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CLOSING THE GAPS IN ENVIRONMENTAL CRIME:

A Risk-Based Approach to Tackling Money Laundering in the Timber Supply Chain

Table of Contents

1. Introduction	1
2. Detecting Risks of Illegalities in the Timber Sector	2
2.1. Conflicts of Interest Involving Environmental Officials Linked to Timber Companies.....	4
2.2. Fraud and Corruption in the Approval of Forest Management Plans	7
2.3. Illegal Logging and Timber Processing	11
3. Pilot Study in the State of Pará	13
3.1. Context	13
3.2. Public Data Collected and Processed.....	15
3.2.1 Limitations of the Public Servant Data and Corporate Records Used	17
3.3. Application of Risk Detection Techniques	18
3.3.1. Risk of Conflict of Interest.....	18
3.3.2. Risks of Fraud and Corruption in Forest Management Plan Approvals.....	24
3.3.3. Risks of Illegal Timber Harvesting and Processing	27
3.4. Summary of the Results of the Techniques Applied...	28
4. Conclusion and Recommendations	34
Key Recommendations	35
Endnotes	36

1. Introduction

The Amazon is at a decisive moment. Deforestation has already reduced a significant share of its original forest cover—estimates range from 13% to as much as one third¹—and most of this destruction is illegal. In Brazil alone, 91% of the deforestation recorded between 2023 and 2024 occurred without authorization.² If this trend continues, the forest will move closer to a point of no return, with irreversible consequences for climate regulation, the hydrological cycle, biodiversity, and the region’s socioeconomic stability.

Despite the scale of the crisis, environmental crime still does not occupy a central place in strategies to combat organized crime or in anti-money laundering (AML) systems.³ This disconnect represents a serious gap. Environmental crime has become a large-scale illicit activity: highly profitable, structured through organized networks, and marked by a low risk of accountability. Its viability depends on the systematic use of related crimes⁴—corruption, document fraud and falsification, and money laundering—embedded in otherwise legitimate supply chains.

The timber sector clearly illustrates this dynamic. Illegal logging does not operate outside the productive system; it operates through it. Forest management plans are manipulated, permits are issued under conflicts of interest, documents are falsified, and illegally harvested timber enters the formal market as if it were a legitimate product.⁵ Concealing the illicit origin of this environmental asset effectively amounts to a form of laundering—even if it is not always recognized as such by the institutions responsible for oversight.

Anti-money laundering systems, historically oriented toward financial flows associated with drug trafficking and terrorist financing, still lack tools specifically designed to address the complexity of illicit environmental supply chains. The absence of typologies and indicators focused on environmental crime

creates a regulatory gap that allows illicit revenues to be integrated into the formal market and the financial system with a low likelihood of detection. This omission weakens not only environmental policy but also the integrity of the AML system itself.

Investigating environmental crimes poses additional challenges. Unlike other illicit economies, these activities operate within formally regulated economic sectors—such as timber, gold, and cattle—where legal and illegal practices coexist. Identifying risks requires technical knowledge of sectoral regulations, permitting systems, enforcement mechanisms, and supply chains. Without specific methodologies, the AML system remains structurally ill-equipped to respond to this phenomenon.

Against this backdrop, the Igarapé Institute developed the present study with the aim of strengthening the AML system through the creation of techniques designed to identify risks of fraud, corruption, and money laundering in the timber sector. The proposed methodologies are aligned with the risk-based approach that underpins the AML system, enabling proportionate increases in scrutiny of individuals and legal entities with higher risk exposure.

The indicators developed are organized into three main categories: (i) identifying conflicts of interest between public officials and companies in the timber sector; (ii) detecting risks associated with fraud and corruption in the approval of forest management plans; and (iii) analyzing risks linked to illegal logging and timber processing. By structuring these dimensions, the study recognizes that environmental crime materializes within the functioning of the supply chain itself—and must therefore be addressed with tools capable of engaging with that reality.

To test the applicability of these techniques, the Igarapé Institute conducted a pilot study in the state of Pará. The exercise identified 125 public officials, 204 technical professionals responsible for signing forest management plans, 877 individuals and 116 legal entities holding forest exploitation rights, as well as 346 timber processing facilities with indications of high risk. The exercise demonstrates that it is possible to adapt the AML system to the specific characteristics of environmental crime and to expand its capacity for prevention and detection.

This report is organized into three sections. The first presents the conceptual and methodological foundations of the techniques developed. The second describes the results of the pilot test conducted in the state of Pará. The third brings together the conclusions and recommendations aimed at strengthening the institutional capacity of the AML system in addressing illicit environmental economies.

The Igarapé Institute would like to thank the members of the Technical Advisory Council, composed of representatives from the Basel Institute, the Center for Climate Crime Analysis (CCCA) – Brazil, the FACT Coalition, the Institute for Forest and Agricultural Management and Certification (IMAFLOA), and TRAFFIC, as well as a financial intelligence specialist and former member of a Financial Intelligence Unit in Peru (FIU). The contributions of this group were essential to ensuring technical rigor, methodological robustness, and practical alignment with the needs of institutions responsible for preventing and combating money laundering.

2. Detecting Risks of Illegalities in the Timber Sector

The risk detection techniques for fraud, corruption, and money laundering presented in this report focus on analyzing activities related to timber harvesting. The data were analyzed with the aim of identifying individuals and legal entities at risk of involvement in illegal practices within this supply chain.

This type of analysis makes it possible to detect transactions or actors with a higher likelihood of involvement in illegal activities. The probabilistic nature of risk assessment entails a degree of uncertainty: there may be no illegal conduct in cases classified as high risk, just as transactions or individuals not detected by the analysis may still be associated with illicit practices. Statistically, however, cases classified as high risk tend, on average, to show a greater likelihood of involvement in illegal activities than those assessed as low risk.

While the uncertainties inherent in risk assessment processes require trained professionals to interpret the results correctly, these techniques can be further refined to improve their accuracy, depending on the availability and combination of relevant data.

Relevant information can be drawn from different datasets. Among the key data needed to identify risks in the timber supply chain are detailed records of forest management plans, information on areas under legal protection, corporate registries, and data on public officials.

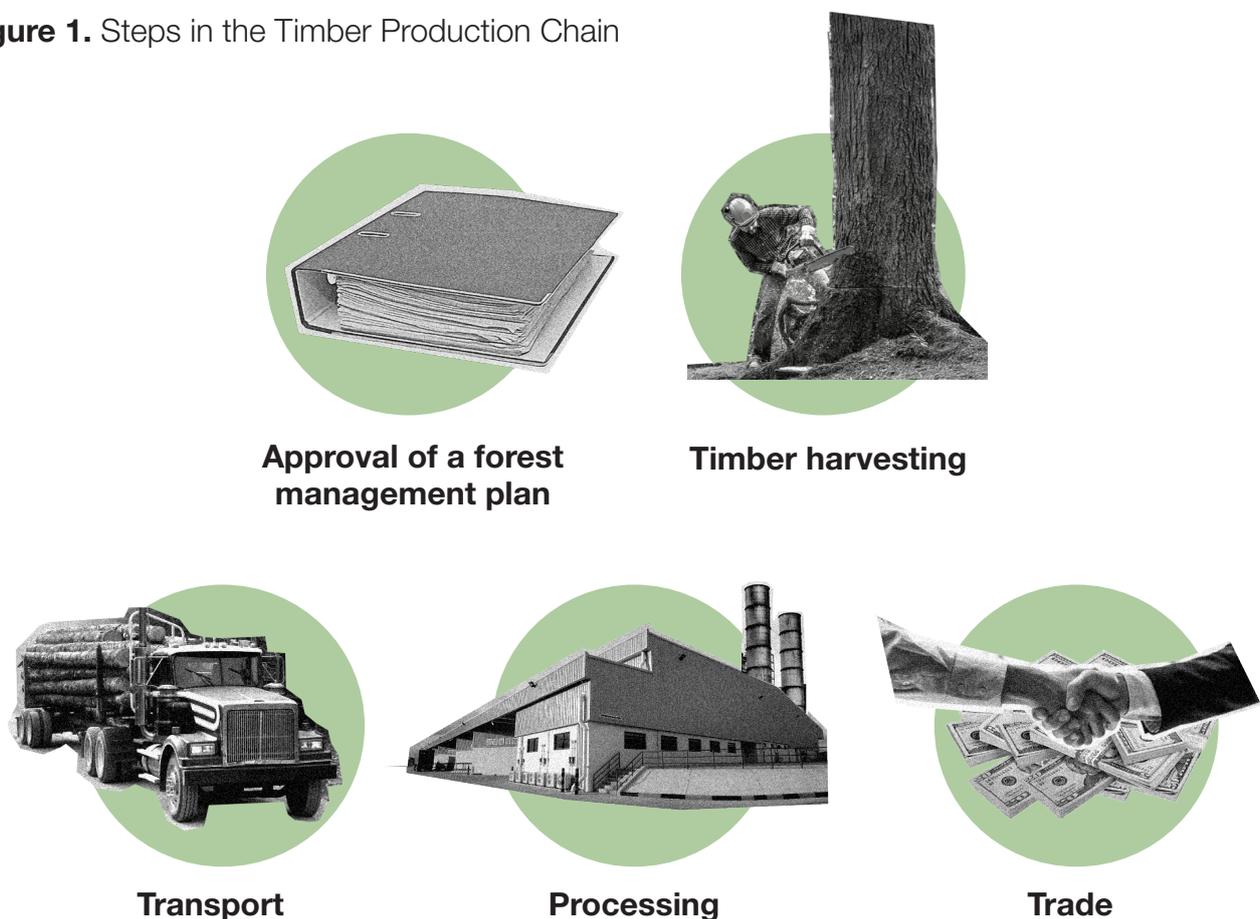
When analyzed in an integrated manner, this information can help financial institutions identify individuals and legal entities that warrant closer scrutiny of their accounts, while also supporting government oversight bodies in carrying out strategically targeted enforcement actions.

The risk detection techniques consider a range of behaviors that may indicate illegalities in timber harvesting, drawing on lessons learned by auditors, investigators, and researchers—some of which have been documented in studies conducted by the Igarapé Institute and its partners.⁶

Illegal practices within the timber supply chain leave traces. These may include the issuance of logging permits for volumes exceeding what would be expected for certain species or in areas where harvesting is prohibited, failure to comply with authorized conditions for harvesting, and processing operations that report artificially high timber yield rates.

In addition, direct or indirect association of public officials with timber companies indicates a serious risk of conflicts of interest that may facilitate corruption. Illegal practices occur at every stage of the supply chain, and risk analysis techniques can be applied across all of them.

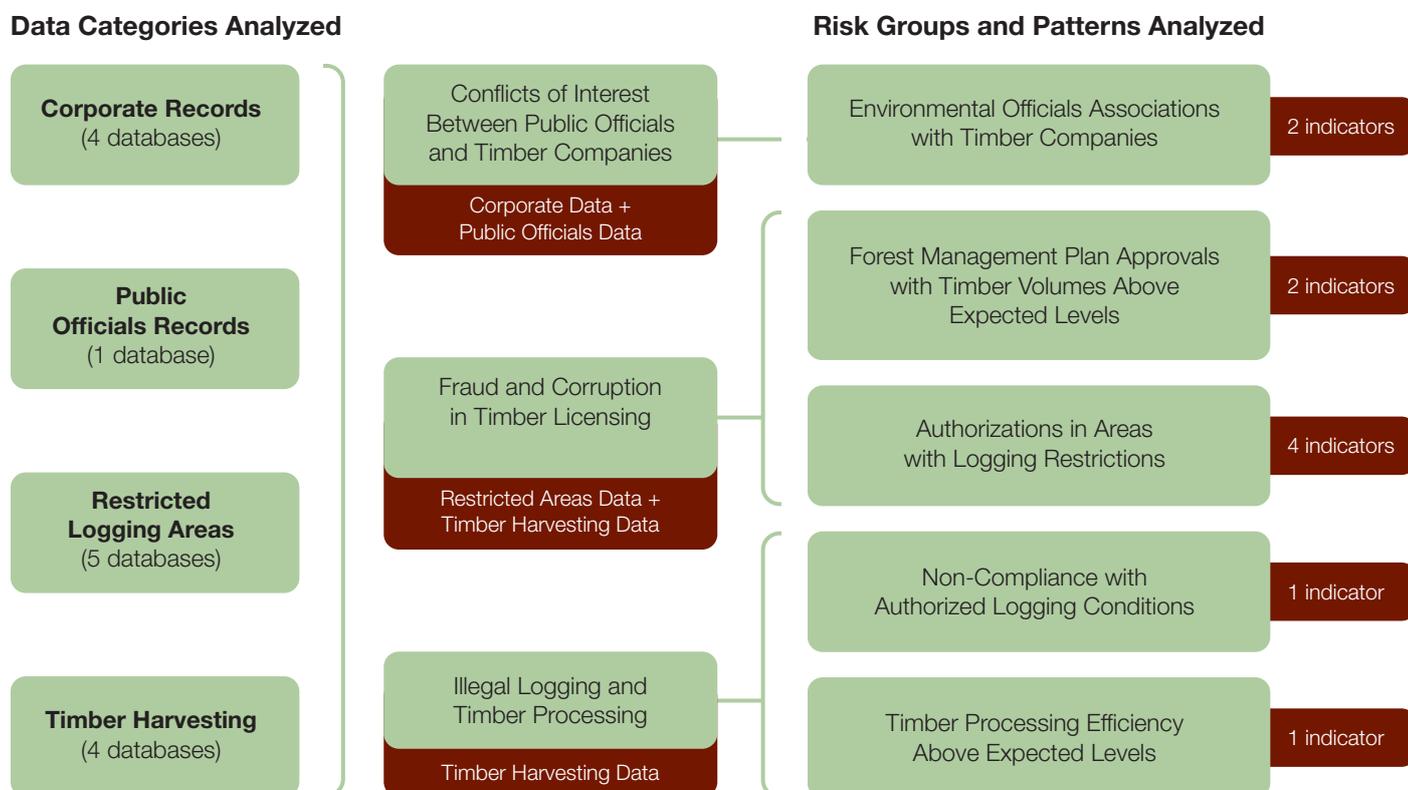
Figure 1. Steps in the Timber Production Chain



The risk detection techniques presented in this report focus on three risk groups: one related to conflicts of interest as a risk factor for corruption, and two associated with illegalities at different stages of the timber supply chain. These groups bring together 10 risk indicators, organized into five patterns, which point to a higher likelihood of illegality in timber harvesting, with varying degrees of uncertainty.

The indicators were developed using data from four different categories, as shown in the figure below.

Figure 2. Overview of the data analyzed and the risk areas examined



2.1. Conflicts of Interest Involving Environmental Officials Linked to Timber Companies

Conflicts of interest involving public officials represent an important risk factor for corruption and may lead to the misuse of public office in favor of private interests, although the existence of a conflict does not in itself constitute corruption.⁷ Identifying risks of conflicts of interest among public officials is essential to safeguarding public integrity.

Public officials at different hierarchical levels may expose the State to conflicts of interest risks. Those in higher-ranking positions are presumed to pose greater risks to public administration, as they exercise greater influence over public resources. Recognizing this risk, legislation such as the Brazilian

Conflict of Interest Law (Law No. 12,813/2013) establishes rules designed to safeguard integrity in public service.⁸

Law No. 12,813/2013 defines conflicts of interest in situations such as the existence of professional or commercial relationships with individuals or companies that have an interest in decisions made by the public official; engagement in activities incompatible with the duties of the office; favoritism toward companies in which the official, their spouse, or relatives up to the third degree hold an interest; and the receipt of gifts from individuals with an interest in the official's decisions, among other circumstances.

Developing indicators to detect patterns of conflict-of-interest risks among public officials poses significant challenges. These behaviors are often linked to corrupt practices and tend to occur discreetly. In addition, conflicts are frequently declared by the

officials themselves through a self-reporting system, without verification by another authority or the requirement of supporting documentation, which facilitates concealment or misrepresentation. This creates an additional challenge for state oversight bodies and financial institutions responsible for identifying such risks, whether among their own staff or their clients.

Different regulations seek to strengthen oversight in cases with a high risk of conflicts of interest. For example, Brazilian Financial Intelligence Unit (Coaf) Resolution No. 40 of November 22, 2021 establishes that the accounts of close relatives and “close associates”⁹ of Politically Exposed Persons (PEPs), as well as the accounts of the PEPs themselves, must be subject to enhanced scrutiny. In practice, this requires financial institutions, for example, to undertake efforts to identify close relationships involving public officials, despite the inherent difficulties in obtaining this type of information.

In this study, risks of conflicts of interest in the timber sector refer to an association between public officials from government agencies with environmental responsibilities and companies engaged in economic activities related to timber production.

A corporate association between a public official from an environmental authority and a timber company was defined as a situation in which a public official working in an agency with environmental responsibilities holds a position of partner or director of a company engaged in economic activities in the timber sector, either directly or indirectly through another person, as illustrated in Figures 3 and 4 and described in Table 1.

Conflicts of interest were characterized by the coexistence of conflicting interests within a given time frame, defined in this study as five years. Two indicators were developed based on publicly available data.

Figure 3. Direct corporate association



Figure 4. Indirect corporate association

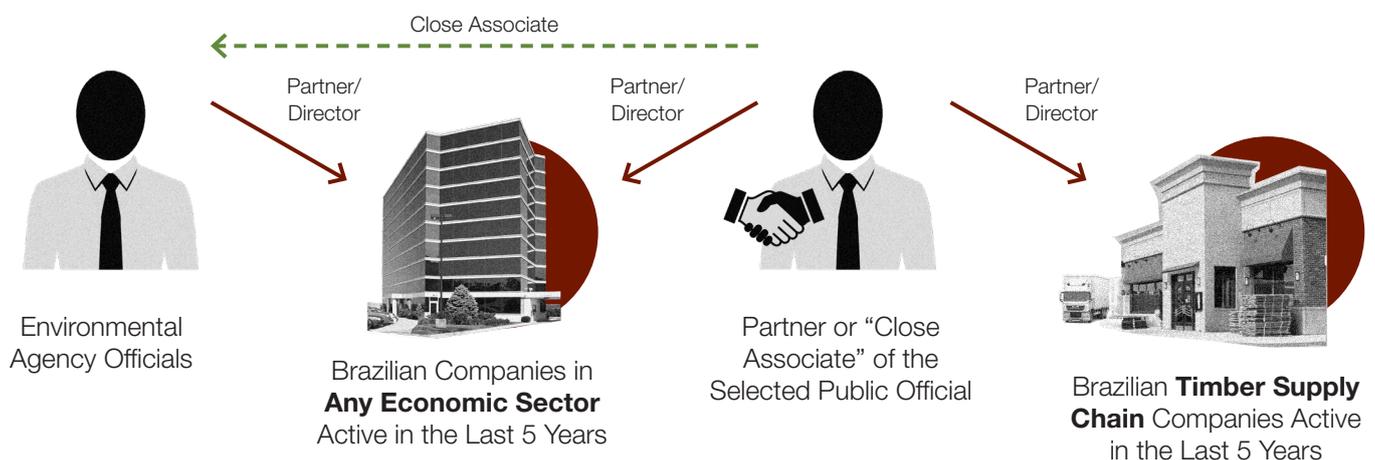


Table 1. Risk pattern and indicators of conflicts of interest involving public officials and timber companies

Risk Pattern	Indicator	Description
Corporate association between a public official from an environmental authority and a timber company	Direct link: A public official from a state agency with environmental oversight responsibilities is directly associated with a timber company	A public official working in a state agency with environmental oversight responsibilities is listed as a partner or director of a company engaged in economic activities in the timber sector, except for companies dissolved more than five years ago
	Indirect link: A public official from a state agency with environmental oversight responsibilities is indirectly associated with a timber company	A public official working in a state agency with environmental oversight responsibilities holds a corporate association with an individual who is a partner or director of a company engaged in economic activities in the timber sector, except for companies dissolved more than five years ago

A public official holding a direct or indirect ownership or board position in a company engaged in economic activities in the timber sector may or may not be the ultimate beneficial owner of the identified company. Although the concept of beneficial ownership varies across jurisdictions, in Brazil it is defined as “the natural person who ultimately, directly or indirectly, owns, controls, or significantly influences the entity” or “the natural person on whose behalf a transaction is conducted,” according to Normative Instruction RFB No. 2,119 of December 6, 2022.

Significant influence is characterized when the natural person “holds more than 25% of the entity’s share capital or voting rights, directly or indirectly,” or “directly or indirectly, acting

individually or jointly, exercises decisive influence over corporate decisions and the power to appoint the majority of the entity’s managers, even without formally controlling it.”¹⁰

This means that the indicators presented in this study are not capable of determining whether the public official is the ultimate beneficial owner of the identified company, which would require a more detailed qualitative analysis of the ownership structure. Given the nature of the problem, the indicators defined here are inherently limited and may fail to capture complex networks of corporate relationships in which public officials conceal their connections to a given company through relatives, trusted associates, legal representatives, or through other companies registered in tax havens.

2.2. Fraud and Corruption in the Approval of Forest Management Plans

The approval process for a Forest Management Plan requires the prior registration of the enterprise and the professional responsible for preparing the project, as well as the submission of technical information and documentation for review by the competent environmental authority through official monitoring and control systems, such as the National System for the Control of the Origin of Forest Products (Sinaflor).¹¹ Among the required documents is the technical project, such as the Sustainable Forest Management Plan (PMFS), which describes the rural property associated with the activity, the proposed type of forest harvesting, the identification of the technical professional responsible, the georeferenced data for the area, and the timeline for logging operations, along with the corresponding forest inventory containing species information and estimated timber volumes, among other technical elements.

The area designated for logging must not overlap with legally protected territories, including strictly protected conservation units, Indigenous lands, and quilombola¹² territories. Once the project is approved, the environmental authority records the corresponding forest credits in the control system, representing the volume of timber authorized for harvesting.

Fraud and corruption risks in the approval of forest management plans are identified through indicators of illegalities related to logging authorizations. These indicators point to risk behaviors in the approval of forest management plans, such as the overestimation of forest inventories or the inclusion of management areas subject to legal restrictions on logging. The indicators established here may suggest deliberate manipulation of authorization processes for timber harvesting in order to improperly benefit a specific forestry enterprise. Table 2 presents the risk patterns and indicators of fraud and corruption in the approval of forest management plans.

Table 2. Risk patterns and indicators of fraud and corruption in the approval of forest management plans

Risk pattern	Indicator	Description
Forest management plan approvals with inventory volumes above expected levels for a given species	Volumetric density (m ³ /ha) above the expected value for the species in a given location	The ratio between timber volume and the harvesting area for a given forest species exceeds the reference value agreed upon by technical experts for that location, indicating potential inflation of the forest inventory
Authorizations for logging in areas with legal restrictions	Authorizations overlapping Indigenous lands	Geospatial data from the logging polygon overlap with geospatial data from polygons of Indigenous lands

continuation

Risk pattern	Indicator	Description
Authorizations for logging in areas with legal restrictions	Authorizations overlapping strictly protected conservation units	Geospatial data from the logging polygon overlap with geospatial data from polygons of strictly protected conservation units
	Authorizations overlapping undesignated public forests or areas without an active concession	Geospatial data from the logging polygon overlap with geospatial data from polygons of undesignated public forests or areas without an active concession
	Authorization overlapping embargoed areas	Geospatial data from the logging polygon overlap with geospatial data from polygons of areas embargoed by environmental authorities

Authorizations of **forest management plans containing inventories that indicate volumes above expected levels** for a given forest species are identified through the extrapolation of reference values for volumetric density, expressed in cubic meters per hectare (m³/ha), for specific species. This indicator uses the expected timber volume per unit of area for each species, considering volumetric density values above the reference threshold as indicative of potential risks of fraud and corruption in the authorization process for timber harvesting.

Technical studies and international parameters provide reference values for acceptable volumetric density for ipê and cedar, species that may become threatened with extinction if their trade is not strictly regulated, as recognized in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). According to the findings of European authorities responsible for enforcing the European Union Timber Regulation (EUTR), the acceptable average volumetric density for ipê is 0.52m³

per hectare (m³/ha),¹³ consistent with parameters suggested by technical forest inventories studies.¹⁴ Volumes exceeding this threshold are recognized by European Union authorities as indicators of potential risk that timber originating from Brazil may have an illegal source.

The document “Non-Detriment Finding for Cedrela spp. in Brazil,” published by the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) in 2025, establishes that the acceptable average volumetric density for cedar ranges between 0.40m³/ha and 0.55m³/ha, depending on the ecological context and the type of forest formation.¹⁵

The approval of forest management plans containing inventories with inflated volumes of forest species allows a greater number of trees to be harvested than expected, enabling the forestry enterprise to use excess timber credits to conceal illegally harvested timber. This warning sign may indicate both the risk of fraud in the forest inventory submitted and

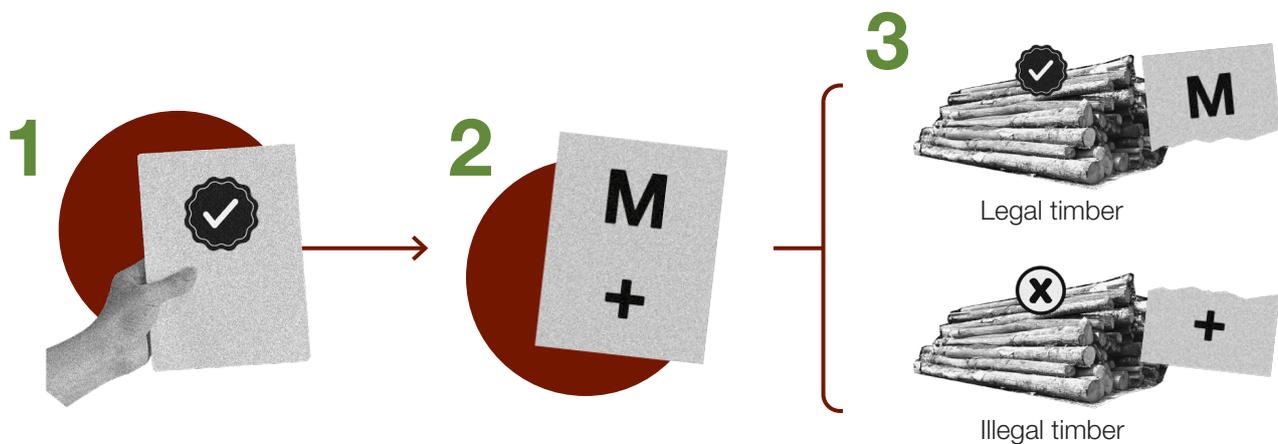
the risk of corruption involving the public official responsible for approving the management plan, particularly when the pattern recurs among the same actors: the technical professional who signs the inventory, the public official who authorizes the plan, and the individual or entity holding the right to exploit the area.

An important limitation of these indicators concerns the possibility of natural phenomena such as “ipê islands” (areas with a high concentration of ipê trees) or specific variations in species population density, which may justify inventories showing higher-than-expected timber volumes in certain areas. Forest inventory studies by Brancalion et al. (2018) and Braz et al. (2022), for example, show that the reference value of 0.52m³/ha for ipê

density adopted by the European Union may be considered low for some areas, generating a high number of false positives where ipê is naturally more concentrated.¹⁶

In addition, the development of indicators for this risk pattern depends fundamentally on technical studies of the population density of each species in specific areas in order to establish reference thresholds for identifying the risk of overestimated forest inventories in forest management plans. Although the techniques presented in this report focus on ipê and cedar, risk indicators for the overestimation of forest inventories could also be developed for other high-value species—such as cumaru, freijó, and maçaranduba—¹⁷ based on established parameters of species population density.

Figure 5. Issuance of timber credits to conceal illegal logging



- 1.** In the licensing process to obtain authorization for timber harvesting, the Sustainable Forest Management Plan is submitted together with a forest inventory, which specifies the management area and the volume of timber to be harvested.
- 2.** The authorization issued by the licensing authority results in the generation of “timber credits” in the official control system, corresponding to the volume of timber approved. When the forest inventory is inflated, the number of timber credits generated exceeds the amount of timber actually available in the licensed area.
- 3.** These excess credits can then be used to “conceal” timber of illegal origin, making it appear as though it had been produced under a duly approved forest management plan. In this way, illegally harvested timber, once declared in the system, acquires an appearance of legality.

Risk indicators related to **authorizations granted for areas subject to legal restrictions** include cases in which logging is authorized in locations where the activity is prohibited. Brazilian legislation prohibits logging in Strictly Protected Conservation Units (Law No. 9,985/2000), Indigenous Lands (Article 231 of the Federal Constitution), and public forests that have not been allocated to local communities or granted under concession to the private sector (Law No. 11,284/2006). Areas embargoed by environmental authorities due to environmental violations are also subject to legal restrictions on use. Authorizations for timber harvesting in these areas indicate a risk of illegal logging and potential signs of corruption involving the public official responsible for approving the project.

These indicators can be aggregated to identify the total number of plans approved under such conditions, increasing the level of risk associated with each actor involved—whether the public official who authorizes the plan, the technical professional responsible for preparing it, or the individual or entity holding the exploitation rights. The indicators can also be refined by measuring the percentage of overlap between authorizations and restricted areas, with higher percentages indicating greater risk.

In the case of undesignated public forests or those without an active concession (FPNDs), unlawful appropriation through Rural Environmental Registry (CAR) records overlapping these areas constitutes a widely recognized problem. According to a study by Carvalho et al. (2025), CAR overlaps in federal FPNDs cover 2.7 million hectares, corresponding to 52% of the total area of this category. In state-level FPNDs, the figure is nearly double, reaching around five million hectares, equivalent to 77% of the total area.

However, disputes regarding the legitimacy of possession and ownership in these areas may generate false positives in the indicators of granted authorizations. This occurs particularly when the allocation of the land has already been formally established but has not yet been recorded or updated in the geospatial data defining the boundaries of these areas.

False positives may also occur in other indicators of authorizations granted for areas subject to legal restrictions on logging. For example, an Indigenous Land may be demarcated after the management authorization has been issued, a strictly protected conservation unit may be created after the authorization is granted, or an embargo may be imposed after the management authorization. Even when the embargo occurs later, however, this situation may still indicate the existence of another irregularity related to logging in the area.

2.3. Illegal Logging and Timber Processing

The risks associated with illegal logging and timber processing include indicators that may reveal non-compliance with authorized logging conditions and processing yields above expected levels.

Table 3. Risk patterns and indicators of illegal logging and timber processing

Risk Pattern	Indicators	Description
Non-compliance with authorized logging conditions	Logging outside authorized periods	Satellite imagery detects that logging occurred before or after the authorized period
Timber processing with yields above expected levels	Raw log conversion factor above expected levels	The ratio between output and input timber volume at a processing facility during a given period exceeds the reference value for the processed product

Non-compliance with **authorized logging conditions is operationalized** through the detection of logging outside the authorized period, whether before or after it. The indicator is constructed using satellite imagery and geospatial data, comparing records from before and after the authorized forest management period and applying algorithms capable of detecting changes in vegetation cover, particularly the “scars” and trails left by selective tree harvesting. These analyses rely on the Normalized Difference Fraction Index (NDFI), which measures the degree of forest degradation by indicating the level of soil exposure.¹⁸ To do so, the temporal series of satellite monitoring data corresponding to the dates of the authorizations analyzed is used.

The risk of **timber processing with yields above expected levels** can be identified through the analysis of production information from timber processing facilities, particularly

when the yield rate for converting raw logs into sawn timber exceeds typical technical parameters. This pattern may indicate the mixing of legally sourced timber with illegal timber during processing. Because illegally harvested timber is not declared as an input, the volume of final products recorded results in an artificially inflated conversion factor, suggesting yields that are inconsistent with normal operational conditions.

An above-expected processing conversion factor can be identified when the ratio between the total volume of timber sold by a processing facility (output) and the total volume of timber received (input) exceeds a previously established reference value.

$$\text{Conversion Factor} = \frac{\text{Volume sold (output)}}{\text{Volume received (input)}}$$

Figure 6. Overestimation of the timber conversion factor



1. The timber processing facility receives both legally sourced timber and raw material for processing.

2. The volume of the resulting product exceeds what would be expected if it were generated exclusively from legally sourced timber, as illegally sourced timber is also incorporated as an input. As a result, the observed conversion rate is artificially higher than technical parameters would indicate.

During timber processing, a loss of volume naturally occurs due to cutting and processing. According to Resolution No. 497/2020¹⁹ of the National Council for the Environment (CONAMA), which establishes procedures for the inspection of timber-processing industries and volumetric yield coefficients, log conversion rates vary depending on the type of product: up to 35% for sawn timber, 45% for sliced veneer, and 55% for rotary veneer.²⁰

This means that from 1m³ of logs, it is possible to obtain up to approximately 0.35m³ of sawn timber, 0.45m³ of sliced veneer, and 0.55 m³ of rotary veneer as usable output. Processing facilities that report coefficients significantly above these limits may, in principle, indicate possible irregularities, such as the introduction of undocumented timber into the processing stage, which would then be effectively “laundered” through official control systems.

However, these expected yield rates are the subject of debate in the academic literature. Parente et al. (2024), analyzing the volumetric yield coefficient (VYC) of timber species in sawmills in the state of Acre, identified an average log-to-sawn-timber conversion rate of 55.53%, a value higher than that established by the CONAMA resolution.

The study also observed substantial variation among species: cerejeira showed a yield of 74.09%, while amarelão reached 46.39%, for example.²¹ Piovesan et al. (2013) demonstrated that volumetric yield can also vary significantly among logs of the same species: in the case of ipê, yields ranged from 34.89% to 67.24%, corresponding to a variation of approximately 33%.²²

Because yield rates may vary due to natural factors, the indices proposed by CONAMA may generate false positives. Nevertheless, as a risk indicator, yields above the reference values are considered to be associated with a higher likelihood of illegal timber processing. A fundamental challenge for this indicator is the absence of a universal reference value applicable to all timber species and processing techniques, whose parameters may vary. For this reason, it is recommended that an appropriate reference value be established for the species, location, and processed product.

In addition, the inventory held by a processing facility—disregarded in the calculation of the indicator—may increase the ratio between output and input timber volumes. To reduce the effect of inventory levels, it is recommended that the longest possible time interval be used in calculating this ratio. In the application of this method, a five-year time window was used to calculate the yield coefficient, with the aim of minimizing distortions related to timber stocks stored in sawmill yards. This interval helps smooth short-term operational and seasonal fluctuations, capturing persistent patterns in timber inputs and outputs, thereby reducing the occurrence of false positives and strengthening the identification of structural risks of illegality.

3. Pilot Study in the State of Pará

3.1. Context

The techniques described in this report were applied in a pilot study in the State of Pará in 2025.

Pará was selected due to its strategic importance for the national timber sector and the high level of transparency of its public data. The state is the largest producer of roundwood in Brazil, with approximately 5 million cubic meters produced annually. This significant volume results both from the management of native forests—with species such as ipê and angelim-vermelho—and from production derived from commercial plantations, such as eucalyptus and pine.²³

Part of this production is destined for international markets, generating substantial revenue: in 2024, the state exported approximately 126 thousand m³ of timber, generating R\$ 1.1 billion in revenue.²⁴ In addition, Pará dedicates around 43 thousand hectares to timber harvesting, representing approximately 13% of the area used for this purpose in the Amazon.²⁵ Despite its importance for both the local and national economy, the timber sector also presents significant illegalities that contribute to deforestation pressures. In Pará, 47% of timber is harvested without proper authorization, according to a study by the Institute of Man and Environment of the Amazon (IMAZON).²⁶

The state agency responsible for regulating and overseeing timber-related activities in Pará is the State Secretariat for Environment and Sustainability (SEMAS).²⁷ In Brazil, forest governance operates in a decentralized manner, with subnational governments responsible for functions such as environmental licensing of activities conducted on rural properties, public forests, and state conservation units. These responsibilities

include licensing forest management for the production of timber and non-timber forest products, as well as monitoring and enforcing compliance across the different stages of the forest production supply chain.²⁸

At the federal level, licensing authority applies to activities conducted in international or interstate border zones, Indigenous lands, federal public forests, and conservation units established by the federal government. Pará has a territory of approximately 124.7 million hectares, of which about 72% corresponds to public forests, distributed across 65.5 million hectares of federal public forests, 24.8 million hectares of state public forests, and 14.6 thousand hectares of municipal public forests.²⁹ Within this context, SEMAS plays a central role in the state's forest governance, without prejudice to the responsibilities exercised by federal and municipal authorities in areas under their respective jurisdictions.

State regulations establish that timber harvesting in Pará must follow a specific procedural flow with SEMAS and its control systems, particularly the Forest Products Commercialization and Transport System (SISFLORA).³⁰ This process includes the following steps:

- **Request for management authorization and opening of the administrative process:** submission of the Sustainable Forest Management Plan (PMFS), accompanied by the Forest Inventory and the Forest Maintenance Responsibility Statement.
- **Technical review and approval of the initial request:** technical assessment of the documentation by SEMAS and issuance of the first Forest Exploitation Authorization (AUTEF), which annualizes the authorized timber volume by species and generates the corresponding forest credits.

- **Reporting and updates during the process:** updating the Forest Management Plan at each harvesting cycle, with the corresponding issuance of a new Autef, as well as the mandatory issuance—through SISFLORA—of the Forest Transport Permit for the transport of forest products and the Declaration of Sale of Forest Products for their commercialization.

SEMAS is the agency responsible for coordinating environmental policies and actions in the state of Pará, while other state institutions perform complementary and equally important roles in this sector. The **Institute for Forest Development and Biodiversity of the State of Pará** (IDEFLOR-Bio) is responsible for managing and promoting the conservation of state public forests dedicated to sustainable production, as well as coordinating, planning, and implementing state programs aimed at strengthening the forest sector.³¹

The agency is also responsible for creating and managing state conservation units (UCs) and currently administers 29 conservation units, totaling approximately 21 million hectares.³² The **Pará State Secretariat for Indigenous Peoples** (SEPI) is responsible for coordinating and implementing public policies aimed at protecting Indigenous peoples. The **Pará Technical Assistance and Rural Extension Company** (EMATER-PA), a public company linked to the agricultural sector, supports rural producers and extractive communities by providing technical assistance and rural extension services. The **Amazon Foundation for the Support of Studies and Research of Pará** (FAPESPA) promotes scientific research by funding studies related to the sustainable use of Amazonian ecosystems and contributing to the development of technologies and strategic information for natural resource management.

Public officials working in these institutions are subject to regulations such as the single legal regime of Pará's public service, which prohibits their participation in the management or administration of private companies or civil associations, except as shareholders or limited partners.³³

In the specific field of environmental management, SEMAS officials are prohibited from owning, partnering in, or being employed by accounting, legal, advisory, or consulting firms involved in matters related to the Secretariat's interests.³⁴

Pará does not have legislation equivalent to the Federal Government's Conflict of Interest Law, which considers as conflicts of interest acts performed for the benefit of a legal entity in which the public official, their spouse or partner, or relatives up to the third degree hold an interest, as well as the provision of services to the state by a company whose activities are controlled, supervised, or regulated by the entity to which the public official is linked, among other provisions described in Chapter 2.

3.2. Public Data Collected and Processed

The techniques for detecting risks of fraud, corruption, and money laundering associated with illegal logging, implemented in the state of Pará, rely on four categories of data. All sources used are publicly available, making the techniques presented here broadly reproducible.

The processing and refinement of the data followed a structured multi-step procedure designed to ensure standardization, consistency, and traceability throughout the analysis. This process included the collection and organization of raw data, data standardization and cleaning, validation, integration across datasets, and the creation of derived variables and indicators. For timber harvesting data in particular, the Medallion architecture was used, which organizes data into three layers (Bronze, Silver, and Gold), corresponding respectively to the stages of raw data collection, processing, and final analytical output.

Table 4. Public data collected and processed in the Pilot Study

Category	Type	Data source	Responsible institution	Access	Scope
State public servants data	Information on public servants, such as name, department of assignment, position, employment status (permanent, commissioned, or temporary), and date of admission	Portal da Transparência do Governo do Pará - Servidores Públicos	Government of Pará	Download via the Pará State Government Transparency Portal	State
Corporate records	Information on legal entities, such as corporate name, registration number, registration status, address, date of incorporation, and economic activity codes	Cadastro Nacional da Pessoa Jurídica (CNPJ) - Estabelecimentos	Brazilian Federal Revenue Service (RFB)	Download via the RFB open data portal	National

continuation

Category	Type	Data source	Responsible institution	Access	Scope
Corporate records	Data on partners and administrators, such as name, identification number, qualification, and date of entry into the partnership	Cadastro Nacional da Pessoa Jurídica (CNPJ) - Sócios	Brazilian Federal Revenue Service (RFB)	Download via the RFB open data portal	National
	Numerical codes for economic activities registered in Brazil	Classificação Nacional de Atividades Econômicas (CNAE 2.3)	Brazilian Institute of Geography and Statistics (IBGE)	Download via the IBGE website	National
Forest harvesting data	Records of forest harvesting authorization	Autorização para Exploração Florestal (AUTEF)	Pará State Secretariat for Environment and Sustainability (SEMAS-PA)	Public API of SEMAS-PA and download of authorization PDFs in the Forest Management module	State
	Registry and technical data on forest management plans	Projeto de Manejo Florestal Sustentável (PMFS)	Pará State Secretariat for Environment and Sustainability (SEMAS-PA)	Public API of SEMAS-PA and download of shapefiles (.shp) in the Forest Management module	State
	Records of transportation and trade of forest products	Guia Florestal (GF) e Guia de Controle Ambiental Eletrônica	Pará State Secretariat for Environment and Sustainability (SEMAS-PA)	SEMAS-PA API and download of PDFs in the Forest Management module	State
	Data on classification of areas with selective logging in the Amazon	Sistema de Monitoramento da Exploração Madeireira (Simex)	Institute of People and the Environment of the Amazon (IMAZON)	Download from Simex open data	Brazilian Amazon

continuation

Category	Type	Data source	Responsible institution	Access	Scope
Data on areas with exploitation restrictions	Official boundary data of Indigenous Lands	Terras Indígenas: Dados Geoespaciais e Mapas	National Foundation of Indigenous People (FUNAI)	Download via the FUNAI platform	National
	Boundary data of federal, state, and municipal Conservation Units	Infraestrutura Nacional de Dados Espaciais	Chico Mendes Institute for Biodiversity Conservation (ICMBio)	Download via the INDE system, adding the ICMBio data layer	National
	Registry data of federal, state, and municipal public forests	Cadastro Nacional de Florestas Públicas: Atualização 2024	Serviço Florestal Brasileiro (SFB)	Download of the official SFB vector database	National
	Areas embargoed by IBAMA due to environmental infractions	Termos de embargo	Brazilian Institute of the Environment and Renewable Natural Resources (IBAMA)	Download via the IBAMA open data portal	National

3.2.1 Limitations of the Public Servant Data and Corporate Records Used

The corporate records and public servant data collected present limitations inherent to the sources used. The Government of the State of Pará does not disclose the registration number in the Individual Taxpayer Registry (CPF) of its public servants, which increases the risk of misidentifying homonyms in analyses that integrate different databases, potentially resulting in the identification of distinct individuals with identical names.

In addition, there are restrictions on the identification of beneficial owners based on the available business data, which vary according to the legal nature of the company. Information is not available on: (i) shareholders of publicly traded or privately held corporations and investment funds; (ii) partners in joint venture

partnerships;³⁵ (iii) companies incorporated abroad, including in tax havens; (iv) the percentage of ownership held by partners in limited liability companies; (v) the visualization of complex corporate structures; and (vi) the identification of the beneficial owner itself.

On the other hand, updated information is available on partners and administrators of limited liability business companies, as well as on administrators of publicly traded or privately held corporations, associations, and investment funds, which allows the construction of indicators based on these data.

Company data for risk analysis may be complemented with information available in state commercial registries, registries of legal entities and document records, or the Brazilian Securities and Exchange Commission (CVM), depending on the legal nature of the entity analyzed.

3.3. Application of Risk Detection Techniques

3.3.1. Risk of Conflict of Interest

The analysis of risks of conflicts of interest was conducted by cross-referencing public servant data and corporate records, with the objective of identifying connections between public officials from agencies operating in the environmental sector in Pará and companies in the timber sector.

Initially, public servant data were collected using filters that selected only those linked to SEMAS and to other agencies previously mapped as relevant to the environmental sector. In total, 2,484 public servants were identified in 2025, as presented in figure 7.

Figure 7. Public servants from environmental agencies in Pará



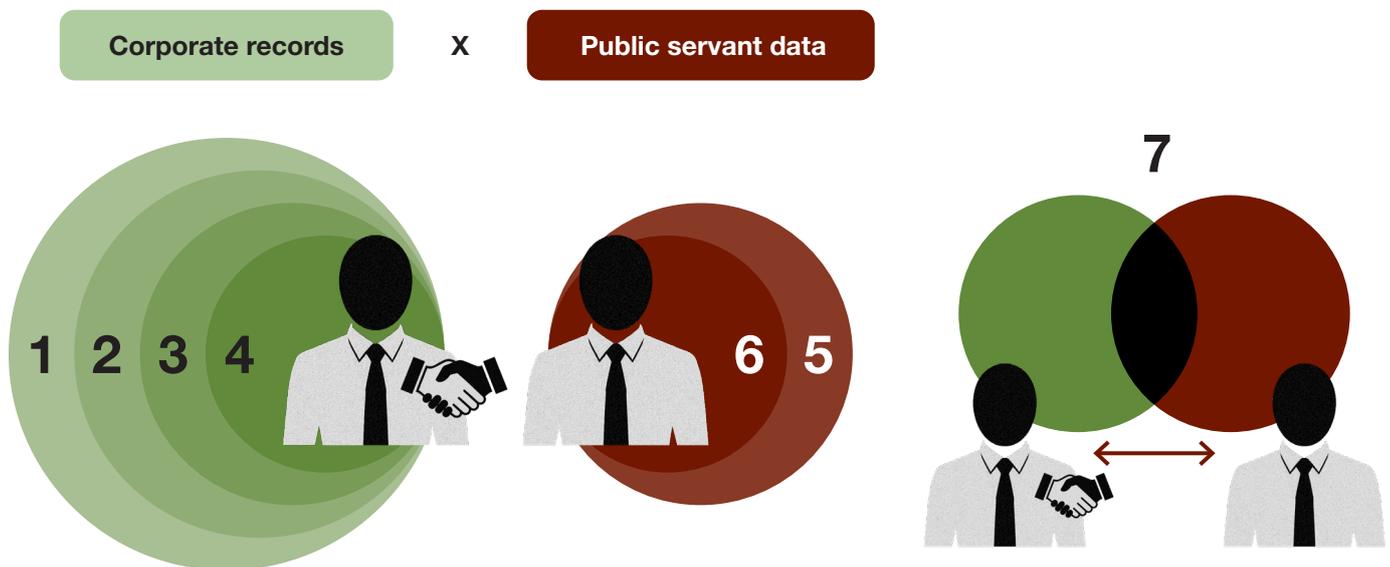
The first analysis of conflict-of-interest risk sought to identify whether these public officials maintain direct links with companies in the timber sector as shareholders or administrators.

To do so, companies registered in Brazil in 2025 were first identified, selecting only those that had been operating in the last five years and whose economic activity was related to the timber sector, according to data from the National Classification of Economic Activities.³⁶ The temporal criterion was applied by excluding companies that had been closed by 2020, retaining those classified under the registration statuses active,

inactive, suspended, null, or closed from 2021 onward.³⁷ Subsequently, the partners and administrators registered in these companies were identified.

Finally, the data on partners and administrators of companies in the timber sector were cross-referenced with the data of public servants linked to the agencies of interest in the state of Pará, with the objective of identifying name matches. This cross-referencing resulted in the identification of 32 records, indicating potential situations in which public servants hold ownership stakes or exercise administrative roles in companies operating in the timber production chain.

Figure 8. Step-by-step identification of direct corporate associations between public officials and timber companies



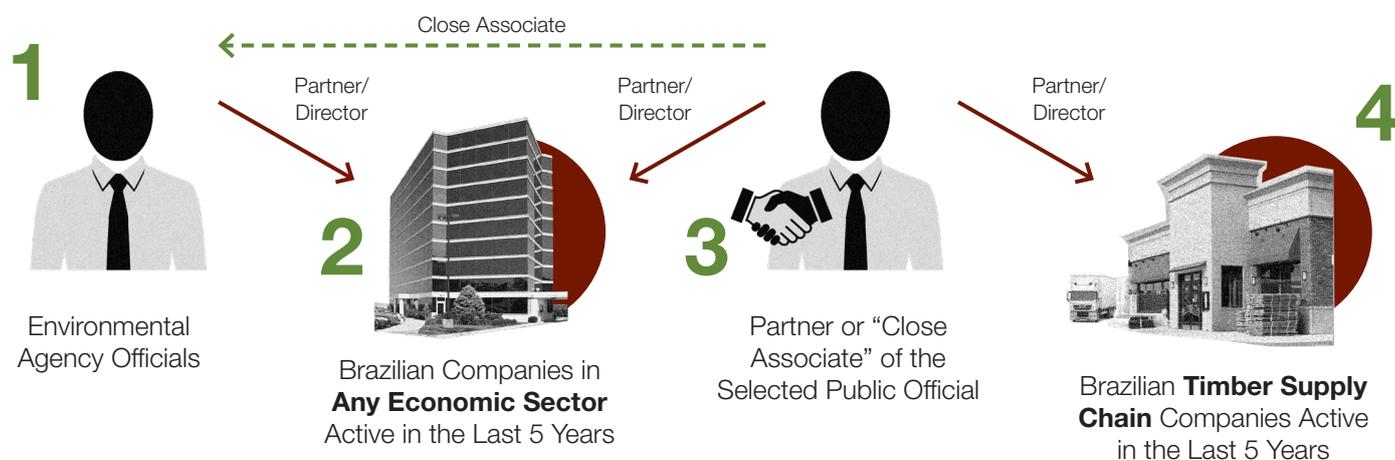
1. Identify companies registered in Brazil
2. Filter companies that have been operating in the last 5 years (excluding dissolved companies)
3. Select companies in the timber supply chain
4. Retrieve information on partners and administrators
5. Identify public servants in Pará
6. Select public servants from agencies with environmental responsibilities
7. Cross-reference the datasets to detect matches

The second analysis of conflict-of-interest risks aimed to verify whether the selected public servants from the agencies of interest maintain indirect association with companies in the timber sector. Compared with the analysis of direct association, two additional steps were incorporated: first, all companies linked to the public servants were identified; next, it was verified whether the other partners

or administrators of these companies held ownership stakes or exercised administrative functions in companies in the timber sector.

The analysis of indirect association between public servants and timber companies resulted in the identification of seven matching names. All of these names had already been identified in the analysis of direct association.

Figure 9. Step-by-step identification of indirect corporate associations between public officials and timber companies



1. Select public servants from agencies with environmental responsibilities
2. Identify Brazilian companies associated with the selected public servant, from any economic sector, operating in the last five years
3. Identify the other partners or administrators of these companies ("close associates")
4. Identify other companies associated with the public servant's "close associates" that operate in the timber supply chain and have been active in the last five years

The analysis of conflict-of-interest risks presents three important caveats for interpreting the results. The first refers to the fact that the adopted method does not identify other types of relationships that may also constitute conflicts of interest. Thus, the indicators presented have limited scope to capture more complex relationship structures in which a public servant conceals ties with companies through relatives, trusted associates, legal representatives, or other companies.

The other two caveats relate to limitations in identifying the beneficial owner and to the possibility of false positives resulting from homonyms among public servants, as detailed in *Section 3.2.1 Limitations of the Public Servant Data and Corporate Records Used*.

In the exercise conducted, there is a probability that associations between the names of public servants and companies in the timber sector actually correspond to different individuals with identical names. For example, only 7 of the 32 names identified in the analysis of direct relationships are linked to companies located in the state of Pará; the remaining 25 cases have a greater likelihood of corresponding to homonyms, as their registered addresses are in other states. This limitation makes it necessary to conduct an individual analysis of each case to assess the likelihood that the result represents a real connection or a false positive.

Case 1: SEMAS public servant linked to a timber company with irregular tax status and other red flags

Among the public servants of SEMAS in Pará identified as partners in companies in the timber sector, one individual was found to hold an ownership interest in a timber company with an irregular status before the Brazilian Federal Revenue Service. The company has been classified as “inactive” since 2018 due to the failure to submit tax declarations for a period of 90 days or more, while the individual has been serving as a public servant at SEMAS in Pará since 2015, occupying a commissioned position. The timber company’s tax irregularity constitutes, by itself, a risk indicator and adds to the potential conflict of interest identified.

In addition, a basic qualitative search regarding this individual and the associated timber company revealed other relevant warning signs. First, the person registered as the company’s contact for tax matters also appears as a contact for several other companies, including a laundry business. Because it is a business with a high circulation of cash, laundries present an elevated risk of money laundering, according to the Financial Action Task Force (FATF).³⁸

Second, the individual holds both an ownership stake and an administrative role, as a shareholder, in a company registered as active with the Federal Revenue Service in the business of repairing accessories for motor vehicles. This company is registered at an address where this activity is not carried out, but which is adjacent to a vehicle repair shop, another sector considered high risk due to the high circulation of cash, according to the FATF.

This example demonstrates the feasibility of the technique developed as a tool for signaling risks of involvement in environmental crimes. It shows that analyzing the business ties of public servants may reveal indications of participation in money laundering

schemes, which should be investigated thoroughly and cautiously by the competent authorities. These risks become even more relevant when public servants have corporate interests in the timber sector or in other sectors susceptible to money laundering, such as laundries and vehicle repair shops, which may handle significant amounts of cash and are therefore vulnerable to money laundering.³⁹

Case 2: Possible link between a SEPI public servant and a timber import and export company and other warning signs

A second example concerns a lawyer who has held a commissioned position at Sepi since 2019, whose name coincides with that of a partner in a timber import and export company located in Rondônia, an Amazonian Brazilian state that borders Bolivia and occupies a strategic position for timber imports from that country. This company has been classified as inactive by the Brazilian Federal Revenue Service since 2018 due to the failure to submit tax declarations, which constitutes a warning sign of irregularities in timber-related activities. It should be noted that, in this case, there is a high risk that the individual may be a homonym.

In addition, public information indicates that this public servant is a defendant in a criminal case before the Federal Court of the Judicial Section of Pará and is also the subject of a disciplinary proceeding before the Brazilian Bar Association (OAB).

Cases such as this, identified through the applied technique, may serve as a starting point for more in-depth analyses using additional data and other sources, allowing for a more precise assessment of the specific situation and highlighting the usefulness and relevance of the methodology employed.

Selection of subclasses of economic activities based on data from the National Classification of Economic Activities (CNAE) of the Brazilian Institute of Geography and Statistics (IBGE)

The Brazilian Institute of Geography and Statistics (IBGE) provides data from the National Classification of Economic Activities (CNAE – Subclasses version 2.3),⁴⁰ which were used in this methodology to define the scope of analysis of legal entities related to the timber production chain. CNAE is a system that standardizes and organizes economic activities in Brazil through numerical codes.

CNAE classes and subclasses were lexically analyzed to identify economic activities related to the timber production chain. For this purpose, keywords such as “wood” and related terms, such as sawmills, forest products, and furniture, were used to map economic activities throughout the entire chain, from harvesting to processing and commercialization. Subclasses related to wood were selected based on the ordering of CNAE production sections, organized into three groupings, according to the nomenclature adopted by the system itself:

- **A:** Agriculture, Livestock, Forestry Production, Fishing, and Aquaculture
- **C:** Manufacturing Industries
- **G:** Trade and Repair of Motor Vehicles and Motorcycles

Additionally, the filter applied by the Brazilian Development Bank (BNDES) to CNAE (subclasses, version 2.2) was consulted to restrict the bank’s support to enterprises using timber of legal and certified origin. This was done to refine the selection and ensure that relevant subclasses were included, with specific attention to the manufacture of furniture predominantly made of wood (C31, subclass 3101-2/00). The BNDES classification adopts the following criteria for the timber production chain:⁴¹

- Enterprises that rely on timber as their main raw material may receive support, provided that the timber originates from planted forests. If the timber comes from native forests, support is conditional on the existence of a Sustainable Forest Management Plan approved by the competent environmental authority, as well as Forest Certification or Chain of Custody Certification issued by an independent body with public credibility.
- Enterprises associated with the exploitation of primary vegetation or native species may receive support, provided that a Sustainable Forest Management Plan approved by the competent environmental authority is in place and that Forest Certification issued by an independent body with public credibility is obtained.

continuation

The BNDES grouping into subsectors considers, for timber, Section C, Division 16 of CNAE, which refers specifically to the Manufacture of Wood Products,⁴² from which all associated subclasses were considered. There is also a grouping related to wood-derived products, referring to furniture, corresponding to Division C31 – Manufacture of Furniture, which includes the following subclasses: 3101-2/00 – Manufacture of furniture predominantly made of wood; 3102-1/00 – Manufacture of furniture predominantly made of metal; and 3103-9/00 – Manufacture of furniture made of other materials, except wood and metal. In the final selection, only subclass 3101-2/00 – Manufacture of furniture predominantly made of wood was considered.

As a result, this analysis identified the following classes and subclasses of economic activities of legal entities in the CNAE database related to the timber supply chain:

- **A02:** Forestry Production.
- **C16:** Manufacture of Wood Products.
- **C31:** Manufacture of Furniture, specifically subclass 3101-2/00 – Manufacture of furniture predominantly made of wood.
- **G46:** Wholesale Trade, specifically subclasses 4613-3/00 – Commercial representatives and agents of the trade of wood, construction materials, and hardware, and 4671-1/00 – Wholesale trade of wood and wood products.
- **G47:** Retail Trade (with emphasis on subclass 4744-0/02 – Retail trade of hardware, wood, and construction materials).

3.3.2. Risks of Fraud and Corruption in Forest Management Plan Approvals

The first risk pattern analyzed in this group refers to the granting of authorizations for management plans whose inventories present volumes above what is expected for forest species.

Using 0.52m³/ha as a reference value for ipê and 0.55m³/ha for cedar—considered volumetric density limits for sustainable management according to the European Union and IBAMA, respectively—the timber harvesting databases were analyzed to detect authorizations of management plans with inventories presenting volumes above what is expected for these species. For each management plan, the following were mapped:

- The total authorized volume (m³)
- The total PMFS area (hectares)
- The volume per area (m³/ha), calculated from the relationship between the two.

The analysis of volumetric density for ipê considered different names and species of ipê, including yellow ipê, as well as cedar.⁴³ As a result, 300 cases for ipê and 28 cases for cedar were identified in the period from 2019 to 2024. For these cases, a group of holders of harvesting rights, the technical professionals who signed the management plans, and the public servants involved in the authorizations with volumetric density above the expected level were identified, as shown in Table 5.

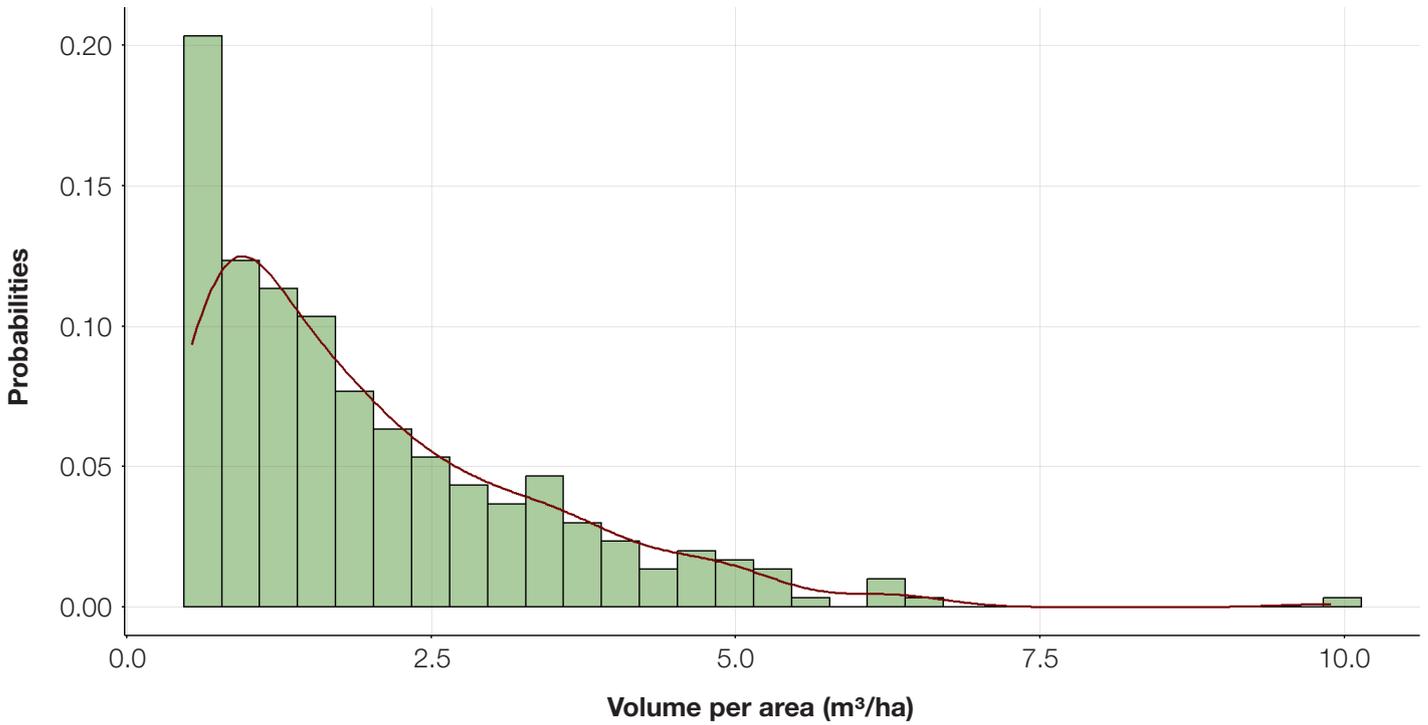
It should be noted that local factors—such as the existence of “ipê clusters” or specific variations in species population density—were not considered. Therefore, the results may reflect either irregularities in authorization processes or natural phenomena (false positives).

As shown in the graphs, a decrease in the number of occurrences can be observed as density increases, with the cases located on the right side of the distribution presenting a higher risk of inflated inventories.

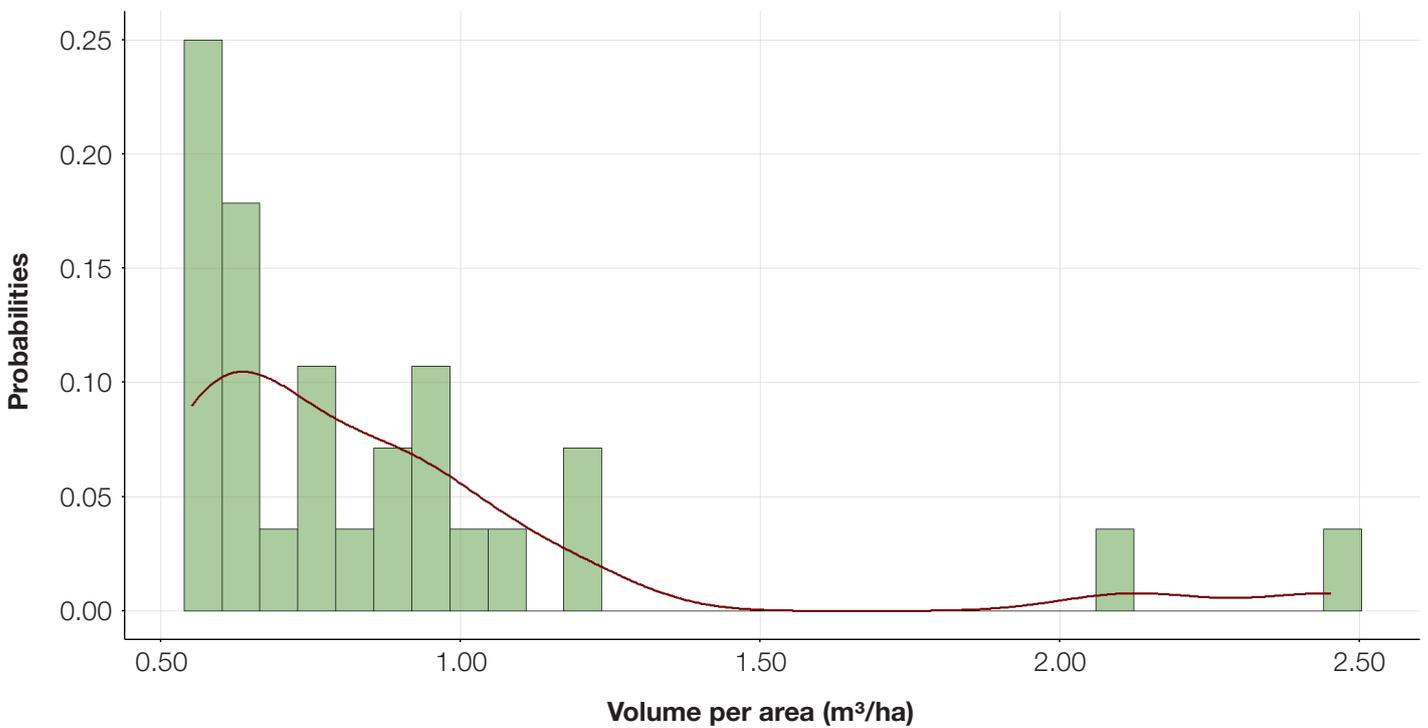
Table 5. Results of the risk analysis of inflated forest inventories

	Volumetric density above the expected value for ipê (2019–2024)	Volumetric density above the expected value for cedar (2019–2024)
Authorizations	300	28
Technical professionals responsible	70	16
Individual rights holders	194	21
Entity rights holders	24	3
Public servants involved in the authorizations	41	18

Graph 1. Probability-scale histogram of authorizations of ipê inventories with density > 0,52 m³/ha



Graph 2. Probability-scale histogram of authorizations of cedar inventories with density > 0,55 m³/ha



The second analysis in this group focused on identifying authorizations for areas with legal restrictions on harvesting, including Indigenous Lands, Strict Protection Conservation Units, undesignated Public Forests or those without an active concession, and areas embargoed by environmental authorities. This analysis cross-referenced geospatial data on forest exploitation related to authorizations and management plans with geospatial data on protected areas, identifying intersections between polygons.

As a result, for the period from 2019 to 2024, 138 authorizations for harvesting overlapping with undesignated public forests or forests without an active concession were identified, 17 overlapping with areas embargoed by

IBAMA, 8 overlapping with Strict Protection Conservation Units, and 1 overlapping with an Indigenous Land. Individuals associated with these transactions were also identified (holders of harvesting rights, technical professionals responsible for the management plans, and public servants who granted the authorizations).

It should be noted that a legal assessment would require a joint analysis of several factors, such as the dates of the authorizations and the status of the areas at the time the authorizations were granted. However, since these authorizations generally present a higher likelihood of involving illegalities, they can be used to assess risks related to the transactions and the agents.

Table 6. Results of the risk analysis of authorizations for restricted areas

	Undesignated public forests or forests without an active concession	Embargoed areas	Strict Protection Conservation Units	Indigenous Lands
Authorizations	138	17	7	1
Technical professionals responsible	49	11	4	1
Individual rights holder	107	11	2	1
Entity rights holder	11	1	2	0
Public servants who granted the authorizations	34	9	5	1

3.3.3. Risks of Illegal Timber Harvesting and Processing

The analysis of non-compliance with authorized exploitation conditions consisted of a spatial cross-reference between the polygons of the Forest Exploitation Authorization (AUTEF), the Sustainable Forest Management Project (PMFS), and the Logging Monitoring System (SIMEX) databases.

As a result, for the period from 2019 to 2024, 109 intersections were identified between forest management areas and areas indicated by Simex as showing signs of degradation on dates corresponding to authorized harvesting, either before or after the authorized period. The same procedure was applied to identify the technical professionals responsible and the holders of harvesting rights.

Regarding the processing of illegal timber, processing facilities with conversion factors above the expected level were identified through cross-referencing forest harvesting databases related to authorizations and forest transport permits, in order to calculate the conversion factor. The conversion factor is calculated as the ratio between the total volume marketed (output) and the total volume of timber received by the processing facility (input) for the period from 2019 to 2024.

Using the value of 0.45 as a reference for yield in the transformation of logs into sliced veneer, established by CONAMA, cases that exceeded this threshold were highlighted as possible instances of processing timber of illegal origin. In total, 346 processing facilities were identified with coefficients above the expected technical limit.

Table 7. Results of the risk analysis of harvesting during unauthorized periods

	Extraction during unauthorized periods	Conversion factor above expected levels
Identified cases	109	346
Technical professionals responsible	39	-
Individual rights holder	73	-
Entity rights holder	36	-
Processing facilities	-	346

3.4. Summary of the Results of the Techniques Applied

The results of the pilot study of the risk detection techniques presented in this report demonstrate their effectiveness in identifying individuals and companies at risk of involvement in fraud, corruption, and money laundering in the timber supply chain. These include public servants from state agencies operating in the environmental sector, companies with economic activities in the timber sector (such as those involving processing facilities), individuals or legal entities holding forest harvesting rights, and technical professionals responsible for forest harvesting projects. Table 8 summarizes, in numerical terms, the results achieved.

Table 8. Summary of the results of the techniques applied

Risk group	Risk patterns	Risk indicators	Results	Period
Conflicts of interest between public officials and timber companies	Corporate association between a public official from an environmental authority and a timber company	Direct link: A public official from a state agency with environmental oversight responsibilities is indirectly associated with a timber company	<ul style="list-style-type: none"> • 32 public servants 	2025
		Indirect link: A public official from a state agency with environmental oversight responsibilities is indirectly associated with a timber company.	<ul style="list-style-type: none"> • 7 public servants <p><i>*public servants correspond to those already identified under the direct link indicator</i></p>	2025
Frauds and corruption in forest licencing	Authorizations for management plans with inventories presenting volumes above the expected level for forest species	Volumetric density above the expected value for ipês species	<ul style="list-style-type: none"> • 300 authorizations; • 70 technical professionals responsible; • 194 individual rights holders; • 24 entity rights holders; • 41 public servants 	2019 - 2024

continuation

Risk group	Risk patterns	Risk indicators	Results	Period
Frauds and corruption in forest licencing	Authorizations for management plans with inventories presenting volumes above the expected level for forest species	Volumetric density above the expected value for cedar species	<ul style="list-style-type: none"> • 28 authorizations; • 16 technical professionals responsible; • 21 individual rights holders; • 3 entity rights holders; • 18 public servants 	2019-2024
		Authorizations overlapping with undesignated public forests or forests without an active concession	<ul style="list-style-type: none"> • 138 authorizations; • 49 technical professionals responsible; • 107 individual rights holders; • 11 entity rights holders; • 34 public servants 	2019 - 2024
	Authorizations for exploitation in restricted areas	Authorizations overlapping with areas embargoed by IBAMA	<ul style="list-style-type: none"> • 17 authorizations; • 11 technical professionals responsible; • 11 individual rights holders; • 1 entity rights holder; • 9 public servants 	2019 - 2024
		Authorizations overlapping with Strict Protection Conservation Units	<ul style="list-style-type: none"> • 7 authorizations; • 4 technical professionals responsible; • 2 individual rights holders; • 2 entity rights holders; • 5 public servants 	2019 - 2024

continuation

Risk group	Risk patterns	Risk indicators	Results	Period
Frauds and corruption in forest licencing	Authorizations for exploitation in restricted areas	Authorizations overlapping with Indigenous Lands	<ul style="list-style-type: none"> • 1 authorizations; • 1 technical professionals responsible • 1 individual rights; • 1 public servant 	2019 - 2024
Illegal timber harvesting and processing	Non-compliance with authorized harvesting conditions	Harvesting during periods incompatible with the authorization	<ul style="list-style-type: none"> • 109 cases; • 39 technical professionals responsible; • 73 individual rights holders; • 36 entity rights holders 	2019 - 2024
	Timber processing with yields above the expected level	Conversion factor from raw logs to processed products above the expected level	<ul style="list-style-type: none"> • 346 cases; • 346 processing facilities 	2019 - 2024
Totals (without duplication)			<ul style="list-style-type: none"> • 125 public servants • 204 technical professionals responsible • 877 individual rights holders • 116 entity rights holders • 346 processing facilities 	

These examples illustrate typical risk patterns associated with conflicts of interest between public officials and timber companies, fraud and corruption in the approval of forest management plans, as well as illegal timber extraction and processing in the state of Pará.

Conflicts of interest involving private enterprises are widely recognized as a risk factor for corruption in public institutions and may involve public officials at different hierarchical levels. Corruption at higher hierarchical levels implies a greater likelihood of more harmful impacts, such as authorizing or failing to supervise criminal groups engaged in activities that violate the law. In 2025, 32 public servants in state agencies in Pará operating in the environmental sector were identified as presenting a risk of having direct or indirect interests, through “close associates,” in companies within the timber supply chain, constituting a potential conflict of interest.

Authorization for timber extraction represents a high-risk stage for fraud and corruption. In this process, improper authorizations may be obtained to exploit areas where timber activities are prohibited. In addition, forest inventories may be inflated in order to generate timber credits above the actual volume available, enabling the concealment of illegally extracted timber. Using the risk detection techniques, 491 authorizations granted under these conditions were identified in the state of Pará over a five-year period, involving technical professionals, holders of harvesting rights, and public servants responsible for approving the projects.

Once properly authorized, timber is extracted and subsequently transported to processing facilities, where it is processed and transformed into products destined for the consumer market. The risk detection techniques are based on identifying behavioral patterns associated with non-compliance with the authorized exploitation period and conversion factors from logs to processed products above reference values, which may

indicate the inclusion of timber of illegal origin in processing. A total of 455 cases with risk of illegal timber extraction and processing were identified in the state of Pará, primarily involving technical professionals and holders of exploitation rights during the extraction stage, as well as processing facilities during the processing stage.

Integrated analyses of these results may provide additional insights for risk analysts. For example, approximately ten companies were identified through the indicators “Conversion factor from raw logs to processed products above the expected level” and “Authorizations overlapping with undesignated public forests or forests without an active concession,” which were also categorized as entities directly or indirectly associated with public servants in the environmental sector. Although these results alone do not confirm illegalities in timber exploitation processes, they highlight risks in certain transactions and may guide enforcement actions.

The use of some of these risk detection techniques by environmental authorities and monitoring agencies has already actively contributed to guiding enforcement actions and investigations into fraud, corruption, and other illegalities in the timber sector, helping to curb illegal practices in timber production. The application of these and other risk detection techniques is particularly relevant for strengthening enforcement actions and supporting due diligence practices adopted by financial institutions with respect to their clients, by public authorities regarding their employees, and even by companies that use forest products in their supply chains.

Although the techniques presented in this document focus on the timber sector in Pará, similar approaches can be applied to other supply chains that exert pressure on illegal deforestation and in other locations, making it possible to identify patterns and risk indicators associated with illicit economies that drive forest degradation.

Other possibilities: additional indicators and complementary data

Other risk indicators for fraud, corruption, and money laundering in timber harvesting can be formulated in addition to those presented in the previous sections. For example, it is possible to identify acts carried out to generate excessive timber credits during both the preparation and approval of sustainable forest management plans through: (i) inventories that overestimate tree height to improperly obtain timber credits, detectable by comparison with expected height values for certain species; and (ii) the designation of areas in the management plan that are not actually harvested after authorization, which may indicate that those credits are being used to conceal timber extracted from prohibited or unauthorized areas. The absence of management activity may be identified through satellite imagery or through the analysis of log transport data.⁴⁴

Fraud in timber transport documentation may also conceal the illegal origin of timber. These cases may be signaled by indicators such as prices below market value, routes inconsistent with known transportation flows, implausible travel times—including trucks registered simultaneously in different locations—and improper cancellation of transport documents. Many of these frauds allow the reuse of timber credits to conceal the illegal origin of logs.⁴⁵

Another way to identify warning signs is through the network analysis method developed by Nonato et al. (2025), which identifies companies involved in timber transactions with risk of unauthorized extraction using transport data from official monitoring systems.⁴⁶

Another complementary approach consists of analyzing political connections based on information about donations from companies and individuals to electoral campaigns. The study by Harding et al. (2023), for example, presents statistical evidence that Colombian mayors elected with external campaign financing impose fewer sanctions against illegal deforestation than those elected with their own resources.⁴⁷

These examples can enrich and qualify the methods described in this study, considering the scale and level of sophistication reached by illegal deforestation and other environmental crimes.

In addition, other datasets may strengthen risk detection techniques by incorporating information about individuals or companies. For individuals, these include criminal records, death records, tax registration status, receipt of social benefits, and powers of attorney. In some cases, these data may indicate the risk of the use of “straw persons” or front men. For legal entities, information such as registrations in tax havens may indicate corporate structures used to conceal beneficiaries of illicit activities. Data on contributions to electoral campaigns also allow the identification of political connections of individuals involved in forest harvesting, indicating potential risks of conflicts of interest and corruption.

continuation

Environmental infraction data in Brazil are also identified at the individual level and are relevant for qualifying risks associated with persons or companies already identified. These data indicate, for example, whether individuals or companies have been fined for environmental violations such as providing false information in monitoring systems, transporting or exporting timber without a valid license, destroying native forest without authorization, or maintaining native timber in storage without proof of origin.

Table 9. Categories of additional data for risk detection techniques

Additional data categories	Information	Research sources
Additional data on individuals	Criminal records, tax registration status with the fiscal authority, death records, receipt of social program benefits, power of attorney records.	Certidão Antecedentes Criminais Consulta de Consultar Cadastro de Pessoa Física (CPF) Cadastro Nacional de Falecidos (CNF Brasil) Pesquisa de recebimento de recursos do Governo Federal Central Online de Escrituras e Procurações (CEP)
Additional data on companies	Registries of companies sanctioned for infractions or harmful acts against public administration, corporate registrations in tax havens, power of attorney records	Cadastro Nacional de Empresas Inidôneas e Suspensas (CEIS) The Offshore Leaks Database Central Online de Escrituras e Procurações (CEP)
Electoral campaign contributions	Political connections of individuals	DivulgaCandContas – Consulta de doadores e contas eleitorais (TSE)
Environmental infractions	Individuals and companies fined for environmental infractions (federal, state, and municipal levels)	Consulta a autos de infração ambiental (Ibama) Consulta a autuações ambientais e embargos (Ibama)

4. Conclusion and Recommendations

This report presented techniques for detecting individuals and companies at high risk of involvement in fraud, corruption, and money laundering in the timber sector, as well as the results of their pilot study in the state of Pará. By structuring indicators based on data analysis—focused on identifying conflicts of interest between public officials and companies, risks of fraud and corruption in the approval of forest management plans, and risks associated with timber extraction and processing—the study demonstrates that it is possible to adapt the logic of the anti-money laundering system to the specific characteristics of environmental crime.

The proposed techniques are aligned with the risk-based approach that guides anti-money laundering and counter-terrorism financing (AML/CFT) policies widely adopted in the financial sector. Just as enhanced monitoring of Politically Exposed Persons (PEPs) is applied in cases of corruption risk, the indicators developed here make it possible to classify actors according to their level of exposure and direct proportional scrutiny and institutional responses. Incorporating environmental crime into this framework is not a marginal innovation but a necessary update to preserve the integrity of the financial system in the face of the expansion of environmental illicit economies.

The pilot experience in Pará shows that the structured use of data strengthens institutional capacity to identify atypical patterns, prioritize investigations, and improve oversight actions. However, implementing these techniques requires

prior assessment of the available data environment, as well as continuous investment in data quality and methodological improvement. This is an incremental process that should be embedded within a medium- and long-term institutional strategy.

The methodologies presented here are not exhaustive. Incorporating new datasets and refining variables can significantly improve the accuracy of the indicators. Access to unique identifiers (such as CPF numbers) by public agencies and financial institutions may reduce false positives in conflict-of-interest analyses and strengthen the robustness of data cross-referencing.

Similarly, information on electoral contributions, sanctioned companies, criminal convictions, beneficiaries of social programs, and expanded data on protected areas and municipal and federal public servants may enrich analyses and expand the system's preventive capacity. Integrating these datasets makes it possible not only to identify individual risks but also to map structural patterns of regulatory capture, fraud, and criminal infiltration in productive chains.

This report demonstrates that strengthening environmental integrity necessarily requires strengthening the anti-money laundering system. Preventing illicit revenues from entering formal markets is a central instrument for dismantling the structures that sustain illegal deforestation and the predatory exploitation of natural resources.

Key Recommendations

1. Incorporate environmental typologies into the anti-money laundering system

Regulatory authorities and financial intelligence units should develop and formalize specific typologies related to environmental crimes, including indicators focused on timber, gold, and cattle supply chains.

2. Adopt a risk-based approach across different supply chains

Financial institutions and oversight and control bodies should incorporate risk indicators into their due diligence processes, particularly in operations linked to sectors with high exposure to deforestation pressures.

3. Invest in technical capacity and data analysis

Effective implementation of these methodologies requires teams trained in data science, financial analysis, and regulatory understanding of environmental supply chains.

4. Update regulatory frameworks where necessary

Where regulatory gaps prevent data sharing or the application of proportional scrutiny measures, regulatory adjustments should be considered to strengthen system integrity.

The modernization of the anti-money laundering system in response to environmental illicit economies is not merely a technical agenda. It represents a strategic decision about how the State and the financial system respond to the expansion of criminal activities that threaten climate stability, biodiversity, and democratic governance.

The integration between environmental policy and financial integrity policy is now an institutional imperative. Ignoring this convergence allows criminal structures to continue operating with increasing sophistication and low risk. Addressing it opens the path for more effective, proportionate, and sustainable responses in the long term.

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9. The term “close associates” is defined in Resolution No. 40 of the Financial Activities Control Council (Coaf), of November 22, 2021, as: I – natural persons known to have joint ownership or partnership in private legal entities or in arrangements without legal personality, who act as agents, even by private instrument, or who maintain any other type of close relationship of public knowledge with a politically exposed person; II – natural persons who exercise control over private legal entities or arrangements without legal personality known to have been created for the benefit of a politically exposed person.
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27. According to Ordinary Law No. 6,462 of 2002.
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29. According to the Multiannual Forest Concession Plan (PPOF) 2024-2027.
30. According to the Pará State Forest Policy, established by Ordinary Law No. 6,462/2002, Normative Instruction No. 5/2015, and Decree No. 2,596/2022.
31. According to State Law No. 6,963/2007. [Lei Estadual nº 6.963 de 2007](#)
32. Pará Agency (2025). [Ideflor-Bio completa 18 anos com protagonismo na conservação da Amazônia](#)
33. According to Law No. 5,810/1994, Art. 177, item VII.
34. According to Ordinance No. 1,847/2008 of the State Secretariat for Environment and Sustainability (SEMAS), Art. 6, item XXVII.
35. The Partnership in Participation (SCP) is a type of unincorporated partnership, regulated by the Brazilian Civil Code, in which there is one ostensible partner, who acts publicly in their own name, and one or more participating (silent) partners, who contribute capital and share in the results without presenting themselves to third parties. It does not have its own legal personality and does not require registration with the Board of Trade, being established through a private contract.
36. The selected classes and subclasses of economic activity were: A02 – Forestry Production; C16 – Manufacture of Wood Products; C31 – Manufacture of Furniture (specifically subclass 3101-2/00 – Manufacture of furniture predominantly made of wood); G46 – Wholesale Trade (specifically subclasses 4613-3/00 – Commercial representatives and agents for the trade of wood, construction materials, and hardware and 4671-1/00 – Wholesale trade of wood and wood products); and G47 – Retail Trade (with emphasis on subclass 4744-0/02 – Retail trade of hardware, wood, and construction materials). For details on the selection, see Table 1.
37. The situations that justify the registration statuses can be consulted in [Normative Instruction RFB No. 2,119, of December 6, 2022](#)
38. Financial Action Task Force (FATF) - 2025. [Money Laundering National Risk Assessment Toolkit](#)
39. Idem
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42. Brazilian Development Bank (BNDES). [Mapeamento de BNDES para CNAE](#)

43. The analysis included the following scientific identifications for ipê recorded in the official databases: *Handroanthus serratifolius*, *Macrolobium pendulum* Willd (ex Vogel), *Tabebuia angustata* Britten, *Tabebuia barbata* (E. Mey.) Sandwith, *Tabebuia capitata* (Bureau & K. Schum.) Sandwith, *Tabebuia cassinoides* (Lam.) DC., *Tabebuia chrysotricha* (Mart. ex DC.) Standl, *Tabebuia heptaphylla* (Vell.) Toledo, *Tabebuia impetiginosa* (Mart. ex DC.) Standl., *Tabebuia ochracea* (Cham.) Standl, *Tabebuia serratifolia* (Vahl) Nichols, *Tabebuia* sp., *Tabebuia umbellata* (Sond.) Sandwith* e *Tabebuia vellosi* Toledo. The analysis of cedar volumetric density considered the scientific names *Cedrela odorata* and *Cedrela fissilis*, as these are the names adopted by the Brazilian Institute of the Environment and Renewable Natural Resources (IBAMA) in its technical opinion.
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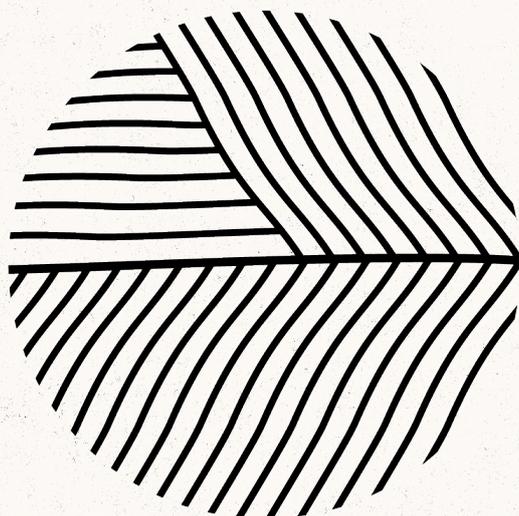
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