



DISASTER RISK GOVERNANCE AND SOCIO-ECOLOGICAL VULNERABILITY IN THE DEVELOPMENT OF REMPANG ISLAND

TATA KELOLA RISIKO BENCANA DAN KERENTANAN SOSIO- EKOLOGIS DALAM PEMBANGUNAN PULAU REMPANG

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Abstract

The development of Rempang Island through the Rempang Eco-City project has become one of Indonesia's strategic initiatives to promote investment, industrialization, and regional economic growth in coastal areas. While the project is expected to strengthen economic competitiveness and attract large-scale investment, its implementation has generated significant social, environmental, and governance challenges. Existing studies on Rempang have primarily focused on land disputes, relocation issues, and agrarian conflicts, with limited attention given to disaster risk governance and socio-ecological vulnerability perspectives. This study aims to analyze the development of Rempang Island through the lens of Disaster Risk Governance (DRG) and socio-ecological vulnerability to understand how development policies, environmental change, and governance arrangements interact in shaping risks within coastal regions. This study employs a qualitative approach using literature review and policy analysis. Data were collected from government regulations, official reports, public policy documents, human rights reports, academic publications, and other credible secondary sources. The analytical framework integrates disaster risk governance, socio-ecological vulnerability, and public policy theories. The findings indicate that the Rempang conflict should not be understood solely as an agrarian dispute or community resistance to relocation. Instead, it reflects broader governance challenges associated with integrating disaster risk considerations into coastal development policies. The project has the potential to generate socio-ecological vulnerabilities related to land tenure uncertainty, livelihood transformation, cultural identity concerns, environmental pressures, and limited stakeholder participation. The study argues that sustainable coastal development depends not only on economic investment but also on the capacity of governance systems to manage emerging risks through collaborative, adaptive, and inclusive approaches. The article contributes to the literature by positioning the Rempang case as a governance-of-risk issue and highlighting the need to integrate economic development, environmental sustainability, and disaster risk reduction within coastal governance frameworks.

Keywords : Disaster Risk Governance, Socio-Ecological Vulnerability, Rempang Island, Coastal Development, Public Policy.

Abstrak

Pengembangan Pulau Rempang melalui proyek Kota Ekologi Rempang telah menjadi salah satu inisiatif strategis Indonesia untuk mendorong investasi, industrialisasi, dan pertumbuhan ekonomi regional di daerah pesisir. Meskipun proyek ini diharapkan dapat memperkuat daya saing ekonomi



dan menarik investasi skala besar, implementasinya telah menimbulkan tantangan sosial, lingkungan, dan tata kelola yang signifikan. Studi yang ada tentang Rempang sebagian besar berfokus pada sengketa tanah, masalah relokasi, dan konflik agraria, dengan perhatian terbatas diberikan pada tata kelola risiko bencana dan perspektif kerentanan sosial-ekologis. Studi ini bertujuan untuk menganalisis pembangunan Pulau Rempang melalui lensa Tata Kelola Risiko Bencana (DRG) dan kerentanan sosial-ekologis untuk memahami bagaimana kebijakan pembangunan, perubahan lingkungan, dan pengaturan tata kelola berinteraksi dalam membentuk risiko di wilayah pesisir. Studi ini menggunakan pendekatan kualitatif dengan menggunakan tinjauan pustaka dan analisis kebijakan. Data dikumpulkan dari peraturan pemerintah, laporan resmi, dokumen kebijakan publik, laporan hak asasi manusia, publikasi akademis, dan sumber sekunder kredibel lainnya. Kerangka analitis mengintegrasikan tata kelola risiko bencana, kerentanan sosial-ekologis, dan teori kebijakan publik. Temuan menunjukkan bahwa konflik Rempang tidak boleh dipahami semata-mata sebagai sengketa agraria atau penolakan masyarakat terhadap relokasi. Sebaliknya, konflik ini mencerminkan tantangan tata kelola yang lebih luas terkait dengan pengintegrasian pertimbangan risiko bencana ke dalam kebijakan pembangunan pesisir. Proyek ini berpotensi menimbulkan kerentanan sosial-ekologis yang berkaitan dengan ketidakpastian kepemilikan lahan, transformasi mata pencaharian, kekhawatiran identitas budaya, tekanan lingkungan, dan partisipasi pemangku kepentingan yang terbatas. Studi ini berpendapat bahwa pembangunan pesisir berkelanjutan tidak hanya bergantung pada investasi ekonomi tetapi juga pada kapasitas sistem tata kelola untuk mengelola risiko yang muncul melalui pendekatan kolaboratif, adaptif, dan inklusif. Artikel ini berkontribusi pada literatur dengan memposisikan kasus Rempang sebagai isu tata kelola risiko dan menyoroti perlunya mengintegrasikan pembangunan ekonomi, keberlanjutan lingkungan, dan pengurangan risiko bencana dalam kerangka kerja tata kelola pesisir.

Kata Kunci : Tata Kelola Risiko Bencana, Kerentanan Sosial-Ekologis, Pulau Rempang, Pembangunan Pesisir, Kebijakan Publik.

1. INTRODUCTION

Background of the Problem

Coastal areas have increasingly become strategic spaces for economic development, industrial expansion, and infrastructure investment in many developing countries. Governments frequently utilize coastal regions as growth poles to accelerate regional competitiveness, attract foreign direct investment, and strengthen integration into global production networks. However, extensive literature has demonstrated that large-scale development projects often generate complex interactions between economic growth, environmental sustainability, social equity, and risk governance (Adger, 2006; Turner et al., 2003). Consequently, contemporary public administration scholarship no longer views development merely as an economic process but as a governance process that shapes the distribution of risks, vulnerabilities, and opportunities across society (Tierney, 2012)..

The increasing recognition of disaster risk governance reflects a broader shift in understanding the relationship between development and risk. The Sendai Framework for Disaster Risk Reduction 2015–2030 emphasizes that disaster risk is not solely produced by natural hazards but also by development choices, institutional arrangements, governance capacities, and patterns of social vulnerability (UNDRR, 2015). In this perspective, poorly governed development interventions may unintentionally create new forms of risk even when their primary objective is economic growth. Therefore, the integration of disaster risk considerations into development planning has become a central concern in both public policy and disaster management studies (Renn, 2008; Tierney, 2012).

The case of Rempang Island represents an important example of this challenge in Indonesia. Located within the Batam–Rempang–Galang (Barelang) region of the Riau Islands Province, Rempang has been designated as a strategic area for investment-driven development through the Rempang Eco-City project. The project is expected to support industrial development, trade



expansion, tourism activities, and regional economic transformation while attracting large-scale investment commitments estimated at approximately IDR 381 trillion (BP Batam, 2023). From a policy perspective, the project reflects the Indonesian government's broader strategy to strengthen national competitiveness through industrialization and investment expansion in strategic coastal regions.

Despite these expected economic benefits, the implementation of the Rempang Eco-City project has generated significant controversy. Public debates surrounding the project have largely focused on land tenure issues, relocation policies, and conflicts involving local communities residing in several long-established Malay settlements on Rempang Island. The conflict attracted national attention following public resistance to relocation plans and disagreements concerning land governance arrangements. Subsequent investigations by the Ombudsman of the Republic of Indonesia identified several forms of maladministration related to project implementation, including procedural weaknesses in land management, public communication, and policy execution (Ombudsman Republik Indonesia, 2024).

Most existing studies have interpreted the Rempang case primarily through the lens of agrarian conflict, land rights disputes, policy resistance, and state–society relations. Recent studies also highlight the existence of a legality–legitimacy gap, whereby development policies may possess formal legal authority but encounter difficulties in securing social acceptance and public trust (Nugroho & Hidayat, 2026). While these studies provide valuable insights into the political and legal dimensions of the conflict, they tend to treat the issue predominantly as a contestation over land ownership, relocation, and development rights. However, limiting the analysis to agrarian conflict risks overlooking a broader governance problem embedded within the Rempang case. From a Disaster Risk Governance perspective, the conflict can be interpreted as an outcome of interactions among development policies, institutional arrangements, environmental transformation, and social vulnerability. In other words, the project does not merely generate disputes over land; it potentially reshapes the socio-ecological system of the island by altering patterns of resource access, livelihood structures, community resilience, environmental conditions, and governance relationships among stakeholders.

This perspective is particularly relevant because coastal communities are highly dependent on interactions between ecological systems and socio-economic structures. According to Adger (2006), vulnerability emerges not only from environmental exposure but also from social, economic, and institutional conditions that determine adaptive capacity. Similarly, Cutter et al. (2003) argue that vulnerability should be understood as a multidimensional phenomenon shaped by social inequalities, resource distribution, governance capacity, and environmental conditions. Consequently, development interventions may increase vulnerability when governance systems fail to anticipate and manage their potential social and ecological consequences.

In the context of Rempang, concerns regarding relocation, livelihood transformation, land tenure uncertainty, cultural identity preservation, and environmental sustainability indicate the presence of interconnected socio-ecological vulnerabilities. These vulnerabilities are further influenced by governance processes that determine who participates in decision-making, whose interests are prioritized, and how risks and benefits are distributed among affected stakeholders. Therefore, the central issue is not simply whether development should proceed, but whether governance arrangements are capable of managing the risks generated by development itself.

Although disaster risk governance has become an increasingly important concept in disaster management and public administration literature, its application to coastal industrial development projects in Indonesia remains relatively limited. Likewise, studies examining the intersection between disaster risk governance and socio-ecological vulnerability within the context of strategic investment projects are still scarce. This gap is particularly evident in the Rempang case, where scholarly attention has concentrated on conflict dynamics rather than on how development policies interact with vulnerability and risk production mechanisms. Accordingly, this article seeks to analyze the



development of Rempang Island through the combined perspectives of Disaster Risk Governance and socio-ecological vulnerability. The article argues that the Rempang conflict should not be understood merely as an agrarian dispute, a relocation issue, or a development controversy. Rather, it represents a manifestation of incomplete integration between coastal development policies and disaster risk governance principles. The risks associated with the project extend beyond environmental concerns and include social, cultural, economic, and institutional vulnerabilities arising from changing spatial arrangements, governance uncertainty, and complex stakeholder interactions. By examining these dimensions, this study contributes to the growing literature on public administration, coastal governance, and disaster management while offering policy insights for achieving more inclusive, adaptive, and resilient coastal development in Indonesia.

Problem Formulation and Research Urgency

The controversy surrounding the development of Rempang Island reveals a broader challenge in contemporary coastal governance, namely the difficulty of balancing economic development objectives with environmental sustainability, social justice, and disaster risk management. While the Rempang Eco-City project has been promoted as a strategic initiative to stimulate investment and regional economic growth, its implementation has generated concerns regarding land governance, community relocation, stakeholder participation, and the long-term sustainability of coastal socio-ecological systems. These concerns suggest that the issue extends beyond a conventional development dispute and raises important questions regarding how risks are governed within large-scale coastal development projects.

From a public administration perspective, the central problem is not merely the existence of conflict between the government and local communities, but rather the extent to which disaster risk considerations have been integrated into development planning and implementation. The literature on disaster risk governance argues that development policies can become sources of risk when governance arrangements fail to recognize vulnerabilities, accommodate stakeholder interests, and anticipate the long-term consequences of environmental and social transformation (Tierney, 2012; UNDRR, 2015). In this regard, the Rempang case provides an important opportunity to examine how governance processes influence the production, distribution, and management of risks within coastal development initiatives.

Existing studies on Rempang have predominantly focused on agrarian conflict, land tenure disputes, relocation policies, human rights concerns, and state–society relations. Although these studies contribute significantly to understanding the political and legal dimensions of the conflict, they provide limited explanation regarding how development policies interact with socio-ecological vulnerability and disaster risk governance mechanisms. Consequently, current scholarship has yet to adequately explain whether the emerging tensions in Rempang should be understood solely as a governance conflict or as a broader manifestation of risk governance challenges associated with coastal development.

This gap becomes increasingly important given the strategic position of Indonesia as an archipelagic nation characterized by extensive coastal zones, environmental sensitivity, and increasing development pressures. Coastal industrialization projects are likely to become more common in the future, making it necessary to understand how governance systems can simultaneously promote economic development while reducing vulnerability and strengthening resilience. Failure to address this issue may lead to the reproduction of similar conflicts and vulnerabilities in other coastal regions across Indonesia.

Accordingly, this study seeks to answer the following research question:

How does the development of Rempang Island reflect the interaction between Disaster Risk Governance and socio-ecological vulnerability within the context of coastal industrial development?

To address this question, the study examines the governance dynamics of the Rempang Eco-City project, analyzes potential vulnerabilities from multiple environmental and socio-economic



perspectives, and evaluates the extent to which disaster risk governance principles have been incorporated into policy implementation. The study argues that the primary challenge facing Rempang is not simply a conflict over land or investment, but a governance challenge arising from the incomplete integration of disaster risk considerations into coastal development policies.

The urgency of this research lies in its potential contribution to both theory and practice. Theoretically, the study expands the application of Disaster Risk Governance and socio-ecological vulnerability frameworks within the field of public administration, particularly in the context of strategic coastal development projects. Practically, the findings are expected to provide insights for policymakers, local governments, and development agencies regarding the importance of integrating risk governance principles into coastal planning processes. By doing so, development policies can be designed not only to generate economic growth but also to enhance social resilience, environmental sustainability, and long-term public value.

Literature Review

1. Disaster Risk Governance

The concept of Disaster Risk Governance (DRG) emerged as a response to the limitations of conventional disaster management approaches that primarily focused on emergency response and post-disaster recovery. Contemporary disaster studies argue that disaster risk is not merely the consequence of natural hazards but also the product of social, political, economic, and institutional processes that shape vulnerability and exposure (Tierney, 2012). This perspective has shifted scholarly attention from hazard-centered approaches toward governance-oriented approaches that emphasize the importance of institutions, stakeholder participation, and policy integration in reducing disaster risks.

The United Nations Office for Disaster Risk Reduction (UNDRR, 2015) defines disaster risk governance as the system of institutions, mechanisms, policy instruments, legal frameworks, and coordination arrangements through which disaster risks are identified, assessed, managed, and reduced. Within the Sendai Framework for Disaster Risk Reduction 2015–2030, effective governance is considered a prerequisite for strengthening resilience and achieving sustainable development because disaster risk is often generated through development decisions that fail to consider vulnerability and exposure (UNDRR, 2015).

Risk governance extends beyond technical risk assessment. Renn (2008) argues that risk governance involves the collective capacity of public institutions, private actors, and civil society to manage uncertainty and address competing interests in decision-making processes. Consequently, governance quality becomes a critical determinant of whether development initiatives reduce existing vulnerabilities or unintentionally create new forms of risk. Tierney (2012) further emphasizes that disaster risk governance should be understood as a multidimensional process involving accountability, legitimacy, transparency, coordination, and stakeholder engagement. In coastal regions, the relevance of Disaster Risk Governance becomes particularly significant because development interventions frequently alter ecological systems, spatial arrangements, and socio-economic structures. Coastal industrialization, urban expansion, and infrastructure development may generate new patterns of vulnerability if governance mechanisms fail to integrate environmental sustainability, social protection, and risk reduction objectives (Renn, 2008). Therefore, the governance of coastal development cannot be separated from the governance of risk itself.

2. Socio Ecological Vulnerability

The concept of socio-ecological vulnerability emerged from sustainability science and environmental governance literature as an attempt to explain why certain communities experience greater impacts from environmental and social change than others. Vulnerability is not solely determined by exposure to hazards but is shaped by the interaction between ecological conditions, social structures, institutional arrangements, and adaptive capacity (Turner et al., 2003). They define vulnerability as the degree to which a coupled human–environment system is susceptible to harm and unable to cope with external stresses or disturbances. This perspective highlights the interconnectedness between social systems and ecological systems, suggesting that changes in one



dimension inevitably influence the other. Consequently, vulnerability should be understood as a dynamic condition rather than a static characteristic.

Similarly, Cutter et al. (2003) argue that vulnerability is socially differentiated. Communities facing similar environmental threats may experience substantially different outcomes because of variations in income, access to resources, institutional support, social capital, and political influence. Their Social Vulnerability Framework demonstrates that disaster impacts are strongly influenced by pre-existing social conditions rather than hazards alone. Adger (2006) further emphasizes that adaptive capacity plays a crucial role in reducing vulnerability. Communities with stronger social networks, secure access to livelihoods, effective institutions, and inclusive governance arrangements tend to be more resilient in the face of environmental and socio-economic change. Conversely, governance failures may increase vulnerability by weakening access to resources and limiting opportunities for adaptation (Adger, 2006).

Within the context of coastal development, socio-ecological vulnerability provides a useful framework for understanding how policy interventions may affect both environmental systems and local communities. Changes in land use, resource access, economic activities, and governance arrangements can reshape vulnerability patterns and influence long-term resilience outcomes (Adger, 2006).

2. RESEARCH METHOD

This study employed a qualitative research approach using literature review and policy analysis methods. A qualitative approach was selected because the study seeks to understand the governance dynamics, socio-ecological vulnerabilities, and disaster risk implications associated with the development of Rempang Island. Qualitative research is particularly appropriate for examining complex public policy issues involving multiple stakeholders, institutional arrangements, social conflicts, and environmental concerns that cannot be adequately explained through quantitative measures alone (Creswell & Creswell, 2018).

The study relied on secondary data collected from official government documents, regulations, reports issued by BP Batam, reports published by the Ombudsman of the Republic of Indonesia, academic journal articles, books, and international policy frameworks related to disaster risk governance and coastal development. Particular attention was given to documents concerning the Rempang Eco-City project, land governance policies, coastal development planning, and stakeholder responses to the project implementation (Ombudsman Republik Indonesia, 2024). Data collection was conducted through a systematic document review process. Relevant documents were identified, screened, and selected based on their relevance to the objectives of the study. To enhance the credibility of the findings, information from academic literature was cross-checked with official government reports and independent institutional publications through source triangulation (Bowen, 2009).

The collected data were analyzed using qualitative content analysis. The analysis began by categorizing information into major themes, including coastal development policy, governance arrangements, socio-ecological vulnerability, environmental risk, and stakeholder relations. Subsequently, thematic coding was employed to identify recurring patterns and governance challenges associated with the development of Rempang Island. The findings were then interpreted using the analytical perspectives of Disaster Risk Governance, Socio-Ecological Vulnerability, and Public Policy Analysis (Adger, 2006; Tierney, 2012; Dunn, 2018).

To evaluate the policy dimension, this study adopted Dunn's (2018) policy evaluation framework, which includes effectiveness, efficiency, adequacy, equity, responsiveness, and appropriateness. These criteria were used to assess the extent to which the development policy of Rempang Island addresses socio-ecological risks while pursuing economic development objectives. Through this analytical framework, the study seeks to explain how governance arrangements influence the production, distribution, and management of risks within coastal development processes.



3. RESULT AND DISCUSSION

1. Rempang Development Policy and Governance Conflict

The development of Rempang Island through the Rempang Eco-City project reflects Indonesia's broader strategy of promoting investment-led regional development in strategic coastal areas. The project is expected to strengthen economic competitiveness, attract large-scale investment, and accelerate industrialization within the Batam–Rempang–Galang (Barelang) corridor (BP Batam, 2023). From a public policy perspective, the initiative represents a government effort to utilize coastal resources as drivers of economic transformation and regional growth. However, the implementation of the project has generated significant governance challenges. Public debate surrounding Rempang has largely focused on land tenure issues, relocation policies, and the position of local communities residing in long-established settlements. The Ombudsman of the Republic of Indonesia identified several maladministration issues related to project implementation, particularly concerning land governance, communication processes, and stakeholder engagement (Ombudsman Republik Indonesia, 2024). These findings suggest that the challenge facing Rempang is not solely a legal or administrative issue but also a governance issue involving legitimacy, participation, and public trust.

From a governance perspective, the Rempang case can be interpreted as a form of **governance conflict**, where multiple actors pursue different objectives within the same policy arena. The central government and BP Batam emphasize economic development and investment opportunities, while local communities prioritize tenure security, cultural continuity, and livelihood sustainability. Such competing interests illustrate what Renn (2008) describes as risk governance challenges, where disagreements arise regarding the distribution of risks and benefits associated with development interventions.

At the same time, the conflict also reflects a **policy conflict** resulting from differences between formal policy objectives and public perceptions of policy outcomes. Although the project seeks to generate long-term economic benefits, concerns regarding relocation, livelihood transformation, and social disruption have shaped public responses to the policy. Recent studies suggest that the Rempang controversy reflects a broader tension between legal authority and social legitimacy, indicating that policy effectiveness cannot be measured solely through regulatory compliance but must also consider public acceptance and stakeholder trust (Nugroho & Hidayat, 2026).

Consequently, the Rempang case demonstrates that coastal development policies operate within complex socio-ecological systems where economic objectives, environmental considerations, and social interests are deeply interconnected. The conflict should therefore be understood not merely as resistance to development but as evidence of the challenges associated with integrating governance, participation, and risk management within large-scale coastal development projects.

2. Socio-Ecological Vulnerability and Disaster Risk Analysis from Nine Environmental Perspectives

The development of Rempang Island presents a complex interaction between environmental systems, socio-economic structures, and governance arrangements. From a Disaster Risk Governance perspective, risk is not solely determined by the presence of environmental hazards but also by the extent to which development interventions alter vulnerability and adaptive capacity within socio-ecological systems (UNDRR, 2015; Tierney, 2012). Therefore, understanding the implications of the Rempang Eco-City project requires a comprehensive assessment of environmental and social conditions that may influence long-term resilience in the coastal region.

Geographically, Rempang Island is located within a coastal and small-island ecosystem characterized by dynamic interactions among terrestrial, marine, and atmospheric processes. Such environments are inherently sensitive to land-use changes because ecological disturbances occurring in one component of the system may trigger cascading impacts on other components (Turner et al., 2003). Consequently, large-scale industrial development should be evaluated not only in terms of economic benefits but also in terms of its implications for environmental sustainability and community resilience.



From a geological perspective, Rempang is not located within one of Indonesia's highest seismic risk zones compared with regions along the Sunda Megathrust. Nevertheless, geological considerations remain important because coastal development activities often involve extensive land modification, infrastructure construction, and changes in surface characteristics that may influence erosion patterns, soil stability, and long-term environmental quality. According to the Sendai Framework, development planning that neglects environmental carrying capacity may increase future vulnerability even in areas with relatively low disaster exposure (UNDRR, 2015).

Hydrological conditions constitute another important dimension of vulnerability. Small islands generally possess limited freshwater resources and highly sensitive watershed systems. Rapid urbanization and industrial expansion may increase pressure on groundwater reserves, alter natural drainage systems, and reduce infiltration capacity through land conversion. International studies indicate that changes in land cover frequently increase flood susceptibility and reduce ecosystem services associated with water regulation (Adger, 2006). In the context of Rempang, hydrological vulnerability should therefore be viewed as a governance issue requiring long-term planning and environmental monitoring.

The oceanographic dimension is equally significant because coastal communities depend heavily on marine ecosystems for economic and social activities. Changes in coastal infrastructure, industrial operations, and shoreline utilization may influence sediment dynamics, coastal circulation, and marine resource availability. While industrial development can generate economic opportunities, inadequate environmental management may create additional pressures on fisheries and coastal ecosystems that support local livelihoods. Such conditions illustrate the close relationship between ecological integrity and social resilience within coastal socio-ecological systems (Turner et al., 2003).

Climate-related risks further strengthen the need for integrated governance approaches. Coastal regions throughout Southeast Asia are increasingly exposed to sea-level rise, coastal flooding, extreme rainfall, and climate variability (IPCC, 2023). Although these risks are not unique to Rempang, future development strategies must incorporate climate adaptation measures to ensure that infrastructure investments and settlement planning remain resilient under changing environmental conditions. Failure to integrate climate considerations into development planning may generate long-term vulnerabilities that exceed immediate economic benefits.

Ecologically, Rempang forms part of a broader coastal ecosystem that includes mangrove habitats, marine biodiversity, and other ecological resources that contribute to environmental stability. Mangrove ecosystems are widely recognized for their role in coastal protection, carbon sequestration, and fisheries productivity (Alongi, 2015). Consequently, maintaining ecological integrity is not solely an environmental objective but also a disaster risk reduction strategy. The degradation of ecological assets may reduce the capacity of coastal systems to absorb environmental shocks and support community resilience.

However, the most significant vulnerabilities associated with the Rempang case appear to emerge from social dimensions rather than purely environmental factors. Social vulnerability is closely related to community capacity to adapt to change, access resources, and participate in decision-making processes (Cutter et al., 2003). Public debates surrounding Rempang reveal concerns regarding tenure security, community participation, relocation policies, and cultural continuity. These concerns suggest that vulnerability is not only produced by environmental exposure but also by uncertainty surrounding social and institutional arrangements.

Economic vulnerability also constitutes a critical consideration. Coastal communities often maintain strong dependence on fisheries, small-scale trade, and marine-based livelihoods. Development-induced transformations may create new employment opportunities while simultaneously disrupting existing economic systems. According to Adger (2006), vulnerability tends to increase when communities experience livelihood transitions without sufficient adaptive support mechanisms. Therefore, economic resilience should be assessed not merely through aggregate



investment figures but through the capacity of local populations to benefit from development outcomes.

Environmental health represents another dimension frequently overlooked in development planning. Industrial expansion, population growth, and increased resource utilization may generate new environmental health challenges related to water quality, waste management, and ecosystem degradation. Although such impacts depend on future project implementation and environmental safeguards, preventive governance measures remain essential because environmental health risks often emerge gradually and become visible only after substantial ecological changes have occurred.

Among the nine dimensions examined, governance emerges as the most influential determinant of vulnerability. Governance shapes how decisions are made, how risks are communicated, how stakeholders participate, and how benefits and burdens are distributed across society (Renn, 2008). The findings of the Ombudsman of the Republic of Indonesia (2024) indicate that governance challenges in Rempang extend beyond technical planning and involve issues of legitimacy, communication, and institutional coordination. Consequently, governance capacity becomes the central factor determining whether development processes reduce existing vulnerabilities or generate new forms of socio-ecological risk.

Taken together, these nine environmental perspectives demonstrate that the primary challenge facing Rempang is not simply environmental degradation or physical disaster exposure. Rather, it is the interaction between environmental change, socio-economic transformation, and governance arrangements that shapes vulnerability within the coastal system. The analysis therefore supports the argument that the Rempang case should be understood as a Disaster Risk Governance issue in which the effectiveness of governance institutions plays a decisive role in determining the sustainability and resilience of future development outcomes.

3. Disaster risk Governance Assesment of Rempang Development

The preceding analysis demonstrates that the development of Rempang Island involves more than environmental and socio-economic considerations. The interaction among multiple stakeholders, competing interests, institutional arrangements, and policy objectives indicates that the central challenge lies in governance itself. Consequently, the Rempang case can be understood as a disaster risk governance issue in which risks emerge not only from environmental conditions but also from the ways in which development decisions are formulated, implemented, and contested (Tierney, 2012).

Disaster Risk Governance emphasizes that effective risk reduction requires coordination among governmental institutions, private actors, local communities, and civil society organizations (UNDRR, 2015). In the context of Rempang, governance complexity arises from the involvement of numerous actors, including the central government, BP Batam, local government authorities, investors, local communities, and various civil society groups. Each actor possesses different interests, resources, and perceptions regarding the objectives and consequences of development. While government institutions tend to emphasize economic growth and investment opportunities, local communities often prioritize tenure security, cultural continuity, and livelihood sustainability. Such differences illustrate the governance dilemma commonly observed in large-scale development projects where competing values shape policy implementation (Renn, 2008).

A critical issue emerging from the Rempang case concerns policy legitimacy. Public administration literature distinguishes between legal legitimacy and social legitimacy. Legal legitimacy refers to the formal authority of government institutions to formulate and implement policies, whereas social legitimacy relates to the degree to which policies are accepted and supported by affected stakeholders (Suchman, 1995). Although the Rempang Eco-City project possesses a legal foundation within national and regional development frameworks, public resistance suggests that legal authority alone may be insufficient to ensure policy acceptance. Recent studies indicate that tensions between formal authority and community perceptions have contributed to what has been described as a legality–legitimacy gap within the governance process (Nugroho & Hidayat, 2026).



Stakeholder participation represents another important dimension of disaster risk governance. The Sendai Framework emphasizes inclusive decision-making as a prerequisite for effective risk reduction because local communities often possess contextual knowledge regarding environmental conditions, livelihood systems, and social vulnerabilities (UNDRR, 2015). In development settings, participation serves not only as a democratic principle but also as a mechanism for identifying potential risks that may otherwise remain overlooked. The controversy surrounding Rempang suggests that stakeholder participation has become a central issue in public debates regarding the project. From a governance perspective, limited participation may reduce trust, increase uncertainty, and amplify perceptions of risk among affected communities.

Institutional coordination is equally significant in determining governance effectiveness. Large-scale coastal development projects require coordination across multiple sectors, including land administration, environmental management, economic planning, infrastructure development, and social protection. Fragmented governance arrangements often create policy inconsistencies and implementation challenges that may increase vulnerability rather than reduce it (Tierney, 2012). Findings from the Ombudsman Republik Indonesia (2024) indicate that coordination challenges, procedural issues, and communication problems contributed to tensions surrounding project implementation. These findings reinforce the argument that governance capacity plays a decisive role in shaping development outcomes.

From the perspective of collaborative governance, development policies are more likely to achieve sustainable outcomes when stakeholders are engaged in collective problem-solving processes characterized by dialogue, trust-building, and shared decision-making (Ansell & Gash, 2008). Collaborative governance does not eliminate conflict; rather, it provides institutional mechanisms for managing disagreements constructively. In the case of Rempang, the persistence of disputes suggests that collaborative mechanisms require further strengthening to facilitate communication among stakeholders and enhance policy legitimacy.

The concept of *risk production* offers additional insight into the governance challenges associated with the project. Traditional disaster management often focuses on reducing existing risks. However, contemporary risk governance literature recognizes that development interventions themselves may generate new forms of risk when governance systems fail to anticipate their social and environmental implications (Beck, 1992; Renn, 2008). In Rempang, risks emerge not only from environmental change but also from uncertainty regarding land tenure, livelihood transformation, social cohesion, and institutional trust. These risks are socially produced through governance processes and therefore require governance solutions.

Taken together, the findings suggest that the principal challenge facing Rempang is not whether development should occur, but how development should be governed. Economic growth, industrial expansion, and infrastructure investment remain legitimate policy objectives. However, the sustainability of these objectives depends on the capacity of governance institutions to integrate risk considerations, stakeholder participation, environmental protection, and social inclusion into decision-making processes. The Rempang case therefore illustrates the importance of Disaster Risk Governance as a framework for understanding and managing the complex interactions among development, vulnerability, and resilience within coastal regions.

4. Policy Evaluation Using William Dunn's Framework

The development of Rempang Island presents an important case for evaluating how public policy balances economic objectives, social interests, environmental sustainability, and risk governance considerations. According to Dunn (2018), policy evaluation should not be limited to measuring policy outputs but should assess the extent to which public policies address societal problems effectively, equitably, and appropriately. Therefore, evaluating the Rempang Eco-City project requires a broader assessment of how the policy responds to economic development goals while simultaneously managing socio-ecological vulnerabilities and governance challenges.



From the perspective of effectiveness, the Rempang development policy demonstrates a strong commitment to attracting investment and promoting regional economic transformation. The project was designed to strengthen the competitiveness of the Batam–Rempang–Galang economic corridor and to position the region as a strategic industrial hub within Indonesia’s national development agenda (BP Batam, 2023). In this regard, the policy has been effective in generating investor interest and placing Rempang at the center of national development discourse. However, effectiveness in public policy extends beyond achieving economic targets. Dunn (2018) argues that a policy can only be considered fully effective when it successfully addresses the broader public problems it seeks to solve. The persistence of social resistance, governance disputes, and concerns regarding stakeholder inclusion suggests that the effectiveness of the policy remains contested from a socio-political perspective.

The criterion of efficiency raises further questions regarding the balance between policy benefits and implementation costs. Economic projections indicate that the project has the potential to generate substantial investment and employment opportunities. Nevertheless, policy implementation has also produced significant social and administrative costs associated with conflict management, stakeholder engagement, institutional coordination, and public communication. Public policy scholars emphasize that efficiency should not be assessed solely in financial terms but should also consider transaction costs, governance costs, and social costs arising during implementation (Dunn, 2018). Consequently, while the anticipated economic returns may be substantial, the governance challenges encountered during implementation indicate that efficiency outcomes remain uncertain and dependent upon the ability of institutions to reduce conflict and improve policy coordination.

Adequacy represents another important dimension of policy evaluation. This criterion examines whether a policy is sufficient to address the underlying problems it intends to solve (Dunn, 2018). In the case of Rempang, the policy successfully identifies economic underdevelopment as a challenge and seeks to address it through industrial investment and infrastructure development. However, the findings presented in this study suggest that economic intervention alone may be insufficient to address the broader socio-ecological realities of the island. Issues related to land tenure uncertainty, community vulnerability, environmental sustainability, and stakeholder trust require policy responses that extend beyond economic development strategies. Therefore, while the policy may be adequate in addressing investment objectives, its adequacy in managing socio-ecological risks remains limited.

The issue of equity is particularly significant in the Rempang case because development policies inevitably produce both benefits and burdens. Public policy evaluation requires an assessment of how these benefits and burdens are distributed among different social groups (Dunn, 2018). The projected benefits of the project include economic growth, employment creation, and regional development. However, concerns have emerged regarding the distribution of risks and costs among local communities, particularly those directly affected by development activities and relocation policies. From an equity perspective, policy legitimacy depends not only on aggregate economic gains but also on perceptions of fairness in the allocation of opportunities, compensation mechanisms, and decision-making processes. Previous studies indicate that perceptions of procedural injustice often contribute to policy resistance even when economic benefits are anticipated (Ansell & Gash, 2008).

Responsiveness refers to the extent to which public policies address the needs, preferences, and concerns of affected stakeholders (Dunn, 2018). The Rempang controversy illustrates the importance of responsiveness in governance processes. Public debates surrounding relocation, cultural identity, livelihood security, and land governance demonstrate that communities evaluate policies not only on the basis of formal legality but also on whether their concerns are acknowledged and addressed. Findings from the Ombudsman Republik Indonesia (2024) suggest that communication and stakeholder engagement constituted significant challenges during policy implementation. This indicates that responsiveness remains a critical area requiring improvement if long-term policy acceptance is to be achieved.



Finally, the criterion of appropriateness examines whether a policy represents the most suitable response to a given public problem (Dunn, 2018). From an economic perspective, industrial development may be considered an appropriate strategy for stimulating regional growth. However, from a Disaster Risk Governance perspective, policy appropriateness must also consider long-term resilience, environmental sustainability, social cohesion, and adaptive capacity. Development strategies that generate economic gains while simultaneously increasing socio-ecological vulnerability may achieve short-term objectives at the expense of long-term sustainability. Therefore, the appropriateness of the Rempang policy depends largely on the extent to which economic development objectives are integrated with risk governance principles and inclusive governance practices.

Overall, the evaluation suggests that the Rempang development policy possesses significant economic potential but faces substantial governance challenges. The policy demonstrates strengths in promoting investment and regional development but reveals limitations in addressing issues of participation, legitimacy, vulnerability, and socio-ecological resilience. Consequently, the central policy challenge is not whether development should proceed, but how development can be implemented in a manner that balances economic growth with social inclusion, environmental sustainability, and disaster risk reduction. Such an approach is consistent with contemporary governance frameworks that emphasize resilience, stakeholder participation, and sustainable development as essential components of effective public policy (UNDRR, 2015).

5. Implications for Coastal Disaster Management and Policy Recommendations

The Rempang case provides important lessons for the future of coastal development governance in Indonesia. Beyond its immediate political and social implications, the case highlights the growing need to integrate disaster risk governance principles into development planning processes, particularly in coastal regions characterized by ecological sensitivity, complex stakeholder relationships, and increasing investment pressures. As coastal areas continue to serve as strategic locations for industrial expansion and infrastructure development, the challenge facing policymakers is not simply how to accelerate economic growth but how to ensure that development does not generate new forms of vulnerability and risk (UNDRR, 2015).

One of the most significant lessons from Rempang is the importance of adopting a resilience-oriented approach to coastal development. Traditionally, development policies have prioritized economic indicators such as investment value, employment generation, and infrastructure expansion. While these indicators remain important, contemporary disaster management literature emphasizes that development success should also be measured by the capacity of communities and ecosystems to withstand, adapt to, and recover from environmental and socio-economic disturbances (Adger, 2006; IPCC, 2023). Consequently, coastal development policies should be designed not only to maximize economic benefits but also to strengthen long-term socio-ecological resilience.

The findings of this study further demonstrate that social vulnerability constitutes one of the most critical dimensions of disaster risk within coastal development contexts. Public concerns regarding tenure security, livelihood continuity, cultural identity, and stakeholder participation indicate that vulnerability is closely linked to governance processes rather than environmental conditions alone. This finding supports previous research arguing that disaster risk is often socially produced through institutional decisions, policy arrangements, and unequal access to resources (Cutter et al., 2003; Tierney, 2012). Therefore, reducing disaster risk in coastal regions requires strengthening social protection mechanisms, enhancing public participation, and ensuring that affected communities are meaningfully involved in development planning.

The Rempang experience also underscores the importance of adaptive governance. Adaptive governance refers to the capacity of institutions to respond flexibly to changing conditions, emerging risks, and stakeholder concerns while maintaining policy effectiveness (Folke et al., 2005). In complex socio-ecological systems, uncertainty is inevitable, making rigid policy approaches increasingly ineffective. Instead, governance institutions must be capable of learning, adjusting, and responding to new information throughout the policy process. In the context of Rempang, adaptive governance



would require continuous stakeholder dialogue, transparent communication mechanisms, and periodic policy reviews to address emerging concerns and reduce governance-related tensions.

Another important implication concerns the role of collaborative governance in coastal disaster management. Large-scale coastal development projects involve multiple actors with diverse interests, resources, and forms of authority. Consequently, effective governance cannot rely solely on hierarchical decision-making structures. Collaborative governance offers an alternative framework that emphasizes shared decision-making, stakeholder engagement, and collective problem-solving (Ansell & Gash, 2008). Strengthening collaborative governance mechanisms could improve policy legitimacy, enhance stakeholder trust, and reduce the likelihood of conflict escalation in future development initiatives.

From a policy perspective, this study suggests that disaster risk assessments should become an integral component of coastal development planning. Such assessments should move beyond conventional environmental impact evaluations and incorporate broader socio-ecological considerations, including livelihood vulnerability, institutional capacity, community resilience, and governance effectiveness. Integrating disaster risk reduction principles into development planning is consistent with the objectives of the Sendai Framework, which advocates the incorporation of risk considerations into all sectors of public policy and development decision-making (UNDRR, 2015).

For Indonesia, the implications of the Rempang case extend beyond a single development project. Similar challenges are likely to emerge in other coastal regions where industrial expansion, infrastructure development, and environmental sustainability intersect. Therefore, policymakers should view Rempang as a strategic learning opportunity for improving coastal governance practices nationwide. Future development initiatives should prioritize risk-informed planning, participatory governance, environmental sustainability, and social inclusion as complementary rather than competing objectives.

Based on these findings, several policy recommendations can be proposed. First, government institutions should strengthen stakeholder participation mechanisms during policy formulation and implementation processes to improve legitimacy and reduce governance conflicts. Second, socio-ecological vulnerability assessments should be integrated into strategic development planning to identify potential risks before implementation begins. Third, inter-institutional coordination among development agencies, environmental authorities, and local governments should be enhanced to improve policy coherence and reduce implementation gaps. Fourth, adaptive governance mechanisms should be institutionalized through periodic monitoring, evaluation, and policy adjustment processes. Finally, disaster risk governance principles should be mainstreamed within coastal development policies to ensure that economic growth objectives are pursued alongside environmental sustainability, social resilience, and long-term risk reduction.

Taken together, these implications reinforce the central argument of this article that the future of coastal development in Indonesia depends not only on investment capacity but also on governance capacity. Sustainable development requires institutions capable of managing complexity, addressing uncertainty, and balancing economic ambitions with social and environmental responsibilities. In this regard, the Rempang case serves as an important example of why disaster risk governance must become a fundamental component of coastal development policy in the twenty-first century.

4. CONCLUSION

This study examined the development of Rempang Island through the perspectives of Disaster Risk Governance and socio-ecological vulnerability to understand how large-scale coastal development projects generate opportunities, risks, and governance challenges. The findings indicate that the Rempang case cannot be adequately explained through the conventional lenses of agrarian conflict, land tenure disputes, or community relocation alone. Rather, the controversy surrounding the Rempang Eco-City project reflects a broader governance challenge associated with the integration of



economic development objectives, environmental sustainability, social resilience, and disaster risk reduction within coastal development policy.

The analysis demonstrates that disaster risk in Rempang extends beyond physical environmental threats. While environmental considerations such as hydrological conditions, coastal ecosystem sustainability, climate-related risks, and ecological integrity remain important, the most significant vulnerabilities identified in this study are associated with social, economic, institutional, and governance dimensions. Concerns regarding land tenure security, livelihood continuity, cultural identity preservation, stakeholder participation, and institutional legitimacy illustrate that vulnerability is socially constructed through interactions among policy decisions, governance arrangements, and community conditions. This finding supports the argument that disaster risk should be understood not merely as a consequence of environmental exposure but as an outcome of the dynamic relationship between development processes and vulnerability structures (Adger, 2006; Tierney, 2012).

The study further reveals that governance plays a central role in determining whether development interventions reduce existing vulnerabilities or generate new forms of risk. The involvement of multiple stakeholders with diverse interests, combined with challenges related to participation, communication, institutional coordination, and policy legitimacy, demonstrates the complexity of governing coastal development in contemporary Indonesia. The findings suggest that governance capacity is a more decisive factor in shaping long-term resilience than the physical characteristics of the development project itself. Consequently, the primary issue facing Rempang is not whether development should occur, but how development should be governed in ways that are inclusive, adaptive, and risk-informed.

From a theoretical perspective, this article contributes to the growing literature on Disaster Risk Governance by extending its application beyond conventional disaster management contexts into the field of strategic coastal development. Existing studies on Rempang have predominantly emphasized legal, political, and agrarian dimensions of the conflict. By integrating Disaster Risk Governance with socio-ecological vulnerability theory, this study provides a broader analytical framework for understanding how development policies influence the production, distribution, and management of risk. The findings reinforce the argument that development policies themselves can become sources of vulnerability when governance systems fail to adequately address stakeholder concerns, environmental uncertainties, and social adaptation needs (Renn, 2008; UNDRR, 2015).

From a public policy perspective, the evaluation based on Dunn's framework indicates that the Rempang development policy possesses substantial economic potential but faces significant challenges in terms of responsiveness, equity, adequacy, and policy legitimacy. While the policy may contribute to investment growth and regional economic transformation, its long-term sustainability depends on the ability of governance institutions to ensure fair distribution of benefits and risks, strengthen stakeholder engagement, and integrate disaster risk considerations into development planning. Economic objectives alone are insufficient to guarantee successful policy outcomes when governance and vulnerability issues remain unresolved.

The findings also carry important implications for coastal disaster management in Indonesia. As the government continues to promote industrialization and investment in coastal regions, future development initiatives must adopt more comprehensive approaches that integrate disaster risk reduction, environmental sustainability, and social inclusion. Risk-informed development planning should become a central component of coastal governance rather than a supplementary consideration. Similarly, socio-ecological vulnerability assessments should be incorporated into strategic planning processes to identify potential risks before implementation begins. Such approaches are consistent with the principles of the Sendai Framework, which emphasizes the integration of disaster risk reduction into all sectors of development policy (UNDRR, 2015).

Based on these findings, this study recommends strengthening stakeholder participation mechanisms, enhancing inter-institutional coordination, institutionalizing adaptive governance practices, and mainstreaming Disaster Risk Governance principles within coastal development policy.



These measures are essential for ensuring that future development projects not only achieve economic objectives but also enhance resilience, sustainability, and social well-being.

In conclusion, the Rempang case illustrates that contemporary coastal development is fundamentally a governance challenge. Sustainable development cannot be achieved solely through investment, infrastructure expansion, or industrial growth. Rather, it requires governance systems capable of balancing economic ambition with environmental stewardship, social justice, and disaster risk reduction. The future success of coastal development in Indonesia will therefore depend on the extent to which governance institutions can effectively manage the complex interactions among development, vulnerability, and resilience within rapidly changing socio-ecological systems.

5. REFERENCES

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