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Utilization of remote sensing in monitoring terrorism threats in the border areas of Indonesia: In the context of relocating the capital city

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ABSTRACT

Background: The relocation of the Capital City of Indonesia/*Ibu Kota Negari (*IKN) to the island of Kalimantan presents new challenges concerning national security, particularly in addressing terrorism threats in border regions. These threats can potentially disrupt national stability and development, necessitating serious attention from the government and stakeholders. This research aims to explore the application of remote sensing technology in monitoring terrorism threats in Indonesia's border regions and to formulate more effective prevention strategies. **Method:** This research explores the application of remote sensing technology in monitoring terrorism threats in Indonesia's border regions and formulates more effective prevention strategies. The study employed brainstorming analysis to gather diverse perspectives based on relevant references and scientific journals, organizing these into an analytical framework. Combining brainstorming methods with scientific journal references enriched the research process while enhancing the validity and reliability of findings, allowing for comprehensive, evidence-based recommendations that contribute significantly to policy development and field practices. **Findings:** Findings indicate that the geographical location of the new capital, being close to the border, may increase security risks. The application of remote sensing technology can significantly enhance early detection capabilities for suspicious activities along borders. By providing more efficient real-time monitoring, these systems facilitate timely interventions and aid in predicting potential terrorism risks through advanced geospatial analysis. **Conclusion:** The results of this study have significant implications for national security strategic planning, emphasizing the need for technology integration into defense systems and counter-terrorism efforts, as well as enhancing international cooperation in maintaining security in border areas. **Novelty/Originality of this article:** This study provides a novel approach to national security in the context of Indonesia's capital relocation by examining the potential of remote sensing technology for terrorism threat monitoring in border regions.

KEYWORDS: border security; capital city; development; geopolitical; geospatial intelligence; remote sensing; terrorism threat.

1. Introduction

In 2019, President Jokowi announced plans to move the capital city of Indonesia from Jakarta to the island of Borneo, which gave rise to conflicting opinions across all levels of society, including academics (Hudalah, 2023). The relocation of the capital city is a strategic decision by the government that offers an alternative solution to encourage equitable development and growth in Indonesia (Syaban, 2023). The hope is that it will create a more efficient and sustainable center of government so that new growth centers will emerge

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outside Java. The construction of the new capital city, which is currently still ongoing, is not only about physical buildings or government administrative systems. However, other aspects require special and complex attention in efforts to maintain state sovereignty, namely national defense, and security against the National Capital City/*Ibu Kota Negara* (IKN), including from the threat of terrorism. The relocation of geographical locations has challenges and requires a new analysis of the potential threat of terrorism, thus requiring the development of adequate defense infrastructure. So that strategic planning and implementation of a counter-terrorism system must be designed comprehensively in facing the possibility of changes in the pattern of terrorism threats in the future.

Terrorism is a crime that can occur anywhere, including on national borders, because its actions can have a wide impact on country. The threat of terrorism can disrupt the security and stability of the country, cause casualties, and hinder national development. Indonesia has a policy in countering terrorism, namely through law enforcement and in the form of counterradicalism and deradicalization (Subagyo, 2021). Good and integrated strategic planning ensures that the relocation of the capital city is not only successful in terms of administration, infrastructure and economy, but also in terms of national security and stability.

North Kalimantan, which is a buffer zone for the National Capital, also has the potential to become a target for terrorism threats, because its territory is adjacent to East Kalimantan as the location of the new Capital City. Geographically, North Kalimantan has an area bordering the Sabah and Sarawak regions of Malaysia, which has the potential to become a land entry point for terrorist groups from abroad. In the Sulawesi Sea, which has the Indonesian Archipelago Sea Lane, it can also be an entry point for terrorist groups from cross-country borders, where Indonesia directly borders the Mindanao Islands, the Philippines and at the same time the Sabah region, Malaysia. The area is adjacent and can be accessed by terrorist network groups to enter either directly to the National Capital or to terrorist headquarters areas such as Poso, Central Sulawesi. Border security forces have limitations in monitoring long borders at all times continuously (Ahmed, 2022). Automated systems can be used to detect intruders at the border and directly send the information to the command center.

The capital city and borders are important spatial attributes of a country, both of which function to maintain the country's sovereignty. The capital city regulates policies that affect border security, while the border protects the capital city and the country's interior from external threats. Both are symbols of a country's sovereignty and control. Although different in their specific functions, both are part of an important state infrastructure and are closely related to national defense (Trevish, 2016). The application of sensing technology has great potential in supporting tasks against potential threats from terrorist groups between countries, especially in the context of moving the National Capital City where the location is getting closer to the border area. This technology allows for monitoring of a wide coverage area more efficiently, in real-time and provides early detection capabilities for suspicious activity or the movement of terrorist groups in the border area.

2. Methods

In this study, the brainstorming analysis approach was employed to gather diverse ideas and perspectives based on relevant references and scientific journals within the scope of the discussion, which were then organized into an analytical framework for the research. By referring to existing literature, researchers can strengthen their arguments and provide a solid theoretical foundation for each generated idea. For instance, when analyzing strategies to enhance border security, researchers may refer to previous studies that assess the effectiveness of similar strategies in comparable contexts.

Thus, the combination of brainstorming methods and references from scientific journals not only enriches the research process but also enhances the validity and reliability of the research findings. This approach allows researchers to develop more comprehensive

and evidence-based recommendations, thereby making a significant contribution to policy development or field practices.

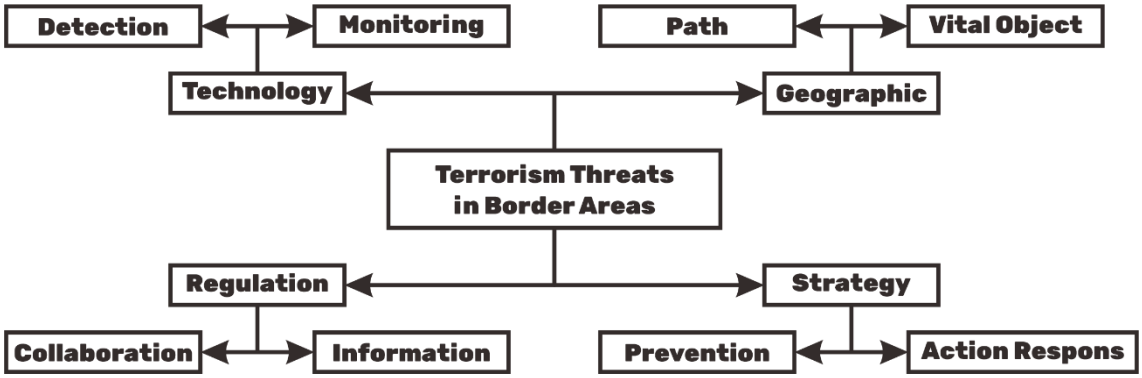

Fig. 1. Brainstorming framework

3. Results and Discussion

Terrorism is an act carried out by an individual or group to cause fear, intimidation, or chaos through violence or threats of violence against civilians. In this context, terrorism can be categorized into several types of threats, the most common of which is International terrorism, which is a multi-national group that involves a global network and often has a broader ideological or political agenda. Ideological terrorism can be based on religion, which often uses religious doctrine as a legitimacy for violent acts. In this case, the educational method training and literacy on ethnic bias need to be improved among policymakers and practitioners (Levy, 2023). Terrorist actions against threats, security, and national defense are challenging tasks for defense institutions around the world and are increasingly important for policymakers who are aware of the security of the country and the general public (Hakonen, 2015). Terrorist threats can also involve technology-based attacks, such as cyber-terrorism, which focuses on critical infrastructure and information systems, or theft of state secrets. These attacks attack digitally against computers, networks, or digital information systems, intending to force people, companies, or governments to meet the attacker's social, economic, or political goals (Smith, 2023). Another type of terrorism that needs attention is environmental terrorism, where individuals or groups use violence or threats to protest or promote environmental issues, often targeting infrastructure related to the exploitation of natural resources. With the world's population increasing and climate change continuing, environmental terrorism is causing threats and disasters at levels of severity never experienced before (Kohler, 2019).

In the development of the National Capital City, several indicators have been set as achievement goals, namely building an ideal city designed to be in harmony with nature, easily accessible, implementing the principles of a circular economy, resilient to challenges, safe, affordable, technology-friendly, and providing equitable economic opportunities for all its citizens. Therefore, the new capital city will later become a magnet for everyone to come (Berawi, 2022). The geographical analysis of the National Capital City shows that its location has a strategic position that can be both an advantage and a challenge in the context of security. Understanding and studying the geographical position of other cities in the world it provides an opportunity for policymakers to identify areas that need to be improved and utilize new areas that have strategic potential (Akande, 2019). Located in the middle of the island of Kalimantan, the National Capital City is surrounded by dense forests and hinterland that make it difficult to reach, but also close to the border areas of other countries. Several cases of terrorist attacks in border areas provide important insights into the security challenges faced by the country.

One example is the terrorist attacks that occurred in the border area between Indonesia and the Philippines, where armed groups such as Abu Sayyaf often carry out kidnappings

and attacks on civilians and security agencies. The Global Terrorism Database noted that Abu Sayyaf had carried out more than 350 previous terrorist attacks, and the escalation of its attacks increased 1.75 times after it declared its loyalty to ISIS (Kalicharan, 2019). These attacks not only caused fear among the public, but also shook the security stability in the region. In addition, the movements of these terrorist groups often take advantage of poorly monitored border areas, making it easier for them to carry out transnational crimes. Thus, an analysis of the attack patterns and tactics used by terrorist groups in borders can help in formulating more effective prevention strategies and increasing cooperation between countries in dealing with the threat of terrorism.

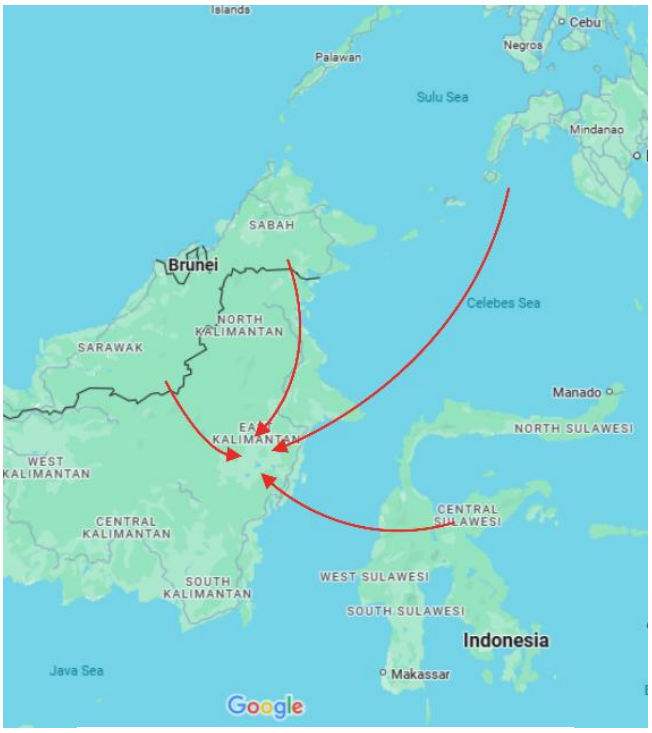

Fig. 2. Prediction route

There is a land route from the border between Sabah and Sarawak with North Kalimantan and East Kalimantan (Indonesia – Malaysia), its position is to the north and northwest of the National Capital. Meanwhile, there is a sea route from the Sulawesi Sea region bordering Sabah, the Mindanao Islands, and the Makassar Strait (Indonesia – Malaysia – Philippines), this position is located to the east and northeast of the Capital. This position poses a security risk, because easy access to the border can be used by terrorist or criminal groups to infiltrate. In addition, transportation routes are limited in the area can hinder rapid response to threats. Cities are complex systems, making it very difficult to build and run a city in such a way that all elements of the system can run harmoniously (Morawska, 2022). With vital objects such as government buildings and important infrastructure being and will be built in the National Capital City, of course the placement of an effective surveillance system along the border is very crucial.

Terrorist acts do not only carry out direct physical attacks, but can also use several actions by reducing or cutting off the supply of important resources such as water and electricity, thus impacting daily living needs. They also carry out acts of terrorism by polluting water sources with hazardous substances that can cause disease and worsen public health conditions, thereby increasing the suffering of civilians (Kohler, 2019). Strategic vital object points, including the Asam-Asam PLTU in the South Kalimantan region, are also likely to be effective targets for terrorist groups. This power plant source is able to supply a large enough electricity supply to support activities in the National Capital City,

meaning that this kind of strategic infrastructure plays a role in supporting energy needs in other Kalimantan regions.

Balikpapan Bay has high biodiversity because it is the estuary of several rivers in 3 regencies/cities, namely Penajam Paser Utara Regency, Kutai Kartanegara Regency and Balikpapan City. Balikpapan Bay has a vital role as a habitat for various protected animal species, making it a very valuable ecosystem from an environmental conservation perspective. The existence of various flora and fauna in this area not only contributes to biodiversity, but also becomes an attraction for research and tourism. We are only beginning to realize and appreciate the impact of human welfare that comes from natural wealth and biodiversity (Sandifer, 2015). In addition, Balikpapan Bay plays a role in the local economy, where many residents depend on natural resources such as fisheries and other marine-based economic activities. Thus, protecting the Balikpapan Bay ecosystem is not only important for environmental sustainability, but also for the economic well-being of the surrounding community. The island of Kalimantan also has a very large area of tropical forest cover, which also functions as one of the most important ecosystems in the world. The concept of development in the capital city that is close to nature can develop forms of sustainable active tourism, especially hiking and cycling, educational tourism, and daily recreational activities for the capital city's residents in the future (Gonia, 2022). The nature reserve on this island also plays a major role in maintaining national ecological security, protecting biodiversity and endangered species. Remote sensing-based change detection technology can identify dynamic changes in land use, as well as warn of possible ecological risks in the nature reserve in a timely manner. The development of technology in unmanned aerial vehicles (UAVs) equipped with artificial intelligence AI, and thermal sensors presents new opportunities for wildlife researchers to conduct surveys in relatively large areas at low cost (Gonzales, 2016). This not only provides technical support for the management of nature reserves adjacent to the concept of developing the National Capital but also ensures the sustainability of endangered species and serves as an environmental buffer from the negative impacts of human activities, such as illegal logging, pollution, and forest burning.

The government must also make efforts to add border posts and improve the quality and capacity of existing ones. PLBN can be a gateway for international tourists who want to enter Indonesia. Currently, several Cross-Border Posts have been built in the northern part of Kalimantan, including the Integrated PLBN Sebatik Sei Pancang, Long Nawang, Labang, and Sei Menggaris. However, what needs to be considered and monitored are the "rat lines" on the country's borders that can become routes for cross-border terrorism to enter Indonesian territory. Therefore, strengthening Cross-Border Posts plays an important role in the initial prevention of terrorists entering Indonesian territory, including in the context of protecting the new National Capital City.

As an entry gate to Indonesian territory, PLBN can control and supervise anyone who enters and exits, especially through land borders. With strict supervision and routine monitoring, these border posts can prevent individuals who are suspected and who may be associated with terrorist groups from entering Indonesian territory or the National Capital City. Technological support such as CCTV, drones, and other sensing technologies enable PLBN to detect suspicious activities around the border area. Surveillance video usually involves one or more entities (people or objects) carrying out activities sequentially or simultaneously. Automatic detection of suspicious behavior from these entities, without the direct involvement of human personnel, is often important. Therefore, anomalous activity detection from surveillance video is used for this purpose (Pawar, 2019). Sensing technology can be used to identify movements that have the potential to lead to terrorist activities, as well as assist patrols and surveillance in determining and identifying paths or routes, both official and unofficial. Thus, PLBN becomes the first line of defense in repelling the threat of terrorism, while supporting national security stability, especially in strategic areas such as the National Capital City. In the context of threat prediction, sensing technology also provides the ability to better predict potential risks. By using dependent variables consisting of satellite imagery and socioenvironmental data, it is possible to

predict the presence or absence of terrorism in Europe at a previously unexplored spatial scale (Buffa, 2022). For example, by monitoring suspicious activity at the border or other strategic locations, sensing systems can provide early warnings that allow authorities to take preventive measures. In a study on real-time imagery of tiger monitoring, images were received in real-time, approximately 30 seconds after the camera captured the image until a notification appeared on the smartphone application. This analysis of the use of AI-based real-time warning systems for managers and local communities suggests how they can help monitor tigers and other endangered species, detect poaching, and provide early warning for human-wildlife conflicts (Dertien, 2023). In this case, the technology can be applied to border posts so that proactive and real-time security measures are determined, rather than reactive ones that often come too late.

The relationship between geography and vulnerability to terrorism threats is crucial in understanding the risks faced by a region, especially the resilience of the National Capital. Remote sensing data from Landsat imagery acquired between 1990 and 2022 were used to identify land use types and time series analysis was conducted to detect changes over time. This classification identified four main categories: vacant land, built-up areas, rocks, and vegetation. The findings showed a significant increase in urban development (Darem, 2023). Geographic factors, such as strategic location on the border, topography, and accessibility, can affect the level of vulnerability to terrorism and crime threats from the capital's borders. For example, areas with open and poorly monitored entry points, which are common in border areas, are more vulnerable to terrorist group infiltration. In addition, geographical conditions such as dense forests or difficult-to-access terrain can complicate threat detection and response efforts. Sensing technology can also be a very important tool in efforts to prevent environmental terrorism threats, including against nature reserve areas. Geographic Information Systems have developed rapidly and achieved technological maturity quickly, and have complete and structured technological steps including data preparation, platform building, modeling, and map production (Zhou, 2020). By using technologies such as satellite sensing, drones, and surveillance cameras, it produces data that can be processed by security authorities to monitor suspicious activities obtained in real-time in forest areas and nature reserves. This technology allows early detection of terrorist activities or other dangerous threats. In addition, the data produced from sensing technology can be used for further analysis, so that preventive measures can be taken more quickly and effectively, and reduce the risk of damage caused.

The use of sensing technology has become increasingly crucial in efforts to improve security, especially in the context of monitoring the threat of terrorism and transnational crime. This technology includes a variety of methods, including satellite or drone imagery, each of which has specific advantages and applications in environmental monitoring and detecting suspicious activity. Satellite imagery, for example, offers wide coverage and can monitor changes in land use over time such as the use of land as a base or terrorist camp and provides valuable information on shifting patterns of activity by terrorists in critical areas. With its high-resolution capabilities, satellite imagery allows analysts to identify abnormal activity that may indicate a threat, such as illegal land clearing or the movement of armed groups.

Detection and monitoring mechanisms implemented to control water routes that allow terrorist groups to enter areas closest to the capital through sea lane borders involve data collection, analysis, and interpretation of information to make informed decisions. These missions are also valuable resources for the operational needs of oceanographic and weather forecasting agencies that provide information to shipping and fishing vessels and offshore operations for route optimization and safety, as well as for other decision makers in the fields of coastal, water resources, and disaster management (Srinivasan, 2023). Data collected through highresolution satellite imagery (VHR) can be integrated into geographic information systems (GIS), allowing for spatial analysis and risk modeling. In addition, the advancement of VHR satellites in sensor resolution combined with computing power using advanced algorithms or AI analysts can improve the ability and feasibility of marine surveys

to predict and respond to a movement pattern in the waters (Hoschle, 2021). Another development in satellite technology is the use of synthetic aperture radar (SAR) satellites which also provide higher resolution SAR imagery, which benefits ship detection and instance segmentation (Wei, 2020).

In the context of the application of sensing technology in other countries, we can see various case studies that demonstrate its effectiveness in improving security. For example, in the United States, the use of drones for border patrols has proven effective in reducing drug smuggling and illegal infiltration activities. Through continuous monitoring and with a high interval pattern, border authorities can detect and arrest criminals and terrorists more quickly, thereby reducing the risk of threats to national security. Border patrols using small drones can provide significant assistance in controlling areas that are inaccessible to patrol agents, reducing agent response times, and increasing the safety of patrol agents working in dangerous areas (Ahmadian, 2022). Drone technology is increasingly popular because of its flexibility and mobility. In hobby drones for example, can be equipped with various sensors and cameras that allow real-time image capture in hard-to-reach areas, as well as conducting surveillance at a cost that is certainly lower than military-specification drones (Yaacoub, 2020). The use of drones in security operations has proven effective in border surveillance, search and rescue, and law enforcement missions, where they can detect suspicious movements and provide necessary information to security officers. Ground-based sensors also play a vital role in detecting threats, especially in smaller areas. These sensors can be used to monitor seismic activity, sound, or even chemical changes in the environment, providing invaluable data to detect threats before they become a bigger problem.

Highly sensitive THz detectors operate in a relatively narrow frequency range. However, Terahertz (THz) technology can be widely used in radar, remote sensing, homeland security and counter-terrorism, high-secret data communication and transmission, atmospheric and environmental monitoring, direct biological information extraction, and medical diagnosis (Shi, 2021). In Israel, remote sensing technology has been widely applied in a security context to monitor activities in potentially dangerous areas of Palestinian forces, such as guarding the border with Gaza. With a sophisticated monitoring system, Israel can detect the movement of Palestinian armed groups and prevent attacks before they occur. On the other hand, the Hamas group uses relatively smaller and faster drones at a much lower price but can be maximized effectively to attack Israeli forces, reflecting the development of increasingly complex and strategic military technology. Although traditionally, UAVs were only used for reconnaissance and surveillance purposes, now UAVs are used to carry out attacks, rescue missions, and various other applications for military purposes (Chamola, 2021). Furthermore, countries in Europe are also starting to adopt sensing technology as part of their security strategies. Similarly, to combat terrorism, several European countries have used satellite imagery to monitor crowd movements and detect suspicious activities in public places. With the combination of advanced sensing technology and intelligence data, these countries can improve public security and respond to threats more quickly and effectively. Overall, the use of sensing technology, whether through satellite imagery or drones, offers an innovative and effective solution to improve security at various levels. Through integrated detection and monitoring mechanisms, this technology not only helps in identifying threats but also in formulating better prevention strategies.

With various considerations from case studies in various countries, it is clear that governments need to invest in sensing technology because it can provide significant benefits in creating a safer and more secure environment from the evergrowing threat of terrorism. The use of sensing technology as a prevention strategy and rapid and responsive reaction action in dealing with security threats has become a major focus for many countries around the world. This technology not only functions as a monitoring tool but also as a source of critical information that allows for more accurate data analysis and threat prediction. The use of sensing technology that can be applied is through the analysis of data

collected from various sources from satellite imagery, drones, and sensors. The number of remote sensing satellites has increased rapidly along with advances in space technology and increasing demand in the space industry. Several evaluations of the effectiveness of remote sensing satellite observations mean that this technology has received widespread attention. Using sophisticated algorithms and machine learning techniques, this data can be processed to identify patterns that indicate potential threats. For example, sudden changes in land use, such as clearing forest areas or unusual human activity in certain locations, can indicate a threat, either in the form of organized crime or terrorism. Through this analysis, authorities can respond faster, intervene before the situation worsens, and plan more effective prevention strategies.

When faced with an emergency situation, a proper response plan is also crucial. Sensing technology plays a central role in designing and executing such a plan. In situations where a threat has been detected, it enables a quick and coordinated response. For example, in the case of a terrorist attack in an urban area such as the capital city, real-time information gathered through drones and sensors can help security forces to know the location and movement of the perpetrators of the terrorist act. This data not only helps in coordinating rescue and law enforcement operations but also in reducing the risk to VVIP officials and civilians living in the capital city. A response plan supported by sensing technology enables authorities to act more strategically and efficiently, optimizing the use of available resources.

However, to implement this strategy effectively, collaboration between sensing technology and the relevant security agencies is essential. They should seriously consider involving teams with proven expertise in operating drones, for example, and rely on their valuable contributions (Pensieri, 2020). Integrating data from multiple sources, such as intelligence reports and local information, with sensing technology can create a more comprehensive picture of the situation. Thus, security units do not rely solely on one type of data, but combine multiple perspectives to make more informed decisions. Examples of successful collaboration can be found in many countries, where law enforcement agencies work with technology companies to develop comprehensive monitoring systems. In this case, sensing technology is not only a tool but also a bridge between the various actors involved in maintaining the security of the capital.

In addition, training and capacity building for security personnel is also an important aspect of this collaboration. Proper training is essential to develop effective conservation practices based on remote sensing data. Personnel must be equipped with the necessary skills to analyze and interpret data generated by sensing technologies. Through intensive training programs, they can understand how to utilize data to detect threats and respond appropriately. This also includes understanding how to operate sensing devices, such as drones and sensors, and how to integrate information from various platforms into field operations. The need for effective and successful training for professionals working in the field (Bernd, 2017).

The War on Terrorism in the sense of Universal War, is a war or conflict that involves the mobilization of all strengths and potential resources, including human resources, infrastructure, and other components as a whole. In some activities or certain events, sensing technology can also be used to increase community participation in maintaining security. By providing access to the community to monitor their surroundings through applications based on sensing technology, they can report suspicious activities in real-time to the authorities. Confucian ethics serves as a useful intellectual resource for examining issues arising from the ethical assessment of (emerging) technology and the formation of engineering professionals (Zhu, 2020). This approach not only expands the scope of monitoring but also increases community awareness and involvement in maintaining the security of their environment. This creates synergy between technology, security institutions, and society, which is an important foundation in building resilience to security threats.

Finally, continuous evaluation and updating of the sensing system is also very important. Technology and threats are constantly evolving, so the existing system must be able to adapt to these changes. Through regular evaluation, authorities can identify weaknesses in existing strategies and make necessary improvements. The number of remote sensing satellites has increased rapidly along with the advancement of space technology and the increasing demand in the space industry. The existence of an evaluation of the effectiveness of remote sensing satellite observations means that this technology is receiving extensive attention (li, 2022). This includes adopting new technologies that may be more efficient in detecting threats or updating the algorithms used for data analysis. Thus, the use of sensing technology is not just a one-time strategy, but a continuous process that focuses on improvement and innovation.

The importance of regulation in the use of sensing technology cannot be overstated, especially in the context of national security and the protection of individual privacy. Clear and comprehensive regulation is needed to ensure that this technology is used ethically and responsibly. The importance of Remote sensing technology as a tool for environmental monitoring and environmental law enforcement is analyzed, while legal issues regarding privacy and data protection from its use for environmental purposes are presented (Maniadaki, 2021). Without an adequate legal framework, the risk of misuse of sensing technology increases, which can lead to violations of privacy and human rights. For example, the use of drones for surveillance in public spaces must be strictly regulated, including requirements for flight permits, monitoring area boundaries, and procedures for collecting and storing data. As surveillance has become part of the infrastructure of contemporary society, the task of understanding and updating the concept of surveillance is more important than ever (Lyon, 2022). Good regulation will also include mechanisms for transparency and accountability so that citizens can know how their data is being used and have channels to report abuse.

In addition, information systems or broadcast media also play an important role in this collaboration. The media can serve as a bridge between government institutions and the public, raising public awareness of the security issues faced. The role of counter-discourse by members of the social elite in influencing the framing of conflict coverage in the mainstream media (Bhowmik, 2023). When information about security threats is disseminated through appropriate media channels, the public can be more vigilant and report suspicious activities to the authorities. In this case, collaboration between security institutions and the media is not only beneficial for public security but also builds public trust in government institutions. Framing theory states that digital media is a development communication engine to create awareness of security issues (Nelson, 2019). This trust is important to create an environment where the public is willing to participate in efforts to maintain security, including through reporting suspicious activities.

International cooperation in border security is also essential, given the often global and multinational nature of threats. Many security issues, such as terrorism, human trafficking, and drug trafficking, do not recognize national borders, requiring collaborative efforts between countries. Increasing human populations and socio-economic development make forest protection more serious, especially for forest ecosystems that cross national borders due to differences in national policies and socio-economic conditions (Tang, 2010). The borders of very rich and very poor countries are highly porous, while the borders of relatively prosperous nation-states are much more difficult to cross (Deutschmann, 2023). In this regard, sensing technology can be used to improve coordination between countries in monitoring border activities. For example, exchanging data between countries on suspicious movements can help identify patterns that indicate criminal activity. Law enforcement agencies must strike a fine balance between sharing terrorism intelligence and ensuring that such information is securely protected (Wong, 2022). Countries can form networks robust intelligence, where information about threats can be shared in real time, thereby improving response capabilities to emergency situations.

The importance of this cooperation is also seen in joint exercises and technology sharing. Countries often conduct security exercises involving the use of sensing technology to train personnel in real situations. These exercises not only improve individual skills but also build trust and understanding between different institutions and countries. In addition, by sharing technology and best practices, countries can strengthen their respective capacities in using sensing technology for security purposes. Evidence suggests that "neighborhood-oriented" governance models at different scales have emerged from the mutual impact of cooperation initiatives and integration processes, where strengthening relationships between levels of governance can produce better models (Wong, 2022). International cooperation can also involve international institutions, such as Interpol or ASEAN, which can serve as platforms for sharing information and resources in dealing with cross-border threats. ASEAN has an agreement known as the ASEAN Convention on Counter-Terrorism (ACCT) to combat terrorism (Prakasa, 2021).

4. Conclusions

Utilization of remote sensing technology to monitor terrorism threats on Indonesia's borders, especially in the context of moving the National Capital City to Kalimantan. The relocation of the capital city presents new challenges related to national security because of its location closer to the international border, which is vulnerable to infiltration of cross-border terrorism. With the vastness of Indonesia's border areas, manual monitoring carried out by security forces has become less effective. Therefore, remote sensing technology, such as satellite imagery, drones, and sensors, plays an important role in monitoring threats.

Remote sensing enables early detection of suspicious activities and terrorist movements in hard-to-reach areas. The border region in North Kalimantan shares borders with Malaysia and the Philippines, areas with a history of terrorist activities such as the Abu Sayyaf group. These groups can take advantage of "rat lines" or poorly monitored borders to infiltrate and threaten national security, especially in the new capital city. In addition to physical threats, this essay also highlights the potential for cyber terrorism attacks, where critical infrastructure, such as electricity and water networks, can be attacked to undermine the new government in the capital city. These threats require intensive surveillance, where remote sensing technology plays a role in monitoring vital objects and responding to threats in real-time. Furthermore, remote sensing also contributes to environmental protection around the capital city. The biodiversity-rich Kalimantan region faces threats from uncontrolled human activities, such as illegal logging and forest burning. This technology can be used to identify changes in land use, maintain nature reserves, and monitor endangered species in the area.

International cooperation is essential in addressing the threat of transnational terrorism. This highlights the crucial importance of collaboration between bordering countries, such as Indonesia, Malaysia, and the Philippines, to create a more effective intelligence information network. By sharing data and analysis, these countries can strengthen their ability to detect and prevent acts of terrorism before they occur. In addition, increasing the capacity of the State Border Post (PLBN) is essential to suppress the potential for terrorist infiltration that could endanger regional stability. The use of advanced technology, such as surveillance cameras (CCTV), drones for aerial monitoring, and remote sensing sensors, will greatly assist in detecting suspicious movements along the border. This is not only about maintaining security but also creating a safer and more stable environment for communities in bordering areas, thus creating positive synergy in efforts to combat this global threat. This cooperation must also include training and knowledge exchange between security forces so that all parties have the same ability to face existing challenges.

The using of remote sensing technology is not only a security solution, but also a strategic tool that can help in making decisions quickly and accurately. This technology allows for the detection of anomalies at the border, provides early warning, and accelerates

security responses. Continuous evaluation of the sensing system is also needed to ensure that this technology is always up-to-date in facing evolving threats. Remote sensing technology is an effective solution to detect and address the threat of terrorism, as well as maintaining national stability and the sustainability of the ecosystem around the new capital city.

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References
Ahmadian, N., Lim, G. J., Torabbeigi, M., & Kim, S. J. (2022). Smart border patrol using drones and wireless charging system under budget limitation. *Computers and Industrial Engineering*. https://doi.org/10.1016/j.cie.2021.107891

Ahmed, H.M., & Essa, H.S. (2022). Survey of intelligent surveillance system for monitoring international border security. *Materials Today: Proceedings*. https://doi.org/10.1016/j.matpr.2021.05.550

Akande, A., Cabral, P., Gomes, P., & Casteleyn, S. (2019). The Lisbon ranking for smart sustainable cities in Europe. *Sustainable Cities and Society*. https://doi.org/10.1016/j.scs.2018.10.009

Berawi M. A. (2022). City of Tomorrow: The New Capital City of Indonesia. *International Journal of Technology*. https://doi.org/10.14716/ijtech.v13i4.6011

Bernd, A., Braun, D., Ortmann, A., Ulloa-Torrealba, Y. Z., Wohlfart, C., & Bell, A. (2017). More than counting pixels – perspectives on the importance of remote sensing training in ecology and conservation. *Remote Sensing in Ecology and Conservation*, *3*(1), 38–47. https://doi.org/10.1002/rse2.27

Bhowmik, S., & Fisher, J. (2023). Framing the Israel-Palestine conflict 2021: Investigation of CNN's coverage from a peace journalism perspective. *Media, Culture and Society*, *45*(5), 1019–1035. https://doi.org/10.1177/01634437231154766

Buffa, C., Sagan, V., Brunner, G., & Phillips, Z. (2022). Predicting terrorism in Europe with remote sensing, spatial statistics, and machine learning. ISPRS International Journal of Geo-Information, 11(4), 211. https://doi.org/10.3390/ijgi11040211

Chamola, V., Kotesh, P., Agarwal, A., Naren, Gupta, N., & Guizani, M. (2021). A Comprehensive Review of Unmanned Aerial Vehicle Attacks and Neutralization Techniques. *Ad Hoc Networks*. Elsevier B.V. https://doi.org/10.1016/j.adhoc.2020.102324

Darem, A. A., Alhashmi, A. A., Almadani, A. M., Alanazi, A. K., & Sutantra, G. A. (2023). Development of a map for land use and land cover classification of the Northern Border Region using remote sensing and GIS. *Egyptian Journal of Remote Sensing and Space Science*. https://doi.org/10.1016/j.ejrs.2023.04.005

Dertien, J. S., Negi, H., Dinerstein, E., Krishnamurthy, R., Negi, H. S., Gopal, R., … Baldwin, R. F. (2023). Mitigating human-wildlife conflict and monitoring endangered tigers using a real-time camera-based alert system. *BioScience*. https://doi.org/10.1093/biosci/biad076

Deutschmann, E., Gabrielli, L., & Recchi, E. (2023). Roads, rails, and checkpoints: Assessing the permeability of nation-state borders worldwide. *World Development*, *164*. https://doi.org/10.1016/j.worlddev.2022.106175

Gonia, A., & Jezierska-Thöle, A. (2022). Sustainable Tourism in Cities—Nature Reserves as a 'New' City Space for Nature-Based Tourism. *Sustainability (Switzerland)*. https://doi.org/10.3390/su14031581

Gonzalez, L. F., Montes, G. A., Puig, E., Johnson, S., Mengersen, K., & Gaston, K. J. (2016). Unmanned aerial vehicles (UAVs) and artificial intelligence revolutionizing wildlife monitoring and conservation. *Sensors (Switzerland)*. https://doi.org/10.3390/s16010097

Hakonen, A., Andersson, P. O., Stenbæk Schmidt, M., Rindzevicius, T., & Käll, M. (2015). Explosive and chemical threat detection by surface-enhanced Raman scattering: A review. *Analytica Chimica Acta. Elsevier B.V.* https://doi.org/10.1016/j.aca.2015.04.010

Höschle, C., Cubaynes, H. C., Clarke, P. J., Humphries, G., & Borowicz, A. (2021). The potential of satellite imagery for surveying whales. *Sensors (Switzerland)*, *21*(3), 1–6. https://doi.org/10.3390/s21030963

Hudalah, D. (2023). Building a capital city, carving out a megaproject legacy?. *Habitat International*. https://doi.org/10.1016/j.habitatint.2023.102933

Kalicharan, V. S. (2019). An evaluation of the islamic state's influence over the Abu Sayyaf. *Perspectives on Terrorism*. ISSN: 23343745

Kohler C., Denner dos Santos C., Bursztyn M. (2019). Understanding environmental terrorism in times of climate change: Implications for asylum seekers in Germany. *Research in Globalization*. https://doi.org/10.1016/j.resglo.2019.100006

Levy, I., & Rozmann, N. (2023). Differences in attitudes toward terrorists: Type of terrorist act, terrorist ethnicity, and observer gender and cultural background. *Group Processes and Intergroup Relations*. https://doi.org/10.1177/13684302211040112

Li, Z., Dong, Y., Li, P., Li, H., & Liew, Y. (2022). A New Method for Remote Sensing Satellite Observation Effectiveness Evaluation. *Aerospace*, *9*(6). https://doi.org/10.3390/aerospace9060317

Lyon, D. (2022). Surveillance. Internet Policy Review, 11(4), 1–19. https://doi.org/10.14763/2022.4.1673

Maniadaki, M., Papathanasopoulos, A., Mitrou, L., & Maria, E. A. (2021). Reconciling Remote

Sensing Technologies with Personal Data and Privacy Protection in the European Union: Recent Developments in Greek Legislation and Application Perspectives in Environmental Law. Laws, 10(2). https://doi.org/10.3390/laws10020033

Morawska, L., Miller, W., Riley, M., Vardoulakis, S., Zhu, Y. G., Marks, G., Garnawat, P., Kumar, P., Thynell, M. (2022). How to build Urbanome, the genome of the city?. *Science of the Total Environment*. https://doi.org/10.1016/j.scitotenv.2021.152310

Nelson, O., Amodu, L., Jegede, A., Adesina, E., & Martins, O. (2019). Global media, digital journalism and the question of terrorism: An empirical inquest on ISIS. *Media Watch*, *10*(2), 212–224. https://doi.org/10.15655/mw/2019/v10i2/49619

Pawar K., & Attar V. (2019). Deep learning approaches for video-based anomalous activity detection. *World Wide Web*. https://doi.org/10.1007/s11280-018-0582-1

Pensieri, M. G., Garau, M., & Barone, P. M. (2020). Drones as an integral partof remote sensing technologies to help missing people. *Drones*, *4*(2), 1–10. https://doi.org/10.3390/drones4020015

Prakasa, S. U. W., Al-Fatih, S., & Haqqi, A. R. A. (2021). Terrorism Eradication in ASEAN Countries: Human Rights Perspective. *Al-Ihkam: Jurnal Hukum Dan Pranata Sosial*, *16*(2), 327–361. https://doi.org/10.19105/AL-LHKAM.V16I2.5021

Sandifer, P. A., Sutton-Grier, A. E., & Ward, B. P. (2015). Exploring connections among nature, biodiversity, ecosystem services, and human health and well-being: Opportunities to enhance health and biodiversity conservation. *Ecosystem Services*. Elsevier B.V. https://doi.org/10.1016/j.ecoser.2014.12.007

Shi, Y., Zhang, X., Qiu, Q., Gao, Y., & Huang, Z. (2021). Design of Terahertz Detection Antenna with Fractal Butterfly Structure. *IEEE Access*, *9*, 113823–113831. https://doi.org/10.1109/ACCESS.2021.3103205

Smith, K. T., Smith, L. M., Burger, M., & Boyle, E. S. (2023). Cyber terrorism cases and stock market valuation effects. *Information and Computer Security*. https://doi.org/10.1108/ICS-09-2022-0147

Srinivasan, M., & Tsontos, V. (2023, August 1). Satellite Altimetry for Ocean and Coastal Applications: A Review. *Remote Sensing*. Multidisciplinary Digital Publishing Institute (MDPI). https://doi.org/10.3390/rs15163939

Subagyo A. (2021). The implementation of the pentahelix model for the terrorism deradicalization program in Indonesia. *Cogent Social Sciences*. https://doi.org/10.1080/23311886.2021.1964720

Syaban A. & Appiah-Opoku S. (2023). Building Indonesia's new capital city: an in-depth analysis of prospects and challenges from current capital city of Jakarta to Kalimantan. *Urban, Planning and Transport Research*. https://doi.org/10.1080/21650020.2023.2276415

Tang, L., Shao, G., Piao, Z., Dai, L., Jenkins, M. A., Wang, S., … Zhao, J. (2010). Forest degradation deepens around and within protected areas in East Asia. *Biological Conservation*, *143*(5), 1295–1298. https://doi.org/10.1016/j.biocon.2010.01.024

Trevish A. I. (2016). Capital cities and state borders: Spatial relationships and shifts. *Regional Research of Russia*. https://doi.org/10.1134/S2079970516030084

Wei, S., Zeng, X., Qu, Q., Wang, M., Su, H., & Shi, J. (2020). HRSID: A High-Resolution SAR Images Dataset for Ship Detection and Instance Segmentation. *IEEE Access*, *8*, 120234–120254. https://doi.org/10.1109/ACCESS.2020.3005861

Wong, J. (2022). Sharing terrorism intelligence: insights from UK law enforcement agencies. *Journal of Policing, Intelligence and Counter Terrorism*, *17*(2), 218–228. https://doi.org/10.1080/18335330.2021.2016898

Wong Villanueva, J. L., Kidokoro, T., & Seta, F. (2022). Cross-Border Integration, Cooperation and Governance: A Systems Approach for Evaluating "Good" Governance in Cross-Border Regions. *Journal of Borderlands Studies*, *37*(5), 1047–1070. https://doi.org/10.1080/08865655.2020.1855227

Yaacoub, J. P., Noura, H., Salman, O., & Chehab, A. (2020, September 1). Security analysis of drones systems: Attacks, limitations, and recommendations. *Internet of Things*

(Netherlands). Elsevier B.V. https://doi.org/10.1016/j.iot.2020.100218
Zhou, C., Su, F., Pei, T., Zhang, A., Du, Y., Luo, B., … Xiao, H. (2020). COVID-19: Challenges to GIS with Big Data. *Geography and Sustainability*. https://doi.org/10.1016/j.geosus.2020.03.005
Zhu, Q. (2020). Ethics, society, and technology: A Confucian role ethics perspective. *Technology in Society*, *63*. https://doi.org/10.1016/j.techsoc.2020.101424

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