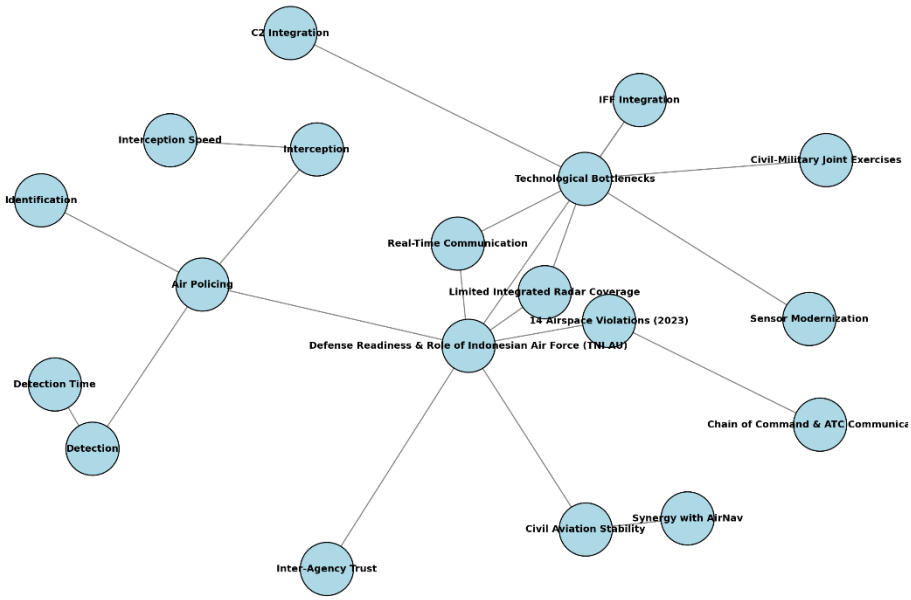

Figure 4. Node Map in Defense Readiness Role of the Indonesian Air Force
Source: Nvivo Analysis by the Researcher, 2025

In this context, indicators of effectiveness include detection time, interception speed, and the ability to maintain stability in civil air traffic flows while defense measures are carried out. Synergy with AirNav is crucial to ensure that sovereignty enforcement does not compromise the safety of commercial aviation. Nevertheless, the effectiveness of the Air Force continues to face challenges, such as limited integrated radar coverage, incomplete integration of Identification Friend or Foe (IFF) systems, and constraints in real-time communication channels. These technological bottlenecks may slow response times and reduce overall effectiveness in addressing threats.

The modernization of sensors, the integration of command-and-control networks, and joint exercises with civilian actors constitute urgent requirements. Moreover, inter-agency coordination must be guided by principles of trust to avoid jurisdictional friction. With these improvements, the role of the Indonesian Air Force will extend beyond defending sovereignty to supporting the security of an increasingly complex civil aviation system.

The node map positions "Defense Readiness & the Role of the Indonesian Air Force (TNI AU)" as the central axis connected to key elements of air defense. Nodes such as Air Policing, Detection, Identification, and Interception represent the operational stages that determine effectiveness in responding to airspace violations. The data point "14 Airspace Violations (2023)" reinforces the urgency of a rapid chain of command and seamless communication with Air Traffic Control (ATC).

In addition, indicators of effectiveness are reflected in the nodes Detection Time, Interception Speed, and Civil Aviation Stability. The connection with the node Synergy with AirNav emphasizes the importance of civil–military coordination to ensure that sovereignty enforcement does not create risks for commercial aviation.

On the other hand, the node map also reveals the structural challenges faced by the Air Force, such as Limited Integrated Radar Coverage, IFF Integration, and Real-Time Communication. The link to Technological Bottlenecks illustrates the primary constraints that may slow responses to threats, highlighting the urgent need for solutions such as Sensor Modernization, C2 (Command & Control) Integration, and Civil–Military Joint Exercises.

The node Inter-Agency Trust underlines that effectiveness depends not only on technological tools but also on the quality of inter-institutional coordination. With technological upgrades and stronger institutional synergy, the Indonesian Air Force fulfills a dual role: safeguarding sovereignty while simultaneously supporting civil aviation security within an increasingly complex airspace system.

4) International Synergy and the Role of ICAO

The effectiveness of Jakarta FIR management is also determined by the involvement of ICAO as an international body. ICAO provides the global standard framework through Annex 11 and Doc 4444, which serve as the "common language" among FIRs. ICAO's international validation of the revised FIR boundary between Indonesia and Singapore grants Indonesia strong legitimacy while minimizing the risk of coordination frictions with neighboring authorities.

ICAO's role is not limited to procedural matters, but also extends to encouraging the enhancement of human resources, equipment, and procedural discipline at the national level. This global effectiveness ensures that Indonesia's navigation services are trusted by international operators. Although ICAO does not directly execute operations, its audit functions and facilitation of coordination within the APAC region strengthen regional synergy.

The effectiveness of inter-state collaboration is evident in the smooth FIR transition, which took place without significant disruptions to transoceanic routes. The standards established by ICAO also create positive incentives for Indonesia to continuously improve the quality of its services. In other words, ICAO's role functions as a "quality safeguard" that ensures all actors operate within the same framework. The effectiveness of the national system will further increase when this global involvement is matched by consistent improvements in domestic capacity.

The node map positions "International Synergy & the Role of ICAO" as the central axis connecting key elements in global airspace governance. The lines Annex 11, Doc 4444, and ICAO Standards highlight ICAO's position as the provider of a universally applicable normative framework. Meanwhile, nodes such as FIR Boundary Validation, Global Legitimacy, and Recognition by the Global Aviation Community illustrate ICAO's role in granting formal recognition to Indonesia's FIR

restructuring, enabling the transition to proceed smoothly without generating international frictions. The links to Inter-FIR Coordination and Regional Facilitation (APAC) demonstrate how global standards are translated into collaborative practices at the regional level.

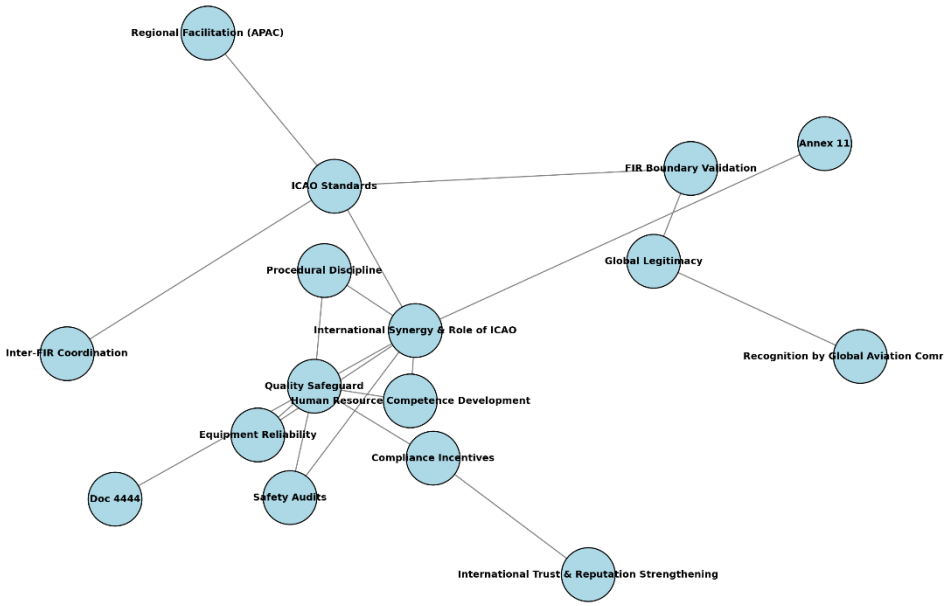

Figure 5. Node Map of International Synergy and the Role of ICAO
Source: Nvivo Analysis by the Researcher, 2025

On the other hand, nodes such as Safety Audits, Human Resource Competence Development, Equipment Reliability, and Procedural Discipline underscore ICAO's function as a global quality control mechanism or quality safeguard. These functions also create Compliance Incentives that encourage member states, including Indonesia, to continuously enhance service capacity. With International Trust and Reputation Strengthening as outcomes, the node map illustrates that ICAO's role is not confined to being a normative regulator, but also extends to serving as the guardian of credibility in the global air navigation system. In conclusion, the effectiveness of international synergy stems from the integration of regulatory legitimacy, regional facilitation, and the drive for continuous improvement.

5) Challenges, Improvements, and Effectiveness Roadmap

The effectiveness of stakeholder roles still faces a number of obstacles, ranging from limited radar integration and real-time communication to shortages of human resources. Without structural improvements, the potential for miscommunication and overlapping authority may reduce the speed of response. Therefore, the reform agenda must include the modernization of CNS/ATM systems, the recruitment of additional certified ATC personnel, joint inter-agency exercises, and the strengthening of collaborative ATFM.

In the defense dimension, upgrading radar coverage and identification systems is a priority. Through these measures, Indonesia can reduce operational bottlenecks and enhance effectiveness on a sustainable basis. The long-term roadmap requires the establishment of measurable cross-agency KPIs, such as time-to-detect, recovery time, and the level of SOP compliance. In addition, inter-

institutional trust must be preserved as social capital to ensure smooth coordination, particularly during crises.

Synergy among stakeholders will be more effective if combined with Indonesia's active presence in ICAO forums and regional cooperation within APAC. Ultimately, the best measure of effectiveness lies in the system's ability to learn and adapt to evolving traffic dynamics and regional risks. This node map positions "Challenges, Improvements, & the Roadmap to Effectiveness" as the central axis with primary branches consisting of obstacles, corrective strategies, and long-term objectives. Nodes such as Technological Constraints, Radar Limitations, Real-Time Communication, and ATC Human Resource Shortages represent the key challenges that could potentially undermine the effectiveness of the airspace security system.

Figure 6. Node Map of Challenges, Improvements, and the Roadmap to Effectiveness
Source: Nvivo Analysis by the Researcher, 2025

The line Potential Miscommunication and Overlapping Authority emphasizes that the challenges are not only technical but also institutional. This relationship indicates that the roadmap for improvement cannot stop at infrastructure alone but must also address governance and coordination dimensions. On the corrective side, nodes such as CNS/ATM Modernization, Additional ATC Personnel, Joint Inter-Agency Exercises, and Collaborative ATFM represent priority steps that must be taken.

Meanwhile, nodes such as Cross-Agency KPIs, Time-to-Detect, Recovery Time, and SOP Compliance serve as effectiveness indicators that can be continuously audited. The roadmap also underscores the importance of Inter-Institutional Trust, Regional Synergy (APAC), and ICAO Participation as social and diplomatic capital to sustain international reputation. The node Adaptation & Learning concludes this map by affirming that the highest level of effectiveness can only be achieved when the system continuously learns from experience, enabling Indonesia to safeguard airspace security while simultaneously strengthening its position in the global arena.

3. Towards a More Effective Governance Model of the FIR

The primary recommendation for a more effective FIR governance model is the application of the principles of collaborative governance that bind all stakeholders. This model must ensure the active involvement of regulators, technical operators, the military, and international organizations in a formal, scheduled forum with a clear mandate. Such a forum could take the form of a Joint Airspace Management Council, functioning as a space for deliberation, coordination, and policy evaluation. Through this mechanism, strategic decisions would no longer be sectoral but collective and consensus-based, thereby enhancing governance effectiveness.

In addition to institutional forums, the FIR governance model must also be supported by stronger technological integration. Radar modernization, CNS/ATM systems, and big data analytics should form the backbone of operations. All stakeholders involved in FIR governance must have access to shared data through an integrated airspace management system. Decision-making can thus be conducted rapidly, based on real-time data, while minimizing the risk of inter-agency miscommunication. This model would also close coordination gaps that have long hindered implementation. Another key recommendation is to strengthen cross-sector human resource capacity.

An effective FIR governance model should emphasize joint training programs involving AirNav, the Indonesian Air Force (TNI AU), and civil regulators. These programs would not only improve technical skills but also foster a shared understanding of each party's roles and responsibilities. From a financial perspective, FIR governance must adopt a sustainable funding scheme. The government could combine state budget allocations (APBN) with public–private partnership (PPP) mechanisms to support the modernization of technology and infrastructure.

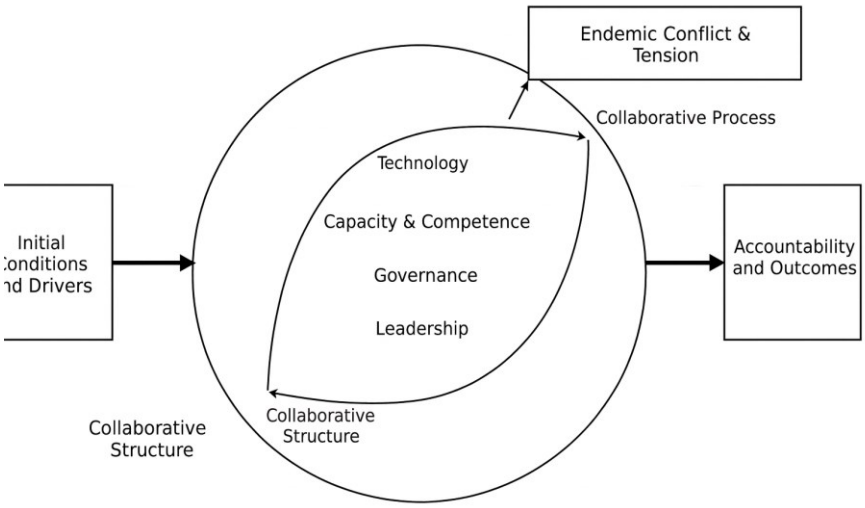

Figure 7. FIR Jakarta Governance Model Based on Collaboration
Source: Author, 2025

Such a scheme would allow strategic projects to proceed without being constrained by fiscal limitations, while remaining within the framework of national sovereignty. With a long-term financing mechanism in place, FIR governance would become more adaptive to emerging challenges, including rising air traffic and non-traditional security threats.

The final recommendation is to ensure that FIR governance remains adaptive and responsive. Regulatory revisions, periodic audits, and feedback loops

from field operations should be integrated into the system. Through this approach, Jakarta FIR governance policies can be continuously updated in line with geopolitical shifts, technological advancements, and the evolving needs of the aviation industry. This model not only enhances the effectiveness of airspace management but also strengthens Indonesia's global standing as a state with a modern, credible, and sustainable air security system. The development of a more effective Jakarta FIR governance model can thus be understood through the lens of collaborative governance, where all stakeholders operate within a synergistic framework.

From this model it can be observed that the core factors of governance—namely technology, capacity and competence, regulatory governance, and leadership cannot function in isolation. They require the support of collaborative processes that foster the active participation of all stakeholders. Such processes are realized through joint forums, regular audits, and inter-institutional communication mechanisms. On the other hand, the collaborative structure serves as an institutional foundation that ensures the outcomes of cooperation are not merely informal, but carry formal and binding legitimacy.

Furthermore, the inclusion of the box "Endemic Conflict & Tension" illustrates the reality that collaboration is not always harmonious. Differences in interests, authority, and resource limitations may generate friction. However, within a structured collaborative cycle, such conflicts can become drivers of innovation and policy improvement. Ultimately, the trajectory of this model leads toward the box "Accountability and Outcomes," where adaptive, transparent, and effective Jakarta FIR governance can enhance public trust as well as Indonesia's global legitimacy in the field of airspace security.

CONCLUSION

The governance of the Jakarta FIR highlights the importance of multi-stakeholder collaboration in safeguarding Indonesia's air sovereignty and security. The findings reveal that the successful transition of FIR management from Singapore to Indonesia was not only a technical matter but also the result of synergy in regulation, diplomacy, and inter-agency trust. The Ministry of Transportation, the Indonesian Air Force (TNI AU), AirNav Indonesia, and ICAO play complementary roles in building a governance system that is legally legitimate, operationally effective, and internationally recognized.

Persistent challenges such as radar limitations, real-time communication gaps, and human resource shortages remain critical obstacles. However, the establishment of cross-agency coordination forums strengthens collective commitment to aviation safety. In this way, collaboration serves as the foundation for achieving more sovereign and credible airspace governance in the eyes of the world. Each stakeholder's role demonstrates a constructive pattern of interdependence. The Ministry of Transportation provides regulatory legitimacy, AirNav Indonesia proves its technical capacity in navigation services, the Air Force ensures defense readiness, while ICAO guarantees compliance with global standards.

This synergy has produced tangible benefits such as increased international air traffic, higher state revenue from navigation charges, and strengthened Indonesia's diplomatic standing. Nevertheless, the gap between macro-level policy and micro-level implementation still requires improvement, particularly in radar integration, ATC reinforcement, and measurable cross-agency performance indicators. Therefore, the effectiveness of FIR governance depends on balancing

policy, technology, and social trust across institutions. Ultimately, this interdependence shows that sovereignty is best secured through collaborative and coordinated governance

ACKNOWLEDGEMENT
-

REFERENCES

Amin, C. (2019). *Penetapan Tapal Batas Wilayah Laut Indonesia Dengan Singapura di Bagian Barat Selat Singapura Menurut Unclos III 1982* [Universitas Islam Riau]. https://repository.uir.ac.id/1946/

Ardan, M. C. (2022). Diplomasi Penyelesaian Sengketa Flight Information Region Indonesia- Singapura di atas Wilayah Kepulauan Riau dan Natuna. *Jurnal Sains, Sosial Dan Humaniora, 2*(2), 1–6. https://doi.org/10.52046/JSSH.V2I2.1320

Arsetyo, Y. I. C. (2021). Pengelolaan Kedaulatan Wilayah Udara Indonesia di Natuna berdasarkan Konvensi Chicago 1944 dalam Perspektif Hukum Internasional. *DEFENDONESIA, 5*(1), 46–55. https://doi.org/10.54755/DEFENDONESIA.V5I1.102

Creswell, J. W. (2003). *A Framework for Design. In Research Design: Qualitative, Quantitative, and Mixed Method*, Approaches (pp. 9–11). Sage.

Creswell, J. W. (2009). *Qualitative inquiry and research design: Choosing among five approaches.* Sage Publications.

Darwis, N. (2018). Politik Hukum Memanfaatkan WIlayah Udara Untuk Kepentingan Penerbangan di WIlayah Kedaulatan NKRI. *Jurnal Ilmiah Hukum Dirgantara, 6*(1), 1–18. https://doi.org/10.35968/JH.V6I1.111

Dirgantara, A., & Meiliana, D. (2023). *Panglima TNI Ungkap Pesawat Militer AS Sering Langgar Wilayah Udara Indonesia Sepanjang 2023.* Kompas.Com. https://nasional.kompas.com/read/2023/07/11/09284011/panglima-tni-ungkap-pesawat-militer-as-sering-langgar-wilayah-udara

Dirgantara, D. (n.d.). *Masuk Wilayah Indonesia Tanpa Izin, TNI AU Perintahkan Pesawat Asing Mendarat. TNI AU Mil.* Retrieved February 2, 2025, from https://tni-au.mil.id/berita/detail/masuk-wilayah-indonesia-tanpa-izin-tni-au-perintahkan

Dirwan, A. (2018). UNCLOS 1982 dan ICAO 1947 dalam Pengaturan Ruang Udara. *Jurnal Ilmiah Hukum Dirgantara, 4*(2). https://doi.org/10.35968/JH.V4I2.94

Firmansyah, M. (2022). *Rebut FIR Kepri-Natuna dari Singapura, Wilayah Udara RI Meluas. Asumsi.* https://asumsi.co/post/68681/rebut-fir-kepri-natuna-dari-singapura-wilayah-udara-ri-meluas/

Husna, L., & Riyanto, A. (2019). Peran Pemerintah Dalam Upaya Pengambilalihan Flight Information Region (Fir) Singapura Atas Wilayah Udara Kepulauan Riau. *Jurnal Cahaya Keadilan, 7*(2), 395–410. https://doi.org/10.33884/JCK.V7I2.1418

Kusumaningrum, A. (2019). *Kedaulatan Negara di Ruang Udara dan Perkembangan Angkutan Udara Internasional.* Universitas Brawijaya Press.

Margaretha, R. (2024). *Implementation Policy Maritime Security in Flight Information Region (FIR) Kepulauan Riau - Natuna.* BIO Web of Conferences, 134, 08003. https://doi.org/10.1051/BIOCONF/202413408003

Margaretha, R., & Mahadiansar, M. (2023). Analisis Identifikasi Pemangku Kepentingan dalam Pengelolaan Flight Information Region (FIR) Kepulauan Riau - Natuna. *NeoRespublica : Jurnal Ilmu Pemerintahan, 4*(2), 445–454. https://doi.org/10.52423/NEORESJURNAL.V4I2.93

Moleong, L. J. (2012). *Metodelogi penelitian kualitatif.* Remaja Rosdakarya.

Pramono, A. (2012). Wilayah Kedaulatan Negara Atas Ruang Udara dalam Prespektif Hukum Internasional. *Masalah-Masalah Hukum, 41*(2), 278–287. https://doi.org/10.14710/MMH.41.2.2012.278-287

Prastowo, A. E., Halkis, M., & Susanto, R. (2023). Kerjasama Antar Negara Dalam mengidentifikasi Pesawat Udara Guna Mendukung Pengamanan Wilayah Udara Nasional Indonesia. *Strategi Pertahanan Udara, 9*(2). https://www.neliti.com/publications/164433/yurisdiksi-wilayah-udara-suatu-negara-dalam-perspektif-hukum-internasional

Prianto, E. B. (2007). *Masalah Kedaulatan Negara di Ruang Udara Kaitannya dengan Hak lintas berdasarkan Konvensi Chicago 1944 dan Perjanjian Lain yang Mengaturnya.* Fiat Justitia Ruat Caelum. https://klinikhukum.wordpress.com/2007/08/13/masalah-kedaulatan-negara-di-ruang-udara-kaitannya-dengan-hak-lintas-berdasarkan-konvensi-chicago-1944-dan-perjanjian-lain-yang-mengaturnya/

Putri, V. M. (2022). Wawasan Nusantara dalam Pertahanan dan Keamanan. *OSFPreprints.* https://doi.org/10.31219/OSF.IO/J7WSK

Rahmi, K., & Charin, R. O. P. (2023). *The Return of Indonesia's Political Will: Implications of Takeover the Flight Information Region (FIR) Natuna's Airspace from Singapore. Proceedings of the International Conference Social - Humanities in Maritime and Border Area (SHIMBA*), 124–128. https://doi.org/10.2991/978-2-38476-150-0_25

Risdiarto, D. (2019). Kendala Hukum Penindakan Terhadap Pesawat Udara Sipil Asing Tidak Berizin Yang Memasuki Wilayah Udara Indonesia. *Jurnal Legislasi Indonesia, 16*(3), 353–368. https://doi.org/10.54629/JLI.V16I3.492

Saptian, M. R. (2017). *Akibat Hukum Dari Perjanjian Antara Indonesia Dengan Singapura Tentang Flight Information Region (FIR) Di Wilayah Udara Kepulauan Natuna.* Universitas Pasundan.

Savitri, R. N. R., & Prabandari, A. P. (2020). TNI Angkatan Udara dan Keamanan Wilayah Udara Indonesia. *Jurnal Pembangunan Hukum Indonesia, 2*(2), 236–245. https://core.ac.uk/download/pdf/327118188.pdf

Setiani, B. (2018). Konsep Kedaulatan Negara di Ruang Udara dan Upaya Penegakan Pelanggaran Kedaulatan oleh Pesawat Udara Asing. *Jurnal Konstitusi, 14*(3), 489–510. https://doi.org/10.31078/JK1432

Sugiyono. (2006). Statistik untuk penelitian. In Alfabeta. Bandung.

Supriyadi, A. A., Gultom, RAG., Manessa, MDM., & Setyanto, A. (2020). Strategy for the Alignment of Singapore Flight Information Region Over Indonesian Airspace. *The Open Transportation Journal, 14*(1), 204–213. https://doi.org/10.2174/1874447802014010204

Susanto, P. C., & Keke, Y. (2019). Implementasi Regulasi International Civil Aviation Organization (ICAO) pada Penerbangan Indonesia. *Aviasi : Jurnal Ilmiah Kedirgantaraan, 16*(1), 53–65. https://doi.org/10.52186/AVIASI.V16I1.23

Vindia, B. Z. (2025). *Jet Tempur Sukhoi Hingga F-16 TNI AU Terpaksa Amankan Pesawat Amerika Serikat yang Masuk Wilayah Indonesia Tanpa Izin.* https://www.zonajakarta.com/nasional/67314360480/jet-tempur-sukhoi-

hingga-f-16-tni-au-terpaksa-amankan-pesawat-amerika-serikat-yang-masuk-wilayah-indonesia-tanpa-izin#google_vignette

Wiguna, A. R., & Putri, G. (2023). Diplomasi Indonesia terhadap Singapura Dalam Pengambilalihan Pelayanan Ruang Udara di Atas Wilayah Kepulauan Riau Dan Natuna 2015-2022. *Kajian Hubungan Internasional, 2*(2), 18–53. https://doi.org/10.31942/KHI.2023.2.2.10198

Wiradipradja, S. (2009). Wilayah Udara Negara (State Air Territory) ditinjau dari Segi Hukum Internasional dan Nasional Indonesia. *Jurnal Hukum Internasional, 6*(4), 495–503.