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Land Management and Adoption of Biodiversity Conservation Approaches

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ABSTRACT

Generally, proposed areas for restoring the environment are growing in number, as are biodiversity conservation efforts in affluent nations. However, the fragmented ownership structure and management of lands, the multitude of landowners, and their diverse characteristics can present substantial obstacles to conservation endeavors. Consequently, attitudes toward conservation initiatives among landowners can vary widely, with some initiatives facing resistance while others garner consent and active participation. The study aims to systematize recent literature (2015–2024), gain knowledge of the context, and explore the social impacts of biodiversity conservation projects on land management. Globally, there is a scarcity of research aiming to establish overarching patterns. The PRISMA approach was used to conduct a rigorous publication evaluation for the current investigation. Finally, 25 identified articles were included in the study to systematize recent literature (2015–2024). To address this void, we conducted a comprehensive evaluation of the material of biodiversity conservation practices on private and public lands, aiming to construct a comprehensive framework of elements impacting the nod of approval of biodiversity conservation efforts on these lands. Our findings indicate that while conservation bodies, especially governmental bodies or non-governmental organizations (NGOs), have limited authority over individual landowners, they can enhance the adoption and perception of biodiversity conservation initiatives on land management by enhancing social communications. We developed four major recommended programs to assist in the development and implementation of biodiversity preservation programs for individuals and governments, as well as to identify actionable strategies for enhancing the social acceptance of such initiatives.

INTRODUCTION

For millennia, humans have reshaped the natural environment to suit their needs and preferences. However, over the past 50 years, this alteration has accelerated significantly, causing a staggering loss of species and deterioration of ecosystems at an unprecedented rate. This alarming trend, highlighted by Myers (1987) and Wilson (1988), indicates a current extinction rate of nearly two species per hour globally, with projections suggesting that up to half of Earth's species could vanish within the next few decades, far surpassing historical extinction rates. Despite longstanding concerns within the scientific community regarding biodiversity, it's only recently gained substantial attention as a critical public policy issue. Increasing awareness has prompted private land managers to prioritize biodiversity conservation. Yet, integrating conservation goals with economic land-use decisions remains a challenging task.

This article proposes a method to address this challenge by defining biodiversity, emphasizing the importance of scientifically informed management, setting conservation standards, evaluating sites for biodiversity potential, and outlining criteria for monitoring the effectiveness of land management strategies.

Biodiversity, often known as biological diversity, remains a comparatively new concept encompassing not just the number and variety of species, but also their genetic makeup, ecosystems, and the processes that sustain

them. Despite its complexity, biodiversity is often simplified to species count, leading to regulatory and management policies primarily focused on preserving individual species of interest. However, a comprehensive understanding of biodiversity involves recognizing its multidimensional nature, spanning from genetic diversity to landscape-scale ecological processes. Land managers often observe that greater habitat diversity supports more species. However, a narrow focus on maximizing local habitat diversity may inadvertently harm regional and global biodiversity by favoring opportunistic species over sensitive ones. Traditional land management practices, such as maintaining habitat edges, can enhance local species diversity but often at the expense of rare and sensitive species.

A shift towards regional and global conservation strategies acknowledges the interconnectedness of ecosystems, genetic diversity, and species across broader landscapes. This perspective allows for more flexible land-use options while prioritizing preserving species requiring large undisturbed habitats, genetically unique populations, and those vital to ecosystem functioning. Emphasizing ecological processes alongside species and community conservation ensures a holistic approach to biodiversity management. While regional-scale conservation does not preclude site-specific habitat manipulation, it emphasizes maintaining ecological processes and species interactions critical to biodiversity. Endangered species may necessitate

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intensive management efforts, even if it means altering natural habitats. Conversely, less critical areas may permit management practices to enhance specific wildlife values without jeopardizing regional or global biodiversity. The cornerstone of a biodiversity conservation initiative for residents lies in a steadfast commitment to managing resources in alignment with the overarching goal outlined above. Upon embracing this mission as an integral part of standard operations, the implementation process involves establishing a framework for evaluating site attributes, assessing sites within a broader context, and defining appropriate conservation aims. Ideally, a management scheme should facilitate the identification of biodiversity elements requiring utmost protection before setting site-specific objectives. As soon as the management ascertains the biodiversity impact and sustainability goals for a site, the program should furnish guiding principles to inform land-use decisions and site management practices. The ensuing land management program delineates a clear directive for biodiversity conservation and presents actionable policies to fulfil that directive. The program minimizes the inherent subjectivity often associated with management decisions by providing objective site classification criteria grounded in factors like formation, scale, and background. It then outlines the conservation target and corresponding management tenet for each classification, offering a blueprint for developing site-specific conservation plans. Crafting a land-use plan entails several sequential steps. Initially, managers should conduct or commission a comprehensive inventory of species, natural habitats, and prevailing ecological processes (such as fire and hydrological regimes) on the site. Subsequently, they should analyze the site's relationship to surrounding areas and its conservation significance within a regional and global framework. This analysis should then be interpreted in light of the site classification criteria established later in the report. Once sites are classified, the program furnishes targets for conservation for every category determined by the overarching goal of preserving viable populations and natural distributions of native species and habitats within the regional landscape. Additionally, the program provides

corresponding stewardship principles to underpin the development of site-specific conservation plans. Adopting a regional and global perspective on biodiversity management provides a comprehensive framework that balances site-specific interventions with broader conservation goals, ensuring the preservation of ecosystems, genetic diversity, and species across various scales.

MATERIALS AND METHODS

These findings draw upon already-made scholastic research that is already in existence. We conducted a systematic literature review following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines as our methodological framework. Our approach involved utilizing databases such as Scopus and Google with customized search parameters, setting standards for the inclusion and exclusion of studies, carrying out the review process steps including recognition, evaluation, and qualification assessment, as well as performing data extraction and analysis.

Resources

The work primarily relies on the extensive Scopus database, renowned for its peer-reviewed journals. Additionally, we performed a tailored search using Google and assessed pertinent non-peer-reviewed articles aligned with our objectives.

Eligibility and Exclusion Criteria

To begin with, only “articles and books” were taken into consideration when it came to document types; as a result, conference papers, reviews, editorials, notes, data papers, and essays weren’t taken into account. Second, non-English articles were not included; only English-language publications were taken into consideration. Thirdly, a timeframe of 2015–2024 was chosen for the chronology. Lastly, topics related to agriculture, biological science, environmental science, life sciences, and physical sciences were chosen; all other topics were omitted (Table 1).

Table 1: The inclusion and exclusion criteria

Exclusion	Eligibility	Criterion
Conference paper, book chapter, review, editorial, conference review	Articles and books	Document Type
	Could not access the article (Full-text articles)	All Open Access (Gold open, Hybrid gold, Bronze and Green)
Non-English	English	Language
Before 2015	Between 2015–2023	Timeline
Aside from three qualified subject	Environmental science, Agriculture, life, physical and biological science	Subject area

Systematic Review Process

Four phases make up the assessment process (Figure 1). However, the initial phase involved finding records in

archives using pre-selected phrases: “land management and biodiversity” OR “land management and biological diversity” AND “case studies.” In keeping with the

review's goals, we looked into actual instances of land administration and ecological diversity to learn more about the topic in question. About 3641 articles altogether from Scopus and Google personalized scans were found using the database search. However, 2218 entries were eliminated before screening because they were duplicates (n = 541). After all, automated technologies flagged them as ineligible (n = 1438), or for other reasons (n = 239). Screening was the next stage. Thirteen thousand and fifty-five of the fourteen thousand and twenty-three articles that were qualified for screening were eliminated and sixty-nine of the articles were assessed further for the eligibility stage. The primary land management and biodiversity study's multifunctionality was one of the eligibility requirements for the publication. 44 publications were eliminated after a thorough review because they did not address the dual roles that land management and biodiversity play. Consequently, 25 publications were found for an additional evaluation in the final assessment step (Figure 1).

Data Abstraction and Analysis

The methodology was performed for the similarity categorization as follows:

Step I

Selecting the common benefits and challenges identified by the external auditors.

Step II

Applying basic binary values (e.g., recognize vs. non-identify), we computed the degree of similarity between the shared benefits and problems. Hence, we inserted a third value across the two binary possibilities to suit our purposes. The following weights were designated:

100% Similarity —1.0

>0% to <100% Similarity —0.5

0% Similarity —0

The overall similarity weight was determined by dividing the overall weight by the number of external professionals who examined the work, that is if more than a single independent reviewer did so.

Step III

By dividing the overall score by the number of publications that reported benefits or problems that were frequently detected by both the writers and independent reviewers, the resulting similarity classification weight was

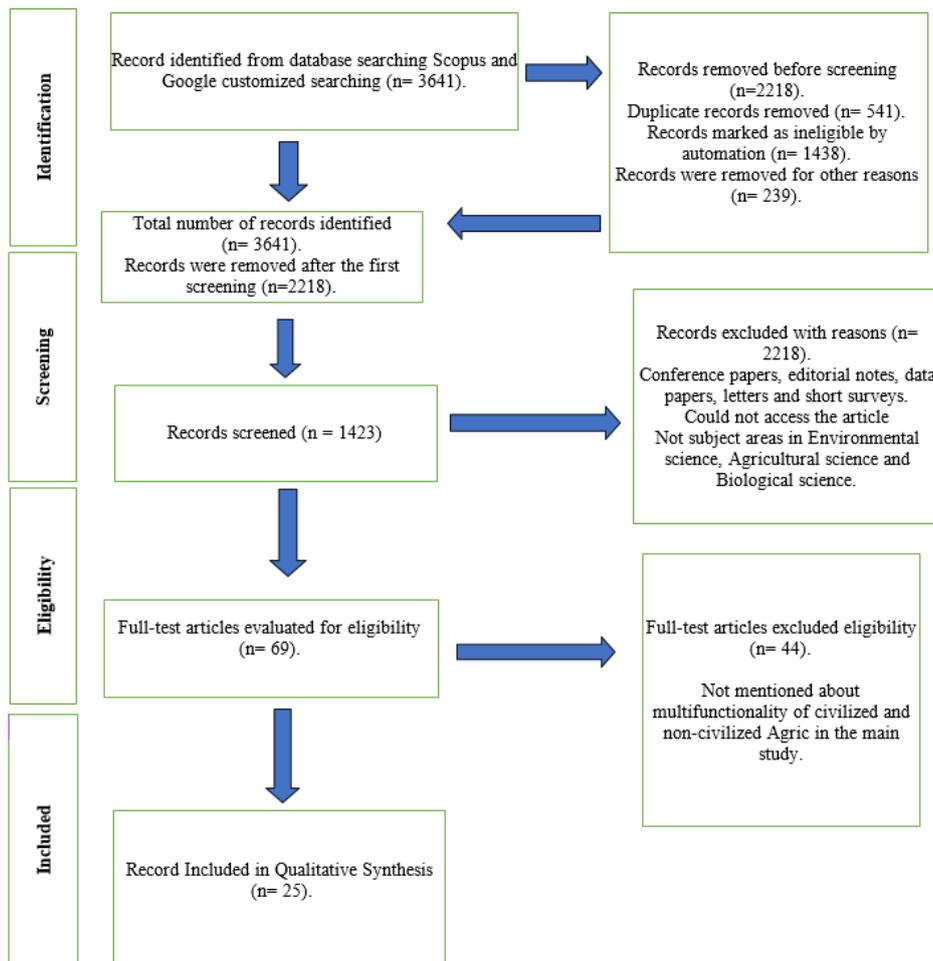


Figure 1: Flow Diagram of the systematic review process

determined as percentiles for advantages and obstacles individually.

The average level score to accept or deny the writer's professional opinion in the advantages and difficulties classification was 50% or higher. Figure 1 depicts the steps and flow of a comprehensive assessment.

RESULTS

From the pool of 25 case studies analyzed, all 25 identified various factors linked to landowners' values (refer to Table 1 and Figure 1). Among the five subcategories explored, the most cited values were conservation ethic and economic mindset (as depicted in Figure 2; refer to Table

Table 2: Typologies used to categorize how Conservation influences land ownership and management

Description	Sub-Typologies	Typologies
LOs that value wildlife for its own sake, even outside of their territory,	Nature	Values
LOs that concur that wildlife or ecological habitats need to be preserved.	Conservation ethics	
LOs that see the inherent worth of their property and regard individuals as its guardians but who may not attach significance to environmental goals or tactics.	Land ethics	
LOs who are seeking monetary gains from their properties view their property as a source of income.	Economic mindset	
LOs who revere lineage, ancestral values, and the cultural heritage of their lands.	Family tradition	
LOs that primarily utilize their property for the countryside, forestry as a whole, farming, or other productive uses.	Agriculture and Production	Livelihoods
LOs that either want to open up their farms for this task or who regard themselves as game shooters on their property.	Field sports	
LOs that primarily cherish their property for leisure purposes or the pleasure it brings.	Lifestyle	
Surface area of private land owned by LOs.	Property size	Land attributes
How healthy the ecosystems are and how diverse the biotic communities are on the land.	Ecosystems and biodiversity.	
When production activities are present on the land, relates to the productivity of those activities.	Land productivity	
Distance of private lands from other natural areas, protected areas or urban areas.	Geographical position	
Beyond communication, cooperation, quality of interactions or perceived legitimacy, this relates to whether LOs trust conservation agents and measures proposed or not.	Trust	Networking and Communications
Relates to LOs' participation in a non-official community-based support network for land management or other.	Cooperation network	
Official information or knowledge transfer provided to LOs regarding conservation measures and programs.	Information	
Relates to positive interactions that LOs have had in the past with conservation agents.	Quality of past interactions	

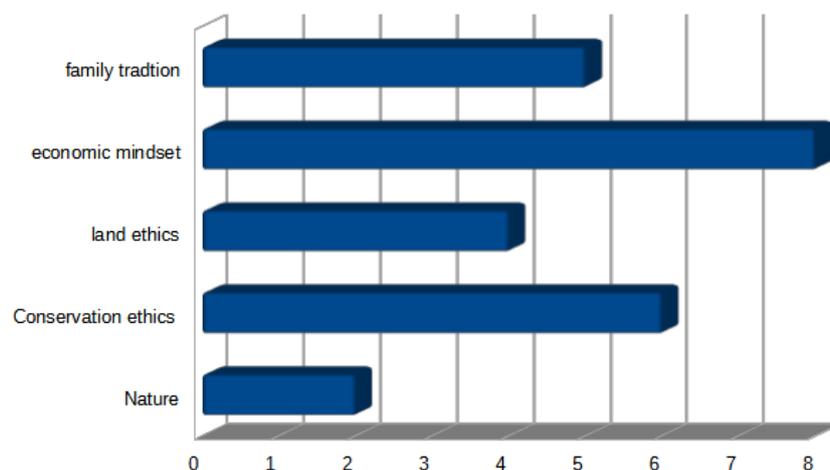


Figure 1: Individual Mindset Case studies reviewed

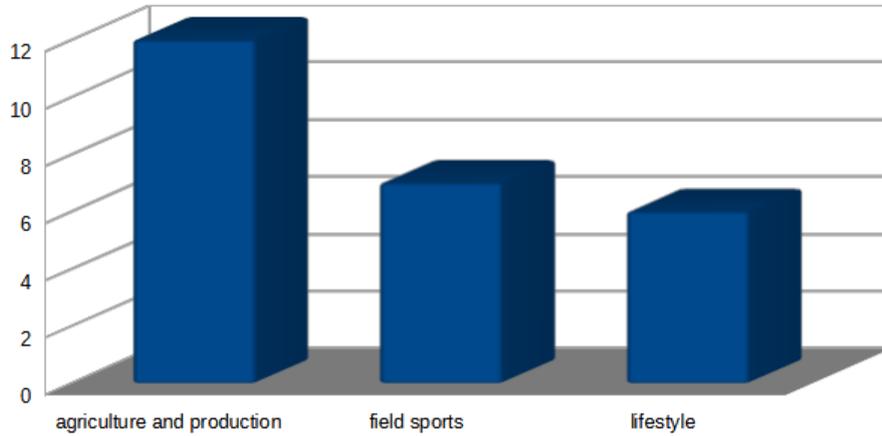


Figure 2: Individual profile case studies reviewed (Livelihoods)

2 for concise descriptions of each subcategory). Both of these values demonstrated a significant positive impact on acceptability. Similarly, landowners who exhibited a commitment to conservation stewardship possessed a strong sense of land ethic, and valued family traditions—essentially, the intrinsic worth of their land—also showed a positive influence on acceptability.

Livelihood

A total of 25 cases explored elements of landlords’ livelihoods (as indicated in Table 1 and Figure 3). Among the three sub-categories examined, The main common sources of income were agriculture as well as

productive operations like raising animals or forestry were the most commonly discussed topics and were generally associated with lower levels of approval (as depicted in Figure 3). Conversely, engagement in field sports or utilizing private land for hunting tended to correlate with higher levels of acceptability toward conservation initiatives. The employment status of landowners did not exert a significant influence on acceptability; however, those with reduced dependency on their land for livelihoods or with occupations outside of their land tended to display greater willingness to embrace conservation measures (as shown in Figure 3; refer to Table 1).

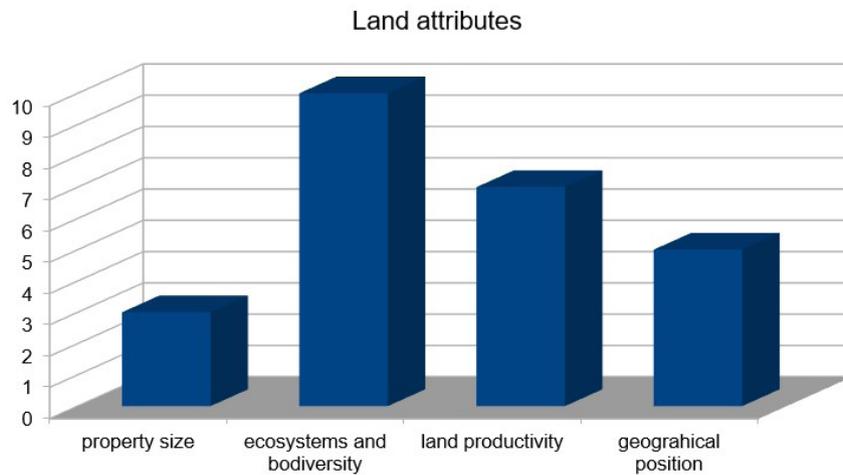


Figure 3: Individual profile case studies reviewed (Land attributes)

Land Attributes Twenty-five instances highlighted factors associated with land attributes (as outlined in Table 1 and illustrated in Figure 4). Property size was the most addressed factor, followed by the condition of ecosystems and biodiversity on landowners’ properties; however, no distinct pattern emerged regarding their impact on acceptability (as depicted in Figure 4).

Generally, land productivity tended to exert an adverse effect on approval. However, the expected land approval, indicating if landlords thought their properties were suitable for conservation programs—regardless of actual eligibility—consistently demonstrated a positive influence on participation in conservation initiatives (as shown in Figure 4; refer to Table 1).

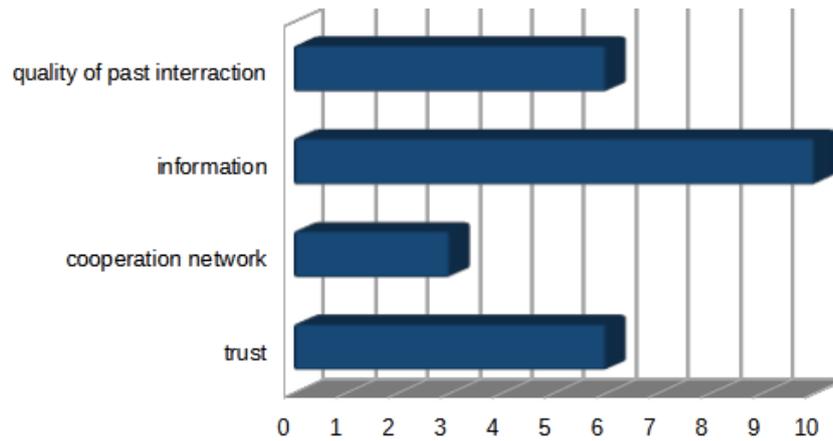


Figure 4: Institution and interaction case studies reviewed

Networking and Communication, Twenty-five cases examined factors of networking and communication (as indicated in Table 1). Belief in conservationists and the presence of systems to work together in remote areas—encompassing the caliber of mutual exchange and education—were the two most frequently discussed subcategories. These were closely followed by the level and quality of information disseminated to landowners by conservation agents, as well as the quality of past interactions between conservation agents and landowners (as illustrated in Figure 5). All four of these subcategories exhibited a positive correlation with the acceptability of conservation measures among landowners. Similarly, positive and regular correspondence involving conservationists and landowners, a comprehensive understanding of conservation measures and their objectives by landowners, and the idea that rescue efforts or practitioners are legitimate also demonstrated positive associations with acceptability (as shown in Figure 5). However, instances detailing cooperation between landowners and conservation agents predominantly displayed a negative impact on approval. Irrelevant ideas arose when the conservationists were linked to governmental bodies, with whom landowners might be hesitant to collaborate. Conversely, collaboration with local non-governmental conservation agents tended to foster a relevant response (refer to Table 1).

DISCUSSION

This study introduces the PRISMA approach to investigate the acceptance of biodiversity and preservation in personal and public land management, moving beyond traditional sectors like agriculture or forestry. By encompassing both natural and production-oriented private lands, our study identified factors influencing conservation efforts despite the distinct uses and management practices of these lands. Furthermore, our synthesis integrates various strategies, tools, and intervention methods to elevate the preservation of land, offering a comprehensive perspective that transcends current discussions primarily centered on compensation and remuneration for ecological services

. We highlight that the acceptance of the bio-diversification and conservation of land extends beyond financial incentives to encompass landowners' attitudes, personal circumstances, and the design of conservation programs. Consequently, solely emphasizing financial incentives may overlook the underlying social structures and landowners' perceptions that can significantly influence, or even determine, the success of conservation initiatives on land.

The longevity of local systems of governance and the legal framework that supports them will determine how much these customary principles and procedures may add to the protection of biodiversity. The concept of conserving is not universally understood. There are several ways to understand conservation. However, biodiversity encompasses flora, fauna, understanding, tradition, and more. There are unequal rights and duties for natural assets due to global change and growing development constraints. Community-driven conservation is likely to stay, as observed by Kumar. How to make volunteering meaningful is the challenge. Whenever conservation is approached with an understanding of what matters to the residents along with what they value for their lives, it can be successful. Hence, a unified awareness of appropriate preservation and growth goals at different stages must be developed through a variety of methodologies, which constitute the foundation for safeguarding biodiversity. The idea is that national forest managers have distinct goals and definitions of conservation compared to international ecological actors. So, it is not a given that managing the forests in the surrounding nations would preserve biodiversity.

The goal of the Masyarakat Terasing (independent nations) in Indonesia, which includes the Bajau, various Dayak groups, Baduy, Kajang, Mentawai, and other independent countries living in distant areas of the island nation, is to advance their economic condition. Numerous nations continue to uphold their indigenous religious beliefs and maintain robust informal organizations. Though many of these individuals desire improvements to their lifestyles made possible by growth, the majority would rather that their forests remain in excellent condition. How long

can they endure in a world that continues to evolve, especially with the impact of the monetary system that rules contemporary cultures? Can such individuals adapt to the pressures of growth and development, and will they continue to believe that biodiversity conservation is important?

Though their customary religious rites are still upheld, residents in Bali are witnessing tremendous economic growth and are closely linked to contemporary society. In addition to accessible locations, like the vicinity of the Batu Karu temples, about 40 km from the popular tourist destinations of Kuta and Seminyak, many dense forests remain untouched. Some Bali Aga nations' citizens still hold their gods, divinities, and ancestors in the highest regard. Like other ethnic groups, the Mentawai, the Baduy, and the Kajang are still inextricably bound to their surroundings. The nomadic Balinese still believe that damaging the ecosystem, their woods, their streams, or their plant life will bring bad luck. But more and more citizens of these nations are leaving to reside, work, and study abroad, and they typically show little regard for cultural norms. Certainly, it is conceivable for a tiny minority of villagers to seriously destroy the ecosystem, even in cases where the majority of the community upholds customary conservation methods.

Only under specific circumstances will Indonesia's traditionally maintained forests' ecological assets be conserved. Assuming that ADAT regulations will be sufficient to guarantee conservation is impractical; it would have been better, but unfortunately, it is not. ADAT criteria apply to landscape elements that have symbolic or utilitarian significance, even though a large portion of ecological diversity may not have these kinds of local significance. Efforts to force homogenous traditional and economic norms on the Indonesian populace for more than a century have undermined even ADAT regulations that could have safeguarded sacrosanct forest regions from any kind of interference. Those nations whose customary behaviours are discussed in this article are aberrations to the norm; many have made an effort to set themselves apart from modernism and continue to rely more heavily than most other nations on Adat laws. Several nations will continue to safeguard biodiversity even if the Adat regulations are being undermined. There are numerous circumstances in which countries can benefit instrumentally from biodiversity.

Unfortunately, many of the benefits of biodiversity are hidden from the local nations. Especially for those living in rural areas, it might be challenging to comprehend the tremendous value that worldwide conservation forces place on rare creatures. For community members, safeguarding these "global public goods" associated with biodiversity would only be reasonable if doing so could assist them in some way. Although compensation for ecological services has been offered but seldom delivered up to now, it may incentivize people to save these species and their ecosystems. To make everything work, it is crucial to comprehend the multiple dimensions of rewards and

the instances in which fairness and ownership are more significant than financial rewards.

The decentralized administration of land to the nations is a good idea, but they must be greater guardians of the values found in forests than those in government, who have been shamefully unable to accomplish this in modern years. But merely relinquishing control is insufficient. Within different places, native authority will take different forms, and so will the laws governing it and the bodies required to guarantee fairness and equality in the exercise of local privileges. A "silver bullet" to guarantee managerial success does not exist. Plans will need to be adjusted for the local environment. Community powers are varied, and the vulnerability of biodiversity assets to change varies. Given the goal and the area, there may be significant differences in the best conservation tactics. Robust state authorities and good administration are essential, but Indonesia has had difficulty establishing efficient forest agencies. It is necessary to give Adat organizations and conventional systems of thought more respect and autonomy, which ought to reinforce rather than undermine these established systems. Systems of law and regulation need to be reinforced. There will need to be strong national leaders. The transition to distributed leadership must be done cautiously, meticulously, and with full awareness of the likelihood of collapse if the proper match between contemporary and conventional customs and traditions is not achieved. Indonesia has the greatest amount of biodiversity worldwide.

The gathering of proof is a crucial stage in utilizing the distribution process to accomplish ecological goals. To further enhance our comprehension of the preservation of biodiversity across all geographical regions, further study is required. Currently, forests under national and government management are losing biodiversity. Research on the effects of biodiversity in community-controlled forests must be produced immediately. All business, group, and government-maintained forests need to have processes in place to evaluate ecological diversity results if wildlife is to be protected. Researchers have previously made the case for more accurate metrics to assess the functionality of intricate forest ecosystems. Measuring the amount of vegetation cover, safeguarding important species, and nations' capacity to keep foreigners out of their woods are all important. They won't have the factual data necessary to support expanding the role of nations in biodiversity protection until they accomplish this.

CONCLUSIONS

In this article, we examined 69 publications encompassing 25 case studies focusing on conservation efforts implemented on private lands and the willingness of landowners to adopt these measures. To uncover overarching patterns, we devised a PRISMA framework to identify common trends indicative of the societal acceptance of conservation initiatives. Our analysis revealed that various factors consistently influence acceptance levels across different cases (refer to

figures 3–5). From these patterns, we derived six recommendations aimed at enhancing the social acceptance of conservation measures. While certain factors affecting individual attitudes may be beyond the control of conservation agents, they can still influence the institutional mindset to design initiatives and actions for conserving which are more inclined to be embraced by landowners. Our findings highlight the effectiveness of inclusive, adaptable, and transparent conservation strategies, advocated through participatory approaches, in bolstering the acceptance of conservation approaches and encouraging landlords to adopt stewardship roles on their properties. These insights, coupled with the actionable strategies for conservation outlined in Figure 6, have the potential to serve as valuable guidelines for conservation planning initiatives on private and public lands.

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