DAIO Defense AI Observatory

A Careful Walk on Thin Ice

Defense AI in Indonesia

Emanuel Ario Bimo and Bagus Jatmiko

DAIO Study 25|31

Ein Projekt im Rahmen von

dtec.bw
Zentrum für Digitalisierungs- und Technologieforschung der Bundeswehr

Finanziert von der Europäischen Union
NextGenerationEU

About the Defense AI Observatory

The Defense AI Observatory (DAIO) at the Helmut Schmidt University in Hamburg monitors and analyzes the use of artificial intelligence by armed forces. DAIO comprises three interrelated work streams:

- Culture, concept development, and organizational transformation in the context of military innovation
- Current and future conflict pictures, conflict dynamics, and operational experience, especially related to the use of emerging technologies
- Defense industrial dynamics with a particular focus on the impact of emerging technologies on the nature and character of techno-industrial ecosystems

DAIO is an integral element of GhostPlay, a capability and technology development project for concept-driven and AI-enhanced defense decision-making in support of fast-paced defense operations. GhostPlay is funded by the Center for Digital and Technology Research of the German Bundeswehr (dtec.bw). dtec.bw is funded by the European Union – NextGenerationEU.

Ein Projekt im Rahmen von

dtec.bw
Zentrum für Digitalisierungs- und Technologieforschung der Bundeswehr

Finanziert von der Europäischen Union NextGenerationEU

A Careful Walk on Thin Ice

Defense AI in Indonesia

Emanuel Ario Bimo and Bagus Jatmiko

DAIO Study 25|31

Ein Projekt im Rahmen von

dtec.bw
Zentrum für Digitalisierungs- und Technologieforschung der Bundeswehr

Finanziert von der Europäischen Union
NextGenerationEU

About the Authors
Dr. Emanuel Ario Bimo runs Segara Giri Strategic, a boutique research and consulting firm based in Indonesia. He earned his doctorate in defense science from the Republic of Indonesia Defense University. His research areas cover a broad array of topics in national security policy, defense strategy, defense management, risk and crisis management, and ICT-induced change in defense sector.

Bagus Jatmiko, Ph.D is the Head of Wargaming Center at the Indonesian Naval Command and Staff College. He earned his Ph.D in information sciences from the Naval Postgraduate School in Monterey, California. His research areas cover a broad spectrum of information warfare, AI in military, cyber security and defense policy, and narrative warfare.

Acknowledgments
The authors would like to thank Dr. Heiko Borchert for the valuable contributions and suggestions to the manuscript draft. The views presented in this report solely belong to the authors and do not represent the views of the authors' institutional affiliations.

Design
Almasy Information Design Thinking

Imprint
Emanuel Ario Bimo and Bagus Jatmiko, A Careful Walk on Thin Ice. Defense AI in Indonesia. DAIO Study 25/31 (Hamburg: Defense AI Observatory, 2025).

Defense AI Observatory | Chair of Political Theory | Helmut Schmidt University
Holstenhofweg 85 | 22043 Hamburg | T +49 40 6541 2776
www.defenseai.eu | contact@defenseai.eu | @Defense_AIO

ISSN (online): 2749–5337
ISSN (print): 2749–5345

Content

1 Executive Summary

Indonesia is the largest country in Southeast Asia in terms of Gross Domestic Product (GDP), population, and territory. Situated at the crossroads of the Indian Ocean and the Pacific Ocean, its strategic geographic position and its distinct archipelagic traits present a myriad of strategic concerns. These span from dealing with various non-traditional security challenges such as illegal border incursions, natural disasters, insurgencies, and terrorism, to ensuring the safety of navigation over its territorial water and mitigating spillover effects from potential conflict escalations in the region. These strategic concerns, combined with the traditional need to constantly prepare for any potential external armed aggressions, have shaped the diverse operational duties of its national armed forces – *Tentara Nasional Indonesia* (TNI) – under the overarching territorial defense approach. The Network Centric Warfare (NCW) concept further supplements this approach to achieve unity of command across multiple domains of operations. Undertaking the multifaceted duties requires diverse sets of defense capabilities, for which artificial intelligence (AI) becomes a critical technological enabler and multiplier.

Currently, defense AI development and adoption are still in its infancy in Indonesia and seem to grow incrementally. The country's careful approach results from strained budgets, which require the government to strike compromises with other national development tasks and thus only provide limited financial freedom for investments in future defense capabilities and AI – despite the growing complexity of threats Indonesia is facing. Furthermore, the lack of an advanced technological and industrial basis creates path dependence in critical technology areas, including AI, and prolong Indonesia's dependence on foreign partners, a situation that stands in contrast to the national ambition of self-reliance. In addition, national decision-makers are also aware of the risks AI may pose. Together these aspects shape local perspectives that consider significant investments in defense AI and other emerging technologies as a risky venture.

Despite these challenges, Indonesia is aware that mastering AI and other emerging technologies will be crucial to conduct future defense missions and address a constantly evolving threat landscape. Consequently, Indonesia faces a dilemma akin to standing on the surface of a vast lake covered with a thin layer of ice: Standing still for too long will likely crack the ice below; but running fast will likely crack the ice as well. Therefore, the country needs to walk cautiously until reaching the shore safely. This, in turn, makes it clear that Indonesia does not have the luxury of incurring considerable opportunity costs that come with malinvestment in defense AI capability development and adoption.

In response, Indonesia has taken an incremental and prudent approach that places a human-centric perspective at the forefront of AI-enabled defense capability investments and adoption. The majority of Indonesia's AI projects are embedded within the development and acquisition of particular platforms and systems to advance national defense modernization. Broader AI adoption is also contingent upon defense organizational reform that yet needs to materialize. Nevertheless, Indonesia has begun to embrace AI by experimenting with concepts of operations involving AI-enabled platforms and equipment through internal trials, exercises, and low-risk non-war operations, which will lay the groundwork for future doctrinal updates. Fostering the future workforce to expand indigenous strategic and technical expertise in defense AI has also become a top priority to address Indonesia's current talent shortage in AI and prepare the existing workforce to adapt to the future need of strategizing and operating with AI-enabled capabilities. Indonesia is also on the way to develop robust nationwide AI ethics and regulation frameworks that advance a human-centric approach to ensure trustworthy, safe, and socially-beneficial AI developments and applications.

2 Thinking About Defense AI

Indonesia's national defense AI approach is primarily nested in its strategic culture,[1] which is reflected in a series of national defense capstone documents. National leaders and senior defense leaders have also recognized the need to attune the defense sector with AI technology. Jakarta's national policy and defense discourse on AI can be traced back to 2020, which marked the enactment of its first 25-year National AI Strategy (Strategi Nasional Kecerdasan Artifisial 2020–2045, hereafter abbreviated as the 2020–45 Stranas KA). In the same year, then-President Joko Widodo had called the TNI to anticipate and respond to recent technological leaps, including AI.[2]

In a nutshell, Indonesia conceives of AI as a defense multiplier, which brings exponential gains to existing tasks that can already be accomplished by human and/or traditional computing approaches. In addition, AI is believed to serve as an instrumental means to unlock hidden potential in tasks that previously could not be accomplished solely by human cognitive power and traditional computing approaches. Indonesia also sees the growing imperative of embracing AI technology as a means to anticipate future defense technology advances and the growing complexities of technology-induced threats, which, in turn, require the country to gradually reduce dependence on foreign suppliers and advance technological self-reliance. Overall, Indonesia is proceeding with caution by emphasizing a human-centric perspective to mitigate any potential unintended consequences that come with operating AI-enabled defense capabilities.

2.1 Strategic Culture and Indonesia's Approach to Defense AI

Strategic culture can shape how a state imagines, develops, and integrates AI into the armed forces.[3] Arguably, Indonesia has several distinct strands of strategic culture that, in various degrees, shape how AI is conceived and adopted in national defense and influence the way it organizes and directs its national resources to develop and use defense AI. These enduring key ideational milieus include its national identity and geopolitical construct as an archipelagic state, its strategic aspiration for national resilience (*Ketahanan Nasional*), its Total People's Defense and Security System (*Sistem Pertahanan dan Keamanan Rakyat Semesta*, hereaf-

1 For the purpose of this study, we use a modified definition of strategic culture from the one posited by Johnston, "Thinking about Strategic Culture," as the ideational milieu that shapes (or limits) the behavior choice of a state.
2 "President of the Republic of Indonesia Reminds the Indonesian Armed Forces on the Development of Defense Technology (Presiden Ingatkan TNI Soal Perkembangan Teknologi Pertahanan)."
3 Farrell/Payne, "Artificial Intelligence and Strategic Culture."

ter abbreviated as *Sishankamrata*), and its independent and active foreign policy principles (*Politik Luar Negeri Bebas dan Aktif*).

Indonesia's Geopolitical Construct and National Identity as an Archipelagic State

Strategically situated at the crossroads of the Indian and Pacific Oceans, Indonesia's geopolitical construct and national identity are derived from its archipelagic characteristics with around 17,380 islands and islets[4] that are scattered within more than three million km2 of the Republic's sovereign waters.[5] These realities frame the Archipelagic Outlook (*Wawasan Nusantara*), a national worldview that conceives the role of the sea as a unifier, instead of a segregator, and comprehends the Republic's diverse geographic, socio-cultural, political, and economic elements as a unified entity.[6] The ratification of the 1982 United Nations Convention on the Law of the Sea (UNCLOS 1982) has hitherto cemented formal international recognition of its status as an archipelagic state.[7]

The formal recognition of Indonesia's status as an archipelagic state expanded the size of the country's territory to three times the size it had prior to the UNCLOS 1982 enactment.[8] The law also grants the Archipelago the sovereign right to exploit maritime and offshore resources within its Exclusive Economic Zone (EEZ). Consequently, the archipelagic status also entails a crucial mandate for Indonesia to ensure the safety of navigation across its three archipelagic sea lanes, i.e., dedicated strategic sea routes within several bodies of Indonesia's territorial waters for peaceful international passages.[9]

Indonesia's geopolitical construct and national identity as an archipelagic state also shape its core national defense concerns regarding sovereignty, territorial integrity, and national unity. The Republic's sovereignty over its vast sea and land territories is vulnerable to different security risks spanning from transnational organized crimes to illegal border incursions. These require Indonesia to conduct continuous patrols and surveillance activities. In addition, the political and socio-cultural diversity of Indonesia's population pose potential threats to the territorial integrity and national unity. These concerns were evident in the past, as

4 For more, see: "The Number of Islands in Indonesia Increases into 17,380, Why Does the Figure Constantly Change Every Year? (Pulau Indonesia Bertambah Jadi 17.380, Mengapa Angkanya Berubah Setiap Tahun?)."
5 For more, see: "Indonesian Marine Reference Data (Data Rujukan Nasional Kelautan)."
6 For more, see: Cribb/Ford, Indonesia Beyond the Water's Edge: Managing an Archipelagic State; Shekhar, Indonesia's Foreign Policy and Grand Strategy in the 21st Century: Rise of an Indo-Pacific Power; Sebastian, Realpolitik Ideology: Indonesia's Use of Military Force; The 2020–24 National Defense General Policy, p. 7.
7 Butcher/Elson, Sovereignty and the Sea: How Indonesia Became an Archipelagic State; Inayati, "ASEAN Maritime Cooperation in Politics and Security."
8 Farhana, "Indonesia's Maritime Diplomacy in ASEAN: An International Vision in the Face of National Challenges."
9 Inayati, "ASEAN Maritime Cooperation in Politics and Security."

violent domestic terrorists and insurgent groups advanced certain ideological or political demands and sought to disintegrate Indonesia.[10] In addition to threatening the territorial integrity and national unity, these threats also affect domestic stability and security, threaten the way of life of its population and inhibit the country's overall national development. In addition, the Archipelago's geographic proximity to several hotspots in the Asia-Pacific region – especially the adjacent South China Sea (SCS), Korean Peninsula, and Taiwan Strait – also entails serious concerns regarding national and regional security and stability.[11] Although Indonesia is not a claimant state to the SCS territorial dispute, any possibly escalating conflict can create security, political, and economic spillover effects that affect the Archipelago.[12] Grappling with these strategic concerns ultimately stretches Indonesia's austere defense resources and capabilities to the limit.

Against this background, AI is perceived as a key technology that can enable the country's armed forces to close existing capability gaps and address the multitude of threats against its sovereignty, territorial integrity, and national unity. Therefore, augmenting defense capabilities with AI technology is perceived to enhance operational efficiency, while also improving the accuracy, timeliness, and effectiveness of actions across the vast territories of the Archipelago.

National Resilience (Ketahanan Nasional)

Indonesia has long adopted a geostrategic philosophy and aspiration of national resilience, dubbed *ketahanan nasional*, emphasizing the ability to withstand and bounce back from all shocks and adversities that endanger the national survival.[13] This approach is grounded in combining resilience in three core natural aspects (dubbed *Tri Gatra,* which encompasses geography, demography, and natural resources) and five main social dimensions (dubbed *Panca Gatra,* which encompasses ideological, political, economic, social and cultural, and defense and security dimensions).[14] As a result of Indonesia's historical trauma of defense technology embargoes imposed by several great powers,[15] the national resilience idea has transcended into the Republic's desire toward defense technological self-reliance, with a strong emphasis on strengthening its indigenous defense industry capa-

10 For more, see: Shekhar, Indonesia's Foreign Policy and Grand Strategy in the 21st Century: Rise of an Indo-Pacific Power, p. 131; Sebastian, Realpolitik Ideology: Indonesia's Use of Military Force; Motin, "Indonesia, an Offshore Balancer in Southeast Asia?;" The 2020–24 National Defense General Policy, p. 7.
11 The 2020–24 National Defense General Policy, p. 3.
12 The 2020–24 National Defense Implementation Policy, p. 2.
13 The 2020–24 National Defense General Policy, p. 7.
14 Sebastian, Realpolitik Ideology: Indonesia's Use of Military Force.
15 Maharani/Matthews, "The Role of Offset in the Enduring Gestation of Indonesia's Strategic Industries," and Matthews et al., "Indonesia's Defense Acquisition Strategy."

bility. This aspiration was codified into national legislation[16] and reflected in the 2020–24 General National Defense Policy (*Kebijakan Umum Pertahanan Negara* 2020–2024, hereafter abbreviated as the 2020–24 Jakumhanneg). The 2020–24 Jakumhanneg outlines the desire to develop an advanced, strong, self-reliant, and competitive domestic defense industry as a key national defense development goal.[17]

To promote the development of an indigenous defense industrial and technology base, article 43 of the Law of the Republic of Indonesia Number 16 of 2012 stipulates that any foreign defense acquisitions require indigenous defense industry participation in the form of countertrade, local content, and/or offset.[18] This policy is expected to be a structural driver to advance national manufacturing capacities and improve the maturity of the national defense industry. Although policy implementation still faces numerous hurdles, it is fair to say that it enabled Indonesia to gradually reduce dependence on foreign suppliers.[19] As a consequence, this experience is also likely to underpin Indonesia's approach to defense AI.

In an adjacent technology domain, Indonesia has also aspired to develop its indigenous semiconductor ecosystem as a critical building block to advance national computing and storage capacity, which also supports aspects of AI sovereignty. To achieve this goal, the Coordinating Ministry of Economic Affairs of the Republic of Indonesia has been setting up a National Task Force on Semiconductor and AI Ecosystems Development (*Satuan Tugas Pengembangan Ekosistem Semikonduktor dan Kecerdasan Artifisial*), which coordinates various stakeholders in laying out a national roadmap to develop an indigenous semiconductor and AI ecosystem and integrate it within the global value chain.[20] This also showcases Indonesia's aspiration for self-reliance in critical technology areas related to AI. At the time of the writing, the task force is still in the process of formulating the national roadmap.

16 Law of the Republic of Indonesia Number 16 of 2012 on Defense Industry and its derivative regulations, such as the Government Regulation of the Republic of Indonesia Number 141 of 2015 on Defense Industry Management.

17 The 2020–24 National Defense General Policy, p. 12.

18 In the explanation section of the law, offset is defined as an arrangement between the government and foreign defense suppliers to return certain amount of the acquisition contract value to the buying country through co-production, joint venture, buy-back, transfer of knowledge, and training.

19 For more on Indonesia's defense offset policy, see: Maharani/Matthews, "The Role of Offset in the Enduring Gestation of Indonesia's Strategic Industries."

20 "The Coordinating Ministry of Economic Affairs of the Republic of Indonesia Holds a Focus Group Discussion to Strengthen Collaboration on Semiconductor and AI development in Indonesia (Kemenko Perekonomian Gelar FGD untuk Perkuat Kolaborasi Pengembangan Semikonduktor dan AI di Indonesia)."

Total People's Defense and Security System (Sishankamrata)

Since its formative years, Indonesia has been adopting a national defense doctrine and philosophy called *Sishankamrata*. This doctrine places great emphasis on the unity of the military and the people in national defense and security. It henceforth adopts whole-of-society and whole-of-government approaches to national defense and security, which place utmost importance on civil-military cooperation and total national resource mobilization to address a broad spectrum of threats.

Sishankamrata originated from the Republic's historical experience of the independence war circa 1945–49. The total defense approach was developed to resist the Dutch reoccupation during this period and has thereafter produced an enduring tradition of combining military and civilian resources for the purpose of national defense.[21] Indonesia's strategic documents build on this tradition by defining a strategic philosophy that puts forward comprehensive approaches to Indonesia's national defense and underpins its emphasis on territorial defense. This philosophy also sets the tone for AI as a technological enabler to support capabilities for national territorial defense while maintaining deep and informal social bonds between the military and Indonesia's broader society.

Sishankamrata has also become a core tenet of Indonesia's national defense policy. It is explicitly stated in the corpus of the Indonesian National Constitution and some of its national legislative acts. In 2019, the enactment of the Law on National Resources Management for National Defense[22] paved the way for implementing *Sishankamrata's* whole-of-society, whole-of-government, and total national resource mobilization approaches to national defense. The Law states that the national resource management for national defense serves to transform human, natural, and manmade resources, as well as national facilities and infrastructure, into a national defense force that is ready to be deployed for national defense purposes.[23] So far, however, there has been no clear articulation on how the national resource management policy would be implemented to utilize all national potential to advance defense AI development and adoption.

In 2021, the Ministry of Defense also revamped *Sishankamrata* to ensure its relevance amid the trends shaping the strategic environment of the early 21st century. This has led to the publication of a new capstone document entitled "The 21st Century Sishankamrata" (*Sishankamrata Abad ke-21*).[24] Given the complex strategic environment and the broad spectrum of threats, the document divides

21 Sebastian, Realpolitik Ideology: Indonesia's Use of Military Force.
22 Codified in the Law of the Republic of Indonesia Number 23 of 2019 on National Resources Management for National Defense.
23 Law of the Republic of Indonesia Number 23 of 2019, Article 3.
24 "The Minister of Defense of the Republic of Indonesia hands the 21st Century Sishankamrata strategic document to the Vice President of the Republic of Indonesia (Menhan Serahkan Dokumen Strategis Sishankamrata Abad-21 Kepada Wapres RI)."

national defense into military defense and non-military defense. In the document, AI has been recognized as an influential technological consideration that shapes the threat landscape, which, in turn, require broad multi-stakeholder collaboration. The document also provides general direction on how AI should be leveraged in military and non-military defense domains. However, due to the classified nature of the document, we are unable to provide a richer description and reflection on the document's discussion of defense AI. Moreover, the document has not yet been codified into the national legal corpus, making it more of a strategic guideline than a legally binding document.

In late 2024, Indonesia established the National Defense Council (*Dewan Pertahanan Nasional*, hereafter abbreviated as DPN), an interagency council to assist the President in formulating an integrated national defense policy and strategy that involves diverse stakeholders from across different ministries, governmental agencies, academic institutions, and community organizations. This integrated national defense policy is meant to serve as a guideline for all ministries, other state institutions, and the broader public in carrying out their respective duties and responsibilities to support national defense implementation.[25] While helping to address the blurring organizational boundaries between military and non-military defense, the DPN may also use its coordination mechanism to improve strategic decision-making related to defense AI.

Independent and Active Foreign Policy (Politik Luar Negeri Bebas dan Aktif)

Indonesia has long held onto independent and active foreign policy principles, dubbed *bebas dan aktif.* These principles were born in an era of heightened great power competition in the Asia-Pacific region during the early years of the Cold War.[26] In this international context, Indonesia did not take sides with any of the competing great power blocs. Rather the country determined its own path and actively contributed to the promotion of international peace and stability based on mutual respect among states. This policy of 'rowing between two reefs' ('*mendayung di antara dua karang*') kept Indonesia from being pulled into a great power bloc's sphere of influence and displaying enmity against the opposing bloc, while at the same time providing Indonesia with ample room for engaging both great power blocs amidst heightened competition.[27] It culminated in Indonesia's co-founding of the Non-Aligned Movement (NAM), which has inspired and pioneered many other South-South cooperation initiatives.

25 Presidential Regulation of the Republic of Indonesia Number 202 of 2024 on the National Defense Council, article 3(a).
26 For more, see: Umar, "The Meaning of Independent and Active Foreign Policy: Revisiting Hatta's 1948 Speech."
27 Ibid.

This historical experience has hitherto shaped Indonesia's international policy as an active subject in international relations free to chart its path independently from great power interferences. From time to time, these tenets have contributed to Indonesia's preference for alternative and loose multilateral and bilateral ties to advance its interests, while also maintaining active engagement with various countries, including great powers. Consequently, Indonesia entered into numerous defense technology and industrial cooperation agreements with a diverse set of partners, also – albeit on a low level – on defense AI, as we will discuss in Chapter 3.

Although providing strategic leeway, the independent and active foreign policy principles also imply a self-restriction not to enter into or commit to formal alliances with any great power bloc. However, this policy preference also presents challenges as it limits the scope of critical defense technologies and components Indonesia can acquire from international partners. This, in turn, may impede progress in indigenously developing defense technologies. In the past, this issue has even caused arms embargoes when its national interests were not aligned with those of great powers.[28] This has molded Indonesia's common practice of diversifying its international arms suppliers to manage the risk of arms embargo, which is also informing its ambition to develop diverse international partnerships to advance defense AI development (see Chapter 3).

2.2 Capstone Documents

Several capstone documents embody the Republic's thought on defense AI. Unlike national AI strategies in other countries, Indonesia's national AI strategy, the 2020–45 Stranas KA, includes defense. In addition, several five-year defense documents, such as the 2020–24 Jakumhanneg and the 2020–24 National Defense Implementation Policy (*Kebijakan Penyelenggaraan Pertahanan Negara* 2020–2024, hereafter abbreviated as the 2020–24 Jakgarahanneg), present the country's thoughts on defense AI.[29]

28 For more, see: Maharani/Matthews, "The Role of Offset in the Enduring Gestation of Indonesia's Strategic Industries," and Matthews et al., "Indonesia's Defense Acquisition Strategy."

29 The document for the five-year term of the current administration (2025–29) has not been enacted at the time of the writing. Therefore, we still use the past administration's documents as the basis of our analysis.

Indonesia's National Policy on AI

In 2020, Indonesia enacted its first 25-year horizon national AI strategy document, the 2020–45 Stranas KA. This document serves as the overarching compass to guide national AI R&D and adoption across various sectors and diverse stakeholders. The document sets out four core aspects that require strategic guidance to successfully develop and adopt AI in line with the Republic's national goals: AI ethics and policy, AI talent development, data and infrastructure, and AI research and innovation. The document also provides a general roadmap for AI research, innovation, and adoption in various sectors. However, this document is not formalized as national-level regulation (e.g., Presidential Regulation or Government Regulation), which makes it less of a legally binding document.

The 2020–45 Stranas KA includes reference to defense as one of the national research and innovation priority sectors.[30] The document states that innovative AI technologies should strengthen defense capabilities and contribute to an adaptive and agile defense posture.[31] The document expects that defense AI research and innovation will result in various AI-powered products to support TNI's war and non-war operations.[32] Among other applications, the document indicates that AI could be used for intelligence analysis, decision-making, intelligent autonomous platforms (both stand-alone and swarms across land, sea, and air domains), advanced weapons, logistics support, predictive maintenance, procurement, and secure communications within the framework of Cognitive Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) to support TNI operationalizing its NCW at strategic, operational, and tactical levels. At the time of the writing, the Indonesian government is in the progress of drafting a five-year National AI Roadmap to illustrate how the long-term aspiration of the 2020–45 Stranas KA will be implemented.[33]

In addition to the 2020–45 Stranas KA, the Coordinating Ministry of Political and Security Affairs recently initiated the formation of the National Task Force on Cyber and AI. The purpose of this task force is to develop the principles for ethical, secure, and reliable AI and cyber solutions that comply with Indonesia's national goals and values.[34] At the time of writing this study, the formal tasks, structure, and membership have not been officially enacted and announced. Nevertheless, we can expect the Task Force to work on harmonizing and strength-

30 The 2020–45 National Strategy on AI, p. 80.
31 Ibid., p. 108.
32 Ibid., p. 109.
33 "Public Consultation on the White Paper of National AI Roadmap and the Concept of Ethical Guideline to AI (Konsultasi Publik Buku Putih Peta Jalan Kecerdasan Artifisial Nasional dan Konsep Pedoman Etika Kecerdasan Artifisial)."
34 "The Coordinating Ministry of Political and Security Affairs of the Republic of Indonesia Pushes the Establishment of National Task Force on Cyber and Artificial Intelligence (Kemenko Polkam Dorong Pembentukan Satgas Siber dan Kecerdasan Artifisial Terpadu)."

ening the existing body of regulations and standards regarding cybersecurity and AI, preparing the national roadmap for cybersecurity and AI development and implementation, and coordinating nationwide collaboration in strengthening AI and cybersecurity governance, capacity building, and legal enforcement against cybersecurity and AI violations. The Task Force's structure will likely be designed to support the execution of those tasks in various sectors, including defense, with experts representing various relevant stakeholders such as government agencies, industries, academia, researchers, think tanks, and societal communities. Setting up this task force also indicates that Indonesia intends to align its national AI and cybersecurity governance and development in a more coherent manner.

Defense AI in Defense Sector's Capstone Documents

Defense AI is recognized as a notable feature of the changing strategic environment, the 2020–24 Jakumhanneg and the 2020–24 Jakgarahanneg contend.[35] Both documents consider AI, alongside other emerging technologies such as robotics, big data, and autonomous systems, as a breakthrough technology shaping the strategic environment in the era of the 4th Industrial Revolution.[36]

AI is expected to assist in independent decision-making, which comes with both opportunities and threats that bring major changes in the defense sector, such as the emergence of asymmetric warfare using unmanned platforms. AI is also perceived to drive innovation in developing weapons technology, changing the paradigm of war, and enlarging the battlefield to include space and cyber domains. Both documents also provide general guidance on national threat perceptions, by distinguishing between actual threats (i.e., real and present imminent threats) and potential threats (i.e., potential threats that may manifest at some point in time in the future). According to these documents, AI is considered an actual threat that warrants highest societal awareness.[37] Despite the risks, both documents underline that defense technology development needs to leverage and harness AI for national defense interests,[38] as AI is perceived as a capability multiplier, especially to enhance defense decision-making.

Other sections of both documents indirectly refer to AI under the rubric of "other technological advances." For instance, the 2020–24 Jakumhanneg document states that to develop a professional, adaptive, and responsive defense workforce, education, training, as well as R&D need to adapt and adopt new technologies.[39]

35 Despite the explicit mentions of AI, both documents do not provide a clear definition of AI and what it encompasses.
36 The 2020–24 National Defense General Policy, p. 3; The 2020–24 National Defense Implementation Policy, p. 3.
37 The 2020–24 National Defense General Policy, p. 4; The 2020–24 National Defense Implementation Policy, p. 4.
38 The 2020–24 National Defense General Policy, p. 12; The 2020–24 National Defense Implementation Policy, p. 25.
39 The 2020–24 National Defense General Policy, p. 9.

In similar ways the documents also implicitly talk about defense AI in relation to further developing the defense workforce, advance the modernization of weapon systems, and enhance defense capabilities for military and non-military tasks including defense technological and industrial capacities.[40]

It is also interesting to note that both documents stipulate the requirement to advance information and communication technology (ICT), thereby implicitly including defense AI, with further developing the armed forces NCW concept.[41] As argued above, this is in line with the 2020–45 Stranas KA document as NCW has provided the strategic umbrella to develop TNI capabilities for the last decade. Within the framework of multi-domain operations, NCW is believed to optimize the TNI's missions spectrum by enabling real-time situational awareness and accelerating command through synchronizing and advancing interoperability among heavily distributed military assets and units across the vast territories of the Archipelago.[42] This aspiration needs to be underpinned by robust communication, data fusion and analysis across sensors, Command and Control (C2), and seamlessly connecting all relevant network nodes. To this end, defense AI plays an important role as a technological enabler, inter alia, for real-time object detection and tracking, big data analytics, and secure and uninterrupted data communication, including communication spectrum management, while also reducing the cognitive load in the C2 nodes and facilitating seamless and reliable data exchange across sensors, C2, and network nodes involved.

2.3 Defense AI in Senior Leaders' Official Statements

Defense AI has also been on the minds of the Indonesian Presidents as well as senior defense leaders. In 2020, then-President Joko Widodo had already called the TNI to anticipate and adapt with the recent technological leap, including the diffusion of AI into weapons systems, by improving the ability to master new defense technologies for strategic national defense planning.[43] Along this line, current President Prabowo Subianto also repeatedly urged the need to strengthen defense technological proficiency, adapt with AI technology, and build national AI

40 The 2020–24 National Defense General Policy, pp. 9, 13-14 & 17; The 2020–24 National Defense Implementation Policy, pp. 11, 15, 17, 19, 21, 26 and 31-32.
41 The 2020–24 National Defense General Policy., p. 12; The 2020–24 National Defense Implementation Policy, pp. 12, 26.
42 Ibid.
43 "President of the Republic of Indonesia Reminds the Indonesian Armed Forces on the Development of Defense Technology (Presiden Ingatkan TNI Soal Perkembangan Teknologi Pertahanan)."

talent pools.[44] During his tenure as Minister of Defense in the previous administration, he also laid the foundation for Indonesia's future defense AI development by launching several defense AI study programs at the Republic of Indonesia Defense University, and, more generally, broadening and deepening Indonesia's international cooperation with various international partners.[45]

As of recently, the discourse within the Indonesian defense establishment signals a cautious, but growing willingness to start embedding AI into the TNI's way of operating, its weapons systems, and personnel capacity building. During the 2025 TNI Annual Coordination Meeting, the TNI Chief Commander underlined the need to revisit TNI's doctrine to adapt to emerging technologies, including AI-powered autonomous systems.[46] In parallel, the defense establishment also takes a cautious approach to augmenting weapon systems with AI, thereby emphasizing the need to assess all possible risks that come with defense AI adoption in critical weapons functions and tasks.[47] As argued above, this cautiousness results from the perceived risks inherent with AI – such as the vulnerability of AI-enabled systems to cyber threats, the unknown or hidden flaws in AI model design, and the so-called AI algorithm 'black box'[48] that poses the risk of generating false outputs –, which prevent defense leaders from fully embracing AI with confidence. Therefore, it is crucial to develop AI in tandem with all enabling components, particularly cybersecurity, to alleviate concerns and enhance levels of confidence. In parallel, defense leaders put a major focus on a human-centric perspective to ensure strict control and prevent unintended consequences stemming from the use of AI in the defense sector.

44 "A Message from President Prabowo: Indonesian Youths ought to Master Cyber and AI (Pesan Prabowo: Anak-Anak RI Harus Menguasai Siber & AI);" "President of the Republic of Indonesia Calls for the Enlargement of Digital Talents to Master AI (Presiden Minta Perbanyak Talenta Digital Hebat untuk Kuasai AI)," "During the 80th Anniversary of the TNI, President Prabowo Emphasized Exemplary Leadership and Professionalism (HUT ke-80 TNI, Presiden Prabowo Tekankan Kepemimpinan Teladan dan Profesionalisme)."

45 For an in-depth discussion of Prabowo Subianto's defense diplomatic undertakings to broaden international cooperation and partnerships for defense modernization during his tenure as Minister of Defense in the previous administration, see: Prihandoko, "Defence Minister Prabowo Subianto's Defence Diplomacy: Strategy and Implications for Military Modernisation."

46 "Chief Commander of the Indonesian Armed Forces: The Imperative of Shifting the Indonesian Armed Forces' Warfare Doctrines into Drone and AI Technologies (Panglima: Doktrin Perang TNI Diubah ke Teknologi Drone dan AI)."

47 The Ministry of Defense of the Republic of Indonesia Maintains Caution in Adopting AI Technology to Its Main Weapons Systems and Equipment (Kemenhan berhati-hati adopsi teknologi AI untuk alutsista)."

48 'Black box' refers to the lack of transparency in AI algorithm, which makes AI's decision-making process inscrutable and beyond human control, thus raising profound concerns on the trustworthiness and reliability of AI-based systems. For more, see: Jenkins et al., "Recent Insights in Responsible AI Development and Deployment in National Defense: A Review of Literature, 2022–2024;" Floridi et al., "AI4People—An Ethical Framework for a Good AI Society: Opportunities, Risks, Principles, and Recommendations;" Davis "Elevating humanism in high-stakes automation: experts-in-the-loop and resort-to-force decision making."

2.4 Discourses on AI Ethics and Regulation

The 2020–45 Stranas KA embodied the first structured and holistic attempt to advance the development of AI ethics and governance in Indonesia. At the time of writing this study, a new Concept of Ethical Guidelines on AI was in the making. These guidelines will set out general value of AI ethics, AI risk identification, mitigation, and safeguard measures, the roles and responsibility of the related stakeholders, and control and evaluation mechanisms.[49] In 2023, the Ministry of Communication and Information of the Republic of Indonesia also issued a circular letter on AI ethics as interim guidance to provide comprehensive and systemic national AI ethics guidelines in response to the recent emergence and pervasive use of generative AI technology in various sectors.[50] The 2023 circular letter was primarily aimed at ensuring that AI technology can be used in line with the principles of ethics, prudence, safety, and oriented toward positive impacts, while also mitigating the negative impacts that may emanate from AI use.[51]

In addition to these foundational documents, the ASEAN Guide on AI Governance and Ethics will also likely influence Indonesia's perspective on AI governance and ethics. Published in 2024, the document outlines several guiding principles on designing, developing, and deploying AI technologies in commercial and non-military or dual-use applications and aims at fostering alignment and interoperability of AI frameworks across ASEAN member states.[52] Nevertheless, the document is not legally binding and the document's adoption is voluntary. The guiding principles outlined in the document include:[53]

- Transparency and explainability,
- Fairness and equity,
- Security and safety,
- Robustness and reliability,
- Human-centricity,
- Privacy and data governance,
- Accountability and integrity.

49 "Public Consultation on the White Paper of National AI Roadmap and the Concept of Ethical Guideline to AI (Konsultasi Publik Buku Putih Peta Jalan Kecerdasan Artifisial Nasional dan Konsep Pedoman Etika Kecerdasan Artifisial)."

50 Circular Letter of the Minister of Communication and Information of the Republic of Indonesia Number 9 of 2023 on AI Ethics (Surat Edaran Menteri Komunikasi dan Informatika Republik Indonesia Nomor 9 Tahun 2023 tentang Etika Kecerdasan Artifisial). The provisions in the circular letter are applicable to all business entities that run AI-based programming activities and all electronic system operators in public and private sectors.

51 Ibid.

52 ASEAN Guide on AI Governance and Ethics, p. 3.

53 Ibid, p. 3. The document also prescribes four key components that need to be in place to implement these values in AI design, development, and deployment: (1) Defining internal governance structures and processes, (2) determining the level of human involvement in AI-augmented decision-making, (3) defining operational management procedures, and (4) setting-up stakeholder interaction and communication. As we discuss in this chapter, these components align with the current Indonesian discourse.

At glance, the general discourse on AI ethics in Indonesia can be categorized into the discourse on AI development and AI use. Both discourses promote an inclusive, human-centric approach at their core to cater for the need of ensuring AI trustworthiness and the safe use of AI for the broader societal benefits of the Indonesian people. The core tenets of *Pancasila*, Indonesia's foundational ideological philosophy, is explicitly stated in the 2020–45 Stranas KA as the fundamental worldview that must be espoused in AI development.[54] *Pancasila* – which aspires an Indonesian society based on the belief in One Supreme God, just and civilized humanity, national unity, democracy led by the wisdom of representation and consultation, and social justice for all people – eventually shapes the dominant discourse of an inclusive, human-centric approach to advance trustworthy, safe, and socially-beneficial AI developments and uses in Indonesia. In addition, Indonesia has also advocated this approach in several international fora and endorsed several international initiatives at regulating AI in line with its espoused values.

AI Development

The 2020–45 Stranas KA views that AI trustworthiness hinges upon the ability of human oversight, technical safety and robustness, data and privacy protection, transparency, social and environmental sustainability, as well as non-discrimination, fairness, and inclusiveness.[55] On the AI development aspect, these prerequisites are reflected in the 2020–45 Stranas KA's suggestions of the need to design systemic and inclusive governance mechanisms that are capable of ensuring AI developer's accountability and transparency in developing AI technology. This should safeguard the public from any potential harms that stem from flaws in AI design, ensuring data and privacy protection, and assuring that AI can serve the ultimate purpose of bringing positive contributions to Indonesian society.[56] To this end, the document suggests establishing some governance measures on AI development, including the idea of imposing minimum service level agreements to the AI developer,[57] establishing an inter-stakeholder commission for AI ethics oversight,[58] and incorporating the cybersecurity governance of AI into the broader cybersecurity governance.[59] At the national level, the future implementation of these suggestions will likely depend on how the forthcoming Concept of Ethical Guidelines on AI, the National Task Force on Cyber and AI, and other prospective implementation mechanisms and institutions translate these suggestions into more concrete measures that can be operationalized and enforced.

54 The 2020–45 Stranas KA, p. 40.
55 Ibid., pp. 39-40.
56 Ibid., p. 41.
57 Ibid., pp. 41, 46.
58 Ibid., p. 48.
59 Ibid., p. 47.

In addition to the 2020–45 Stranas KA, the 2023 Circular Letter of the Minister of Communication and Informatics on AI Ethics also mandated numerous measures to ensure the responsibility of all business entities that runs AI-based programming activities and all electronic system operators at the public and private sectors since the AI development phase. These measures consist of: [60]

- Providing safeguard to the public in using AI and the associated data,
- Preventing the risks of racism and any harmful actions that may arise from the use of AI,
- Ensuring the fulfillment of obligations to protect users' security and rights in digital media,
- Providing complete information associated with the AI-based technology development to prevent any potential negative impacts and losses to the users,
- Exercising prudent by taking risk management and crisis management considerations into account when developing AI.

AI Use

On the AI use aspect, the 2020–45 Stranas KA views AI not as a legal subject, but as the technological product of human activities.[61] Therefore, the users of AI technology assume major legal responsibility for AI use. In line with this understanding, the document suggests four categories of AI norms that should be designed in the future.[62] Additionally, the 2020–45 Stranas KA also differentiates between three different human-centric perspectives of using AI:[63]

- Human-in-the-loop: Refers to human's ability to intervene in each step of the decision cycle that involves AI.
- Human-on-the-loop: Refers to human's ability to intervene the AI system design and oversee the AI system's operation.
- Human-in-command: Refers to human's ability to oversee all activities of an AI system (including overseeing the broader economic, social, legal, and ethical impacts that stem from the use of AI system) and decide when and how AI system can be used in a specific situation.

60 Circular Letter of the Minister of Communication and Information of the Republic of Indonesia Number 9 of 2023 on AI Ethics (Surat Edaran Menteri Komunikasi dan Informatika Republik Indonesia Nomor 9 Tahun 2023 tentang Etika Kecerdasan Artifisial). The provisions in the circular letter are applicable to all business entities that runs AI-based programming activities and all electronic system operators in the public and private sectors.

61 Ibid., p. 43.

62 Ibid., p. 43. These four categories include regulation on specific types of AI technology applications (e.g., automatic decision-making and face recognition), regulation on AI technology application in specific sectors (e.g., financial and health sectors), provisions on the legal responsibility for any intended consequences of the use of AI in criminal and civil laws, and a voluntary code of ethics on the use of specific AI technology applications.

63 Ibid., p. 39.

In addition, the 2023 Circular Letter of the Minister of Communication and Informatics on AI Ethics also mandated several measures to safeguard the use of AI, namely by ensuring that AI is not used for automated decision-making in any domains involving policymaking or activities concerning humanity and ensuring the use of AI only to improve innovation capability and problem-solving ability.[64]

Endorsement and Advocation of International Discourses on AI Ethics and Regulation

In line with the country's core values, Indonesia has endorsed several international attempts to advance the regulation of AI. In 2021, Indonesia has adopted the United Nations Educational, Scientific and Cultural Organization (UNESCO) Recommendation on the Ethics of AI. In late 2024, Indonesia has even completed the AI Readiness Assessment Methodology (RAM) that was set out by UNESCO in an attempt to align its national AI development governance with the UNESCO Recommendation on the Ethics of AI, making it the first Southeast Asian country to endorse UNESCO's RAM.[65] Other than UNESCO's initiatives, it also attended the 2023 AI Safety Summit and endorsed the Bletchley Declaration.[66] These efforts indicate Indonesia's inclination to align its AI ethics and regulation with emerging global standards.

Indonesia has also been a consistent advocate of the Responsible Use of AI in the Military Domain (REAIM), although it is not listed among the endorsing countries.[67] Based on publicly available information on Indonesia's participation in the 2023 and 2024 REAIM Summits,[68] Indonesia has consistently called for a global multi-stakeholder dialogue to discuss an AI ethics framework that considers the unique characteristics of AI and its potential unintended consequences in the military domain. In addition, Indonesia also called for the narrowing of existing global gaps in AI technologies to ensure that AI technology can be harnessed for the benefit and security interest of all nations. This position mainly stems from

64 Circular Letter of the Minister of Communication and Information of the Republic of Indonesia Number 9 of 2023 on AI Ethics (Surat Edaran Menteri Komunikasi dan Informatika Republik Indonesia Nomor 9 Tahun 2023 tentang Etika Kecerdasan Artifisial). The provisions in the circular letter are applicable to all business entities that runs AI-based programming activities and all electronic system operators at the public and private sectors.

65 "Indonesia: Artificial Intelligence Readiness Assessment Report."

66 "The Bletchley Declaration by Countries Attending the AI Safety Summit, 1-2 November 2023."

67 For the complete list of REAIM 2023 endorsing countries, see: https://www.government.nl/documents/publications/2023/02/16/reaim-2023-endorsing-countries (last accessed 27 October 2025).

68 For more information on Indonesia's position during the 2023 REAIM Summit, see: "The Governor of the National Resilience Institute of the Republic of Indonesia Became the Chief of Indonesian Delegations at the REAIM Summit 2023 in The Hague, Netherlands (Hadiri KTT Kecerdasan Buatan di Belanda, Gubernur Lemhannas RI Bertindak Sebagai Ketua Delegasi Indonesia)." For more information on Indonesia's position during the 2024 REAIM Summit, see: "2024 Annual Performance Report of the Directorate of International Security and Disarmament of the Ministry of Foreign Affairs of the Republic of Indonesia (Laporan Kinerja Direktorat Keamanan Internasional dan Perlucutan Senjata Kementerian Luar Negeri RI Tahun 2024);" "Director of International Security and Disarmament of the Ministry of Foreign Affairs of the Republic of Indonesia Attended REAIM Summit 2024 in Seoul, South Korea on 9-10 September 2024 (Direktur Keamanan Internasional dan Perlucutan Senjata Kementerian Luar Negeri RI telah Menghadiri REAIM Summit 2024 di Seoul, Korea Selatan pada Tanggal 9-10 September 2024)."

Indonesia's deep-seated concerns of AI's potential massive proliferation to diverse range of malign actors and the disruptive advantages of AI-powered autonomous systems that will likely increase state preferences to resort for military options in resolving conflicts.[69] Furthermore, the potential speed of action that autonomous systems offer in military operations also bears the risk of narrowing the room for diplomatic negotiation,[70] whereas the current technological gap between advanced and developing nations will risk further tipping the balance of power in favor of the more technologically-advanced countries. All these concerns are in line with the previously discussed defense capstone documents that indicate Indonesia's anticipation of AI's major potentials in shaping future strategic environment and threat landscape.

Beyond REAIM, Indonesian diplomats have also voiced concern on the use of lethal autonomous weapons systems (LAWS) in several United Nations General Assembly (UNGA) sessions. During the general debate at the First Committee of the 77th session of UNGA, Indonesia rejected the automation of killing by machine and called the need to shine a spotlight of attention on autonomy in weapon systems.[71] During the thematic debate on conventional weapons at the First Committee of the 78th session of UNGA, Indonesia on behalf of Non-Aligned Movement (NAM) called the need for new legally-binding provisions for addressing the humanitarian and international security challenges posed by emerging technologies in the area of LAWS,[72] which also imply AI. Indonesia also voted in support of UNGA Resolution 78/241 on LAWS that also voices these concerns.[73]

69 "The Governor of the National Resilience Institute of the Republic of Indonesia Became the Chief of Indonesian Delegations at the REAIM Summit 2023 in The Hague, Netherlands (Hadiri KTT Kecerdasan Buatan di Belanda, Gubernur Lemhannas RI Bertindak Sebagai Ketua Delegasi Indonesia)."

70 Ibid.

71 "Statement by Deputy Permanent Representative of the Republic of Indonesia H.E. Mohammad K. Koba at the General Debate of the First Committee of the 77th Session of the UN General Assembly New York, 3 October 2022."

72 Statement by Delegation of the Republic of Indonesia on behalf of the Non-Aligned Movement at the Thematic Debate: "Conventional Weapons" of the First Committee of the 78th Session of the UN General Assembly.

73 For more, see: UNGA Resolution 78/241 on Lethal Autonomous Weapons Systems.

3 Developing Defense AI

Indonesia's defense AI development is still in its infancy. While striving to improve multi-domain situational awareness as well as effectiveness, efficiency, and timely deployment of its defense assets and personnel to address the multitude of national defense threats, Indonesia's current defense AI development priorities focus on a human-centric and data-driven approach.[74] Ongoing projects encompass different capability areas, spanning from Command, Control, Communication, Computer, and Intelligence (C4I) systems to unmanned platforms for Intelligence, Surveillance, and Reconnaissance (ISR) missions. Most of these projects are meant to support the TNI's modernization agenda shaped by its NCW concept.[75]

In a nutshell, Indonesia takes a two-pronged approach in developing its defense capability, including its AI-enabled defense capability:

- The first approach, which is in line with Indonesia's national resilience aspirations, involves indigenous state-owned and private defense industry enterprises as the main engines that drive defense AI development. Since 2022, Indonesia has consolidated some of its largest state-owned defense industry enterprises under a holding company named DEFEND ID. Some of the respective companies like PT. Len Industri (Persero), PT. PAL (Persero), and PT. Dirgantara Indonesia (Persero) develop systems and platforms that feature AI technology. Indonesia's development ecosystem usually involves a consortium of defense companies, higher education and research institutions, the Ministry of Defense, and TNI to develop defense capabilities that cater to the user's requirements. The deep network that has been built over the years among the partners of this ecosystem has helped promoting several indigenous defense capability development projects that feature AI technology.
- Beyond the defense ecosystem, Indonesia's national AI ecosystem is still significantly limited and thus hardly able to meaningfully support the defense ecosystem. Despite being capable of developing AI models, Indonesia's national AI ecosystem still suffers from limited key enabling technologies and infrastructures. As reflected in the 2024 Government AI Readiness Index by Oxford Insight, Indonesia scores low on the technological maturity and infrastructure dimensions. For example, the country's existing data center capacity stands at 430 Mega Watts (MW), lagging far behind its estimated capacity needs at 2,700 MW.[76] On the computing infrastructure element, a rough estimate mentioned that Indonesia has around 11,000 to 14,800 class-H100 NVIDIA or equivalent Graphics Processing Units (GPU), which reside across

74 This is very much in line with the approach most countries currently adopt. For more, see: Borchert, „The Very Long Game of Defense AI Adoption: Introduction," pp. 11-14.

75 In line with the overarching capstone documents discussed in Section 2 (i.e., the 2020–45 Stranas KA, 2020–24 Jakumhanneg, and 2020–24 Jakgarahanneg).

76 Kure, "Indonesia Needs a Total of 2700 MW Data Center Capacity (Indonesia Butuh Kapasitas Pusat Data 2700 MW)." The Indonesian government is also currently in the progress of building some tier-IV National Data Centers, under the national e-government policy (codified in the Presidential Regulation Number 95 of 2018).

various entities, including cloud service and data center providers, government entities, and higher education and research institutions.[77] However, Indonesia's data governance is evolving as the government has advanced integrating data across various sectors through the 'One Data' policy,[78] which is also expected to increase the availability of high quality data for developing AI models.

- The second approach involves international defense industry partners in several sophisticated capability development and off-the-shelf acquisitions that national defense companies cannot yet provide. The way Indonesia acquires AI-enabled defense capabilities from diverse foreign suppliers reflects its *bebas dan aktif* foreign policy principles and demonstrate its risk management practice to mitigate any potential defense embargoes.

At the time of this writing, Indonesia has not had a publicly accessible document or information that comprehensively encompasses all areas of defense AI development. Thus, this section only provides a general description of several ongoing defense AI development endeavors based on publicly disclosed information.

3.1 Domestic R&D

Indonesia has a broad indigenous defense industrial base, including land platforms, naval platforms, aerospace platforms, electronics and IT system, munitions, and Maintenance, Repair, and Overhaul (MRO).[79] Some of Indonesia's domestic state-owned and private defense companies have embarked on R&D projects that involve the adoption of AI technology to develop capabilities for C4I, autonomous platforms for ISR mission, and data analytics for asset management. However, due to limited national defense industrial capacities, Indonesia also needs to partner with foreign companies, for example, to advance its plans for unmanned systems.

C4I Functions

Several state-owned enterprises and private enterprises have ongoing development projects that involve defense AI. PT. Len Industri (Persero), a state-owned

77 The estimated figure refers to the latest version of the draft 2025-2029 National AI Roadmap that was circulated for public consultation process at the time of this writing. The draft can be accessed at: https://www.komdigi.go.id/berita/siaran-pers/detail/konsultasi-publik-buku-putih-peta-jalan-kecerdasan-artifisial-nasional-dan-konsep-pedoman-etika-kecerdasan-artifisial (last accessed 27 October 2025).

78 The 'One Data' policy, dubbed 'Satu Data Indonesia', is codified in the Presidential Regulation Number 39 of 2019. The policy elaborates the guidelines for data governance at all governmental levels and sectors to produce accurate, updated, integrated, accountable, accessible, and exchangeable data in supporting national development. To achieve these data qualities, data producers must adhere to the certain data, metadata, and data interoperability standards.

79 As Richard Bitzinger suggested, Indonesia qualifies as a so-called Tier 2B arms producers with a smaller, broad-based but technologically less advanced defense industrial base. For more, see: Bitzinger, "New Ways of Thinking about the Global Arms Industry," as cited in Laksmana et al., "Concerted Autonomy: Defence-industrial Partnerships in the Asia-Pacific."

enterprise specializing in defense electronics, is currently developing an AI-powered joint C2 system named AXYS MD and an AI-powered system for intelligence data fusion and analysis named MINDS:

- AXYS MD is an AI-powered joint tactical C2 system that integrates communication, data processing, and situational awareness to support commanders with fast, informed decision-making capabilities to improve mission efficiency and effectiveness. The system harnesses AI technology in support of threat evaluation, mission assignment, weapon trials, automatic track identification, and route optimization.[80]
- MINDS is an AI-powered system that integrates the collection and analysis of intelligence data from various sources to assist decision-making process. AI is used for data processing features, namely the integration and analysis of intelligence from various sources, such as Human Intelligence (HUMINT), Open Source Intelligence (OSINT), Geospatial Intelligence (GEOINT), and other intelligence sources.[81]

Multiintegra Technology Group, a private defense enterprise specializing in defense electronics and informatics, is also currently developing AI-powered systems to support the use of autonomous systems.[82] For electronic warfare, the company is using AI to develop cognitive terrestrial radio spectrum management to harden military communication against adversarial radio frequency interference. The company has also developed an AI-powered system to assist communication intelligence activities. These tailored systems demonstrate the promising potentials of Indonesia's domestic private enterprises to contribute in providing future defense AI solutions that meet national defense requirements.

Unmanned Platforms for ISR Mission

Indonesia has been developing indigenous autonomous underwater vehicle (AUV) and unmanned aerial vehicle (UAV), which are mainly built for ISR mission.

- **Autonomous Underwater Vehicles (AUV)**
  Kapal Selam Otonom (KSOT) was developed by PT. PAL (Persero), an Indonesian state-owned shipyard enterprise.[83] During the 2024 Future Submarine International Seminar, the CEO of PT. PAL (Persero) stated that AI will enhance the platform's operational performance, such as navigation, decision-making, and

80 "DEFEND ID Product Catalogue 2025," p. 15.
81 Ibid., p. 16.
82 "Multiintegra Exhibits Military Electronics and Cyber Technologies (MultiIntegra Tampilkan Teknologi Militer Elektronik dan Siber)."
83 "PT. PAL Indonesia (Persero) Exhibits Advanced Technologies in Naval Defense System during the Indo Defense 2024 (PT. PAL Indonesia Usung Teknologi Canggih Sistem Pertahanan Laut di Indo Defence 2024)."

autonomy.[84] The integration of AI technology is expected to enable safe, efficient, unmanned underwater operation without risking human lives.[85] KSOT-008, a KSOT prototype, was showcased during the TNI's 80th Anniversary Commemoration Parade. It was reported that KSOT is capable of staying submerged for up to 72 hours and travel at a maximum speed of 20 knots. The AUV can also be operated through an autonomous submarine command center using direct radio frequency or satellite communication[86] and can also be equipped with six Exocet torpedoes.[87] Currently composed of more than 50% local content, KSOT's future local content composition is set out to increase,[88] indicating Indonesia's aspiration to strengthen its indigenous defense industrial capability.

- **Unmanned Aerial Vehicles (UAV)**

  Indonesia has also been embarking on developing several indigenous UAVs. Although there has been no publicly disclosed information stating whether these UAVs already feature AI, there is a prospect of future AI technology integration to enhance these UAVs' features.

  The first undertaking is Wulung, a class-1 ISR Unmanned Aerial Vehicle (UAV) developed by a consortium involving PT. Dirgantara Indonesia (Persero), a state-owned defense enterprise specializing in aerospace technology, the National Research and Innovation Agency of the Republic of Indonesia (*Badan Riset dan Inovasi Nasional*, hereafter abbreviated as BRIN), and the Defense R&D Agency of the Ministry of Defense. Equipped with a ground control station, the UAV is capable of both autonomous and manual modes of operation.[89] Beginning in 2014, the Wulung UAV prototype had passed various tests, and the first batch of its production was commenced in 2016, with three platforms procured by the Ministry of Defense for deployment in the Indonesian Air Force's UAV Squadron.[90] It is also being further developed for future use as a tactical drone in maritime patrol operations of the Indonesian Navy and Coast Guard authorities, with the demonstration flight conducted in March 2025.[91]

84 "The CEO of PT. PAL Indonesia (Persero) Highlights the Development of AI-Powered Unmanned Submarine during the Future Submarine Seminar (CEO PT. PAL Indonesia Soroti Pengembangan Unmanned Submarine Berteknologi AI di Future Submarine Seminar)."
85 Ibid.
86 "PT. PAL Indonesia (Persero)'s Autonomous Submarine (KSOT) was Showcased during the 80th Anniversary Commemoration (Kapal Selam Autonomous (KSOT) di Panggung HUT ke-80 TNI);" Elezhar, "Indonesia Debuts AI-Powered Autonomous Submarine Armed With Six Torpedoes."
87 "PT. PAL's Homegrown Autonomous Submarine Debuted in the TNI's 80th Anniversary Commemoration (Debut Kapal Selam Autonomous Buatan PT PAL di HUT ke-80 TNI)."
88 "PT. PAL Indonesia (Persero) Exhibits Advanced Technologies in Naval Defense System during the Indo Defense 2024 (PT. PAL Indonesia Usung Teknologi Canggih Sistem Pertahanan Laut di Indo Defence 2024)."
89 "DEFEND ID Product Catalogue 2025," p. 69.
90 "A Closer Look at Wulung UAV at PT. Dirgantara Indonesia (Persero) (Mengamati PUNA Wulung di PTDI, Sang Elang Pengawas dari Langit)."
91 "Wulung and Elang Hitam, the National Drone Backbones (Wulung dan Elang Hitam, "Drone" Tumpuan Anak Bangsa)."

Indonesia has also initiated the development of a class-3 Medium Altitude Long Endurance (MALE) UAV named Elang Hitam. Initiated in 2017, Elang Hitam UAV is developed by a consortium involving PT. Dirgantara Indonesia (Persero), BRIN, PT Len, the Defense R&D Agency of the Ministry of Defense, Bandung Institute of Technology, and the Indonesian Air Force.[92] With 24-hours endurance and 300kg payload capacity, Elang Hitam can be operated for reconnaissance missions, target detection/identification using Electro-Optronics (EO)/Infrared (IR) and Synthetic Aperture Radar (SAR) payloads.[93] It also has an autonomous flight feature, including Automatic Take-off and Landing (ATOL).[94] The UAV prototype is currently still going through several tests before entering the production pipeline.[95]

PT. Dirgantara Indonesia (Persero), which has been forging cooperation with international partners for the past few years, is expected to advance joint development and transfer of technology projects for UAVs. In June 2025, the company signed a Memorandum of Understanding (MoU) with Milkor, a South African defense company, on improving UAV features, exchanging knowledge, using joint production capacities, and launching joint market expansion activities.[96] In 2023, PT. Dirgantara Indonesia also signed a contract with Turkish Aerospace Industry (TAI) for the purchase of 12 Anka UAV. The respective agreement also covered transfer of technology arrangements and joint UAV production.[97]

These cooperations may constitute the starting point for deeper defense industrial cooperation on UAV technology development, including sophisticated AI technology to support UAV functions. As argued above, Indonesia's approach to bilateral defense industrial cooperation is shaped by its foreign policy principles and its risk-conscious procurement approach meant to limit the risk of being subject to foreign arms embargoes. Furthermore, these arms cooperation practice seem to originate from the country's historical roots as a pioneer of South-South cooperation (i.e., cooperation with South Africa) and its identity as the world's largest Muslim-populated country (i.e., cooperation with Turkey).

92 Ibid.
93 "DEFEND ID Product Catalogue 2025," p. 70.
94 Ibid.
95 "Chief of Staff of the Indonesian Air Force Inspected the Development Process of Elang Hitam Drone at PT. Dirgantara Indonesia (Persero) (KSAU tinjau proses pengembangan Drone Elang Hitam di PT DI)."
96 "IDEX 2025: PT. Dirgantara Indonesia (Persero) Collaborates with Milkor, South Africa to Develop Small and Medium UAVs in Indonesia (IDEX 2025: PTDI Berkolaborasi dengan Milkor dari Afrika Selatan untuk Pengembangan UAV Kecil dan Sedang di Indonesia);" "PT. Dirgantara Indonesia (Persero) and Milkor Enter into UAV Marketing Cooperation in Indonesia (PTDI-Milkor Jajaki Kerja Sama Pemasaran UAV di Indonesia)."
97 For more, see: "Turkish Aerospace Industries to deliver 12 Anka drones to Indonesia."

Asset Management

In the field of asset maintenance and management, PT. Len Industri (Persero) has developed Maestro, an AI-powered system to streamline spare parts, asset, and MRO management.[98] AI technology is used to enable Maestro's intelligent automation features, such as knowledge and learning management as well as predictive maintenance. By harnessing AI technology, Maestro strives to improve the effectiveness, efficiency, and accuracy of asset management, which could improve operational readiness while reducing maintenance costs. Both aspects are important given TNI's very large area of operations that must be addressed within a limited defense budget.

3.2 International Acquisition

Based on the publicly available information, Indonesia has also acquired AI-enabled defense platforms and systems from various foreign suppliers, such as

- two Fincantieri's Multipurpose Combat Ship (MPCS)/*Pattugliatore Polivalente d'Altura* (PPA)-class warships that feature AI technology in their operational combat center to support operational decisions;[99]
- Exail's mine warfare systems, consisting of Inspector 90 Unmanned Surface Vehicles (USVs) and the Seascan and K-Ster Mine Identification and Disposal Systems (MIDS) that will be deployed from two of the recently acquired naval Mine Countermeasure Vessels (MCMV);[100]
- thirteen units of Thales' Ground Master (GM) 400 Alpha radars and the associated Skyview C2 system;[101]
- and the aforementioned acquisition of Anka MALE UAV from Turkey.[102]

These international acquisitions signal Indonesia's growing inclination to acquire and incorporate AI-powered platforms to support various national defense missions in the future.

98 "DEFEND ID Product Catalog 2025," p. 17.
99 "Fincantieri: Contract Signed for the Supply of Two PPAs to Indonesia;" "PPA Frigates Program for the Indonesian Navy: Born to Be Innovative, Flexible and Responsive."
100 "Exail to Equip Indonesian Navy with Next-Generation Unmanned Mine Countermeasures System;" "Exail Wins Indonesian Navy Contract for Mine Warfare Systems."
101 "Thales to Reinforce Indonesia's Sovereign Airspace Protection capabilities with PT Len;" "Ground Master 400 Alpha, Taking Long-Range Air Surveillance to the Next Level."
102 "Turkish Aerospace Industries to deliver 12 Anka drones to Indonesia."

4 Organizing Defense AI

The 2020–45 Stranas KA states that AI research and innovation in the defense sector is carried out by defense enterprises under the National Defense Industry Policy Committee (*Komite Kebijakan Industri Pertahanan*, hereafter abbreviated as KKIP).[103] At the national level, the document also mandates the establishment of an AI Industry Research and Innovation Collaboration institution (*Kolaborasi Riset dan Inovasi Industri Kecerdasan Artifisial*, hereafter abbreviated as Korika) to orchestrate cross-sectoral AI research and innovation. Given the potential of Korika to influence AI development in the defense sector, this section will explain both the defense sector's institutional setup led by KKIP as well as the broader national AI institutional setup orchestrated by Korika. In addition to KKIP and Korika, this section will also discuss the prospective roles of the forthcoming National Task Force on Cyber and AI and the recently established National Defense Council (DPN) in organizing defense AI in Indonesia.

4.1 National-Level Institutional Setup

The 2020–45 Stranas KA advances multi-stakeholder cooperation in the form of a quadruple helix, involving civil society, academia, industry and government entities, to optimize and synergize all stakeholders and resources within the national AI ecosystem to accelerate AI research, innovation, and adoption across various sectors.[104]

Korika was established to champion and ensure a sustainable quadruple helix collaboration in AI research and innovation and to optimize cross-stakeholder resource synergy for national AI research and innovation. To serve these purposes, Korika's core functions consist of governing and executing research and innovation in AI.[105] Under the governing function, Korika carries out activities that span from determining the priority of industrial research and innovation initiative programs, along with the research and innovation center of excellence in each industrial sector; coordinating research and innovation policy support; and overseeing the execution of industrial research and innovation initiative programs.[106] Under the execution function, Korika serves as a project management office that carries out planning, implementation program formulation, budgeting and financing, synchronization and consolidation, evaluation and control, and continuous improvement of AI research and innovation projects.[107]

103 The 2020–45 National Strategy on AI, p. 108.
104 Ibid., p. 37.
105 Ibid., p. 187.
106 Ibid.
107 Ibid.

Korika is expected to cross-pollinate AI expertise across a multitude of actors, thus driving opportunities to spin-off and spin-in AI technology expertise between the military and civilian sectors. According to the official Korika website,[108] the Republic of Indonesia Defense University is the only defense member of Korika. Other relevant defense organizations such as the R&D agencies are not listed. This is likely to suggest that the Defense University plays a critical role as a hub to link the broader national AI ecosystem with the specific defense AI ecosystem.

In addition to Korika, the forthcoming National Task Force on Cyber and AI and the recently-established DPN could prospectively influence the organization of defense AI in Indonesia in different ways. Given the coordinating nature of the Task Force this initiative will likely bring a more structured and comprehensive approach in the formulation, implementation, and oversight of AI standardization in the defense sector. The DPN, which serves as an inter-stakeholder forum for integrated and synchronized national defense decision-making, will enable a whole-of-government and a whole-of-society approach in national defense strategy and policy making. This includes aspects to improve civil-military collaboration in strengthening the domestic technological and industrial basis for defense AI and increase the spin-in of civilian AI expertise to the defense sector, gradually helping Indonesia to accomplish the future ambition of reducing dependence on foreign suppliers.

4.2 Defense Sector's Institutional Setup

Despite a gradual uptick in defense AI R&D projects and the foreign acquisition of AI-augmented defense systems, Indonesia's public and private defense institutions remain largely unchanged. In particular, none of the relevant public sector defense entities has initiated institutional reforms to advance the adoption of defense AI.

As per the 2020–24 Jakumhanneg and the 2020–24 Jakgarahanneg discussed in Section 2, there is no explicit or implicit mention of institutional and governance changes in response to defense AI or other emerging technologies. The closest implementation policy direction in the 2020–24 Jakgarahanneg only mentioned the strengthening of cooperation between industry, government, and research institutions to foster defense technology innovation.[109] This implicitly indicates that the defense sector still entrusts existing organizations with defense AI thereby

108 For more, see: https://korika.id/members/page/9/#akademis (last accessed 27 October 2025).
109 The 2020–24 National Defense Implementation Policy, p. 34.

following a project-based approach to embed AI as a technological component in ongoing defense R&D and acquisition projects.

Indonesia's current defense AI ecosystem involves several stakeholders, namely the Ministry of Defense, the TNI Joint and Services Headquarters, KKIP, defense companies, and higher education and research institutions. Right now, this ecosystem is decentralized, but coordinated. KKIP is in charge of strategically coordinating inter-ministerial defense industrial policy definition and decision-making. This also includes aligning end user capability requirements with the acquisition source, determining whether a particular capability will be indigenously sourced or bought from a foreign partner, and regulating the type of offsets (e.g., minimum local content requirement, transfer of technology, or joint production) that come with an acquisition project from foreign suppliers.[110] At the time of writing this study, there has been no official information on defense offset schemes that involve AI technology in Indonesia. Nonetheless, such an approach will likely be implemented in any future offset practices aimed at fostering indigenous AI technology proficiency.

The R&D Agency of the Ministry of Defense and the R&D Office in each military service act as coordinators to implement collaborative projects with industrial and academic partners, while the Defense Logistics Agency of the Ministry of Defense carries out the overall defense acquisition process. In addition to acting as the R&D partners of the defense establishment, defense companies and academic institutions also serve as recipients of technology transfers under project-specific offset arrangements, engage in joint production with international defense partners, or act as subcontractors in fulfillment of local content requirements in international defense acquisition projects.

Any acquired capabilities will be handed over to the designated organization unit(s) under one of the TNI Joint or Service Headquarters, which will be responsible for maintaining and ensuring the readiness of the capabilities. The TNI Joint Headquarter, through its operational command organization unit(s), will act as the end user, which employs and operates the acquired capabilities for the TNI's missions. The NCW concept will be implemented by the TNI Joint Headquarter to ensure that all capabilities can be operated in a synchronized manner under a unity of command for multi-domain operations throughout the Archipelago.

110 Law of the Republic of Indonesia Number 16 of 2012 on Defense Industry.

5 Funding Defense AI

Currently, Indonesia does not have a dedicated defense AI budget line. As the country thinks of defense AI as a capability multiplier, defense AI is integrated in project-specific activities and thus also budgeted as an integral element of the respective capability development and acquisition initiatives.[111]

Indonesia has long suffered from a very low defense budget, which has never exceeded 1.5% of its GDP during the last two decades. In a large part, Indonesia's current condition as a developing country that has to meticulously balance its state budget to meet defense objectives and overall national development priorities has been the main cause of its minuscule defense budget. This consequently hampers the overall defense R&D and acquisition budget, including available funds to be allocated for AI-associated defense capabilities.

The Compiled Annual Work Plan and Budget of the Government (*Himpunan Rencana Kerja dan Anggaran Kementerian Negara/Lembaga*, hereafter abbreviated as RKA K/L) is the most complete publicly available document that can be studied to comprehend the government's defense budget allocation. The document provides the annual budget compilation of each ministry and government agency, including the Ministry of Defense and the TNI. Because the 2020–45 Stranas KA and the defense sector's capstone documents were issued around 2020–2021 (which implied that their effective implementation supposed to begin in 2021) and most of the AI-related R&D and acquisitions in defense sector discussed in this study also evidently took place from 2021 onwards, the analysis of defense R&D and acquisition in this study are limited to the figures in the RKA K/L documents from fiscal years (FY) 2021 to 2025.

The defense R&D budget is reported in aggregate with defense industrial development and defense higher education budget under the account of the Defense Research, Industry, and Higher Education Program (*Program Riset, Industri, dan Pendidikan Tinggi Pertahanan*) in the RKA K/L documents. Out of the total defense budget that roughly ranges around IDR129-165trn (about USD8-10.3bn), the combined defense R&D, industry, and higher education budget of the Ministry of Defense and the TNI only revolved around 0.25%–1.40% during 2021 to 2025.[112] Since there is no further breakdown on the detailed R&D budget information in

111 Based on the taxonomy suggested by Borchert, "The Very Long Game of Defense AI Adoption: Introduction," p. 20, Indonesia falls into the category of countries that somehow finance defense AI, i.e., "it is not clear, what the respective countries spend on defense AI because budgets are not disclosed."

112 The figures were obtained from our calculation based on the publicly-disclosed data in: "Book III of the Compiled Annual Work Plan and Budget of the Government of the Republic of Indonesia FY 2021," pp. 41-42; "Book III of the Compiled Annual Work Plan and Budget of the Government of the Republic of Indonesia FY 2022," Appendix I, pp. 11-12; "Book III of the Compiled Annual Work Plan and Budget of the Government of the Republic of Indonesia FY 2023," Appendix I, pp. 11-12; "Book III of the Compiled Annual Work Plan and Budget of the Government of the Republic of Indonesia FY 2024," Appendix I, pp. 12-13; "Book III of the Compiled Annual Work Plan and Budget of the Government of the Republic of Indonesia FY 2025," Appendix I, pp. 13-14.

the RKA K/L document, we are unable to provide a more granular figure of the R&D budget allocated to defense AI R&D projects.

Given the government's very limited defense R&D budget, most of the defense AI R&D initiatives are self-funded by the defense enterprises that are engaged in defense AI R&D endeavors.[113] This lack of government funding has become a major impediment to develop domestic defense industrial capacities. This and the fact, that defense companies do not know if the government will commit to procure their products once they have become market-ready, have discouraged many domestic defense companies from investing in high-risk defense AI R&D endeavors.

The defense acquisition budget is reported under the account of the Defense Weapons Systems, Equipment, and Facilities Modernization Program (*Program Modernisasi Alutsista, Non Alutsista, dan Sarpras Pertahanan*) in the RKA K/L documents. Out of the total defense budget, the annual defense acquisition budget only ranged from 25.91%–41.76% during 2021 to 2025.[114] Since there is no further breakdown on the detailed acquisition budget information in the RKA K/L document, we are unable to provide the exact acquisition budget information for each item that features defense AI. Nevertheless, major defense acquisition projects that involve foreign suppliers are primarily funded using external sources, especially international loans or export credits.[115] Such funding sources, albeit the inconveniences that come alongside them,[116] are preferred because of the inability to fund expensive systems and platforms out of an already very small annual defense budget.

113 There is currently no available information on the exact figure of aggregate defense AI R&D spending by the domestic defense industry enterprises.

114 The figures were obtained from our calculation based on the publicly-disclosed data in: "Book III of the Compiled Annual Work Plan and Budget of the Government of the Republic of Indonesia FY 2021," pp. 41-42; "Book III of the Compiled Annual Work Plan and Budget of the Government of the Republic of Indonesia FY 2022," Appendix I, pp. 11-12; "Book III of the Compiled Annual Work Plan and Budget of the Government of the Republic of Indonesia FY 2023," Appendix I, pp. 11-12; "Book III of the Compiled Annual Work Plan and Budget of the Government of the Republic of Indonesia FY 2024," Appendix I, pp. 12-13; "Book III of the Compiled Annual Work Plan and Budget of the Government of the Republic of Indonesia FY 2025," Appendix I, pp. 13-14.

115 Matthews et al., "Indonesia's Defense Acquisition Strategy."

116 For more in-depth discussion on the issue, see: Matthews et al., "Indonesia's Defense Acquisition Strategy."

6 Fielding and Operating Defense AI

Indonesia has fielded and operated defense AI in low-risk areas that do not involve operating completely autonomous AI platforms or systems (human out-of-the-loop) for hazardous tasks that might endanger human lives or cause significant damage to other critical assets and the surrounding operating environments. Capabilities that have been fielded mainly result from the TNI's internal experiments involving AI and the procurement of defense capabilities that feature AI technology. However, none of them have been deployed into actual battlefield use because the current fieldlings still pertain to exclusive internal trials, exercises, and non-war military operations. As a consequence, priority areas for using defense AI include the support of ISR missions, geospatial mapping, C2, and targeting functions, and more general applications improving situational awareness and decision-making under the overarching NCW concept and territorial defense approach.

At the time of writing this study, Indonesia has not published any comprehensive documentation that would showcase current defense AI use cases. Therefore, and given public access to relevant information is very restricted, we are only able to describe those defense AI applications that have been disclosed publicly.

6.1 Army

Some of the Army's defense AI use cases include artillery firing support, simulated training, and data analytics to aid topographic mapping activities:

- **Pesawat Terbang Tanpa Awak II (PTTA II)**
  Indigenously developed by the Indonesian Army and PT. Nexin, a private Indonesian defense enterprise, PTTA II is an AI-enabled UAV to enhance long-range targeting and fire correction capabilities of the Army's field artillery systems.[117] It adopts AI technology to enable intelligent object recognition and obstacle avoidance in its automated navigation feature. Its current use is still limited to internal trials within the Army Field Artillery units.

- **Simulasi Pandang (SIMPAN)**
  Developed by the Indonesian Army and PT. Nexin, SIMPAN is an AI-enabled system to simulate close combat scenario.[118] By blending AI with mixed reality technology, SIMPAN enables realistic close combat simulated training for the Army's infantry personnel.

117 "IndoDefence 2025: Indonesia Turns to Homegrown PTTA II Drone to Improve Artillery Fire Accuracy;" "Pesawat Terbang Tanpa Awak Tahap II (PTTA II)."
118 "Simulasi Pandang (SIMPAN)."

- **Dittopad 4.0**
  Developed in partnership between the Directorate of Topography of the Indonesian Army and Esri, a geographic information system (GIS) software developer, Dittopad 4.0 is an AI-enabled intelligent GIS system to support the Army's topographic functions. The system supports different functions such as the management and analysis of geospatial big data from various sources to develop detailed and accurate maps, planning and decision-making processes, and is used to improve overall situational awareness based on advanced geo-intelligence capabilities.[119]

6.2 Navy

The Indonesian Navy has been using AI for target detection and targeting, data analytics to support C2 and operational decision-making, and data analytics for seabed mapping:

- **Ambara UAV**
  Indigenously developed by the Navy and PT. Sapta Cakra Manunggal, a private Indonesian defense enterprise, Ambara is a hybrid multicopter VTOL and fixed-wing drone with an AI-enabled target detection and tracking feature to support the Naval Aviation's ISR missions.[120]

- **System Performance Readiness and Tactical Analysis (Spartan)**
  Indigenously developed by the Navy, Spartan is an AI-enabled data analytics application to detect anomalies in vessel traffic and activities, automate vessel tracking, and provide recommendations on the possible course of action based on real-time data of available naval warships at sea.[121] Spartan has been rolled out in a naval operation to secure the 2022 G20 Summit in Bali, Indonesia.[122]

---

119 "The Readiness of the Directorate of Topography of the Indonesian Army with Esri Indonesia in Facing the Digital Disruption Era (Kesiapan Dittopad Hadapi Era Disrupsi Digital Bersama Esri Indonesia);" "Dittopad 4.0: Supporting Indonesia's National Security Operations."

120 "Indonesian Naval Aviation Tested Ambara VTOL Drone for Maritime Surveillance (Puspenerbal Uji Coba Drone VTOL Ambara untuk Pengawasan Maritim)."

121 "Indonesian Navy's Electronic Corps Cadets Enter AI World: Opening the Door of Innovation and Building the Nation's Future (Taruna AAL, Korps Elektronika Tingkat III Menerjang Dunia AI: Membuka Pintu Inovasi dan Membangun Masa Depan Bangsa);" "The Unison Outlook of the Chief Commander of the Indonesian Armed Forces General Andika and the Chief of Staff of the Indonesian Navy Admiral Yudo to Bring Advanced Technologies to the Indonesian Navy Warships (Kompaknya Jenderal Andika dan Laksamana Yudo Inginkan Teknologi Canggih di Kapal Perang TNI AL!);" "Indonesian Navy's Electronic Corps Cadets Monitor Vessel Traffic in Indonesia's National Jurisdiction Waters (Taruna AAL Korps Elektronika memantau lalu lintas kapal laut di wilayah perairan yurisdiksi nasional)."

122 Ibid.

- **HidroSDB35**
  Indigenously developed by the Navy, HidroSDB35 is an AI-based Satellite Derived Bathymetry (SDB) application to process and convert satellite image data, aerial photographs, and aerial videos from various manned and unmanned platforms into bathymetric maps with a high accuracy level for predicting seabed depth.[123] The application is currently deployed in the Naval Hydro-Oceanography Center and is able to be used for both military and civilian purposes.

6.3 Air Force

In several press releases, the Indonesian Air Force has occasionally stated that it already utilizes AI to support several functions. Some official statements vaguely mention that the Air Force has fielded AI-enabled systems to support C2 and communication functions[124] as well as airspace security function.[125] An official statement also vaguely mentioned the Air Force fielding AI technology for undisclosed purposes during the 2024 Angkasa Yudha Joint Exercise,[126] which may serve as the basis for its future doctrinal update to incorporate AI and other advanced technologies.

In terms of unmanned ISR platforms, the Indonesian Air Force currently has two UAV squadrons, namely Squadron 52 under the Raden Sadjad Air Force Base in Natuna Islands and Squadron 51 under the Supadio Air Force Base in West Borneo. Both UAV squadrons are strategically positioned near Indonesia's land and maritime borders to enable effective and efficient UAV deployment for border surveillance operations, thus supporting the border security missions. The squadrons are currently operating numerous class-1 to class-3 UAVs, such as Aerostar TUAV, Wulung UAV, and CH-4 UAV, which likely include AI-assisted features.

In addition, the Air Force has also fielded an AI-enabled simulation system named Virtual Maintenance Training (VMT) EC725. Indigenously developed by the Air Force, it is an AI-enabled system for immersive simulation to train engineers in repairing and maintaining the EC725 helicopter. It is currently deployed in Squadron 302 for the helicopter engineer education program.[127]

123 "Indonesian Naval Hydro-Oceanography Center Introduces HidroSDB35 for Special and Emergency Operations (Pushidrosal perkenalkan HidroSDB35 untuk operasi khusus dan darurat)."
124 "The Indonesian Air Force Utilizes AI, and will Keep on Monitoring the Development of AI (TNI AU Pakai AI, akan Terus Ikuti Perkembangan Kecerdasan Buatan)."
125 "The Indonesian Air Force Develops AI-based Defense Technology in 2025 (TNI AU kembangkan teknologi pertahanan berbasis AI pada 2025)."
126 Ibid.
127 "A Series of the Exhibited Technological Innovations by the Indonesian Armed Forces at Indo Defence (Sederet Teknologi Karya TNI di Indo Defence)."

7 Training for Defense AI

The 2020–45 Stranas KA mandated the development of national work competency standards (*Standar Kompetensi Kerja Nasional Indonesia*, hereafter abbreviated as SKKNI) in the AI field that can guide future AI education and training curricula, while also establishing the minimum competency standards required for AI specialists.[128] Currently, two SKKNIs have been enacted on work competencies related to AI, one for knowledge-based systems the other on data science.[129] These SKKNIs have been adopted as part of educating and training AI specialists in various national sectors, including defense AI specialists.

Indonesia offers defense AI training and education for both the military service and the civilian defense workforce. The primary executive agencies for defense AI training and education are the Ministry of Defense's Education and Training Agency and the Republic of Indonesia Defense University; TNI Joint Headquarters' Doctrine, Education, and Training Command and Command and Staff College; and each of the TNI Service Headquarters' Doctrine, Education, and Training Command, Military Academy, Engineering Polytechnics, and Command and Staff College. Most of the agencies have conducted training and education programs on defense AI and the associated competence areas, such as data science, machine learning, and cybersecurity. The training and education programs are mostly clustered based on the role of the workforce, such as users, technical specialists, and senior leadership.

The Republic of Indonesia Defense University, a higher education institution operated under the Ministry of Defense, runs numerous multidisciplinary higher education programs on national defense. These programs are open to military service and civilian workforces in the defense establishments as well as civilian workforces in non-defense establishments. The Republic of Indonesia Defense University has incorporated defense AI education into some of its study programs, such as a master's program in sensing technology and cyber defense engineering and an undergraduate program in military informatics engineering and military electronics engineering. Several Master's Theses and Undergraduate Theses in the Republic of Indonesia Defense University have also studied the application of numerous data-driven AI techniques to enhance various functions within the defense sector.

128 The 2020–45 National Strategy on AI, p. 55.

129 For more, see: Decree of the Minister of Manpower Affair of the Republic of Indonesia Number 123 of 2021 on the Indonesian National Work Competence Standard in Information and Communication Category, Programming, Computer Consultation, and Related Activities Classification, Artificial Intelligence Field, Knowledge Based System Subfield; Decree of the Minister of Manpower Affair of the Republic of Indonesia Number 299 of 2020 on the Indonesian National Work Competence Standard in Information and Communication Category, Programming, Computer Consultation, and Related Activities Classification, Artificial Intelligence Field, Data Science Subfield.

Students at the Republic of Indonesia Defense University are also encouraged to experiment and develop innovative AI-based defense solutions and participate in various technology innovation competitions abroad. In some case, students that had developed their own solutions for AI-enabled facial recognition or advanced robotic systems for disaster rescue and evacuation, even gained international recognition.[130] In addition, there are career prospects for the Republic of Indonesia Defense University's graduates to serve as civilian and military service workforces in the defense establishments, signifying its strategic role in providing talent pools of future workforce with technical proficiency in defense AI-related areas.

Military service workforces with technical expertise and specialization in defense AI usually come from the electronics corps. Each service's Electronics Center or Office is also responsible for the career and technical proficiency development of electronic corps personnel in AI. Individual experts are also strongly encouraged to take formal and informal education and training programs held in other institutions outside the TNI. Upon completion, they are encouraged to share the knowledge and skills that they have obtained to facilitate knowledge and skill diffusion from the civilian institution to the TNI.

130 "The Rector of the Republic of Indonesia Defense University Appreciates the Faculty of Defense Science and Technology's Students and Cadets for Innovative and Strategic Achievements at the National and International Levels (Rektor Unhan RI Apresiasi Mahasiswa dan Kadet FTTP Unhan RI atas Prestasi Inovatif dan Strategis di Tingkat Nasional dan Internasional)."

8 Conclusion

Indonesia's national identity and geopolitical construct as an archipelagic state, its enduring territorial defense doctrine, and the increasing complexity that Archipelago defense entails, have shaped the way in which Indonesia implements its NCW concept. Overall, the goal is to improve unity of command and situational awareness to enable effective, efficient, and integrated use of defense assets and units for multi-domain operations. In this context, AI plays an instrumental role as a crucial enabling technology.

However, this ambition meets a hard reality characterized by the country's long-standing fiscal constraints, current shortage of AI talents, and the perceived risks of AI technology. Consequently, Indonesia's defense AI approach is very careful and incremental – analogous to a careful walk on a thin ice layer. This implies that Indonesia only gradually rolls out AI-augmented defense capabilities, which are solidly anchored in a data-driven and human-centric paradigm, thus echoing an approach that many other nations are pursuing as well.[131]

Despite its careful and incremental approach to defense AI adoption, the future will likely witness the growing use of AI as part of Jakarta's defense acquisitions in various capability areas. The Republic also aspires defense technological and industrial self-reliance, including for defense AI, in line with its national resilience outlook that was also further reinforced by past traumas with arms embargoes. But current financial and technological deficiencies will make this ambition hard to accomplish.

Although Indonesia's software and AI model development capability is growing, it still lacks other key enabling elements to realize a self-reliant defense AI capability, especially in terms of computing, data, and telecommunication infrastructures. This finding resonates with a recent and growing discourse on digital and AI sovereignty among countries of the Global South that yearn for agency and control in various aspects of digital technology including AI. But despite their political ambitions, these countries are still constrained in many key technological areas to have a truly sovereign national digital and AI capability.[132] At the same time the same countries also face a hard time dealing with the global struggle for AI dominance that also touches upon aspects like computing hardware, data availability, and access to talents.[133]

131 For more, see: Borchert, "The Very Long Game of Defense AI Adoption: Introduction," pp. 12-14.
132 For more on topics, see, inter alia: Belli/Gaspar (eds.), The Quest for AI Sovereignty, Transparency and Accountability, Official Outcome of the UN IGF Data and Artificial Intelligence Governance Coalition; Belli, "BRICS Countries and AI Sovereignty: Introduction to Thematic Section;" Jiang/Belli (eds.), Digital Sovereignty in the BRICS Countries: How the Global South and Emerging Power Alliances Are Reshaping Digital Governance.
133 For more, see: Scharre, Four Battlegrounds: Power in the Age of Artificial Intelligence.

In navigating through these constraints, Indonesia has taken a diversified approach to international defense capability development and acquisition that comes with various offset arrangements. These involve transfer of knowledge and technology and/or co-production schemes to gradually step up its indigenous defense technology and industrial capability and the broader key enabling elements to defense AI, while simultaneously managing the risks of not being subject to future arms embargoes. Furthermore, it has also undertaken considerable measures to prepare its workforce and build future talent pools to pick up with the ever-increasing needs to develop and incorporate AI into its defense capabilities and deal with future threats that involve AI. Future success in building indigenous AI-augmented defense technologies and establishing local talent pools could also gradually boost the defense establishment's confidence in adopting and fielding defense AI solutions more vigorously.

Civil-military collaboration is deemed important to facilitate the pooling of resources and capabilities that can be jointly harnessed to strengthen the defense AI ecosystem as well as the broader national AI ecosystem. To this end, Indonesia's total defense tradition – which emphasizes whole-of-society and whole-of-government approaches to address the complex gamut of military and non-military defense challenges and threats – underpins its basic approach to civil-military cooperation and collaboration in defense technology, including defense AI. Most of the ongoing civil-military collaboration in defense AI emerged from a relatively unstructured bottom-up approach, although guided by an overarching orientation to develop defense AI in support of the NCW concept for multi-domain operations in traditional and non-traditional military missions. The current approach still leverages existing informal networks that have been forged between some working units in TNI or the Ministry of Defense, higher education and research institutions, and/or industry under numerous collaborative R&D projects.

As the total defense tradition becomes more formalized and institutionalized in the national legal corpus and defense policy-making mechanism, the future may witness a notable increase in civil-military collaboration on defense AI development and the fruition of the long-awaited quadruple helix defense AI cooperation involving the broader civil society stakeholders to complement the traditional government-industry-academia triad. The forthcoming National Task Force on Cyber and AI may set in motion a sound and integrated AI governance, and its focus on cybersecurity will eventually help reducing defense AI vulnerabilities pertaining to cyber risks. In parallel, the DPN may streamline civil-military cooperation and thus strengthen the emerging defense AI ecosystem alongside other key enabling elements.

Overall, and reflecting upon the approach undertaken by Indonesia so far, orchestrating future civil-military cooperation in defense AI will require a coherent roadmap, which can shed clarity on the priority capability areas that require defense AI development, and cascade each priority capability area into detailed AI technological requirements that need to be developed through the civil-military cooperation. Considerations on available resources and risk appetite need to be incorporated in this roadmap as key criteria to establish the right priority capability areas that are relevant for the country's future defense capability profile. Ultimately such a roadmap would serve as a compass and structured guideline to foster concerted efforts across different stakeholders of the quadruple helix and enable them to carefully navigate the risks that AI technology entails. Lastly, such a roadmap will also serve as a most useful means to align the implementation of Indonesia's defense offset strategy with its broader national aspiration to pursue self-reliance in AI technology and its enabling elements to advance national defense.

Literature

"2024 Annual Performance Report of the Directorate of International Security and Disarmament of the Ministry of Foreign Affairs of the Republic of Indonesia (Laporan Kinerja Direktorat Keamanan Internasional dan Perlucutan Senjata Kementerian Luar Negeri RI Tahun 2024)," Directorate of International Security and Disarmament of the Ministry of Foreign Affairs of the Republic of Indonesia, https://kemlu.go.id/files/repositori/65405/173873764867a307f0d9a5c_LKj_KIPS_2024_RevDir__2_.pdf (last accessed 27 October 2025).

"A Closer Look at Wulung UAV at PT. Dirgantara Indonesia (Persero) (Mengamati PUNA Wulung di PTDI, Sang Elang Pengawas dari Langit)," Airspace Review, 24 July 2018, https://www.airspace-review.com/2018/07/24/mengamati-puna-wulung-di-ptdi-sang-elang-pengawas-dari-langit/ (last accessed 27 October 2025).

"A Series of Exhibited the Indonesian Armed Forces' Technological Innovations by the Indonesian Armed Forces at Indo Defence (Sederet Teknologi Karya TNI di Indo Defence)," Kompas.id, 11 June 2025, https://www.kompas.id/artikel/sederet-teknologi-karya-tni-di-indo-defence (last accessed 27 October 2025).

"ASEAN Guide on AI Governance and Ethics," Association of Southeast Asian Nations, February 2024, https://asean.org/wp-content/uploads/2024/02/ASEAN-Guide-on-AI-Governance-and-Ethics_beautified_201223_v2.pdf (last accessed 27 October 2025).

"Chief Commander of the Indonesian Armed Forces: The Imperative of Shifting the Indonesian Armed Forces' Warfare Doctrines into Drone and AI Technologies (Panglima: Doktrin Perang TNI Diubah ke Teknologi Drone dan AI)," CNN Indonesia, 31 January 2025, https://www.cnnindonesia.com/nasional/20250131193629-20-1193329/panglima-doktrin-perang-tni-diubah-ke-teknologi-drone-dan-ai (last accessed 27 October 2025).

"Chief of Staff of the Indonesian Air Force Inspected the Development Process of Elang Hitam Drone at PT. Dirgantara Indonesia (Persero) (KSAU tinjau proses pengembangan Drone Elang Hitam di PT DI)," Antara News, 11 March 2025, https://www.antaranews.com/berita/4704045/ksau-tinjau-proses-pengembangan-drone-elang-hitam-di-pt-di#google_vignette (last accessed 27 October 2025).

"Circular Letter of the Minister of Communication and Information of the Republic of Indonesia Number 9 of 2023 on AI Ethics (Surat Edaran Menteri Komunikasi dan Informatika Republik Indonesia Nomor 9 Tahun 2023 tentang Etika Kecerdasan Artifisial)," the Ministry of Communication and Information of the Republic of Indonesia, https://jdih.komdigi.go.id/produk_hukum/view/id/883/t/surat+edaran+menteri+komunikasi+dan+informatika+nomor+9+tahun+2023 (last accessed 27 October 2025).

"Director of International Security and Disarmament of the Ministry of Foreign Affairs of the Republic of Indonesia Attended REAIM Summit 2024 in Seoul, South Korea on 9-10 September 2024 (Direktur Keamanan Internasional dan Perlucutan Senjata Kementerian Luar Negeri RI telah Menghadiri REAIM Summit 2024 di Seoul, Korea Selatan pada Tanggal 9-10 September 2024)," Official Instagram Account of the Directorate of International Security and Disarmament of the Ministry of Foreign Affairs of the Republic of Indonesia, https://www.instagram.com/p/C_xFSpQyoIX/ (last accessed 27 October 2025).

"Dittopad 4.0: Supporting Indonesia's National Security Operations," Esri Indonesia, 15 April 2021, https://esriindonesia.co.id/resources/news/dittopad-40-supporting-indonesias-national-security-operations (last accessed 27 October 2025).

"During the 80th Anniversary of the TNI, President Prabowo Emphasized Exemplary Leadership and Professionalism (HUT ke-80 TNI, Presiden Prabowo Tekankan Kepemimpinan Teladan dan Profesionalisme)," Presidential Office of the Republic of Indonesia, 5 October 2025, https://www.presidenri.go.id/siaran-pers/hut-ke-80-tni-presiden-prabowo-tekankan-kepemimpinan-teladan-dan-profesionalisme/ (last accessed 27 October 2025).

"Exail to Equip Indonesian Navy with Next-Generation Unmanned Mine Countermeasures System," Exail, 24 June 2025, https://www.exail.com/news/

exail-to-equip-indonesian-navy-with-next-generation-unmanned-mcm-system (last accessed 27 October 2025).

"Exail Wins Indonesian Navy Contract for Mine Warfare Systems," Navalnews.com, 24 June 2025, https://www.navalnews.com/naval-news/2025/06/exail-wins-indonesian-navy-contract-for-mine-warfare-systems/ (last accessed 27 October 2025).

"Fincantieri: Contract Signed for the Supply of Two PPAs to Indonesia," Fincantieri, 28 March 2024, https://www.fincantieri.com/en/media/press-releases/2024/fincantieri-contract-signed-for-the-supply-of-two-ppas-to-indonesia/ (last accessed 27 October 2025).

"Government AI Readiness Index 2024," Oxford Insights, 20 Deember 2024, https://oxfordinsights.com/ai-readiness/ai-readiness-index/ (last accessed 27 October 2025).

"Ground Master 400 Alpha, Taking Long-Range Air Surveillance to the Next Level," Thales, 19 November 2021, https://www.thalesgroup.com/en/greece/press_release/ground-master-400-alpha-taking-long-range-air-surveillance-next-level (last accessed 27 October 2025).

"IDEX 2025: PT. Dirgantara Indonesia (Persero) Collaborates with Milkor, South Africa to Develop Small and Medium UAVs in Indonesia (IDEX 2025: PTDI Berkolaborasi dengan Milkor dari Afrika Selatan untuk Pengembangan UAV Kecil dan Sedang di Indonesia)," PT. Dirgantara Indonesia (Persero), 19 February 2025, https://www.indonesian-aerospace.com/en/media/news/detail/1396/idex-2025-ptdi-berkolaborasi-dengan-milkor-dari-afrika-selatan-untuk-pengembangan-uav-kecil-dan-sedang (last accessed 27 October 2025).

"IndoDefence 2025: Indonesia Turns to Homegrown PTTA II Drone to Improve Artillery Fire Accuracy," Army Recognition, 12 June 2025, https://armyrecognition.com/news/aerospace-news/2025/indodefence-2025-indonesia-turns-to-homegrown-ptta-ii-drone-to-improve-artillery-fire-accuracy (last accessed 27 October 2025).

"Indonesia: Artificial Intelligence Readiness Assessment Report," UNESCO, 2024, https://unesdoc.unesco.org/ark:/48223/pf0000392317 (last accessed 27 October 2025).

"Indonesian Marine Reference Data (Data Rujukan Nasional Kelautan)," Ministry of Marine Affairs and Fisheries, https://sidako.kkp.go.id/sidako/data-kelautan (last accessed 27 October 2025).

"Indonesian Naval Academy is Ready to Welcome AI Ecosystem (AAL Siap Menyongsong Ekosistem AI)," Indonesian Naval Academy, 22 March 2024, https://aal.ac.id/berita/8771/AAL-SIAP-MENYONGSONG-EKOSISTEM-AI/ (last accessed 27 October 2025).

"Indonesian Naval Aviation Tested Ambara VTOL Drone for Maritime Surveillance (Puspenerbal Uji Coba Drone VTOL Ambara untuk Pengawasan Maritim)," Indonesia Defense, 30 July 2025, https://indonesiadefense.com/puspenerbal-uji-coba-drone-vtol-ambara-untuk-pengawasan-maritim/ (last accessed 27 October 2025).

"Indonesian Naval Hydro-Oceanography Center Introduces HidroSDB35 for Special and Emergency Operations (Pushidrosal perkenalkan HidroSDB35 untuk operasi khusus dan darurat)," Antara News, 12 September 2024, https://www.antaranews.com/berita/4329627/pushidrosal-perkenalkan-hidrosdb35-untuk-operasi-khusus-dan-darurat (last accessed 27 October 2025).

"Indonesian Navy's Electronic Corps Cadets Monitor Vessel Traffic in Indonesia's National Jurisdiction Waters (Taruna AAL Korps Elektronika Memantau Lalu Lintas Kapal Laut di Wilayah Perairan Yurisdiksi Nasional)," Indonesian Naval Academy, 9 December 2023, https://aal.ac.id/berita/8593/Taruna-AAL-Korps-Elektronika-memantau-lalu-lintas-kapal-laut-di-wilayah-perairan-yurisdiksi-nasional/ (last accessed 27 October 2025).

"Members (Anggota)," Kolaborasi Riset dan Inovasi Kecerdasan Artifisial, https://korika.id/members/ (last accessed 27 October 2025).

"Pesawat Terbang Tanpa Awak Tahap II (PTTA II)," PT. Nexin, undated, https://nexin.id/ptta_ii.html (last accessed 27 October 2025).

"PPA Frigates Program for the Indonesian Navy: Born to Be Innovative, Flexible and Responsive," Fincantieri, no date, https://www.fincantieri.com/globalassets/prodotti-servizi/repository/brochure-ppa-indonesia.pdf (last accessed 27 October 2025).

"President of the Republic of Indonesia Calls for the Enlargement of Digital Talents to Master AI (Presiden Minta Perbanyak Talenta Digital Hebat untuk Kuasai AI)," Official Information Portal of the Government of the Republic of Indonesia, 16 August 2025, https://indonesia.go.id/kategori/sosial-budaya/9873/presiden-minta-perbanyak-talenta-digital-hebat-untuk-kuasai-ai?lang=1 (last accessed 27 October 2025).

"President of the Republic of Indonesia Reminds the Indonesian Armed Forces on the Development of Defense Technology (Presiden Ingatkan TNI Soal Perkembangan Teknologi Pertahanan)," Presidential Secretariat of the Republic of Indonesia, 23 January 2020, https://www.presidenri.go.id/siaran-pers/presiden-ingatkan-tni-soal-perkembangan-teknologi-pertahanan/ (last accessed 27 October 2025).

"PT. Dirgantara Indonesia (Persero) and Milkor Enter into UAV Marketing Cooperation in Indonesia (PT-DI-Milkor Jajaki Kerja Sama Pemasaran UAV di Indonesia)," PT. Dirgantara Indonesia (Persero), 13 June 2025, https://www.indonesian-aerospace.com/id/media/berita/detil/1472/ptdi-milkor-jajaki-kerja-sama-pemasaran-uav-di-indonesia (last accessed 27 October 2025).

"PT. PAL's Homegrown Autonomous Submarine Debuted in the TNI's 80th Anniversary Commemoration (Debut Kapal Selam Autonomous Buatan PT PAL di HUT ke-80 TNI)," Tempo.co, 5 October 2025, https://www.tempo.co/politik/debut-kapal-selam-autonomous-buatan-pt-pal-di-hut-ke-80-tni-2076574 (last accessed 27 October 2025).

"PT. PAL Indonesia (Persero) Exhibits Advanced Technologies in Naval Defense System during the Indo Defense 2024 (PT. PAL Indonesia Usung Teknologi Canggih Sistem Pertahanan Laut di Indo Defence 2024)," PT. PAL Indonesia (Persero), 11 June 2025, https://www.pal.co.id/pt-pal-indonesia-usung-teknologi-canggih-sistem-pertahanan-laut-di-indo-defence-2024/ (last accessed 27 October 2025).

"PT. PAL Indonesia (Persero)'s Autonomous Submarine (KSOT) was Showcased during the 80th Anniversary Commemoration (Kapal Selam Autonomous (KSOT) di Panggung HUT ke-80 TNI)," PT. PAL Indonesia (Persero), 6 October 2025, https://www.pal.co.id/kapal-selam-autonomous-ksot-di-panggung-hut-ke-80-tni/ (last accessed 27 October 2025).

"Public Consultation on the White Paper of National AI Roadmap and the Concept of Ethical Guideline to AI (Konsultasi Publik Buku Putih Peta Jalan Kecerdasan Artifisial Nasional dan Konsep Pedoman Etika Kecerdasan Artifisial)," Ministry of Communication and Digital of the Republic of Indonesia, 8 August 2025, https://www.komdigi.go.id/berita/siaran-pers/detail/konsultasi-publik-buku-putih-peta-jalan-kecerdasan-artifisial-nasional-dan-konsep-pedoman-etika-kecerdasan-artifisial (last accessed 27 October 2025).

"REAIM 2023 Endorsing Countries and Territories," 4 April 2025, Government of the Netherlands, https://www.government.nl/documents/publications/2023/02/16/reaim-2023-endorsing-countries (last accessed 27 October 2025).

"Simulasi Pandang (SIMPAN)," PT. Nexin, undated, https://nexin.id/simpan.html (last accessed 27 October 2025).

"Statement by Delegation of the Republic of Indonesia on behalf of the Non-Aligned Movement during the Thematic Debate: "Conventional Weapons" at the First Committee of the 78th Session of the UN General Assembly," United Nations Office for Disarmament Affairs, https://docs-library.unoda.org/General_Assembly_First_Committee_-Seventy-Eighth_session_(2023)/Indonesia_NAM.pdf (last accessed 27 October 2025).

"Statement by Deputy Permanent Representative of the Republic of Indonesia H.E. Mohammad K. Koba at the General Debate of the First Committee of the 77th Session of the UN General Assembly New York, 3 October 2022," United Nations Office for Disarmament Affairs, https://unoda-documents-library.s3.amazonaws.com/General_Assembly_First_Committee_-_Seventy-Seventh_session_(2022)/Indonesia-GD-3-Oct-2022.pdf (last accessed 27 October 2025).

"Thales to Reinforce Indonesia's Sovereign Airspace Protection capabilities with PT Len," Thales, 19 June 2023, https://www.thalesgroup.com/en/countries-asia-pacific/indonesia/press_release/thales-reinforce-indonesias-sovereign-airspace (last accessed 27 October 2025).

"The Bletchley Declaration by Countries Attending the AI Safety Summit, 1-2 November 2023." UK Department for Science, Innovation & Technology, Foreign, Commonwealth & Development Office, Prime Minister's Office, 13 February 2025, https://www.gov.uk/government/publications/ai-safety-summit-2023-the-bletchley-declaration/the-bletchley-declaration-by-countries-attending-the-ai-safety-summit-1-2-november-2023 (last accessed 27 October 2025).

"The CEO of PT. PAL Indonesia (Persero) Highlights the Development of AI-Powered Unmanned Submarine during the Future Submarine Seminar (CEO PT. PAL Indonesia Soroti Pengembangan Unmanned Submarine Berteknologi AI di Future Submarine Seminar)," PT. PAL Indonesia (Persero), 16 May 2024, https://www.pal.co.id/ceo-pt-pal-indonesia-soroti-pengembangan-unmanned-submarine-berteknologi-ai-di-future-submarine-seminar/ (last accessed 27 October 2025).

"The Coordinating Ministry of Economic Affairs of the Republic of Indonesia Holds a Focus Group Discussion to Strengthen Collaboration on Semiconductor and

AI development in Indonesia (Kemenko Perekonomian Gelar FGD untuk Perkuat Kolaborasi Pengembangan Semikonduktor dan AI di Indonesia)," Coordinating Ministry of Economic Affairs of the Republic of Indonesia, 30 April 2025, https://www.ekon.go.id/publikasi/detail/6336/kemenko-perekonomian-gelar-fgd-untuk-perkuat-kolaborasi-pengembangan-semikonduktor-dan-ai-di-indonesia (last accessed 27 October 2025).

"The Coordinating Ministry of Political and Security Affairs of the Republic of Indonesia Pushes the Establishment of National Task force Force on Cyber and Artificial Intelligence (Kemenko Polkam Dorong Pembentukan Satgas Siber dan Kecerdasan Artifisial Terpadu)," Coordinating Ministry of Political and Security Affairs of the Republic of Indonesia, 15 July 2025, https://polkam.go.id/kemenko-polkam-dorong-pembentukan-satgas-siber-dan-kecerdasan-artifisial-terpadu/ (last accessed 27 October 2025).

"The Governor of the National Resilience Institute of the Republic of Indonesia Became the Chief of Indonesian Delegations at the REAIM Summit 2023 in The Hague, Netherlands (Hadiri KTT Kecerdasan Buatan di Belanda, Gubernur Lemhannas RI Bertindak Sebagai Ketua Delegasi Indonesia)," National Resilience Institute of the Republic of Indonesia, 16 February 2023, https://lemhannas.go.id/berita/berita-utama/1845-hadiri-ktt-kecerdasan-buatan-di-belanda-gubernur-lemhannas-ri-bertindak-sebagai-ketua-delegasi-indonesia/id (last accessed 27 October 2025).

"The Indonesian Air Force Utilizes AI, and will Keep on Monitoring the Development of AI (TNI AU Pakai AI, akan Terus Ikuti Perkembangan Kecerdasan Buatan)," Pikiran Rakyat, 4 December 2023, https://www.pikiran-rakyat.com/nasional/pr-017434064/tni-au-pakai-ai-akan-terus-ikuti-perkembangan-kecerdasan-buatan (last accessed 27 October 2025).

"The Minister of Defense of the Republic of Indonesia hands the 21st Century Sishankamrata strategic document to the Vice President of the Republic of Indonesia (Menhan Serahkan Dokumen Strategis Sishankamrata Abad-21 Kepada Wapres RI)," Ministry of Defense of the Republic of Indonesia, 18 June 2021, https://www.kemhan.go.id/2021/06/18/menhan-serahkan-dokumen-strategis-sishankamrata-abad-21-kepada-wapres-ri.html (last accessed 27 October 2025).

"The Ministry of Defense of the Republic of Indonesia Maintains Caution in Adopting AI Technology to Its Main Weapons Systems and Equipment (Kemenhan berhati-hati adopsi teknologi AI untuk alutsista)," Antara News, 19 December 2024, https://www.antaranews.com/berita/4538398/kemenhan-berhati-hati-adopsi-teknologi-ai-untuk-alutsista (last accessed 27 October 2025).

"The Number of Islands in Indonesia Increases into 17,380, why does the figure constantly change every year? The Figure (Pulau Indonesia Bertambah Jadi 17.380, Mengapa Angkanya Berubah Setiap Tahun?)," Geospatial Information Agency of the Republic of Indonesia, 13 December 2024, https://sipulau.big.go.id/news/11 (last accessed 27 October 2025).

"The Readiness of the Directorate of Topography of the Indonesian Army with Esri Indonesia in Facing the Digital Disruption Era (Kesiapan Dittopad Hadapi Era Disrupsi Digital Bersama Esri Indonesia)," Directorate of Topography of the Indonesian Army, 8 October 2024, https://dittop.tni-ad.mil.id/kesiapan-dittopad-hadapi-era-disrupsi-digital-bersama-esri-indonesia/ (last accessed 27 October 2025).

"The Rector of the Republic of Indonesia Defense University Appreciates the Faculty of Defense Science and Technology's Students and Cadets for Innovative and Strategic Achievements at the National and International Levels (Rektor Unhan RI Apresiasi Mahasiswa dan Kadet FTTP Unhan RI atas Prestasi Inovatif dan Strategis di Tingkat Nasional dan Internasional)," The Republic of Indonesia Defense University, 15 July 2025, https://www.idu.ac.id/berita/rektor-unhan-ri-apresiasi-mahasiswa-dan-kadet-fttp-unhan-ri-atas-prestasi-inovatif-dan-strategis-di-tingkat-nasional-dan-internasional.html (last accessed 27 October 2025).

"The Unison Outlook of the Chief Commander of the Indonesian Armed Forces General Andika and the Chief of Staff of the Indonesian Navy Admiral Yudo to Bring Advanced Technologies to the Indonesian Navy Warships (Kompaknya Jenderal Andika dan Laksamana Yudo Inginkan Teknologi Canggih di Kapal Perang TNI AL!)," Tribun Medan, 15 December 2022, https://medan.tribunnews.com/2022/12/15/kompaknya-jenderal-andika-dan-laksamana-yudo-inginkan-teknologi-canggih-di-kapal-perang-tni-al (last accessed 27 October 2025).

"Turkish Aerospace Industries to Deliver 12 Anka Drones to Indonesia," Defence Industry Europe, 8 August 2023, https://defence-industry.eu/turkish-aerospace-industries-to-deliver-12-anka-drones-to-indonesia/ (last accessed 27 October 2025).

Belli, Luca and Walter Britto Gaspar (eds.), The Quest for AI Sovereignty, Transparency and Accountability, Official Outcome of the UN IGF Data and Artificial Intelligence Governance Coalition (Cham: Springer Nature, 2025, pre-print version).

Belli, Luca, "BRICS Countries and AI Sovereignty: Introduction to Thematic Section," The African Journal of Information and Communication, 2024:34 (2024), pp. 1-6, https://doi.org/10.23962/ajic.i34.20864 (last accessed 27 October 2025).

Bitzinger, Richard, "New Ways of Thinking about the Global Arms Industry," Strategic Insights No. 98. (Australia Strategic Policy Institute: 2015).

Book III of the Compiled Annual Work Plan and Budget of the Government of the Republic of Indonesia FY 2021 (Buku III Himpunan Rencana Kerja dan Anggaran Kementerian Negara/Lembaga Tahun Anggaran 2021), Ministry of Finance of the Republic of Indonesia, https://media.kemenkeu.go.id/getmedia/d68aa95b-89b0-4778-98d6-8965b8abcbaa/buku-iii-himpunan-rka-kl-ta-2021.pdf (last accessed 27 October 2025).

Book III of the Compiled Annual Work Plan and Budget of the Government of the Republic of Indonesia FY 2022 (Buku III Himpunan Rencana Kerja dan Anggaran Kementerian Negara/Lembaga Tahun Anggaran 2022), Ministry of Finance of the Republic of Indonesia, https://media.kemenkeu.go.id/getmedia/48b40547-26be-46b9-8c2f-205c9be1419d/buku-iii-himpunan-rkakl-ta-2022.pdf (last accessed 27 October 2025).

Book III of the Compiled Annual Work Plan and Budget of the Government of the Republic of Indonesia FY 2023 (Buku III Himpunan Rencana Kerja dan Anggaran Kementerian Negara/Lembaga Tahun Anggaran 2023), Ministry of Finance of the Republic of Indonesia, https://media.kemenkeu.go.id/getmedia/9de29092-7498-43a9-873b-b845699066fd/Buku-III-Himpunan-RKAKL-TA-2023.pdf?ext=.pdf (last accessed 27 October 2025).

Book III of the Compiled Annual Work Plan and Budget of the Government of the Republic of Indonesia FY 2024 (Buku III Himpunan Rencana Kerja dan Anggaran Kementerian Negara/Lembaga Tahun Anggaran 2024), Ministry of Finance of the Republic of Indonesia, https://anggaran.kemenkeu.go.id/assets/FTPPortal/Peraturan/NK%20UU%20APBN%20Lapsem/Buku%20III%20Himpunan%20RKAKL%20TA%202024.pdf (last accessed 27 October 2025).

Book III of the Compiled Annual Work Plan and Budget of the Government of the Republic of Indonesia FY 2025 (Buku III Himpunan Rencana Kerja dan Anggaran Kementerian Negara/Lembaga Tahun Anggaran 2025), Ministry of Finance of the Republic of Indonesia, https://media.kemenkeu.go.id/getmedia/6ecae803-b27d-4427-8ccf-3fca8bf2facb/03-BUKU-III-HIMPUNAN-RENCANA-KERJA-DAN-ANGGARAN-RAPBN-TA-2025.pdf?ext=.pdf (last accessed 27 October 2025).

Borchert, Heiko, "The Very Long Game of Defense AI Adoption: Introduction," in Heiko Borchert, Torben Schütz, and Joseph Verbovszky (eds.), The Very Long Game: 25 Case Studies on the Global State of Defense AI (Cham: Springer Nature, 2024), pp. 1-38 (https://link.springer.com/chapter/10.1007/978-3-031-58649-1_1 last accessed 27 October 2025).

Butcher, John G. and R. E. Elson, Sovereignty and the Sea: How Indonesia Became an Archipelagic State (Singapore: NUS Press, 2017).

Cribb, Robert B. and Michele Ford (eds.), Indonesia Beyond the Water's Edge: Managing an Archipelagic State (Singapore: Institute of Southeast Asian Studies, 2009).

Davis, Jenny L., "Elevating Humanism in High-Stakes Automation: Experts-in-the-loop and Resort-to-force Decision Making," Australian Journal of International Affairs, 78:2 (2024), 200-209.

Decree of the Minister of Manpower Affair of the Republic of Indonesia Number 123 of 2021 on the Indonesian National Work Competence Standard in Information and Communication Category, Programming, Computer Consultation, and Related Activities Classification, Artificial Intelligence Field, Knowledge Based System Subfield (Keputusan Menteri Ketenagakerjaan Republik Indonesia Nomor 123 Tahun 2021 tentang Penetapan Standar Kompetensi Kerja Nasional Indonesia Kategori Informasi Dan Komunikasi Golongan Pokok Aktivitas Pemrograman, Konsultasi Komputer Dan Kegiatan Yang Berhubungan Dengan Itu (Ybdi) Bidang Keahlian Artificial Intelligence Subbidang Knowledge Based System), Ministry of Manpower Affair of the Republic of Indonesia, https://skkni-api.kemnaker.go.id/v1/public/documents/e6d73934-5d4a-4b83-a47d-afbf313ec4b9/download (last accessed 27 October 2025).

Decree of the Minister of Manpower Affair of the Republic of Indonesia Number 299 of 2020 on the Indonesian National Work Competence Standard in Information and Communication Category, Programming, Computer Consultation, and Related Activities Classification, Artificial Intelligence Field, Data Science Subfield (Keputusan Menteri Ketenagakerjaan Republik Indonesia Nomor 299 Tahun 2020 Penetapan Standar Kompetensi Kerja Nasional Indonesia Kategori Informasi dan Komunikasi Golongan Pokok Aktivitas Pemrograman, Konsultasi Komputer dan Kegiatan yang Berhubungan dengan Itu (Ybdi) Bidang Keahlian Artificial Intelligence Subbidang Data Science), Ministry of Manpower Affair

of the Republic of Indonesia, https://skkni-api.kemnaker.go.id/v1/public/documents/0991d039-f4ed-46cc-a459-f328a3b75757/download (last accessed 27 October 2025).

DEFEND ID Product Catalogue 2025, DEFEND ID, 2025, https://www.defend.id/catalog (last accessed 27 October 2025).

Elezhar, Akhsan Erido, "Indonesia Debuts AI-Powered Autonomous Submarine Armed With Six Torpedoes," The Defense Post, 10 October 2025, https://thedefensepost.com/2025/10/10/indonesia-ai-submarine-torpedoes/ (last accessed 27 October 2025).

Farhana, Faudzan, "Indonesia's Maritime Diplomacy in ASEAN: An International Vision in the Face of National Challenges," in Khanisa and Faudzan Farhana (eds.), ASEAN Maritime Security: The Global Maritime Fulcrum in the Indo-Pacific (Singapore: Springer, 2022), pp. 77-92.

Farrell, Theo, and Kenneth Payne, "Artificial Intelligence and Strategic Culture," in Kerry M. Kartchner, Briana D. Bowen, and Jeannie L. Johnson (eds.), Routledge Handbook of Strategic Culture (London/New York: Routledge, 2023), pp. 470-484.

Floridi, L., Josh Cowls, Monica Beltrametti, Raja Chatila, Patrice Chazerand, Virginia Dignum, Christoph Luetge, Robert Madelin, Ugo Pagallo, Francesca Rossi, Burkhard Schafer, Peggy Valcke, and Effy Vayena, "AI4People—An ethical framework for a good AI society: Opportunities, risks, principles, and recommendations," Minds and Machines, 28:4 (2018), pp. 689-707.

Inayati, Ratna Shofi, "ASEAN Maritime Cooperation in Politics and Security," in Khanisa and Faudzan Farhana (eds.) ASEAN Maritime Security: The Global Maritime Fulcrum in the Indo-Pacific (Singapore: Springer, 2022), pp. 27-42.

Jenkins, R., John P. Sullins, Obinna Kalu, Aisha Kamath, and Krittana Phumjam, "Recent Insights in Responsible AI Development and Deployment in National Defense: A Review of Literature, 2022–2024," Journal of Military Ethics, 24:1 (April-May 2025), pp. 1-23, https://www.tandfonline.com/doi/full/10.1080/15027570.2025.2483058 (last accessed 27 October 2025).

Jiang, Min and Luca Belli (eds.), Digital Sovereignty in the BRICS Countries: How the Global South and Emerging Power Alliances Are Reshaping Digital Governance (Cambridge: Cambridge University Press, 2024).

Johnston, Alastair Iain, "Thinking about Strategic Culture," International Security, 19:4 (Spring 1995), pp. 32-64.

Kure, Emanuel, "Indonesia Needs a Total of 2,700 MW Data Center Capacity (Indonesia Butuh Kapasitas Pusat Data 2700 MW)," Investor Daily, 19 February 2025, https://investor.id/business/389709/indonesia-butuh-kapasitas-pusat-data-2700-mw (last accessed 27 October 2025).

Laksmana, Evan A., McGerty, Fenella, Waldwyn, Tom, Vidal, Albert, Levesques, Antoine, and Barrie, Douglas, "Concerted Autonomy: Defence-industrial Partnerships in the Asia-Pacific," Strategic Dossiers, 3:1 (April 2025), pp. 14-45.

Law of the Republic of Indonesia Number 16 of 2012 on Defense Industry, State Gazette of the Republic of Indonesia, https://www.kemhan.go.id/itjen/wp-content/uploads/migrasi/peraturan/UU0162012.pdf (last accessed 27 October 2025).

Law of the Republic of Indonesia Number 23 of 2019 on National Resources Management for National Defense, State Gazette of the Republic of Indonesia, https://peraturan.bpk.go.id/Download/114482/UU%20Nomor%2023%20Tahun%202019.pdf (last accessed 27 October 2025).

Maharani, Curie, and Ron Matthews, "The Role of Offset in the Enduring Gestation of Indonesia's Strategic Industries," Defence and Peace Economics, 34:7 (November 2023), pp. 981-1002.

Marison, Walda, "The Indonesian Air Force Develops AI-based Defense Technology in 2025 (TNI AU kembangkan teknologi pertahanan berbasis AI pada 2025)," Antara News, 11 December 2024, https://www.antaranews.com/berita/4524067/tni-au-kembangkan-teknologi-pertahanan-berbasis-ai-pada-2025 (last accessed 27 October 2025).

Martiar, Norbertus Arya Dwiangga "Wulung and Elang Hitam, the National Drone Backbones (Wulung dan Elang Hitam, "Drone" Tumpuan Anak Bangsa)," Kompas.id, 16 March 2025, https://www.kompas.id/artikel/wulung-dan-elang-hitam-drone-tumpuan-anak-bangsa (last accessed 27 October 2025).

Matthews, Ron, Curie Maharani, Jupriyanto, and Shang Su Wu, "Indonesia's Defense Acquisition Strategy," Asian Security (6 July 2025), pp. 1-24, https://doi.org/10.1080/14799855.2025.2527088 (last accessed 27 October 2025).

Motin, Dylan, "Indonesia, an Offshore Balancer in Southeast Asia?," World Affairs, 187:3 (May 2024), pp. 267-276, https://doi.org/10.1002/waf2.12027(last accessed 27 October 2025).

Pangestu, Ega, "Multiintegra Exhibits Military Electronics and Cyber Technologies (MultiIntegra Tampilkan Teknologi Militer Elektronik dan Siber)," Radio Republik Indonesia, 20 June 2025, https://rri.co.id/bisnis/1596136/multiintegra-tampilkan-teknologi-militer-elektronik-dan-siber (last accessed 27 October 2025).

Regulation of the Minister of Defense of the Republic of Indonesia Number 12 of 2021 on the 2020-2024 National Defense Implementation Policy, Ministry of Defense of the Republic of Indonesia, https://jdih.kemhan.go.id/wp-content/themes/jdih/file/permenhan/permenhan_2021_file_20230215034951_PERMENHAN%20NO%2012%20TAHUN%202021%20TTG%20JAKHANNEG%202022-2024.pdf (last accessed 27 October 2025).

Presidential Regulation of the Republic of Indonesia Number 202 of 2024 on the National Defense Council, State Gazette of the Republic of Indonesia, https://peraturan.bpk.go.id/Download/371455/Perpres%20Nomor%20202%20Tahun%202024.pdf (last accessed 27 October 2025).

Presidential Regulation of the Republic of Indonesia Number 8 of 2021 on the 2020-2024 National Defense General Policy, State Gazette of the Republic of Indonesia, https://www.kemhan.go.id/wp-content/uploads/2022/08/Perpres_No_8_Tahun_20211-3.pdf (last accessed 27 October 2025).

Prihandoko, Reine, "Defence Minister Prabowo Subianto's Defence Diplomacy: Strategy and Implications for Military Modernisation," in Muhamad Haripin, Adhi Priamarizki, and Leonard C. Sebastian (eds.), Military Modernisation and Civil-Military Relations in Indonesia (Singapore: Springer Nature Singapore, 2025), pp. 69-89.

Scharre, Paul, Four Battlegrounds: Power in the Age of Artificial Intelligence (New York, NY: WW Norton & Company, 2023).

Sebastian, Leonard, Realpolitik Ideology: Indonesia's Use of Military Force (Singapore: ISEAS, 2006).

Shekhar, Vibhanshu, Indonesia's Foreign Policy and Grand Strategy in the 21st Century: Rise of an Indo-Pacific Power (London: Routledge, 2018).

The 2020-2045 National Strategy on Artificial Intelligence (Strategi Nasional Kecerdasan Artifisial Indonesia 2020-2045), Kolaborasi Riset dan Inovasi Industri Kecerdasan Artifisial (Korika), 2020, https://korika.id/wp-content/uploads/2024/07/stranas-ka-2045.pdf (last accessed 27 October 2025).

Umar, Ahmad Rizky M., "The Meaning of Independent and Active Foreign Policy: Revisiting Hatta's 1948 Speech," in Evan A. Laksmana and Lina Alexandra (eds.), Hatta and Indonesia's Independent and Active Foreign Policy: Retrospect and Prospect (Jakarta: Centre for Strategic and International Studies, 2022), pp. 21-34.

Yanwardhana, Emir, "A Message from President Prabowo: Indonesian Youths ought to Master Cyber and AI (Pesan Prabowo: Anak-Anak RI Harus Menguasai Siber & AI)," CNBC Indonesia, 10 December 2024, https://www.cnbcindonesia.com/news/20241210165954-4-594795/pesan-prabowo-anak-anak-ri-harus-menguasai-siber-ai (last accessed 27 October 2025).

List of Abbreviations

2020–24 Jakgarahanneg	*Kebijakan Penyelenggaraan Pertahanan Negara* 2020–2024 (The 2020–24 National Defense Implementation Policy of the Republic of Indonesia)
2020–24 Jakumhanneg	*Kebijakan Umum Pertahanan Negara* 2020–2024 (The 2020–24 General National Defense Policy of the Republic of Indonesia)
2020–45 Stranas KA	*Strategi Nasional Kecerdasan Artifisial 2020–2045* (The 2020–45 National AI Strategy of the Republic of Indonesia)
AI	Artificial intelligence
ASEAN	Association of Southeast Asian Nations
ATOL	Automatic Take-off and Landing
AUV	Autonomous Underwater Vehicle
BRIN	*Badan Riset dan Inovasi Nasional* (The National Research and Innovation Agency of the Republic of Indonesia)
C2	Command and Control
C4I	Command, Control, Communication, Computer, and Intelligence
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
DPN	*Dewan Pertahanan Nasional* (The National Defense Council of the Republic of Indonesia)
EEZ	Exclusive Economic Zone
EO	Electrooptronics
FY	Fiscal Year
GDP	Gross Domestic Product
GEOINT	Geospatial Intelligence
GPU	Graphics Processing Unit
HUMINT	Human Intelligence
ICT	Information and Communication Technology
IR	Infrared
ISR	Intelligence, Surveillance, and Reconnaissance
KKIP	*Komite Kebijakan Industri Pertahanan* (The National Defense Industry Policy Committee of the Republic of Indonesia)
Korika	*Kolaborasi Riset dan Inovasi Industri Kecerdasan Artifisial* (AI Industry Research and Innovation Collaboration, an institutional setup in Indonesia to promote nationwide interstakeholder collaboration in AI research and innovation)
KSOT	Kapal Selam Otonom (An indigenous unmanned submarine platform development undertaken by PT. PAL (Persero))
LAWS	Lethal Autonomous Weapons Systems

MALE	Medium Altitude Long Endurance
MCMV	Mine Countermeasure Vessel
MIDS	Mine Identification and Disposal Systems
MPCS	Multipurpose Combat Ship
MRO	Maintenance, Repair, and Overhaul
NAM	Non-Aligned Movement
NCW	Network Centric Warfare
NDA	Non-disclosure Agreement
OSINT	Open Source Intelligence
PPA	*Pattugliatore Polivalente d'Altura* (Similar to the MPCS)
PTTA II	Pesawat Terbang Tanpa Awak II (An indigenous unmanned aerial vehicle developed by PT. Nexin and the Indonesian Army)
R&D	Research and Development
RAM	AI Readiness Assessment Methodology
REAIM	Responsible Artificial Intelligence in the Military domain
RKA K/L	*Himpunan Rencana Kerja dan Anggaran Kementerian Negara/Lembaga* (The Compiled Annual Work Plan and Budget of all Ministries and Government Agencies in Indonesia)
SAR	Synthetic Aperture Radar
SCS	South China Sea
SIMPAN	Simulasi Pandang (An indigenous AI-enabled close combat simulation system developed by PT. Nexin and the Indonesian Army)
Sishankamrata	*Sistem Pertahanan dan Keamanan Rakyat Semesta* (Total People's Defense and Security System, a long-held national defense philosophy in Indonesia similar to total defense)
SKKNI	*Standar Kompetensi Kerja Nasional Indonesia* (Indonesian national work competence standards)
Spartan	System Performance Readiness and Tactical Analysis (A tactical decision support system developed by the Indonesian Navy)
TNI	*Tentara Nasional Indonesia* (Indonesian Armed Forces)
UAV	Unmanned Aerial Vehicle
UNCLOS 1982	The 1982 United Nations Convention on the Law of the Sea
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNGA	United Nations General Assembly
USV	Unmanned Surface Vehicle
VMT	Virtual Maintenance Training

Defense AI Observatory Studies

25|30 Heiko Borchert, Bonds That Separate. Defense AI in the Arab Gulf States

25|29 Rafał Lipka, Jakub Wernik, and Wojciech Dzięgiel, Guarding the Alliance's Eastern Frontiers. Defense AI in Poland

25|28 Umaima Ali, An Underdeveloped Strategic Necessity. Defence AI in Pakistan

25|27 Heiko Borchert, Christian Brandlhuber, and Jeronimo Dzaack, Thinking Before Sinking. Red and Blue AI Tactics for Naval Combat

24|26 Heiko Borchert and Christian Brandlhuber, His Hands Can't Hit What His Eyes Can't See. Emergent AI Tactics for Successful Operations in the Air Littoral

24|25 Mahmoud Javadi, Heavy Thunder, No Rain: Defense AI in Iran

24|24 Kitsch Liao, Intelligent National Defense Amid Strategic Ambiguity? Defense AI in Taiwan

24|23 Motohiro Tsuchiya, Overcoming the Long Shadow of the Past. Defense AI in Japan

24|22 Vitaliy Goncharuk, Survival of the Smartest? Defense AI in Ukraine

24|21 Youngwook Park, Wil the One Ring Hold? Defense AI in South Korea

23|20 Tomas Jermalivičius, Caught Between Today and Tomorrow. Defence AI in Estonia

23|19 Nikolaos Karampekios, Konstantinos Sakalis, and Iraklis Oikonomou, Harnessing the Potential. Defense AI in Greece

23|18 Andreas Graae, Servers Before Tanks? Defence AI in Denmark

23|17 Kévin Martin and Lucie Liversain, A Winding Road Before Scaling-Up? Defense AI in France

23|16 Sami O. Järvinen, Cautious Data-Driven Evolution. Defence AI in Finland

23|15 Inbar Dolinko and Liran Antebi, Embracing the Organized Mess. Defense AI in Israel

23|14 Alastair Finlan, A Fertile Soil for AI? Defense AI in Sweden

23|13 John Lee, "Overtaking on the Curve?" Defense AI in China

23|12 Heiko Borchert, Torben Schütz, and Joseph Verbovszky, Master and Servant. Defense AI in Germany

23|11 Katarzyna Zysk, High Hopes Amid Hard Realities. Defense AI in Russia

23|10 Yvonne Hofstetter and Joseph Verbovzsky, How AI Learns the Bundeswehr's "Innere Führung." Value-Based Engineering with IEEE7000™-2021

23|09 Robert C Engen, When the Teeth Eat the Tail: A Review of Canada's Defence Artificial Intelligence

23|08 Çağlar Kurç, Enabling Technology of Future Warfare. Defense AI in Turkey

23|07 Lauren A. Kahn, Risky Incrementalism. Defense AI in the United States

22|06 Yvonne Hofstetter, Wie KI Innere Führung lernt. Wertbasierte Technik mit IEEE7000™-2021

22|05 Andrea Gilli, Mauro Gilli, and Ivan Zaccagnini, Exploring the Benefits of a New Force Enabler: Defense AI in Italy

22|04 Kenneth Payne, Bright Prospects – Big Challenges. Defense AI in the United Kingdom

22|03 Heiko Borchert, Christian Brandlhuber, Armin Brandstetter, and Gary S. Schaal, Free Jazz on the Battlefield. How GhostPlay's AI Approach Enhances Air Defense

22|02 Peter Layton, Evolution not Revolution. Australia's Defence AI Pathway

21|01 Heiko Borchert, Torben Schütz, Joseph Verbovszky, Beware the Hype. What Military Conflicts in Ukraine, Syria, Libya, and Nagorno-Karabakh (Don't) Tell Us About the Future of War

Defense AI Observatory

www.defenseai.eu