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Operationalizing the "Rights of Nature": Conceptual and Enforcement Challenges in National Environmental Jurisprudence

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ABSTRACT

Background. Growing recognition of nature as a rights-bearing entity challenges conventional environmental law, yet legal recognition does not necessarily produce effective ecological protection.

Purpose. This study examines how national legal systems translate the rights of nature into enforceable duties and institutional mechanisms.

Method. Using qualitative doctrinal research and comparative documentary analysis, it evaluates constitutional provisions, judicial decisions, legislation, and implementation arrangements in Ecuador, Colombia, and New Zealand.

Results. The findings identify three distinct pathways: constitutional protection in Ecuador, judicial recognition and guardianship for Colombia's Atrato River, and statutory legal personality for New Zealand's Whanganui River. Across these models, representation, clearly assigned responsibilities, judicial remedies, and sustained monitoring influence the capacity to pursue enforcement. The analysis reveals a persistent gap between establishing ecological rights and demonstrating environmental recovery; available legal documents substantiate institutional developments but do not establish causal improvements in ecosystem conditions.

Conclusion. Longitudinal ecological assessment and further investigation of community participation are needed to evaluate whether these arrangements deliver lasting protection across different political and ecological governance contexts.

KEYWORDS

Ecological Justice, Environmental Jurisprudence, Legal Personhood

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INTRODUCTION

Environmental degradation, biodiversity loss, and climate change have exposed significant limitations in conventional environmental law frameworks. Traditional legal systems generally conceptualize nature as an object of ownership, regulation, or human protection rather than an independent bearer of legal rights. Growing ecological pressures have encouraged alternative legal approaches recognizing ecosystems as entities possessing intrinsic value and legally enforceable interests (Gimenez, 2022; Jodyvash, 2026). The emergence of the rights of nature represents a significant development in environmental jurisprudence, challenging anthropocentric assumptions underlying traditional legal doctrines. Ecuador's 2008 Constitution explicitly recognizes nature's rights to

existence, regeneration, and restoration.

National recognition of ecological rights has stimulated debates concerning their practical implementation within established judicial and administrative institutions. Legal recognition does not automatically guarantee environmental protection, particularly where enforcement mechanisms remain fragmented. Understanding the relationship between ecological personhood, institutional responsibility, and judicial remedies is essential for assessing whether this emerging legal approach can produce meaningful environmental outcomes (Al-Mu'adhdhin, 2025; Garayová, 2025).

The central problem concerns the discrepancy between formal recognition of nature's rights and their effective enforcement within national legal systems. Constitutional provisions and judicial declarations may acknowledge ecosystems as rights-bearing entities without establishing sufficiently precise implementation responsibilities. Uncertainty surrounding legal representation, institutional accountability, and available remedies complicates the translation of ecological rights into enforceable obligations.

Conceptual ambiguity presents additional difficulties because nature's legal personhood does not necessarily correspond with conventional understandings of legal capacity. Questions arise concerning who may represent ecosystems, which ecological interests receive priority, and how conflicting environmental and economic interests should be resolved. Judicial institutions must interpret ecological rights within legal systems historically structured around human interests (Ayala, 2022; Riva, 2026).

Enforcement difficulties also emerge from limited institutional resources, competing governmental mandates, and inadequate ecological monitoring. The Atrato River judgment illustrates an approach combining state responsibility with community guardianship, yet implementation requires sustained institutional coordination. The effectiveness of ecological rights consequently depends on more than judicial recognition or the symbolic establishment of legal personality (Alamri, 2025; Amin, 2025).

This study aims to critically examine the conceptual foundations and enforcement challenges associated with operationalizing the rights of nature within national environmental jurisprudence. Its primary objective is to evaluate how selected legal systems define ecological rights, establish legal representation, and translate constitutional or statutory recognition into judicially enforceable obligations.

The research further seeks to identify institutional conditions affecting the implementation of ecological rights. Particular attention is directed toward judicial standing, guardianship structures, environmental restoration, administrative coordination, and compliance monitoring. Examining these dimensions enables a clearer understanding of how legal recognition interacts with practical mechanisms intended to protect ecosystems.

The study ultimately intends to develop an integrated analytical framework connecting ecological legal status with institutional enforcement capacity. This framework evaluates whether clearly defined rights, accountable representatives, accessible remedies, and measurable implementation mechanisms contribute to effective environmental governance. Its intended contribution is to clarify the conditions under which ecological rights become operational legal protections (Roy, 2026; Siswanto, 2025).

Existing scholarship has extensively examined the philosophical and jurisprudential foundations of nature's rights, particularly the transition from anthropocentric environmental protection toward ecocentric legal reasoning. Christopher Stone's foundational work on natural objects as rights-holders remains influential. Further analytical attention is needed to connect these

theoretical arguments with institutional conditions governing judicial enforcement and ecological restoration.

Comparative legal developments provide different approaches to recognizing ecological interests. Ecuador incorporates constitutional rights, Colombia employs judicial recognition and guardianship, and New Zealand establishes statutory legal personality. These models demonstrate institutional diversity but raise unresolved questions concerning representative authority, remedial effectiveness, and implementation accountability across distinct national legal environments (Ningsih, 2025; Robinson, 2026).

Existing research also requires closer integration between doctrinal recognition and evidence of environmental outcomes. Judicial decisions may establish innovative legal principles without demonstrating subsequent ecological recovery. The resulting analytical gap concerns how legal institutions transform formal environmental rights into enforceable duties, measurable restoration obligations, and sustained ecological protection.

The proposed research introduces an enforcement-centered interpretation of nature's rights that distinguishes symbolic legal recognition from operational legal effectiveness. Its conceptual contribution lies in examining ecological personhood alongside judicial accessibility, institutional representation, governmental accountability, and remedial implementation. This perspective shifts analytical attention from whether nature possesses rights toward how those rights acquire practical legal significance (Amiruddin, 2024; Syafi'i, 2025).

The study advances a multidimensional framework integrating rights recognition, representative legitimacy, enforceable obligations, institutional coordination, and ecological outcome assessment. Its proposed originality concerns the relationships among these dimensions rather than their individual existence. The framework provides criteria for examining why similar legal recognition arrangements may produce different enforcement capacities across national jurisdictions (Page, 2024; Park, 2026).

The significance of this investigation extends to environmental jurisprudence, constitutional interpretation, and ecological governance. An integrated enforcement framework may assist courts, legislators, and environmental institutions in designing legally coherent mechanisms for protecting ecosystems. The research offers a foundation for strengthening accountability, improving environmental remedies, and connecting ecological rights recognition with demonstrable environmental protection.

RESEARCH METHODOLOGY

This study adopts a qualitative doctrinal legal research design integrating comparative jurisprudential analysis and normative institutional inquiry. The research examines how the rights of nature are conceptualized, legally recognized, and translated into enforceable obligations within national environmental legal systems. Doctrinal analysis investigates constitutional provisions, judicial decisions, statutory frameworks, and principles governing ecological legal personality. Comparative analysis evaluates differences in institutional representation, judicial remedies, governmental responsibilities, and implementation mechanisms. Normative inquiry assesses whether existing legal arrangements provide coherent foundations for ecological protection, institutional accountability, and environmental restoration (Navarro, 2026; Offor, 2024).

The comparative framework focuses on Ecuador, Colombia, and New Zealand, representing distinct approaches to recognizing ecological rights. Ecuador's 2008 Constitution establishes constitutional protection for nature, Colombia's Constitutional Court recognized the Atrato River as a rights-bearing entity in Judgment T-622/2016, and New Zealand's Te Awa Tupua Act 2017

establishes legal personhood and representation arrangements for the Whanganui River. These jurisdictions enable examination of constitutional recognition, judicial innovation, and statutory institutionalization without treating their legal mechanisms as functionally identical.

The research population comprises publicly accessible legal documents, judicial decisions, governmental reports, and scholarly publications addressing ecological rights and their implementation. Primary sources include constitutional provisions, legislation, authoritative judgments, administrative regulations, and official implementation documents. Secondary sources encompass peer-reviewed scholarship, legal commentaries, and institutional assessments concerning environmental jurisprudence. The principal units of analysis are legal provisions, judicial reasoning, institutional responsibilities, and documented enforcement arrangements. Ecological conditions are considered only where credible documentary evidence supports an assessment of implementation outcomes (Sayuti, 2025; Thani, 2025).

Purposive sampling selects the three jurisdictions according to their jurisprudential significance, institutional diversity, and availability of authoritative legal materials. Documents qualify for inclusion when they address ecological legal status, representative authority, judicial standing, remedial obligations, institutional coordination, or enforcement monitoring. Sources lacking verifiable legal authority or substantive relevance are excluded. The sample prioritizes foundational recognition instruments and subsequent implementation materials, allowing comparison between formal rights and mechanisms intended to realize them. Selection remains criterion-based rather than statistically representative of global environmental jurisprudence.

The principal research instrument is a structured legal document analysis matrix designed to classify conceptual and enforcement characteristics across jurisdictions. The matrix incorporates six analytical dimensions: legal recognition, ecological rights definition, representative legitimacy, institutional obligations, judicial remedies, and enforcement accountability. Each dimension contains interpretive indicators addressing legal standing, guardianship, administrative responsibility, restoration requirements, compliance monitoring, and available corrective measures. Documentary entries record source authority, jurisdiction, publication date, legal status, relevant provisions, and implementation evidence. These procedures establish transparent connections between documentary materials and comparative interpretations (Kanyama, 2026b; Thani, 2025).

A qualitative coding protocol complements the matrix by identifying recurring legal concepts, institutional patterns, and enforcement challenges. Coding categories distinguish constitutional entitlements, statutory personality, judicial recognition, representation arrangements, and compliance mechanisms. Source credibility is assessed through authenticity, institutional authority, legal currency, and documentary consistency. Interpretive reliability is strengthened through repeated coding, comparison of authoritative materials, and documentation of alternative explanations. The instrument evaluates the legal architecture of enforcement without assuming that formal recognition demonstrates measurable ecological recovery.

The research procedure comprises documentary identification, eligibility screening, legal interpretation, comparative coding, and normative synthesis. Relevant materials are retrieved from official legislative repositories, constitutional court databases, governmental publications, and academic research platforms. Search expressions combine rights of nature, ecological personhood, environmental jurisprudence, legal guardianship, judicial enforcement, and ecological restoration. Retrieved documents are assessed against predetermined selection criteria, verified for legal authority, and organized by jurisdiction and institutional function. Foundational legal instruments are distinguished from subsequent implementation evidence to preserve analytical chronology (Hamdi, 2025; Katini, 2025).

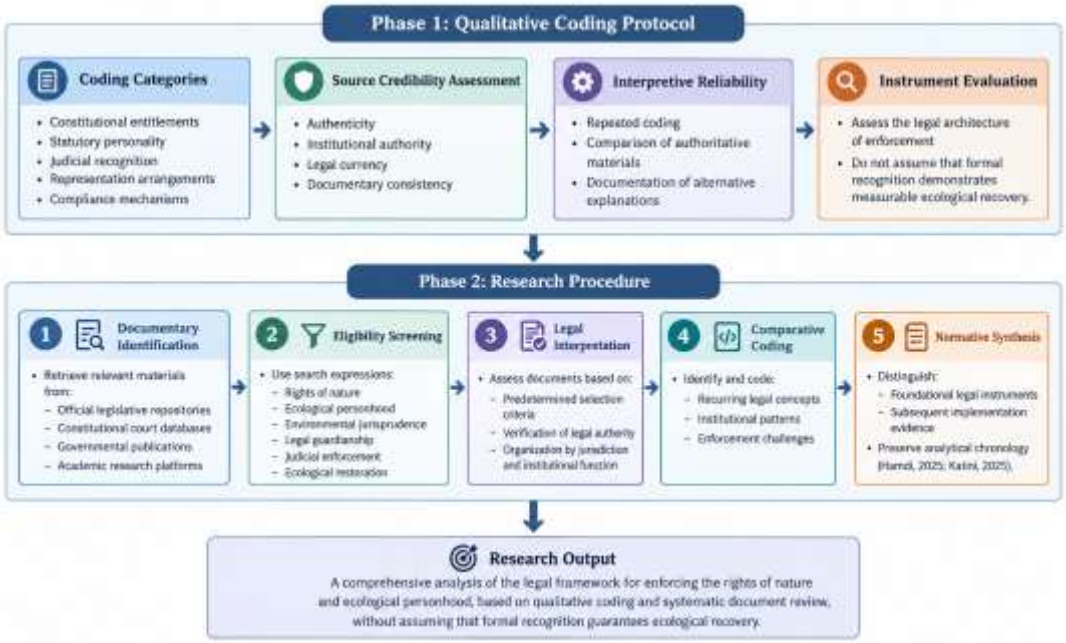


Figure 1. Research Flowchart for Qualitative Legal Analysis of Nature's Rights and Ecological Personhood Enforcement

Doctrinal examination initially reconstructs the legal foundations of ecological rights in each jurisdiction. Comparative analysis subsequently evaluates representative authority, enforcement procedures, judicial remedies, and institutional responsibilities using the analytical matrix. Particular attention is directed toward differences between legally established obligations and documented administrative compliance. Normative synthesis identifies institutional strengths, conceptual ambiguities, and implementation barriers. Findings are assessed against competing legal interpretations and available ecological evidence before developing a comparative framework connecting rights recognition with enforceable environmental protection (Ferreira, 2026; Shetty, 2025).

RESULT AND DISCUSSION

The comparative examination of environmental jurisprudence in Ecuador, Colombia, and New Zealand identifies three distinct mechanisms for recognizing and operationalizing the rights of nature. Ecuador establishes constitutional recognition through Articles 71–74 of its 2008 Constitution, including rights concerning ecological existence, regeneration, restoration, and precautionary protection. Colombia's Constitutional Court recognized the Atrato River and its basin as rights-bearing entities through Judgment T-622/2016. New Zealand established legal personality for the Whanganui River through the Te Awa Tupua Act 2017. These instruments demonstrate a transition from exclusively human-centered environmental protection toward legal arrangements recognizing ecological interests directly.

The secondary documentary evidence comprises three foundational recognition instruments and selected judicial and administrative implementation materials. Ecuador's framework contains four constitutional articles specifically addressing nature's rights, whereas Colombia's principal judgment establishes river guardianship and multiple institutional obligations. New Zealand's legislation establishes legal personality, representative institutions, coordination mechanisms, and dedicated funding arrangements. These figures describe identifiable legal provisions rather than statistical measurements of environmental improvement. Table 1 presents the principal institutional

characteristics, highlighting differences between constitutional recognition, judicially established protection, and statutory legal personality.

Table 1. Comparative Legal Recognition and Enforcement Mechanisms of the Rights of Nature

Analytical dimension	Ecuador	Colombia	New Zealand
Primary legal authority	Constitution of 2008, Articles 71–74	Constitutional Court Judgment T-622/2016	Te Awa Tupua Act 2017
Recognition model	Constitutional rights of nature	Judicial recognition of Atrato River's rights	Statutory legal personality
Ecological subject	Nature and ecological systems	Atrato River, basin, and tributaries	Whanganui River as Te Awa Tupua
Representation	Broad constitutional entitlement to seek enforcement	State and ethnic community guardians	Te Pou Tupua
Institutional obligations	Protection, restoration, precaution	Protection, conservation, maintenance, restoration	Representation, coordination, river governance
Enforcement mechanisms	Constitutional litigation and remedies	Judicial orders and compliance monitoring	Statutory governance and representation
Documented implementation evidence	Los Cedros judgment and remedial orders	T-622 monitoring arrangements and subsequent institutional oversight	Statutory offices, strategy institutions, and funding provisions
Principal limitation of evidence	Ecological recovery not established by judgment alone	Compliance measures do not establish completed restoration	Institutional design does not demonstrate ecological improvement

The comparative evidence reveals that ecological legal recognition operates through different institutional pathways. Ecuador constitutionally recognizes nature as a rights-holder, permitting individuals and communities to seek enforcement before public authorities. Colombia's judicial approach connects ecological rights with governmental responsibilities and community guardianship. New Zealand establishes legal personality through legislation supported by designated representatives and collaborative governance arrangements. These differences demonstrate that legal recognition cannot be reduced to a single institutional model. Each jurisdiction constructs distinctive relationships between ecological interests, human representation, and the legal mechanisms responsible for implementation.

The differences also clarify why formal recognition does not automatically produce effective environmental protection. Constitutional provisions establish authoritative legal standards but require judicial and administrative application. Judicial declarations may prescribe institutional responsibilities without ensuring timely compliance. Statutory governance structures provide organizational continuity but remain dependent on resources, effective coordination, and implementation within the broader legal system. The documentary findings consequently distinguish three analytical stages: establishing legal status, translating that status into enforceable

institutional responsibilities, and verifying whether implementation produces measurable environmental benefits. The available sources provide stronger evidence concerning the first two stages than the third.

The documentary analysis identifies six recurring dimensions shaping the operationalization of ecological rights: recognition, representation, legal standing, institutional responsibility, judicial remedies, and compliance monitoring. Ecuador's constitutional provisions permit broad participation in defending ecological interests and expressly recognize nature's entitlement to restoration. Colombia's Atrato River judgment establishes shared representation involving the government and ethnic communities. New Zealand's legislation creates Te Pou Tupua to act on behalf of Te Awa Tupua and establishes additional arrangements concerning strategic coordination and funding. These mechanisms reflect different approaches to addressing the practical difficulty that ecosystems cannot independently exercise conventional procedural rights.

The examined instruments reveal distinctions between preventive protection and restorative accountability. Preventive mechanisms seek to avoid ecological degradation through precautionary obligations, environmental assessment, and institutional supervision. Restorative mechanisms respond to established harm through rehabilitation, remedial orders, and continuing oversight. Ecuador's constitutional provisions expressly recognize restoration alongside precautionary measures, while Colombia's judgment requires governmental action addressing environmental degradation affecting the Atrato basin. New Zealand's framework emphasizes institutional representation and coordinated river governance. These variations demonstrate that rights recognition may support preventive and restorative functions without guaranteeing that either function operates effectively in practice.

The inferential analysis suggests that effective operationalization depends less on the formal category of ecological legal recognition than on the institutional arrangements connecting rights with enforceable duties. Constitutional recognition provides authoritative legal protection, judicial recognition establishes obligations in particular disputes, and statutory personality creates structures through which ecological interests may be represented. None of these mechanisms independently guarantees implementation. Their practical significance depends on whether responsible actors possess clearly defined authority, adequate resources, accessible remedies, and mechanisms for assessing compliance. This inference emerges from comparative legal reasoning rather than statistical evidence demonstrating causal relationships between institutional design and environmental recovery.

The examined arrangements also support a conditional relationship between representative legitimacy and enforcement capacity. Community participation may strengthen the representation of ecological interests by incorporating local knowledge and lived environmental experience. Governmental participation can provide administrative authority and access to public resources. Institutional effectiveness nevertheless requires clarity concerning decision-making responsibilities, accountability, and the resolution of competing interests. Colombia's joint guardianship model and New Zealand's statutory representation framework offer different arrangements for addressing these requirements. The comparative evidence suggests that representative legitimacy and operational authority must be considered together, although their relative effectiveness remains unverified without systematic implementation data.

The analysis identifies a relationship between the precision of legal obligations and the capacity to evaluate enforcement. Rights expressed through general constitutional language establish normative commitments but may require subsequent judicial interpretation to determine specific governmental responsibilities. Judicial remedies can translate these commitments into

defined actions, deadlines, and reporting requirements. Institutional mechanisms subsequently provide opportunities to monitor whether obligations have been addressed. Ecuador's Los Cedros judgment demonstrates this connection through measures concerning environmental authorizations, restoration, administrative coordination, and implementation reporting. The significance of such arrangements lies in making legal duties more identifiable and reviewable rather than automatically securing ecological recovery.

The comparative findings further reveal an interaction between enforcement monitoring, institutional continuity, and ecological accountability. Environmental restoration often requires sustained action extending beyond the conclusion of judicial proceedings. Monitoring institutions can document administrative progress, identify implementation obstacles, and maintain attention to outstanding obligations. Colombia's public oversight institutions established additional coordination and reporting measures in December 2024 concerning implementation of the Atrato judgment. This development illustrates continued institutional engagement eight years after the original decision. The evidence demonstrates the existence of monitoring arrangements but does not independently establish successful restoration across the affected river basin.

The Ecuadorian case study examines Constitutional Court Judgment No. 1149-19-JP/21 concerning the Los Cedros Protected Forest. The Court determined that environmental authorizations associated with mining exploration violated constitutional rights of nature and related environmental protections. Its reasoning considered biodiversity, ecosystem integrity, scientific uncertainty, and the precautionary principle. The decision invalidated relevant authorizations and required measures addressing environmental protection, restoration, and administrative regulation. These judicial findings demonstrate how constitutionally recognized ecological rights can inform concrete remedies against government decisions permitting potentially harmful activities. The judgment provides evidence of judicial enforcement, although subsequent environmental recovery requires separate verification.

The Colombian and New Zealand cases present contrasting institutional approaches to ecological protection. Judgment T-622/2016 recognized the Atrato River as a rights-bearing entity and required governmental and community participation in its guardianship. Subsequent oversight measures addressed reporting and compliance coordination. New Zealand's Te Awa Tupua Act 2017 established the Whanganui River as a legal person and created Te Pou Tupua as its representative. The legislation also provides institutional coordination arrangements and a dedicated fund. These cases demonstrate differences between judicially supervised restoration obligations and statutory structures supporting long-term representation, without establishing that either approach achieves superior ecological outcomes.

The Los Cedros case illustrates how environmental jurisprudence can transform ecological rights from constitutional principles into judicially enforceable standards. The Court treated ecosystem integrity and precaution as legally relevant considerations when assessing administrative authorizations. Its remedies extended beyond recognizing a violation by addressing environmental permissions and future regulatory practices. This approach demonstrates the relationship between ecological rights adjudication and administrative accountability. The decision nevertheless cannot establish that all ordered measures were completed or that environmental conditions subsequently improved. Judicial enforceability and ecological effectiveness remain separate dimensions requiring different forms of evidence.

The Atrato and Whanganui cases illustrate the institutional importance of representation. Colombia's guardianship arrangement links governmental responsibility with the participation of affected ethnic communities, reflecting the relationship between ecological protection and local

environmental governance. New Zealand's framework establishes a statutory representative institution within a broader settlement recognizing the relationship between the Whanganui River and Whanganui iwi. These arrangements differ in origin, legal structure, and institutional purpose. Their common significance lies in assigning identifiable responsibility for advancing ecological interests. The findings do not support treating guardianship arrangements as interchangeable or assuming that their existence alone resolves conflicts concerning resources, implementation, and environmental priorities.

The combined findings reveal a central tension within contemporary environmental jurisprudence: recognizing nature as a rights-holder can expand legal protection without ensuring that ecological rights are effectively implemented. Constitutional provisions, judicial declarations, and statutory legal personality provide different foundations for institutional responsibility. Their effectiveness depends on representation, enforceable obligations, accessible remedies, coordinated administration, and sustained oversight. The distinction between recognition and implementation is particularly important because documentary evidence of legal innovation may be mistaken for evidence of ecological improvement. The comparative analysis therefore identifies enforcement capacity as a critical dimension of operationalizing nature's rights.

The research supports an integrated analytical framework connecting ecological recognition with representative legitimacy, institutional obligations, remedial specificity, compliance monitoring, and environmental outcome verification. Its principal finding is conceptual and doctrinal: operational effectiveness should be assessed through the mechanisms translating legal status into accountable action rather than through formal recognition alone. The examined jurisdictions demonstrate different institutional approaches without providing comparable quantitative evidence of restoration outcomes. A defensible evaluation of ecological rights consequently requires combining legal analysis with documented compliance and independently assessed environmental conditions. Such integration offers a foundation for distinguishing symbolic recognition, enforceable protection, and demonstrable ecological recovery.

The findings demonstrate that recognizing the rights of nature represents a significant transformation in environmental jurisprudence, although its practical effectiveness depends on institutional implementation. Comparative analysis of Ecuador, Colombia, and New Zealand identifies three distinct legal pathways: constitutional recognition, judicially established ecological rights, and statutory legal personality. These approaches challenge conventional anthropocentric legal assumptions while establishing different mechanisms for environmental representation, accountability, and restoration (Mansoor, 2026; O'Neil, 2026).

The comparative evidence reveals that legal recognition alone cannot guarantee ecological protection. Ecuador's constitutional provisions establish substantive ecological rights, Colombia's Atrato River judgment integrates environmental protection with community guardianship, and New Zealand's Te Awa Tupua framework creates dedicated representative institutions. Their differences demonstrate that effective enforcement requires identifiable responsibilities, adequate administrative capacity, accessible remedies, and continuing institutional coordination.

The documentary findings further identify substantial differences between judicial enforceability and measurable ecological recovery. Ecuador's Los Cedros judgment illustrates how constitutional ecological rights can invalidate administrative authorizations inconsistent with environmental protection. Colombia's Atrato River decision establishes restoration responsibilities and monitoring arrangements, while New Zealand emphasizes representative governance. These developments demonstrate legal institutionalization without independently establishing successful ecological restoration (Mansoor, 2026; Quillatupa-Machuca, 2026).

The central finding concerns the implementation gap between ecological legal recognition and environmental outcomes. Rights-bearing status creates opportunities for judicial protection, but meaningful enforcement depends on translating legal entitlements into operational obligations. The analysis consequently identifies institutional accountability, representative legitimacy, remedial specificity, and ecological monitoring as interconnected dimensions of effective rights-of-nature governance.

The findings extend Christopher Stone's (1972) foundational argument that natural objects may possess legally recognized rights and exercise those rights through appropriate representation. Stone challenged the assumption that nature must remain merely an object of human legal interests. The present analysis advances this discussion by examining the institutional conditions required to transform ecological legal standing into enforceable obligations and measurable protection.

The comparative findings also correspond with Kauffman and Martin (2017), who examined thirteen Ecuadorian rights-of-nature lawsuits and identified differences in enforcement outcomes associated with institutional relationships, political conditions, and judicial understanding. Their research demonstrates that constitutional recognition does not ensure consistent judicial implementation. The present study extends this insight through comparison with Colombian guardianship arrangements and New Zealand's statutory representative institutions.

The Colombian findings complement jurisprudential perspectives emphasizing biocultural relationships between ecosystems and the communities whose identities, livelihoods, and cultural practices depend upon them. Judgment T-622/2016 recognizes the Atrato River's ecological interests alongside the rights of affected ethnic communities. This relationship suggests that ecological protection and human rights need not function as competing legal priorities when institutional arrangements recognize their interdependence.

The New Zealand findings offer a contrasting perspective by demonstrating how ecological legal personality can emerge through negotiated historical redress and statutory governance. Te Awa Tupua recognizes the Whanganui River within a framework reflecting the relationship between Whanganui iwi and the river. The comparison broadens conventional rights-of-nature scholarship by emphasizing legal traditions, representative legitimacy, and institutional continuity rather than assuming a universal model of ecological personhood (Azam, 2026; Goldstein, 2026).

The findings signify a broader transformation in the philosophical foundations of environmental law. Traditional environmental regulation frequently protects ecosystems through their importance to human health, property, or economic welfare. Rights-of-nature approaches introduce the possibility that ecological systems possess legally relevant interests independently of immediate human benefit. This development challenges conventional distinctions between legal subjects and objects.

The comparative analysis also reveals that ecological personhood involves institutional construction rather than merely philosophical recognition. Rivers and forests cannot independently initiate proceedings, monitor government agencies, or implement restoration measures. Human representatives and public institutions necessarily translate ecological interests into legally actionable demands. The legitimacy, competence, and accountability of these representatives consequently become central to environmental jurisprudence.

The implementation gap reflects a tension between ambitious ecological principles and existing governance structures. Courts may recognize environmental rights while administrative institutions continue operating through fragmented mandates, limited financial resources, and competing development objectives. This tension suggests that judicial innovation can precede

institutional transformation. Formal legal recognition therefore represents an important beginning rather than the completion of environmental protection (Arafa, 2026; Sharma, 2025).

The findings further indicate that ecological justice requires sustained relationships between legal institutions and environmental knowledge. Judicial remedies become meaningful when their implementation can be examined through credible ecological information. Restoration plans, biodiversity assessments, water quality monitoring, and transparent compliance reporting provide possible mechanisms for evaluating progress. Legal accountability must consequently remain connected to scientifically defensible environmental assessment.

The theoretical implications concern the need to distinguish ecological legal status from institutional enforcement effectiveness. Recognition of nature as a rights-bearing entity challenges anthropocentric legal frameworks, but enforceability depends on additional institutional arrangements. Environmental jurisprudence should therefore evaluate ecological rights through legal recognition, representative legitimacy, specific obligations, remedial accessibility, and measurable implementation rather than constitutional or statutory declarations alone.

The judicial implications involve strengthening the precision and enforceability of environmental remedies. Courts should identify responsible institutions, clarify restoration requirements, establish appropriate reporting arrangements, and provide mechanisms for reviewing compliance. Ecuador's Los Cedros judgment illustrates the relevance of precautionary principles and judicial scrutiny of environmental authorization. Such approaches can improve administrative accountability without presuming that judicial orders automatically produce ecological recovery (Kanyama, 2026a; Porras, 2024).

The institutional implications concern the design of legitimate and effective ecological representation. Colombia's guardianship arrangements demonstrate the potential importance of cooperation between governmental institutions and affected communities. New Zealand's statutory framework provides a contrasting model of designated representation and coordinated river governance. These arrangements suggest that representative authority must be accompanied by clear responsibilities, adequate resources, and procedures for resolving institutional disagreements (Burdon, 2023; Panigrahi, 2026).

The policy implications extend to environmental restoration, administrative coordination, and sustainable development planning. Governments considering rights-of-nature legislation should establish implementation responsibilities alongside legal recognition. Effective policies require institutional funding, transparent monitoring systems, community participation, and accessible enforcement procedures. Environmental governance should also distinguish compliance with administrative requirements from independently verified ecological improvements.

The observed differences arise partly because ecological rights have developed through distinct constitutional, judicial, and political contexts. Ecuador constitutionalized nature's rights within a broader vision of ecological well-being. Colombia's recognition of the Atrato River responded to severe environmental degradation affecting ethnic communities. New Zealand's framework emerged from the historical relationship between Whanganui iwi and the Crown. These origins influence the institutional meaning of ecological protection.

The implementation gap also reflects the complexity of translating broad legal principles into administrative action. Constitutional recognition may establish enforceable rights without specifying every operational responsibility. Judicial decisions can clarify particular duties, although implementation frequently requires cooperation among multiple institutions. Statutory governance frameworks may establish permanent representative structures but remain dependent on their practical operation within existing environmental regulation (Galanzino, 2025; Panigrahi, 2026).

Institutional fragmentation provides another explanation for enforcement difficulties. Environmental harm often involves overlapping responsibilities concerning mining, water management, biodiversity protection, public health, and territorial administration. Government agencies may possess different mandates, resources, and regulatory priorities. Coordinating these institutions becomes especially challenging when restoration requires sustained intervention across extensive ecosystems and multiple administrative jurisdictions.

The limited evidence concerning ecological outcomes reflects differences between legal and environmental timescales. Judicial decisions can establish obligations immediately, whereas ecological recovery may require years of restoration, monitoring, and institutional intervention. Environmental conditions also respond to climatic variation, ongoing human activity, and ecosystem complexity. Demonstrating that legal recognition produces ecological improvement consequently requires longitudinal evidence capable of distinguishing institutional contributions from other environmental influences.

The findings support developing an integrated enforcement framework linking ecological legal recognition with operational accountability. Such a framework should clarify the scope of ecological rights, establish legitimate representation, identify institutional duties, and provide accessible remedies. Implementation arrangements should incorporate transparent reporting and environmental monitoring while respecting the distinct legal and cultural foundations of each jurisdiction (Galanzino, 2025; Yusuf, 2025).

Future research should examine whether rights-of-nature judgments and legislation generate observable improvements in ecosystem conditions. Longitudinal studies could evaluate biodiversity indicators, water quality, habitat restoration, and administrative compliance before and after relevant legal interventions. Comparative research should distinguish improvements associated with ecological rights from outcomes attributable to conventional environmental regulation or unrelated policy developments.

Additional investigations should examine the experiences of Indigenous peoples, local communities, environmental officials, and legal representatives participating in ecological governance. Qualitative interviews and institutional case studies could identify challenges concerning representation, decision-making authority, financial resources, and competing environmental priorities. Such evidence would strengthen understanding of how ecological rights operate beyond formal judicial and legislative documents (Hidayatullah, 2025; Sonkar, 2026).

The proposed research agenda ultimately emphasizes a transition from symbolic recognition toward demonstrable environmental accountability. Rights-of-nature jurisprudence can expand ecological protection when legal innovation is supported by legitimate representation, enforceable obligations, and sustained institutional capacity. Future regulatory development should preserve the intrinsic value of ecosystems while establishing practical mechanisms for environmental recovery. Effective ecological justice requires both meaningful legal recognition and credible evidence that institutional action contributes to protecting and restoring nature.

CONCLUSION

The central finding of this study is that recognizing nature as a rights-bearing subject does not, by itself, secure ecological protection. Comparative analysis of Ecuador, Colombia, and New Zealand reveals three legal pathways: constitutional recognition, judicial acknowledgment accompanied by guardianship, and statutory legal personality. These pathways broaden the legal standing of ecosystems but differ in how they assign representative authority, establish enforceable duties, and organize institutional oversight. Ecuador's Los Cedros litigation demonstrates the

capacity of constitutional rights to constrain environmentally harmful authorizations, while the Atrato River and Whanganui River arrangements illustrate alternative structures for representing ecological interests. The distinctive finding is an implementation gap between the creation of ecological rights and verified environmental improvement. Judicial orders, designated guardians, and legislative recognition provide mechanisms for accountability, yet their existence cannot be equated with completed restoration or measurable ecological recovery.

The study contributes an integrated conceptual and methodological framework for evaluating the operational effectiveness of rights-of-nature regimes. Rather than treating legal personhood as the principal indicator of success, the framework connects six dimensions: legal recognition, representative legitimacy, institutional responsibility, remedial specificity, compliance monitoring, and ecological outcome verification. Its comparative approach distinguishes the legal architecture of enforcement from evidence of actual implementation, thereby avoiding unsupported assumptions about the environmental effects of judicial innovation. The framework also clarifies that constitutional protection, court-supervised guardianship, and statutory representation should be assessed rather than ranked through a universal model. Its contribution lies in linking doctrinal interpretation to an evaluation of institutional accountability without reducing ecological justice to administrative compliance.

The study is limited by its documentary research design, the selection of three jurisdictions, and uneven access to comparable implementation and environmental monitoring data. Foundational judgments and legislative provisions establish legal obligations but offer insufficient evidence to determine whether ecosystems have recovered because of rights-of-nature interventions. Differences in political institutions, Indigenous relationships with ecosystems, administrative resources, and environmental conditions further restrict generalization. Future research should combine longitudinal ecological indicators with systematic analysis of court compliance records, government budgets, restoration plans, and independent monitoring reports. Interviews with guardians, Indigenous and local communities, judges, and environmental officials could illuminate how representation and institutional coordination operate in practice. Comparative studies involving additional jurisdictions should investigate when legally enforceable rights produce observable ecological benefits, when implementation stalls, and which accountability mechanisms explain those differences. Such evidence would support more precise institutional reforms while preserving the distinct normative foundations of ecological rights.

DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this work the author(s) used Google Gemini to assist in improving grammar, language quality, and overall readability of the text. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

AUTHORS' CONTRIBUTION

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

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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