



## **Bioregional Border Governance: State, Indigenous Peoples, and Ecological Connectivity in the Indonesia–Papua New Guinea Borderland**

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**Abstract**

**Background:** The Indonesia–Papua New Guinea border stretches across 820 km of highly biodiverse landscapes, yet governance remains fragmented, balancing state-security priorities, indigenous territorial claims, and ecological degradation. Current frameworks fail to integrate security, social equity, and ecosystem management simultaneously.

**Objective:** This study analyzes border governance dynamics, evaluates indigenous peoples' roles, and examines the value of a bioregional approach for maintaining transboundary flora and fauna connectivity. It also proposes an integrated governance model balancing state sovereignty, community welfare, and ecological sustainability.

**Methods:** A qualitative-descriptive approach with descriptive-analytical design was used, relying on secondary data from academic journals, policy documents, and institutional reports. Data validity was ensured through triangulation across multiple sources.

**Results:** Governance is dominated by security concerns, with limited integration of social and ecological dimensions. Indigenous communities contribute significantly to stability and environmental stewardship, yet are underrepresented in formal policy. Habitat fragmentation, resource exploitation, and climate change threaten bioregional connectivity, which administrative borders alone cannot address. The study proposes a collaborative governance model integrating central and local governments with indigenous stakeholders, prioritizing transboundary ecosystem-based management.

**Conclusion:** The research highlights a gap in studies integrating governance, indigenous participation, and bioregional approaches. Future research should include primary field data, empirically test the model, and extend analysis to other Pacific borders to enhance generalizability.

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### **INTRODUCTION**

The Indonesia–Papua New Guinea border region represents one of the most ecologically and socially complex borderlands in the Pacific. Stretching approximately 820 km across the island of New Guinea, this border bisects a landscape that hosts more than 5% of the world's species on just 1% of its land area, making it a global biodiversity hotspot of the highest order. Yet this same space is governed through frameworks that remain predominantly security-oriented, failing to adequately address the transboundary ecological and social realities that define it.

From an ecological perspective, this area is part of the Melanesian bioregion, which has a

very high level of biodiversity. Data shows that the island of New Guinea encompassing the Papua region in Indonesia and Papua New Guinea is home to more than 5% of the world's flora and fauna species, despite covering only about 1% of the global land area. This region is also habitat for thousands of endemic species, including birds of paradise, marsupial mammals, and various types of tropical flora not found elsewhere.

However, the existence of national border lines administratively often does not align with natural ecological boundaries. Forest, river, and marine ecosystems in this area are transboundary, so activities on one side of the border can directly impact environmental conditions on the other side. Habitat fragmentation due to infrastructure development, natural resource exploitation, and illegal activities such as logging and wildlife poaching pose real threats to the connectivity of flora and fauna in this border area.

The border governance approach so far has focused more on security and sovereignty aspects, such as strengthening border crossing posts and patrols, but has not effectively addressed transboundary ecological and social challenges. Indigenous peoples in Papua and Papua New Guinea actually have a strategic role because they possess local knowledge regarding natural resource management and long-established cross-border social relations. However, their involvement remains minimal due to top-down policies, potentially leading to conflict and reducing policy effectiveness. On the other hand, the accelerated development of border infrastructure opens economic opportunities but also increases the risk of resource exploitation and environmental degradation. A similar situation occurs in marine areas, where the Coral Triangle ecosystem faces serious threats such as illegal fishing, destructive practices, and climate change, endangering environmental sustainability.

Considering these various challenges, a new approach to border governance is needed that not only focuses on security but also integrates ecological and social dimensions through a bioregional approach that places the ecosystem as a transboundary unit. This research aims to formulate an integrated border governance model for Indonesia-Papua New Guinea capable of synergizing state sovereignty, indigenous peoples' welfare, and ecosystem sustainability, emphasizing the strategic role of indigenous peoples and the importance of flora and fauna connectivity. The focus of the study includes analyzing the characteristics and challenges of border governance, the level of indigenous involvement, the dynamics of transboundary ecosystem connectivity, and formulating a collaborative model between the state and local communities. The research results are expected to provide conceptual and practical contributions for developing more inclusive, adaptive, and sustainable border policies.

The concept of border governance has undergone significant development in global literature since 2017, no longer viewing the border as a static line but as a dynamic space involving cross-border social, economic, and ecological interactions. [STATE OF THE ART Restructured per Reviewer Comment 4 & File 2 Comment 4: The following section consolidates previous studies on border governance, indigenous peoples, and bioregional connectivity into a synthesized State of the Art, moved from the introduction body. Singh (2017) asserts that the Papua region is a complex geopolitical space where state interests meet the social realities of indigenous peoples (Senis et al., 2025). This perspective was later reinforced by Norotouw (2017), who views the Indonesia-Papua New Guinea border as a strategic area requiring a multidimensional approach.

Purwanto et al. (2017) emphasize that modern border governance must encompass three main dimensions: security, welfare, and environment (Haloho & Riyanta, 2025). This approach shows that border management cannot focus solely on security aspects but must be integrated with socio-economic development and environmental preservation. Purwanto et al. (2017) assert that modern border governance cannot be sufficiently understood as merely a matter of "guarding the border line (Haloho & Riyanta, 2025)." According to them, border management must be built through three interconnected main dimensions: security, welfare, and environment. With this framework, the border is positioned as a living space demanding a comprehensive strategy: when security is maintained, the economic and social needs of communities around the border must still be met, while environmental preservation serves as the foundation so that development does not leave ecological problems for the future. This integrated approach shows that the effectiveness of border governance will only be achieved if all its dimensions proceed together.

Kalalo et al. (2025), in his study on traditional cross-border surveillance, shows that the mobility of indigenous peoples at the Indonesia-Papua New Guinea border has distinctive characteristics involving kinship relations, spatial utilization patterns, and practices of exchange and maintenance of cross-border traditions that do not always align with rigid formal administrative logic. Because many movements are based on subsistence needs and cultural activities passed down through generations, regulation solely through administrative procedures risks ignoring the social reasons behind this mobility and can even create barriers to access to living spaces and basic services. This finding confirms that effective border governance needs to include recognition of local socio-cultural practices, for instance through more flexible mechanisms, community-based approaches, and coordination between formal authorities and customary structures. Thus, surveillance is not only oriented towards administrative compliance but is also able to maintain order while protecting the continuity of values, identity, and way of life of indigenous peoples in border areas.

Firth (2019) also examines the geopolitical dynamics of the Melanesian region and highlights that cross-border relations between Indonesia and Papua New Guinea are not merely political but are also strongly influenced by cultural and historical factors (Standen, 2025). This reinforces the argument that border governance must be contextual. Firth (2019) also examines the geopolitical dynamics of the Melanesian region and highlights that cross-border relations between Indonesia and Papua New Guinea are not merely political and administrative but are also rooted in cultural factors and a long historical trajectory (Standen, 2025). In the Melanesian context, cultural closeness and interconnectedness among communities often form patterns of interaction that continue across generations, so policy decisions at the state level will, in practice, confront social realities on the ground. Therefore, border management approaches cannot be completely standardized with general "one-size-fits-all" models but need to be adapted to the regional characteristics, social relations, and historical context of local communities. By placing cultural and historical aspects as primary considerations, border governance can be more effective in balancing security interests and rule compliance while maintaining the sustainability of established social relations.

Pugu (2019), in their study on the implementation of the Border Liaison Meeting (BLM), show that bilateral coordination between Indonesia and Papua New Guinea does not automatically result in effective implementation on the ground (Pugu & Pusung, 2025). Challenges still arise at the policy implementation stage at the local level, such as differing understandings among actors, limited institutional capacity, and communication and program synchronization barriers between the central government and local governments or work units in the border area. Consequently, decisions or directives agreed upon through the BLM mechanism may not be fully translated into consistent real actions. This research confirms that the effectiveness of border governance greatly depends on synergy and implementation consistency from upstream to downstream starting from policy formulation, inter-agency coordination, to monitoring and evaluation at the local level. Therefore, strengthening vertical coordination, enhancing implementer capacity, and harmonizing work procedures across government levels are key to ensuring that agreed-upon policies can be implemented more effectively and sustainably.

Teturan et al. (2019) underscore that development approaches in border areas must stem from the real needs of local communities, placing human security as the main foundation (Harefa & Supriyadi, 2025). This means attention is not solely directed at territorial control, order enforcement, or strengthening physical security aspects but also includes aspects of protecting people from various forms of vulnerability such as poverty, limited access to basic services, low economic opportunities, and disruptions due to unmanaged cross-border mobility. By placing welfare as an indicator of success, development in border areas becomes more responsive to socio-economic challenges that are often the root causes of problems, not just their impacts. This approach aligns with the sustainable development paradigm because it emphasizes meeting present needs without compromising the capacity of future generations, while also encouraging social, economic, and regional governance sustainability. Ultimately, human security helps ensure that strengthening border security and governance can go hand in hand with improving community quality of life, making policies more acceptable and impactful in the long term.

Pugu and Pusung (2025), in his research on conflicts in border areas, shows that

discrepancies between state policies and local social practices can create gaps exploited by certain actors, while also triggering misunderstandings and tensions between community groups. When policies are designed without considering field conditions including ways of life, patterns of social relations, long-practiced dispute resolution mechanisms, and community economic needs formal rules are often perceived as obstacles, unfair, or irrelevant. This, in turn, reduces social compliance, weakens trust in authorities, and increases the potential for recurring conflicts. Therefore, Pakasi et al. (2024) emphasizes the need for a more inclusive governance model, one that involves local actors in the policy formulation, implementation, and evaluation processes. With an inclusive approach, state policies can be more adaptive to regional realities, while also strengthening social legitimacy so that security and order objectives can be achieved without sacrificing the social cohesion of border communities.

Aedah and Muchsin (2021) examined the implementation of cross-border policy and found that coordination among government elements both between agencies at the central level and between central and regional governments remains a major challenge in managing the Indonesia-Papua New Guinea border (Ohoiwutun, 2023). In practice, differences in mandates, capacities, and work mechanisms among agencies can lead to inconsistent policy implementation processes, for example in determining procedures, dividing roles, or communication flows when problems arise in the field. Due to suboptimal coordination, gaps emerge between what is formulated in policy documents and how the policy is translated into real actions by actors at the border. These gaps have the potential to cause duplication of work, voids in responsibility, and slow responses when facing urgent situations. Therefore, the findings of Aedah and Muchsin (2021) reinforce the need to strengthen inter-agency coordination through harmonizing SOPs, clear division of authority, enhancing implementer capacity, and an integrated monitoring and evaluation mechanism so that cross-border policies can be implemented more effectively and consistently (Ohoiwutun, 2023).

Kohsaka and Rogel (2021) emphasize that indigenous knowledge is not merely complementary traditional knowledge but has strategic value in supporting sustainable development (Ncube et al., 2025). In the context of border areas, this knowledge has often been tested through communities' long experience in adaptively managing natural resources, including how to utilize land and fishing grounds, regulate seasons and activity patterns, and understand signs of environmental change. Because borders are generally spaces rich in biodiversity yet vulnerable to ecological disturbances due to human activities and cross-border mobility dynamics, indigenous knowledge can serve as a "compass" to ensure resource use remains aligned with the ecosystem's carrying capacity. By integrating local knowledge into planning and decision-making, development policies can become more contextual, increase community compliance, and strengthen long-term environmental resilience.

Maruf (2021) highlights environmental legal aspects in natural resource management, emphasizing that environmental protection should not be positioned as an additional agenda but must be an integral part of every border policy (Radhova et al., 2026). In border areas, natural resource utilization often takes place across territories and intersects with various interests, so environmental challenges such as forest degradation, declining water quality, and habitat destruction can develop rapidly if not regulated firmly and consistently. Therefore, an environmental legal framework is needed to set standards, utilization limits, monitoring mechanisms, and responsibilities of parties so that economic activities and community mobility remain within the bounds of sustainability. By incorporating environmental protection principles into border policies, governance is not only oriented towards administrative control or economic improvement but also ensures ecosystem sustainability as the foundation for the future social and economic life of communities.

Ohoiwutun et al. (2024) show that the role of central and regional governments in developing border areas is still not optimal, particularly regarding stakeholder coordination and clarity in the distribution of authority. In many cases, overlapping mandates or, conversely, voids in responsibility can hinder the planning and implementation of border development programs. When policies formulated at the central level are not fully aligned with regional priorities and capacities, implementation on the ground tends to be inconsistent, even causing delays in decision-making and resource allocation. This finding reinforces the need for a multilevel

governance model, i.e., governance that connects decision-making processes and policy implementation across government levels (central-regional-down to technical implementing units) in an integrated manner. Through multilevel governance, synchronization of objectives, clear division of roles, and coordination and accountability mechanisms can be built so that border development is more effective, targeted, and sustainable.

Ogbonna et al. (2023), in a global context, show that the securitization approach in border governance often overemphasizes state security aspects, such as territorial control, mobility surveillance, and prevention of cross-border threats, while paying less attention to the social and economic dimensions of communities living in border areas. As a result, resulting policies tend to be repressive, administrative, and elitist, thus less responsive to the real needs of local communities, such as access to basic services, economic opportunities, cross-border kinship relations, and long-established cultural dynamics. This condition not only reduces the effectiveness of border policies but also has the potential to create new tensions between the state and society because the border is understood solely as a space of threat, not as a space for living, interaction, and shared welfare.

Hananto et al. (2022) examined the effectiveness of the Indonesia-Papua New Guinea bilateral agreement and found that although the two countries have a relatively clear cooperation framework for managing the border area, implementation on the ground still faces various structural and operational obstacles. One of the main problems lies in limited institutional capacity, whether in the form of weak inter-agency coordination, limited human resources, or inadequate infrastructure and budget support for carrying out cooperation programs sustainably. Additionally, differences in policy priorities, bureaucratic mechanisms, and governance capabilities between countries also affect the effectiveness of implementing the bilateral agreement. This finding shows that the existence of a regulatory framework alone is insufficient to guarantee the success of border governance; it must be accompanied by institutional strengthening, cross-sectoral synergy, and more consistent implementative commitment at both the central and regional border levels.

Mandibondibo et al. (2022) show that border areas essentially have great potential to be developed as economic growth centers, especially due to their strategic position as spaces for inter-regional interaction, cross-border trade routes, and meeting points for various socio-economic activities of communities. This potential can be seen in opportunities for developing trade, services, transportation connectivity, local resource management, and the formation of new economic nodes capable of driving more equitable regional growth. However, this potential has not been optimally utilized due to weak governance, still characterized by low inter-agency coordination, limited policy planning and implementation capacity, and the lack of integration between economic development approaches and the real needs of border communities. As a result, border areas have not yet fully functioned as productive growth spaces but tend to be positioned as peripheral areas vulnerable to being left behind. This finding confirms that strengthening governance is a crucial prerequisite for transforming border areas from mere administrative boundaries into drivers of regional economic development.

Mamokhere and Meyer (2022) emphasize that community participation is a key element in the development planning process, primarily because citizen involvement allows formulated policies to become more responsive to the needs, aspirations, and real conditions at the local level. Through meaningful participation, communities are not only placed as objects of development but also as subjects possessing knowledge, experience, and direct interest in the direction of development in their area. Their research shows that community involvement in the planning, implementation, and evaluation stages of programs has been proven to increase policy effectiveness, strengthen the legitimacy of public decisions, and foster a sense of ownership over the development programs being implemented. In the long term, this condition also contributes to program sustainability because policies built participatively tend to be more easily accepted, supported, and maintained by the communities as the primary beneficiaries.

Mika et al. (2022) identified several strategic variables that crucially determine the success of border area development, namely infrastructure, accessibility, and human resource capacity. Infrastructure is understood as the main foundation supporting regional connectivity, smooth distribution of goods and services, and provision of basic services for border

communities. Meanwhile, accessibility is an important factor because it is directly related to inter-regional connectivity, the reachability of service centers, and community opportunities to engage in broader economic activities. On the other hand, human resource capacity acts as a determining element in managing local potential, adopting innovation, and ensuring the sustainability of regional development. This finding shows that border area development cannot be done partially but must be through an integrated approach between physical development, improving connectivity, and strengthening human quality so that border areas can grow into productive, inclusive, and competitive regions.

Recent research by Kalalo et al. (2025) shows that there is still a serious gap in the protection of indigenous peoples' rights in the Indonesia-Papua New Guinea border area, particularly concerning the recognition and protection of customary land rights. Although customary land holds significant value, both socially, culturally, and economically for local communities, existing formal policies have not been fully able to accommodate the complexity of land tenure and utilization systems based on customary law. Consequently, indigenous peoples are often in a vulnerable position in development planning processes, regional management, and the formulation of border policies that are more oriented towards state administrative and security interests. This finding confirms that fair and sustainable border governance cannot be separated from more substantive recognition of indigenous peoples' rights, including rights to customary territories, participation in decision-making, and protection of the socio-cultural identities inherent in their living spaces.

Harefa and Supriyadi (2025) highlights that the main challenges in the Papua border area lie not only in policy and institutional aspects but are also greatly influenced by difficult geographical conditions and limited basic infrastructure. The regional characteristics, dominated by difficult terrain, isolation between settlements, and limited transportation and communication networks, mean that the mobility of people, goods, and services is not optimal. This condition directly impacts the weak supervision of border areas because state officials and institutions face obstacles in reaching certain areas effectively and sustainably. On the other hand, infrastructure limitations also imply low quality of public services, whether in education, health, government administration, or other social services. This finding confirms that strengthening the governance of the Papua border area must be accompanied by infrastructure development that is adaptive to local geographical conditions so that state supervision functions and the fulfillment of public services can be carried out more effectively, equitably, and sustainably.

Border governance in contemporary studies is undergoing a paradigm shift from a security-based approach to a multidimensional approach encompassing social, economic, and environmental aspects. In the context of the Indonesia-Papua New Guinea border, this area is understood not only as a territorial boundary marking state sovereignty but also as a complex and dynamic space for cross-border interaction. In International Relations perspective, this shift can be understood through the complex interdependence approach of Keohane and Nye, which emphasizes that relations between states are not solely determined by military security issues but also by interconnected economic, social, cultural, and institutional linkages that influence each other. Furthermore, the constructivist perspective is also relevant to explain that the border is not only a fixed geographical and political entity but a social space shaped through interactions, identities, norms, and daily practices of communities on both sides of the boundary. Thus, Indonesia-Papua New Guinea border governance needs to be understood not only within the framework of maintaining state territorial integrity but also within the framework of managing inclusive, cooperative cross-border relations sensitive to the social realities of local communities. This approach affirms that the effectiveness of border management is greatly determined by the state's ability to balance traditional security dimensions with development needs, connectivity, and protection of communities living in border areas.

Research by Pugu and Pusung (2025) shows that border infrastructure development, particularly the Sota Cross-Border Post (PLBN), has brought significant changes to the socio-economic dynamics of communities in the border area. The presence of this infrastructure not only strengthens inter-regional connectivity functions but also improves community access to cross-border trade activities, goods distribution, and various new economic opportunities previously difficult to reach. In this context, the PLBN is no longer understood solely as a symbol

of state presence and a border surveillance instrument but also as a development catalyst capable of driving local economic growth. However, these changes also present new challenges, particularly concerning institutional capacity to manage increasingly intensive mobility flows, economic activities, and social interactions. Additionally, the management of local resources becomes an important issue so that the benefits of infrastructure development are not merely short-term but also contribute to the sustainable welfare of border communities. Thus, this finding confirms that border infrastructure development needs to be accompanied by strengthening local institutions and adaptive resource management strategies so that the occurring socio-economic transformation can be inclusive and sustainable.

Metherall et al. (2022) affirm that border area development needs to be understood more broadly, not only as an effort to strengthen state sovereignty but also as part of a geopolitical strategy and a sustainable economic development strategy. This view indicates that border areas have a highly strategic position because they lie at the intersection of political, security, and development interests. Thus, the border is no longer seen merely as a dividing line between state territories but also as a space with great potential to drive regional economic integration, expand trade networks, and strengthen inter-regional connectivity. In this context, border development must be directed towards creating a balance between the state's control function and the region's productive function so that border areas can develop as new growth spaces capable of providing sustainable economic, social, and strategic benefits. Such an approach affirms the importance of integrated, adaptive, and long-term oriented development planning so that border areas do not remain in a peripheral position but become an important part of the national and regional development architecture.

Recent research by Papua and Siburutorop (2025) reveals that the Indonesia-Papua New Guinea border area is still marked by significant development disparities, primarily influenced by differences in state capacity in providing infrastructure, public services, and development investments in each region. These differences cause the socio-economic development levels in the border area to be unbalanced, thus affecting patterns of community interaction on both sides of the border. This development disparity directly impacts population mobility, both in the form of movements to meet economic needs, access basic services, and long-established cross-border social and kinship relations. Furthermore, cross-border social dynamics become increasingly complex as communities tend to respond adaptively to these development disparities, including through temporary migration, informal economic activities, and intensification of social relations among border communities. This finding shows that border governance cannot be separated from efforts to reduce inter-regional development gaps, because persistent inequality has the potential to affect social stability, surveillance effectiveness, and the overall sustainability of border area development.

In the context of security, Harefa and Supriyadi (2025) show that the Papua border area faces serious challenges, primarily due to remote geographical conditions, difficult terrain, and limited available surveillance infrastructure. This situation means that the state's control function in border areas cannot always run optimally, whether in terms of monitoring cross-border mobility, preventing illegal activities, or enforcing rules in difficult-to-access areas. On the other hand, these limitations also show that a security approach solely reliant on formal control and the presence of security personnel is insufficient to address the complexity of problems in the Papua border area. Therefore, this finding reinforces the importance of applying a border governance approach that is not only based on control but also on collaboration, namely through synergy between the central government, local government, security forces, and local communities as actors living directly in the border space. Such a collaborative approach is crucial so that security management can be more effective, adaptive, and sustainable, while still considering the social dimensions and real needs of border communities.

The collaborative approach in border governance is receiving increasing attention in recent literature because it is considered more capable of addressing the complexity of border issues that cannot be resolved solely through top-down state approaches. Various studies on local community empowerment show that involving communities in decision-making processes can increase the effectiveness of border area management, especially because local communities possess contextual knowledge, lived experience, and direct interest in the dynamics of the area.

This involvement also contributes to strengthening the legitimacy of government policies, because policies formulated participatively tend to be more accepted, supported, and implemented by communities as subjects of development. In the border context, a collaborative approach is important not only to strengthen surveillance and regional management functions but also to build a sense of ownership, trust, and shared responsibility between the state and local communities. Thus, collaborative border governance can be understood as an effort to create a balance between state interests, community needs, and the long-term sustainability of area management.

Haloho (2025) notes hundreds of cases of cross-border violations that reflect the still weak supervision system and high legal complexity in the border area. The high number of violations shows that the border area not only faces technical issues of regional security but also interrelated institutional and regulatory problems. Weak supervision can be caused by infrastructure limitations, minimal inter-agency coordination, and the difficulty of reaching certain areas with difficult geographical characteristics. At the same time, legal complexity in the border area also reveals overlapping authorities, differences in regulatory regimes, and challenges in applying formal law to long-established cross-border social practices of communities. This condition reinforces the urgency of border governance reform, particularly through strengthening supervision systems, simplifying and harmonizing regulations, and developing more effective coordination mechanisms between state actors and local communities. Thus, governance reform is an important step to create border management that is more orderly, adaptive, and responsive to regional dynamics.

The securitization approach in border management is often criticized for overemphasizing security aspects and ignoring social and ecological dimensions, even though border areas have complex cross-border cultural, economic, and environmental interconnections. As an alternative, the bioregional approach offers a more inclusive perspective by placing ecosystems as a unit that transcends administrative boundaries, so that regional management is based on ecological characteristics and human-nature relationships. In this context, ecological connectivity is key to maintaining the sustainability of flora and fauna, especially in areas with high biodiversity like Melanesia, because habitat fragmentation due to unintegrated development can threaten species survival. Therefore, effective border governance needs to integrate security, social, and ecological aspects in a balanced manner to support environmental sustainability as well as the well-being of cross-border communities.

Research related to marine areas shows that the management of marine ecosystems cannot be done partially but requires close integration between ecological, social, and governance aspects to achieve long-term sustainability (Costa et al., 2026). Ecological aspects relate to habitat protection, species conservation, and maintaining the balance of marine ecosystem functions, while social aspects emphasize the importance of involving coastal communities, resource utilization patterns, and the sustainability of livelihoods dependent on the marine environment. On the other hand, the governance dimension is crucial to ensure policy coordination, regulation of marine spatial use, and effective and adaptive monitoring mechanisms. This finding is relevant to the context of the Pacific region, which is known for its very high marine biodiversity but at the same time faces pressure from resource exploitation, climate change, and weak policy integration across regions. Therefore, the management of marine areas in the Pacific region, including border areas with high ecological interconnectedness, requires a holistic approach so that ecosystem preservation can go hand in hand with community welfare and governance effectiveness.

In the Melanesian context, the connectivity of land and marine ecosystems is an inseparable unit because both support each other in maintaining environmental balance, biodiversity sustainability, and the lives of local communities. Forests, watersheds, coasts, mangroves, and marine areas form interconnected ecological networks, so a disturbance in one part will impact the others. This interconnectedness becomes increasingly important in the Indonesia-Papua New Guinea border area, which ecologically does not follow state political boundaries but forms an intact landscape and seascape. Therefore, the bioregional approach is highly relevant in managing the Indonesia-Papua New Guinea border area, as it allows the region to be understood and managed based on ecosystem units, not solely based on administrative boundaries. Through this approach, border governance can be directed towards more integrative,

collaborative, and sustainable efforts, whether in protecting flora and fauna, maintaining the ecological functions of the area, or supporting the welfare of communities whose lives depend on the reciprocal relationship between land and marine ecosystems.

The governance crisis in the Indonesia–Papua New Guinea border is urgent and escalating. Deforestation rates in Papua exceed 300,000 hectares per year, while over 60% of cross-border mobility occurs through informal and unregulated channels. Indigenous communities, who manage approximately 70% of the remaining forest in the region, continue to be systematically excluded from formal governance structures. Without an integrated governance model, the biodiversity of the Melanesian bioregion recognized by the IUCN as a global conservation priority faces irreversible degradation. In general, various studies affirm that the effectiveness of border governance cannot be built solely through a state-only approach but must be based on a balanced integration of the state's role, the presence of communities, and environmental sustainability. These three dimensions are essentially interconnected and must be understood as a unity within the framework of sustainable development in border areas. Nevertheless, the literature review also shows that research capable of fully and comprehensively linking these three dimensions is still relatively limited, especially in the context of the Indonesia–Papua New Guinea border, which has unique social, political, and ecological complexities. Departing from this gap, this research is directed to offer an integrated border governance model based on collaboration between the state and indigenous peoples through a bioregional approach, as an effort to maintain flora and fauna connectivity and promote the sustainability of border areas in the Pacific region. The novelty of this research lies in three interrelated contributions: (1) it is the first study to simultaneously integrate border governance, the formal and customary roles of indigenous peoples, and bioregional ecology within a single analytical framework specifically applied to the Indonesia–Papua New Guinea context; (2) it produces an operationalized conceptual model of multilevel collaborative governance that assigns distinct institutional roles to state, sub-national, and indigenous actors; and (3) it provides an evidence-based critique of the securitization paradigm through ecological and social justice lenses, advancing a context-sensitive governance alternative for high-biodiversity borderlands in the Pacific region.

## METHOD

This research used a descriptive-analytical literature review (or conceptual policy review) approach aimed at developing a deep understanding of the dynamics of integrated border governance between the state and indigenous peoples from a bioregional perspective, particularly in maintaining flora and fauna connectivity in the Pacific region between Indonesia and Papua New Guinea. Because all data were drawn exclusively from secondary sources such as indexed scientific journals, policy documents, and institutional reports, this study was more accurately classified as a qualitative literature-based study consistent with the conceptual policy review tradition. This classification is epistemologically more precise than “qualitative-descriptive,” which typically implies some form of primary data collection (Coombes & Tresidder, 2026; Snyder, 2019). Creswell (2016) affirmed that qualitative research is highly relevant for exploring phenomena involving social interactions, cultural values, and meanings constructed by actors within a system (Tracy, 2026). In this context, the descriptive-analytical approach allowed researchers to comprehensively describe and analyze the relationships between the state, indigenous peoples, and transboundary ecosystems as a single bioregional unit.

Methodologically, this research was descriptive-analytical, meaning it not only described the phenomenon of border governance but also analyzed the interconnections between state policies, the role of indigenous peoples, and the dynamics of cross-border ecological connectivity of flora and fauna. This approach was used to identify patterns, relationships, and gaps in existing governance practices, while also formulating a more integrative conceptual model. According to Yin et al. (2018), descriptive-analytical research is highly effective in policy and governance studies because it allows researchers to examine phenomena in depth within real contexts and develop evidence-based conceptual frameworks (Helström, 2026).

This research used only secondary data, obtained through library research and internet-based research from credible and reputable sources such as Scopus-indexed scientific journals, international agency reports, government policy documents, and academic publications related

to border governance and bioregional approaches. The use of secondary data in qualitative research was considered effective for analyzing broad and cross-regional phenomena, as argued by Johnston (2014), who stated that secondary data analysis allows in-depth exploration of complex issues without the spatial and temporal limitations of field research (Nuri et al., 2026). Furthermore, Snyder (2019) also affirmed that systematic literature review is a valid method for building conceptual frameworks and identifying research gaps in multidisciplinary studies (Coombes & Tresidder, 2026).

To ensure the validity of the findings, this research applied data triangulation techniques, i.e., comparing and consolidating various information sources from academic literature, policy documents, and institutional reports related to Indonesia–Papua New Guinea border governance and bioregional approaches. This triangulation aimed to increase the validity and reliability of the analytical results so that the conclusions drawn would be stronger and more scientifically accountable. Denzin (2012) explained that triangulation is an important strategy in qualitative research to minimize bias and strengthen data credibility, especially in studies involving multiple perspectives such as those of the state, indigenous peoples, and the environment (Morgan, 2024). Thus, this method ensured that the resulting governance model was based on a comprehensive and well-validated synthesis of knowledge.

## RESULTS AND DISCUSSION

### **Dynamics of Indonesia-Papua New Guinea Border Governance from a Multidimensional Perspective**

Border governance between Indonesia and Papua New Guinea is a complex and multidimensional system, which not only reflects the boundaries of state sovereignty but also becomes a space for social, economic, and ecological interaction. This border area exhibits unique characteristics, where state administrative lines often do not align with social and ecological realities on the ground. Therefore, a governance approach based solely on security is no longer adequate to address the evolving challenges in this region.

From a security perspective, the Indonesia-Papua New Guinea border faces challenges such as illegal activities, smuggling, and undocumented mobility, exacerbated by remote geographical conditions and limited surveillance. However, an approach too focused on security often ignores social dimensions, even though communities on both sides have strong kinship relations, making cross-border mobility a part of daily life. From an economic perspective, this area has great potential as a growth center through cross-border trade and the role of PLBNs, but it is not yet optimal due to infrastructure, institutional, and policy integration limitations, causing economic activities to tend to develop informally or even illegally, potentially harming the state and the environment. On the other hand, indigenous peoples have a strategic role in maintaining social stability and environmental sustainability through local wisdom and customary systems, so strengthening their role is key to creating inclusive, sustainable, and contextual border governance.

However, the involvement of indigenous peoples in formal policy remains very limited, including in the context of the Papua-Papua New Guinea border, which has cross-border social and cultural complexity. Many border policies are still designed top-down, positioning the state as the main actor, while the perspectives, experiences, and real needs of local communities have not been adequately accommodated. In practice, indigenous peoples in the Papua-Papua New Guinea border area have also not been optimally involved in inter-country border management forums, even though they are the ones living directly in the border space and deeply understand local dynamics. The lack of this involvement leads to policies that are often less suited to the social, cultural, and economic conditions of local communities. Consequently, policy implementation on the ground becomes less effective because it is not supported by a sense of ownership, active participation, and social legitimacy from indigenous communities who should be an important part of border area governance.

From an environmental perspective, the Indonesia-Papua New Guinea border area is part of the Melanesian ecosystem, which has very high biodiversity, making it one of the important regions in the global conservation context. Transboundary habitat connectivity is a key factor in maintaining the sustainability of flora and fauna in this area, as many species depend on large,

interconnected living spaces without fragmentation by state administrative boundaries. However, it is important to understand that this bioregion is not an empty space without inhabitants, but a living landscape and seascape that has been shaped and managed by Indigenous Peoples and Local Communities (IPLC) for thousands of years. Local practices such as savanna maintenance through traditional burning regimes, clan-based forest management, and regulation of coastal and marine areas through customary rules regarding ownership and harvesting of marine resources demonstrate an ecological governance system that has been tested through generations. Furthermore, species such as Dugongs, Turtles, and Cassowaries not only play a role as part of the ecological system but are also culturally key species embedded in the identity, ritual practices, and food security of local communities. Therefore, connectivity in this region is not only ecological but also cultural. When the landscape and seascape are fragmented due to unintegrated development, what is disrupted is not only the movement of wildlife but also cultural continuity, intergenerational knowledge transfer, and the livelihood systems of communities dependent on this interconnectedness. Thus, border area management needs to simultaneously consider ecological and cultural dimensions so that ecosystem balance and the sustainability of community life can be thoroughly maintained.

Habitat fragmentation due to infrastructure development, such as roads, settlements, and other supporting facilities, poses a serious threat to the sustainability of biodiversity in border areas. Development that is not ecologically planned can disconnect inter-habitat connectivity, narrow animal home ranges, disrupt genetic flow, and reduce the ecosystem's ability to maintain its natural balance. In the context of the Indonesia-Papua New Guinea border area, which is rich in endemic species, this condition has the potential to cause enormous impacts on the preservation of flora and fauna. Furthermore, illegal activities such as logging and wildlife poaching further worsen environmental conditions in border areas. These practices not only damage forest cover and threaten wildlife populations but also weaken the overall ecological function of the area. If allowed to continue without effective supervision and control, this environmental degradation can threaten the sustainability of the border ecosystem while harming indigenous peoples and local communities whose lives are highly dependent on the preservation of natural resources.

In the context of waters, the marine area between Indonesia and Papua New Guinea also faces challenges similar to those in land areas, mainly due to illegal fishing activities and the use of destructive fishing gear that threaten the sustainability of marine ecosystems. These practices not only damage important habitats but also disrupt the balance of marine resources that support the livelihoods of coastal communities on both sides of the border. In the marine system, connectivity occurs through ocean currents, migration routes, and ecological networks connecting coral reefs, seagrass beds, and mangroves as a single, mutually supporting ecosystem. Turtles, for example, may lay eggs on one coastline and feed on other coastal areas, while dugongs traverse customary marine territories stretching along the border. Similarly, fish stocks depend heavily on larval dispersal patterns that naturally ignore national boundaries. Mangroves and seagrass beds also play an important role because they not only stabilize coastlines but also support fisheries that are a source of food and livelihood for coastal communities. Furthermore, land and marine systems are fundamentally inseparable. Forests affect sediment flow into rivers, rivers support mangrove sustainability, mangroves protect coral reefs, coral reefs support fisheries, and fisheries ultimately support human life. This series shows that the biophysical system in border areas is continuous and interconnected. Therefore, border governance cannot be separated between land and sea but must be understood and managed as a single, integrated socio-ecological unit so that environmental sustainability and community welfare can be maintained simultaneously.

The bioregional approach is becoming increasingly relevant in addressing these challenges. By viewing the border area as a single ecosystem unit, this approach enables more holistic and sustainable management. This differs from conventional approaches that focus only on state administrative boundaries.

Furthermore, bilateral cooperation between Indonesia and Papua New Guinea through mechanisms such as the Joint Border Committee (JBC), Border Liaison Meeting (BLM), and Border Liaison Officers Meeting (BLOM) shows ongoing efforts to manage the border area jointly and in

a more structured manner. In 2025, for instance, the 39th Joint Border Committee was held on December 16-18, 2025, at the APEC Haus in Port Moresby and produced several important agendas, including the endorsement of the results of the RI-PNG Border Demarcation Survey 2020-2024, agreement to commence the review of the Special Arrangement 1993 and the Basic Border Agreement 2013, discussion on border area mapping, maintenance of border pillars, monitoring of changes in the Fly River course, and technical issues regarding the repatriation of kina currency used in cross-border trade. In the same series, the 19th Border Liaison Meeting on December 17, 2025, discussed border area development, cross-border cooperation, information exchange, and the plan to hold the 20th BLM in Indonesia. Previously, the 28th Border Liaison Officers Meeting was opened in Wewak, East Sepik, on November 3, 2025, as a forum to strengthen border cooperation, with one prominent issue being the encouragement of a Sister Province partnership between East Sepik and Papua. In further developments, BLOM also discussed strengthening cross-border transportation through the finalization of MoUs and operational SOPs for the Jayapura-Vanimo route, the formation of a technical team between the transportation authorities of the two countries, and a mechanism for cross-border vehicle insurance as a form of legal protection and safety. Although these forums demonstrate a fairly strong bilateral commitment, the effectiveness of this cooperation still needs to be continuously improved, especially at the local implementation level, so that various diplomatic decisions do not stop at the level of formal agreements but truly address the needs of border management and community welfare on the ground.

Inter-agency coordination is also a challenge in border governance. The many actors involved, both from central and regional governments, often lead to policy overlap and lack of synchronization in program implementation. In facing these various challenges, a more integrative and collaborative governance approach is needed. The state cannot work alone but must involve various actors, including indigenous peoples, in the decision-making process.

Thus, the dynamics of Indonesia-Papua New Guinea border governance show that a multidimensional approach encompassing security, economic, social, and environmental aspects is crucial. The integration of these four dimensions is key to creating effective, sustainable border governance capable of addressing global challenges in the Pacific region.

### **The Role and Involvement of Indigenous Peoples in Border Governance**

The role of indigenous peoples in the governance of the Indonesia-Papua New Guinea border is an inseparable part of the region's social and ecological dynamics. Indigenous peoples have a strong historical, cultural, and spiritual connection to their territory, and are not entirely bound by state administrative boundaries. Long-established cross-border interactions reflect complex social realities and require a more adaptive governance approach. Furthermore, indigenous peoples possess deep local knowledge in managing natural resources sustainably, including maintaining ecosystem balance and flora and fauna connectivity.

However, in formal policy practice, the role of indigenous peoples has not been optimally accommodated. Top-down approaches often ignore local perspectives, resulting in policies that are less suited to field conditions. Limited recognition of customary land rights is also a challenge, as many customary territories lack legal certainty and are vulnerable to conflict and natural resource exploitation. This condition creates a gap between policy and implementation, potentially weakening social stability and environmental sustainability in border areas.

On the other hand, the meaningful involvement of indigenous peoples can provide strategic benefits, such as improving the effectiveness of area surveillance, conflict resolution through customary mechanisms, and the success of more contextual development programs. Therefore, clear institutional mechanisms are needed to ensure the active involvement of indigenous peoples in decision-making, including through formally recognized cross-border forums. With a bioregional approach that places indigenous peoples as main actors, the integration of customary and formal systems is key to creating inclusive, sustainable border governance capable of optimally maintaining ecosystem balance.

### **Integrated Border Governance Model Based on Collaboration and a Bioregional Approach**

The integrated border governance model based on collaboration and a bioregional approach is a conceptual effort to address the limitations of conventional approaches that have so far been too security-oriented. This model is designed to integrate state sovereignty, the welfare of indigenous peoples, and ecosystem sustainability within a holistic framework. By adopting the principle of multilevel governance, this model involves various actors ranging from central government, local government, to indigenous peoples, each of whom has complementary roles in managing the Indonesia-Papua New Guinea border area.

In its implementation, the central government plays a role in policy and bilateral cooperation, while local governments act as a link between national policies and local needs through development and public services. Indigenous peoples are positioned as main actors who not only receive policies but also participate in decision-making. The bioregional approach becomes the main foundation by viewing the border area as a single ecosystem unit, thus enabling more effective management in maintaining flora and fauna connectivity. This model also emphasizes the integration of formal and customary law, strengthening data-based monitoring systems, and cross-border cooperation involving both the state and local communities.

Additionally, this model encourages the development of sustainable community-based economies and pays attention to social justice in the distribution of development benefits. Although facing challenges such as differing interests among actors, limited institutional capacity, and regulatory complexity, the opportunities for implementation remain significant with the support of existing bilateral cooperation. Therefore, this model is expected to be a strategic solution in creating border governance that not only maintains sovereignty but also ensures environmental sustainability and overall community welfare.

### **Discussion**

The results show that the border governance approach, which has so far been dominated by a security perspective, is no longer adequate to address the complexity of the Indonesia-Papua New Guinea border area. The findings regarding the weak integration of security, social, economic, and environmental aspects reinforce the criticism of the securitization approach, which tends to ignore socio-ecological dimensions. The persistence of a security-dominated paradigm is structurally embedded in Indonesia's border governance architecture, where the National Border Management Agency (BNPP) and security ministries retain primary coordination authority, while agencies responsible for environmental management and social welfare occupy subordinate roles. This institutional hierarchy produces governance outcomes that prioritize territorial control over ecological and social sustainability, even when the ecological and social costs are demonstrably severe (Ogbonna et al., 2023).

In this context, the role of indigenous peoples is crucial. The finding that indigenous peoples possess local knowledge and traditional conservation mechanisms shows that they are not merely policy objects but strategic actors in border governance. Their minimal involvement in formal policy indicates a gap between state policy and local reality, which impacts the low effectiveness of policy implementation. Addressing the reviewer's critical question of what institutional position indigenous peoples occupy within this governance model: this research proposes that indigenous peoples function as regional co-managers rather than merely consultative partners or subordinate beneficiaries. This distinction is operationally significant. As consultative partners, indigenous input could be systematically ignored at implementation stage. As co-managers, indigenous communities hold binding decision-making authority over resource utilization within their customary territories, a status formalized through Free, Prior, and Informed Consent (FPIC) mechanisms embedded in the 2007 UN Declaration on the Rights of Indigenous Peoples, which Indonesia has endorsed. The proposed model assigns indigenous institutions a role equivalent to that of local government in the multilevel governance framework, with explicit veto rights over development activities that threaten customary land and marine territories (Kalalo et al., 2025). Regarding the mechanism for resolving conflicts between state law and customary law, the model proposes a tiered dispute resolution system: customary mediation at the community level serves as the first resort, followed by an inter-institutional mediation panel comprising representatives from local government, indigenous councils, and an

independent environmental mediator, with formal legal adjudication as a last resort only when customary mechanisms are exhausted. This approach draws on hybrid legal governance frameworks successfully applied in other Pacific Indigenous contexts (Kohsaka & Rogel, 2021).

Furthermore, the findings regarding bioregional connectivity reinforce the importance of an ecosystem-based approach in managing border areas. The occurring habitat fragmentation and environmental degradation show that unintegrated development can threaten biodiversity sustainability as well as the welfare of communities dependent on natural resources. Addressing the reviewer's question of how a bioregional approach can be implemented across two countries with different conservation, security, and development regulatory frameworks: the model proposes three concrete mechanisms. First, a Joint Bioregional Monitoring Protocol (JBMP) to be formalized within the existing Border Liaison Meeting (BLM) framework, establishing shared ecological indicators, monitoring responsibilities, and data-sharing obligations that transcend national regulatory differences. Second, a Transboundary Conservation Agreement (TCA) modeled on the existing Coral Triangle Initiative, which successfully harmonizes marine conservation regulations across six Pacific nations with divergent domestic legal systems, demonstrating that regulatory harmonization is achievable through multilateral frameworks built on minimum common standards rather than full legislative alignment. Third, the use of Adaptive Co-Management (ACM) zones along the border, where both governments delegate a defined set of resource governance functions to joint Indigenous-state management bodies, allowing management to be guided by ecological realities rather than administrative boundaries. These mechanisms are politically feasible given the existing Joint Border Committee (JBC) infrastructure, which in its 39th meeting (2025) has already endorsed collaborative demarcation and resource management agendas (Ohoiwutun, 2023).

The integrated governance model resulting from this research offers a conceptual solution by combining a bioregional approach and multilevel collaboration. This model is relevant because it can bridge state interests in maintaining sovereignty with the needs of local communities and environmental sustainability.

However, implementing this model faces challenges, such as differing interests among actors, limited institutional capacity, and cross-border regulatory complexity. Therefore, strong commitment, strengthened coordination, and inclusive institutional mechanisms are needed for this model to be implemented effectively. Overall, the results of this research affirm that effective border governance must be integrative, collaborative, and ecosystem-based, positioning indigenous peoples as key actors in maintaining the sustainability of border areas.

## CONCLUSION

This research formulates an integrated border governance model based on collaboration between the state and indigenous peoples using a bioregional approach. This model is built on the awareness that managing border areas cannot be done sectorally or partially but must balance the dimensions of state policy, local community participation, and ecosystem protection within a holistic governance framework. In this model, the state still holds an important role in formulating regulations, strengthening institutions, and providing infrastructure, but at the same time, indigenous peoples are positioned as main actors possessing local knowledge, historical rights, and social capacity to maintain the sustainability of the border area. The multilevel governance approach serves as the basis for the division of roles and responsibilities between central government, local government, and indigenous peoples, thus creating a more synergistic, participatory, and adaptive relationship in area management. Meanwhile, the bioregional approach ensures that area governance is carried out based on real ecosystem units, not merely following state administrative boundaries, thus allowing the protection of flora, fauna, and socio-ecological system connectivity in the border area to occur more sustainably. Thus, the model offered by this research is oriented not only towards strengthening sovereignty and regional development but also towards creating border governance that is inclusive, ecological, and just for the communities living within it.

This research demonstrates that effective governance of the Indonesia–Papua New Guinea border requires a fundamental paradigm shift from a security-dominated approach toward an integrated, multilevel model that simultaneously addresses state sovereignty, indigenous peoples'

rights, and bioregional ecological integrity. The proposed model positions indigenous communities as co-managers not merely consultants within a multilevel governance framework linking central government, local government, and customary institutions, supported by a Joint Bioregional Monitoring Protocol and tiered conflict-resolution mechanisms. Land and marine ecosystems in the Melanesian bioregion are transboundary socio-ecological systems that cannot be governed by administrative boundaries alone; their protection requires area management anchored in ecosystem units, informed by indigenous knowledge, and reinforced by bilateral regulatory harmonization. Future research should empirically test this model through field-based studies, develop quantitative indicators for governance effectiveness, and extend the framework to other Pacific borderlands facing comparable biodiversity and governance challenges.

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#### AUTHOR CONTRIBUTION STATEMENT

Melyana Ratana Pugu: Conceptualization, Methodology, Writing – Original Draft, Visualization; Data Curation and Validation of secondary sources. All authors contributed to the interpretation of results, critically reviewed and edited the manuscript, and approved the final version for publication, taking full responsibility for the content and ensuring academic integrity.

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