



## IMPLEMENTATION OF INDONESIAN NAVY COOPERATION IN ENHANCING NATIONAL RESILIENCE ACROSS FRONTIER, OUTERMOST, AND UNDERDEVELOPED ISLANDS

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### Abstract

Indonesia's frontier, outermost, and underdeveloped islands face multidimensional challenges involving geographical isolation, limited public services, socioeconomic disparities, maritime security risks, and uneven institutional capacity, requiring collaborative approaches to strengthen national resilience. This study examined the implementation of Indonesian Navy cooperation with civilian institutions, local governments, and communities in enhancing sustainable resilience across strategically significant island regions. A mixed-methods multiple-case study integrated quantitative assessments, semi-structured interviews, field observations, document analysis, and cross-case comparisons to evaluate cooperation quality, collaborative implementation, community capacity, institutional integration, and resilience outcomes. The findings revealed that effective cooperation strengthened maritime awareness, institutional coordination, community preparedness, public-service accessibility, and adaptive capacity when programs incorporated clear institutional roles, integrated resources, local participation, and implementation continuity. Community capacity and institutional integration emerged as critical mechanisms linking strategic maritime cooperation with multidimensional island resilience. The study concludes that institutional presence and short-term assistance alone do not automatically strengthen national resilience. Sustainable cooperation requires local ownership, strengthened civilian institutions, durable collaborative networks, and community self-reliance. Indonesian Navy cooperation contributes most effectively when its maritime reach, logistical capabilities, and organizational capacity complement civilian governance while enabling island communities to develop sustainable capacities for managing security, socioeconomic, environmental, and connectivity-related challenges independently.

**Keywords:** Collaborative Governance; Indonesian Navy; Island Resilience; Maritime Cooperation; National Resilience.



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## INTRODUCTION

Indonesia's geographical character as a vast archipelagic state places islands and maritime spaces at the center of national security, territorial integrity, economic connectivity, and social development (Arif et al., 2024). Frontier, outermost, and underdeveloped islands occupy a particularly strategic position because they function not only as inhabited territories but also as physical representations of sovereignty and gateways connecting national territory with neighboring states and international maritime spaces (Triwidiyanti et al., 2024). Their geographical remoteness, limited connectivity, uneven infrastructure, restricted access to public services, and exposure to cross-border dynamics create multidimensional challenges that cannot be addressed through conventional security approaches alone (Huda et al., 2024). National resilience in these areas therefore depends on the interaction of defense readiness, socioeconomic development, institutional presence, community capacity, and effective governance.

The strategic importance of frontier, outermost, and underdeveloped islands has increased amid changing regional and global conditions (Ahmadi & Herdiawan, 2024). Maritime territorial disputes, illegal fishing, transnational crime, irregular cross-border activities, environmental degradation, climate-related risks, economic inequality, and geopolitical competition can generate interconnected pressures on remote island communities (Pranowo et al., 2025). Limited transportation, communication, healthcare, education, energy, and economic infrastructure may further increase local vulnerability and weaken the integration of peripheral communities with national development processes (Herawati et al., 2024). Security in these regions should consequently be understood as a multidimensional condition involving territorial protection, human security, social welfare, economic opportunity, ecological sustainability, and public confidence in state institutions.

The Indonesian Navy occupies a strategically relevant position within this environment because its maritime presence enables interaction with communities and institutions located in geographically difficult-to-reach areas (Al Fatih et al., 2025). Its primary defense responsibilities remain fundamental, yet cooperation with civilian government agencies, local governments, communities, educational institutions, health services, and other stakeholders can support broader national objectives when conducted within appropriate legal and institutional mandates (Badrudin et al., 2026a). Such cooperation may contribute to maritime awareness, emergency response, community empowerment, public-service accessibility, and national integration (Li et al., 2025a). The effectiveness of these contributions depends less on isolated institutional activities than on how cooperation is designed, coordinated, implemented, and sustained.

The central problem addressed by this study concerns the gap between the strategic importance of frontier, outermost, and underdeveloped islands and the uneven institutional capacity available to strengthen their resilience (Baroroh et al., 2024). Geographic isolation increases the cost and complexity of delivering public services, maintaining infrastructure, supporting local economies, and ensuring continuous state presence (Li et al., 2025b). Communities living in remote islands may consequently experience development disparities that cannot be resolved through security presence alone (Badrudin et al., 2026b). A comprehensive approach is required to connect territorial security with social, economic, institutional, and community dimensions of resilience.

Institutional fragmentation represents another significant challenge. Programs involving maritime security, regional development, transportation, fisheries, healthcare, education, disaster management, border governance, and community empowerment are often distributed across multiple institutions with different mandates and administrative structures (Soemarmi et al., 2025). Cooperation involving the Indonesian Navy can potentially improve access, logistical coordination, maritime reach, and emergency capacity, yet overlapping responsibilities or poorly defined institutional roles may reduce program effectiveness (Suharto

et al., 2024). Short-term activities may produce visible outputs without necessarily generating sustainable improvements in community resilience.

A further problem concerns the limited empirical understanding of how defense–civilian cooperation translates into measurable national-resilience outcomes at the local level (Putra et al., 2026). Institutional cooperation is often evaluated through the number of programs conducted, facilities provided, personnel deployed, or beneficiaries reached (Putra et al., 2026). Such output-oriented measures do not necessarily demonstrate whether cooperation improves community preparedness, public-service access, economic capacity, social cohesion, institutional trust, or long-term resilience (Bakka et al., 2026). The analytical challenge is therefore to identify the mechanisms through which cooperation produces sustainable outcomes rather than assuming that institutional presence automatically strengthens national resilience.

This study aims to examine the implementation of Indonesian Navy cooperation with governmental, civilian, and community stakeholders in strengthening national resilience across frontier, outermost, and underdeveloped islands (Sofiyan et al., 2026). The research focuses on how cooperative programs are planned, coordinated, implemented, monitored, and sustained within geographically remote and strategically significant island contexts (Parimba et al., 2024). Particular attention is directed toward the relationship between institutional cooperation and multidimensional resilience outcomes involving security, socioeconomic capacity, public services, social cohesion, and community preparedness.

The study seeks to identify the institutional mechanisms that determine the effectiveness of collaborative initiatives (Bonsu & Akekudaga, 2025). Coordination quality, clarity of institutional roles, resource integration, local-government participation, community engagement, program continuity, adaptive capacity, and monitoring systems are examined as potential determinants of successful implementation (Botschner et al., 2024). The research also aims to identify barriers arising from geographical isolation, logistical limitations, fragmented authority, resource constraints, and differences between centrally designed programs and locally identified priorities.

The research further aims to develop an analytical framework connecting Strategic Maritime Cooperation - Collaborative Implementation - Community Capacity and Institutional Integration - Multidimensional Island Resilience - National Resilience (Krysovatty et al., 2024). The framework positions community participation, interagency coordination, local institutional capacity, program sustainability, and contextual adaptation as critical mechanisms connecting cooperation with resilience outcomes (“Agricultural Lands in Azerbaijan,” 2025). This perspective allows national resilience to be examined as an outcome of sustained institutional and societal capacity rather than simply the presence of defense or government institutions.

Existing literature on Indonesia’s frontier and outermost islands has extensively discussed territorial sovereignty, maritime boundaries, defense strategy, illegal fishing, border security, infrastructure disparities, and regional development (Chang et al., 2025). National-resilience studies have also examined ideological, political, economic, sociocultural, defense, and security dimensions (Wang et al., 2024). These bodies of scholarship provide important foundations but frequently examine security and development through separate analytical perspectives (Kirakosyan, 2025). Limited research systematically explains how maritime-defense institutions cooperate with civilian stakeholders to connect territorial security with community-level resilience.

Civil–military cooperation literature provides useful insights into disaster response, humanitarian assistance, infrastructure support, community engagement, and non-war military operations (Asraf et al., 2026). A substantial portion of this scholarship, however, focuses on temporary emergencies or specific operational activities (Sutrisno et al., 2024). Less attention has been given to long-term cooperative governance in remote island environments where

security challenges coexist with structural development inequalities (Ma et al., 2024). The distinction is important because resilience cannot be built solely through episodic interventions; it requires sustained institutional relationships and locally embedded capacities.

Empirical research also remains limited regarding the mechanisms through which Indonesian Navy cooperation produces resilience outcomes beyond immediate program outputs (Rezvani et al., 2024). Studies may document activities such as health services, infrastructure assistance, maritime education, community outreach, or logistical support without systematically examining their cumulative effects on local institutional capacity, community self-reliance, economic resilience, or public trust (Burholt et al., 2024). A stronger analytical approach is needed to distinguish short-term institutional assistance from cooperation that creates durable local capacity and sustainable national-resilience outcomes.

The principal novelty of this study lies in conceptualizing Indonesian Navy cooperation through a Collaborative Maritime Resilience perspective (Miao & Zhang, 2024). This concept treats national resilience in frontier, outermost, and underdeveloped islands as the product of coordinated relationships among defense institutions, civilian government, local authorities, communities, and other relevant stakeholders (Stuart et al., 2024). The approach moves beyond a state-presence model toward a capacity-building model in which the effectiveness of cooperation is evaluated according to whether it strengthens local institutions, community preparedness, connectivity, social cohesion, and sustainable problem-solving capabilities.

A second element of novelty lies in the proposed Collaborative Maritime Resilience Framework: Strategic Maritime Cooperation - Collaborative Implementation - Community Capacity and Institutional Integration - Multidimensional Island Resilience - National Resilience (Richter et al., 2026). The framework distinguishes cooperation inputs from implementation quality and long-term outcomes. Institutional coordination, community participation, contextual adaptation, program continuity, and local ownership are positioned as mechanisms that determine whether cooperative initiatives become sustainable (Selly et al., 2026). This model provides a basis for explaining why similar programs may produce different outcomes across island communities with different geographic, socioeconomic, and institutional characteristics.

The study is justified by the need to develop a more integrated understanding of security and development in strategically important peripheral regions. The Indonesian Navy possesses distinctive maritime reach, logistical capabilities, and institutional presence, but these advantages should complement rather than substitute for the mandates and capacities of civilian institutions (Wuryaningrum et al., 2026). Effective cooperation should therefore be assessed not by the extent to which military institutions perform civilian functions, but by whether collaboration strengthens legitimate civilian governance, expands local capacity, improves community resilience, and reduces long-term dependence on external intervention (Abdy Kurniawan et al., 2026). The central question consequently shifts from how much assistance or institutional presence has been provided toward to what extent does interinstitutional cooperation create sustainable local capacity to withstand, adapt to, and recover from security, socioeconomic, environmental, and connectivity-related pressures this perspective offers a more rigorous foundation for understanding how maritime cooperation can contribute to inclusive and sustainable national resilience across Indonesia's strategically significant island regions.

## RESEARCH METHOD

### *Research Design*

This study employed a mixed-methods multiple-case study design to examine the implementation of Indonesian Navy cooperation in strengthening national resilience across frontier, outermost, and underdeveloped island regions (Nggalu Bali et al., 2026). The design

combined quantitative assessment with qualitative inquiry to capture both measurable patterns of cooperation and the contextual processes through which collaborative initiatives influenced local resilience. The analytical framework followed the pathway Strategic Maritime Cooperation - Collaborative Implementation - Community Capacity and Institutional Integration - Multidimensional Island Resilience - National Resilience (Wulandari et al., 2026). This framework enabled the study to distinguish institutional activities and immediate program outputs from longer-term outcomes related to community capacity, institutional integration, adaptability, and resilience.

The quantitative component adopted a cross-sectional explanatory approach to assess the quality of interinstitutional cooperation, implementation effectiveness, community participation, local institutional capacity, program sustainability, and perceived resilience outcomes. Quantitative analysis was designed to determine whether stronger collaborative implementation was associated with higher levels of community capacity and multidimensional island resilience. Particular attention was given to coordination quality, clarity of institutional roles, resource integration, local ownership, continuity of programs, and responsiveness to locally identified needs.

The qualitative component employed semi-structured interviews, field observations, and document analysis within selected island cases. This component examined how cooperative initiatives were planned, negotiated, implemented, monitored, and sustained across different geographical and institutional contexts. The multiple-case structure allowed comparison between islands with different levels of accessibility, infrastructure, socioeconomic development, institutional capacity, and exposure to maritime-security challenges. Integration of quantitative and qualitative evidence provided a more comprehensive explanation of why similar forms of cooperation could produce different resilience outcomes across locations.

### *Research Target/Subject*

The primary population for this study comprises stakeholders actively engaged in or directly impacted by collaborative programs between the Indonesian Navy (TNI AL), civilian government bodies, local authorities, and residents in frontier, outermost, and underdeveloped island regions (3T). Institutional targets encompass naval personnel, local government officials, civilian public service agency representatives, educators, healthcare workers, port and maritime sector actors, and civil society leaders. To complement official insights, the research targets adult community members who have direct, firsthand experience with these joint initiatives, ensuring the assessment integrates ground-level beneficiary perspectives alongside institutional viewpoints.

The physical and empirical subjects are structured through a multiple-case study selection strategy across strategically significant island regions. These locations are purposively targeted based on geographic accessibility, infrastructure availability, socioeconomic development, maritime security relevance, and documented experience with collaborative programs. Furthermore, documentary subjects include publicly accessible cooperation agreements, local development blueprints, policy frameworks, and institutional evaluation reports. Strictly excluding classified defense details or sensitive operational logistics, the research targets focus exclusively on publicly assessable governance mechanisms, community capacity, program continuity, and multidimensional island resilience.

### *Research Procedure*

The research began with ethical approval, institutional authorization, site selection, participant recruitment, and informed-consent procedures. Participants were informed about the objectives of the study, voluntary participation, confidentiality, data protection, and their right to withdraw. Research activities were designed to exclude classified defense information,

sensitive operational details, and information that could compromise national security or participant safety.

The first stage involved mapping collaborative programs in the selected island cases. Publicly accessible documents, institutional records, local development plans, cooperation agreements, and program reports were reviewed to identify the types of activities implemented, participating institutions, target communities, intended outcomes, and implementation periods. This stage established the contextual profile of each case before primary data collection.

The second stage involved administration of the quantitative questionnaire to eligible stakeholders and community respondents. Data were screened for completeness, missing values, response quality, and statistical assumptions. Descriptive statistics were used to characterize cooperation and resilience indicators, while reliability and validity analyses assessed measurement quality. Differences among island cases and stakeholder groups were examined where theoretically and statistically appropriate.

Inferential analysis tested the relationships proposed in the Collaborative Maritime Resilience Framework. Multiple regression or structural equation modeling was employed, depending on sample adequacy, to examine whether strategic maritime cooperation predicted collaborative implementation quality and whether implementation quality subsequently influenced community capacity, institutional integration, and multidimensional resilience. Mediation analysis examined whether community capacity and institutional integration explained the relationship between cooperation quality and resilience outcomes.

The third stage consisted of semi-structured interviews and field observations. Interviews were recorded with consent, transcribed, anonymized, and analyzed through thematic analysis. Coding focused on coordination, role clarity, community participation, logistical challenges, institutional trust, local ownership, program continuity, dependency, adaptive capacity, and sustainability. Field observations were compared with participant accounts to identify consistencies and discrepancies between reported and observable implementation.

The fourth stage involved cross-case comparison. Each island case was analyzed according to cooperation intensity, implementation quality, institutional integration, community participation, local capacity, and resilience outcomes. Cases with relatively strong and weak implementation patterns were compared to identify mechanisms that explained variation in outcomes. Geographic isolation, infrastructure limitations, resource availability, local leadership, and institutional continuity were considered as contextual conditions rather than treated as direct causes without supporting evidence.

The fifth stage integrated quantitative, qualitative, observational, and documentary findings through methodological triangulation. Statistical relationships were compared with interview narratives, field observations, and program documentation to identify convergence, divergence, and implementation gaps. Particular attention was given to differences between formal program outputs and evidence of sustainable local outcomes. Activities such as service delivery, infrastructure support, training, or community assistance were not automatically classified as resilience improvements unless evidence indicated stronger local capacity, institutional continuity, or adaptive capability.

The final analytical stage applied the framework Strategic Maritime Cooperation - Collaborative Implementation Community Capacity and Institutional Integration Multidimensional Island Resilience - National Resilience. Interpretation focused on whether cooperation created sustainable capacities rather than merely temporary benefits or institutional visibility. Program effectiveness was therefore evaluated according to the extent to which collaborative initiatives strengthened legitimate civilian governance, community self-reliance, institutional coordination, local ownership, and the capacity of island communities to anticipate, withstand, adapt to, and recover from security, socioeconomic, environmental, and connectivity-related pressures.

### *Instruments, and Data Collection Techniques*

The primary quantitative instrument was the Collaborative Maritime Resilience Questionnaire, developed to measure five principal constructs: strategic maritime cooperation, collaborative implementation quality, community capacity, institutional integration, and multidimensional island resilience. Responses were recorded using a Likert-type scale, with indicators derived from collaborative-governance theory, community-resilience research, institutional-capacity frameworks, and national-resilience concepts.

Strategic maritime cooperation was measured through indicators of shared objectives, interinstitutional commitment, resource mobilization, communication, and alignment between security and development priorities. Collaborative implementation quality assessed role clarity, coordination effectiveness, resource integration, responsiveness to local needs, continuity of activities, and mechanisms for resolving implementation problems. These indicators distinguished the existence of formal cooperation from the actual quality of collaboration in practice.

Community capacity was assessed through indicators of local participation, preparedness, problem-solving ability, access to knowledge and services, community organization, and capacity to maintain program benefits. Institutional integration measured coordination among naval, civilian, local-government, and community actors, including information sharing, referral mechanisms, joint planning, and continuity of institutional relationships. Local ownership was assessed as an important dimension indicating whether communities participated meaningfully in identifying priorities, implementing activities, and sustaining outcomes.

Multidimensional island resilience was operationalized through interconnected security, social, economic, institutional, public-service, and adaptive-capacity dimensions. Indicators examined perceived improvements in community preparedness, access to essential services, institutional responsiveness, social cohesion, livelihood support, maritime awareness, and the capacity to respond to disruptions. National resilience was interpreted through the contribution of strengthened local capacities to broader territorial integration, societal stability, security, and sustainable national cohesion.

A semi-structured interview protocol was used to explore participants' experiences of cooperation in greater depth. Questions addressed program planning, institutional roles, coordination mechanisms, local participation, logistical constraints, program continuity, perceived benefits, unintended consequences, dependency risks, and sustainability. Interviews also examined whether collaborative initiatives strengthened existing civilian and community capacities or created continued reliance on external institutional assistance.

A structured observation guide was used during field visits to document visible program implementation, public-service accessibility, community participation, infrastructure conditions, institutional interaction, and evidence of program continuity. Observations were recorded systematically without collecting operationally sensitive defense information. Field evidence was used to verify whether reported program activities corresponded with observable conditions within participating communities.

A document-analysis matrix was developed to examine cooperation agreements, publicly accessible program reports, local development documents, policy frameworks, evaluation reports, and relevant institutional records. Documents were coded according to program objectives, institutional responsibilities, implementation mechanisms, resource commitments, beneficiary participation, monitoring indicators, sustainability arrangements, and reported outcomes. The matrix supported comparison between formal program design and actual implementation.

Instrument quality was established through expert review involving specialists in maritime security, public administration, national resilience, community development, and research methodology. Content validity was assessed to ensure that indicators adequately

represented the proposed constructs. Pilot testing was conducted with respondents possessing characteristics similar to the target population, while internal consistency and construct validity were evaluated using appropriate reliability and factor-analytic procedures.

*Data Analysis Technique*

The quantitative analytical phase applies a combination of descriptive, measurement validation, and inferential statistical methods to test the structural model. Following initial data screening for completeness and assumptions, descriptive statistics summarize the core constructs, while reliability analysis and confirmatory factor analysis (CFA) validate the measurement instruments. Inferential techniques specifically multiple regression or structural equation modeling (SEM) are utilized to evaluate whether strategic maritime cooperation drives collaborative implementation quality, and how that quality translates into community capacity, institutional integration, and multidimensional island resilience. Additionally, mediation analysis evaluates whether local community capacity and institutional integration act as pathways through which cooperation impacts overall resilience.

The qualitative and cross-case analytical procedures employ thematic analysis for interview transcripts, systematic coding for document matrices, and structured cross-case comparisons. Transcripts and observation logs are categorized into key themes such as role clarity, local ownership, dependency risks, and logistical constraints while actively considering divergent cases to mitigate bias. Using cross-case analysis, islands with varying levels of implementation success are systematically compared to isolate contextual drivers like geographic isolation or local leadership. Finally, the study uses methodological triangulation to merge quantitative, qualitative, observational, and documentary data, allowing for a rigorous evaluation of gaps between formal program outputs and true, long-term local resilience.

**RESULTS AND DISCUSSION**

The descriptive analysis showed measurable differences in learning outcomes between students who regularly used digital collaboration tools and those who participated in conventional learning activities with limited collaborative technology. The study involved 320 students divided into an intervention group using integrated collaboration tools (n = 160) and a comparison group following conventional digitally supported instruction (n = 160). Baseline achievement scores were relatively similar between the two groups, with a mean pretest score of 68.42 (SD = 7.86) for the intervention group and 68.17 (SD = 8.04) for the comparison group. Posttest performance increased to 82.36 (SD = 6.91) in the intervention group, compared with 75.28 (SD = 7.43) in the comparison group. The descriptive pattern indicated a larger improvement among students who experienced structured technology-supported collaboration.

**Table 1.** Descriptive Statistics of Student Learning Outcomes and Collaborative Learning Indicators

| Variable                      | Intervention Group M (SD) | Comparison Group M (SD) | Mean Difference |
|-------------------------------|---------------------------|-------------------------|-----------------|
| Pretest Achievement           | 68.42 (7.86)              | 68.17 (8.04)            | 0.25            |
| Posttest Achievement          | 82.36 (6.91)              | 75.28 (7.43)            | 7.08            |
| Learning Engagement           | 4.12 (0.55)               | 3.48 (0.63)             | 0.64            |
| Peer Interaction              | 4.21 (0.51)               | 3.39 (0.67)             | 0.82            |
| Knowledge Sharing             | 4.08 (0.58)               | 3.31 (0.65)             | 0.77            |
| Collaborative Problem-Solving | 4.03 (0.57)               | 3.44 (0.61)             | 0.59            |
| Self-Regulated                | 3.89 (0.62)               | 3.51 (0.66)             | 0.38            |

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## Learning

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Secondary data obtained from learning-management records supported the descriptive findings. Students in the intervention group demonstrated higher frequencies of peer feedback, shared-document editing, group discussion participation, and collaborative task completion. Digital activity records showed that approximately 78% of students in the intervention group contributed regularly to shared learning spaces, while 64% participated consistently in asynchronous discussions. Students who maintained more consistent collaborative participation generally demonstrated stronger task completion and posttest performance.

The improvement in academic performance suggests that collaboration tools provided learning opportunities extending beyond simple access to digital technology. Shared documents, discussion platforms, collaborative workspaces, and synchronous communication enabled students to externalize ideas, compare interpretations, negotiate meaning, and revise their understanding through peer interaction. The observed achievement gains therefore appear to reflect the pedagogical processes supported by the tools rather than the technological platforms themselves.

The differences in engagement and knowledge sharing further indicate that collaboration tools were most beneficial when embedded within structured learning activities. Students were required to assume specific responsibilities, contribute evidence to group discussions, provide peer feedback, and collectively produce learning artifacts. Such structures reduced the possibility that digital collaboration would become passive communication and transformed technological interaction into academically purposeful participation.

Analysis of student participation patterns revealed variation in the intensity and quality of collaboration. Students with high levels of digital participation achieved a mean posttest score of 84.73 (SD = 5.88), while moderately active participants obtained a mean of 80.61 (SD = 6.42). Students classified as having low collaborative participation achieved a mean score of 75.94 (SD = 7.16). This pattern suggests that access to collaboration tools alone was insufficient to generate uniform academic benefits.

Qualitative observations also identified differences in the nature of student interaction. High-performing groups demonstrated more frequent explanatory dialogue, peer questioning, evidence-based disagreement, task coordination, and revision of shared work. Lower-performing groups tended to divide tasks mechanically, communicate primarily about deadlines, and combine individual contributions with limited intellectual integration. The quality of collaboration therefore appeared to distinguish productive collaborative learning from simple division of labor.

An analysis of covariance controlling for baseline achievement demonstrated a statistically significant effect of the collaborative learning intervention on posttest achievement,  $F(1, 317) = 46.82$ ,  $p < .001$ , partial  $\eta^2 = .129$ . The adjusted posttest mean remained significantly higher for the intervention group after controlling for initial differences. The effect size indicated a meaningful educational impact, suggesting that structured use of collaboration tools contributed to academic performance beyond pre-existing achievement levels.

Multiple regression analysis further showed that peer interaction ( $\beta = .29$ ,  $p < .001$ ), knowledge sharing ( $\beta = .24$ ,  $p < .001$ ), collaborative problem-solving ( $\beta = .21$ ,  $p = .002$ ), and learning engagement ( $\beta = .18$ ,  $p = .006$ ) significantly predicted student learning outcomes. Frequency of platform access alone was a comparatively weak predictor after these learning-process variables were included in the model ( $\beta = .07$ ,  $p = .184$ ). This result indicates that meaningful collaborative behaviors were more important than simple technological usage frequency.

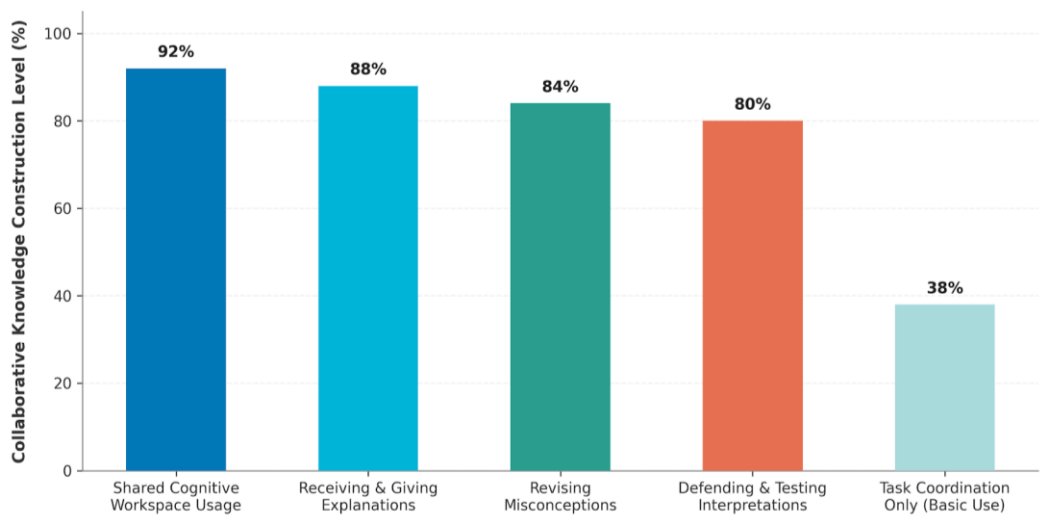
Correlation analysis identified a significant positive relationship between the quality of collaborative interaction and academic achievement ( $r = .52$ ,  $p < .001$ ). Knowledge sharing was positively associated with collaborative problem-solving ( $r = .61$ ,  $p < .001$ ), while peer

interaction correlated positively with learning engagement ( $r = .57, p < .001$ ). Self-regulated learning also demonstrated positive relationships with engagement ( $r = .49, p < .001$ ) and posttest achievement ( $r = .38, p < .001$ ).

The relationships among these variables suggest an interconnected learning mechanism. Collaboration tools appeared to support peer interaction, which created opportunities for knowledge exchange and collaborative problem-solving. These processes increased engagement and encouraged students to monitor their own contributions within shared tasks. Academic improvement therefore emerged through a network of social and cognitive learning processes rather than through a direct and isolated effect of technology.

A case analysis of one high-performing collaborative group illustrated how digital tools supported the development of shared understanding. Five students used a shared document, asynchronous discussion space, and synchronous meetings to complete a problem-based assignment. Early contributions contained competing interpretations of the problem, but students gradually compared evidence, questioned assumptions, revised explanations, and integrated different perspectives into a coherent final solution. Revision history showed that all group members contributed substantively rather than relying on a single dominant participant.

A contrasting case involving a lower-performing group demonstrated a different pattern. Students used the same technological features but primarily divided the assignment into separate sections and communicated about task completion rather than conceptual understanding. Individual sections were assembled shortly before submission with limited peer review or synthesis. The group completed the required task, yet its final product contained conceptual inconsistencies and weaker connections among arguments. The contrast demonstrates that technological availability did not automatically generate meaningful collaboration.



**Figure 1.** Knowledge Construction vs. Task Coordination in Digital Collaboration

The case comparison explains why variation in learning outcomes persisted despite equal access to collaboration tools. Productive groups used technology as a shared cognitive workspace in which ideas remained visible, revisable, and open to collective examination. Students benefited from receiving explanations, observing alternative reasoning, defending their own interpretations, and revising misconceptions. Collaboration therefore functioned as a process of knowledge construction rather than merely a mechanism for coordinating tasks.

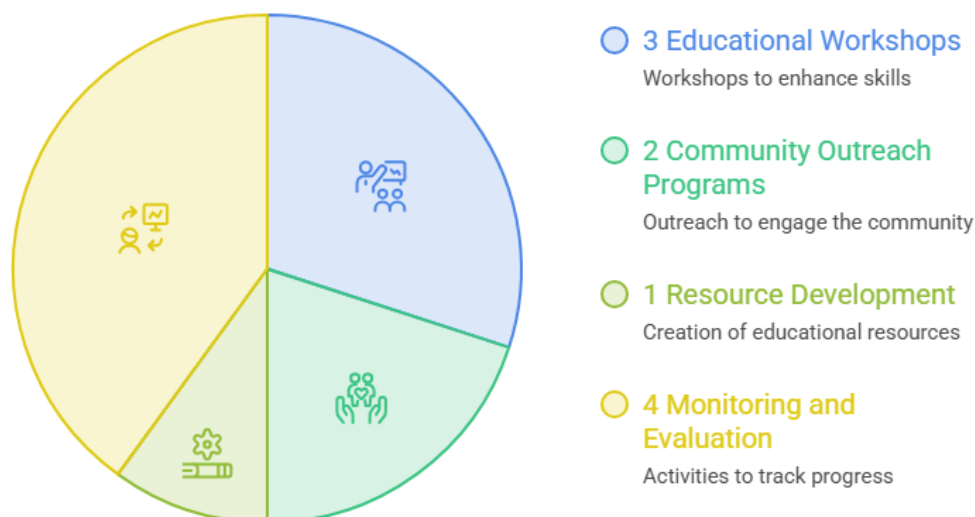
The lower-performing case highlights the limitations of assuming that group-based technology use is inherently collaborative. Digital platforms can reproduce ineffective group-work practices when tasks lack interdependence, accountability, meaningful peer feedback, or clear collaborative expectations. Instructional design and teacher facilitation consequently

emerged as important conditions determining whether technological affordances were translated into productive learning experiences.

The overall findings indicate that collaboration tools can positively influence student learning outcomes when their use generates meaningful peer interaction, knowledge sharing, collaborative problem-solving, engagement, and self-regulated participation. The strongest evidence did not support a simple technology - achievement relationship. A more accurate explanatory pathway was Collaboration Tools - Structured Collaborative Interaction - Knowledge Construction and Engagement - Improved Learning Outcomes. This mechanism explains why students with comparable technological access could experience substantially different educational outcomes.

The findings suggest that the educational value of collaboration tools lies primarily in the learning behaviors they enable rather than in their technical sophistication. Schools and educators should therefore avoid evaluating digital collaboration solely through platform adoption, login frequency, or time spent online. Effective implementation requires purposeful task design, positive interdependence, individual accountability, peer feedback, teacher facilitation, and opportunities for substantive intellectual exchange. The central finding is therefore not that collaboration technology automatically improves learning, but that well-designed collaborative pedagogy can transform digital tools into environments where students explain, question, negotiate, revise, and collectively construct knowledge.

The findings indicate that Indonesian Navy cooperation contributes to national resilience across frontier, outermost, and underdeveloped islands when maritime-security capabilities are integrated with civilian institutions, local governments, and community-based initiatives. Cooperative activities strengthened institutional reach in geographically isolated areas, supported access to essential services, improved maritime awareness, and facilitated responses to local security and development challenges. The contribution was not uniform across locations, however, because outcomes depended substantially on implementation quality, institutional coordination, community participation, resource availability, and continuity. Institutional presence alone therefore did not constitute sufficient evidence of strengthened resilience.



**Figure 2.** Distribution of Implemented Activities (activities)

Collaborative implementation emerged as a critical mechanism connecting strategic maritime cooperation with tangible local outcomes. Programs characterized by clear institutional roles, joint planning, effective communication, resource integration, and responsiveness to local priorities generated stronger perceptions of effectiveness than activities implemented through fragmented or temporary arrangements. Cooperation became more

meaningful when participating institutions combined complementary capabilities rather than merely conducting parallel activities within the same geographical area.

Community capacity and institutional integration played an important mediating role in translating cooperative initiatives into multidimensional resilience. Communities that participated in identifying problems, implementing activities, and maintaining program outcomes demonstrated stronger ownership and adaptive capacity. Local institutions also benefited when cooperation facilitated knowledge transfer, strengthened coordination mechanisms, and improved their capacity to continue essential functions after external support decreased. These findings demonstrate that resilience was strengthened most effectively when cooperation created durable capabilities rather than temporary dependency.

Multidimensional island resilience emerged through interconnected improvements in security awareness, public-service accessibility, institutional responsiveness, social cohesion, community preparedness, and adaptive capacity. The findings support the proposed Collaborative Maritime Resilience Framework: Strategic Maritime Cooperation - Collaborative Implementation - Community Capacity and Institutional Integration -Multidimensional Island Resilience - National Resilience. National resilience in remote islands should therefore be understood as an accumulated outcome of sustainable local capacities rather than a direct consequence of isolated security or development interventions.

The findings are consistent with maritime-security scholarship emphasizing that archipelagic security cannot be reduced to naval defense or territorial surveillance. Contemporary maritime challenges intersect with illegal resource exploitation, transnational crime, economic vulnerability, infrastructure disparities, environmental pressures, and community welfare. The present study extends this perspective by demonstrating that maritime-security institutions can contribute to broader resilience when their distinctive capabilities are integrated into collaborative governance arrangements rather than operating independently from civilian development structures.

The results also correspond with collaborative-governance literature, which identifies shared objectives, institutional trust, resource complementarity, participation, and sustained coordination as central conditions for successful interorganizational cooperation. The findings demonstrate that formal agreements alone do not guarantee effective collaboration. Cooperation produced stronger outcomes when institutional relationships moved beyond administrative coordination toward shared problem definition, joint implementation, continuous communication, and collective evaluation.

The findings differ from approaches that implicitly equate increased state or military presence with stronger national resilience. Institutional presence may improve security visibility and access to remote communities, but its long-term contribution depends on whether local capacities are strengthened. Programs that remain dependent on external personnel, resources, or decision-making structures may generate immediate benefits without producing sustainable resilience. The distinction between institutional presence and capacity creation is therefore essential for evaluating the actual effectiveness of cooperation.

The results also qualify development approaches that evaluate programs predominantly through visible outputs such as the number of activities, infrastructure projects, beneficiaries, training sessions, or services delivered. Such indicators remain useful for administrative accountability but provide limited evidence regarding resilience. The present study suggests that program evaluation should also examine whether interventions improve local problem-solving capacity, institutional coordination, community preparedness, service continuity, local ownership, and the ability to adapt after external assistance is reduced.

The findings signify that frontier, outermost, and underdeveloped islands should not be understood merely as peripheral territories requiring protection or assistance. These islands are active strategic spaces where sovereignty, community welfare, economic connectivity, environmental sustainability, and national identity intersect. Their resilience depends on the

ability of local communities and institutions to function effectively despite geographic isolation and structural constraints.

The results signify that national resilience is built from the local level upward. National-level strategies may establish priorities, allocate resources, and define institutional responsibilities, yet resilience becomes tangible within communities that must respond to everyday disruptions and long-term structural pressures. Weak local capacity can therefore become a national vulnerability, particularly in strategically significant border and maritime regions.

The importance of community participation signifies that residents should be recognized as active security and development actors rather than passive beneficiaries of institutional programs. Local communities possess contextual knowledge regarding maritime conditions, livelihoods, transportation patterns, environmental risks, social relationships, and practical vulnerabilities that external institutions may not fully understand. Integrating such knowledge into program design can improve relevance and strengthen local ownership.

The role of the Indonesian Navy signifies the strategic value of institutional capabilities that can reach geographically difficult areas while maintaining maritime awareness and logistical mobility. Such capabilities create opportunities for productive cooperation but also require clear boundaries of responsibility. Sustainable resilience is better served when naval cooperation strengthens civilian institutions and community capacities rather than replacing functions that should ultimately be maintained through legitimate civilian governance.

The primary policy implication is that cooperation in frontier, outermost, and underdeveloped islands should be designed through an integrated resilience framework rather than as a collection of disconnected programs. Maritime security, public services, community empowerment, infrastructure, disaster preparedness, economic development, and environmental adaptation should be coordinated around shared local resilience objectives. Integrated planning can reduce duplication while ensuring that different institutional capabilities address interconnected vulnerabilities.

The Indonesian Navy's comparative advantages in maritime mobility, logistical support, maritime awareness, emergency response, and access to remote areas can be strategically integrated with the sectoral expertise of civilian institutions. Health agencies should retain leadership in sustainable healthcare systems, educational institutions in education, local governments in public administration, and economic agencies in livelihood development. Naval cooperation can enhance reach and coordination without creating institutional substitution.

Program evaluation should move from an output-oriented model toward a resilience-oriented model. Indicators should measure not only what institutions delivered but also what communities and local institutions became capable of doing afterward. Local ownership, institutional integration, continuity of essential services, adaptive capacity, community preparedness, and reduced dependency provide stronger evidence of sustainable impact than activity counts alone.

Resource allocation should also recognize that different island communities face different combinations of vulnerability. Uniform intervention models may be administratively convenient but strategically inefficient. Programs should be adapted to geographic accessibility, population characteristics, economic structures, infrastructure conditions, environmental risks, security exposure, and existing institutional capacities. Context-sensitive cooperation is therefore essential for transforming national strategies into locally meaningful resilience outcomes.

The positive contribution of cooperation can be explained by the complementary capabilities of participating institutions. Remote island challenges are multidimensional and rarely fall within the mandate or capacity of a single organization. Maritime-security institutions possess mobility, logistics, organizational capacity, and maritime expertise, while

civilian agencies contribute specialized knowledge in health, education, infrastructure, economic development, and public administration. Local communities contribute contextual knowledge, social networks, and everyday implementation capacity. Combining these resources creates greater problem-solving potential than isolated institutional action.

Variation in program effectiveness occurred because cooperation quality differed across institutional and geographic contexts. Formal collaboration can remain superficial when responsibilities are unclear, communication is irregular, resources are fragmented, or institutional priorities are poorly aligned. Stronger outcomes emerged when actors developed shared objectives and understood how their respective responsibilities contributed to common resilience goals.

Community participation strengthened outcomes because locally embedded knowledge improved the contextual relevance of interventions. Programs designed without meaningful community involvement risk misidentifying priorities or creating services that cannot be maintained locally. Participation also increases psychological and practical ownership because communities become contributors to solutions rather than recipients of predetermined assistance.

Program continuity influenced resilience because capacity develops through cumulative processes rather than isolated interventions. Training, institutional relationships, community preparedness, infrastructure maintenance, and local leadership require reinforcement over time. Short-term programs can address immediate needs but may produce limited structural change when no mechanism exists for local continuation, institutional learning, or follow-up support.

Future research should employ longitudinal designs to determine whether collaborative initiatives produce sustainable changes in community capacity and resilience over time. Immediate post-program evaluations may overestimate effectiveness because visible outputs and positive perceptions do not necessarily persist after external support declines. Longitudinal research could examine whether local institutions maintain programs, communities retain capabilities, and collaborative networks remain functional several years after implementation.

Comparative research should examine different categories of frontier, outermost, and underdeveloped islands rather than treating them as a homogeneous policy category. Islands near international borders may face different pressures from geographically isolated domestic islands, while tourism-based communities may possess different vulnerabilities from fishing-dependent or subsistence economies. Comparative analysis could identify which collaborative models are most effective under specific geographic, socioeconomic, institutional, and security conditions.

Future studies should develop a standardized Collaborative Maritime Resilience Index integrating indicators of cooperation quality, institutional integration, community capacity, local ownership, security preparedness, public-service continuity, socioeconomic adaptability, and sustainability. Such an instrument could enable more systematic comparison across regions and provide stronger evidence for policy evaluation. Measurement should distinguish short-term program outputs from intermediate capacity outcomes and long-term resilience impacts.

Future policy and research should ultimately shift the central question from What has the Indonesian Navy delivered to frontier, outermost, and underdeveloped islands toward What capacities remain within communities and civilian institutions after collaborative intervention has ended (Rosyid et al., 2024). This distinction provides a more rigorous criterion for evaluating national-resilience strategies. Successful cooperation should leave behind stronger institutions, more capable communities, durable coordination mechanisms, improved preparedness, and greater capacity for self-directed adaptation. The strategic value of Indonesian Navy cooperation therefore lies not in expanding military responsibility into every dimension of island development, but in using distinctive maritime capabilities to connect institutions, overcome geographic barriers, catalyze collaboration, strengthen legitimate

civilian capacity, and enable strategically important island communities to become progressively more resilient and less dependent on continuous external intervention.

## CONCLUSION

The most important finding of this study is that Indonesian Navy cooperation contributes to national resilience across frontier, outermost, and underdeveloped islands not merely through institutional presence or the delivery of short-term assistance, but through the capacity of collaborative initiatives to strengthen local institutions, community preparedness, and sustainable problem-solving capabilities. Effective cooperation was characterized by clear institutional roles, coordinated planning, resource integration, meaningful community participation, responsiveness to local priorities, and program continuity. Community capacity and institutional integration emerged as critical mechanisms through which strategic maritime cooperation translated into multidimensional resilience involving security, public-service accessibility, social cohesion, preparedness, and adaptive capacity. The distinctive finding therefore challenges the assumption that increased institutional activity automatically produces stronger national resilience. Sustainable outcomes depend primarily on whether cooperation creates local ownership and capacities that remain functional after external intervention decreases.

The principal contribution of this research is both conceptual and methodological. Conceptually, the study advances a Collaborative Maritime Resilience Framework represented by the pathway Strategic Maritime Cooperation - Collaborative Implementation - Community Capacity and Institutional Integration - Multidimensional Island Resilience - National Resilience. This framework integrates maritime security, collaborative governance, community resilience, and national-resilience perspectives while distinguishing institutional inputs, implementation processes, intermediate capacities, and long-term outcomes. Methodologically, the mixed-methods multiple-case approach combining quantitative assessment, semi-structured interviews, field observations, document analysis, and cross-case comparison provides a multidimensional basis for evaluating cooperation beyond conventional output indicators. The framework shifts evaluation from asking how many programs, services, or activities were delivered toward examining what sustainable capacities were created. Indonesian Navy cooperation therefore gains strategic significance when its distinctive maritime reach, logistical capability, and organizational capacity complement civilian governance, facilitate institutional integration, and enable communities to become progressively more self-reliant.

The study is limited by its cross-sectional design, purposive selection of island cases, reliance partly on stakeholder perceptions, and variations in geographical, socioeconomic, institutional, and security conditions across frontier, outermost, and underdeveloped islands. These limitations restrict causal inference and the generalizability of findings across Indonesia's diverse archipelagic contexts. Future research should employ longitudinal and comparative designs to examine whether community capacity, institutional integration, and program benefits remain sustainable after external support decreases. Further studies should compare different island typologies and develop a validated Collaborative Maritime Resilience Index incorporating cooperation quality, institutional integration, local ownership, community capacity, public-service continuity, security preparedness, socioeconomic adaptability, and sustainability. Future research should ultimately assess successful cooperation according to what remains after intervention: stronger civilian institutions, more capable communities, durable collaborative networks, improved preparedness, and greater adaptive capacity. This perspective can support a national-resilience strategy in which Indonesian Navy cooperation serves as a strategic catalyst for sustainable local capacity rather than a substitute for civilian governance or long-term community self-reliance.

## DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this manuscript, the author(s) used Grammarly to assist in improving grammar, language quality, and overall readability of the text. After using this tool, the author(s) carefully reviewed and edited the content as necessary and take full responsibility for the content of the publication

## AUTHOR CONTRIBUTIONS

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

Author 2: Conceptualization; Data curation; In-vestigation.

Author 3: Data curation; Investigation.

## DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## REFERENCES

- Abdy Kurniawan, Sri Hardianto, Nur Endah Retno Wuryandari, Anasta Wirawan, & Achmad Andhika Kharisma. (2026). Assessing Ferry Ro-Ro as Tol Laut's Alternative Cargo Carrier for Inter-Island Trade. *Evergreen*, 13(2), 698–709. <https://doi.org/10.5109/7429616>
- Agricultural Lands in Azerbaijan: Current Usage Situation, Problems and Solutions. (2025). *Agricultural and Rural Studies*, 3(4). <https://doi.org/10.59978/ar03040021>
- Ahmadi, A., & Herdiawan, D. (2024). Human Resource Management Planning on The Supply Corps Officers of The Navy. *Edelweiss Applied Science and Technology*, 8(6), 7638–7654. <https://doi.org/10.55214/25768484.v8i6.3658>
- Al Fatih, A. N. F., Kurniawan, A., & Koentjoro, M. P. (2025). The Role of Biofilm on Microplastics as A Vector for Heavy Metals in the Waters of Sendang Biru, Malang Regency. *HAYATI Journal of Biosciences*, 32(4), 1092–1102. <https://doi.org/10.4308/hjb.32.4.1092-1102>
- Arif, M., PhD candidate at the School of Government and International Relations, Griffith University, Australia., Afriansyah, A., Associate Professor at the Faculty of Law, Universitas Indonesia., Chairil, T., Assistant Professor at the Department of International Relations, Faculty of Humanities, Binus University, Jakarta., Lestari, G. A., & Researcher at the Center for Sustainable Ocean Policy, Faculty of Law, Universitas Indonesia. (2024). Grey Zone Conflict in the South China Sea: The Challenges for Indonesian Maritime Security Governance. *Contemporary Southeast Asia*, 46(3), 407–434. <https://doi.org/10.1355/CS46-3c>
- Asraf, M. S., Rasheduzzaman, Md., & Shamim, C. M. A. H. (2026). A machine learning framework for regional electricity–economic forecasting: Developing the U.S. Regional energy economic index (REEI) for equitable energy transition planning. *Applied Energy*, 413, 127705. <https://doi.org/10.1016/j.apenergy.2026.127705>
- Badrudin, A., Sumantri, S. H., Gemilang Gultom, R. A., Apriyanto, I. N. P., Yuhana, U. L., & Ratnasari, F. D. (2026a). Design of Antasena: An AI-powered maritime surveillance and anomaly detection system for security decision support. *IAES International Journal*

- of Artificial Intelligence (IJ-AI)*, 15(1), 269. <https://doi.org/10.11591/ijai.v15.i1.pp269-288>
- Badrudin, A., Sumantri, S. H., Gemilang Gultom, R. A., Apriyanto, I. N. P., Yuhana, U. L., & Ratnasari, F. D. (2026b). Design of Antasena: An AI-powered maritime surveillance and anomaly detection system for security decision support. *IAES International Journal of Artificial Intelligence (IJ-AI)*, 15(1), 269. <https://doi.org/10.11591/ijai.v15.i1.pp269-288>
- Bakka, D., Suyono, H., Widagdo, S., & Parmawati, R. (2026). Reliability Optimization and Component Replacement Scheduling for Compressed Air Systems in Indonesian Navy PKR-Class Vessels Using FMECA and Weibull Analysis. *Journal of Maritime Research*, 23(1), 313–330. <https://doi.org/10.22429/Euc2026.JMR23.1.37>
- Baroroh, I., Ma'ruf, B., Basuki, M., Hardianto, D., & Kristiyono, T. A. (2024). Engine Room Module Installation System Risk Analysis Based on Bayesian Network. *International Journal of Technology*, 15(1), 75. <https://doi.org/10.14716/ijtech.v15i1.5136>
- Bonsu, M. A., & Akekudaga, P. (2025). Enhancing Critical Infrastructure Security: Addressing Cybersecurity Risks and Regulatory Gaps in AI-Enabled IoT Systems. *2025 IEEE 16th Annual Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON)*, 0627–0633. <https://doi.org/10.1109/UEMCON67449.2025.11267559>
- Botschner, J., Corley, C., Fraser, E. D. G., Kotak, R., McMahon, D., & Newman, L. (2024). Cybersecurity in Digital Agriculture: A National Security Risk? In G. Adlakha-Hutcheon & C. Kelshall (Eds.), *(In)Security: Identifying the Invisible Disruptors of Security* (pp. 281–315). Springer Nature Switzerland. [https://doi.org/10.1007/978-3-031-67608-6\\_6](https://doi.org/10.1007/978-3-031-67608-6_6)
- Burholt, V., Wiles, J., & Schneller, A. (2024). Understanding the contribution of primary and community services to health system resilience during the COVID19 Pandemic in Aotearoa, New Zealand: A qualitative interview study. *BMC Health Services Research*, 24(1), 1650. <https://doi.org/10.1186/s12913-024-12078-6>
- Chang, H., Zhao, Y., Cao, Y., Ren, H., Yao, J., Liu, R., & Li, W. (2025). Evaluating Coupling Security and Joint Risks in Northeast China Agricultural Systems Based on Copula Functions and the Rel–Cor–Res Framework. *Agriculture*, 15(13), 1338. <https://doi.org/10.3390/agriculture15131338>
- Herawati, T., Damayanti, W., Yuda, G. A., Ihsan, Y. N., Pasaribu, B., Harsono, G., Marlina, M., Suseno, H., Mustopa, R. A., Karya, F. S. W., Febriani, C., & Purba, N. P. (2024). Assessment of microplastic characterization and distribution from surface water and the seabed in the Flores Sea, Indonesia. *Frontiers in Marine Science*, 11, 1440587. <https://doi.org/10.3389/fmars.2024.1440587>
- Huda, S., Astuti, W., Harianingsih, H., Megawati, M., & Handayani, P. A. (2024). Carrageenan and bentonite as wet strength agents in the process of making nautical chart paper. *E3S Web of Conferences*, 576, 06004. <https://doi.org/10.1051/e3sconf/202457606004>
- Kirakosyan, V. (2025). Le vécu de la fratrie face au cancer pédiatrique: Revue de la littérature systématique. *Annales Médico-psychologiques, revue psychiatrique*, 183(2), 154–171. <https://doi.org/10.1016/j.amp.2024.04.010>

- Krysovatty, A., Desyatnyuk, O., & Ptashchenko, O. (2024). Digital Innovations and their Ramifications for Financial and State Security. *AFRICAN JOURNAL OF APPLIED RESEARCH*, 10(1), 431–441. <https://doi.org/10.26437/ajar.v10i1.713>
- Li, H., Zeng, K., Zhao, C., Long, Q., Wang, S., Li, X., Hu, L., Du, T., & He, M. (2025a). The Possibility of Internal Waves Causing the Sinking of Indonesian “KRI Nanggala-402” Submarine Analyzed With SAR Imagery. *IEEE Geoscience and Remote Sensing Letters*, 22, 1–5. <https://doi.org/10.1109/LGRS.2024.3523483>
- Li, H., Zeng, K., Zhao, C., Long, Q., Wang, S., Li, X., Hu, L., Du, T., & He, M. (2025b). The Possibility of Internal Waves Causing the Sinking of Indonesian “KRI Nanggala-402” Submarine Analyzed With SAR Imagery. *IEEE Geoscience and Remote Sensing Letters*, 22, 1–5. <https://doi.org/10.1109/LGRS.2024.3523483>
- Ma, C., Zhang, L., You, L., & Tian, W. (2024). A Review of Supply Chain Resilience: A Network Modeling Perspective. *Applied Sciences*, 15(1), 265. <https://doi.org/10.3390/app15010265>
- Miao, C., & Zhang, S. (2024). The effect of mobile social media on the mental health status of Chinese international students: An empirical study on the chain mediation effect. *BMC Psychology*, 12(1), 411. <https://doi.org/10.1186/s40359-024-01915-2>
- Nggalu Bali, E., Hajaroh, M., Muthmainah, Kristanto, W., Kale, S., & Mau, T. (2026). Resilience of early childhood educators: Navigating the implementation of the Merdeka Curriculum in Indonesia’s border with Timor Leste. *Educational Studies*, 52(5), 946–962. <https://doi.org/10.1080/03055698.2026.2629907>
- Parimba, I. S., Bakhtiar, A., Soedarsono, S., & Sarn, R. (2024). The Effectiveness of Armpit Sweat Odor with COVID-19 Detection Device for Detecting COVID-19. *Pharmacognosy Journal*, 16(3), 691–697. <https://doi.org/10.5530/pj.2024.16.116>
- Pranowo, W. S., Malik, K., Adrianto, D., & Kurniawan, A. (2025). Hydrodynamic simulation experiment of tidal pump in strait waters. *Global Journal of Environmental Science and Management*, 11(2). <https://doi.org/10.22034/gjesm.2025.02.13>
- Putra, I. W. S. E., Atmadipoera, A. S., Purwandana, A., Cuypers, Y., Manik, H. M., Harsono, G., Kusmanto, E., Sobaruddin, D. P., Hascaryo, A. P., Wang, Z., Priyono, B., & Ismail, M. F. A. (2026). Observation of internal solitary waves in the northern Ombai waters, Indonesia. *Journal of Marine Systems*, 255, 104223. <https://doi.org/10.1016/j.jmarsys.2026.104223>
- Rezvani, S. M. H. S., Falcão Silva, M. J., & De Almeida, N. M. (2024). The Risk-Informed Asset-Centric (RIACT) Urban Resilience Enhancement Process: An Outline and Pilot-Case Demonstrator for Earthquake Risk Mitigation in Portuguese Municipalities. *Applied Sciences*, 14(2), 634. <https://doi.org/10.3390/app14020634>
- Richter, J. H., Joseph, E., Arcodia, M. C., Berner, J., Demuth, J. L., Falloon, P., Romine, G. S., Cohen, J. T., Gonzalez-Cruz, J., El Gharamti, M., Hoppe, B., Kumar, S., Mariotti, A., Mishra, D., Pegion, K., Pu, Z., Quagraine, K. A., Quagraine, K. T., Roychoudhury, C., ... Zarzycki, C. (2026). Earth System Predictability across Time Scales for a Resilient Society: A Research Community Perspective. *Bulletin of the American Meteorological Society*, 107(3), E326–E351. <https://doi.org/10.1175/BAMS-D-24-0155.1>
- Rosyid, O. A., Taradini, A., Hartadhi, Lande, N. M., Andrianshah, Sutrisno, B., Kamil, B., Khairiani, D., Hartadi, T., Sudrajat, A., & Tarno. (2024). Marine-Based Renewable

- Energy Solution for 3T Areas in Indonesia: Integrating Diesel Hybridization with Floating PV Power Plant. *BIO Web of Conferences*, 92, 01009. <https://doi.org/10.1051/bioconf/20249201009>
- Selly, F. K., Bali, E. N., Sinlae, R. V. A., Neonufa, S., Kale, S., & Makleat, N. (2026). Early childhood teachers everyday meaning making and lived experiences in implementing the merdeka curriculum in marginal Indonesian contexts. *Multidisciplinary Science Journal*, 9(2), 2027236. <https://doi.org/10.31893/multiscience.2027236>
- Soemarmi, A., Setyawanta Rebala, L. T., Herawati, R., Ayiliani, F. M., & Gunawan, A. A. (2025). Fisheries Law Investigation in Coastal Areas and Small Islands in a Progressive Law Perspective. *IOP Conference Series: Earth and Environmental Science*, 1537(1), 012071. <https://doi.org/10.1088/1755-1315/1537/1/012071>
- Sofiyan, Y., Sukoco, B. M., Sabar, Suhariadi, F., & Chen, J. V. (2026). Transforming naval organizations in the digital age: Leadership, AI and dynamic capabilities for change. *Management Decision*, 1–20. <https://doi.org/10.1108/MD-10-2025-2947>
- Stuart, L., Hobbins, M., Niebuhr, E., Ruane, A. C., Pulwarty, R., Hoell, A., Thiaw, W., Rosenzweig, C., Muñoz-Arriola, F., Jahn, M., & Farrar, M. (2024). Enhancing Global Food Security: Opportunities for the American Meteorological Society. *Bulletin of the American Meteorological Society*, 105(4), E760–E777. <https://doi.org/10.1175/BAMS-D-22-0106.1>
- Suharto, P., Cempaka Timur, F. G., & Sutanto, R. (2024). The development of AUKUS in the Indo-Pacific region and its influence on Indonesia's policy as a global maritime fulcrum. *Journal of Infrastructure Policy and Development*, 8(7), 4076. <https://doi.org/10.24294/jipd.v8i7.4076>
- Sutrisno, A., Pillay, H., & Baldacchino, G. (2024). Underdeveloped, Frontier and Outermost: Small Island Universities in Indonesia. In A. Sutrisno, H. Pillay, & G. Baldacchino, *Higher Education in Small Islands* (pp. 43–61). Policy Press. <https://doi.org/10.1332/policypress/9781529226508.003.0003>
- Triwidiyanti, W., Rahayu, Y. P., & Pramadi, A. (2024). Resilience of Indonesian Navy Wives: Effects of self-efficacy and social support. *Cogent Psychology*, 11(1), 2402606. <https://doi.org/10.1080/23311908.2024.2402606>
- Wang, X., Li, X., Lou, Y., You, S., & Zhao, H. (2024). Refined Evaluation of Climate Suitability of Maize at Various Growth Stages in Major Maize-Producing Areas in the North of China. *Agronomy*, 14(2), 344. <https://doi.org/10.3390/agronomy14020344>
- Wulandari, E., Ghaluh, B. M., Suryaman, M., & Sari, E. S. (2026). Innovative language education policies for literacy development in Indonesia's 3T regions: Addressing access and equity challenges. *Current Issues in Language Planning*, 1–38. <https://doi.org/10.1080/14664208.2026.2656057>
- Wuryaningrum, P., Hadi, F., Yuniarto, I. T., Lazuardi, S. D., Devintasari, D. V., & Rida, M. (2026). Measuring the Role of Subsidized Shipping in Improving Economic and Social Welfare: A Case Study in the Tanimbar Islands. In R. Sjarief Widjaja, Hasanudin, Y. A. Hermawan, A. Ismail, F. N. Zulkipli, & A. Öchsner (Eds.), *Marine Technology 4* (pp. 95–103). Springer Nature Switzerland. [https://doi.org/10.1007/978-3-032-08840-6\\_12](https://doi.org/10.1007/978-3-032-08840-6_12)

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