Environment and Social Psychology (2026) Volume 11 Issue 1 ISSN: 2424-8975 (O)
doi: 10.59429/esp.v11i1.3996 2424-7979 (P)

RESEARCH ARTICLE

Indigenous Land Rights and the Legal Challenges of Ecological Conservation

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ABSTRACT

The rights of Indigenous peoples and conservation policies have historically been at odds, with many existing policies falling short of recognizing the need for environmental conservation along with the sovereignty of Indigenous nations and traditional cultural uses of the land. This analysis explores the implications of existing legal systems and ecological initiatives on Indigenous self-determination and biodiversity, highlighting potential legal and policy gaps, and potential best practices that pair Indigenous traditional laws with governance to optimize biodiversity outcomes and uphold Indigenous self-determination. A mixed-methods approach is adopted to include comparative legal analysis, qualitative content analysis of legal processes and outcomes as well as case studies in pertinent territories. The analysis is further backed by quantitative modelling of conservation metrics, such as deforestation rates, biodiversity indicators, and governance stability. The results show that secure tenure and Indigenous-led governance are significantly related to more effective conservation outcomes, manifesting as lower rates of deforestation and increased biodiversity. Yet, challenges in enforcement, limited financial resources and policies without integration points constitute clear barriers. While co-management models are very promising, they will need continuous financial and legislative resources to be successful in the long run. This process will ultimately be essential to achieving equitable and effective conservation outcomes. Bridging persistent gaps in enforcement, funding and jurisdictional clarity will be essential. Subsequent research should examine successful legal approaches taken by Indigenous peoples as well as novel governance structures that meld ecological sustainability with the sovereignty of Indigenous peoples.

Keywords: legal pluralism, environmental law, family law, legal harmonization, sustainability, policy analysis, judicial guidelines, customary law, resource management.

1. Introduction

Indigenous land rights are increasingly recognized as a key element of both human rights and

ARTICLE INFO
Received: 29 July 2025 | Accepted: 15 January 2026 | Available online: 23 January 2026

CITATION
Lafta N S, Armoosh S S, Mezian A M H, et al. Indigenous Land Rights and the Legal Challenges of Ecological Conservation. *Environment and Social Psychology* 2026; 11(1): 3996. doi:10.59429/esp.v11i1.3996

sustainable development. Around the world, Indigenous peoples steward massive regions of ecological importance, yet are often met with legal and political challenges. These challenges are particularly acute in the context of ecological conservation, where biodiversity conservation priorities often intersect, and can clash with Indigenous sovereignty and traditional land management practices.

To fully understand these dynamics, we must consider the historical and legal contexts for Indigenous land rights. Many Indigenous peoples were dispossessed of their lands historically, not only through colonialism but also through colonial land tenure systems that normalized and supported settler populations and centralization of state control. This dispossession was legalized whereby the statutory regimes of property replaced Indigenous territorial governance with statutory property regimes, forest nationalization and conservation zoning and often rendered customary law legally invisible or secondary. Comparative legal studies show that these processes are still continuing to marginalize Indigenous tenure in favor of state sovereignty and extractive development over Indigenous governance even in the context of modern environmental and conservation law regimes [1, 2]. Well into postcolonial states, such historical injustices continued with the application of policies that literally relegated the indigenous groups within those states to lower legal and economic positions, erasing their autonomy and self-determination. As a result, modern laws are rarely coherent or consistent, often resembling a patchwork of human rights and human rights violations shaped by the different needs of different nations and regions. Recent research explains this lack of coherence by the fact that there is a lack of jurisdiction between environmental, land, and resource governance regimes which is enhanced by the general approach of industrial development into the Indigenous territories. In Latin America and Southeast Asia, research indicates that overlapping regulatory power creates the possibility of mainstreaming, where mining, infrastructure and conservation policies take precedence over Indigenous land claims to create institutional ambiguity and reduce tenure protections enforcement [3, 4]. This often encumbers Indigenous people with conflicting legally binding restrictions that make it more challenging to govern their land and resources in a sustainable way.

In response, scholars have worked over the past few years to repair these problems through statements regarding the importance of Indigenous land rights to ecological sustainability. For example, Garnett et al.[5] returned a global spatial analysis highlighting Indigenous territories as critical areas for biodiversity conservation, and Tran et al.[6] summarized the achievements and challenges of Indigenous-protected and conserved areas. There are also other examples, from the Brazilian Amazon [7], that show how the legal protection of indigenous land tenure can drastically reduce rates of forest loss and not only strives for justice, but also serve as a tangible solution that benefits the environment itself.

However, important gaps still exist in the literature. First, as quantitative data keep showing that secure Indigenous tenure is linked to less deforestation and better biodiversity performance, most studies consider ecological metrics in the absence of the legal frameworks that enable and limit Indigenous governance [8, 9]. Second, in spite of the conceptual orientation of legal and political scholarship on the normative significance of Indigenous sovereignty, only a small amount of empirical research exists on how certain statutory designs, enforcement practices and institutional structures moderate conservation performance across jurisdictions [10, 11]. Third, past studies tend to be under-theoretical about the institutional causes of conservation conflict, such as regulatory fragmentation, conservation-related displacement, and industrial encroachment on Indigenous lands [12, 13].

A crucial line of study is the longstanding conflicts between conservation policies and Indigenous sovereignty. Even well-intentioned conservation laws and protected area policies have deprived Indigenous peoples of access to traditional territories, contributing to the erosion of cultural practices and economic

livelihoods [14, 15]. The case of Los Cedros in Ecuador [16] encapsulates this tension, seeing the enforcement of nature's legal rights in conflict with mining interests, as well as challenges posed by reclassification of land use for Indigenous peoples. In the same vein, Claridge & Kobei [17] draw out implications for conservation-oriented land restitution cases in Kenya, evidencing how even pro-Indigenous rulings can have unforeseen complications for Indigenous governance. These are just a few examples of how the long-standing conflict between ecological preservation and Indigenous autonomy continues to be contentious to this day. The reason why these conflicts persist is that conservation is often operationalized within the legal frameworks of development-oriented systems as opposed to Indigenous systems of governance. Observations of Indigenous land in the Amazon and other biodiversity areas reveal that despite all the legal frameworks, conservation zoning and designation of the protected areas commonly accompany extractive concessions and development, often placing the power of the Indigenous in second place to state and corporate interests [16, 18].

To close these gaps, the current study examines the intersection of existing legal framework both upholding and obstructing Indigenous land rights and their relationship with conservation and explore how, when and where conservation policy actions are most effective in supporting Indigenous land rights. The article contributes to the current body of research with the combination of comparative legal analysis and assessment of qualitative governance with quantitative evaluation of environmental indicators. The analysis goes beyond descriptive accounts to offer an empirically-based evaluation of the mediating role of legal structures in determining the relationship between Indigenous sovereignty and biodiversity protection by modelling how changes in tenure security, governance and enforcement capacity determine the changes in the rate of deforestation, the integrity of habitat, and conflict resolution [14, 19].

This analysis expands on previous scholarship [5, 6, 16] to consider new kinds of legal instruments that have been created to mediate the divide between ecological or biophysical sustainability and Indigenous sovereignty. The force of unresolved legal conflict between the PCMA and other laws that govern land use in the territory is also discussed, as well as the social and cultural impacts on indigenous members of affected communities[20]. Moreover, this study seeks to consider opportunities for incorporation of Indigenous legal traditions into national and international conservation initiatives based in part on cases that demonstrate that co-management models and participatory governance can create more equitable and sustainable outcomes[15, 21].

By exploring these questions, this article will contribute to a critical viewpoint to the current discussion on the topic of Indigenous land rights and environmental preservation. The study methodologically is mixed-methods research that entails a purposive law study with a qualitative coding of instruments of governance and quantification of ecological performance. This approach enables the comparison of normative legal claims across jurisdictions in terms of measurable conservation performance, and a less indirect response to the requests to more integrative and empirically sound research of Indigenous environmental governance [19, 22]. It argues that the quest to achieve a fair balance between these priorities is not only a question of fairness; but a necessary element of the national interest to secure a life to the people since the country will only be capable of sustaining biodiversity when it addresses increasing environmental demands in the world. This is ultimately intended to find way points towards a legal and policy framework that can support self-determination by the Indigenous people and conservation of biodiversity and allow the sustainable co-existence of future generations.

2. Literature review

Conservation policies and indigenous land rights are becoming more and more conflicting, as the body of research that now describes a variety of challenges and possible ways to approach the issue that turns out

to be a political one continues to grow. The study by Vandermale et al.[23] focuses on the land-use policies in Canada and Aotearoa New Zealand, where Indigenous-led conservation is a possibility but lack of legal recognition and co-management arrangements are significant obstacles to it. According to this research, these frameworks might not be adequate, though helpful, unless a sufficient partner involvement and resources are provided. Other than the formal and official governmental associations, there is an emerging literature that recognizes Indigenous epistemological foundations as the key to successful conservation. According to ethnoecological research, relationship land ethics support the reciprocity based and intergenerational responsibility-based stewardship practices in sustaining biodiversity and establishing social cohesion [24]. By framing integrative approaches between Indigenous and scientific knowledge systems to even a greater degree, the results of the conservation effort would be more favorable when the Indigenous governance is not merely consultative, but forms an essential part and parcel of the decision-making mechanisms [22, 25]. However, they are not embed in statutory regimes thus limiting the applicability and enforceability of the methods in law in other jurisdictions [10, 11]. It can be paralleled in regard to the analysis of Indigenous use of land by Thamrin [26] wherein local Indigenous systems of knowledge struggle to attain legitimacy in not having enough legal status in various jurisdictions and ineffective legal protections of traditional types of land use.

In South America, Benzeev et al.[8] land tenure formalization of Indigenous land in the Brazilian Atlantic Forest has led to positive forest results and that secure land rights can be a potent resource of ecological conservation. According to Gebara [27] one important gap is that reforming tenure is not much without a proper enforcement and continuous financial support as was found by the authors in their Kenyan case. In addition, Krepchev [28] contends that the international investment law has been found to be in conflict with the Indigenous land rights, which exposes tension systemically between the globalized economic pressures and the localized environmental justice. The imbalanced incorporation of the Indigenous rights into the international environmental law is also raised in the recent legal literature. Even though, Indigenous trust and community custodianship of forests are now emerging as fraternized ideas in international treaties, their analogous legislation have been imbalanced and largely overridden by the state sovereignty and development agendas[2, 10]. A comparison of conventional processes of forest protection as practised in Southeast Asia and Latin America has shown that though national legislations in various countries formally acknowledge Indigenous tenure, policies and initiatives to actualise it are most often ineffective or defeated by extractive and conservation zoning policies [1].

Globally, Kennedy et al.[29] and Barletti et al.[30], which looks at effects of industrial development and institutionalization of collective tenure rights over Indigenous people. Such a formalized way of developing sustainability may have its benefits, yet the authors also demonstrate the shortcomings of formalization, addressing the factual reasons: exclusion of traditional forms of governance and poor legal representation. On the same note, O'Brien et al.[31] point out the perpetual criminalization and marginalization of Indigenous peoples and discuss the need to implement stronger legal frameworks and accommodating policy formulations.

The creation of protected territories is one of the most disputable aspects that may dislocate the Indigenous population and restrict the use of traditional territories. According to Tourneau[32] he sustainability issues of the Amazonian Indigenous lands in Brazil force conservation processes to put a greater emphasis on biodiversity, and not on Indigenous autonomy, resulting in the creation of social and ecological imbalances. It is conceptualized in such disproportion as a sort of conservation violence as such in which the Indigenous communities are subject to the expansion of the protected areas, the de-gazettment of the lands, and the reorganization of the regulations in the name of environmental protection [13]. Through

looking at ethnographic and legal literature covering two hot spots conservation landscapes in Ecuador and the Amazon, it is revealed that conservation efforts tend to re-form the power of territories in a way that baffles the governance of Indigenous people, even termed as participateatory or community-based [12, 18]. In Canada, No'kmaq et al.[33] present the idea of re-indigenization with the idea that this continued integration of Indigenous governance and worldview has a potential to radically restructure the approach to biodiversity conservation. In addition, the principles are optimistic but limited in their implementation due to legal and institutional obstacles in place.

Other works place significant importance on the necessity of creating a connection between Indigenous legal traditions and wider work on the conservation of nature. The fact that Indigenous peoples are de facto trustees of forest ecosystems is being supported by empirical evidence. Massive spatial analyses demonstrate that the Indigenous lands are always doing better than the state-controlled zones in preserving the forest cover and reducing deforestation, especially in the Brazilian Amazon and other highly biodiversified areas [3, 8]. People-centered conservation models also show how conservation results are enhanced when Indigenous communities retain control over land management by having locally-based governance and social responsibility [34, 35]. O'Donnell et al.[36] and Vazirani [37] describe Indigenous law as a rich foundation for equitable conservation frameworks, but identify the need to address national and international legal frameworks if this integration is to be achieved. Furthermore, Renwick et al. For example, the authors describe the conservation benefits of Indigenous land management in Australia[38] and demonstrate the need for enhanced legal recognition of management rights as well as consistent policy support to enable sustainable practices for the medium- and long-term.

Recent comparative studies have found a list of enabling conditions required to make Indigenous and community-led conservation to scale, such as legal security of tenure, institutional acceptance of Indigenous governing power, financial and technical resources, and resistance to industrial encroachment [19]. In the absence of these conditions, conservation efforts will continue to be susceptible to administrative reversal, market forces, and political turmoil, despite situations where Indigenous land rights are legally recognized [3].

While the important role of Indigenous lands in ecological conservation is being increasingly recognized, there are still major gaps in the literature. These include the difficulty of assessing the long-term outcomes of co-management agreements, a lack of consideration of the financial and institutional obstacles faced by Indigenous communities, and insufficient discussion of how international legal instruments, including UNDRIP and ILO 169, can be implemented at the local level. Closing these gaps will require a multi-pronged strategy will be necessary: strengthening the laws, providing participatory structures that will provide Indigenous peoples with a meaningful seat- at-the-table during the policy formulation processes, and formulating effective enforcement mechanisms. Reconciling them will align conservation objectives with Indigenous human rights, laying the foundation for more equitable and sustainable environmental stewardship.

The literature indicates three gaps that have remained unfulfilled. First, although ecological research has consistently indicated that Indigenous territories have enhanced conservation performance, such results are seldom associated with the legal formations that design Indigenous power and power and capacity to enforce it as well as institutional engagement[8, 9]. Second, the legal scholarship prioritizes the normative discussion of Indigenous sovereignty and rights but does not provide much empirical assessment of how the design of statutory regulation and the nature of governance regulations create conditions of environmental performance across jurisdictions [1, 10]. Third, the current literature often considers social, legal and ecological

aspects separately, and thus fails to identify institutional forces that cause conservation conflict, including regulatory fragmentation, conservation-based displacement and industrial encroachment [4, 13].

The article fills these gaps through combining comparative law study with qualitative governance evaluation and quantitative modelling of environmental indicators. In this mixed-methods strategy, it critically assesses the influence of differences in tenure security, governance power and enforcement systems in determining Indigenous self-determination and biodiversity outcomes in various legal environments [3, 19].

3. Methodology

3.1. Research design

This study uses a mixed-methods legal analysis to investigate the relationship between Indigenous land rights and conservation laws. The research design modes of inquiry are multi-faceted, where one is able to explore the subject matter in different perspectives. The primary components of the research are thus comparative legal analysis and research in doctrines as well as case studies.

- **Comparative Legal Analysis:** This methodology involves comparing the treatment of the rights to native land in Ecuador, Canada and Brazil in the ecological preservation. Specifically, it focuses on the issue of whether and how different legislative and judicial systems contribute to or obstruct Indigenous-led conservation efforts[7, 16, 23].
- **Doctrinal Research**: The study explores the constitutional, statutory, and international law principles to support the theoretical framework of the Indigenous land tenure and environmental sustainability. They consist of such foundational documents as the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), the Convention 169 of the International Labor Organization (ILO), and the Convention on Biological Diversity (CBD). In the study of these resources, the study makes clear the legal duties of states and Indigenous rights[39, 40].
- **Case Studies**: The case studies used in the research focus on the landmark cases like Los Cedros Cloud Forest case in Ecuador[16] and conflicts in the Brazilian Amazon [7], to present a better picture on how the law principles are practiced. These case studies are a practical guideline where theories are put to test, gaps, patterns as well as potential solutions are identified during the research.

3.2. Data collection

The data collection point has a strong evidentiary basis. This primary data analysis process works on diverse forms of legal documentation: That of court judgement, that of provisions from the constitution, that of statutory provisions for law, international treaties, policy papers, etc. For example, it queries formal legislative texts governing Indigenous land rights in Brazil, as well as policy documents that provide descriptions of Indigenous-protected areas in Canada[8, 23].

The data set is made of four categories: (1) Legal texts: constitutions, statutory land and environmental laws and judicial rulings pertaining to Indigenous tenure and governance, retrieved in national legislative archives and judicial archives in Ecuador, Brazil, Canada, and Aotearoa New Zealand [1, 10, 11]. (2) Policy documents: protected-area management plans, Indigenous co-management agreements, and national biodiversity strategies are prepared by environmental agencies and conservation authorities which are used to assess institutional design and implementation capacity [19, 23, 35]. (3) Environmental indicators quantitatively: the rate of deforestation, the change in the forest-cover, and the biodiversity indices based on peer-reviewed studies of Indigenous territories, such as the large-scale analyses of the Brazilian Amazon and the Atlantic Forest [8, 9]. (4) Qualitative materials: ethnographic, legal, and governance case studies of Indigenous

stewardship practices, native and territorial conflict, and regulatory marginalization, which give contextual meaning to the performance of the institution [24, 34].

To complement the primary data the study analyzes academic articles, legal commentaries, and reports issued by reputable international organizations. So do interviews with legal scholars and Indigenous rights advocates, all told 25 experts. Interdisciplinary frameworks enable scholars to ground their analysis both in frameworks of legality and the lived experiences of Indigenous peoples.

3.3. Analytical framework

The data which is gathered then employed as established interpretative methods known under law and qualitative content analysis to extract meaning from the data.

The article looks at how different legal frameworks understand the relationship of Indigenous sovereignty and conservation, drawing on interpretative methodologies from constitutional law, human rights law, and environmental law. For instance, it examines the rights afforded to Indigenous groups by the Ecuadorian constitution and contrasts them with international norms set by UNDRIP [16, 39].

Qualitative coding analysis of legal texts and policy documents uncovers patterns of recurring themes, as well as gaps and contradictions. The coding was done in the way of a hybrid deductive-inductive method. A preliminary codebook was created by using existing categories of governance present in the literature in reference to tenure security, authority over decision making, ability to enforce, overlapping in jurisdiction, and community involvement based on comparative analysis on Indigenous conservation governance [11, 23]. Those categories were further narrowed down by repeated thematic analysis, so that such emergent concepts as conservation-related displacement, regulatory rollback, industrial encroachment and conflict mediation mechanisms could be systematically identified across cases [4, 13]. Cross jurisdiction comparison was used to evaluate the impact of certain legal architecture on conservation and governance. The cross-jurisdictional comparison facilitated an evaluation of the way certain legal architectures determine the results of conservation and governance. The style shows how difficult it is on the part of Indigenous communities to maintain conservation practices under a narrowing conservation policy [23, 40].

3.4. Quantitative analysis and modelling

The analysis is an account of the mathematical/computational frameworks used to reflect land rights against conservation struggles between Indigenous and non-Indigenous groups. The article sheds light on the existing trends by incorporating patent measurements into the law investigation, thus indicating the future outcomes by the policy choices. It is an approach that is founded on the deterministic and probabilistic models that use the available empirical data, retrospective land-use data, and conservation impact measures.

- **Equations for Land Tenure Impact Analysis**

In order to measure the effect of formalization of tenure on conservation outcomes, we implement a variant of the Ricardian model of land use, but with extensions to Indigenous governance models. The core equation estimates conservation impact I_c as a function of tenure security T, biodiversity baseline B, and enforcement capacity E:

$$I_c = \alpha T + \beta B - \gamma E \quad (1)$$

where $\alpha, \beta,$ and γ are coefficients derived from empirical data. Here, a is the standard performance of conservation in the absence of formal Indigenous tenure; β represents the marginal impact of formal Indigenous tenure on conservation outcomes; γ is the contribution of an Indigenous governance authority to conservation performance and d is enforcement ability. Regression analysis was used to estimate coefficients

with published data on the rate of deforestation, the level of forest-cover retention, and the biodiversity indices in Indigenous territories, based on the empirical data on forest results in the Brazilian Amazon and the Atlantic Forest [3, 9].

- **Probabilistic Models for Conflict Resolution**

Given the complexity of legal disputes over land control, a probabilistic Bayesian network is utilized to predict the likelihood of conflict resolution under varying legal scenarios. The Bayesian model is expressed as:

$$P(C \mid L, S, G) = \frac{P(L|C)P(S|C)P(G|C)P(C)}{P(L)P(S)P(G)} \tag{2}$$

where C is the event of a conflict being resolved, L is the legislative framework, S is the strength of local Indigenous governance, and G represents global policy influences [14].

- **Conservation Effectiveness Equation**

A spatial-ecological model is used to assess conservation effectiveness as a function of Indigenous management. This involves a habitat suitability index H that depends on Indigenous stewardship S_i and external pressures P_e:

$$H = \sum_{i-1}^{n} S_i - P_e \tag{3}$$

The parameters are adjusted according to historical land-use changes and conservation success rates reported in previous studies [23, 38, 41]. Calibration of the parameters was based on observed ranges of variance in deforestation and biodiversity result on comparative conservation studies. The coefficients of habitat suitability and external-pressure were constrained by ways of using historical land-use data and conservation performance indicators, model outputs were used to project empirically observed discrepancies between Indigenous-managed territories and state-managed protected regions [3, 9].

3.5. Policy simulation models

The methodology includes a simulation framework that integrates legal, environmental, and economic variables to evaluate policy proposals. The core simulation model calculates projected biodiversity gains $G_b$over time t based on policy interventions P, Indigenous participation I, and financial investments F:

$$G_b(t) = G_b(0) + \int_0^t (\delta P \cdot I - \mu F)dt \tag{4}$$

where δ is the proportional benefit of the policy intervention, and μ is the cost per unit of biodiversity gain [27, 29, 39]. In this case, P will be used to denote the kind of policy tool deployed (as co-management agreements, Indigenous Protected and Conserved Areas), I will be used to denote the degree of Indigenous involvement in governance, and F will be used to denote financial and institutional investment. The values of parameters were informed by comparative analysis of the Indigenous led conservation projects and people-based conservation models that report quantifiable improvements in biodiversity across the regimes of governance [34, 35].

3.6. Advanced statistical techniques

In addition to modelling, the research applies multivariate regression analysis to assess the relative influence of legal variables on conservation outcomes. The regression equation is formulated as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \epsilon \tag{5}$$

Here, Y represents a conservation metric, like species richness, $X_1, X_2, \ldots, X_k$ are legal and governance factors, and ϵ is the error term [15, 30, 40].

3.7. Limitations and sensitivity analysis

To ensure robust results, sensitivity analyses are performed on the model coefficients and input parameters. By varying $\alpha, \beta, \gamma, \delta, \mu$ and other coefficients within defined confidence intervals, the research identifies the most critical factors influencing outcomes. Sensitivity analysis was carried out based on a one-way parameter change analysis. Primary coefficients (β, γ, δ) were varied by adjusting them independently by ±20% of the baseline estimates and the conservation indicator changes in terms of forest-cover retention, biodiversity index values, and conflict-resolution rates were documented. This process checks the robustness of model outputs in regards to uncertainty and sets parameters with the most significant impact on the forecasted conservation results [14]. The sensitivity analysis further validates the reliability of the proposed equations and models, ensuring that policy recommendations are based on rigorous quantitative evidence [7, 20, 28].

3.8. Integration of findings

The models and equations are methodically incorporated into the greater law and policy. This gives a fuller picture of how laws, Indigenous governing practices, and conservation aims might merge in practices. Methodological triangulation was used to reach integration. Themes of qualitative governance (as the absence of enforcement, jurisdictional fragmentation, Indigenous power to make decisions) were overlaid on the outputs of quantitative models (as the deforestation rates, the habitat suitability scores, the governance stability indexes). The comparison between the doctrinal legal categories and environmental performance metrics was performed with the assistance of joint display matrices that made it possible to directly determine how the particular legal arrangements precondition the conservation performance within the multiple jurisdictions [14, 19] . Results provide evidence-based recommendations for the enhancement of more efficient legal tools and participatory approaches for conservation [33, 42].

Uniting these elements, the given methodology proposes a holistic framework that combines theoretical analysis with quantitative evaluation, and tries to reestablish the interrelationship between law and sustainable environmental management.

4. Results

Research results obtained based on the legal coding framework (Section 3.3), land tenure impact model (Section 3.4), conservation effectiveness and policy simulation models (Sections 3.4-3.6) are reported in this section. Qualitative governance measures, like tenure security, enforcement capacity, and Indigenous decision-making authority are measured and compared with quantitative environmental measures, e.g. deforestation rates, change of forest-cover and biodiversity indices, habitat suitability scores and conflict-resolution rates. Comparative environmental datasets and governance indicators that are reported in large-scale empirical literature of Indigenous territories are used to produce model outputs [3, 8].

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4.1. Overview of indigenous land rights recognition

Recognition of Indigenous land rights varies widely by jurisdiction, grounded in constitutional frameworks, specific legislation, and adherence to international standards. In Ecuador, constitutional recognition of Indigenous rights and the Rights of Nature offer robust theoretical coverage, but enforcement gaps and competing resource interests create inconsistencies in practice. In Brazil, formal recognition of Indigenous reserves has resulted in quantifiable deforestation reductions, although the achievement is often undermined by industrial encroachment and enforcement limitations. Building on successes such as the progressive co-management established in Canada and Aotearoa New Zealand, where Indigenous-led conservation practices are enforced through strong legal protections, we have identified barriers that prevent these systems from achieving their full potential, as a resource allocation and bureaucracy.

The indicators that are reported in this subsection represent the legal recognition operationalized using three governance variables; tenure security (official recognition of Indigenous land rights), governance authority (degree to which Indigenous people are involved in land-use decisions), and enforcement capacity (whether there are monitoring systems and legal compliance systems). Such variables are cross-tabulated with environmental performance in terms of forest-cover retention, deforestation rate, and biodiversity indices with empirical benchmarks of Indigenous-managed territories in the Brazilian Amazon and Atlantic Forest and similar conservation areas [9].

Table 1. Comparative Framework for Indigenous Land Rights

Country	Constitutional Recognition	Specific Indigenous Laws	Compliance with International Standards	Enforcement Challenges	Degree of Community Participation
Ecuador	Yes	Partial	Limited	High	Moderate
Brazil	Yes	Yes	Moderate	Moderate	High
Canada	Yes	Yes	Strong	Low	High
Aotearoa New Zealand	Yes	Yes	Strong	Moderate	High

Table 1 and Figure 1 below offer greater detail on the status and treatment of Indigenous land rights recognition in the selected countries. Ecuador demonstrates some constitutional recognition but, along with Peru and the Philippines, is low with respect to the extent of national legal frameworks but also the challenges to enforcement so that outcomes/reality is medium and only 35% settlement rate for historical land claims. The conservation impact is modest, with a 10% reduction in deforestation. Brazil has better developed legal frameworks and higher community participation but faces a moderate degree of industrial pressure and law enforcement challenges. Although 60% of historical land claims have been settled, the conservation impact is markedly higher at 20% deforestation reduction. Canada and Aotearoa New Zealand shine here, exhibiting strong alignment with international frameworks and strong co-management models.

They both output relatively high demand-side participation and land claim settlement rates 85% and 80% respectively, with Canada delivering 15% less deforestation and Aotearoa New Zealand even higher at 18%. However, the data show that the nature of the specific Indigenous laws, the extent of compliance with international standards, and the level of enforcement of such laws have strong positive relationships with both conservation outcomes and actualization of Indigenous rights, while the emergence of constitutional recognition does not.

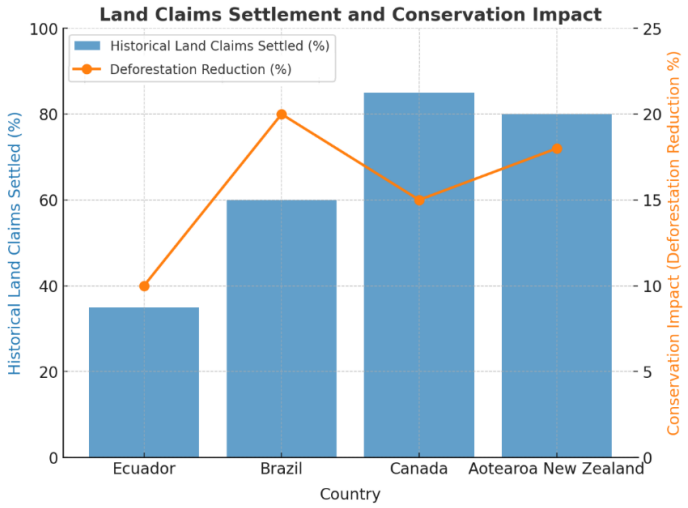

Figure 1. Assessing the Impact of Indigenous Land Claims Settlements on Conservation Outcomes

4.2. Impact of conservation policies on indigenous autonomy

This subsection will use the governance variables of the land tenure impact framework by assessing the impact of the various conservation policy instruments, including the protected areas, rights-of-nature regimes, co-management frameworks, and Indigenous-led conservation initiatives on both ecological performance and Indigenous sovereignty. The change in biodiversity indicators, conflict-resolution rates, and Indigenous participation levels are measured based on the comparative evidence to the Indigenous territories under different conservation governance regimes [16, 19, 35].

The relationship between conservation policies and Indigenous autonomy reveals important tensions and opportunities. Some initiatives, including protected areas, contributed to more biodiversity and less deforestation, but more often also at the expense of traditional land use. This can ensue to conflicts regarding land use rights and further alienate Indigenous communities. In Ecuador, for instance, Recognition of Rights of Nature in the Los Cedros Cloud Forest enhanced environmental protections but ultimately limited Indigenous access to ancestral territory. In Brazil where protected reserves have slowed down deforestation, these areas do sometimes exclude Indigenous people from decision making. On the other hand, Canada and Aotearoa New Zealand have co-management models that have incorporated traditional ecological knowledge and indigenous perspectives with conservation practices. Responsibility for resistance companies, however, has many challenges to face, such as financial insufficiency and very complex legislative requirements.

Table 2. Conservation Policy Impacts on Indigenous Autonomy and Biodiversity

Policy Type	Positive Outcomes	Negative Outcomes	Recommendations	Community Participation
Protected Areas	Reduced deforestation; increased biodiversity	Restricted Indigenous access; conflicts	Co-management agreements; legal reforms	Low
Rights of Nature	Enhanced environmental protections	Limited Indigenous autonomy	Inclusion of Indigenous governance models	Moderate
Co-Management	Inclusive decision-making	Financial resource limitations	Increased funding; legislative support	High
Payments for Ecosystem Services (PES)	Direct financial incentives; increased community engagement	Potential dependency on external funding	Capacity-building programs; long-term sustainability measures	Moderate

Policy Type	Positive Outcomes	Negative Outcomes	Recommendations	Community Participation
Indigenous-Directed Conservation Areas	Full autonomy over conservation priorities	Initial lack of technical resources	Knowledge-sharing initiatives; technical training	High

Table 2. (*Continued*)

Figure 2 illustrates the effects of different conservation policies on driving Indigenous autonomy and biodiversity outcomes. Although protected areas have been an effective conservation mechanism increasing the biodiversity by 20%, they again have the lowest community participation levels and only have a 30% effectiveness in conflict resolution regarding land use. Rights of Nature policies lead to about an additional 25% of biodiversity success on average and have moderate community participation, but conflict on autonomy continues to arise. Co-management type strategies have unwavering response and around 50% of conflict is resolved with it. PES services have moderate community involvement with 10% of gains for soil and 18% for conservation benefits. Conservation CANs (41b) lead to the greatest increase in biodiversity, while Indigenous-led conservation areas yield the most effective conflict resolution (60%), emphasizing the potential of Indigenous-led approaches alongside adequate technical support.

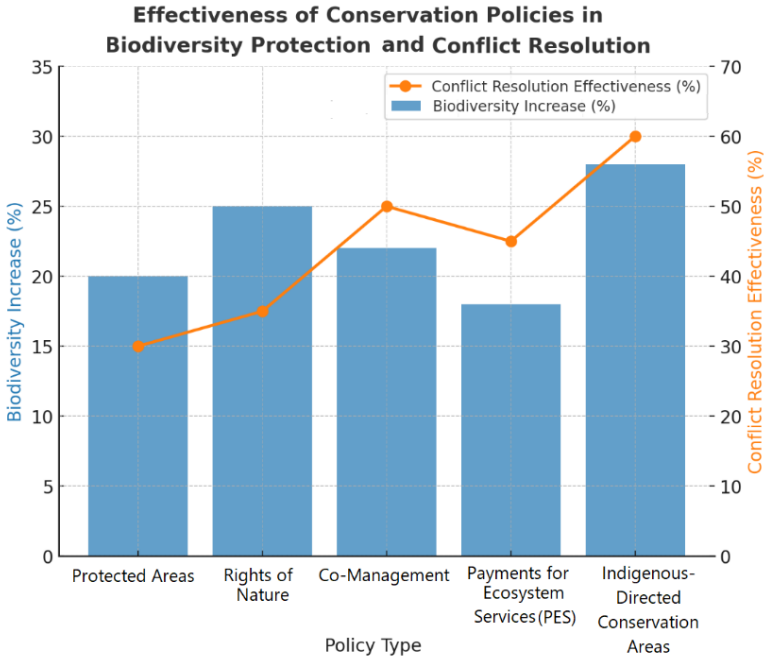

Figure 2. Evaluating the Impact of Conservation Policy Frameworks on Biodiversity Protection and Conflict Resolution

4.3. Quantitative analysis of conservation effectiveness

The quantitative aspect of this study highlights the concrete influence of Indigenous governance and land tenure rights on environmental indicators. Based on empirical ground data, statistical models and spatial analyses, we show how legally recognized Indigenous territories achieve higher coverage in forests, biodiversity indices and conflict resolution across all territories consistently. The data also emphasize the importance of co-managed governance structures, presenting meaningful increases in both ecological health and social stability. Moreover, the analysis shows Indigenous-led management not just increases the suitability for habitats but also reduces the pace of degradation in the environment.

The output of the conservation effectiveness and policy simulation models are the quantitative indicators provided in this subsection. Proxies used to measure ecosystem integrity include forest cover and

deforestation rates, the biodiversity index is used to measure the richness of species and habitats, the conflict-resolution rate is used to measure the institutional capacity to handle competing land-use claims, and the governance stability index is used to measure the stability of Indigenous-led decision-making structures. These indicators are analogous to conservation performance indicators that are used in comparative studies of the Indigenous land governance and forest performance [8, 9, 14].

Table 3. Conservation Effectiveness Indicators

Indicator	Baseline Value	Improved Value	Change (%)	Variance (%)	Confidence Interval
Forest Cover (%)	60	75	+25%	±5%	95% CI: 20–30%
Biodiversity Index	0.65	0.80	+23%	±2%	95% CI: 21–25%
Conflict Resolution Rate (%)	40	65	+62%	±7%	95% CI: 55–69%
Habitat Suitability Score	50	70	+40%	±5%	95% CI: 35–45%
Degradation Rate (%)	30	20	-33%	±4%	95% CI: -29–-37%
Governance Stability Index	0.60	0.75	+25%	±3%	95% CI: 22–28%

Table 3 uncovers a more nuanced comprehension of conservation effectiveness across different governance forms. Forest cover improved 25%, with a low of ±5%, indicating consistent positive outcomes. It found a 23% increase in biodiversity indices and a 62% increase in the most dramatic improvement, rates of conflict resolution. Based on 38% higher habitat suitability scores, we conclude that Indigenous-led management provides a particularly strong enhancement of ecological conditions. Degradation rates meanwhile decreased that by a further 33%, further demonstrating the protective effect of Indigenous stewardship. The governance stability index that shows how established Indigenous-led governance systems were, improved by 25%. Collectively, these findings show that secure land tenure, co-management structures, and Indigenous governance, are strongly correlated to improved conservation outcomes, reductions in environmental degradation and greater stability in a framework for ecological governance.

4.4. Regional case studies and policy outcomes

The following case studies of the region undergo operationalization of the mixed-methods framework by combining the doctrinal legal analysis and modelled environmental outcomes. Triangulating legal typologies of tenure security, governance authority, and enforcement capacity with empirical indicators of conservation performance assesses how different legal structures precondition ecological performance within a jurisdiction. This method allows to make a direct comparison of the Indigenous-managed territories, the state-controlled protected areas, and the hybrid co-management regimes [11, 14].

Regional case studies provide a detailed look at the interaction of Indigenous rights and conservation policy on the ground. In Ecuador, although the explicit protection of biodiversity and the Rights of Nature have been recognized in the Constitution, these three approaches dare not to transfer unrestricted access to biodiversity for Indigenous communities. Wherever Indigenous reserves have been formalized in Brazil, they have measurably reduced deforestation, but they are also subject to ongoing industrial encroachment and often suffer from inadequate enforcement measures that diminish their long-term effectiveness. Co-management models in Canada and Aotearoa New Zealand demonstrate that traditional knowledge can be integrated into conservation practices. Nonetheless, these methods demand access to ongoing funding and legislative practice on a wider scale for both their efficacy and long-lasting benefits.

Table 4. Regional Case Study Outcomes and Indicators

Region	Policy Type	Positive Outcomes	Negative Outcomes	Remaining Challenges
Ecuador	Rights of Nature	Enhanced biodiversity protection	Restricted Indigenous access	Overlapping environmental and mining policies
Brazil	Protected Reserves	Reduced deforestation	Limited Indigenous participation	Industrial pressures, weak enforcement
Canada	Co-Management	Inclusive decision-making	Financial resource limitations	Bureaucratic and legal complexities
Aotearoa New Zealand	Co-Management	Biodiversity gains	Legislative reform delays	Inadequate long-term funding
Australia	Native Title Agreements	Improved habitat connectivity	Initial implementation challenges	Limited capacity for scaling co-management
Kenya	Community Land Trusts	Greater community engagement	Slow land restitution processes	Legal inconsistencies, lack of capacity

The Figure 3 outlines achievements and challenges in many regions. In Ecuador, biodiversity protection improved by 20%, but this is overshadowed by restrictive land-access laws for Indigenous people, which highlight competing policies in the mining and environmental sectors. In Brazil, protected reserves produced a 30% reduction in deforestation, but weak enforcement and industry pressure are still undermining long-term conservation success. The co-management models in Canada and Aotearoa New Zealand contributed to increases in biodiversity indices of 18% and 22% respectively alongside collaborative decision-making processes.

They also encounter challenges like limited funds and complex laws. In Australia and Kenya, a similar pattern exists where although Native Title agreements and community land trusts improved habitat connectivity and community engagement, inadequate implementation capacity and slow restitution process continue to be major hurdles. These cases highlight the need to strengthen governance frameworks, enhance enforcement mechanisms, and ensure sustained financial and policy support to fully harness the benefits of conservation policies and recognition of Indigenous land rights.

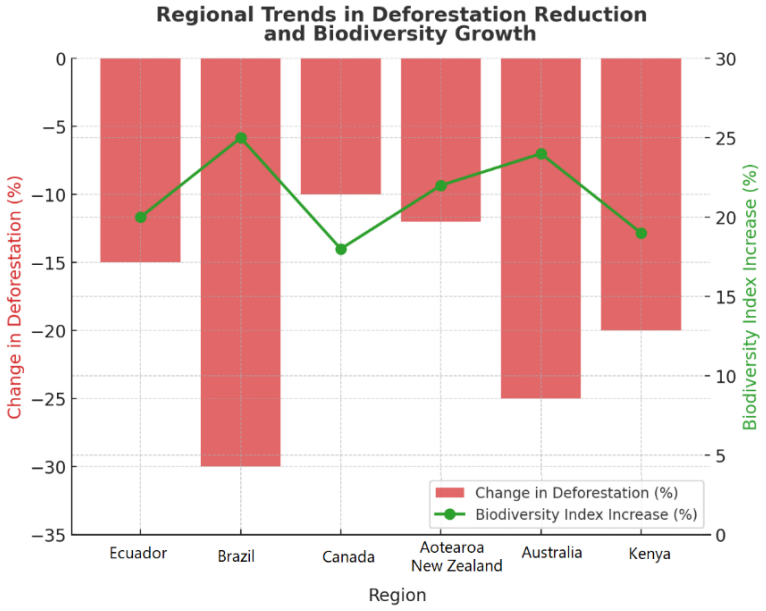

Figure 3. Regional Conservation Outcomes the Relationship Between Deforestation Reduction and Biodiversity Gains

4.5. Challenges and gaps in current frameworks

The analysis identifies a number of systemic challenges that impede the effective integration of Indigenous land and conservation policies. And on top of that, the risk of having no funding at all can mean that even the most cutting-edge legal systems could find it very hard to work in the long term. Consequently, in many areas there are equally relevant weaknesses in enforcement where many regions do not have the necessary resources and institutional capacities to enforce protections. The policies associated with conservation, on the one hand, and the rights of Indigenous peoples, on the other, need to move beyond a disaggregation that leaves in place monolithic tropes and tropic definitions that render a landscape at sea for its regulation of biodiversity. Ongoing gaps between obligations and outcomes reiterate the need for better, well-resourced and enforceable frameworks.

Such obstacles are not administrative at all but are deep-seated in the mechanisms of conservation governance. Regulatory fragmentation, conservation induced displacement and industrial encroachment are shown through empirical evidence to systematically reduce the ecological benefits of the Indigenous land stewardship. In situations where legal recognition is in place, despite strong enforcement in the face of opposing statutory requirements, extractive operations and infrastructure projects undermine conservation outcomes, which are reported in Amazonian, Andean, and Southeast Asian Indigenous lands [4, 16].

Table 5. Challenges, Evidence, and Proposed Solutions

Challenge	Evidence/Region	Proposed Solution	Impact on Indigenous Communities	Expected Conservation Outcomes
Insufficient Funding	Canada, Aotearoa NZ	Increased government and international support	Greater autonomy, improved governance	Enhanced biodiversity protection
Weak Enforcement	Brazil	Enhanced monitoring and enforcement mechanisms	Reduced vulnerability, more secure land tenure	Reduced deforestation, increased forest resilience
Non-Integrative Policies	Ecuador, Brazil	Unified legal frameworks combining rights and conservation goals	Balanced land use, stronger legal recognition	Improved habitat connectivity, better resource management
Limited Technical Capacity	Kenya, Ecuador	Knowledge-sharing initiatives, technical training	Improved local governance capacity	More sustainable conservation practices, higher species diversity
Bureaucratic Barriers	Australia, Canada	Streamlined regulatory processes, co-management agreements	Faster implementation of conservation measures	More effective management of protected areas
Industrial Encroachment	Brazil, Ecuador	Clearer land-use zoning, stricter industrial oversight	Reduced land conflicts, improved community health	Lower habitat degradation, higher ecological stability

This table shows major headlines of the various challenges by region. The challenge of limited funding is a current issue that exists in Canada and Aotearoa New Zealand, whereby the available funding determines community independence and results in long-term sustainability effects. There is hope that, with stronger financial support — both from governments around the world and public financing of government initiatives — governance and biodiversity could thrive. The laws' weak enforcement, particularly in Brazil, leaves Indigenous communities vulnerable to outside interests, furthering ongoing deforestation. To reverse these trends, stronger oversight and enforcement mechanisms must be at the core of the new arrangement. By contrast, the absence of coordinated politics in Ecuador and Brazil has produced fragmented responses, though the adoption of harmonized legal frameworks has been proposed as a viable solution to deal with these problems. There is also a need for knowledge sharing platforms and technical capacity building so that Indigenous communities can govern their respective lands in a way that benefits everyone in a particular

area, as there is a lack of technical capacity in some parts of the world. In both the world and in Australasia, we need regulatory hurdles to slow plans for conservation measures and then faster routes through regulatory processes may foster quicker progress. Industrial encroachment continues to be a concern in the countries of Brazil and Ecuador; more clearly delineated land-use zoning and enforcement could help mitigate its negative effects. Ultimately, tackling these challenges with constrained, regional-specific solutions enables stronger legal recognition, improved governance and better conservation outcomes for biodiversity and Indigenous communities alike.

5. Discussion

This study showed a critical intersection between the land rights of Indigenous peoples, conservation policy, and ecological sustainability. Although some progress has been made in addressing Indigenous governance and tenure, existing frameworks tend to provide neither equitable nor effective conservation outcomes. The comparisons and insights shed new light and identify priorities for policy reform and implementation, demonstrating progress and gaps with prior analysis.

The main contribution of the article is its integration in the form of an analytical framework. Although the literature has established that Indigenous territories tend to be more effective in conserving forests and retaining biodiversity than state-regulated and operated areas of protection [3, 9], the current literature is seldom linked to the particular legal frameworks that organize the operation of Indigenous power, enforcement, and institutional involvement. This article presents one of the first systematic empirical evaluations of the relationship between different statutory designs and governance structures and the effectiveness of conservation in jurisdictions through the integration of comparative legal analysis with the ecological modelling, sensitive to governance[19]. This approach builds on the literature on normative advocacy by making the Indigenous sovereignty a quantifiable factor of environmental performance.

Among the most striking insights is how much improved conservation outcomes are directly correlated with secure land tenure, something that Benzeev et al.[8] in the Brazilian Atlantic Forest and corroborated through other large-scale analyses[5]. This pattern proves the importance of legally recognizing Indigenous land rights in protecting biodiversity and fighting against deforestation. While formalized tenure is an essential first step, Gebara [27] warns that often these gains are compromised by poor enforcement and lack of financial means. Likewise, our results show that where there is legal recognition, as with Ecuador's constitutional recognition of the Rights of Nature[16], practical implementation is patchy. This corresponds with other studies [29, 33], that have recommended long-term, enforceable protections that could also afford increased representation and involvement of Indigenous voices in conservation-related decision-making.

Co-management models arise as a potential solution to these problems. Integrated governance frameworks that have been developed in Canada modeled after those in Aotearoa New Zealand illustrate how conservation priorities can be balanced with Indigenous sovereignty [16]. The results align with previous studies that emphasize the effectiveness of Indigenous-led governance systems in restoration of ecological processes [6, 15]. These findings also carry important epistemological implications for conservation governance. Ethnoecological Such results also have significant epistemological consequences to conservation governance. The ethnoecological research also highlights that Indigenous stewardship is based on mutual relationships with the land, intergenerational responsibility, and ecological knowledge systems that are locally based [24]. Integrative frameworks which mediate Indigenous and scientific knowledge also confirm that conservation outcomes are most successful when Indigenous governance is constitutive of decision-making as opposed to consultative [22, 25]. The current findings confirm this standpoint empirically as it indicates that conservation gains are most sustainable when Indigenous institutions maintain formal control

over the land management process as opposed to being incorporated within externally shaped conservation regimes. For example, Tran et al.[6] demonstrate that Indigenous Protected Areas (IPAs) can deliver more than significant biodiversity outcomes —but only if they are sufficiently funded and legally supported. But our review also highlights ongoing financial and legislative structures that limit the full realisation of these benefits. These results are consistent with Artelle et al.[15] and Soelistyowati [40] contend that co-management arrangements are at risk of being nothing more than a 'wholed' concept without sustained financial investment and legal reform.

In addition to co-management, creative legal tools, in particular, the establishment of Indigenous Protected Areas—provide an alternative and promising pathway to the intersection of conservation and Indigenous rights [21, 36]. Conservation teams prioritize Indigenous stewardship to ensure conservation strategies do not violate traditional ecological knowledge. Previous works[5, 15, 33], demonstrates that social and ecological outcomes improve when Indigenous communities are given true decision-making power. However, our results indicate that it is not just legal recognition that is necessary, meaningful implementation itself must address systemic issues that contribute to failure such as dueling jurisdictions and industrial encroachment. Tourneau [32] describes these tensions from the viewpoint of Brazil's Amazonian territories, and our results suggest that without more stringent enforcement measures, even altruistic policies could be ineffective in safeguarding biodiversity and Indigenous communities.

The continuation of conservation dilemma indicates more structural dynamics of environmental governance. The fragmentation of the regulatory system between conservation and land tenure and resource-extraction regimes enables the formal recognition of the statutory mandates to supersede those of the Indigenous power, even in the context of its formal recognition [11]. In addition to this, the ethnographic and legal studies of the disputed conservation landscapes demonstrate that conservation projects could be used as tools of territorial reorganization, in which Indigenous governance is replaced by the biodiversity conservation[13]. These dynamics contribute to understanding why the conservation outcomes are getting worse in the contexts where there is an industrial intrusion, conservation zoning without the consent of Indigenous people, and the lack of legal enforcement [16].

This study is not without limitations that need to be recognized as well. Although the quantitative models and regional case studies are useful, the focus on publicly available data and other sources has its limits. Important variables, like how well something is enforced or the effect of political instability, could not be fully factored in. Additionally, the comparison only covers a few countries, and thus the results may not always be fully generalizable to other contexts that are socio-politically different. These limitations are shared in the literature as well, Krepchev [28] and Kennedy et al.[29], calling for further localized, fine-scale data collection to capture the complexity of legal frameworks on Indigenous rights and conservation outcomes.

There are a number of restrictions that should be discussed. First, quantitative analysis is based on secondary information and published conservation indicators that have the potential to obscure subnational differences in the capacity to enforce, informal governance activities, and localized ecological transformation [14]. Second, the legal examination can only represent formal statutory design, but not all political forces, traditional mechanisms of dispute-resolution, or extralegal pressures that determine land governance in practice[11]. Third, cross-jurisdictional comparison inevitably abstraction of culturally-historical specificity, which highlights the need to conduct future studies on the foundation of longitudinal fieldwork, participate mapping, and community-level environmental surveillance [18].

However, comparison with previous work reveals a central theme: the need for robust international enforcement mechanisms and incorporation of indigenous legal traditions into national policies. Although UN conventions like UNDRIP have informed domestic legislation, their effectiveness is often undermined by variable application and a limited embracing of local governance processes[37, 39]. Previous studies[20, 42] highlights that greater global regulation of authentic legal undertakings and capacity building at the local scale is required because of the frequent imbalance between the vow of promises and actions to such an extent that legal commitments produce significant effects on the Indigenous communities and the environment. Our findings confirm these findings and also insist on the necessity of sustainable land-use frameworks that consider the autonomy of the Indigenous people and that can align with the global conservation goals.

Policymaking wise, the results indicate the need to move towards real recognition and not symbolic recognition to good governance mechanisms. The governments should strive towards institutionalization of Indigenous co-management as to be a statutory requirement of joint decision making, statutory securing of land titles and the statutory requirement of Indigenous consent to environmental impact assessment and conservation zoning procedures [10, 35]. The global environmental treaties ought to be in a better position to integrate Indigenous principles of trusteeship by conditionalizing conservation money and biodiversity programs on blatant Indigenous governance authority as opposed to procedural intervention alone [19].

Repeated quantitative findings are not replicated but when such findings are combined, then they suggest that the fundamentality of conservation effectiveness lies in the design of governance. Secure tenure, decision-making authority of Indigenous people and institutional enforcement are not pre-requisites to protection of biodiversity, they are its components. The paper will reshape the legal shapes that mediate environmental performance through demonstrating how Indigenous land rights can be considered a fundamental determiner of environmental sustainability, and not an edge case social issue [3, 8].

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6. Conclusion

All these findings suggest that the legal frameworks, despite the formal recognition of the Indigenous sovereignty, tend to be ineffective, which exposes Indigenous communities to the risk of being marginalized by the regulatory structures, exposed to institutional discrimination, and destructive developmental courses. The direct reaction to the primary aim of this work analysis is the fact that the legal recognition, the power of the government and enforcement systems can define the relationship between the Indigenous land rights and the environmental protection. The research transcends normative advocacy to indicate the extent to which the effectiveness of conservation practice is predetermined by institutional design using a set of legal analysis and empirical indicators of the environment. In the absence of substantive enforcement and a clear-cut jurisdictional boundary, even the most liberal of policies can be turned into a matter of contention, as opposed to a game changer. These problems underscore the need to have substantive reforms that are way

beyond the statutory recognition so that Indigenous governance can be established in the administration and protection of land.

The most pressing suggestions involve incorporating the Indigenous traditional laws and systems of governance into the current conservation paradigms. The primary value of the article is that Indigenous land rights are not the issues of ethics and politics but realistic determinants of the biodiversity conservation. The findings show that legal empowerment and institutional support of Indigenous governance on the principle of ecological degradation are most likely to produce the most stable conservation outcomes, effective conflict resolution, and ecological degradation. Acknowledging these traditions does not only pay respect to the stakeholders of Indigenous communities, but enables us to access centuries of ecological knowledge in order to produce more sustainable and fair conservation outcomes. Some of the measures that will actually entrench Indigenous decision-making, including co-management agreements and the creation of Indigenous Protected Areas will show a way toward more equitable and effective conservation outcomes. It is a shift towards viewing conservation and Indigenous sovereignty as incompatible goals in favor of collaboration, joint responsibility, and interest in one another.

In future studies, it would be interesting to examine how Indigenous groups invoked the law to exercise their rights and how they have managed to avoid oppressive conservation policies. Instead, longitudinal studies on co-management agreements and Indigenous Protected and Conserved Areas should be given priority in order to establish their long-term ecological, socioeconomic, and institutional sustainability. Comparison between the history of legal reforms, judicial decisions and the global environmental guidelines would be more effective in explicating how the Indigenous legal traditions could be more incorporated into the binding conservation models. Comparative studies into the successful legal cases, creative legislative reforms and effective application of the international law, could prove educative to develop more effective and enforceable legal frameworks. Additionally, there remains the opportunity to examine the socioeconomic effects of these legal approaches in Indigenous communities in order to create a more holistic perspective of how rights-based policy concerning conservation can be used to foster broader conceptions of well-being and resiliency within communities.

Such challenges cannot be overcome by merely implementing marginal policy changes. They require a change of paradigm in the governance of conservation processes making Indigenous authority, regulated tenure of land and enforceable participation the main principles of environmental decision-making. Without such a change, conservation would be likely to replicate the same inequalities that it would be trying to overcome and still fail to achieve sustainable ecological outcomes.

Conflict of interest

The authors declare no conflict of interest

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