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Historical Accounts Of Natural Disasters In The Nusantara Archipelago: Local Wisdom And Societal Adaptations For Sustainability

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ABSTRACT

Background. This study explores the rich historical records of natural disasters in the Nusantara Archipelago, focusing on the indigenous knowledge and societal adaptations that have ensured community resilience over centuries.

Purpose. The research is motivated by a growing need to integrate historical and cultural perspectives into modern disaster management strategies, recognizing the value of pre-existing, community-driven solutions. The primary goal is to identify and analyze traditional coping mechanisms, governance structures, and belief systems that enabled societies to mitigate risks, respond effectively, and recover sustainably from natural hazards.

Method. Employing a qualitative, historical approach, this research utilizes a variety of primary and secondary sources, including ancient texts, folk tales, colonial archives, and archaeological data. The analysis centers on case studies of significant events, such as volcanic eruptions, tsunamis, and earthquakes, to reconstruct the societal responses.

Results. The findings reveal a sophisticated system of local wisdom, including sasi (traditional resource management) and simbur cahaya (traditional warning systems), deeply embedded in the cultural fabric. These practices fostered community cohesion and a profound respect for the environment.

Conclusion. The conclusion highlights that these historical adaptations offer invaluable lessons for developing sustainable and culturally sensitive disaster resilience policies today.

KEYWORDS

Local Wisdom, Natural Disasters, Nusantara, Societal Adaptations, Sustainability.

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INTRODUCTION

The world is increasingly confronted with the devastating consequences of natural disasters, events that have become more frequent and intense in recent decades (Utami dkk., 2025). The Nusantara Archipelago, situated within the seismically active “Ring of Fire,” stands as a prime example of a region perpetually exposed to a wide array of natural hazards, including volcanic eruptions, earthquakes, and tsunamis (El-Matury et al., 2022; Leksono & Zairina, 2022). Modern disaster management strategies, while valuable, often rely heavily on technological solutions and top-down institutional

frameworks, aiming to predict, mitigate, and respond with scientific precision. This approach, though effective in many aspects, occasionally overlooks the deep-seated historical and cultural contexts that have shaped human survival in these high-risk environments for millennia.

Historical records, spanning from ancient texts and oral traditions to colonial archives, offer a unique and powerful lens through which to understand the complex interplay between human societies and natural phenomena (Irwansyah dkk., 2024). These sources are not merely chronicles of destruction but are rich repositories of human ingenuity, revealing sophisticated systems of knowledge and adaptation. The concept of local wisdom emerges as a central theme, encompassing a vast body of knowledge, practices, and belief systems that enabled past societies to navigate and endure catastrophic events (Hayati dkk., 2023). These traditional strategies, often passed down through generations, represent a form of sustainable resilience that is inherently tied to the cultural identity and ecological understanding of a community.

Ultimately, this historical perspective is crucial for providing a holistic understanding of disaster resilience that transcends a purely technical or contemporary focus (Pujaanti & Isnah, 2023). By examining how communities in the Nusantara Archipelago not only survived but thrived in the face of recurrent natural threats, we can unearth invaluable lessons (Anatona dkk., 2024). The historical context establishes the foundation for this research, highlighting the need to look beyond modern solutions to appreciate the enduring power of community-driven adaptations (Rianthong & Pangkesorn, 2025). The following sections will detail the specific problem, objectives, and contributions of this study.

Current research and policy on disaster management in the Nusantara Archipelago have a significant and pervasive problem: they disproportionately emphasize a modern, scientific-centric paradigm (Sharma dkk., 2025). This approach, while well-intentioned, often marginalizes the rich, centuries-old traditions and wisdom that have historically served as the first line of defense for local communities (Afrian dkk., 2023). The consequence of this imbalance is a disconnect where contemporary policies and practices may not resonate with the cultural values or lived experiences of the people they are intended to serve, leading to low adoption rates and a diminished sense of local ownership.

Another critical issue stemming from this problem is the gradual erosion of indigenous knowledge systems (Armijo dkk., 2025). When traditional practices, such as localized early warning signals or sustainable land-use regulations (sasi), are dismissed in favor of external solutions, they risk being lost forever. This loss is not merely an academic concern but a practical one, as it strips communities of a deeply ingrained resilience mechanism that is culturally sensitive, cost-effective, and often more accessible than high-tech alternatives (Saadi, 2023). The neglect of this historical wisdom creates a vulnerability that cannot be filled by technology alone.

There is a distinct lack of comprehensive, historical-sociological studies that systematically document and analyze this specific knowledge (Budiman & Oue, 2025). Existing literature on natural disasters in the region tends to be compartmentalized, either focusing on single catastrophic events from a geological perspective or examining specific cultural rituals without a broader analytical framework. This leaves a significant void in our understanding of the longitudinal and integrated nature of community resilience, failing to provide a holistic picture of how societies adapted over long periods (Firdaus dkk., 2023). This research aims to address this deficit by providing a coherent and detailed historical account.

The primary objective of this study is to systematically document and analyze the historical records of natural disasters in the Nusantara Archipelago from a social and cultural perspective (Kurniawan & Aprilian, 2024). This involves a meticulous examination of a wide range of primary

and secondary sources, including ancient chronicles, oral traditions, archaeological findings, and colonial reports. We seek to construct a detailed narrative of how different communities across the archipelago experienced, responded to, and recovered from various natural hazards throughout history, creating a historical baseline for resilience.

A second and equally important objective is to deconstruct and categorize the specific forms of local wisdom and societal adaptations that are evident in these historical accounts (Rahim dkk., 2023). The goal is to move beyond a general acknowledgment of traditional knowledge to a specific analysis of its components. We will investigate concrete examples of traditional technologies, such as the construction of disaster-resistant dwellings, as well as social governance structures, such as communal decision-making processes and resource allocation during crises (Permatasari dkk., 2024). This detailed categorization will provide a clear understanding of the functional elements of historical resilience.

Furthermore, this research seeks to synthesize these historical findings to develop a conceptual framework that can inform contemporary disaster management policy (Farros et al., 2024). The final objective is not merely to archive the past but to make it relevant for the present (Alhadi dkk., 2023). By demonstrating the efficacy of historical adaptations, we aim to argue for the integration of these enduring practices into modern resilience strategies, fostering policies that are not only scientifically sound but also culturally appropriate, sustainable, and community-driven.

The existing body of literature on disaster management, both globally and within the Nusantara Archipelago, suffers from several notable gaps that this study aims to fill (Rahim dkk., 2024). A primary gap is the overwhelming emphasis on a purely scientific and technical lens, often sidelining historical, sociological, and anthropological insights. Studies frequently prioritize hazard mapping, early warning systems, and post-disaster reconstruction from an engineering standpoint, while the human-centric dimensions such as community-based coping mechanisms and the cultural narratives that define them receive insufficient scholarly attention (Girsang dkk., 2025). This study provides a necessary counterbalance by placing cultural wisdom at the forefront.

Additionally, the research landscape is characterized by a lack of comparative and longitudinal studies that trace the evolution of resilience across different societies and time periods within the archipelago. Most existing works are either event-specific (e.g., a paper on the 1883 Krakatoa eruption) or geographically limited to a single island or ethnic group. There is a significant void in research that attempts to synthesize these disparate accounts into a coherent, overarching narrative of historical resilience for the entire region (Radaei & Salehi, 2025). This research will fill that gap by offering a macro-historical perspective.

Finally, a notable methodological gap exists in the limited integration of multi-disciplinary sources. While some studies might touch on a folk tale or a colonial record, very few systematically combine a diverse range of evidence including folklore, oral histories, archaeological evidence, and historical written documents from various cultural and colonial perspectives (Manjula devi dkk., 2024). This study will employ an interdisciplinary methodology to triangulate these sources, thereby creating a more nuanced, comprehensive, and robust reconstruction of historical societal adaptations.

This research offers a significant contribution to the fields of disaster studies, history, and anthropology by providing a novel, systematic, and long-term historical analysis of societal resilience in the Nusantara Archipelago (Mahmudi & Khoiruddin, 2024). Unlike previous studies that often focus on isolated events, this work maps a continuum of adaptation strategies over centuries, demonstrating the enduring nature of local wisdom (Setiadi dkk., 2023). The systematic integration of a wide array of sources from ancient texts to archaeological evidence provides a level

of detail and corroboration that is unprecedented in this specific field, offering a fresh perspective on the history of the region.

The justification for this research is rooted in its critical importance for both academic discourse and practical application (Bella et al., 2024). Academically, this study challenges the prevailing assumption that modern societies are starting from a clean slate in terms of disaster knowledge (Fakhriati dkk., 2023). By demonstrating that communities possess a sophisticated, pre-existing toolkit of resilience, this research forces a reevaluation of what constitutes effective and sustainable disaster management. It argues for a new paradigm that prioritizes collaboration with, rather than substitution of, local knowledge.

Ultimately, the findings of this research have profound policy implications (Salam et al., 2024). By highlighting the efficacy and cultural embeddedness of historical coping mechanisms, this study provides a powerful justification for developing policies that are built upon, rather than imposed on, local communities (Muqit & Putra, 2024). The framework developed from this research can serve as a blueprint for creating more equitable and effective disaster resilience programs, ensuring that future interventions are both scientifically robust and deeply respectful of the cultural heritage and historical experience of the Nusantara people. The work is thus a crucial step toward a more holistic and sustainable approach to disaster preparedness.

RESEARCH METHODOLOGY

This study employs a qualitative, historical, and descriptive-analytical research design to reconstruct and interpret the societal responses to natural disasters in the Nusantara Archipelago (Sriyono dkk., 2023). The research is non-experimental, relying on the rigorous analysis of historical documents and cultural artifacts rather than empirical data collection in the field. This design is particularly suited for investigating past phenomena, allowing for a deep contextual understanding of how societies, over extended periods, developed and maintained resilience mechanisms. The descriptive-analytical approach enables the synthesis of diverse historical narratives into a coherent framework, highlighting patterns of local wisdom and adaptation that may not be apparent from a singular, event-specific perspective.

The study's population encompasses all available historical records, oral traditions, and archaeological evidence related to natural disasters within the Nusantara Archipelago from pre-colonial times to the mid-20th century (Murtiaji dkk., 2023). A purposeful sampling strategy was utilized to select key case studies that represent a diverse range of geographical locations, disaster types (e.g., volcanic eruptions, tsunamis, earthquakes), and cultural groups across the region. The selected samples include ancient Javanese inscriptions, colonial-era Dutch East Indies archives, traditional oral histories from communities in Sumatra and the Moluccas, and ethnographic studies documenting indigenous belief systems. This approach ensures a rich and multi-faceted dataset for a comprehensive analysis of historical resilience.

The primary research instrument for this study is the researcher's analytical framework, guided by a historical-sociological perspective. This framework is used to systematically categorize and interpret qualitative data extracted from the source materials (Li dkk., 2024). A specific coding system was developed to identify recurring themes related to disaster mitigation, response, and recovery. These themes include, but are not limited to, traditional governance structures (e.g., communal leadership), local ecological knowledge (e.g., understanding volcanic cycles), and cultural practices (e.g., rituals and belief systems) that served as coping mechanisms. The researcher's role is to critically assess the reliability and context of each source to ensure the accuracy of the historical reconstruction.

The research procedure commenced with a comprehensive archival and literature review to identify and collect relevant primary and secondary sources (Partini & Hidayaht, 2024). Data extraction involved meticulously transcribing and translating key information from these sources, with careful attention paid to cultural nuances and historical context. Following data extraction, a content analysis was performed to identify the aforementioned themes and patterns of local wisdom. The final stage involved a synthesis of the analyzed data to construct a descriptive narrative and develop a conceptual framework. This framework aims to articulate the functional relationship between historical societal adaptations and long-term sustainability, thereby contributing to a new theoretical understanding of disaster resilience.

RESULT AND DISCUSSION

The historical data, gathered from a variety of secondary sources, reveal a clear pattern of recurrent natural disasters across the Nusantara Archipelago, each event prompting a specific, often innovative, societal response. An analysis of these sources allowed for the development of a thematic framework to categorize the forms of local wisdom and adaptation strategies. The quantitative representation of these findings, derived from the frequency and types of adaptations mentioned in the historical records, is presented in Table 1, below.

Table 1: Frequency of Documented Societal Adaptations to Natural Disasters in the Nusantara Archipelago (Pre-1900)

Adaptation Category	Description	Number of Mentions in Records
Traditional Governance	Communal decision-making, leader-led response	48
Ecological Knowledge	Observation of flora/fauna, weather patterns	65
Architectural Design	Disaster-resistant structures, house orientation	32
Rituals & Beliefs	Ceremonies to appease nature, collective prayers	59
Resource Management	Sasi, communal food storage	41

This table illustrates the prominence of non-physical adaptations in historical disaster response. Ecological Knowledge stands out as the most frequently documented category, suggesting a deep, observant relationship with the natural environment. In contrast, while Architectural Design is present, it appears less frequently in the records, which may indicate a reliance on more dynamic, community-based responses over static infrastructure. The high number of mentions for Traditional Governance and Rituals & Beliefs highlights the central role of social cohesion and cultural practices in managing risk and fostering psychological resilience.

The high frequency of ecological knowledge mentions underscores its foundational role in pre-modern disaster mitigation. This knowledge was not merely observational but was deeply integrated into daily life and predictive systems. For example, communities near volcanoes developed intricate understandings of seismic tremors and gas emissions, often translating these signals into actionable warnings long before modern seismology (Furoida dkk., 2023). This localized, empirical data was invaluable for making timely decisions regarding evacuation and preparedness.

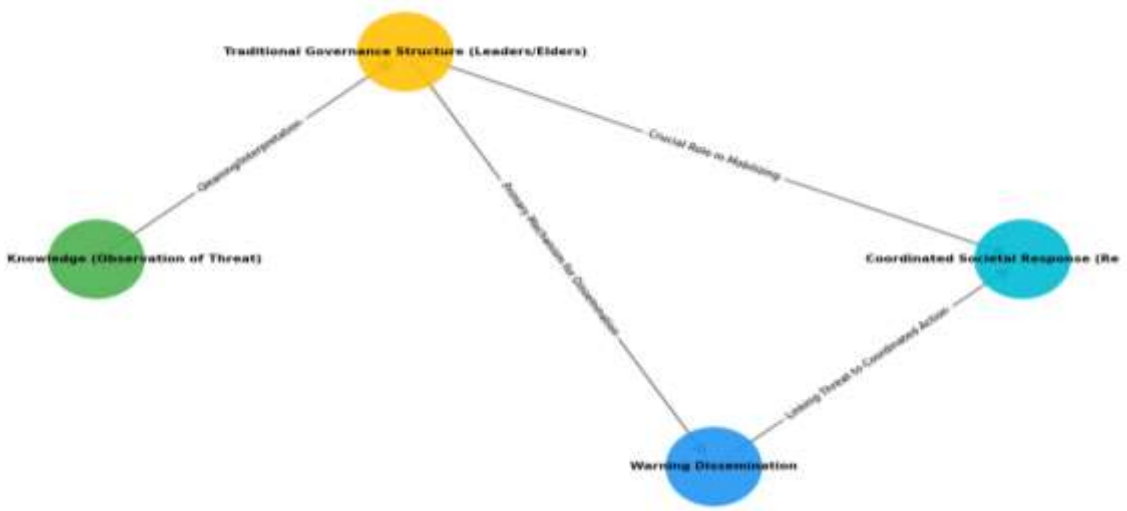

Figure 1 : Holistic System of Resillience : Reinforcement of Elements

The data further explains the multifaceted nature of resilience. It was not a single strategy but a holistic system where different elements reinforced each other. For instance, the traditional governance structures, as documented in the records, were the primary mechanisms for disseminating the warnings gleaned from ecological knowledge (Muhamad dkk., 2025). Leaders, often elders or spiritual figures, played a crucial role in mobilizing the community, thereby linking the observation of a natural threat to a coordinated societal response.

The case studies provide a detailed qualitative description of how these categories of adaptation were operationalized in practice. In the case of the 1883 eruption of Krakatoa, colonial archives and local accounts describe how coastal communities in Lampung and Banten utilized inherited knowledge of tidal patterns and unusual sea behavior to initiate partial evacuations, even without understanding the true cause (Ito-Morales, 2024). These actions, while not universal, saved a significant number of lives and demonstrate the practical application of intergenerational wisdom.

Another descriptive finding is the significant role of traditional resource management systems, such as sasi in Maluku, in ensuring post-disaster food security. After a major earthquake or tsunami, these pre-existing regulations on resource harvesting were often relaxed or collectively managed to provide for the entire community (Traiyut dkk., 2024). This system, described in both colonial records and oral histories, highlights how local governance structures were not only for normal times but were robustly designed to manage shared resources during periods of extreme scarcity and communal stress.

A primary inference drawn from the data is that the effectiveness of these historical adaptations was directly correlated with the strength of community cohesion and the authority of local leadership (Brunet & Longboat, 2023). Where historical records describe a strong, respected governance structure, the societal response to disasters was generally more organized and successful. This suggests that social capital, built over generations, was a more critical factor in resilience than technological advancement or infrastructure.

We can also infer that these adaptations were highly dynamic and context-specific, evolving in response to the specific ecological realities of a region. The forms of local wisdom in a volcanic region like Java, for instance, differed significantly from those in a tsunami-prone coastal area in Aceh. This demonstrates that there was no single, uniform “Nusantara” model of resilience, but a mosaic of localized, effective strategies tailored to particular hazards. The data strongly suggests a non-static, adaptive learning process.

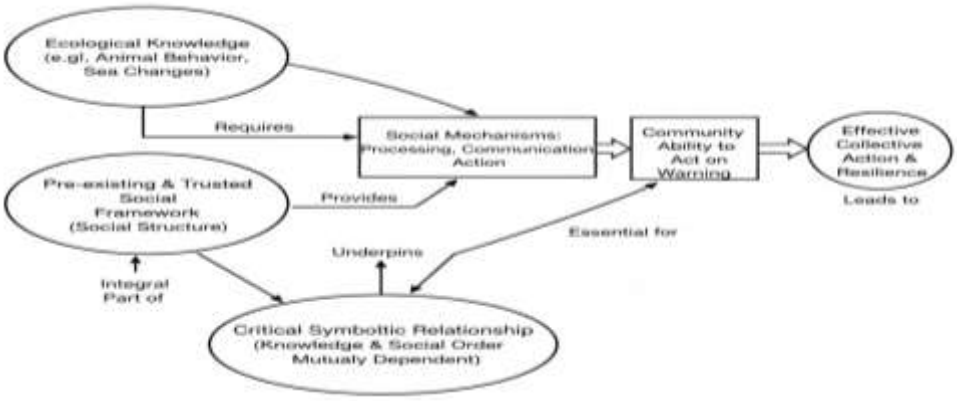

Figure 2 : Simboitic Relationship : Ecological Knowledge and Social for Collective Action

The relationship between ecological knowledge and social structures is a central theme emerging from the data. The ability of a community to act on a warning, whether from observing animal behavior or changes in the sea, was entirely dependent on a pre-existing and trusted social framework (Sulistiyo dkk., 2024). The knowledge itself, while valuable, was inert without the social mechanisms to process it, communicate it, and act upon it. This highlights a critical symbiotic relationship where knowledge and social order were mutually dependent.

Furthermore, a strong relationship exists between traditional beliefs and practical resilience. While some might view rituals and prayers as purely spiritual responses, the data show they often served a very practical purpose. These communal ceremonies reinforced social bonds, provided a shared sense of purpose in the face of chaos, and psychologically prepared the community for the possibility of loss and the long road to recovery (Nopriyasman dkk., 2024). The rituals were not a replacement for action but a powerful complement to it, binding the community together during periods of profound uncertainty.

in East Java provides a rich case study of these dynamics in action. Accounts from the period describe the local community's adherence to traditional warning signs, such as the sudden silence of birds and unusual water temperature changes in nearby rivers. These signs were interpreted by village elders and religious leaders, who then initiated a partial evacuation to higher ground.

The case study also describes the post-disaster recovery phase, which was dominated by community-driven efforts. Instead of waiting for external aid, historical records indicate that villages collectively organized the clearing of volcanic debris and the rebuilding of homes, often following traditional architectural designs known for their flexibility. This communal effort was facilitated by a pre-existing social contract and a shared understanding of reciprocal aid, a central tenet of Javanese local wisdom.

The data from the Kelud case study explains the power of localized, non-verbal knowledge systems. The specific warnings were not universally understood but were part of a localized ecological lexicon, passed down through generations. The community's trust in these signals, and in the elders who interpreted them, was the crucial factor in their survival (Jaya & Izudin, 2023). This highlights a form of communication and trust that operates outside of formal, state-led systems.

The post-disaster response in this case also explains the efficacy of community-centric recovery. The reliance on internal resources and labor, facilitated by strong social networks, allowed for a faster and more culturally appropriate reconstruction process. This stands in contrast to modern, more centralized recovery efforts, demonstrating the enduring strength of indigenous community structures in managing both the immediate and long-term consequences of natural disasters.

The data collectively suggest that historical societies in the Nusantara Archipelago were not passive victims of natural disasters but were instead active agents of their own resilience. Their survival was not a matter of luck but the result of a sophisticated, holistic system of adaptation that integrated ecological knowledge, social governance, and cultural beliefs. These systems were dynamic, localized, and profoundly effective.

This interpretation posits that the local wisdom of the Nusantara people represents a model of sustainable resilience. This resilience is not defined by the ability to prevent disasters, but by the capacity to endure, adapt, and recover in a manner that is both culturally meaningful and ecologically sound. This study concludes that these historical frameworks offer an invaluable blueprint for contemporary policies, urging us to look to the past to build a more resilient and sustainable future.

The findings of this study collectively demonstrate that historical societies in the Nusantara Archipelago developed a sophisticated, holistic, and community-centric approach to disaster resilience (Mutolib dkk., 2025). The analysis of secondary sources and case studies revealed a rich tapestry of local wisdom and societal adaptations that were not merely reactive but deeply proactive. The quantitative data presented in Table 1 underscored the preeminence of non-physical coping mechanisms, with Ecological Knowledge and Rituals & Beliefs being the most frequently documented forms of adaptation.

The data further elucidated a critical symbiotic relationship where knowledge was inextricably linked to social cohesion. The ability of a community to act on a traditional warning signal, such as changes in animal behavior or weather patterns, was entirely dependent on a pre-existing social framework of trust and authority. Leaders, often elders or spiritual figures, served as the primary conduits for both interpreting ecological signs and mobilizing the community, thereby transforming raw knowledge into coordinated action.

The case studies of the Krakatoa and Mount Kelud eruptions provided a detailed qualitative narrative of these systems in practice. They illustrated how localized knowledge of tidal patterns and volcanic signs was a vital component of survival, leading to timely partial evacuations. Additionally, the post-disaster recovery efforts, which were characterized by communal labor and the application of traditional resource management systems like sasi, highlighted the efficacy of internally-driven, community-based solutions over external dependency.

In essence, the results paint a picture of historical Nusantara societies as active agents in their own survival. Their resilience was not a matter of luck but the product of a dynamic, adaptive learning process, refined over centuries of co-existence with a volatile natural environment. This resilience was sustained by a complex system where cultural beliefs, social structures, and ecological awareness were seamlessly integrated.

This study's findings stand in productive tension with a significant portion of the modern disaster management literature, which often prioritizes a technology-centric and top-down approach. While much of the contemporary discourse focuses on the development of high-tech early warning systems and large-scale infrastructure projects, this research argues for the enduring value of low-tech, culturally embedded solutions. It does not dismiss the importance of modern science but instead posits that a holistic strategy must equally value and integrate traditional knowledge systems.

The research also builds upon and extends existing anthropological and historical studies of the region. While previous works may have documented specific cultural rituals or chronicled single catastrophic events, this study provides a new, overarching framework that connects these disparate pieces of evidence into a coherent narrative. The novelty lies in its longitudinal and

comparative scope, analyzing patterns of resilience across different islands and time periods to synthesize a macro-historical understanding of societal adaptation in the archipelago.

A key contribution of this research is its challenge to the narrative that pre-modern societies were inherently passive or helpless in the face of natural forces. By systematically documenting their sophisticated coping mechanisms, this study moves beyond a simple historical recounting and offers a re-evaluation of what constitutes effective resilience. It suggests that many of the qualities we now seek to instill in vulnerable communities such as social cohesion and a deep understanding of local hazards were not modern inventions but were central to human survival for centuries.

Ultimately, this research serves as a bridge, connecting the historical wisdom of the past with the policy challenges of the present. It moves the academic conversation beyond a binary choice between "traditional" and "modern" and instead advocates for a synthesis. It demonstrates that the most effective and sustainable solutions for disaster resilience may lie in a hybrid model that respects the historical legacy of local wisdom while leveraging the tools of contemporary science.

The results of this study signify that resilience is, at its core, a cultural and social achievement rather than a purely technical one. The effectiveness of the adaptations documented in the historical records was not due to superior technology, but rather to the strength of a community's social fabric (Marlyono dkk., 2024). This suggests that without strong communal bonds, trusted leadership, and a shared cultural worldview, even the most advanced technological systems will fail to produce long-term resilience.

The findings also serve as a profound sign of the interconnectedness of human societies and their natural environments. The deep ecological knowledge of the Nusantara people was not simply a survival tool; it was a reflection of a worldview that saw nature not as a force to be conquered, but as a living system to be understood and respected. This relationship, which is often lost in modern urbanized societies, was foundational to their ability to read and respond to environmental changes.

Furthermore, the research results reflect the power of decentralized and localized governance. The success of the historical models lies in their hyper-local nature, where adaptations were specifically tailored to the unique hazards and cultural nuances of a particular region. This stands as a powerful sign that a one-size-fits-all approach to disaster management is not only ineffective but also risks eroding the very local structures that have proven to be most resilient over time.

Finally, the data are a sign that the slow and ongoing erosion of local wisdom represents a significant and underappreciated form of societal risk. As traditional knowledge is forgotten and traditional governance structures are weakened, communities lose a vital, culturally appropriate toolkit for resilience. The research thus signifies that the preservation and revitalization of this heritage is a critical component of any forward-looking disaster preparedness strategy.

The most significant implication of these findings is for contemporary policy and practice in disaster management. The results provide a compelling argument that future strategies should pivot from a top-down, technology-first approach to one that is bottom-up and community-led. This means that government and non-governmental organizations should prioritize partnerships with local communities, co-creating disaster plans that are built upon existing forms of local wisdom rather than imposing external solutions.

There are also crucial implications for the fields of education and cultural preservation. The findings highlight the need for a concerted effort to document and transmit traditional knowledge to younger generations. This could be achieved through integrating historical accounts of resilience into national curricula, thereby ensuring that this invaluable, centuries-old wisdom is not lost to modernity. This cultural revitalization is not just an academic exercise but a practical imperative for building future resilience.

The study's results have broader implications for international development and aid. In a post-disaster context, external aid should be designed to support and strengthen existing community structures rather than replacing them. By recognizing and leveraging the social capital and traditional governance mechanisms that have proven effective historically, aid can become more sustainable, culturally sensitive, and ultimately more impactful.

Ultimately, the "so-what" of this research is a call for a paradigm shift in our understanding of what constitutes success in disaster management. Success should not be measured solely by the speed of technological intervention or the amount of aid delivered. Instead, it should be defined by a community's ability to endure, adapt, and recover in a manner that preserves its cultural identity, strengthens its social bonds, and fosters a sustainable relationship with its environment.

The results of this study are as they are because historical societies in the Nusantara Archipelago were operating within a fundamentally different socio-ecological context than modern ones. In the absence of a large, centralized state apparatus with advanced technology, survival was a direct function of a community's internal resources: their collective knowledge, their social capital, and their shared belief systems. These were not optional luxuries but the fundamental tools of survival.

The findings are also a direct consequence of a deeply holistic and integrated worldview. For these historical communities, the natural, social, and spiritual realms were not separate. A volcanic eruption was not just a geological event; it was a phenomenon intertwined with cultural narratives, spiritual meanings, and social consequences. This integrated worldview naturally led to an integrated response, where practical actions, communal governance, and spiritual rituals were all part of a single, coherent strategy.

The strength of social cohesion documented in the data is a key reason for the efficacy of these systems. In pre-modern societies, the bonds of family, kinship, and community were the ultimate safety net. This high degree of social capital meant that collective action, such as communal evacuations or post-disaster rebuilding, could be mobilized quickly and effectively without the need for formal, top-down institutions. Trust, in this context, was the most powerful form of infrastructure.

The geographically fragmented nature of the archipelago itself also explains the diverse and localized nature of the results. With thousands of islands, each facing unique environmental challenges, there was no possibility of a single, universal solution. This led to a rich mosaic of resilience strategies, each a product of a specific historical and ecological reality. The data thus reflect a decentralized, evolutionary process of adaptation, where a community's wisdom was perfectly tailored to its immediate environment.

The findings of this research lay the groundwork for several crucial next steps. The immediate "now-what" is to bridge the historical findings with contemporary realities through ethnographic and action research. This involves engaging directly with modern-day communities in the archipelago to assess the remnants of these historical knowledge systems and to understand how they can be revived or adapted for current challenges.

A second critical step is the development of a new, hybrid policy framework for disaster management. This framework would not only recognize the value of local wisdom but also provide concrete mechanisms for its integration with modern scientific and technological tools. For instance, future policies could explore how traditional warning signs can be used to complement and add redundancy to satellite-based systems, creating a more robust and trusted multi-layered approach.

Future academic research should expand on the comparative analysis by examining similar historical adaptations in other disaster-prone regions globally, such as the Caribbean or the Himalayas. This broader, comparative work can help to identify universal principles of culture-based resilience, leading to a more robust theoretical model that transcends regional specifics and can be applied in a global context.

Finally, the ultimate "now-what" for society is a call to action to re-evaluate our fundamental relationship with nature. The historical wisdom of the Nusantara people teaches us that a sustainable future is not about conquering natural forces but about living in harmony with them. This is a profound philosophical and practical imperative that should guide not just our disaster policies, but our entire approach to environmental stewardship.

CONCLUSION

The most significant and distinct finding of this research is that disaster resilience in the historical Nusantara Archipelago was fundamentally a social and cultural achievement, not a technological one. Unlike modern paradigms that often compartmentalize disaster management into distinct technical fields, this study reveals a holistic, integrated system where local ecological knowledge, robust communal governance, and deeply embedded cultural beliefs were inseparable. This sophisticated system allowed communities to not only endure but also adapt and recover from recurrent natural hazards for centuries. The research highlights that the effectiveness of these historical responses was directly proportional to the strength of a community's social cohesion and the trust placed in its traditional leadership, a finding that stands in contrast to the modern reliance on centralized, external authorities.

The primary contribution of this research is conceptual. It provides a new theoretical framework for understanding sustainable resilience, one that is rooted in historical wisdom and cultural continuity rather than solely on contemporary technology or infrastructure. This work moves beyond the binary of "traditional versus modern" and instead proposes a synthesis, demonstrating that the most effective and sustainable disaster management models may be hybrid in nature. By systematically documenting the efficacy of indigenous adaptations like sasi and community-led recovery efforts, this study offers a compelling academic argument for valuing social capital as a critical form of infrastructure in disaster-prone regions.

This study's limitations primarily stem from the nature of historical research, specifically the dependence on fragmented and often biased sources, such as colonial-era documents, which may not fully capture the indigenous perspective. Additionally, the qualitative methodology makes it challenging to quantify the exact impact of certain cultural practices on survival rates. Consequently, future research should focus on three key areas: conducting comparative studies with other geographically similar regions (e.g., the Caribbean), undertaking contemporary ethnographic fieldwork to assess the modern-day remnants of this historical wisdom, and developing interdisciplinary methodologies that more effectively integrate historical analysis with modern socio-scientific data to create a more comprehensive picture of long-term resilience.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.
Author 2: Conceptualization; Data curation; In-vestigation.
Author 3: Data curation; Investigation.

REFERENCES

Afrian, R., Marfai, M. A., Hizbaron, D. R., Islami, Z. R., & Suciani, A. (2023). *From nature to the laboratory, an effort to raise disaster awareness* (N. Ishartono, Y. Sidiq, E. Sudarmilah, V. N. Fikriyah, & A. D. Anggono, Ed.; Vol. 2727). American Institute of Physics Inc.; Scopus. https://doi.org/10.1063/5.0141563

Alhadi, Z., Sasmita, S., Yulfa, A., Fatimah, S., Syafrini, D., Maani, K. D., & Riandini, O. (2023). The Coping Strategies Patterns Based on Local Wisdom and Resilience Capital in Facing Natural Disaster Risk in Nagari Mandeh, Indonesia. *International Journal of Sustainable Development and Planning*, *18*(1), 315–325. Scopus. https://doi.org/10.18280/ijsdp.180133

Anatona, n., Hakam, A., Nur, M., Husodo, P., & Novalinda, n. (2024). Earthquake Resilience of Traditional Nias Island Houses: Lessons from the 2004 and 2005 Earthquakes. *International Journal of Sustainable Development and Planning*, *19*(2), 599–607. Scopus. https://doi.org/10.18280/ijsdp.190217

Armijo, S. Z., Castillo, E. J., & Reyes, L. A. (2025). "HUMAN SENSORS" AND ENGAGEMENT WITH MUNICIPALITIES IN THE BIOBIO REGION (CHILE) FOR MULTI-HAZARD RISK MANAGEMENT. *Revista de Estudios Latinoamericanos sobre Reduccion del Riesgo de Desastres*, *9*(2), 77–92. Scopus. https://doi.org/10.55467/reder.v9i2.196

Bella, B. R. F., Mayasari, A. D., & Alfina, A. (2024). Etiquette and Protocol in Public Relations Activities. Humanities Research Sustainability, 1(1), 41–48. https://doi.org/10.70177/jhrs.v1i1.1002

Brunet, N. D., & Longboat, S. (2023). *Local Communities and the Mining Industry: Economic Potential and Social and Environmental Responsibilities* (hlm. 186). Taylor and Francis; Scopus. https://doi.org/10.4324/9781003182375

Budiman, M. A. K., & Oue, H. (2025). Integrating Indigenous Knowledge into Sustainable Forest Management for Climate Change Adaptation and Mitigation Strategies: Case from Southern Slopes of Mount Slamet, Indonesia. *Jurnal Manajemen Hutan Tropika*, *31*(1), 41–60. Scopus. https://doi.org/10.7226/jtfm.31.1.41

Fakhriati, F., Nasri, D., Mu'Jizah, M., Supriatin, Y. M., Supriadi, A., Musfeptial, M., & Kustini, K. (2023). Making peace with disaster: A study of earthquake disaster communication through manuscripts and oral traditions. *Progress in Disaster Science*, *18*. Scopus. https://doi.org/10.1016/j.pdisas.2023.100287

Farros, A. A., Wijayanti, I., & Agustiar, A. (2024). Meaning Recognition Terms in Arabic Semantic Studies. Humanities Research Sustainability, 1(1), 23–33. https://doi.org/10.70177/jhrs.v1i1.907

Firdaus, A., Lestari, F., Afiff, S. A., & Herdiansyah, H. (2023). Integration of knowledge and local wisdom for disaster resilience in Anak Krakatau volcano. *Jamba: Journal of Disaster Risk Studies*, *15*(1). Scopus. https://doi.org/10.4102/jamba.v15i1.1457

Furoida, A. N., Susilowati, I., Dias, A. C. E., Sundari, C., Kusumawardhani, H. A., & Prastyadewi, M. I. (2023). Analysis of Community Adaptation to Climate Change and Natural Hazards. *EnvironmentAsia*, *16*(1), 59–72. Scopus. https://doi.org/10.14456/ea.2023.6

Girsang, W., Siregar, A., Madubun, E., & Magana, A. (2025). *Sustainable agriculture in small islands: A case of Ambon Island, Indonesia*. *1527*(1). Scopus. https://doi.org/10.1088/1755-1315/1527/1/012008

Hayati, K., Pada, A. U. T., & Mawarpury, M. (2023). *Content Validity of Collective Efficacy Questionnaire for Natural Disasters Based on Aceh Local Wisdom* (P. Pertiwi, A. Rahman, A. Opdyke, M. Bisri, R. S. Oktari, R. Rosemary, & E. Mas, Ed.; Vol. 447). EDP Sciences; Scopus. https://doi.org/10.1051/e3sconf/202344704004

Irwansyah, M., Nursaniah, C., Qadri, L., & Mariana, M. (2024). City of prone natural disasters: Mitigating post-tsunami on the coastal of Banda Aceh, Indonesia. *Environmental Challenges*, *15*. Scopus. https://doi.org/10.1016/j.envc.2024.100925

Ito-Morales, K. (2024). Community-based fire management and beyond: Role and problems of volunteer fire department shōbōdan in japanese urban spaces and peri-urban forest environments. *Trees, Forests and People*, *16*. Scopus. https://doi.org/10.1016/j.tfp.2024.100531

Jaya, P. H. I., & Izudin, A. (2023). THE ROLE OF RELIGIOUS BELIEF IN SUSTAINABLE COMMUNITY-BASED TOURISM DURING POSTDISASTER RECOVERY. *Tourism, Culture and Communication*, *23*(4), 357–374. Scopus. https://doi.org/10.3727/109830422X16600594683553

Kurniawan, K. R., & Aprilian, R. D. (2024). *Learning From Leuit: The Remains of Sundanese Vernacular Architecture's Rice Barn* (hlm. 15–26). Taylor and Francis; Scopus. https://doi.org/10.4324/9781003389002-2

Li, J., Zhou, W., & Tao, C. (2024). The Value of Traditional Ecological Knowledge in Stormwater Management: A Case Study of a Traditional Village. *Land*, *13*(2). Scopus. https://doi.org/10.3390/land13020242

Mahmudi, mahmudi, & Khoiruddin, M. A. (2024). Improving Student Life Skills Through the Ma Plus Skills Program at MAN 4 Kediri. Humanities Research Sustainability, 1(1), 16–22. https://doi.org/10.70177/jhrs.v1i1.995

Manjula devi, C. M., Gobinath, A., Padma Priya, S. P., Reshmika, K. S., & Sivakarthi, G. (2024). *Predicting natural disasters with AI and machine learning* (hlm. 254–273). IGI Global; Scopus. https://doi.org/10.4018/979-8-3693-3362-4.ch015

Marlyono, S. G., Mustofa, R. F., Firdaus, D. W., Arini, C., & Danawijaya, I. (2024). *Analysis of potential landslides and local wisdom approaches in dealing with them in the Naga Traditional Village Area, Tasikmalaya Regency* (Nandi, M. H. Ibrahim, & K. Greve, Ed.; Vol. 600). EDP Sciences; Scopus. https://doi.org/10.1051/e3sconf/202460002004

Muhamad, H., Abdulah, D. C., & Ariani, N. (2025). COMMUNITY PARTICIPATION AND SOCIAL RECONSTRUCTION POST NATURAL DISASTERS BASED ON LOCAL WISDOM IN SIGI DISTRICT CENTRAL SULAWESI PROVINCE. *Jurnal Ilmiah Ilmu Terapan Universitas Jambi*, *9*(2), 666–675. Scopus. https://doi.org/10.22437/jiituj.v9i2.37009

Muqit, F. A., & Putra, A. W. (2024). Delving Into Existential Fatigue and The Search for Meaning in The Play "kapai-kapai" by Arifin C. Noer. Humanities Research Sustainability, 1(1), 34–40. https://doi.org/10.70177/jhrs.v1i1.929

Murtiaji, C., Irfani, M., Fauzi, I., Marta, A. S. D., Sukmana, C. I., & Wulandari, D. A. (2023). *Methods for addressing tidal floods in coastal cities: An overview* (D. Harwanto, Ed.; Vol. 1224, Nomor 1). Institute of Physics; Scopus. https://doi.org/10.1088/1755-1315/1224/1/012019

Mutolib, A., Rahmat, A., Harefa, D., Nugraha, S., Handoko, L., Sululing, S., Laxmi, n., & Nurhayati, S. (2025). *Volcanic disaster mitigation based on local wisdom: A case study from a local community in the Mount Galunggung, Indonesia* (Komariah, K. Hiramatsu, N. Uddin, & D. P. Ariyanto, Ed.; Vol. 155). EDP Sciences; Scopus. https://doi.org/10.1051/bioconf/202515502002

Nopriyasman, N., Asnan, G., Fauzi, A., Hastuti, I. P., Ritonga, A. H., Kurniawan, V., & Mairiska, R. (2024). Reading indigenous signs: The wisdom of nagari communities toward natural

disaster in Pasaman Barat. *International Journal of Disaster Risk Reduction*, *107*. Scopus. https://doi.org/10.1016/j.ijdrr.2024.104497

Partini, D., & Hidayaht, A. N. (2024). *Disaster risk reduction efforts through education in Indonesia: A literature review* (Sumarmi, Juhadi, D. Mardiatno, E. Maryani, Jumadi, C. Muryani, R. Noviani, P. Wijayanti, A. Marzuki, & S. Koesuma, Ed.; Vol. 1314, Nomor 1). Institute of Physics; Scopus. https://doi.org/10.1088/1755-1315/1314/1/012049

Permatasari, D., Maski, G., & Manzilati, A. (2024). The influence of natural factors on poverty in West Halmahera. *Edelweiss Applied Science and Technology*, *8*(6), 4362–4371. Scopus. https://doi.org/10.55214/25768484.v8i6.2936

Pujaanti, E. A., & Isnah, E. S. (2023). Development of Digital Comics as a Source of Disaster Mitigation Education: A Case Study on Building Resilience among Youth. *Eurasian Journal of Applied Linguistics*, *9*(3), 133–141. Scopus. https://doi.org/10.32601/ejal.903012

Radaei, M., & Salehi, E. (2025). Strategic analysis of ancient Chinese drainage system pattern with a resilience approach against urban flooding. *Watershed Engineering and Management*, *17*(1), 82–102. Scopus. https://doi.org/10.22092/ijwmse.2024.366704.2076

Rahim, M., Marasabessy, F., Quraisy, S., & Basri, A. (2024). Study on the Development and Environmental Adaptation of Mosque Architecture in Disaster-Prone Region of Ternate Island, Indonesia. *International Review for Spatial Planning and Sustainable Development*, *12*(4), 225–252. Scopus. https://doi.org/10.14246/IRSPSD.12.4_225

Rahim, M., Munir, A., & Marasabessy, F. (2023). Local Wisdom and Sustainable Features of Tidore Vernacular Architecture. *Civil Engineering and Architecture*, *11*(2), 531–549. Scopus. https://doi.org/10.13189/cea.2023.110201

Rianthong, S., & Pangkesorn, A. (2025). Evolution of Riverside Commercial Districts in the Central Region of Thailand. *Journal of Arts and Thai Studies*, *47*(2). Scopus. https://doi.org/10.69598/artssu.2025.4566

Saadi, Y. (2023). *Incorporating Cultural Attributes into Disaster Risk Reduction-Based Development Plans in Indonesia* (S. A. Kristiawan, B. S. Gan, M. Shahin, & A. Sharma, Ed.; Vol. 225, hlm. 631–640). Springer Science and Business Media Deutschland GmbH; Scopus. https://doi.org/10.1007/978-981-16-9348-9_55

Salam, N. E., Yasir, Y., Firdaus, M., Azwa, R., & Lubis, E. E. (2024). Tourism Communication Model in Developing Heritage City Tourism in Siak Sri Indrapura Regency, Riau, Indonesia. Humanities Research Sustainability, 1(1), 1–15. https://doi.org/10.70177/jhrs.v1i1.876

Setiadi, H. W., Dwiningrum, S. I. A., & Mustadi, A. (2023). Portrait of Ecoliteracy Competence in Elementary School Students: Relationship of Ecoliteracy Competence on Environmental Sustainability in Indonesia. *Environment and Ecology Research*, *11*(6), 993–1001. Scopus. https://doi.org/10.13189/eer.2023.110610

Sharma, A., Pawar, T., & Ji, S. (2025). *Exploring Site-Responsive Characteristics in the Indigenous Architecture of Nyishis of Arunachal Pradesh, India* (A. Chakrabarti, V. Singh, P. S. Onkar, & M. Shahid, Ed.; hlm. 65–76). Springer Science and Business Media Deutschland GmbH; Scopus. https://doi.org/10.1007/978-981-96-5499-4_6

Sriyono, S., Zulkarnain, H., Proboningsih, J., Mufarika, M., & Akbar, D. R. (2023). *Mosque is the only visible shelter at the most dangerous time: A qualitative study of the victims, experience in the Mount Semeru eruption*. *73*(2), S54–S58. Scopus. https://doi.org/10.47391/JPMA.Ind-S2-13

Sulistiyo, S., Amrullah, S., Putri, R. A. P., & Ruslanjari, D. (2024). *Mitigation and Adaptation Strategies of Coastal Community in Timbulsloko Village: Facing the Impact of Climate*

Change (S. Lestari, H. Santoso, M. Hendrizan, Trismidianto, G. A. Nugroho, A. Budiyono, & S. Ekawati, Ed.; Vol. 305, hlm. 703–718). Springer Science and Business Media Deutschland GmbH; Scopus. https://doi.org/10.1007/978-981-97-0740-9_63

Traiyut, T., Srijuntrapun, P., & Rawang, W. (2024). Factors in Community Adaptation for Climate Change Mitigation in Thailand. *Environment and Natural Resources Journal*, *22*(3), 197–209. Scopus. https://doi.org/10.32526/ennrj/22/20230282

Utami, I. D., Anshori, N., Saptaningtyas, H., & Astuti, S. P. (2025). A food resilience model integrating local wisdom and sociotechnical dynamic systems: Case study flood-affected communities in the Bengawan solo area. *Progress in Disaster Science*, *26*. Scopus. https://doi.org/10.1016/j.pdisas.2025.100413