



Rethinking Forest Conservation: The Genesis and Evolution of Community Forest Concessions as a Socio-Ecological Governance Model in Guatemala's Maya Biosphere Reserve

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Abstract

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ARCHIVAL RECORD

Rethinking Forest Conservation: The Genesis and Evolution of Community Forest Concessions as a Socio-Ecological Governance Model in Guatemala's Maya Biosphere Reserve

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Abstract

This study analyzes the historical and institutional genesis of the community forest concessions model in the Maya Biosphere Reserve (MBR), Guatemala, as a case of socioecological transformation in tropical forest landscapes. Using a qualitative historicalinstitutional approach. The research integrates literature review, document analysis and comparative perspectives to examine how the model emerged in response to structural conditions of rural poverty, insecure land tenure, agricultural frontier expansion and weak state presence. The findings show that the concession system evolved as an adaptive governance arrangement that aligned conservation objectives with local livelihoods through the combination of conditional use rights, community organization and economic incentives derived from sustainable forest management. The results indicate that areas under community concessions have maintained near-zero deforestation rates while generating local income, strengthening territorial governance and promoting institutional learning across multiple scales. The study demonstrates that the effectiveness of the model is not attributable to a single factor, but to the interaction of socio-ecological components, including land tenure as a concession's model, incentives, rules, capacities, and actors within a polycentric governance system. The case contributes to the literature by providing empirical evidence on how community-based forest management can reconcile conservation and development objectives. It also highlights key enabling conditions and limitations for policy design and replication in other tropical contexts.

Keywords: *Community sustainable forest management, Institutional innovation, Land tenure security, Polycentric governance, Rural livelihoods, Socio-ecological systems, Tropical deforestation*

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1. Introduction

Tropical deforestation remains one of the most critical global environmental challenges, with persistent losses of forest cover in biodiversity-rich regions (FAO, 2024). This phenomenon is closely associated with structural drivers such as rural poverty, agricultural frontier expansion and weak territorial governance, which together constrain the adoption of sustainable land-use practices (FAO, 2025a; FAO, 2025b; FAO, ILC & CIRAD, 2026; OECD et al., 2025). In Latin America, these dynamics are particularly pronounced in frontier regions characterized by insecure land tenure and limited state presence.

In response, a growing body of literature highlights community forest management as a viable pathway to reconcile conservation and rural development objectives (FAO, 2025; CIFOR, 2025). Evidence shows that some forests managed by local communities exhibit significantly lower deforestation rates compared to strictly protected areas lacking local engagement (Blackman et al., 2017; FAO, 2022), largely due to stronger territorial control and locally aligned incentives (World Bank, 2026). In the Maya Biosphere Reserve (MBR) of Guatemala, recent studies confirm that community forest concessions have maintained near-zero deforestation rates

25 - 30 years after the concessions model started while generating local income, employment and institutional strengthening (Stoian et al., 2018; Ureta et al., 2025; FAO, 2025).

These outcomes are consistent with contemporary theoretical frameworks, particularly socio-ecological systems (SES) and polycentric governance, which emphasize that sustainability emerges from the interaction of actors, rules, incentives and adaptive capacities across multiple levels (Ostrom, 2009; IPBES, 2025; CIFOR, 2025; Allen et al., 2025; Behboudian et al., 2025). In parallel, the literature underscores the importance of economic incentives (such as access to forest markets, value chains and ecosystem service mechanisms) in reducing pressure on forest resources, especially in contexts of rural poverty (Angelsen & Wunder, 2003; World Bank, 2025; FAO, 2025; Pascucci, 2025).

Despite this growing consensus, the emergence of successful community-based forest governance systems remains insufficiently understood from a historical and institutional perspective. In the case of the Maya Biosphere Reserve, the forest concession model did not result from a linear policy design, but rather from a complex process shaped by tensions between strict conservation approaches and sustainable use strategies, within a context of rural

poverty, land tenure insecurity and agricultural expansion during the early 1990s (FAO, 2025; World Bank, 2025).

Unlike exclusionary conservation models, the MBR incorporated a multiple-use zoning scheme that enabled the development of forest concessions as an innovative governance mechanism within protected areas (CONAP, 2001). However, the operationalization of this model was initially driven by external actors, including the OLAFO Project (CATIE) and the Rodale/Center Maya initiative - in coordination with national institutions, contributing to the gradual consolidation of a community-based forest management system (CIFOR, 2025).

Against this background, this study aims to analyze the historical and institutional process that led to the emergence and consolidation of the community forest concession model in the Maya Biosphere Reserve (MBR), Guatemala, and to assess its coherence with contemporary frameworks of socio-ecological systems and polycentric governance, contributing to ongoing debates on how community-based forest management can effectively address deforestation in tropical socio-ecological systems. By doing so, the study provides insights relevant for policy design and for the adaptation of similar models in other tropical contexts under comparable structural conditions.

2. Methodology

2.1. Research Approach

This study adopts a qualitative research design based on a historical-institutional approach, suitable for analyzing long-term transformations in complex socio-ecological systems (Mahoney & Thelen, 2010). The case of the MBR is examined as a critical case of institutional innovation in tropical forest governance.

The analysis is grounded in the recognition that the forest concession model emerged under specific structural conditions, including rural poverty, insecure land tenure, agricultural frontier expansion and weak state presence, factors commonly associated with deforestation dynamics in tropical regions (Curtis et al., 2018; FAO, 2025; Shumi et al., 2024).

2.2. Analytical Framework

The analytical framework integrates three interdependent dimensions that structure the interpretation of the forest concession process in the Maya Biosphere Reserve (MBR) (Figure 1).

These dimensions provide a systemic lens to analyze the interactions between ecological resources, institutional arrangements and socio-economic dynamics, enabling a comprehensive understanding of the model.

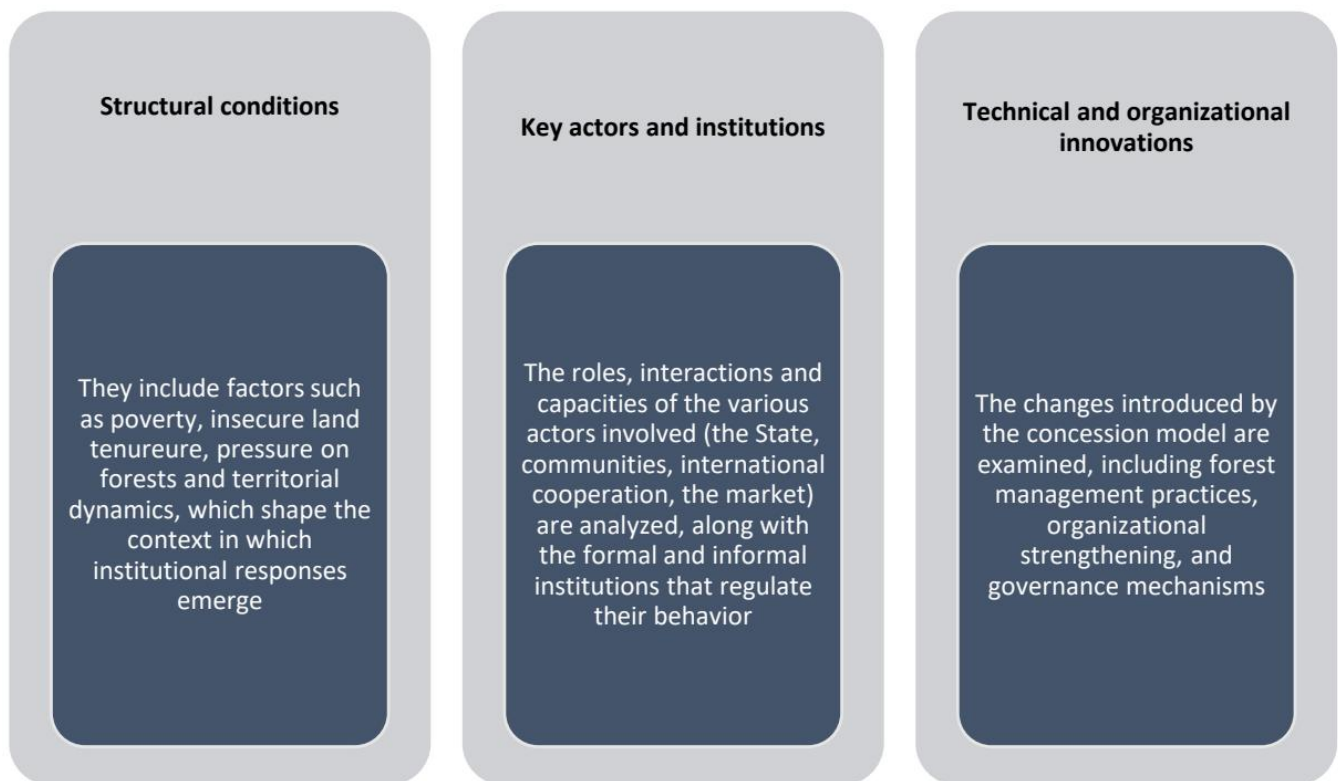


Figure 1. Interdependent dimensions of the analytical framework for the forest concession process in the Maya Biosphere Reserve, Petén, Guatemala.

The study is further guided by an integrated conceptual approach combining elements from socio-ecological systems (SEs), polycentric governance and community forest management (Figure 2). Rather than treating these as separate theoretical domains, they are operationalized as complementary analytical lenses to examine the interaction between actors, institutions and forest resources.

- 1 SOCIO-ECOLOGICAL SYSTEMS (SES)**
It allow us to analyze the interactions between resources, actors, rules, and incentives (Folke et al., 2021).
- 2 POLYCENTRIC GOVERNANCE**
It explains the coexistence of multiple decision-making centers and their contribution to the resilience of the system (Morrison et al., 2019).
- 3 COMMUNITY FOREST MANAGEMENT**
Which provides evidence on the effectiveness of models based on local rights and economic benefits (Blackman et al., 2017).



Figure 2. Conceptual approaches applied to the forest concession process in Petén, Guatemala.

This integrated framework enables the interpretation of the forest concession model as an adaptive institutional arrangement emerging from the interaction of rules, incentives, capacities, and actors.

2.3. Research Design and Methods

The study is structured as an analytical case study, combining multiple methodological strategies:

- Systematic review of scientific literature on forest governance, socio-ecological systems and community forestry;
- Historical-documentary analysis to reconstruct the origin, design, and evolution of the concession model in the MBR;
- Comparative insights from international experiences to strengthen analytical generalization.

2.4. Data Sources

The analysis is based on triangulation of multiple sources, including:

- Peer-reviewed scientific literature;
- Primary institutional documents related to the concession process;
- Technical reports from international organizations (e.g., FAO, CIFOR) and recent empirical and policy-oriented studies (Allen et al., 2025; Cooper et al., 2025);
- Empirical evidence on the performance of community forest concessions in the MBR.

This triangulation enhances the robustness and validity of the findings.

2.5. Analytical Strategy

The case is analyzed as a long-term socio-ecological transition, in which outcomes related to forest conservation, governance and local livelihoods are understood as the result of dynamic interactions among structural conditions, institutional arrangements, and economic incentives.

From this perspective, the forest concession model is interpreted as an adaptive governance system, where conservation outcomes emerge from the alignment of incentives, rules, and local capacities within a multi-level institutional context.

Recent literature emphasizes that such systems must be analyzed through integrated approaches, where outcomes cannot be attributed to a single causal factor, but rather to the specific configuration of institutional arrangements and local capacities (Folke et al., 2021; FAO, 2025).

3. Results

The analysis of the design and implementation of the forest concession model in the MBR reveals a profound socio-ecological transformation. The system transitioned from a context characterized by high deforestation, weak governance and insecure land tenure toward a structured model of sustainable forest management based on rights, multi-level governance, and economic incentives.

3.1. Conceptual explanation of the model

3.1.1. Origin of the concessions

As part of global efforts to recognize the importance of forest biodiversity, the government of Guatemala created the MBR to preserve these fragile and threatened ecosystems. In a relatively short period of time, a marked polarization emerged between the human populations that entered the protected area through the slash-and-burn process and the entities associated with the MBR, while the central government prioritized a restrictive conservation model that initially left aside the realities and needs of local human populations.

The environmental crisis in the MBR reached a critical threshold during the late 20th century, exacerbated by government-mandated activities that led to widespread forest loss through fire. Consequently, international agencies and non-governmental organizations provided technical and strategic support to state institutions, aiming to stabilize the land-use boundary and prevent further forest loss to agricultural expansion.

The forestry concession model originated as an experimental initiative in sustainable forest management with the San Miguel La Palotada community. Comprising 30 families, the community managed a 7,039-hectare domain characterized by the extraction of non-timber forest products (NTFPs), including chicle (*Manilkara zapota*), xate palm (*Chamaedorea* spp. - whose leaves are used internationally in decorative form) and allspice (*Pimenta dioica*). These activities were supplemented by subsistence-level grain cultivation and traditional hunting.

The experimental framework was further tested through the community of La Pasadita. Managing roughly 18,000 ha, this 70-family collective engaged in the same extraction of chicle, xate and allspice as San Miguel; however, it also featured an existing livestock component. The inclusion of cattle fattening within the concession's boundaries marked a critical step in addressing the competition between forest conservation and traditional pastoral land uses.

This model of community concession implied the transfer of rights of use and decision-making from individuals to legally recognized collective entities and required compliance with a series of regulations, assigning the rights through renewable contracts of 25 years. To this end, the Conservation Project for Sustainable Development in Central America, popularly known as the OLAFO/CATIE Project, with donor funds from the Governments of Denmark, Norway and Sweden, and the executing entity CATIE (Tropical Agricultural Research and Higher Education Center), supported the efforts of the Government of Guatemala to create forest concessions in the Multi-Use Zone (MUZ) of the MBR.

Upon demonstrating that the community-based forest management model adhered to established sustainability standards, the National Council of Protected Areas (CONAP) formally granted the San Miguel La Palotada and La Pasadita concessions in 1994 and 1997, respectively. Following these successful pilots, CONAP authorized the scaling of the model to encompass approximately 500,000 hectares within the MUZ. Concurrently, USAID-Guatemala sanctioned a supporting forest concession program to facilitate management within the Maya Biosphere Reserve (MBR).

This has been one of the most serious attempts to formalize sustainable forest management in the region under community land tenure systems, albeit with limited rights.

3.1.2. The Allocation Process for Forest Concessions

It included the recognition of the physical presence of the community and the use of the timber and non-timber resources of the forest. The families that were part of the concessionaire communities also had rights to practice small-scale agriculture and livestock through silvo-agricultural and silvopastoral systems, as well as hunting and fishing.

The criteria considered for granting concessions to the community members were to have a physical presence in the areas requested under concession and to guarantee the sustainable management of natural resources through a contract with CONAP. The minimum organizational model that was found to support the organizations of groups of people who were not communities was that of "associations", which were not only easy to constitute administratively before the departmental government.

This figure of civil association served as the basic legal vehicle to provide legal personality to organized community groups, allowing them to comply with the administrative requirements necessary to formally sign concession contracts with the State.

The key steps to establish an association in Guatemala are those presented in Figure 3.

Constitutive Act	Convening a minimum of six individuals with full legal capacity to conduct the assembly, elect a provisional board of directors, and draft the founding minutes.
Drafting of bylaw	Establishing the bylaws to govern the association, including name, headquarters, duration, purpose, objectives, and the rights and duties of its members.
Notarization and Legal Formalization	Formalizing the minutes and bylaws through a public deed authorized by a notary public.
Legal Incorporation and Enrollment	Submit the documentation to the Civil Registry of the municipal seat or to the Registry of Legal Entities of the Ministry of the Interior, as applicable.
Registration with the Tax Administration Superintendency (SAT)	Once established, the association must be registered with the SAT to obtain a Taxpayer Identification Number, appoint an accountant, and, if applicable, apply for tax-exempt status.
Additional Requirements	Appointing a legal representative and ensuring the association's name does not conflict with an existing entity.

Figure 3. Steps to form an association in Guatemala.

While the “association” was formally registered, an informal community organization was used as a committee for the improvement of the place where they had invaded within the MBR; this as a basis for establishing the legal entity.

Once the concession contracts were acquired, they were formed as a broad scheme of conservation and sustainable development, with an essential role in the buffer zone of the protected areas.

The emerging regulatory framework for forest management introduced formal guidelines developed by the OLAFO Project and

CONAP. These rules were fundamentally shaped by the principles of sustainable natural resource management.

Timber management rights within the concessions were formalized by the State and monitored by CONAP. To mitigate risks associated with the communities’ lack of technical forestry experience, the State reserved the right to rescind contracts if management standards were not met.

The above is represented in Figure 4.



Figure 4. Initial and final conditions of the forest concession process for the Multiple Use Zone of the Maya Biosphere Reserve of Petén, Guatemala.

An aspect that is worth highlighting is that community forest management under **the concession scheme was inspired by a modality of generating sustainable management of**

resources through community social participation, which followed social democratic principles of work. Revenue from sustainable timber management was initially reinvested

into essential local infrastructure, including access roads, health centers, communal stores, schools and potable water systems, fostering social development. As technical capacity and harvest volumes grew, communities transitioned toward industrial value-addition, expanding into the production and export of processed timber. Currently, other products with greater added value are already sold and the wood is sold dry and complying with the requirements of the international FSC (Forest Stewardship Council) certifier, with whom the community concessions of Petén work.

In this sense, the certification of sustainable forest management was based on international standards and was adopted as the

official management standard. Therefore, the management plans of the concessions have support that guarantees their sustainable management at the international level, and imply general plans for 25 or more years, with five-year medium-term plans and annual operating plans. Likewise, as part of the awarding of the concessions, environmental impact studies were prepared, among others. Other requirements were subsequently added, such as the expansion of forest production to include a number of secondary timber species. In this way, the final design of the forestry concession model is shown in Figure 5.

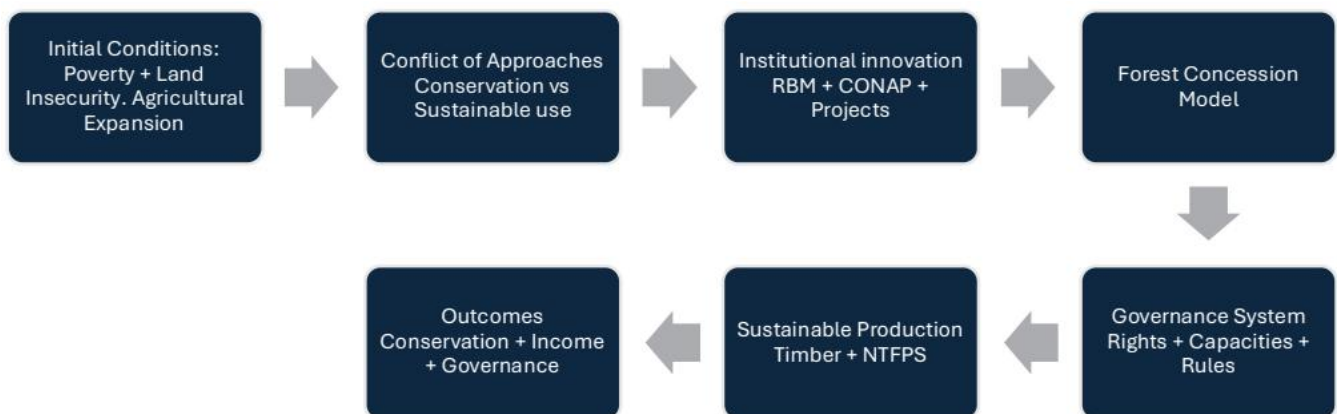


Figure 5. Final conceptual model of the forest concession system in the Maya Biosphere Reserve, Guatemala.

3.2. Transformation of initial structural conditions

The forest concession model emerged as a response to three critical structural problems:

3.2.1. Land tenure insecurity

Prior to the implementation of the model, the absence of clear rights of use generated incentives for short-term exploitation, promoting processes of informal occupation, deforestation and speculative sale of land.

The introduction of forest concession contracts made it possible to:

- Establish conditional rights of use;
- Generate territorial security;
- Discourage the conversion of the forest to other uses.

This change was fundamental to reconfigure the incentives of local actors.

3.2.2. Rural poverty and dependence on unsustainable practices

The communities depended mainly on subsistence systems based on slash-and-burn, which implied constant expansion of the agricultural frontier.

The concession model enabled the following outcomes:

- Diversify sources of income;
- Generate local employment;
- Replace extractive practices with sustainable forest management.

3.2.3. Conflict of approaches in conservation

There was a strong tension between:

- Strict conservation (exclusion of communities);
- Sustainable use with an economic basis.

The concessions model partially resolved this tension through a hybrid scheme that integrated:

- Conservation;
- Production;
- Local governance.

These dynamics are detailed in Table 1.

Table 1. Initial conditions, concession model interventions and results observed in the Multiple Use Zone of the Maya Biosphere Reserve, Guatemala.

Initial structural condition	Previous dynamics	Intervention of the concession model	Observed Result
Insecurity of tenure	Informal occupation, speculative deforestation	Allocation of rights through concession contracts	Territorial security, and reduction of deforestation
Structural rural poverty	Slash-and-burn dependence	Forest income generation (timber and non-timber)	Economic diversification and reduced pressure on forest
Expansion of the agricultural frontier	Conversion from forest to agriculture	Economic incentives to keep the forest standing	Forest cover stabilization
Weak institutional presence	Lack of territorial control	State supervision (CONAP) and community monitoring	Effective territorial control
Conflict of approaches	Conservation vs. productive use	Hybrid model of sustainable use	Conservation-development integration

3.3. Analytical Structure of the Model

The concession model is supported by a diversified set of economic activities that link forest conservation with income generation. These include:

- Sustainable timber production (e.g., *Swietenia macrophylla*, *Cedrela odorata*) for national and international markets;
- Non-timber forest products such as xate (*Chamaedorea* spp.), chicle (*Manilkara zapota*) and allspice (*Pimenta dioica*);
- Agroforestry systems;
- Local value-added processing. These components constitute the economic foundation of the system, enabling the alignment of conservation incentives with local livelihoods (Ureta et al., 2025; Monroy Sagastume, 2025; Rodas et al., 2021; Stoian et al., 2018; Blackman et al., 2017).

3.4. Governance Arrangement: Core of the Model

The forest concession system is structured around three interdependent pillars:

■ RIGHTS

- Allocation of forest concessions;
- Conditional access to land tenure and forest resources for at least 25 years, renewable.

■ CAPACITIES

- Community organization;
- Technical training;
- Implementation of sustainable forest management practices.

■ RULES

- Approved management plans;
- State supervision (CONAP);
- Compliance with environmental and forestry regulations.

This configuration reflects a system of conditional tenure, where access to resources is contingent upon compliance with sustainability standards.

3.5. Transformation of Structural Conditions

The concession model emerged as a response to three critical structural constraints:

3.5.1. Land Tenure Insecurity

Prior to implementation, unclear tenure arrangements incentivized short-term resource extraction, land speculation and deforestation.

The introduction of concession contracts resulted in:

- Defined and conditional use rights;
- Increased tenure security;
- Reduced incentives for forest conversion.

3.5.2. Rural Poverty and Unsustainable Practices

Local livelihoods were largely dependent on shifting cultivation (slash-and-burn), driving continuous agricultural expansion.

The concession model enabled:

- Income diversification;
- Local employment generation;
- Transition toward sustainable forest-based livelihoods.

3.5.3. Conflict between Conservation Approaches

A fundamental tension existed between:

- Strict conservation (exclusionary approach);
- Productive use of forest resources.

The concession model partially resolved this conflict through a hybrid approach integrating conservation, production, and local governance.

3.6. Environmental Outcomes

Environmental results represent one of the most robust findings of the study:

- Significant reduction in deforestation, with near-zero rates in concession areas;
- Maintenance of forest cover relative to non-concession areas;
- Conservation of biodiversity within managed landscapes.

These results demonstrate a transition from active degradation to functional conservation.

3.7. Socioeconomic Outcomes

The model established a forest-based economic system that aligns conservation with livelihoods:

- Increased local income from timber and non-timber products;
- Employment generation within communities;
- Investment in public goods, including education, health, and infrastructure.

Importantly, benefits are both individual and collective, reinforcing social cohesion and institutional legitimacy.

3.8. Governance and Institutional Outcomes

The concession model consolidated a polycentric governance system characterized by:

- Strengthened community organizations;
- Development of technical capacities;
- Implementation of formal rules and management systems;
- Multi-level coordination among communities, government and international actors.

A key outcome is effective territorial control, where communities actively engage in monitoring, enforcement and prevention of illegal activities.

3.9. Productive System and Market Integration

The model established a productive system based on maintaining the forest standing, including:

- Sustainable timber harvesting;
- Non-timber forest product commercialization;
- Value-added processing;
- Forest certification (FSC).

This enabled:

- Integration into international markets;
- Increased economic value of forest resources;
- Stable incentives for conservation.

3.10. Institutional Innovation

The concession model represents a complex institutional innovation emerging from the interaction of:

- State institutions (CONAP);
- Local communities;
- International cooperation (OLAFO/CATIE, Rodale, USAID, among others).

The system is structured around:

- Long-term conditional rights (25-year renewable contracts);
- Strengthened local capacities and community enterprises;
- Formal regulatory frameworks combined with certification mechanisms.

3.11. Integrated Interpretation: Socio-Ecological Transition

Overall, the results indicate that the MBR concession model constitutes a socio-ecological transition characterized by:

From:

- Deforestation
- Tenure insecurity
- Rural poverty
- Weak governance

To:

- Forest conservation
- Defined resource rights
- Forest-based local economies
- Effective territorial governance

The transition reflects a systemic reconfiguration driven by the alignment of incentives, institutional arrangements and local capacities.

4. Discussion

The results obtained in this study confirm that the forest concession model of the Maya Biosphere Reserve (MBR) constitutes a case highly consistent with contemporary approaches of socio-ecological systems, polycentric governance and community forest management. However, beyond its coherence with the existing literature, the case provides additional elements that allow us to deepen the understanding of the processes of institutional transformation in complex tropical contexts.

First, the analysis shows that the performance of the model cannot be explained by a single causal factor, but by the systemic configuration of multiple interdependent components, as summarized in Table 2. This configuration clearly reflects the structure of a socio-ecological system (SES), where the interaction between resources, actors, rules, incentives and capacities generates positive feedback dynamics that favor the sustainability of the system.

Table 2. Configuration of the socio-ecological system (SES) of the Maya Biosphere Reserve (MBR) of Guatemala.

SES Component	Elements in MBR	Function in the system	Result
Resource	Tropical forest (timber and non-timber)	Ecological basis of the system	Forest cover conservation
Actors	Communities, CONAP, international cooperation	Management, regulation and technical support	Multi-level governance
Rules	Concession contracts, management plans, FSC certification	Regulation of the use of the resource	Sustainable management
Incentives	Forest revenues, access to markets	Alignment of economic interests	Reducing deforestation
Capabilities	Community organizing, technical knowledge	Implementation of forest management	Operational efficiency
Interactions	Multi-level coordination and learning	System Adaptation	Socio-ecological resilience

Table 3. Dimensions, indicators and implications of the forest concession model of the Maya Biosphere Reserve of Petén, Guatemala by analytical dimension.

Dimension	Key indicators	Observed results	Implications
Environmental	Deforestation, forest cover, biodiversity	Deforestation rates close to zero	Validation of community forest management as a conservation strategy
Socioeconomic	Income, employment, social investment	Increased income, local employment, investment in community services	Poverty reduction and strengthening social capital
Institutional	Governance, regulatory compliance, territorial control	Organizational strengthening, community monitoring, multilevel articulation	Consolidation of polycentric governance
Productive	Forest production, value added, markets	Community Forest Enterprise Development, FSC Certification	Market insertion and economic sustainability

In particular:

- It coincides with evidence showing that community participation reduces deforestation (Blackman et al., 2017).
- It reinforces the hypothesis that economic incentives are key to conservation (Angelsen & Wunder, 2003).
- It validates the principles of polycentric governance (Ostrom, 2009).

Likewise, the case provides empirical evidence on the importance of institutional innovation processes as shown in Table 3 driven from the territory, rather than from centralized designs.

In this sense, the results observed in the MBR reinforce the hypothesis put forward in the recent literature that sustainability in tropical forest systems depends less on the restriction of access to the resource and more on the quality of the institutional arrangements that regulate its use. This finding is particularly relevant, as it implicitly questions traditional approaches to exclusionary conservation, showing that the inclusion of local actors under regulated conditions can generate better results in terms of conservation.

4.1. Systemic Nature of the Forest Concession Model

The findings confirm that the forest concession model in the MBR cannot be explained through a single causal mechanism, but rather as the outcome of a complex configuration of interdependent socio-ecological components. This aligns with the socio-ecological systems (SES) framework, which conceptualizes sustainability as an emergent property arising from interactions among resources, actors, institutions, and feedback mechanisms (Folke et al., 2021; Ostrom, 2009).

In the MBR, conservation outcomes, particularly near-zero deforestation rates, are associated with the combined effect of clearly defined use rights, locally embedded governance structures, economic incentives, and adaptive institutional arrangements, rather than solely with legal protection or enforcement. This

systemic configuration reinforces recent findings that emphasize the importance of integrated institutional settings in sustaining forest landscapes under pressure (CIFOR, 2025; FAO, 2025; Allen et al., 2025; Behboudian et al., 2025).

4.2. Polycentric Governance, Power and Institutional Coordination

The MBR concession system provides strong empirical support for the theory of polycentric governance, demonstrating how multiple centers of decision-making (communities, state institutions and international actors) can interact to produce effective governance outcomes (Ostrom, 2009; Gatto et al., 2022; Schlager, 2025).

Rather than generating fragmentation, the coexistence of these actors enabled coordination, learning and adaptation across scales. This finding is consistent with recent literature suggesting that polycentric systems are particularly effective in managing complex environmental challenges when supported by coordination mechanisms, clear rules, and differentiated institutional capacities (Kellner, 2024; Enberg, 2025).

However, recent advances in literature highlight that polycentric governance must also be understood through the lens of power relations. Morrison et al. (2019) emphasizes that power asymmetries among actors can shape decision-making processes and influence outcomes within polycentric systems. The MBR case suggests that, while external actors (e.g., international cooperation) played a critical role in initiating the model, the gradual strengthening of community organizations helped rebalance power relations, enabling more equitable governance outcomes.

Similarly, Djenontin and Larson (2025) highlight that effective forest governance depends on the interaction between formal institutions and locally embedded governance systems. The MBR experience confirms this interaction, where state regulation, community organization and external support converged to create a functional governance arrangement.

Furthermore, Faboye (2024) emphasizes the role of hybrid governance systems in which formal and informal authorities

coexist and complement each other. This is particularly evident in the MBR, where community norms and organizational structures operate alongside formal regulatory frameworks, reinforcing system effectiveness.

4.3. Community Forest Management as a Conservation Strategy

The results reinforce the growing body of evidence positioning community forest management (CFM) as a viable alternative to exclusionary conservation models. In line with previous studies, the MBR demonstrates that community-managed forests can achieve equal or superior conservation outcomes compared to strictly protected areas (Blackman et al., 2017; FAO, 2022; Ureta et al., 2025; Shivani et al., 2022).

Importantly, the case highlights that the effectiveness of CFM is not automatic, but contingent upon enabling conditions such as tenure security, organizational capacity, market access and institutional support (Kimengsi et al., 2023; Tiki et al., 2025). The MBR experience illustrates how these factors can be combined to create a functional governance system capable of controlling deforestation and generating local benefits.

Moreover, the findings support recent international evidence showing that participatory forest management contributes not only to conservation outcomes, but also to livelihood improvements and territorial governance (Ota et al., 2023; Sarun et al., 2025; Loomis et al., 2024).

4.4. The Central Role of Economic Incentives

One of the most significant contributions of this study is the empirical confirmation that economic incentives constitute a structural pillar of conservation in tropical forest systems. The MBR model demonstrates that conservation becomes viable when local actors derive tangible benefits from maintaining the forest standing.

This finding is consistent with the foundational work of Angelsen and Wunder (2003) and with more recent analyses emphasizing the role of forest-based value chains, ecosystem services, and market integration in reducing deforestation pressures (World Bank, 2025a; FAO, 2025; World Bank, 2025b).

However, the results also highlight that incentives must be embedded within robust institutional frameworks. Without clear rules and monitoring mechanisms, economic incentives may lead to resource overexploitation rather than conservation. Thus, the effectiveness of incentives depends on their interaction with governance structures and tenure arrangements.

4.5. Institutional Innovation and Adaptive Governance

The MBR concession model represents a case of incremental institutional innovation, emerging from a process of experimentation, adaptation, and learning rather than from a predefined policy design (Mahoney & Thelen, 2010; Pascucci, 2025).

The model evolved through pilot experiences, scaling processes, and the progressive incorporation of actors and institutional arrangements. This adaptive pathway allowed the system to respond to changing environmental, social and political conditions, reinforcing its resilience.

Additionally, the interaction between formal institutions and informal governance systems proved critical. This finding is consistent with literature emphasizing that institutional complementarity (rather than institutional substitution) is key for effective forest governance (López-Vargas et al., 2023; Djenontin & Larson, 2025).

4.6. Territorial Governance and Control

A particularly relevant finding is the emergence of effective territorial control exercised by community concessionaires. Unlike centralized enforcement models, governance in the MBR is grounded in continuous local presence, social legitimacy, and aligned incentives.

This hybrid governance arrangement (combining state oversight with community-based monitoring) has proven effective in preventing illegal activities and maintaining forest cover. Similar findings have been reported in other tropical contexts, where community involvement enhances compliance and enforcement capacity (Forest Declaration Assessment, 2025; Ureta et al., 2025; Cooper et al., 2025).

4.7. Limitations and Enabling Conditions

Despite its success, the MBR model is not free from limitations. Key constraints include:

- Dependence on international cooperation;
- High transaction and compliance costs;
- Uneven organizational capacities;
- Persistent external pressures such as agricultural expansion and illegal activities.

These findings confirm that the model's success depends on specific enabling conditions, reinforcing the argument that community forest management systems require contextual adaptation rather than direct replication (Kimengsi et al., 2023; Tiki et al., 2025; Shumi et al., 2024).

4.8. Implications for Policy and Replicability

The MBR case provides several relevant lessons for forest policy:

- Conservation and production can be compatible under appropriate institutional arrangements;
- Conditional tenure rights are more effective than exclusionary approaches in frontier contexts;
- Polycentric governance requires coordination and institutional clarity;
- Economic incentives must be aligned with governance systems.

However, replicability should focus on underlying principles (such as institutional alignment, tenure security and incentive structures) rather than attempting to replicate the model as a fixed blueprint.

5. Conclusions

This study analyzed the historical and institutional genesis of the community forest concession model in the Maya Biosphere Reserve (MBR), Guatemala, and assessed its coherence with contemporary frameworks of socio-ecological systems and polycentric governance. The findings strongly support that the effectiveness of the model is associated with the systemic interaction of institutional arrangements, economic incentives, and local capacities.

First, the study demonstrates that the forest concession model constitutes a successful example of socio-ecological transformation. The transition from a context of high deforestation, insecure land tenure and weak governance toward a system characterized

by forest conservation, defined use rights and effective territorial governance reflects a structural reconfiguration of the relationship between society and forest ecosystems. This transformation highlights the importance of aligning incentives, institutions, and local actors in the management of common-pool resources.

Second, the findings confirm that community forest management can effectively reconcile conservation and development objectives when supported by enabling conditions such as tenure security, organizational capacity and access to markets. In the MBR, the combination of conditional use rights, community organization and forest-based economic activities has generated a system in which conservation outcomes and local livelihoods are mutually reinforcing.

Third, the study provides empirical support for polycentric governance theory by demonstrating how multiple centers of decision-making (local communities, state institutions and international actors) can interact to produce effective governance outcomes. However, the results also indicate that the effectiveness of such arrangements depends on coordination mechanisms, institutional clarity and shared objectives, rather than on the mere existence of multiple actors.

Fourth, the analysis highlights the central role of economic incentives in sustaining conservation outcomes. The MBR model shows that forest conservation becomes viable when it is economically competitive with alternative land uses. At the same time, the study underscores that incentives must be embedded within robust institutional frameworks to prevent resource overexploitation and ensure long-term sustainability.

Fifth, the study reveals that the forest concession model emerged through a process of incremental institutional innovation rather than through a predefined policy design. This adaptive trajectory (characterized by experimentation, learning and gradual scaling) was critical for the consolidation of the model and its capacity to respond to changing socio-environmental conditions.

Despite its success, the model also faces important limitations, including dependence on external support, uneven institutional capacities and persistent external pressures on forest resources. These findings suggest that the replication of the model requires careful consideration of local conditions and cannot be achieved through simple policy transfer.

Overall, the MBR concession model represents a relevant empirical case demonstrating that conservation in tropical forest landscapes is more effective when based on adaptive governance systems that integrate local actors, economic incentives, and multi-level institutional arrangements. The main contribution of this study lies in showing how such configurations can emerge and stabilize over time, offering valuable lessons for forest policy and governance in other tropical regions facing similar challenges.

■ REFERENCES

- [1] Allen, CR; Grima, N; Belohrad, V; Fisher, B (eds.). 2025. Forests as Pillars of Social and Economic Resilience. A Global Assessment Report. IUFRO World Series Volume 45. Vienna. 223 p. <https://www.iufro.org/publications/world-series/ws45>
- [2] Angelsen, A; Wunder, S. 2003. Exploring the forest—poverty link. Bogor, Indonesia, Center for International Forestry Research (CIFOR). pp. 2125. <https://www.cifor.org>
- [3] Behboudian, M; Emanmi-Skardi, JM; Anamaghi, S; Santos Ferreira, CS; Wang-Erlandsson, L; Halbac-Cotoarã-Zamfir, R; Kalantari, Z. 2025. Social resilience of tropical forest ecosystems: A systematic review of core principles and their application. *Journal of Environmental Management*. 394: 127319. <https://doi.org/10.1016/j.jenvman.2025.127319>
- [4] Blackman, A; Corral, L; Lima, E; Asner, G. 2017. Titled indigenous communities protects forests. *Proceedings of the National Academy of Sciences* 114 (16): 13. <https://doi.org/10.1073/pnas.1603290114>
- [5] Center for International Forestry Research (CIFOR). 2025. Community forestry and sustainable livelihoods: Evidence from tropical regions. Bogor, Indonesia, CIFOR. 120 p. <https://www.cifor.org/knowledge/publication/>
- [6] Center for International Forestry Research (CIFOR). 2025. Community forestry, tenure and governance in Latin America. Indonesia, Bogor, CIFOR. 130 p. <https://www.cifor.org/knowledge/publication/>
- [7] Center for International Forestry Research (CIFOR). 2025. Forests, governance and livelihoods: Advances in socio-ecological systems research. Bogor, Indonesia, CIFOR. 140 p. <https://www.cifor.org/knowledge/publication/>
- [8] Consejo Nacional de Áreas Protegidas. 2001. Plan Maestro de la Reserva de la Biosfera Maya 2001-2006. Guatemala: CONAP. 120 p. <https://www.conap.gob.gt>
- [9] Cooper, LT; Kalman, RB; Miranda-Beas, C; Delgado Puley, D; Castro Pacheco, CA; Zanabria Vizcarra, P; Larson, AM; MacFarlane, DW. 2025. Partnering on forests and climate with indigenous peoples and local communities: Improving Success Indicators with Insights from a conservation incentive program in Perú. *Sustainability* 17, 7176. <https://doi.org/10.3390/su17167176>
- [10] Curtis, PG; Slay, CM; Harris, NL; Tyukavina, A; Hansen, MC. 2018. Classifying drivers of global forest loss. *Science* 361(6407): 1108–1111. <https://doi.org/10.1126/science.aau3445>
- [11] Djenontin, I; Larson, A. 2025. Analysis of Forest Governance and Institutions for Social and Economic Resilience. Chapter 4. In: Allen, CR; Grima, N; Belohrad, V; Fisher, B. (Eds.). Forests as pillars of social and economic resilience: Governance and institutions. IUFRO Global Assessment Report. IUFRO World Series, Vol 45. pp. 88-117. <https://www.cifor-icraf.org/publications/pdf/chapters/46145-Larson-2025.pdf>
- [12] Enberg, C. 2025. Concerted action in a polycentric landscape of climate governance. *Journal of Environmental Policy & Planning*. <https://doi.org/10.1080/1523908X.2025.2581045>
- [13] Faboye, S. 2024. Polycentric governance and traditional authorities in natural resource management. *Ecology and Society*, 30(4) Art. 45. <https://ecologyandsociety.org/vol30/iss4/art45/>
- [14] Folke, C; Carpenter, S; Walker, B; Scheffer, M; Chapin T; Rockström, J. 2010. Resilience thinking: integrating resilience, adaptability and transformability. *Ecology and Society* 15(4): 20–25. <http://www.ecologyandsociety.org/vol15/iss4/art20/>

- [15] Folke, C; Polasky, S; Rockström, J; Galaz, V; Westley, F; Lamont, M; Scheffer, M; Österblom, H; Carpenter, S; Chapin, F; Seto, K; Weber, E; Crona, B; Daily, G; Owen, P; Gordon, L; Hoff, H; Levin, S; Will, J; Walker, B. 2021. Our future in the Anthropocene biosphere. *Ambio*, 50: 834–869. <https://doi.org/10.1007/s13280-021-01544-8>
- [16] Food and Agriculture Organization (FAO). 2024. The State of the World's Forests 2024 - Forest-sector innovations towards a more sustainable future. Rome, Italy: FAO. <https://doi.org/10.4060/cd1211en>
- [17] Food and Agriculture Organization (FAO). 2025. The State of the World's Forests 2025: Forest pathways for green recovery and inclusive development. Rome, Italy: FAO. 160 p. <https://www.fao.org/state-of-forests/en/>
- [18] Forest Declaration Assessment Partners. 2025. Forest Declaration Assessment. Climate Focus (coordinator and editor). Amsterdam, Netherlands. 123 p. <https://forestdeclaration.org/wp-content/uploads/2025/10/Assessment2025.pdf>
- [19] Gatto, A; Drago, C; Valente, M. 2022. A polycentric approach to the governance of common goods. *Ecological Economics* 195: 107356. <https://doi.org/10.1016/j.ecolecon.2022.107356>
- [20] Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. 2025. Global Assessment Report on Biodiversity and Ecosystem Services - Updated synthesis 2025. Bonn, Germany: IPBES. 200 p. <https://ipbes.net/global-assessment>
- [21] Kellner, E. 2024. Polycentric climate governance: A systematic literature review. *Global Environmental Politics* 24(3): 24–47. https://doi.org/10.1162/glep_a_00723
- [22] Kimengsi, JN; Owusu, R; Charmakar, S; Manu, G; Giessen, L. 2023. A global systematic review of forest management institutions: towards a new research agenda. *Landscape Ecology*, 38: 307–326. <https://doi.org/10.1007/s10980-022-01577-8>
- [23] Loomis, JJ; de Araújo e Souza, F; Angel, M; Fabbri, A. 2024. Technology-enhanced community forest management in tropical regions: A state of the art. *Journal of Environmental Management*. 350: 119651. <https://doi.org/10.1016/j.jenvman.2023.119651>
- [24] López-Vargas, P; Gonzales Tovar, J; Hajjar, R. 2023. Interactions between formal and informal institutions governing community and small-scale timber enterprises: The case of the Ampiyacu river basin in the Peruvian Amazon. *Forest Policy and Economics* 157: 103070. <https://doi.org/10.1016/j.forpol.2023.103070>
- [25] Mahoney, J; Thelen, K. 2010. Explaining institutional change: Ambiguity, agency, and power. Cambridge University Press. 254 p.
- [26] Miranda, JJ; Corral, L; Blackman, A; Asner, G; Lima, E. 2014. Effects of protected areas on forest cover change and local communities: evidence from the Peruvian Amazon. Washington DC, USA: Inter-American Development Bank, Office of Strategic Planning and Development Effectiveness. IDB Working Paper Series No. IDB-WP-559. 38 p.
- [27] Monroy Sagastume, HA. 2025. Dinámica de la cobertura forestal en la Reserva de la Biosfera Maya (MBR) y el proyecto REDD+ GuateCarbon. *Ciencia Latina Revista Científica Multidisciplinar* 9(5): 5057-5080. <https://doi.org/10.37811/clrcm.v9i5.19842>
- [28] Morrison, TH; Adger, WN; Brown, K; Lemos, MC; Huitema, D; Phelps, J; Evans, L; Cohen, P; Song, AM; Turner, R; Quinn, T; Hughes, TP. 2019. The black box of power in polycentric environmental governance. *Global Environmental Change*. 57: 101934. <https://www.sciencedirect.com/science/article/pii/S0959378019302729?via%3Dihub>
- [29] Organisation for Economic Co-operation and Development (OECD); Development Bank of Latin America (CAF); European Commission (EC). 2025. Latin American Economic Outlook 2025: Promoting and financing production transformation. París, Francia: OECD Publishing. 250 p. <https://doi.org/10.1787/80e48de5-en>
- [30] Organización de las Naciones Unidas para la Alimentación y la Agricultura (FAO). 2025. Global Forest Resources Assessment 2025: Main report. Roma, Italia: FAO. 180 p. <https://www.fao.org/forest-resources-assessment/2025/en/>
- [31] Organización de las Naciones Unidas para la Alimentación y la Agricultura (FAO). 2025a. The State of Food and Agriculture 2025: Addressing land degradation across landholding scales. Roma, Italia: FAO. 170 p. <https://www.fao.org/publications/sofa/2025/en/>
- [32] Organización de las Naciones Unidas para la Alimentación y la Agricultura (FAO). 2025b. Regional overview of food security and nutrition in Latin America and the Caribbean 2025. Santiago de Chile, Chile: FAO. 150 p. <https://www.fao.org/americas/publicaciones/es/>
- [33] Organización de las Naciones Unidas para la Alimentación y la Agricultura (FAO); International Land Coalition (ILC); Centre de coopération internationale en recherche agronomique pour le développement (CIRAD). 2026. Status of land tenure and governance 2026: Securing land rights for sustainable development. Roma, Italia: FAO. 120 p. <https://www.fao.org/land-tenure/resources/en/>
- [34] Ostrom, E. 2009. A general framework for analyzing sustainability of social-ecological systems. *Science*, 325: 419–422. <https://doi.org/10.1126/science.1172133>
- [35] Ota, M; Ota, Tetsuji; Shimizu, K; Onda, N; Ma, V; Sokh, H; Mizoue, N. 2023. Community forests and conservation. *PNAS Nexus* 2(10): 1-9. <https://doi.org/10.1093/pnas-nexus/pgad320>
- [36] Pascucci, S. 2025. Theorizing polycentric governance of global socio-ecological challenges through a mesoinstitutional perspective. *Journal of Institutional Economics* 45: 1–18. <https://doi.org/10.1017/S1744137425100325>
- [37] Rodas, A; Monterroso, I; Stoian, D. 2021. Dinámicas productivas en torno al cambio de uso del suelo y sus repercusiones en la Reserva de Biósfera Maya (MBR) en Petén, Guatemala. Working Paper 1. Bogor, Indonesia: Centro para la Investigación Forestal Internacional (CIFOR); y Nairobi, Kenia: Centro Internacional de Investigación Agroforestal (ICRAF). 43 p.

- [38] Sarun, H; Nat, S; Hun, H. 2025. Human-forest interactions: Community-based management, livelihoods and social-ecological systems. *Journal of Agriculture and Environment*, 2: 119–144. <https://doi.org/10.5281/zenodo.17922013>
- [39] Schlager, E. 2025. Polycentricity and state-reinforced self-governance: Revisiting Ostrom. *Ecology and Society*, 30(3) Art. 3. <https://www.ecologyandsociety.org/vol30/iss3/art3/>
- [40] Shivani, A; Banjit, S; Phimonphan, S; Lambin, E. 2022. Effectiveness of community forests for forest conservation in Nan province, Thailand. *Journal of Land Use Science* 17(1): 307–323. <https://doi.org/10.1080/1747423X.2022.2078438>
- [41] Shumi, G; Loos, J; Fischer, J. 2024. Applying social-ecological system resilience principles to the context of woody vegetation management in smallholder farming landscapes of the Global South. *Ecosystems and People*: 20(1) 2339222 17 p. <https://doi.org/10.1080/26395916.2024.2339222>
- [42] Stoian, D; Rodas, A; Butler, M; Monterroso, I; Hodgson, B. 2018. Forest concessions in Petén, Guatemala; A systematic analysis of the socioeconomic performance of community enterprises in the Maya Biosphere Reserve. Bogor, Indonesia, Center for International Forestry Research (CIFOR). 8 p. 7160-brief.pdf
- [43] Tiki, L; Abdallah, JM; Marquardt, K; Tolera, M. 2024. Does Participatory Forest Management Reduce Deforestation and Enhance Forest Cover? A Comparative Study of Selected Forest Sites in Adaba-Dodola, Ethiopia. *Ecologies* 5: 647-663. <https://doi.org/10.3390/ecologies5040038>
- [44] Tiki, L; Marquardt, K; Abdallah, J. 2025. Participatory forest management: Analysis of local forest governance and implications for REDD+ implementation in the Adaba-Dodola Forest in Ethiopia. *Trees, Forests and People*.
- [45] Ureta C, SX; Zamora M, FM; Pineda C, PA; Ngo B, MA. 2025. Corrigendum: Thirty years of community forest management in the Maya Biosphere Reserve; A review of its successes and challenges for conservation and governance of tropical forest socioecological systems. *Trees, Forests and People*. Volume 21. 100949. 13 p.
- [46] World Bank (WB). 2025a. Land tenure security and sustainable forest management. Washington, DC: World Bank. 140 p. <https://www.worldbank.org/en/topic/land>
- [47] World Bank (WB). 2025b. State and Trends of Carbon Pricing 2025. Washington, DC, USA, World Bank. 180 p. <https://carbonpricingdashboard.worldbank.org/publications>
- [48] World Bank (WB). 2026. Forests for Development: Community forestry and tenure security. Washington, DC, USA, World Bank. 150 p. <https://www.worldbank.org/en/topic/forests>