

Strategy of the Nuclear, Biological, and Chemical Detachment in Responding to a Novel Disease Pandemic (A Case Study of Assistance Operations in Natuna in 2020)

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Abstract

Novel disease pandemics have demonstrated that biological threats can significantly affect national stability, public health, and national resilience. Normatively, the Nuclear, Biological, and Chemical Engineering Detachment (Denzinubika), as the Chemical, Biological, Radiological, and Nuclear (CBRN) unit of the Indonesian Army, is expected to possess optimal capabilities in supporting Military Operations Other Than War (MOOTW) for pandemic response. However, the implementation of assistance operations is still influenced by various internal and external factors that affect the effectiveness of the unit's mission. This study aims to analyze these factors and formulate strategies for enhancing Denzinubika's capabilities in addressing future biological threats. This study employed a qualitative descriptive method, with data collected through interviews, document studies, and field observations. Data analysis was conducted using the Miles and Huberman model, consisting of data collection, data reduction, data display, and conclusion drawing. The analytical framework used in this study includes the Ends-Ways-Means Strategy Theory of Arthur F. Lykke Jr. (1989), Defense Theory of Barry Buzan (1991), Capacity Building Theory of Grindle (1997), and Military Readiness Theory of James J. Tritten (1994). The findings indicate that the factors influencing pandemic assistance operations include personnel competence, CBRN capabilities and equipment, organizational structure, operational experience, policy support, technological development, cross-sector cooperation, and the dynamics of biological threats. The required strategies include strengthening organizational capacity, improving personnel capabilities, modernizing CBRN facilities and infrastructure, and enhancing cooperation and interoperability. The study concludes that strengthening organizational capacity and integrated operational readiness are key factors in ensuring Denzinubika's effectiveness in responding to novel disease pandemics.

Keywords: Strategy, Assistance Operations, Pandemic



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INTRODUCTION

The emergence of novel infectious diseases has fundamentally reshaped the global security environment by demonstrating that biological threats extend beyond the public health sector and have become multidimensional challenges affecting national defense, economic stability, social resilience, and international security. The Coronavirus Disease 2019 (COVID-19) pandemic represents one of the most significant global crises of the twenty-first century, exposing vulnerabilities in national preparedness systems and highlighting the necessity of integrated responses involving both civilian and military institutions. According to the World Health Organization (WHO), although the Public Health Emergency of International Concern (PHEIC) status was officially lifted in 2023, emerging infectious diseases continue to pose serious risks to global health security, requiring countries to strengthen preparedness, response capabilities, and institutional resilience (World Health Organization [WHO], 2024). In contemporary security studies, pandemics are no longer viewed solely as health emergencies but as non-military threats capable of disrupting national stability, economic activities, governmental functions, and defense readiness. Barry Buzan (1991) argues that national

security encompasses military and non-military dimensions, including political, economic, societal, and environmental security. Consequently, biological threats require comprehensive national responses involving multiple sectors rather than relying exclusively on public health institutions. This perspective has encouraged many countries to integrate military capabilities into national emergency management frameworks, particularly for responding to Chemical, Biological, Radiological, and Nuclear (CBRN) emergencies.

Within the Indonesian defense system, the Indonesian National Armed Forces (Tentara Nasional Indonesia-TNI) play a strategic role in responding to non-military threats through Military Operations Other Than War (MOOTW). Law Number 34 of 2004 concerning the Indonesian National Armed Forces mandates the military to assist government agencies in disaster management, humanitarian assistance, and national emergency response. Accordingly, specialized military units possessing CBRN capabilities are expected to contribute significantly during biological emergencies by providing force protection, biological detection, decontamination, environmental sterilization, and technical support for national crisis management. One of Indonesia's earliest large-scale military responses to the COVID-19 pandemic occurred during the evacuation and quarantine operation of Indonesian citizens repatriated from Wuhan, China, in early 2020. The Government designated Natuna Island as the quarantine location, requiring extensive coordination among military units, civilian health authorities, and other government agencies. During this operation, the Nuclear, Biological, and Chemical Engineering Detachment (Detasemen Zeni Nuklir Biologi Kimia-Denzinubika) of the Indonesian Army was deployed to conduct biological hazard mitigation through CBRN procedures, including detection, decontamination, environmental monitoring, personnel protection, and operational support. The Natuna Assistance Operation represented Indonesia's first comprehensive military biological emergency response and provided valuable operational experience in managing an emerging infectious disease under conditions of considerable uncertainty.

International organizations increasingly recognize that effective pandemic preparedness requires institutional collaboration between civilian and military organizations. The World Health Organization (2023) emphasizes that military organizations possessing specialized medical and CBRN capabilities should be integrated into all phases of emergency management, including prevention, preparedness, response, and recovery. Similarly, NATO identifies CBRN defense capability as an essential component of military readiness in addressing biological threats, emphasizing interoperability, rapid deployment, and coordinated command structures (NATO, 2022). These developments indicate that specialized military organizations such as Denzinubika must continuously enhance organizational capacity, technological capability, and operational readiness to effectively respond to future biological emergencies. Despite the successful implementation of the Natuna Assistance Operation, several organizational challenges remained evident throughout the mission. The effectiveness of Denzinubika was influenced by various internal and external factors, including personnel competence, availability of CBRN equipment, organizational structure, operational experience, interagency coordination, technological development, policy support, and the dynamic characteristics of biological threats. These challenges suggest that although operational objectives were successfully achieved, improvements are still required to strengthen organizational capability and enhance future operational readiness. Similar findings have been reported in previous studies indicating that military effectiveness during pandemics depends upon organizational preparedness, logistics capability, institutional coordination, and continuous capacity development (Tuser et al., 2021; Ries et al., 2022; Boland, 2023). Previous research has extensively examined military participation in pandemic management; however, most studies

focus on military organizations at the institutional level rather than specialized CBRN units. Existing literature rarely investigates the strategic development of military CBRN organizations by integrating organizational capacity, operational readiness, interoperability, personnel competency, and strategic management within a comprehensive analytical framework. Moreover, empirical studies specifically examining the operational experience of Indonesia's Denzinubika during the Natuna Assistance Operation remain extremely limited. This gap demonstrates the need for research that specifically addresses the strategic development of specialized CBRN military capabilities in responding to emerging biological threats.

This study seeks to address that research gap by analyzing the strategy employed by the Nuclear, Biological, and Chemical Engineering Detachment during the 2020 Natuna Assistance Operation. Drawing upon Arthur F. Lykke Jr.'s Ends-Ways-Means Strategy Theory, Barry Buzan's Defense Theory, Grindle's Capacity Building Theory, and James J. Tritten's Military Readiness Theory, this research examines the internal and external factors influencing operational effectiveness and formulates strategic recommendations for strengthening Denzinubika's organizational capability in responding to future biological threats. The findings are expected to contribute both theoretically to the advancement of defense studies and practically to the enhancement of Indonesian Army CBRN capability in supporting Military Operations Other Than War (MOOTW).

Research Gap and Novelty

Existing studies on military involvement in pandemic response primarily focus on civil-military cooperation, emergency management, and public health support. However, limited research specifically examines the strategic role of specialized Chemical, Biological, Radiological, and Nuclear (CBRN) units, particularly the Indonesian Army's Nuclear, Biological, and Chemical Engineering Detachment (Denzinubika), in responding to emerging infectious disease pandemics. Moreover, previous studies rarely integrate strategic, organizational, and operational perspectives into a comprehensive framework for strengthening CBRN capabilities. This study addresses this research gap by analyzing the strategy of Denzinubika during the 2020 Natuna Assistance Operation through the integration of Ends-Ways-Means Strategy Theory, Defense Theory, Capacity Building Theory, and Military Readiness Theory. The novelty of this research lies in the development of a comprehensive defense strategy model that enhances the organizational capability, operational readiness, and interoperability of Denzinubika in supporting Military Operations Other Than War (MOOTW) against future biological threats and emerging disease pandemics.

RESEARCH METHODS

This study employs a qualitative research design using a case-study approach to analyze the strategy of the Nuclear, Biological, and Chemical Engineering Detachment (Denzinubika) in responding to the novel disease pandemic during the 2020 Assistance Operation in Natuna. A qualitative approach was selected because the study seeks to explore organizational strategies, operational readiness, and decision-making processes in responding to biological threats rather than measuring variables quantitatively. The Natuna operation was chosen as the case study because it represents Indonesia's first large-scale military response to a biological emergency involving the evacuation and quarantine of Indonesian citizens during the early stage of the COVID-19 pandemic. Data were collected through semi-structured interviews, document analysis, and field observations involving military personnel, policy documents, operational reports, and relevant regulations. Data analysis followed the interactive model of Miles and Huberman, including data collection, data reduction, data display, and conclusion

drawing. The analysis was guided by four complementary theoretical frameworks: Arthur F. Lykke Jr.'s Ends–Ways–Means Strategy Theory to evaluate strategic alignment; Barry Buzan's Defense Theory to examine biological threats as non-military security challenges; Grindle's Capacity Building Theory to assess organizational capability development; and James J. Tritten's Military Readiness Theory to evaluate operational preparedness. Triangulation of data sources was applied to ensure the credibility and validity of the research findings.

RESEARCH RESULTS AND DISCUSSION

Research Results

This section presents the findings of the study derived from interviews, document analysis, and field observations concerning the role of the Nuclear, Biological, and Chemical Engineering Detachment (Denzinubika) during the 2020 Natuna Assistance Operation. The results indicate that the effectiveness of the operation was influenced by both internal and external factors, including personnel competence, CBRN equipment capability, organizational readiness, interagency coordination, policy support, and the evolving characteristics of biological threats. These findings form the basis for formulating strategic recommendations to strengthen Denzinubika's capability in responding to future pandemic emergencies.

Internal Factors Affecting Pandemic Response Operations

The findings reveal that organizational readiness was primarily determined by the competence of personnel, the availability of CBRN equipment, operational experience, and the organizational structure of Denzinubika. Personnel demonstrated strong professionalism and adaptability during the Natuna Assistance Operation despite the limited understanding of the COVID-19 virus at the early stage of the pandemic. Nevertheless, the study found several limitations related to specialized biological equipment, continuous training, and operational procedures, which affected the unit's overall readiness in responding to biological emergencies. These findings suggest that strengthening human resources, modernizing equipment, and improving operational doctrine are essential to enhancing future CBRN operations.

External Factors Affecting Pandemic Response Operations

The study also identified several external factors influencing the effectiveness of Denzinubika's operations. Government policies, interagency collaboration, technological developments, and the dynamic nature of biological threats significantly affected operational implementation. Effective coordination among the Indonesian National Armed Forces, the Ministry of Health, local governments, and other national institutions enabled the successful execution of quarantine and decontamination activities in Natuna. However, the research also indicates that future biological emergencies will require stronger interoperability, integrated planning, and sustainable policy support to ensure rapid and coordinated responses.

Discussion

The findings of this study demonstrate that the effectiveness of the Nuclear, Biological, and Chemical Engineering Detachment (Denzinubika) during the 2020 Natuna Assistance Operation was determined by the strategic alignment between organizational objectives, operational methods, and available resources. This finding is consistent with Arthur F. Lykke Jr.'s Ends–Ways–Means Strategy Theory, which emphasizes that an effective strategy can only be achieved when strategic objectives (ends), implementation methods (ways), and available resources (means) are balanced and mutually supportive (Lykke, 1989). During the Natuna operation, Denzinubika successfully executed biological detection, decontamination, force

protection, and quarantine support despite the unprecedented uncertainty posed by the COVID-19 outbreak. However, the study also revealed that organizational effectiveness depended not only on the competence of personnel but also on the availability of modern CBRN equipment, standardized operational procedures, and institutional readiness. These findings suggest that future biological emergency responses require continuous modernization of organizational resources and doctrine to maintain operational effectiveness under rapidly evolving threat environments (Lykke, 1989).

From the perspective of Defense Theory, the findings confirm that biological threats have evolved into multidimensional non-military security challenges capable of affecting national resilience, public health, economic stability, and social order. Buzan (1991) argues that contemporary security extends beyond conventional military threats and includes political, economic, societal, and environmental dimensions. The COVID-19 pandemic clearly demonstrated that biological emergencies require comprehensive national responses involving military and civilian institutions. The successful implementation of the Natuna Assistance Operation illustrates the importance of integrating defense organizations into national health emergency management through effective civil-military cooperation, coordinated command structures, and interagency collaboration. This integrated approach not only strengthens operational effectiveness but also enhances national resilience against future biological threats (Buzan, 1991; World Health Organization [WHO], 2023).

The study also supports Grindle's Capacity Building Theory, which emphasizes that sustainable organizational performance depends on continuous improvement in human resources, institutional arrangements, organizational systems, and technological capability (Grindle, 1997). The findings indicate that although Denzinubika successfully accomplished its operational mission, improvements are still required in personnel development, specialized biological training, modernization of CBRN equipment, and institutional learning. These aspects are essential for strengthening organizational adaptability and ensuring that Denzinubika remains capable of responding to increasingly complex biological emergencies. Similar conclusions are reported by Farhat et al. (2024), who emphasize that modern CBRN organizations require continuous investment in professional training, advanced technology, and organizational innovation to maintain operational effectiveness in emerging biological threat environments.

Furthermore, the findings are closely aligned with Military Readiness Theory, which explains that operational success depends upon preparedness, training, logistics support, interoperability, and organizational responsiveness (Tritten, 1994). The Natuna Assistance Operation demonstrated that rapid deployment, effective logistics management, and coordination among military units and civilian agencies were critical determinants of mission success. Nevertheless, the study identified several challenges related to equipment readiness, operational standardization, and long-term capability development, indicating that military preparedness should be viewed as a continuous process rather than a temporary response to emergencies. This interpretation is supported by the World Health Organization (2023), which recommends strengthening civil-military collaboration, institutional preparedness, and integrated emergency planning as key components of future pandemic preparedness.

Overall, this study demonstrates that strengthening Denzinubika requires a comprehensive defense strategy integrating organizational capacity development, modernization of CBRN equipment, continuous personnel training, doctrinal refinement, and enhanced interoperability among military and civilian institutions. Such an integrated strategy not only supports the implementation of Military Operations Other Than War (MOOTW) but also reinforces Indonesia's national preparedness against future biological threats and

emerging infectious disease pandemics. Consequently, this study contributes both theoretically and practically by providing a strategic framework for developing Indonesia's specialized CBRN capability in accordance with contemporary defense and health security challenges.

CONCLUSION

This study concludes that the effectiveness of the Nuclear, Biological, and Chemical Engineering Detachment (Denzinubika) in responding to the 2020 Natuna Assistance Operation was influenced by the interaction of internal and external factors affecting organizational capability and operational readiness. Internal factors included personnel competence, CBRN equipment, organizational structure, and operational experience, while external factors comprised government policy, technological development, interagency cooperation, and the dynamic nature of biological threats. These findings indicate that strengthening organizational capability requires continuous improvement in personnel, equipment, institutional systems, and operational preparedness to effectively respond to future biological emergencies (Grindle, 1997; Tritten, 1994). Furthermore, the study demonstrates that an effective pandemic response strategy should integrate strategic objectives, operational methods, and organizational resources within a comprehensive defense framework. The proposed strategy emphasizes organizational capacity development, modernization of CBRN equipment, enhancement of personnel competence, doctrinal refinement, and stronger civil-military interoperability. This strategic approach is consistent with the Ends-Ways-Means Strategy Theory, which highlights the importance of balancing strategic objectives, implementation methods, and available resources (Lykke, 1989), while also supporting the concept of comprehensive national security against non-military threats as emphasized by Buzan (1991). Therefore, the proposed strategy is expected to strengthen Denzinubika's capability in supporting Military Operations Other Than War (MOOTW) and enhance Indonesia's preparedness for future emerging infectious disease pandemics.

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