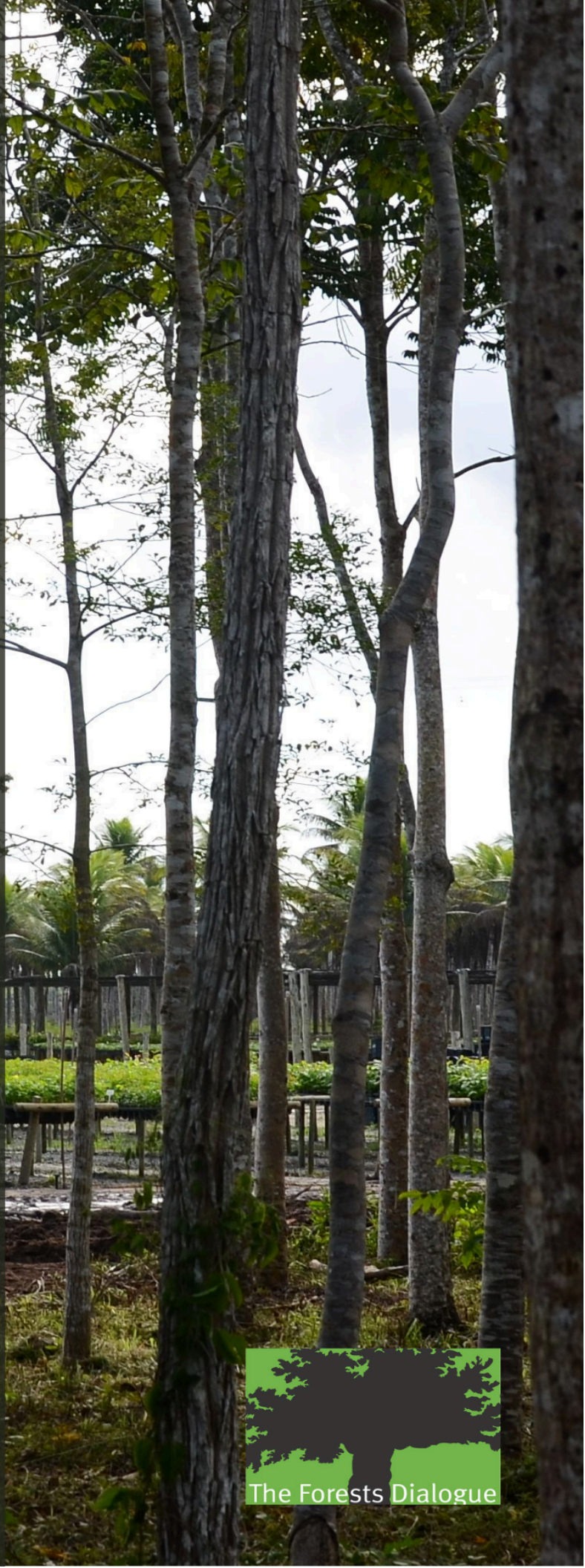
ENGAGING THE PRIVATE SECTOR TO SUPPORT ECOSYSTEM CONSERVATION AND RESTORATION TO INCREASE BIODIVERSITY IN SOUTHERN BAHIA, BRAZIL

Background Paper Prepared for TFD's Field Dialogue on Ecosystem Restoration
4-7 May 2026 | Bahia, Brazil



The Forests Dialogue

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ENGAGE! EXPLORE! CHANGE!

Ecosystem Restoration Field Dialogue

May 4-7, 2026 | Porto Seguro, Bahia, Brazil

Background Paper

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1. Introduction

The Ecosystem Restoration Initiative led by The Forests Dialogue (TFD), in collaboration with the Food and Agriculture Organization of the United Nations (FAO) Advisory Committee on Sustainable Forest based Industries (ACSFI), was established in response to global calls to accelerate ecosystem restoration under the United Nations Decade on Ecosystem Restoration (2021–2030). The initiative seeks to better understand how the forest sector, particularly private forest-based actors, can contribute to restoration in degraded landscapes while addressing ecological integrity, social equity, and long-term sustainability. Southern Bahia has emerged as a priority landscape within this initiative, not only as the host of the Brazilian Restoration Dialogue, but as a region where global restoration debates intersect directly with concrete land-use decisions, institutional arrangements, and long standing social and ecological challenges.

Located within the Central Atlantic Forest Corridor, southern Bahia is one of the most biodiverse and threatened regions of the Atlantic Forest biome. Centuries of land use change driven by agriculture, logging, infrastructure development, and urban expansion have resulted in a mosaic landscape characterized by forest remnants, pasturelands, plantation forestry, agroforestry systems, and protected areas. At the same time, the region retains exceptional ecological value,connectivity potential and Key Biodiversity Areas (KBA), making it a focal area for restoration initiatives. The predominance of private landholdings, including

large forestry companies, agricultural enterprises, and mixed-use properties, means that restoration outcomes in southern Bahia are closely linked to private sector strategies and investment decisions.

Early phases of the Ecosystem Restoration Initiative, including the Restoration Roundtable convened in 2022 and the Scoping Dialogue held in early 2023, identified a set of key tensions, or "fracture lines," that shape restoration efforts globally. These tensions are particularly evident in southern Bahia. One central issue concerns the role of economically driven reforestation and restoration activities. In the region, private investment has enabled restoration efforts at scales rarely achieved through public programs alone, including large scale native forest restoration, plantation-based land use transitions, and carbon financed projects. However, stakeholders have also raised concerns that economic drivers, especially those linked to carbon markets, may overshadow broader ecological objectives or social considerations if restoration success is defined too narrowly.

Related to this is the growing importance of climate, carbon, and biodiversity finance in southern Bahia. The region has become a testing ground for restoration models that seek to finance long-term ecosystem recovery through voluntary carbon markets and corporate climate commitments. These initiatives demonstrate the potential of private finance to mobilize resources at scale, but they also surface unresolved questions around land tenure, carbon rights, benefit sharing, permanence, and the alignment of carbon metrics with ecosystem function and biodiversity outcomes. These challenges mirror global debates but are intensified in southern Bahia by the coexistence of diverse land users, including Indigenous peoples, traditional communities, smallholder farmers, and large corporate landowners.

Additional fracture lines identified by the initiative, such as tensions between top down and bottom-up approaches, the risk of incentivizing restoration at the expense of halting deforestation, and the challenge of meeting restoration targets while supporting local livelihoods are deeply embedded in the region's social and institutional landscape. Southern Bahia has a long history of social mobilization, environmental conflict, and collaborative experimentation, making evident issues of trust building and participation. Restoration in this context cannot be treated solely as a technical or financial exercise but must be understood as a long-term social process embedded in contested landscapes.

Recognizing the importance of grounding global debates in local realities, the Ecosystem Restoration Initiative has emphasized field-based dialogue as a core approach. Following the first field dialogue in East Kalimantan, Indonesia, southern Bahia was selected as the site for the Brazilian Restoration Dialogue to be held in May 2026. The dialogue is jointly hosted by the Bahia Forest Forum, the Brazilian Forests Dialogue, and TFD, institutions with long standing experience facilitating multi stakeholder engagement in the region. Southern Bahia was chosen not only because of its ecological significance, but because it represents a mature landscape for dialogue, where private sector actors, civil society organizations, research institutions, and community representatives have been engaging, often contentiously, but increasingly collaboratively, for more than two decades.

The Brazilian Restoration Dialogue aims to clarify ecosystem restoration needs, specific to southern Bahia, expand engagement with regional stakeholders, and explore how private sector actors can support restoration efforts more effectively at regional, national and international levels. Through plenary discussions, small working groups, and field visits to active restoration sites, protected areas, and productive landscapes, the dialogue seeks to connect global restoration frameworks with the lived experience of land managers and communities. Key outputs include this background paper synthesizing scientific and contextual knowledge on restoration in Brazil and southern Bahia, a co chairs' summary capturing shared insights and areas of divergence, and a co-developed action plan outlining collaborative strategies and next steps.

Southern Bahia's relevance to the initiative is further reinforced by Brazil's ambitious restoration commitments under the Paris Agreement, the Bonn Challenge, and Initiative 20x20. These national and international targets depend heavily on implementation in regions such as the Atlantic Forest, where restoration potential overlaps with dense human populations and intensive land use. Southern Bahia has already been a focal area for implementation of these commitments through initiatives such as the Atlantic Forest Restoration Pact, corporate led restoration projects, and regional financing mechanisms. At the same time, ongoing deforestation pressures and land use conflicts underscore the challenge of moving from isolated projects to durable, landscape scale recovery.

The institutional context of southern Bahia provides both opportunities and constraints for private sector engagement in restoration. The Bahia Forest Forum has coordinated multi stakeholder dialogue since 2005, focusing on environmental compliance, ecological corridors, and sustainable forest partnerships. The Brazilian Forests Dialogue connects this regional experience to a national platform, while TFD provides an international framework for neutral facilitation and cross regional learning. Together, these institutions position southern Bahia not only as a site of restoration activity, but as a laboratory for understanding how private sector engagement can be aligned with ecological integrity, social legitimacy, and long-term landscape transformation.

2. Global overview of ecosystem restoration

Deforestation and forest degradation continue worldwide, with forest cover declining most rapidly in large forest regions of Africa and South America. Although global deforestation rates have slowed in recent years, these regions have experienced the most significant recent losses of naturally regenerating forests, which are particularly important for biodiversity and ecosystem resilience (FAO, 2025). The continued unsustainable use of forest resources is accelerating climate change, driving biodiversity loss, and threatening the food, water, and energy security of hundreds of millions of people, particularly in forest dependent and climate vulnerable regions (FAO, 2025).

In response to these converging crises, ecosystem restoration has emerged as a critical component of global conservation strategies, climate change mitigation efforts, and

sustainable development pathways. This shift is strongly reflected in international policy through the United Nations Decade on Ecosystem Restoration (2021–2030), which positions restoration as a central nature-based solution for addressing environmental degradation while supporting human well-being (UNEP and FAO, 2021; UNEP, 2024). Recent global analyses indicate that restoring just 15% of converted lands in priority areas could prevent up to 60% of projected species extinctions while sequestering approximately 299 gigatons of CO_2, equivalent to roughly 30% of the total increase in atmospheric CO_2 since the Industrial Revolution (Strassburg et al., 2020). These findings underscore the disproportionate global benefits that targeted restoration can deliver.

Opportunities for ecosystem restoration exist across a wide range of degraded ecosystems, including agricultural landscapes, savannahs, wetlands, peatlands, and mangroves. Among these, peatlands and mangroves are of global importance due to their exceptionally high carbon storage capacity and their role in climate regulation, flood protection, and coastal resilience (FAO, SER and IUCN, 2023). Restoration interventions span a continuum from reestablishing ecological integrity at local scales, such as community led forest regeneration, to implementing large scale landscape and seascape restoration initiatives that integrate multiple land uses and stakeholders (UNEP and FAO, 2021).

Successful ecosystem restoration depends fundamentally on effective collaboration among diverse stakeholders. These include scientists, policymakers, non-governmental organizations, the private sector, indigenous peoples, and local communities, as well as elders, religious leaders, women, and youth, whose knowledge systems and social roles are increasingly recognized as essential for long term success (Aronson et al., 2020; Dawson et al., 2021). Although ecosystem restoration requires long term commitment, sustained financing, and adaptive management, growing evidence shows that its benefits for biodiversity conservation, climate regulation, disaster risk reduction, and human wellbeing can be profound, durable, and far reaching when implemented inclusively and at scale (Abhilash, 2021).

2.1. International initiatives and pledges on ecosystem restoration

Ecosystem restoration has gained strong international momentum through a series of global initiatives and political pledges that explicitly link restoration to biodiversity conservation, climate change mitigation, and sustainable development, e.g. Paris Agreement, the Bonn Challenge, and Initiative 20x20. Central among these is the United Nations Decade on Ecosystem Restoration (2021–2030), which provides a global framework to prevent, halt, and reverse ecosystem degradation across terrestrial, freshwater, coastal, and marine systems. The Decade emphasizes scaling restoration actions that deliver measurable benefits for both nature and people, while fostering cross sectoral collaboration and investment (UNEP and FAO, 2021).

Complementing this global framework, the Kunming–Montreal Global Biodiversity Framework commits countries, under Target 2, to place at least 30% of degraded ecosystems under effective restoration by 2030. Importantly, this target emphasizes ecological integrity, connectivity, and long-term functionality, rather than short term or single objective restoration

interventions (CBD, 2022). Together, these commitments elevate restoration from a technical activity to a central pillar of global biodiversity governance.

Within this evolving policy landscape, Forest and Landscape Restoration (FLR) has emerged as a cornerstone approach, particularly for tropical forested landscapes. FLR goes beyond site level tree planting to restore ecological functionality and human wellbeing across entire landscapes, integrating forests, agriculture, water systems, and other land-uses in working landscapes. This approach is operationalized most prominently through the Bonn Challenge, which aims to restore 350 million hectares of degraded and deforested land by 2030 through voluntary, country led FLR commitments that respect national priorities and local contexts.

Regional platforms such as the African Forest Landscape Restoration Initiative (AFR100) further translate global ambitions into actionable commitments by supporting countries to include FLR into national development, climate, and land use strategies. In parallel, the Glasgow Leaders' Declaration on Forests and Land Use reinforces the central role of restoration by committing countries to halt and reverse forest loss and land degradation by 2030, while explicitly recognizing the stewardship role of Indigenous Peoples and local communities (UNFCCC, 2021). Together, these initiatives create a coherent enabling environment for large scale, inclusive, and outcome-oriented landscape restoration.

2.2. Challenges and opportunities of global ecosystem restoration

Despite strong international momentum, translating restoration commitments into durable outcomes remains challenging. A persistent gap exists between ambition and implementation, illustrated by the failure to meet the Aichi Biodiversity Target on restoration by 2020. This experience highlights the difficulty of sustaining political attention, financing, and institutional capacity over the long-time horizons required for ecological recovery (Waring, 2024). Restoration efforts often remain small scale, fragmented, and insufficiently integrated into broader land use planning and development strategies.

Financing constraints are among the most significant barriers to scaling restoration. Global assessments indicate that current investment levels fall far below what is required to meet international targets, with funding still dominated by public sources. Private investment remains limited due to long payback periods, perceived risks, and weak or immature markets for ecosystem services (UNEP, 2024; zu Ermgassen and Löfkvist, 2024). Governance and social equity challenges further complicate restoration, particularly where priority restoration areas overlap with lands managed by Indigenous Peoples and local communities. Failure to recognize land tenure, local knowledge, and benefit sharing arrangements risks social conflict and reduced long term effectiveness (Waring, 2024). On the other hand, collaboration with indigenous peoples and local communities also provides opportunities to achieve sustainable development goals through ecosystem restoration.

Monitoring and evaluation (M&E) limitations also undermine accountability and learning. Weak baseline data, inconsistent indicators, and limited technical capacity constrain the ability to

assess restoration effectiveness and to support adaptive management across diverse ecosystems and regions (IUCN, 2025b). These challenges are amplified by ecological complexity and climate uncertainty, as restoration outcomes are highly context specific and increasingly influenced by extreme weather events and competing land use pressures. There are important opportunities to enhance M&E through the adoption of community-based monitoring systems based on traditional knowledge systems (see IPBES Monitoring Assessment).

Despite these constraints, ecosystem restoration represents one of the most powerful nature-based solutions available. Restoration can simultaneously sequester carbon, enhance climate resilience, recover biodiversity, and improve ecosystem services such as water regulation, soil fertility, and food security. UNEP (2021) estimates that large scale restoration could generate trillions of dollars in ecosystem service benefits, with returns significantly exceeding the costs of inaction. In addition, strong alignment among global frameworks, including the UN Decade on Ecosystem Restoration, the Global Biodiversity Framework, the Paris Agreement, and the Glasgow Leaders' Declaration creates a coherent international mandate for scaling restoration and mobilizing finance (CBD, 2022; UNEP and FAO, 2021).

Landscape scale approaches such as Forest and Landscape Restoration are particularly promising, as they integrate ecological, social, and economic objectives and are more likely to deliver durable biodiversity, climate, and livelihood outcomes than narrowly focused tree planting interventions (IUCN, 2025a; Vijaykumar and Babu, 2024).

2.3. Potential roles of the private sector, particularly the forest sector, in ecosystem restoration

The private sector is increasingly recognized as a critical actor in scaling ecosystem restoration, complementing public and donor led efforts under global frameworks such as the UN Decade on Ecosystem Restoration and the Kunming–Montreal Global Biodiversity Framework. This role is particularly significant in the forest sector, given the large share of forest lands under private ownership or management and the sector's influence over land use decisions, investment flows, and global commodity supply chains (The Forests Dialogue, 2023).

One of the most important contributions of the private sector lies in the mobilization of finance at scale. Global analyses consistently demonstrate that public funding alone is insufficient to meet restoration targets, making private investment essential for closing the financing gap. Private actors can mobilize capital through impact investment, blended finance structures, carbon and biodiversity markets, and long-term land use enterprises that link restoration outcomes with financial returns (World Bank, 2024). In the forest sector, this includes investments in restoring degraded forest lands, rehabilitating production landscapes, and financing sustainable forest-based value chains that support both ecological recovery and economic viability (The Forests Dialogue, 2023).

Beyond financing, the forest sector plays a direct and operational role in implementing restoration through land management practices. Private forest owners, plantation companies, and timber producers manage extensive areas where restoration can be integrated into production systems through assisted natural regeneration, native mixed species forestry, agroforestry, and riparian and buffer zone restoration. Empirical evidence shows that embedding restoration within forest management improves long term productivity, strengthens resilience to climate risks, and enhances the provision of ecosystem services such as water regulation and soil protection (Chisika and Yeom, 2024).

The private sector also contributes technical expertise, innovation, and operational capacity that are often limited in public institutions. Forestry and restoration companies bring experience in planning, implementation, monitoring, and long-term maintenance at scale, as well as access to new technologies and data systems that improve efficiency and accountability. Global reviews highlight the importance of these capabilities in reducing transaction costs, strengthening monitoring and reporting, and supporting adaptive management in restoration initiatives (World Bank, 2024).

A particularly important role of the forest sector lies in advancing Forest and Landscape Restoration (FLR). FLR emphasizes restoring ecological functionality while enhancing human well-being across entire landscapes. Private forest and agribusiness actors are well positioned to support FLR by aligning restoration with supply chains, engaging in landscape level partnerships, and coordinating with governments, communities, and civil society. Multi stakeholder dialogues and policy studies emphasize that sustained private sector engagement is essential for achieving FLR outcomes at scale and over the long-time horizons required for ecological recovery (The Forests Dialogue, 2023; IUCN, 2023).

Private sector participation is also central to inclusive and community-based restoration. Evidence from forest dependent regions shows that restoration outcomes are more durable and socially legitimate when private actors collaborate with Indigenous Peoples, local communities, and smallholders, supporting community forestry, livelihood diversification, and equitable benefit sharing arrangements. Such partnerships help strengthen social acceptance, reduce conflict, and improve long term ecological outcomes (Bhattarai et al., 2025).

Finally, the private sector can act as a market and supply chain catalyst for restoration. Corporate commitments to deforestation free and nature positive supply chains, combined with investments in restoration within sourcing landscapes, can drive systemic change beyond individual projects. Policy briefs and investment analyses highlight the potential of these market-based approaches to mainstream restoration as part of broader sustainable land use transitions (Partnerships for Forests, 2019).

2.4. Potential benefits for the private sector of engagement in ecosystem restoration

Engagement in ecosystem restoration offers the private sector a growing set of strategic, financial, operational, and reputational benefits, particularly in a global context marked by

climate change, biodiversity loss, and increasingly stringent sustainability related regulation. Recent global assessments emphasize that restoration is no longer solely a philanthropic activity, but increasingly a core component of long-term business value creation and risk management (World Bank, 2024; IUCN, 2025b).

A primary benefit is risk reduction and enhanced supply chain resilience. Many businesses depend directly on ecosystem services such as water availability, soil fertility, climate regulation, and pollination. Degradation of these services increases operational costs and exposure to climate-related disruptions. By investing in ecosystem restoration, companies can stabilize the natural systems that underpin production and sourcing, thereby reducing long term risks related to resource scarcity, extreme weather, and supply volatility (IUCN, 2025b). World Bank case studies further show that restoration can improve land productivity and resilience in forest and land-based value chains, strengthening the reliability of raw material supply (World Bank, 2024).

Ecosystem restoration can also generate new revenue streams and financial opportunities. Restoration activities may produce sustainable timber and non-timber forest products, ecosystem service payments, carbon credits, biodiversity credits, and other nature-based financial instruments. Evidence compiled by the World Bank demonstrates that restoration projects can be structured as investable opportunities rather than relying solely on public or grant finance, with returns linked to ecosystem services, land value appreciation, or environmental markets (World Bank, 2024). In parallel, companies engaged in restoration are increasingly well positioned to access green finance, blended finance facilities, and impact investment capital as financial institutions shift toward nature positive portfolios (UNEP, 2024).

Another key benefit lies in regulatory preparedness and reduced compliance risk. Environmental regulations related to climate, biodiversity, and land use are tightening globally, including requirements for deforestation free supply chains, biodiversity targets, and environmental disclosure. Proactive engagement in ecosystem restoration allows companies to anticipate regulatory change, reduce future compliance costs, and demonstrate alignment with emerging global frameworks such as the Kunming–Montreal Global Biodiversity Framework (IUCN, 2025b).

Engagement in restoration also delivers significant reputational and market advantages. Investors, consumers, and business partners increasingly expect companies to demonstrate credible, measurable contributions to environmental sustainability. Restoration initiatives, particularly those that deliver co-benefits for biodiversity and local communities, enhance brand value, strengthen ESG performance, and reinforce a company's social license to operate. IUCN (2025b) highlights that restoration enables companies to move beyond "do no harm" approaches toward nature positive leadership, which can differentiate firms in competitive markets.

Finally, ecosystem restoration supports innovation, learning, and long-term competitiveness. Companies involved in restoration often develop new technical capacities, partnerships, and business models related to nature-based solutions, land management, and environmental

monitoring. These capabilities can drive innovation, improve operational efficiency, and open access to emerging markets linked to sustainability and nature positive economies (World Bank, 2024).

2.5. Current financial practices and monitoring systems in ecosystem restoration

Ecosystem restoration finance has evolved rapidly from small, grant funded projects toward more diverse financial models and increasingly standardized monitoring systems, driven by global commitments under the UN Decade on Ecosystem Restoration and the Kunming–Montreal Global Biodiversity Framework. While practices continue to evolve, several dominant approaches are now widely recognized.

Historically, ecosystem restoration has been financed primarily through public funding and donor support, including national budgets, multilateral funds such as the GEF and GCF, and bilateral development assistance. These sources remain critical, particularly for early-stage projects, high risk contexts, and restoration activities with strong public good characteristics (World Bank, 2024).

In recent years, there has been growing emphasis on mobilizing private finance through blended and market-based approaches. Blended finance, combining public or philanthropic capital with private investment, is now commonly used to reduce risk and improve the bankability of restoration projects. The World Bank (2024) documents multiple cases in which concessional finance, guarantees, or technical assistance are used to recruit private investors for restoration linked to agriculture, forestry, and landscape management.

Nature-based markets are another increasingly prominent financial mechanism. These include voluntary carbon markets, emerging biodiversity credit schemes, payments for ecosystem services, and sustainable commodity value chains. While still unevenly developed, such mechanisms are viewed as key pathways to generating long term revenue streams from restored ecosystems, particularly when aligned with strong governance frameworks and environmental safeguards (UNEP, 2024).

At the project level, financial structuring is becoming more sophisticated, with growing use of project finance vehicles, landscape funds, and aggregated portfolios that bundle multiple restoration activities to reduce transaction costs and improve scalability. These approaches are increasingly attractive to investors when accompanied by clear impact metrics, robust MRV systems, and risk management frameworks (Ascenzi et al., 2025).

Monitoring systems have similarly evolved from ad hoc reporting toward more standardized, multi-dimensional frameworks that track ecological, social, and financial outcomes. Most restoration initiatives now emphasize results-based monitoring to demonstrate effectiveness, accountability, and value for money (IUCN, 2025b). Advances in remote sensing, geospatial analysis, and digital data platforms enable consistent tracking of restoration progress across large areas and over time.

2.6. Financial influences for attracting new private sector actors into ecosystem restoration

From a financial perspective, ecosystem restoration is increasingly viewed not only as an environmental imperative but also as an emerging investment and risk management opportunity. Recent global analyses highlight that the design of financial incentives, risk sharing mechanisms, and revenue models plays a decisive role in bringing new private sector actors, including investors, banks, agribusinesses, forestry companies, and corporates, into restoration initiatives (World Bank, 2024).

A central influence is the improvement of risk–return profiles for restoration investments. Traditionally, ecosystem restoration has been perceived as high risk and low return. However, blended finance structures, combining public or concessional capital with private investment, are increasingly used to reduce upfront risks and make restoration projects financially viable. Studies show that instruments such as guarantees, first loss capital, and technical assistance facilities can significantly lower barriers to entry for private investors and financial institutions (World Bank, 2024).

The creation of revenue generating mechanisms is another powerful driver. Financial models that link restoration to predictable cash flows, such as carbon markets, biodiversity or nature credits, payments for ecosystem services, and sustainable forest and agricultural value chains, make restoration investable for a broader range of market actors. Evidence from UN Decade and IUCN supported initiatives indicates that projects with reliable revenue streams are more likely to attract commercial banks and corporate supply chain investors in addition to traditional impact investors (IUCN, 2025b; UNEP, 2024).

Regulatory and policy driven financial incentives further influence private sector participation. As governments introduce deforestation free supply chain rules, biodiversity targets, and disclosure requirements, companies face rising compliance costs if they fail to address nature related risks. Financial analyses show that restoration investments can help companies manage regulatory exposure and avoid future liabilities, effectively acting as a form of cost avoidance and financial hedging (FAO, 2023).

Finally, project aggregation and standardization strongly affect market entry. Individual restoration projects are often too small or complex to attract private finance. Financial approaches that aggregate projects into portfolios or landscape level funds, combined with standardized monitoring and reporting systems, reduce transaction costs, improve transparency, and increase scalability (Ascenzi et al., 2025).

3. Ecosystem restoration in the Atlantic Forest and southern Bahia, Brazil

The Atlantic Forest (Mata Atlântica) is one of the world's most biodiverse yet most degraded tropical forest biomes. After centuries of deforestation driven by logging, agriculture, and urbanization, only a fraction of its original extent remains, highly fragmented across a densely populated and economically productive region of Brazil, Argentina, and Paraguay. In response,

the Atlantic Forest has become one of the most advanced and coordinated large scale ecosystem restoration efforts globally, supported by long-standing alliances such as the Atlantic Forest Restoration Pact and its trinational extension. These initiatives integrate conservation, restoration, water security, and livelihoods, and have been recognized by the United Nations as a World Restoration Flagship under the UN Decade on Ecosystem Restoration.

Restoration in the Atlantic Forest is characterized by landscape scale, multi stakeholder approaches rather than isolated tree planting projects. Strategies include assisted natural regeneration, restoration with native species, agroforestry, native species silviculture, riparian corridor recovery, and connectivity planning across mosaics of protected areas, farms, and private lands. Because much of the biome lies outside protected areas, restoration is deeply embedded in private properties, agricultural systems, and community managed territories, making governance, incentives, and long-term financing as important as ecological techniques. Indigenous and community managed lands often show strong restoration outcomes, underscoring the role of tenure security, local knowledge, and inclusive governance.

Within this broader context, southern Bahia stands out as a priority restoration landscape. The region combines exceptional biological richness with a long history of cacao cultivation under the traditional cabruca agroforestry system, where cacao is grown beneath a native forest canopy. Cabruca systems have maintained forest structure, high tree diversity, and wildlife habitat, while also supporting livelihoods and buffering crops against climate extremes. As a result, cabruca is increasingly recognized not as a transitional land use, but as a restoration compatible production system that integrates biodiversity conservation, climate resilience, and rural economies (da Silva Rocha and Piotto, 2026). Recent investments, including a major FAO-GEF project initiated in 2026, aim to strengthen cabruca management, improve landscape connectivity, and align restoration with sustainable cacao value chains.

Southern Bahia is also emerging as a testing ground for new finance driven restoration models, including carbon and timber market initiatives and private sector restoration on degraded lands (Santos et al., 2026). These efforts demonstrate growing interest from agribusinesses, forestry companies, cooperatives, and investors, while also revealing persistent tensions. Key challenges include balancing economic incentives with ecological integrity, ensuring equitable benefit sharing, avoiding narrow carbon or tree count metrics, and securing long term monitoring and governance (Benzeev et al., 2025). Overall, the Atlantic Forest, and southern Bahia in particular, illustrates both the promise and complexity of ecosystem restoration in human dominated landscapes, showing that lasting success depends on aligning ecological goals with social inclusion, finance, and long-term institutional commitment.

3.1. The landscape and land use context

The Atlantic Forest is one of the most biodiverse yet fragmented forest biomes within Latin America. Existing as the second largest tropical biome in South America spanning across most of Brazil's coastline into Paraguay and Argentina, this region has endured significant forest loss

over the last decade with only 24% of the original forest extent left (Marques et al. 2021a, 2021b, Vancine et al. 2024, Amaral et al. 2025). Because of this, the Atlantic Forest is a fundamental example of a human-modified tropical landscape and exists amongst a continuum of human pressures on its remaining forest patches (Arroyo-Rodríguez et al. 2017). Most of the remaining forests exist within small forest patches surrounded by heterogenous land-use types, with as much as 97% of all forest patches across the Atlantic Forest being smaller than 50 ha (Vancine et al. 2024). Because of this high fragmentation, over half of the remaining vegetation is within 90 m of forest edge, highlighting that much of the remaining forest may be experiencing negative edge effects from adjacent land-use.

However, with ~ 70% of Brazil's population residing in the Atlantic Forest biome and 80% of Brazil's GDP coming from this region (Solórzano et al. 2021, Amaral et al. 2025), the adjacent land-use surrounding these forests is exceptionally heterogenous and dynamic, both spatially and temporally (Solórzano et al. 2021). While this region has faced anthropogenic disturbance since before the landing of Portuguese settlers in 1500, forest lost, and land-use change occurred in mass and rapidly expanded from the 1800s with acceleration occurring in the early 1900's following increased urbanization and agricultural industrialization (Solórzano et al. 2021). As a result, the modern Atlantic Forest is not only a forest mosaic of various patch sizes, but also a land-use mosaic consisting of various forms of agriculture including sugarcane, soybean, citrus, cacao, coffee, tree plantations, and pasture interspersed with urban centers, indigenous territories, and protected areas (Tabarelli et al. 2010, de Oliveira and Solórzano 2014, Solórzano et al. 2021). As such, the Atlantic Forests of today consists of many novel regenerating forest ecosystems with a wide array of anthropogenic pressures altering forest regeneration, biodiversity, and biomass accumulation (Solórzano et al. 2021). While this biome has been principally dominated by pasture over the last 40 or so years, there has been a steady decline of pastureland co-occurring with increases primarily in agriculture, but also tree plantations (Figure 1) (Lira et al. 2021). Between 1985 and 2017, pasture decreased by ~25%, while agricultural and tree plantations increased by ~100% and 200% respectively (Lira et al. 2021).

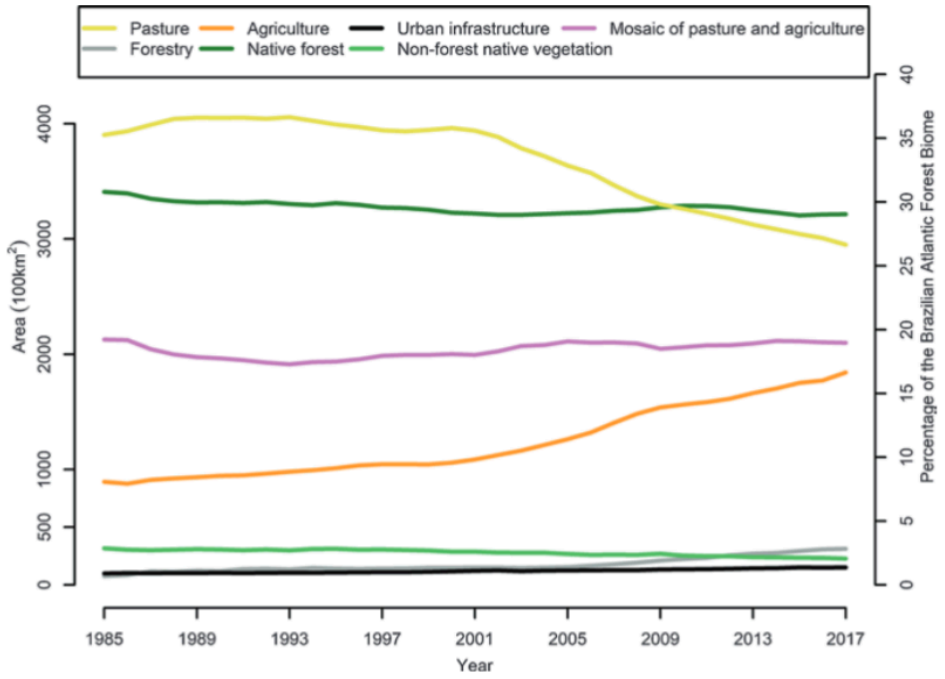

Figure 1 – Land-use and land-cover change from 1985 to 2017 for the Brazilian Atlantic Forest from Lira et al. (2021) and data from data from MapBiomas Project v 3.0

Along with these land-use shifts, forest cover has not been static. From 1986-2020 the Brazilian Atlantic Forest lost ~ 2.4% of forest vegetation cover and between 2010 and 2020, there was 186,289 ha of mature forest lost (forest present since 1985) with over 70% of the observed deforestation occurring on private land and 8% occurring in conservation and community-owned areas (Vancine et al. 2024, Amaral et al. 2025). In particular, deforestation was concentrated across Mina Gerais, Bahia, Paraná and Santa Catarina with much of deforested areas replaced with agriculture (principally pasture and silviculture, Figure 2) and nearly half of the deforestation occurring in small patches (< 18 ha) (Amaral et al. 2025). Alarmingly, much of the Atlantic Forest resides in private property with only ~ 10% protected under protected area or indigenous area classification (Vancine et al. 2024), further highlighting the vulnerability of these forests and their sensitivity to anthropogenic disturbance. Indeed, regenerating forests are also often repeatedly re-cleared hindering forest regeneration in the area, with an estimated 1.23 Pg of C gains lost by the re-clearing of young forest between 1985 and 2019 (Piffer et al. 2022a).

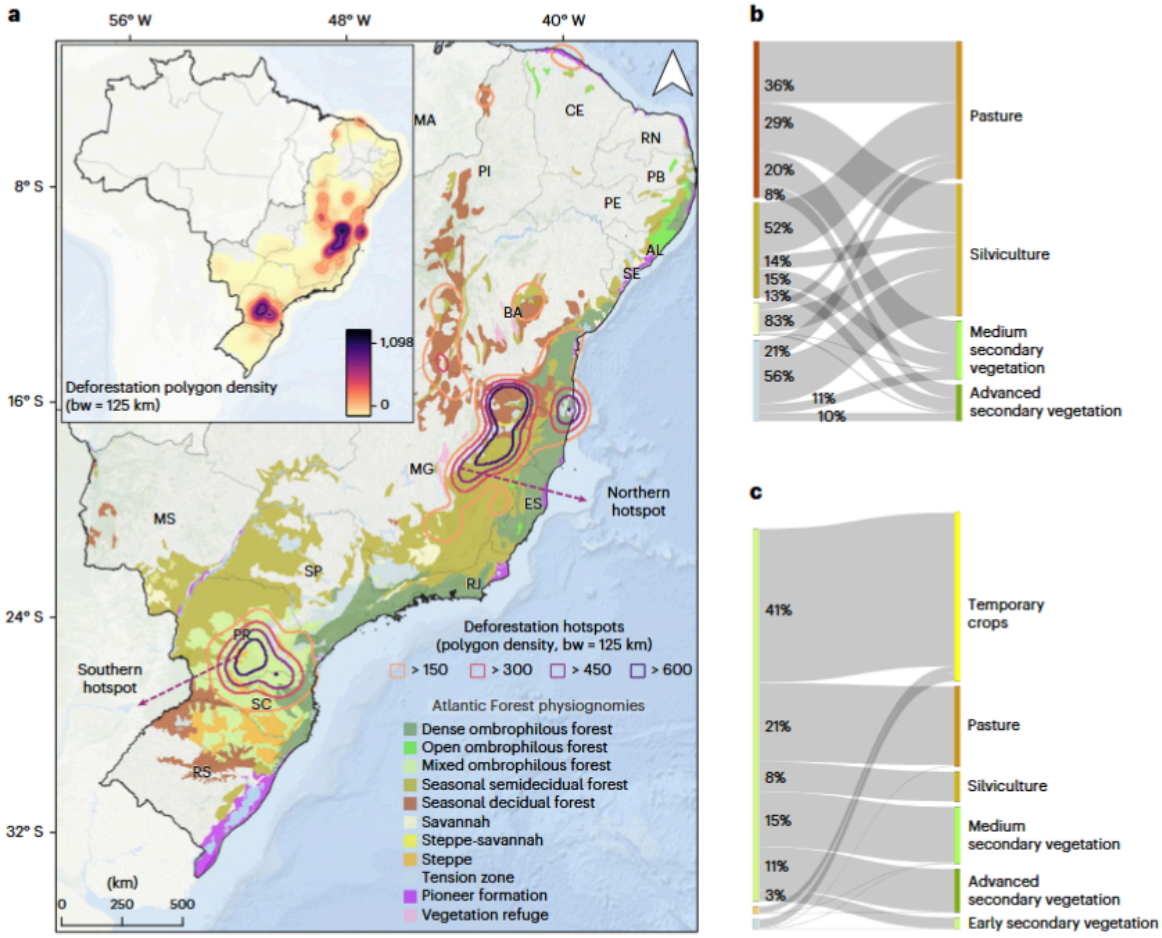

Figure 2 – Deforestation hotspots in the Atlantic Forest. Figure taken from Amaral et al. (2025). Panel 'a' represents deforestation hotspots with a kernel density map of deforestation. Panels 'b' and 'c' represent the loss of vegetation to alternate land-uses in the northern (b) and southern (c) deforestation hotspots. Different colors in 'b' and 'c' denote shifts from vegetation of different physiognomies denoted by the legend in panel 'a'.

To combat this high amount of deforestation within the Atlantic Forest the Brazilian government has enacted several key policies to aid in the legal protection of this biome, such as the Atlantic Forest Law introduced in 2006 and the Brazilian Native Vegetation Protection Law in 2012 with a number of institutions coming together to form the Atlantic Forest Restoration Pact in 2009 (De Siqueira et al. 2021, Lira et al. 2021, Vancine et al. 2024). With the implementations of these legislative actions and organization, Brazilian Atlantic Forest regeneration appears to have progressed with post-legislation trends showing increasing forest regeneration (Figure 3), though with increasing replacement of mature forest with young forest (Rosa et al. 2021, Vancine et al. 2024). Despite this heavy degradation and deforestation, the Atlantic Forest is still one of the top 5 biodiversity hotspots in the world with exceptionally high floral diversity and endemism while providing a wide array of ecosystem services to humans and animals alike (Joly et al. 2014). While increasing agricultural expansion has decimated the region over the last 100 years, deforestation rates have declined substantially since 1985 with

many young secondary forests regenerating in a complex mosaic of human land-use (Piffer et al. 2022b, Vancine et al. 2024).

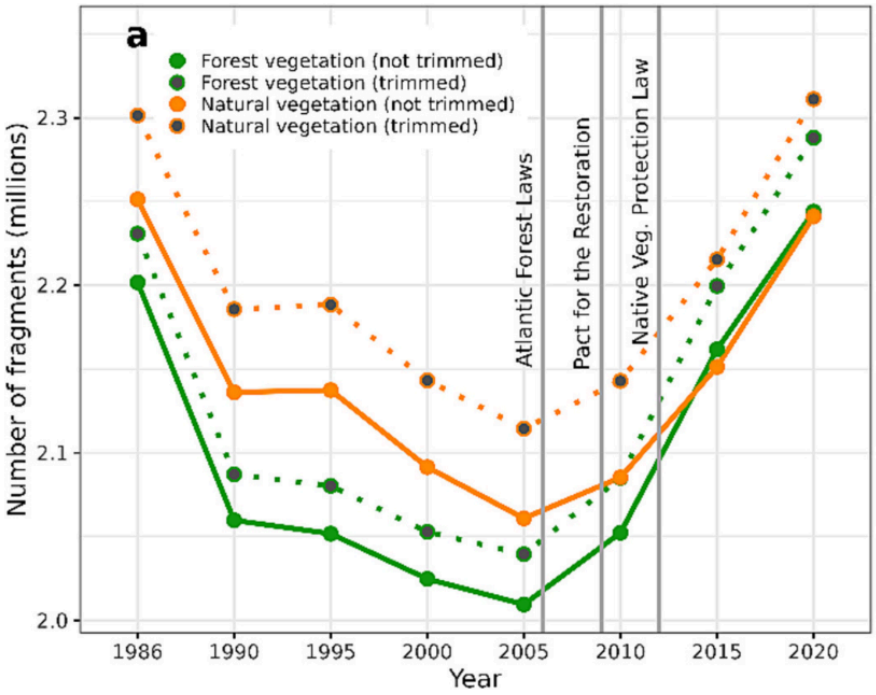

Figure 3 – Figure taken from Vancine et al. (2024) showing the trend of fragment number change following the generation of legislative action and restoration programs in the Brazilian Atlantic. Trimmed lines refer to data that were trimmed using roads and railway geospatial information.

Southern Bahia is part of a larger region of the Atlantic Forest known as Hiléia Baiana, a region ranging from southern Bahia to northern Espírito Santo (Faria et al. 2021). It was in this area where the Portuguese first arrived in Porto Seguro in 1500 and, much like the rest of the Atlantic Forest, this region has been exposed to extremely high rates of deforestation and degradation, with much of the forest lost to expanding urbanization and industrial agriculture (Faria et al. 2021). Nonetheless, the Hiléia Baiana has still been recognized as one of the 5 regions of endemism in the Atlantic Forest, hosting incredibly high rates of both floral and faunal diversity across multiple physiognomies (Silva and Casteleti 2005). Within one forest patch in Bahia, an astonishing 454 tree species was recorded, highlighting the immense floral diversity in this region and the importance forest remnants have for conservation (Thomas 1998) This area is also differentiated by a significant expansion of tree plantations spanning thousands of hectares across southern Bahia.

While tree plantations have been present in the Atlantic Forest landscape since at least the 1980s, there has been a substantial increase in southern Bahia, especially over the last two decades. South of the Rio Jequitinhonha, Bahia has seen a ~ 670 % increase in tree plantations primarily composed of Eucalyptus while pasture has seen a decrease of ~ 3% and forest formation has decreased by ~ 27% within the same period (Figure 4, percent change

calculated from Mapbiomas 10.1 data). As the two dominant land-uses in this region, tree plantations and pasture make up a majority of the landscape matrix surrounding forests in southern Bahia (Figure 4). The stark expansion of tree plantations in this region appears to have accelerated after 2005 with the majority of tree plantation expansion replacing primarily pasture but also forest over the last 2 decades (Figure 5), highlighting the dynamic nature of this landscape not only in terms of forest cover, but also land-use.

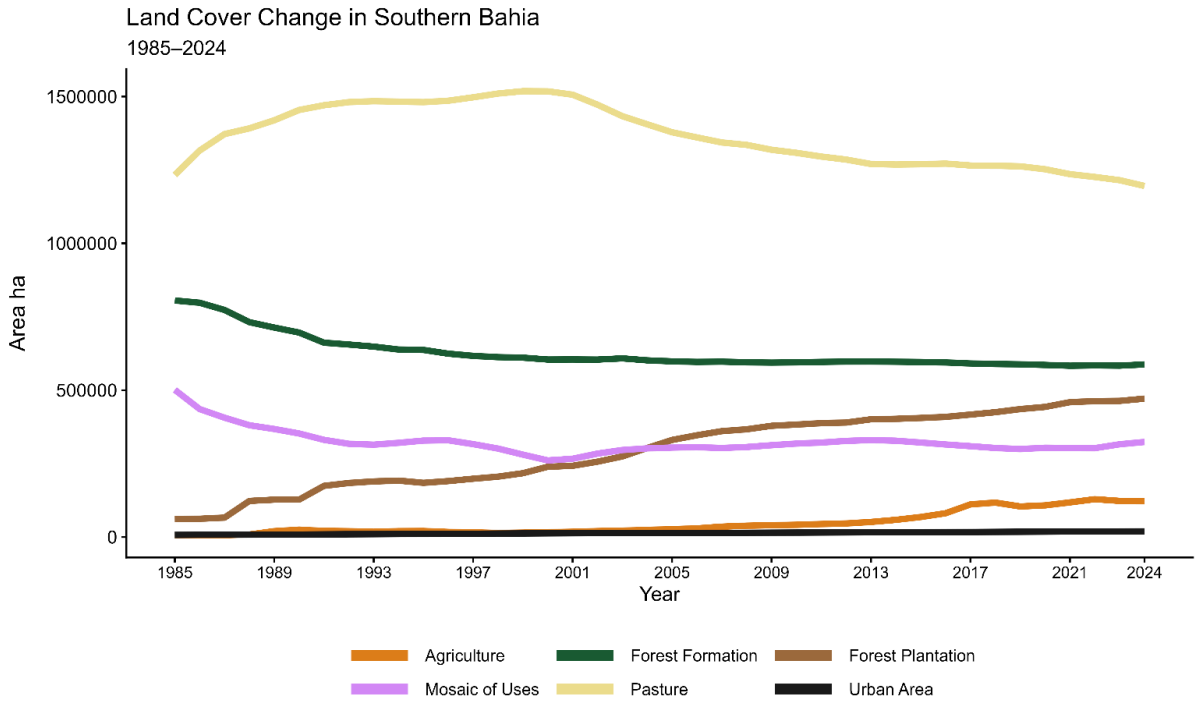

Figure 4 – Land-use land-cover change for Southern Bahia (south of the Rio Jequitinhonha). Data taken from Mapbiomas platform, version 10.1.

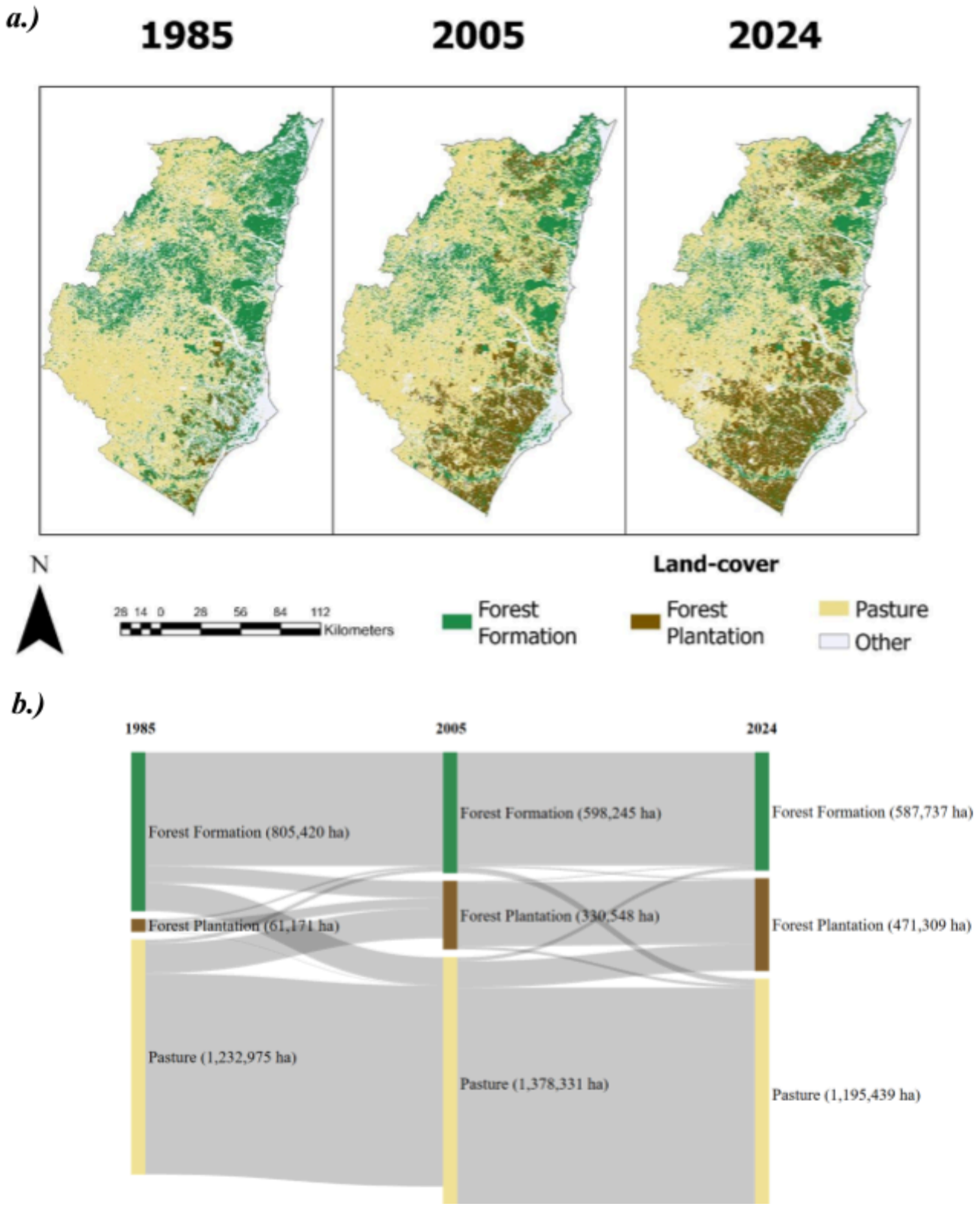

Figure 5 – Forest formation, forest plantation, and pasture change from 1985, 2005, and 2024. Panel a illustrates change across southern Bahia, and panel b illustrates how much forest

formation and pasture contributed to forest plantation across the three-time steps. Numbers next to each label indicate total land-cover of that cover type for each respective year. Data taken from Mapbiomas version 10.1.

3.2. Ecosystem restoration policies in Brazil

In Brazil, ecosystem restoration has evolved into a policy-driven agenda supported by an extensive legal and institutional framework. This policy dimension is particularly important because much of the current country's restoration area available is in highly degraded private properties, where the recovery of native vegetation depends on regulation and environmental compliance. Over the past decades, environmental laws, regulatory instruments, and national commitments have progressively shaped the conditions under which restoration is planned, implemented, and monitored across the country. Within this context, ecosystem restoration has become not only an ecological response to biodiversity loss and climate change, but also a central component of Brazilian environmental governance.

Brazil has committed to restoring approximately 12 million hectares of native vegetation by 2030, and meeting this target has required the consolidation of a broad restoration strategy supported by legal mandates, institutional mechanisms, and policy instruments designed to guide implementation and promote compliance (Brock et al., 2021; Crouzeilles et al., 2019; De Andrade Moreira et al., 2024). Brazil is now well known for its extensive environmental legal system, developed over many years through a series of laws, constitutional measures, and regulations designed to safeguard native vegetation, manage land use, and encourage the restoration of damaged ecosystems (Fig. 6). Far from being guided solely by voluntary action, restoration in the country is strongly structured by public policy and by a dense legal architecture that defines responsibilities, implementation pathways, and compliance mechanisms across landscapes (Fig. 6). Brazil's ecosystem restoration agenda is supported by a broad legal and institutional framework that includes the National Environmental Policy (Law 6,938/1981), the Environmental Crimes Law (Law 9,605/1998), the National System of Conservation Units (Law 9,985/2000), the Atlantic Forest Law (Law 11,428/2006), and the Native Vegetation Protection Law (Law 12,651/2012), commonly known as the New Brazilian Forest Code (Brasil, 2012) (Fig. 6). Together, these legal instruments have shaped the principles, obligations, and enforcement mechanisms that govern the protection and recovery of native vegetation in the country. Here, the policy instruments that have most strongly shaped ecosystem restoration practice in Brazil across different biomes and landscape contexts.

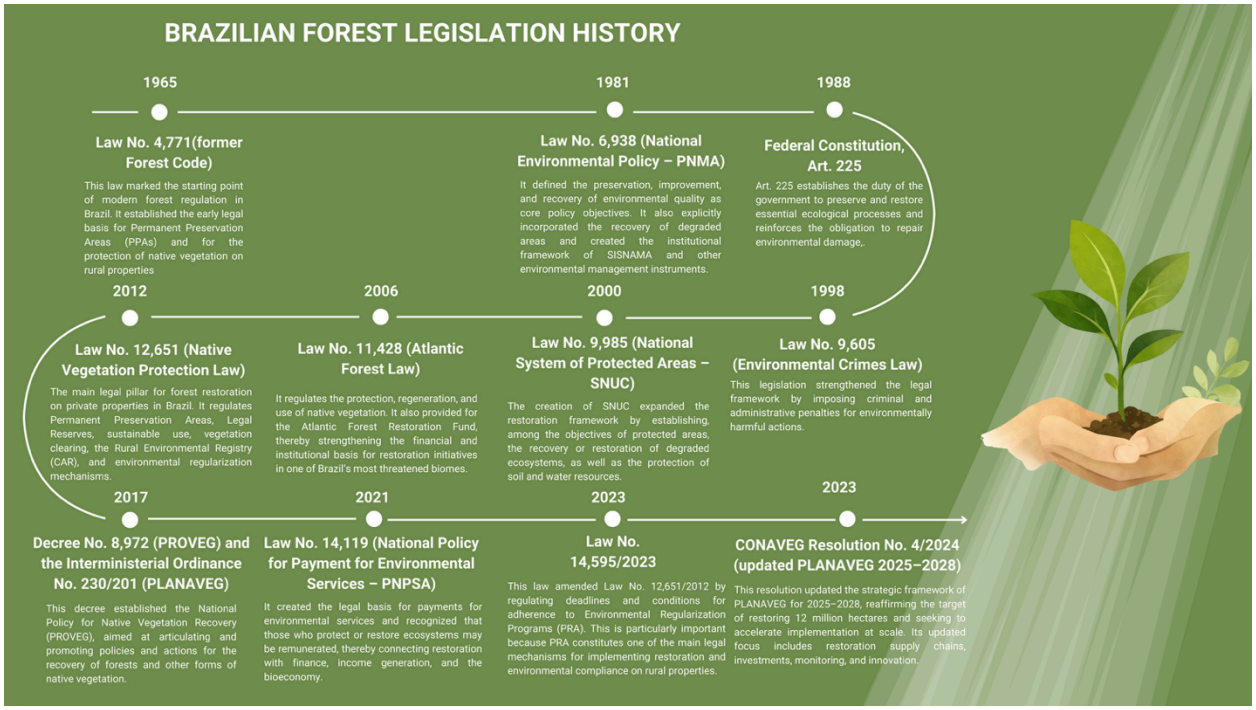

Figure 6. Timeline of the main Brazilian policy instruments that have shaped and supported ecosystem restoration in the country.

The Brazilian Forest Code serves as the core legal framework guiding ecosystem restoration efforts in Brazil. This law outlines the main principles for safeguarding Brazil's native vegetation, including the consolidation of two important mechanisms: the Permanent Preservation Areas (PPAs) and Legal Reserves (LRs) (Fig. 7). PPAs are protected areas, whether still covered by native vegetation, that are intended to safeguard water resources, landscape stability, biodiversity, soil protection, and human well-being (Fig. 7). They typically include environmentally sensitive areas such as riparian zones, springs, steep slopes, and hilltops. LRs, in turn, are areas located within rural properties that must be maintained under native vegetation to ensure the sustainable use of natural resources, support ecological processes, conserve biodiversity, and protect native fauna and flora (Fig. 7). Unlike PPAs, which are primarily associated with environmentally fragile areas, LRs play as a broader legal requirement for maintaining native vegetation within the productive landscape.

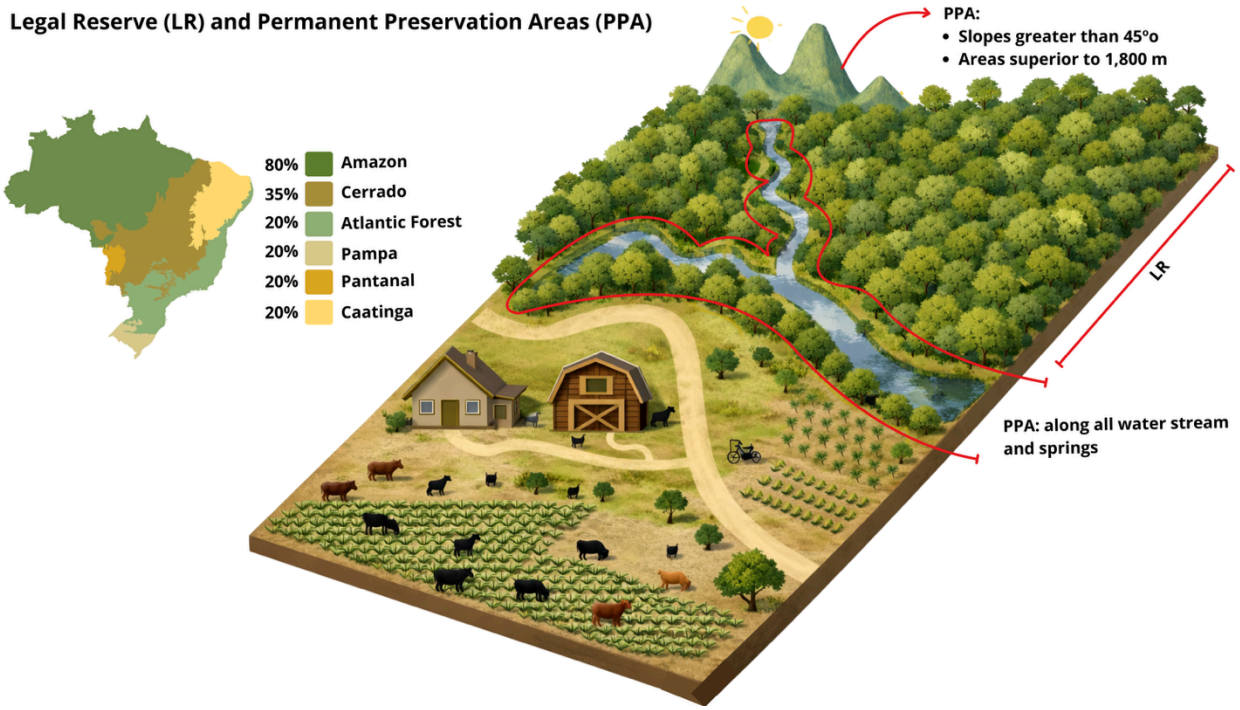

Figure 7. Illustrative representation of the two main mechanisms established by the Brazilian Forest Code for native vegetation protection and restoration in rural properties: Permanent Preservation Areas (PPAs), and Legal Reserves (LRs).

The legal requirement for LRs varies between 20-80% of area according to the property's location and Brazilian biome, thereby rural properties must maintain 80% of native vegetation when located in forest areas within the Legal Amazon, 35% when located in Cerrado areas within the Legal Amazon, and 20% when located in grassland areas within the Legal Amazon or in all other regions of the country (Fig. 7). All together, these policies are directly linked to restoration efforts in Brazil because deficits in APPs and LRs create environmental liabilities that must be addressed through different restoration methods such as natural regeneration, active restoration (i.e., mixed native species planting), or compensation, within the framework of the Brazilian Forest Code and the Environmental Regularization Program (PRA). The law explicitly states that every rural property must maintain native vegetation as LR, and it requires the restoration of illegally deforested LR areas. At the same time, unlike the APPs, LRs are not intended to be strictly set aside from economic use. The Forest Code (Law No. 12,651) expressly allows their sustainable economic use through forest management, including commercial production of timber and non-timber forest products subject to authorization and ecological safeguards. Thus, the Legal Reserve is a particularly important instrument in Brazil because it combines restoration obligations with the possibility of long-term productive use, provided that such use remains compatible with biodiversity conservation and the maintenance of native vegetation.

In recent years, Brazil has supplemented the legal structure of the Forest Code with other policy instruments to expand ecosystem restoration and support its ambitious restoration

goals. A key achievement was the Decree 8,972/2017, which established the National Plan for the Recovery of Native Vegetation (PLANAVEG, in Portuguese). The plan reaffirms the common national goal of recovering 12 million hectares of native vegetation by 2030 and links this target to the implementation of public policies, financial incentives, markets, technologies, and good agricultural practices. (Fig. 6). Another important advance is the recent creation of economic instruments associated with restoration initiatives. For instance, the Law 14,119/2021 established the National Policy on Payment for Environmental Services, creating a formal legal framework to compensate landowners for conserving and restoring forests, as well as for maintaining the ecosystem services these areas provide. More recently, the Law 15,042/2024 established the Brazilian Greenhouse Gas Emissions Trading System, which creates and regulates a carbon market in Brazil.

3.3. Current ecosystem restoration goals, priorities, and activities in Brazil and southern Bahia

Brazil has committed to restoring millions of hectares of native vegetation by 2030 as part of its National Determined Contribution (NDC) under the Paris Agreement, reflecting the country's effort to restore ecosystem at planetary scales (Crouzeilles et al., 2019). More recently, Brazil has refined its restoration agenda through PLANAVEG 2025–2028, reaffirming its commitment to restore 12 million hectares of native vegetation by 2030 while providing a clearer roadmap of the strategies, policy instruments, and implementation pathways required to achieve this target (Fig. 6). The updated PLANAVEG 2025-2028 reframes this commitment and organizes it into three main arrangements to facilitate Brazil to achieve its ambitious targets on time, as follows: 9 million hectares associated with Forest Code compliance in PPAs, LRs, and restricted-use areas; 2 million hectares in public and collective lands, including protected areas and Indigenous territories; and 1 million hectares in low-productivity rural lands through productive restoration models such as agroforestry, crop–livestock–forest integration, and native-species silviculture. Even so, the key question is no longer whether Brazil has a restoration target, but whether current progress and methods are sufficient to meet its commitments by 2030 target. During the 2025 United Nations Climate Change Conference (COP30), the Ministry of the Environment and Climate Change (MMA) announced that Brazil had 3.414 million hectares of native vegetation undergoing restoration by late 2025 (MMA, 2025). Although this represents an important progress, it still corresponds to only about one third of the Brazil's NDCs, meaning that a substantial gap remains to be closed before the 2030 deadline.

On the other hand, ecosystem restoration efforts in Brazil have involved not only government action but also significant contributions from non-state coalitions and restoration networks. In the Atlantic Forest, the Atlantic Forest Restoration Pact (PACTO, in Portuguese) emerged in 2009 as a bottom-up, multi-stakeholder movement bringing together NGOs (non-governmental organizations), governments, private companies, and research institutions around the goal of restoring 15 million hectares by 2050 (Crouzeilles et al., 2019; Toto et al.,

2025). The PACTO is especially relevant because it shows that restoration in Brazil has advanced not only through government action, but also through coordinated action by civil society and cross-sector partnerships. The PACTO also pledged to restore 1 million hectares toward the 2020 Bonn Challenge (Crouzeilles et al., 2019). Recent reports indicate that the PACTO now brings together more than 300 stakeholders and has facilitated the restoration of over 113,000 hectares, with an additional 740,000 hectares in process of recovery across the entire Brazilian Atlantic Forest (Toto et al., 2025). The restoration efforts supported by PACTO throughout the Brazilian Atlantic Forest have produced meaningful impact with an increased restored forest cover of about 10–20% (Toto et al., 2025).

In southern Bahia, ecosystem restoration has been promoted through complementary approaches that combine landscape-scale ecological corridors, agroforestry systems, and long-term private conservation initiatives. As an example, the Institute for Ecological Research (IPÊ, in Portuguese) recently launched the restoration of an ecological corridor across Prado, Porto Seguro, and Itamaraju municipalities as part of the Central Atlantic Forest Corridor strategy (IPÊ, 2025a). This initiative aims to restore 111 hectares by 2028, including 91 hectares through forest restoration and 20 hectares through agroforestry and silvopastoral systems, with the major goal of reconnecting 49,000 hectares of landscape encompassing the Descobrimento National Park, the Monte Pascoal Historic and Natural Park, and two Indigenous territories (IPÊ, 2025a). By late 2025, more than 6,000 seedlings had already been planted across 12 ha through the IPÊ initiative in southern Bahia, and the short-term target was to restore 50 hectares in PPAs and LRs. The initiative also marks the development of restoration supply chains and the strengthening of strategic partnerships with organizations such as Primaflora, while supporting local capacity building through training actions associated with the Prospera and Environmental Leadership Training Initiative (ELTI) projects (ELTI, 2025; IPÊ, 2025b).

Another key example in southern Bahia is the Arboretum program, which functions as a regional restoration infrastructure rather than simply a planting initiative. It was created to address technical and logistical bottlenecks across the restoration chain in southern Bahia, the program supports conservation and restoration through integrated seed, seedling, planting, and knowledge-generation networks (Arboretum, 2025). Its Hiléia Seed Network brings together more than 40 collectors from seven traditional rural communities, while its seedling network includes four nurseries and a central nursery, supporting the production of more than 500 native forest species, including rare, endemic, and threatened taxa (Arboretum, 2025). Beyond supplying restoration inputs, the program also develops arboreta for silvicultural research, seed banking, and genetic conservation, and implements restoration through both agroforestry systems and high-diversity native species plantings. Other recent initiatives further demonstrate the commitment to ecosystem restoration in southern Bahia, including the Cacau and Florestas project, which targets 2,900 hectares of restoration, and the Maturembá corridor project, which combines forest restoration, ecological connectivity, and Indigenous participation in the southern Bahia landscape (Arboretum, 2024). Another example is the Michelin Ecological Reserve in Bahia, that stands out as a compelling successful example of long-term private-sector engagement in Atlantic Forest conservation and restoration,

protecting 3,950 hectares of forest while combining forest protection, ecological restoration, scientific research, environmental education, and ecotourism. The reserve was recognized by the World Business Council for Sustainable Development as a global reference case in environmental restoration.

Looking at the future, the main challenge and next steps for Brazil are to accelerate implementation, secure the long-term permanence of restored areas, strengthen monitoring systems, expand restoration supply chains, and mobilize sufficient public and private finance to close the remaining gap by 2030. Only through the effective engagement of multiple stakeholders, including governments, nonprofit organizations, research institutions, local communities, and the private sector, will Brazil be able to meet such ambitious targets. This will also require overcoming persistent barriers, particularly limited funding, technical and logistical bottlenecks, and the need to align ecological and socioeconomic dimensions of restoration.

3.4. Mapping key private sector involvement in ecosystem restoration in southern Bahia

Southern Bahia provides an important setting for understanding how private-sector actors can contribute to ecosystem restoration in a working landscape. In this context, the private sector should not be treated as a single category. It includes large forestry companies, agribusiness firms, restoration enterprises, investors, and companies experimenting with production models that incorporate native species and biodiversity goals. The central question is therefore not simply whether the private sector is involved, but how different firms are already participating, what incentives shape their engagement, and how those efforts relate to broader restoration dynamics in southern Bahia.

Perhaps the most visible group consists of large landholding forestry companies, such as Veracel and Suzano. Veracel's 2025 public forest stewardship plan presents the company not only as a pulp producer, but also as a major landowner managing a mosaic of planted forests, legal reserves, permanent preservation areas, and protected native vegetation in southern Bahia. The company reports a total area of 237,513 hectares in Bahia, of which more than 111,000 hectares are not intended for planting and are instead designated as legal natural reserves, permanent preservation areas, the Veracel Station reserve, and other protected areas (Veracel, 2025). Suzano has adopted a comparable landscape scale approach through its participation in large scale native forest restoration initiatives in southern Bahia. In partnership with Biomas, a restoration company backed by major Brazilian corporations, Suzano is supporting the restoration of approximately 1,200 ha of Atlantic Forest. This initiative forms part of a broader corporate strategy to restore degraded lands, generate ecosystem services, and finance restoration through long term carbon credit generation, while explicitly situating restoration within operational forestry landscapes rather than treating it as an isolated compensatory activity.

Together, these cases show that the forest sector's contribution to restoration in southern Bahia is not limited to isolated planting projects. Large forestry firms can shape restoration by

allocating land use, planning ecological corridors, protecting remnant native vegetation, and managing fragmented landscapes in the long term. Both Veracel's stewardship framework and Suzano's engagement in large scale restoration projects explicitly position corporate forest operations within one of the most vulnerable and biodiversity rich regions of the Atlantic Forest, framing private landholdings as key arenas for reversing regional degradation while maintaining certified forest management practices and economic viability.

A second actor group consists of specialized restoration companies and firms linked to carbon markets. These actors are helping create a more explicit restoration economy in Brazil. In July 2025, re.green announced that Nestlé had selected the company as its technical partner to restore 2,000 hectares of Atlantic Forest in cocoa- and coffee-producing landscapes in southern Bahia. Both re.green's account of the initiative and Reuters' reporting present the project as part of a wider corporate effort to support more resilient supply chains while advancing restoration and climate goals (re.green, 2025; Reuters, 2025). This model broadens the range of private actors involved in restoration. It introduces financing logics that differ from more traditional compliance- or philanthropy-driven approaches, including long-term restoration contracts, carbon-linked expectations, and supply-chain risk management. It also suggests that restoration in southern Bahia is increasingly being viewed not only as an environmental obligation, but also as part of wider corporate strategies around sourcing, risk, and long-term land stewardship (re.green, 2025).

A third group includes firms exploring productive restoration through native-species silviculture. These businesses are relevant because they test whether restoration can be combined with long-term economic returns from biodiverse forestry systems. Symbiosis is one of the clearest examples in this space. The company emphasizes a model that links restoration and conservation objectives with the production of high-value native timber, while also investing in seed collection, genetic diversity, and the biological inputs needed to sustain restoration over time (Apple, 2024). For southern Bahia, this is important because it suggests that restoration need not always be framed as land use without productive value. Native-species silviculture may offer one pathway for making restoration more economically viable for investors and landholders, especially where mixed-use land management models are more feasible than strict set-asides. Although such approaches will not be suitable in every context, they widen the range of private-sector engagement beyond legal compliance, philanthropy, or carbon finance alone.

These company-level efforts also operate within a broader enabling environment shaped by collaborative initiatives, most notably the Atlantic Forest Restoration Pact and other regional restoration initiatives. This institutional context matters because it shows that private-sector engagement in restoration is not occurring in isolation. Rather, it is developing within a wider field of technical networks and partnerships to connect restoration practice across the biome. Recent peer-reviewed evidence reinforces the significance of this setting, where measurable positive effects of this institutional articulation turned into higher forest recovery of participating private lands, concluding that large-scale restoration on private land is possible,

although outcomes depend strongly on institutional support and the economic attractiveness of competing land uses (Toto et al., 2025).

In conclusion, private-sector engagement in southern Bahia can be understood through several overlapping functions: landscape stewardship by large forestry companies; restoration delivery and finance by specialized enterprises; and productive restoration through native-species silviculture. This diversity is important because it shows that restoration is already being linked to multiple business strategies, including land management, supply-chain resilience, carbon finance, and sustainable production systems. For policymakers, the key consideration is not to prescribe a single model, but to strengthen the enabling conditions that allow these different forms of engagement to contribute to credible, landscape-scale restoration. This includes clear standards for monitoring and outcomes, coordination among actors, and institutional support that aligns private initiatives with broader ecological and territorial objectives in southern Bahia (Pacto pela Restauração da Mata Atlântica, 2024).

4. Private sector engagement in ecosystem restoration in southern Bahia

Ecosystem restoration in southern Bahia is increasingly shaped by private sector engagement, reflecting both the ecological significance of the Atlantic Forest biome and the predominance of private landholdings in the region. A large share of land with restoration potential is managed by private actors, making restoration outcomes closely dependent on corporate strategies, investment decisions, and the policy and market conditions that influence land use on private properties.

This section examines private sector engagement in ecosystem restoration in southern Bahia through three dimensions: policy and institutional framework shaping private participation; potential forest based and non-forest private sector interests in restoration; and the opportunities and constraints associated with private engagement, including economic, governance, and ecological considerations. Together, these dimensions provide a basis for evaluating the conditions under which private actors can contribute to effective and durable restoration outcomes in the region.

4.1. Policy context for private sector engagement in ecosystem restoration in southern Bahia

Southern Bahia occupies a strategic position within Brazil's national and international restoration agenda. The region forms part of the Central Atlantic Forest Corridor, one of the most biodiverse and ecologically significant landscapes in the world, while also containing extensive areas of degraded land under private ownership with high potential for restoration. This combination of ecological importance and land tenure structure places private actors at the center of restoration outcomes, making the policy and institutional context for private sector engagement particularly consequential.

Ecosystem restoration in southern Bahia is structured by a layered legal and policy framework that combines federal environmental law, biome specific regulation, and state level implementation instruments (Brock et al., 2021; De Andrade Moreira et al., 2024). Together, these policies establish restoration as a mandatory component of land use governance rather than a voluntary conservation activity. In a region where most land suitable for restoration is privately owned and embedded in productive landscapes, this framework plays a decisive role in shaping incentives, constraints, and the scale at which restoration can occur.

At the federal level, the central policy instrument is the Native Vegetation Protection Law (Law No. 12,651/2012), known as the Brazilian Forest Code. The Forest Code mandates the protection and recovery of native vegetation on rural properties through two legal categories: Permanent Preservation Areas (APPs) and Legal Reserves (RLs). APPs protect environmentally sensitive areas such as riparian zones and steep slopes, while Legal Reserves require landowners to maintain or restore a minimum proportion of native vegetation within their properties. In the Atlantic Forest biome, including southern Bahia, these requirements are especially significant due to the biome's high degree of fragmentation and the density of rural properties (Benzeev et al. 2023).

From a policy perspective, the Forest Code is designed as a compliance-based restoration regime. Landowners with vegetation deficits must enroll in the Environmental Compliance Program (Programa de Regularização Ambiental – PRA), committing to restore, regenerate, or compensate for degraded areas within defined timelines. The Rural Environmental Registry (Cadastro Ambiental Rural – CAR) functions as the core administrative tool, linking spatial land use data to legal obligations. By embedding restoration within land registration and environmental licensing systems, the Forest Code ties compliance to access to credit, permits, and legal security, using regulatory leverage rather than direct financial incentives as its primary enforcement mechanism.

In the Atlantic Forest, this federal framework is reinforced by the Atlantic Forest Law (Law No. 11,428/2006), which introduces stricter controls on land use change and restoration than those applied in other biomes. The law reflects a policy decision to treat the Atlantic Forest as a biome of special public interest, emphasizing principles such as the socio-environment function of property, precaution, and intergenerational equity. For southern Bahia, this means that restoration obligations are not only broader in scope but also subject to higher scrutiny in licensing and land use planning, increasing the regulatory weight of restoration decisions within productive landscapes.

Implementation of these federal policies in southern Bahia occurs primarily through state level regulation, most notably Decree No. 15,180/2014, which governs forest management, conservation of native vegetation, and environmental regularization in the State of Bahia. This decree establishes the State Forestry Register of Rural Properties (Cadastro Estadual Florestal de Imóveis Rurais – CEFIR) and the state PRA, aligning Bahia's systems with the federal CAR/PRA framework while detailing procedures, technical criteria, and enforcement mechanisms. In policy terms, the decree operationalizes restoration law by translating federal mandates into administrative routines overseen by state environmental authorities.

The Bahia framework emphasizes environmental regularization as a prerequisite for lawful land use. Registration in CEFIR and adherence to PRA commitments are required for environmental licensing and regulatory stability. This approach strengthens legal clarity but also reveals implementation challenges. Assessments of PRA implementation in Bahia indicate frequent delays in restoration schedules, inconsistent interpretation of compliance deadlines, and limited technical capacity among landholders, particularly small and medium producers. These challenges illustrate a broader policy tension: while restoration obligations are legally clear, the capacity to implement them equitably and effectively remains uneven (Benzeev et al. 2023).

Recognizing these constraints, Bahia has increasingly sought to complement its regulatory approach with broader policy instruments. Programs such as Bahia + Verde reflect an effort to integrate restoration into climate policy, biodiversity conservation, and sustainable development strategies (Bahia, 2023). These initiatives incorporate tools such as environmental compensation, conversion of environmental fines, and strategic planning for carbon stocks and water resources. Although they do not alter core legal obligations under federal and state law, they represent a policy shift toward combining command and control regulation with financial and institutional mechanisms that can lower barriers to compliance and improve restoration quality.

4.2. Potential forest and non-forest private sector interests in ecosystem restoration in southern Bahia

Ecosystem restoration at planetary scales will require significant investment. Although several nations have committed to restoring large amounts of degraded ecosystems worldwide, significant challenges remain in turning pledges into effective on the ground action, especially considering high restoration costs, and lack of investment. (Strassburg et al., 2019). The global costs to meet current international restoration commitments are estimated at between USD 311 billion to USD 692 billion, representing approximately 0.38–2.65% of annual global GDP (Verhoeven et al., 2024). These costs are particularly difficult for less developed countries, which have fewer financial resources but have pledged to restore larger areas (Fagan et al., 2020). Consequently, public funding alone is unlikely to be sufficient to meet ambitious restoration targets, making private sector investment essential for scaling up ecosystem restoration. In this context, both the forest and non-forest private sectors will play a critical role in supporting restoration, not only by mobilizing financial resources, but also by creating market opportunities for goods, services, and business models that can enhance the economic viability and persistence of restored landscapes (WRI, 2017).

Within the forest sector, the timber market is probably one of the best opportunities for the private sector in ecosystem restoration, in addition to being a forest product with a clear market demand. In the last years, restoration science and practice have created and tested a range of restoration models capable of delivering both ecological (e.g., biodiversity, and climate mitigation) and socioeconomic benefits (e.g., income generation, job creation). From this perspective, ecosystem restoration has now become a profitable land use option, thereby

attracting private investors in innovative multifunctional restoration approaches that integrate ecological with socioeconomic outcomes (Brancalion et al., 2020; Santos et al., 2026; Zhang et al., 2025) (Fig. 8). For instance, a previous study conducted in Bahia indicates that intercropping exotic eucalypts with mixed native species plantations is sufficient to offset 44%–75% of restoration costs through the eucalypti's timber sales, while at the same time eucalypts can serve as a transitional component in restoration plantings, increasing biomass accumulation without compromising native species regeneration (Brancalion et al., 2020). Since Brazil's forest legislation allows the sustainable management of LRs (Brasil, 2012), this reforestation model intercropping a commercially valuable exotic tree species with native species may be a useful alternative to generate revenue and offset restoration costs.

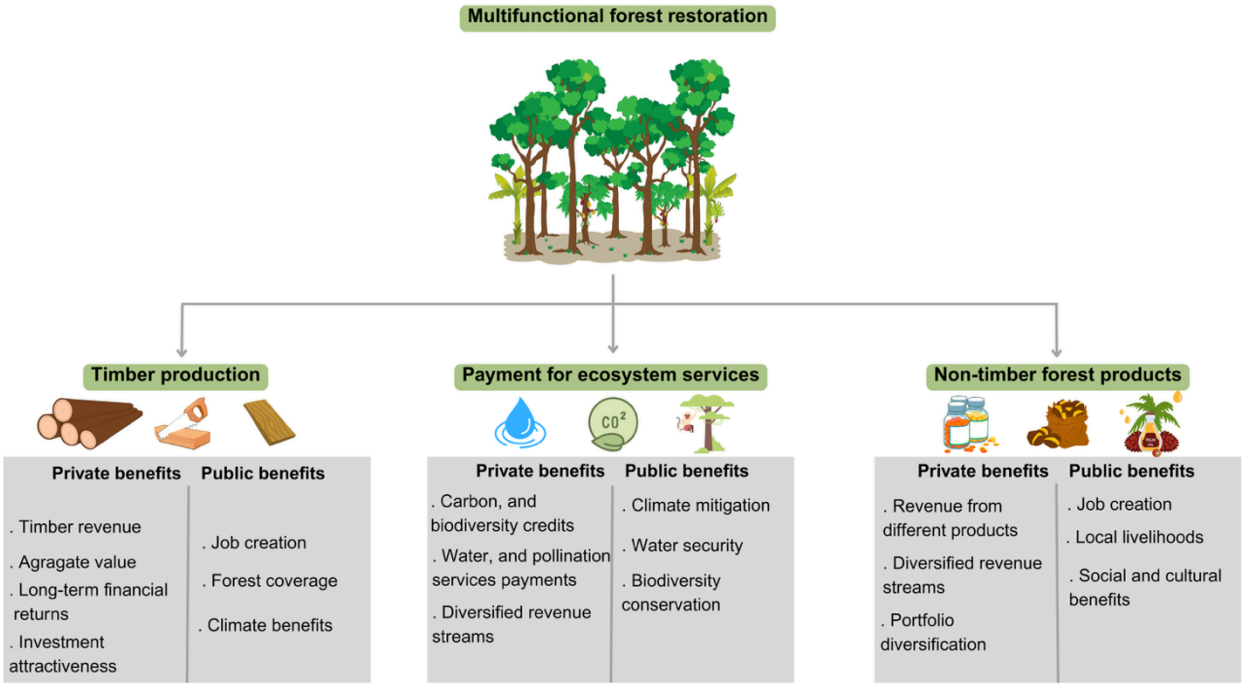

Figure 8. Conceptual representation of multifunctional forest restoration, highlighting three main pathways through which restored forests can generate private and public benefits.

Beyond eucalypt-based systems, integrating native silviculture in reforestation plantations has attracted more attention in the last years. Several native Brazilian timber species are recognized for their high-quality wood properties and uniqueness aesthetic, which contribute to their high economic value. In view of this, interest in producing these species through restoration plantings has increased as timber harvesting from native forests is prohibited for many of them due to their threatened conservation status (de Lima et al., 2024). The company Symbiosis is a leading example of restoration-oriented private investment in southern Bahia, based on a restoration model integrating high-value native timber production. Rather than treating restoration as a purely conservationist or compliance-driven activity, the company frames it as a productive land-use strategy built around high-value Brazilian native timber (e.g., Cariniana

legalis (Mart.) Kuntze, and Dalbergia nigra (Vell.) Allemão ex Benth.), large-scale seedling production, and genetic improvement. Symbiosis presents this model as a scalable alternative to both illegal logging and conventional monocultures. As an example of cross-sector partnership, Symbiosis has been supported by BNDES (National Bank of Economic and Social Development) with an investment of R$ 77.6 million by the Climate Fund financing for a Symbiosis project in southern Bahia to plant 1,500 hectares of productive forests with native Atlantic Forest species, aimed at supplying sustainable tropical timber and recovering native vegetation in the region. In the same way, Re.green company, another Brazilian large-scale private restoration company that positioned high-value native timber production as a key component of its restoration strategy, has also demonstrated how ecosystem restoration in southern Bahia can attract the interest from the non-forest private sector. In 2025, the company partnered with Nestlé to restore 2,000 hectares of Atlantic Forest in cocoa- and coffee-producing landscapes in the region. In parallel, BNDES also announced a funding of R$ 186.7 million for Re.green projects in the Amazon and Atlantic Forest, including 2,000 hectares in Bahia. These are some examples that suggest how ecosystem restoration in southern Bahia is increasingly being seen not only as a conservation agenda, but also as a financial opportunity for the private sector and an important mechanism that can make restoration efforts achieve larger scales.

Beyond native timber production as a forest commodity, carbon markets are becoming another major pathway through which restoration businesses can attract and engage private investors. In these situations, restored forests are valued for their ability to additionally remove carbon dioxide from the atmosphere. As a case of study, Re.green's financial strategy is mainly centered on the sale of carbon credits from their restored areas as a means of making ecosystem restoration financially viable, while generating revenue. Recently, Re.green has made an agreement with Microsoft that involves the delivery of approximately 3 million tons of carbon removal credits over 15 years, while its partnership with Nestlé in southern Bahia is expected to generate around 880,000 high-integrity carbon credits over 30 years. Symbiosis has also a similar business strategy by combining the selling of different nature goods (e.g., native timber, and carbon credits) from restored areas, as the company is part of Apple's Restore Fund, an initiative designed to scale high-quality nature-based carbon removal while also delivering biodiversity and local livelihood benefits.

In addition to carbon credit markets, biodiversity credits are emerging as a complementary frontier for financing ecosystem restoration (Barbosa et al., 2025). Unlike carbon credits, which monetize quantified climate mitigation outcomes, biodiversity credits are being developed as tradable assets linked to verified gains in ecological condition, habitat quality, and species conservation, thereby creating a mechanism to reward restoration projects for environmental values that are not captured by carbon alone (Antonelli et al., 2024; Barbosa et al., 2025). In 2024, Verra launched its Nature Framework, an asset framework methodology under Verra's Sustainable Development Verified Impact Standard (SD VISta) Program, to quantify biodiversity outcomes and generate Nature Credits with the certification process become open to all eligible projects from January 2026 (VERRA, 2024). Although still at an early stage of development, the biodiversity credit market is growing rapidly and may become an important

source of revenue for restoration projects. For southern Bahia, this is particularly relevant because the region is recognized as an important center of endemism and biodiversity within the Atlantic Forest, a biome globally known for its exceptional species richness and high degree of threat (Murray-Smith et al., 2009; Thomas et al., 1998). In this sense, biodiversity credit markets may be particularly promising in this region, where the additionality of restoration efforts tends to be greater, potentially generating both higher ecological gains and greater economic value (Brancalion et al., 2019). This, in turn, constitutes another meaningful opportunity for the forest and non-forest private sectors.

Finally, restoration programs can also generate a wide range of non-timber forest products that create additional economic opportunities and strengthen private sector interest in restoration. Non-Timber Forest Products (NTFPs) are particularly relevant because they can provide recurrent income, diversify production systems, stimulate local value chains, and promote technological development in processing, commercialization, and product innovation (Afonso, 2022; Kar and Jacobson, 2012). There are several NTFPs that can be harvested in reforestation programs (Krainovic et al., 2023; Santos et al., 2023). Some examples of success cases of NTFPs production in different restoration approaches are already known (Araujo-Santos et al., 2025; Krainovic et al., 2023; Medeiros et al., 2024). Among the NTFPs already produced in southern Bahia, latex extracted from *Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg., a tree species native to Brazil, stands out as one of the main NTFPs extracted in the region. Another is piassava obtained from Attalea funifera Mart., an endemic Brazilian palm and a traditional forest product of the region that supports local livelihoods (Araujo-Santos et al., 2025; Medeiros et al., 2024).

4.3. Potential opportunities and constraints of private sector engagement in ecosystem restoration in southern Bahia

Private sector actors have significantly contributed to ecosystem restoration in southern Bahia. For example, one study that analyzed the relationship between property size, forest cover, and forest restoration teased out that efforts by eucalyptus companies to conduct ecological restoration accounted for large natural forest gains between 1985 and 2019 (Benzeev et al., 2023). Although this study did not directly measure restoration activities conducted by private sector actors versus other types of landowners, the authors determined that the spatial locations with high levels of forest restoration were also areas with a high concentration of private sector actors conducting ecosystem restoration projects. Specifically, some companies may have conducted large areas of land restoration in their degraded areas to achieve Forest Stewardship Council (FSC) and Programme for the Endorsement of Forest Certification (PEFC) certification and to comply with the Native Vegetation Protection Law. Accordingly, this study demonstrates that private sector actors have the ability and potential to conduct ecosystem restoration at large spatial scales. Although much ecological restoration by the private sector has taken place because of regulations and requirements to conduct restoration (Pinto et al., 2014), restoration has taken place, nonetheless.

The benefit of private sector actors in contributing to the goals of ecosystem restoration is that the private sector already has the installed capacity, and large property sizes to contribute to large-scale projects. In contrast, smaller-scale property owners can only contribute a fraction of the amount. In the context of southern Bahia, private sector actors have already contributed significantly to a large-scale project to restore land between national parks in the Monte Pascoal-Pau Brasil Ecological Corridor. This project has successfully restored hundreds of hectares of forest on company-owned properties. The private sector has also made a large contribution to jobs for ecosystem restoration in Brazil, contributing 37% of all temporary and permanent jobs in restoration (Brancalion et al., 2022).

When thinking of the environmental damage caused by private sector actors in southern Bahia, a large concern is the impact on water supply of the estimated 658,000 hectares of large-scale eucalyptus and timber plantations planted by the private sector. There are examples showing that Eucalyptus may lessen water supply as well as create challenges for local people, which could have detrimental impacts for landowners and communities who depend on water supply in the region (Desta et al., 2023). Rather than continuing to diminish water resources, private sector actors could be an important part of the environmental solution, specifically targeting actions to restore water supply as an essential outcome of environmental projects. Ecological restoration is a process that not only focuses on planting trees and seedlings, but instead encompasses entire ecosystems, thus prioritizing water supply, water quality, and river health alongside the land area of planted trees and biodiversity.

The effects of eucalyptus plantations on water supply have been particularly harmful for several quilombola communities in the extreme south of Bahia. Clashes between companies and communities over rights to land has resulted in a context of conflict, violence, and death threats. Rather than continuing to fight against communities, private sector actors could ask communities what they are looking for, and could assist communities achieve their principal demands, such as land rights and guaranteed access to sustainable livelihoods into the future. Many communities are seeking to conduct ecological restoration in their own communities and on their own terms (Benzeev et al., 2025), and the private sector could support communities in technical capacity in accomplishing their future goals to compensate for these ecological and social harms. In this way, ecosystem restoration becomes a social-environmental endeavor, benefitting environmental as well as social outcomes.

Private sector actors could benefit by forming ethical collaborations with local communities. One example of a project that has done this well in Southern Bahia is the Southern Bahia People and Nature Fund (Brazilian acronym: FASB) – a socio-environmental organization that has invested in 45 restoration projects in Southern Bahia for restoring landscapes and contributing to sustainable livelihoods for local communities. Compared to local community partnerships that create stipulations for local communities, potentially requiring communities to forego certain rights to gain funding, FASB grants communities protagonism over their own ecological restoration projects. Although these projects require long-term relationships and trust-building, they have proven effective in the long term. The private sector could learn from

programs like FASB that enable local leadership, true participation, and protagonism, thus promoting a socially informed form of ecological restoration.

5. Conclusions

This background paper highlights ecosystem restoration as a pivotal response to accelerating deforestation, climate change, and biodiversity loss, with benefits that extend far beyond environmental recovery. While international initiatives and scientific evidence clearly demonstrate the transformative potential of restoration, significant gaps remain between ambition and implementation, particularly in financing, governance, and long-term monitoring. Bridging these gaps will require coordinated action across public and private sectors, strong engagement of indigenous peoples and local communities, and the scaling of landscape-based approaches that align ecological integrity with social and economic objectives.

In the case of southern Bahia, there is a robust and institutionally well-defined legal framework for ecosystem restoration. Anchored in the Brazilian Forest Code, strengthened by the Atlantic Forest Law, and operationalized through Bahia's regulatory instruments, it establishes restoration as a central component of land use governance. However, its effectiveness depends on how regulatory mandates are combined with implementation capacity, enforcement consistency, and supportive policy instruments. Southern Bahia illustrates both the strength of Brazil's restoration policy architecture and the need to evolve from a compliance focused model toward one that more effectively converts legal obligation into long term ecological recovery. In addition, southern Bahia offers a uniquely important but complex context for private sector engagement in ecosystem restoration. Emerging business models based on timber, carbon, biodiversity credits, and non-timber forest products demonstrate that restoration can align ecological goals with economic incentives. However, persistent challenges, including social conflicts, uneven implementation capacity, and historical inequalities affecting indigenous and quilombola communities, underscore that restoration cannot be framed solely as a technical or financial endeavor. Meaningful progress depends on coupling private investment and operational capacity with ethical collaboration, community leadership, and landscape scale approaches that integrate ecological recovery with social justice and long-term sustainability.

Finally, southern Bahia exemplifies both the promise and the complexity of scaling ecosystem restoration through private sector engagement in highly contested and biodiverse landscapes. The region's ecological importance, predominance of private landholdings, and long history of social and institutional mobilization make it a critical arena for testing how global restoration ambitions will be translated into concrete and durable outcomes.

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