



Managing Strategic Resource Interdependence For Coastal Disaster Mitigation: A Collaborative Governance Study In Palu

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ABSTRACT

This study examines how interdependence among actors shapes coastal disaster mitigation governance in Palu City following the 2018 disaster. In recent studies, there are still gaps in understanding how power relations, resource distribution, and legitimacy influence mitigation effectiveness in a multi-actor context. To address this, this study uses a qualitative approach with an intrinsic case study design and a Resource Dependence Theory (RDT) framework. Data were collected through in-depth interviews, field observations, and document analysis, then analysed using qualitative social network mapping with coding based on four RDT dimensions: organisational strategy, programs, resources, and institutions. The findings indicate that mitigation governance in Palu is defined by asymmetric interdependence patterns, where actors with control over resources, particularly financial and technical resources, tend to dominate the policy agenda. However, this interdependence also opens up space for strategic collaboration through mechanisms for the exchange of legitimacy, knowledge, and capacity. Based on these findings, this study proposes the concept of “strategic interdependence for resilience,” which repositions interdependence as an active and institutionalized governance instrument. This study contributes by extending RDT into the context of coastal disaster governance and offers an analytical framework for understanding the transformation of dependency into adaptive capacity in complex socio-ecological systems.

Keywords:

Resource Dependence Theory,
Strategic Interdependence,
Coastal Disaster Governance,
Disaster Risk Reduction,
Collaborative Governance

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INTRODUCTION

Coastal areas in disaster-prone countries increasingly face complex socio-ecological risks that require not only technical mitigation but also robust governance arrangements (de Vries & Pinuji, 2023; Djalante et al., 2011; Ismeti et al., 2023) . The 2018 earthquake, tsunami, and liquefaction in Palu, Indonesia, exposed the vulnerability of coastal ecosystems and the limitations of existing governance systems in responding to combined disasters (Daswati et al., 2020; Hasbullah, 2024) . Empirical evidence indicates that tsunami waves in Palu Bay reached significant heights, causing loss of life and extensive environmental damage (Efendi & Sumiar, 2019) . However, areas protected by mangrove ecosystems experienced relatively lower impacts, demonstrating the importance of mangroves as a natural coastal buffer and an integral component of disaster risk reduction strategies (Darwati et al., 2019) . Beyond their protective function, mangroves provide important ecological and socio-economic benefits, including shoreline stabilisation, biodiversity support, and livelihood sustainability for coastal communities (Khairul Muluk et al., 2023) .

While the importance of mangrove ecosystems has been recognised, the Palu case reveals a more fundamental challenge: the governance gap in managing coastal resilience. Empirical studies show that both government agencies and non-governmental actors, such as community-based environmental groups, share the goal of conserving mangrove ecosystems as a means of protecting coastal areas (Harahab et al., 2021; Khairul Muluk et al., 2023; McPhearson & Professor Nadja Kabisch, 2023) . However, these efforts remain fragmented and uncoordinated, often operating in parallel rather than synergistically. For example, while community groups are actively involved in mangrove planting, monitoring, and beach cleanup initiatives, government agencies tend to focus on regulatory planning and programmatic interventions with limited integration of grassroots initiatives (Budiman et al., 2019; Dharma et al., 2021; Harahab et al., 2020; Husamah & Hudha, 2018; Krisnadi, 2020) . This disconnect results in inefficiency, duplication of efforts, and ultimately undermines the sustainability of conservation outcomes.

The earthquake and tsunami that struck Palu City in 2018 left deep scars, both in terms of material losses and loss of life. This event served as a stark reminder that coastal areas, especially those in vulnerable locations like Palu, must have robust, sustainable mitigation strategies. Regional development planning can no longer ignore the aspect of disaster mitigation (Crow & Albright, 2019; Schlüter et al., 2020) , as disaster risk is no longer a possibility but an inevitability that must be regularly anticipated. One mitigation strategy that has proven effective and is attracting increasing attention is an ecosystem-based approach (Cookey et al., 2016; Crow & Albright, 2019; Ma et al., 2019), particularly through the rehabilitation and conservation of mangrove forests. Mangroves have a crucial ecological function: in addition to absorbing the energy of tsunami waves, they also protect coastlines from abrasion and seawater intrusion. Other benefits include providing habitat for marine life, sequestering carbon, and improving water quality . Tsunamis with wave heights exceeding 10 meters cause abrasion, mangrove loss, and shoreline degradation. This damage is exacerbated by anthropogenic pressures such as mangrove deforestation, mining sedimentation, and approximately 30–33 tons of plastic waste per day. These conditions indicate that the vulnerability of the Palu coast is not only due to natural disasters, but also to weak governance of buffer ecosystems, such as mangroves, which serve as natural coastal protection. Vulnerable coastal areas such as Palu Bay should be managed through integrated and sustainable ecosystem-based mitigation strategies, where mangroves play a key role as nature-based solutions (NBS) in reducing disaster risk (Jouault et al., 2021; McPhearson & Professor, Nadja Kabisch, 2023; O'Leary et al., 2023) .

However, the reality on the ground shows a significant gap between expected conditions and current practices. Although various actors, both government and non-governmental, have undertaken conservation efforts such as mangrove planting, coastal rehabilitation, and waste cleanup, these efforts tend to be partial, uncoordinated, and not yet institutionalised within a collaborative governance framework. This gap is further evident in the unrealised implementation of various strategic agendas, such as the designation of mangrove conservation zones, the development of coastal study centres, and the rehabilitation of post-disaster-damaged coral reef ecosystems. Furthermore, there is a capacity imbalance between government actors, who possess legitimacy and resources, and community actors, who have high levels of action but are limited by institutional and legal standing. This situation indicates that the main problem lies not only in the ecological aspect, but also in the weak integration of governance and management of resource dependencies between actors.

Thus, it is important to examine how coastal disaster mitigation strategies should not only focus on technical interventions but also on strengthening collaborative governance that integrates various actors and dispersed resources (Purnomo et al., 2025) . This study is relevant because it seeks to bridge this gap by examining how resource interdependence can be strategically managed within a collaborative governance framework to strengthen coastal resilience in Palu City. Regional development planning can no longer ignore disaster mitigation (Crow & Albright, 2019; Schlüter et al., 2020), , as disaster risk is no longer a possibility but an inevitability that must be systematically anticipated. One mitigation strategy that has proven effective and is gaining increasing attention is the ecosystem-based approach (Cookey et al., 2016; Crow & Albright, 2019; Ma et al., 2019), particularly through the rehabilitation and conservation of mangrove forests. Mangroves have a very important ecological function. In addition to absorbing tsunami wave energy, mangroves also protect coastlines from abrasion and seawater intrusion. Other benefits include providing habitat for marine life, sequestering carbon, and improving water quality (Estradivari et al., 2022; Perez et al., 2025; Tang et al., 2024) .

This study is grounded in the broader challenges of managing coastal areas that are increasingly vulnerable to ecological degradation and disaster risk, particularly in developing countries like Indonesia. Coastal zones like Palu City, which suffered severe damage from the 2018 earthquake, tsunami, and liquefaction, demonstrate the urgent need for an integrative approach that links environmental management with institutional collaboration. While previous research has largely focused on infrastructure rehabilitation, community resilience, and technical mitigation, (Hasbullah, 2024) attention to how resource dependencies between actors influence the effectiveness of disaster governance remains limited. The application of Resource Dependence Theory (RDT) to this domain remains rare, despite its analytical power in revealing how organizations coordinate under conditions of interdependence (Pfeffer & Salancik, 1978; Scott, 2016a) .

The urgency of research on Strategic Coastal Area Management in Disaster Mitigation from the perspective of Resource Dependency Theory stems from Palu City's empirical conditions: it is highly vulnerable to earthquakes, tsunamis, and liquefaction due to its location on the Palu-Koro fault. The 2018 disaster highlighted weaknesses in the existing mitigation system across spatial planning, infrastructure readiness, and coastal community participation. This vulnerability is further exacerbated by land conversion practices, coastal area development that often ignores sustainability principles, and the community's high dependence on natural resources. This situation demands strategic management that is not only technical but also able to integrate the interests of various actors. Within the Resource Dependency Theory (RDT) framework, organizations or governments cannot operate alone

due to limited resources, including assets, human resources, capabilities, and knowledge. The Palu City Government relies on collaboration with coastal communities that possess local knowledge, the private sector that controls capital and technology, and NGOs and academic institutions that provide data, research, and access to international funding. Therefore, this research is important because it can explain how interdependence between factors can be managed to become a strategic force in disaster mitigation. The emerging research gap is that previous studies have focused more on the technical aspects of disaster mitigation or on formal policies alone. At the same time, only a few have examined the strategic management of coastal areas, emphasizing the patterns of resource dependency among factors. Therefore, this research is expected to provide conceptual and practical contributions to the formulation of more adaptive, collaborative, and sustainable disaster mitigation strategies.

This study presents theoretical and empirical novelty by extending the application of Resource Dependence Theory (RDT) to the domain of coastal environmental governance and disaster mitigation. In this area, the theory remains underexplored. Theoretically, this study reframes RDT from its conventional organizational and corporate context to a multi-actor governance framework that captures the dynamics of resource interdependence among governments, NGOs, communities, and the private sector in managing post-disaster environments (Pfeffer & Salancik, 1978; Scott, 2016a). This conceptual advancement, termed strategic interdependence for resilience, positions dependency not as an institutional weakness but as a deliberate governance mechanism that fosters adaptive capacity, shared legitimacy, and collective learning (Glavovic & Smith, 2014; Nunan, 2018). Empirically, this study provides new evidence from Palu City, a disaster-prone coastal area in Indonesia severely impacted by the 2018 earthquake, tsunami, and liquefaction. Existing studies have largely focused on technical mitigation or spatial rehabilitation (Hasbullah, 2024; Ismeti et al., 2023), while neglecting the structural implications of resource dependency on policy implementation and collaboration effectiveness. By integrating insights from Taylor & Francis's work on disaster governance, adaptive management, and coastal resilience (Campbell, 2019; Hiwasaki, 2017b; Wisner, Gaillard, et al., 2012), this study bridges a significant theoretical and empirical gap, offering a comprehensive model linking RDT to collaborative governance, institutional strengthening, and sustainability transitions. Consequently, this study not only advances theoretical understanding but also provides a new analytical pathway for transforming dependency into a strategic resource for building resilient and adaptive coastal governance systems.

METHODS

This study uses a qualitative approach with an intrinsic case study design. (Eri Barlian, 2016; Reed et al., 2009; Yin, 2015) to examine how strategic interdependence between actors shapes coastal disaster mitigation governance in Palu City. This approach was chosen because the phenomenon under study cannot be reduced to a linear cause-and-effect relationship; rather, it results from complex interactions among actors operating within a layered, interconnected institutional configuration. Theoretically, this design is relevant to the network governance perspective (Inguaggiato et al., 2021; EH Klijn & Koppenjan, 2016) which emphasizes that public policy capacity is no longer centralized in the state but rather spread across a network of actors with interdependent resources.

In this context, coastal disaster mitigation is not merely a technocratic issue, but an arena for negotiation of interests, distribution of authority, and cross-sectoral knowledge production. Therefore, intrinsic case studies allow researchers to capture contextual meanings, informal practices, and coordination mechanisms often invisible in quantitative or

comparative approaches. The case of Palu was chosen because it represents a high-risk coastal urban system located along the Palu–Koro fault, where the 2018 earthquake, tsunami, and liquefaction exposed not only ecological fragility but also institutional fragmentation. Rather than treating disaster mitigation as a purely technical or infrastructural issue, this study places it within the framework of Resource Dependence Theory (RDT) as developed by Jeffrey Pfeffer and Gerald R. Salancik, which views organizations as entities dependent on the external environment for critical resources, thus triggering power relations, adaptation strategies, and coordination mechanisms among actors.

Operationally, RDT in this study is defined through three main dimensions. First, resource dependence, which is measured through the type and level of actors' need for external resources such as funding, risk data, mitigation technology, and social legitimacy (RM Emerson, 1962; Hillman et al., 2009; Pfeffer & Salancik, 1978) . Indicators include the frequency of access to cross-sector resources, the intensity of collaboration, and the level of substitution of available resources. Second, power asymmetry, which reflects the extent to which certain actors have greater control over the distribution of strategic resources (Daswati et al., 2020; Edgardo, 2021; EH Klijn & Koppenjan, 2016) . This dimension is identified through decision-making capacity, dominance in coordination forums, and the ability to influence the policy agenda. Third, dependence management strategies, which include negotiation practices, alliance formation, co-optation, and the use of intermediary actors to reduce uncertainty and increase access to resources (Casciaro & Piskorski, 2005; Davis & Cobb, 2010; Pfeffer & Salancik, 1978) . Through this operationalization, the interaction among local governments, NGOs, the private sector, and communities is not only understood as a coordinative relationship but also as a dynamic process of resource exchange and negotiation that shapes the configuration of disaster mitigation governance. This approach not only clarifies the analytical context of the study but also provides a framework that can be replicated in other studies examining risk governance in complex socio-ecological systems, particularly in coastal areas with high vulnerability.

To support this analysis, informants in this study were purposively selected to represent the structure of interdependence between actors in post-disaster recovery governance. This selection was not based solely on institutional representation but aimed to capture the dynamics of power relations, resource distribution, and mediation roles within cross-sectoral networks. Key participants included officials from the Palu City Regional Disaster Management Agency (BPBD) as key actors in policy coordination, representatives from the Environmental Agency who play a role in ecosystem control and rehabilitation, NGO activists involved in advocacy and assistance to affected communities, academic experts with competencies in geotechnical analysis and risk mapping, and private sector actors who contributed to the reconstruction and development process of coastal areas, as follows:

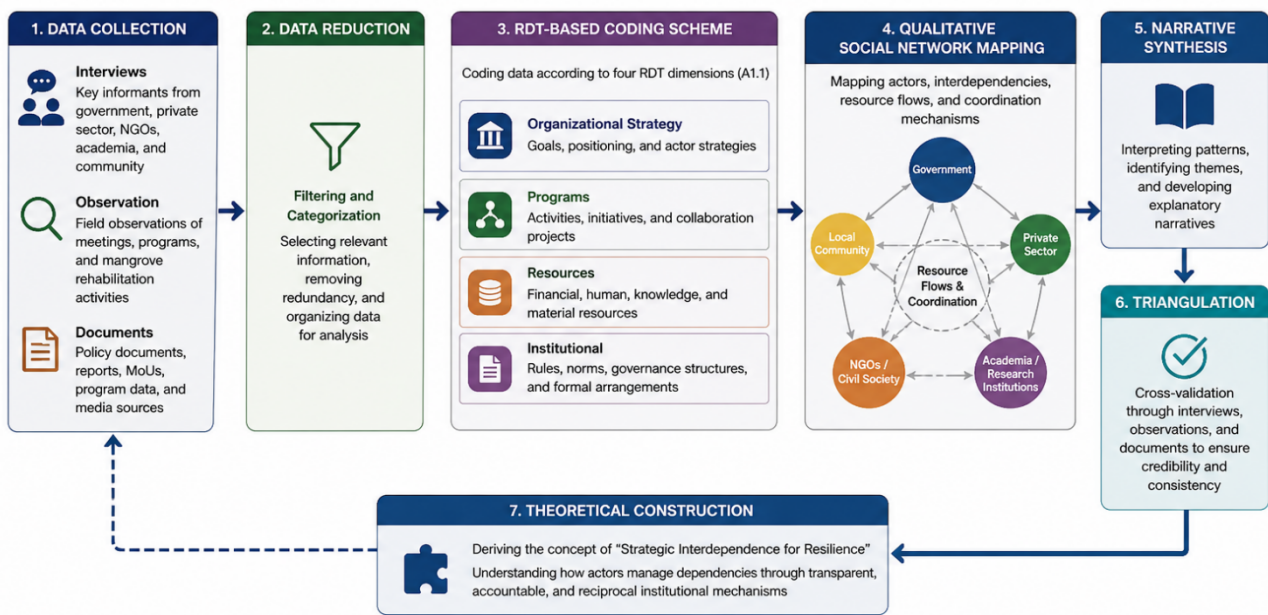
Table 1. Informant Data in the Study

Informant Category	Number of people)	Focus of Investigation
Officials from the Palu City Regional Disaster Management Agency (BPBD)	5	Disaster management policies, cross-sector coordination, decision-making, and post-disaster response/recovery mechanisms
Representative of the Environmental Agency	4	Environmental issues, area rehabilitation, coastal governance, and monitoring of reconstruction impacts

Post-disaster recovery activist	NGO	12	The role of advocacy, community assistance, social networks, and criticism of the effectiveness of recovery policies
Selected private sector actors involved in coastal reconstruction and development		3	Investment, development contribution, relations with the government, and influence on resource distribution
Total		24	

Source: Researcher's Processing, 2026

The above data were collected through in-depth semi-structured interviews, direct field observations at coastal mitigation sites, analysis of local regulatory and policy documents, and review of institutional reports related to disaster mitigation programs. The researcher describes the analytical framework used to map relationships among actors in coastal disaster mitigation governance, employing a qualitative social network mapping approach grounded in Resource Dependence Theory (RDT). The process begins with data collection and reduction, followed by coding based on the four dimensions of RDT, which are then used to identify patterns of dependency, resource flows, and coordination mechanisms between stakeholders. To enrich the analysis of relationships between actors, qualitative social network mapping is applied to trace patterns of resource flows and coordination mechanisms between stakeholders, as follows:



Note: This framework integrates qualitative data analysis with RDT dimensions to map inter-actor relationships, resource dependencies, and coordination mechanisms in coastal disaster mitigation governance.

Source: Researcher's Processing, 2026

Figure 1. Analytical Framework for Qualitative Social Network Mapping Based on Resource Dependence Theory (RDT)

The figure above illustrates the analytical flow that integrates a qualitative approach with the Resource Dependence Theory (RDT) framework to understand the dynamics of interdependence between actors in coastal disaster mitigation. Data obtained through interviews, observations, and documents were first reduced and coded based on the four main dimensions of RDT: organizational strategy, programs, resources, and institutions. This

coding process formed the basis for qualitative social network mapping that explored relationships between actors, resource flow patterns, and established coordination mechanisms. The mapping results were then synthesized narratively and validated through cross-source triangulation to ensure consistency of findings. Through this stage, the analysis not only produced a description of actor relationships but also enabled the conceptual construction of “strategic dependencies for resilience,” as a form of institutionalized interdependence management in disaster governance.

Particular attention is paid to identifying how dependency is transformed into strategic collaboration, or, conversely, how it generates power asymmetries and coordination deficits. The research procedure proceeds in sequential stages: identification of institutional actors and dependency structures, mapping post-disaster resource mobilization patterns, analyzing coordination mechanisms, and refining the conceptual framework of "strategic dependency for resilience." Through this design, the study advances theory by extending RDT to environmental disaster governance and offers practical recommendations for institutionalizing balanced, transparent, and reciprocal interdependence in coastal resilience policies.

RESULT AND DISCUSSION

Implementation of Marine-Coastal Strategic Management for Disaster Mitigation

In this study, the implementation of disaster mitigation in Palu City is analyzed through four main dimensions based on Resource Dependence Theory (RDT): organizational strategy, programs, resources, and institutions. These four dimensions capture how organizations respond to resource limitations and dependencies through strategic adaptation, rather than simply administrative compliance. Thus, disaster mitigation is not understood as a purely technical intervention, but as a process of managing dependencies between actors within a complex governance system. The findings of this study indicate that coastal disaster mitigation governance in Palu City is heavily influenced by patterns of inter-actor dependencies on unevenly distributed key resources, including finance, knowledge, and social legitimacy. While the local government, particularly the Regional Disaster Management Agency (BPBD), holds formal authority and access to public funding, in practice it relies heavily on other actors, particularly academics who provide technical data and risk analysis, and NGOs who play a role in building social legitimacy at the community level. On the other hand, the private sector contributes through the provision of material resources and investment. However, its involvement is largely determined by regulatory certainty and the stability of public policy. This situation confirms that no single actor has complete control over all the resources needed to achieve effective disaster mitigation. A BPBD informant emphasized this: "We have the authority, but the technical data and community support are not entirely in our hands" (W1). This finding reinforces the basic assumption of Resource Dependence Theory (RDT) that organizations cannot exist autonomously and are always embedded in a complex network of external dependencies.

Furthermore, this study found asymmetries in the distribution and control of resources, despite reciprocal dependency relations. The government remains the formal center of coordination, but this structural dominance does not always align with substantive capacity to manage the complexity of disaster risk. Conversely, actors who control specific resources such as risk data or direct access to affected communities often wield greater influence in decision-making processes, despite not always holding formal positions within institutional structures. This is reflected in the statement of a BPBD informant, " Sometimes decisions are made without truly considering the available technical data." Thus, power in governance is

not solely determined by formal hierarchy, but also by control over critical, irreplaceable resources.

At the operational level, inter-actor coordination mechanisms operate through a combination of formal and informal channels. Cross-sector coordination forums are the primary official instrument. However, their effectiveness is often bolstered by intermediary actors, such as NGOs and academics, who bridge the gap between policy and implementation on the ground. These actors play a strategic role in connecting resources, facilitating communication, and reducing information uncertainty. One NGO activist stated: "We often act as a link between the government and the community, especially when programs are not immediately understood on the ground." However, this reliance on intermediary actors also reflects structural weaknesses in the formal coordination system, which has not yet been fully institutionalized stably and effectively.

The findings above indicate that interdependence between actors does not automatically result in effective collaboration. In some cases, these relationships can be transformed into strategic partnerships that enhance mitigation capacity, but in other contexts, they actually reinforce policy fragmentation. Phenomena such as overlapping programs, duplicated interventions, and weak synchronization between institutions remain common. A private sector actor emphasized this: "There are many programs, but they often run their own programs" (W7). Thus, interdependence can be a source of both collaboration and conflict, depending on the institutional capacity to manage these relationships adaptively, transparently, and in a coordinated manner.

Overall, the findings suggest that disaster mitigation in Palu is a process of resource negotiation among interdependent actors. This interdependence encompasses not only material resources such as funding and infrastructure, but also non-material resources, including technical knowledge, social legitimacy, and network capital. However, without institutionalized coordination mechanisms and balanced resource distribution, such interdependence tends to result in fragmentation, program duplication, and power imbalances. In this context, this study proposes the concept of "strategic interdependence for resilience," a condition in which interdependent relationships between actors are not only recognized but actively managed through transparent, reciprocal, and institutionalized collaborative mechanisms. This approach emphasizes that resilience is not built through institutional autonomy, but rather through effective management of interdependence. Thus, the Palu case not only confirms the relevance of RDT for explaining the dynamics of disaster governance but also extends its application to complex coastal socio-ecological systems. These findings suggest that the success of disaster mitigation is largely determined by actors' capacity to transform interdependence into structured collaboration, rather than merely sporadic interactions.

From a Resource Dependence Theory (RDT) perspective, disaster mitigation in Palu not only reflects limited organizational capacity but also represents an arena for resource negotiation within a network of actors (Jeffrey Pfeffer & Gerald R. Salancik, 1978). In this context, resources are not limited to material assets such as infrastructure and evacuation facilities, but also include non-material resources such as technical knowledge, social legitimacy, and network capital, which are often more decisive under conditions of high uncertainty. This strengthening aligns with contemporary RDT developments that emphasize that organizations actively manage dependencies through strategic alliances, cross-sector collaboration, and resource exchange (Amy J. Hillman et al., 2009). In the context of coastal mitigation, this is evident in the involvement of universities and research institutions in providing geotechnical data and risk mapping, which form the basis for evidence-based

decision-making. This process reflects what the governance literature calls the co-production of knowledge, where knowledge is not produced hierarchically but through interactions between state and non-state actors (see Elinor Ostrom, 1996).

Furthermore, these dynamics can be understood through a network governance perspective, which emphasizes that public policy is generated through the interdependence of actors within interdependent networks (Audet, 2015; Binada, 2023; E.H. Klijn & Koppenjan, 2016; E. Sorensen & Torfing, 2009; E.S. and J. Torfing, 2007) . In the Palu case, the BPBD did not operate as an autonomous, dominant actor, but rather as a nodal actor that had to navigate relationships with NGOs, academics, the private sector, and local communities. The reliance on NGOs for social mobilization and on academics for technical validation suggests that institutional capacity is shaped by position within the network rather than by formal authority. However, it is important to note that this dependence is not neutral. The advanced literature on RDT shows that dependence often results in power asymmetries, particularly when control over strategic resources is unequal (Tiziana Casciaro & Mikolaj J. Piskorski, 2005). In the context of Palu, actors who control funding, technology, or data can influence the policy agenda, potentially shifting collaboration into covert domination.

On the other hand, within the framework of disaster governance, this approach aligns with the argument that resilience depends not only on technical capacity but also on the system's ability to learn and adapt through multi-actor interactions (Ben Wisner et al., 2012; Timothy Beatley, 2009). Thus, collaboration between government, academia, the private sector, and communities is not only an instrumental strategy but also a mechanism for collective knowledge production that enhances the system's adaptive capacity. By integrating RDT and network governance perspectives, the findings in Palu demonstrate that inter-actor dependencies cannot be understood as institutional weaknesses. Rather, they are a structural prerequisite for adaptive governance, as long as they are managed through transparent, accountable, and mutually beneficial mechanisms. In this context, unmanaged dependencies risk generating fragmentation and power asymmetries, while strategically managed dependencies can lay the foundation for sustainable coastal resilience.

However, empirical observations and recent literature reveal that the potential for this multi-actor interdependence is hampered by coordination deficits and overlapping mandates (Hummel & Kusumasari, 2024; Nunan, 2017) . Fragmentation between government agencies, NGOs, and donor-driven programs often leads to duplication and competition over funding rather than collaboration. Resource Dependence Theory (RDT) helps explain this friction: when control of resources becomes unequal, power asymmetries increase, enabling dominant actors—often those controlling financial flows—to set the policy agenda (Emerson et al., 2012; Scott, 2016b) . For example, private companies involved in post-disaster reconstruction may prioritize economic gain over community safety or ecological restoration. At the same time, NGOs may face legitimacy challenges when overly dependent on donor funding. Consequently, building reciprocal interdependence in which each actor recognizes the value of the other's resources is crucial for maintaining effective mitigation governance. This can be achieved through a co-management model that formalizes shared authority and ensures that coordination mechanisms are institutionalized, rather than ad hoc. (Binada, 2023; E. Klijn & Koppenjan, 2000; ES and J. Torfing, 2007) .

Coastal communities in Palu play a crucial role in disaster mitigation through their local ecological knowledge, including traditional evacuation routes, interpretation of natural warning signs, and community-based adaptation practices that have evolved over generations. Within the Resource Dependence Theory (RDT) framework, this knowledge constitutes an intangible resource capital that complements technical and financial capacity.

Local governments rely on these community resources to ensure that mitigation policies are contextually grounded and practically implementable. Purely top-down governance models, as seen in many disaster management programs, tend to neglect these local assets, resulting in low sustainability and weak ownership . The private sector also plays a central role in this interdependence, particularly in property and infrastructure development along Palu's coastline. However, without regulatory oversight and ethical guidance, private investment risks exacerbate vulnerability through environmental degradation and unsafe land conversion. From an RDT perspective, because the private sector has substantial financial resources and political influence, government dependence must be balanced with stringent regulatory instruments that align private activities with disaster mitigation goals and sustainable coastal development principles.

The success of Palu's strategic coastal management also depends on the integration of disaster management information systems and technologies, such as tsunami early warning systems, geological hazard mapping, and evacuation simulations. These technologies often originate from national institutions or international collaborations, highlighting the importance of external institutional relationships in addressing local capacity deficits. Regional Disaster Management Theory (RDT) states that organizations operating in complex environments must actively cultivate relationships beyond their internal structures to access critical resources (Pfeffer & Salancik, 1978) . Therefore, the Palu City Government, through the Regional Disaster Management Agency (BPBD), relies on cross-actor collaboration with ministries, research institutions, and global partners to secure data, expertise, and funding. This dependency is not inherently negative; rather, it is a strategic necessity that can enhance organizational legitimacy and operational effectiveness if managed transparently. Disaster mitigation, particularly earthquakes, tsunamis, and liquefaction, requires not only technical competence but also systematic coordination mechanisms that institutionalize these interdependencies within a sustainable governance framework.

The Palu City Regional Disaster Management Agency (BPBD) program strategy focuses on developing non-structural mitigation programs such as public education, evacuation simulations, and the creation of detailed disaster risk maps. This initiative aligns with the Decree of the Head of the Education and Training Institute No. KEP/98/IV/2016, which emphasizes the integration of disaster risk education into regional governance. From the perspective of Resource Dependence Theory (RDT), (Casciaro & Piskorski, 2005; Pfeffer & Salancik, 1978) this program strategy illustrates how BPBD actively mobilizes knowledge resources from external actors such as geological data from universities, early warning analysis from BMKG, and community feedback to improve the quality of mitigation planning. Reliance on academic and technical expertise signifies an adaptive strategy to overcome internal limitations (R.M. Emerson, 1962) , transforming knowledge dependence into organizational learning (Pfeffer & Salancik, 1978) . Without this exchange and co-production of knowledge, mitigation efforts risk becoming fragmented, reactive, and disconnected from the socio-ecological realities of coastal landscapes (E.H. Klijin & Koppenjan, 2016; Mandell, 2001; Provan & Kenis, 2008) .

The policy implications of Palu's strategic management approach reveal that governance systems built on structured interdependencies can significantly influence how communities and institutions respond when disasters recur. The first key implication relates to policy integration and institutional preparedness. By institutionalizing coordination among government, private actors, NGOs, and community groups, local authorities can reduce redundancy and expedite resource mobilization during emergencies. When policies are formulated based on RDT logic, the contributions of each actor (financial, technical, or social)

are recognized and systematically integrated into the disaster management cycle. This creates a governance environment that encourages resource complementarity rather than competition, which is especially important when multiple hazards occur simultaneously. Conversely, when coordination is weak, as observed in the 2018 disaster response mechanisms, they become fragmented, delaying critical decisions and increasing vulnerability among coastal populations. Thus, the ability to manage interdependencies before a disaster directly determines institutional agility and response efficiency when a crisis recurs.

The presence of collaborative structures and empowered communities within a policy framework will foster stronger local ownership and collective preparedness (Binada, 2023). When community organizations, religious groups, and local knowledge systems are included in official mitigation and response plans, social capital is mobilized as an active resource rather than merely an informal complement. This inclusion enhances trust and legitimacy, two important intangible assets identified by RDT as key resources within governance systems (Glavovic & Smith, 2014). In the Palu context, this means that communities are not simply recipients of aid but active agents of resilience, able to interpret early warning signs, manage local evacuation routes, and disseminate information quickly. Such empowerment reduces reliance on top-down assistance and builds a culture of shared accountability. Consequently, when disasters occur again, adaptive community behavior supported by institutional coordination can significantly reduce loss of life and recovery delays.

However, continued unequal control of resources and socioeconomic disparities can exacerbate vulnerability if policy implementation remains inconsistent. For example, overreliance on private capital for reconstruction can lead to uneven recovery, with profit-driven investments prioritizing commercial zones over vulnerable settlements. Similarly, if interdependence among actors is not transparently managed, it can degenerate into networks of patronage or bureaucratic inertia, undermining collaborative intentions. Therefore, the most important policy challenge is to ensure that interdependence is organized as a system of accountability and reciprocity, rather than subordination. In future disaster scenarios, the resilience of Palu's coastal communities will depend on how effectively this governance balance is maintained, with all actors, regardless of resource ownership, participating in a balanced exchange of responsibilities. When strategic interdependence is embedded in policy practice, the Palu governance model can serve as an adaptive prototype for broader Indonesian coastal resilience, ensuring that the next disaster, while inevitable, is less devastating in its social and institutional consequences.

Theoretically, this study reaffirms that Resource Dependence Theory (RDT) provides a powerful analytical lens for understanding how institutions in disaster-prone regions can transform structural limitations into adaptive capacities through interdependence and collaboration. By framing dependency not as an institutional weakness but as a strategic governance mechanism, the Palu case advances RDT beyond its organizational origins, integrating it into the domain of coastal and disaster governance. Its four strategic dimensions (organizational, programmatic, resource, and institutional) demonstrate that resilience emerges not from autonomy but from the intelligent management of interdependence among actors, legitimacy exchanges, and shared responsibilities. This theoretical synthesis contributes to the global discourse on environmental governance by positioning strategic interdependence for resilience as a key paradigm for adaptive systems operating under uncertainty and resource scarcity.

Empirically, Palu's experience provides concrete evidence that systematic coordination and multi-actor collaboration can reshape the trajectory of disaster recovery and long-term

community well-being. The implementation of this strategy, despite limited resources, has fostered a more inclusive, participatory, and knowledge-based approach to disaster mitigation. Through partnerships with universities, NGOs, the private sector, and donor agencies, the Regional Disaster Management Agency (BPBD) has demonstrated that interdependence, when managed transparently, can mobilize external expertise, funding, and innovation beyond the government's internal capacity. These empirical insights underscore that disaster mitigation in developing coastal areas must evolve from technical responses to governance transformations rooted in interdependence, accountability, and learning. In short, both theoretically and empirically, Palu's evolving disaster governance model reflects a transformative shift from vulnerability to resilience, grounded in collaborative management and equitable resource sharing. If supported by consistent policy commitments, improved resource coordination, and institutional strengthening, Palu City can serve as a national prototype for managing complex coastal risks. This demonstrates how strategic governance of dependencies can simultaneously protect lives, enhance institutional legitimacy, and promote sustainable coastal prosperity across Indonesia's archipelagic landscape.

Theoretical Contributions to Resource Interdependence: Multi-actor Collaboration and Institutional Strengthening

The findings of this study cannot be reduced to a single binary position, simply supporting or refuting Resource Dependence Theory, but rather demonstrate a more complex relationship. These findings both support and complement, and to some extent correct, its underlying assumptions. Empirically, the results of the Palu study confirm the core proposition of RDT that organizations are never autonomous and always depend on other actors to access critical resources. However, at the same time, these findings show that in the context of coastal disaster governance, dependency does not cease to be an instrumental relationship, but rather develops into a process of negotiating legitimacy, trust, and knowledge that is not fully explained in the classic formulation of RDT (Malpass & Malpass, 2011; A. Sorensen, 2015; J. Torfing, 2009) . In other words, this study supports RDT at the ontological level—interdependence as a basic condition for organizations to influence each other (Hillman et al., 2009; Pfeffer & Salancik, 1978) , but complements it at the analytical level (the social and institutional mechanisms that govern dependency). Furthermore, this study also implicitly challenges the RDT tendency to view dependency as something that needs to be minimized (Davis & Cobb, 2010; R.M. Emerson, 1962; J. Torfing, 2009) Instead, empirical evidence shows that in high-risk social systems (disaster management), such as in Palu, dependency needs to be managed and institutionalized to generate collective resilience. Therefore, the theoretical position of this study is not merely affirmative, but rather reconstructive, maintaining the foundations of RDT while expanding it into a framework for understanding collaborative governance under conditions of high uncertainty and complexity.

A key criticism, particularly relevant in the Palu context, is RDT's focus on instrumental resource exchange while downplaying the roles of norms, legitimacy, and cognitive capacities in shaping actor behavior (Hiwasaki, 2017b; Scott, 2016a; Wisner, Blaikie, et al., 2012). Furthermore, RDT often treats resource dependencies as static , whereas in post-disaster situations, emergency dependencies develop into enduring institutional patterns or patronage systems. To address this, this study integrates RDT with institutional theory and network governance, emphasizing the dynamic mechanisms of legitimacy exchange and coordination . This synthesis allows for a richer analysis of not only "who controls what," but also "why and through what mechanisms" resources are mobilized, distributed, and

legitimized among actors. Resource Dependence Theory (RDT), developed by Jeffrey Pfeffer and Gerald R. Salancik, provides an important foundation for understanding how organizations manage resource dependencies.

However, empirical findings in Palu suggest that the RDT assumptions, which focus on instrumental resource exchange, need to be expanded. Field data indicate that social legitimacy, trust, and local knowledge are as crucial as material resources in determining the effectiveness of disaster mitigation. For example, interviews with BPBD (Regional Disaster Management Agency) and NGO actors revealed that the success of mitigation programs is determined not only by the availability of funds or infrastructure, but also by community acceptance. " The program will not work if the community does not trust it, even if the funds are available " (NGO activist). This finding confirms W. Richard Scott's critique of RDT, which argues that organizational behavior is determined not only by the logic of efficiency but also by institutional norms and legitimacy. Therefore, this study expands RDT by incorporating normative and cognitive dimensions into strategic resources.

Furthermore, classical RDT tends to treat dependency as a static condition. However, empirical data in Palu shows that dependency is dynamic and temporal. During the emergency response phase, dependency on donors and external institutions increased significantly, but during the recovery phase, this dependency did not always decrease but instead transformed into long-term, sometimes structural, relationships. " After the aid was finished, we remained dependent on the same network for the next program " (BPBD Official). This finding suggests a "shift from emergency dependency to structural dependency," which is not fully explained in classical RDT (RM Emerson, 1962; Pfeffer & Salancik, 1978) . Thus, this study contributes by introducing the temporality dimension of dependency, in line with the adaptive governance literature, which developed from network governance and collaborative governance (Ansell & Gash, 2008; Compston, 2009; E. Klijn & Koppenjan, 2000; Osborne, 2010; Robert Agranoff & Michael McGuire, 2011; Sørensen et al., 2016; Sørensen & Torfing, 2009) , which has so far faced limitations in reading contesting multi-actor networks (Binada, 2023; Robert Agranoff & Michael McGuire, 2011) .

The empirical uniqueness of this study unfolds across several layers. First, it maps post-disaster resource flows in Palu using qualitative inquiry and social network analysis to identify donor centrality, the intermediary role of NGOs, and public-private relations in resource distribution (Borongnan et al., 2022; Xue et al., 2023) . Second, it tests the emerging concept of "strategic dependencies for resilience," analyzing how co-management mechanisms (formal agreements, cost-sharing systems, and legitimacy bargaining) enhance mangrove rehabilitation and adaptive capacity (Flannery, 2022; Hiwasaki, 2017a). Third, it explores the temporal transformation of dependencies, examining whether emergency collaborations evolve into institutionalized resilience or regress into structural dependencies (Hummel & Kusumasari, 2024; Ku, 2024). These layers provide nuanced empirical contributions by linking dependency structures to adaptive governance outcomes in coastal environments in developing countries. This multidirectional dependency reflects what has been described as strategic dependency (Pfeffer & Salancik, 1978) , where power asymmetries do not necessarily lead to domination but to negotiated coordination. In Palu, the challenge lies in transforming this fragile dependency into productive collaboration, a condition in which financial, social, and ecological resources circulate within a balanced governance framework, rather than reinforcing vertical dependency or bureaucratic inertia.

Furthermore, social network analysis shows that resource distribution in Palu is not neutral, but rather structured within a network that demonstrates the centrality of certain actors, particularly donor agencies and NGOs as intermediaries. This is evident in the

coordination pattern in which NGOs act as liaisons between the government and the community: " We often act as bridges, because the government cannot always directly access the community " (NGO activist). This finding reinforces RAW Rhodes's network governance argument that policy capacity is determined by an actor's position within the network, not solely by formal authority. In this context, RDT is expanded to include the network dimension (network embeddedness) as a mechanism for distributing power and resources. However, the data also show that this dependency does not always result in productive collaboration. Institutional fragmentation, overlapping mandates, and short-term donor interventions create what can be called a "dependency trap": " There are many programs, but they are often not synchronized across institutions " (Private sector). This condition confirms that unmanaged dependency can reinforce power asymmetries, as explained in the development of RDT (Davis & Cobb, 2010; R.M. Emerson, 1962; Hillman et al., 2009) . In other words, dependency is a double-edged sword; it can result in collaboration or domination, depending on the institutional mechanisms that regulate it.

The concept of "strategic dependency for resilience" proposed in this study provides important theoretical implications by extending RDT from the classical paradigm oriented towards dependency reduction to an approach that emphasizes the management of interdependence as a source of adaptive capacity in coastal disaster governance. Empirical findings indicate that interdependence among actors (government, private sector, NGOs, and communities) does not merely reflect organizational limitations, but can function as a mechanism for the production of resilience when institutionalized through transparent, accountable, and reciprocal coordination. Within this framework, strategic resources are no longer limited to material aspects, but also include social legitimacy, local knowledge, and trust as key elements in the process of resource negotiation and distribution. The novelty of this research lies in three main contributions: first, transposing RDT into the domain of coastal disaster governance characterized by socio-ecological complexity; second, shifting the analytical focus from mere resource control to the dynamics of negotiation, distribution, and legitimacy within multi-actor networks; and third, formulating dependency as an active and institutionalized governance instrument, rather than merely a passive structural condition. Prospectively, this study opens a further research agenda to test the validity of this concept across various geographical and sectoral contexts, to explore variations in forms of interdependence across the stages of the disaster cycle, and to integrate RDT with institutional approaches and collaborative governance to understand the transformation of power relations and adaptive capacity longitudinally.

CONCLUSION

This study demonstrates that coastal disaster mitigation governance in Palu City cannot be reduced to a purely technical issue, but rather is the result of a dynamic, asymmetrical, and continually negotiated configuration of inter-actor dependency relationships. Through the lens of Resource Dependence Theory (RDT), empirical findings confirm that public, private, and civil society organizations are never fully autonomous, but are interdependent in accessing and managing strategic resources, both material and non-material, such as legitimacy, local knowledge, and social trust. Contrary to the classical assumption of RDT, which tends to view dependency as a condition to be minimized, this study demonstrates that in a high-risk context like Palu, dependency becomes a prerequisite for the formation of adaptive capacity when managed institutionally. Based on these findings, this study proposes the concept of "strategic dependency for resilience," which repositions interdependence as an active, institutionalized, and productive governance instrument. This

concept expands RDT by incorporating the dimensions of networks, legitimacy, and temporality, thus explaining how dependency evolves from the emergency phase to long-term collaborative patterns. Practically, the policy implications emphasize the importance of establishing transparent, accountable, and reciprocal cross-sectoral coordination mechanisms to prevent institutional fragmentation and power asymmetries. Thus, this study not only strengthens the relevance of RDT but also transforms it into an analytical framework for understanding collaborative governance in complex socio-ecological systems, offering a conceptual model that can be replicated in other coastal areas in developing countries.

AI DISCLOSURE STATEMENT

In preparing this publication, generative artificial intelligence (AI) tools were used to assist with language editing, including translation, paraphrasing, and searching for relevant references for literature studies and previous research. The entire research design, analysis process, data interpretation, and drawing research gaps, theoretical gaps, and conclusions were carried out entirely manually by the author. The author is fully responsible for all intellectual input and the final content of this manuscript.

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