IGARAPÉ INSTITUTE
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MARKETS AND FOREST:

Comparative Analysis of the Economic Sectors that Pressure the Amazon Basin

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Presentation

The Amazon is the largest tropical forest on the planet, harboring about 10% of global biodiversity and playing a vital role in regulating the climate and the carbon cycle. Its vast expanses of dense forest and interconnected rivers sustain millions of people, among them Indigenous and traditional communities whose ways of life are deeply intertwined with the ecological balance of the region.

Despite its socio-environmental relevance, the Amazon is under increasing pressure from economic activities that drive deforestation and feed illicit dynamics. The uncontrolled expansion of the gold, timber, cattle, and land markets — sectors that move billions of dollars — is associated not only with environmental degradation but also with the advance of organized crime in the region. These production chains, although legally recognized, coexist with informal, irregular, and criminal practices, becoming frequent targets of environmental crime.

Unlike other offenses, environmental crime presents a particular complexity: the natural resources extracted, such as gold and timber, are not illicit by nature. Nor is the transformation of native forest land for agricultural and livestock purposes illicit in itself. Illegality arises in the way these resources are extracted, produced, or cultivated, transported, commercialized, or inserted into production chains, which makes it essential to differentiate between the legal and the illegal. When the criminal origin of a natural product is concealed — whether through false documents, corruption, exploitation in prohibited areas, or failures in oversight — this product circulates in the market as if it were legitimate. Unlike drug or arms trafficking, whose illegality is intrinsic, in environmental crime one of the main challenges lies precisely in tracing and proving illegality.

In this context, Indigenous and extractivist communities inhabiting protected areas are frequently exposed to risks. They coexist with criminal groups, informal workers, corrupt public officials, and unscrupulous companies that make up an ecosystem of environmental and related crimes, intensifying social vulnerability and undermining the integrity of Amazonian ecosystems.[1]

The authorities of the eight countries that make up the Amazon Basin — Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, and Venezuela — act, each in their own way, to regulate, control, and oversee these economic activities. However, normative differences, regulatory gaps, and the absence of effective regional cooperation mechanisms hinder coordinated action. Even when control agencies act, the permeability of borders facilitates the movement of supplies, goods, and capital, weakening the capacity to confront illicit flows.

In light of this challenge, this study provides a comparative diagnosis of the institutional structures and regulations applicable to the four main markets associated with deforestation in the Amazon: gold, timber, cattle, and land.

Although they are not the only markets associated with criminality — activities such as the trafficking of wildlife, sand, drugs, arms, and human trafficking also move large sums — the sectors analyzed in this study constitute the main drivers of illegal deforestation. By generating substantial profits and enabling the concealment of the criminal origin of resources through trade and the financial system, these markets not only degrade the environment but also promote capital flight and corrode legality.

With the aim of understanding to what extent the countries of the Amazon Basin are prepared to regulate and control these markets, and thus distinguish legal from illegal practices, we established a set of thirteen indicators, divided into **four key dimensions**:

- **Economic, social, and environmental context**
- **Regulation and governance**
- **Monitoring and transparency**
- **Law enforcement**

The selection of dimensions and indicators was based on previous studies by the Igarapé Institute, which mapped the illegal dynamics of these markets, as well as the structural and institutional conditions that favor them. The feasibility of adopting uniform criteria — meaning comparable across countries —was also taken into account.

With these indicators, we developed a performance dashboard that enables the comparison of regulatory effectiveness and institutional capacity of each country in addressing the illegalities present in these chains.

Performance levels (Low, Moderate, High) were assigned by the research team based on the collection and analysis of data relating to each chain in each country, later calibrated through consultations with specialists. Data collection took place between November 2024 and February 2025.

Table 1. Indicators and reference categories for the comparative analysis of production chains that drive deforestation in the Amazon

Dimension	Indicator	Reference Category
Economic, social, and environmental context	**1.1.** Economic Autonomy of the Sector	Degree of economic dependence of the production chain on national Gross Domestic Product (GDP) and export share (in absolute and relative values). A score of 2 represents greater autonomy of the national economy (sector with reduced weight); a score of 0 represents greater dependence (sector with high weight).
	1.2. Sector Formality	Comparison of the informality rate in the sector in the analyzed country with the global average. This considers informality, precariousness, overlap with illicit activities, and the involvement of armed actors. A score of 0 indicates a predominantly informal sector; a score of 2 indicates a highly formalized sector with institutional control.
	1.3. Ecological Compatibility	The degree of socio-environmental impact of the chain, particularly on the Amazon biome, including its contribution to deforestation, greenhouse gas (GHG) emissions, and predatory resource use. Scores: 0 = high environmental pressure; 2 = greater ecological compatibility and sustainability.

continuation

Dimension	Indicator	Reference Category
Regulation and governance	**2.1.** Definitions	Clarity and comprehensiveness of legal definitions of illicit activity in the sector. Scores: 0 = no definition; 1 = generic or ambiguous definition; 2 = clear legal definition that recognizes illegality and provides for specific sanctions.
	2.2. Legislation	Existence and robustness of the legal framework in the sector, considering environmental, criminal, and administrative frameworks. This assesses regulatory stability and legislative autonomy. Score 2 = stable and comprehensive legal frameworks.
	2.3. Criminal Sanctions	Severity of penalties for crimes related to the supply chain. Scores: 0 = maximum penalties below the global average; 1 = penalties within the average; 2 = penalties above the average (in years). Considers only sector-specific crimes.
	2.4. Administrative Sanctions	Range and variety of applicable administrative sanctions (e.g., fines, default interest, product and machinery seizures, license revocation or suspension, financial freezes). Scores: 0 = absent or ineffective sanctions; 1 = partial sanctions; 2 = broad sanctions with financial disincentives.
	2.5. Institutional Competence of Authorities	Clarity and functionality of the institutional architecture for regulation and oversight. This includes defined mandates, inter-institutional cooperation, specialized units (e.g., Financial Intelligence Units – FIUs), and technical capacity. Score: 2 = robust institutional framework.

continuation

Dimension	Indicator	Reference Category
Monitoring and transparency	**3.1.** Equipment Control	Mechanisms for control, tracking, and registration of critical equipment (e.g., dredgers, chainsaws, trucks, tractors), including monitoring of transporters, fuels, and inputs. Score: 2 = comprehensive and operational systems.
	3.2. Transparency	Availability and traceability of information on production, transportation, marketing, and financial flows. Scores: 0 = lack of public data; 1 = partial access (upon request); 2 = high transparency and integration with monitoring institutions.
	3.3. Stakeholder Engagement	Involvement of non-state actors in monitoring and promoting good practices. This includes adherence to initiatives such as the Extractive Industries Transparency Initiative (EITI), Organization for Economic Cooperation and Development (OECD) guidelines, or the International Council on Mining and Metals (CMM), as well as other multistakeholder initiatives. Score: 2 = strong civil society engagement and influence on sectoral policies.
	3.4. Mercury	Specific to the gold mining chain, this indicator assesses the ratification of international treaties (e.g., Minamata), national regulation, and monitoring of mercury use/import of mercury. Score: 2 = effective control regimes.
Law enforcement	**4.1.** Operational Actions	Existence and frequency of policing operations to prevent and investigate crime, and respond to incidents, product seizures, equipment destruction, contractual sanctions, and coordinated action among institutions. Score: 2 = consistent and coordinated action.
	4.2. Public Integrity	Degree of exposure to corruption in public agencies responsible for the supply chain. It considers impunity, whistleblowing, and integrity mechanisms. Scores: 0 = high corruption and institutional fragility; 2 = greater public integrity.

- **Dimension 1: Economic, social, and environmental context**

In this dimension, we consider aspects such as the country's autonomy in relation to the market or sector, the economic share of the activity in the national GDP, and exports in absolute and relative terms (indicator 1.1); the degree of sector formality, i.e., labor market characteristics, inherent labor risks, and the lack of legal protection for workers (indicator 1.2); and ecological compatibility, measured by the contribution of economic activity to deforestation and the volume of greenhouse gas emissions, as well as aspects related to protected areas, particularly data indicating the extent to which the activity occurs in the Amazonian portion of the countries (indicator 1.3). Together, the three indicators highlight the economic, social, and environmental context, which can make the country more dependent on market revenues, more vulnerable to the negative impacts of the activity, including deforestation and the conversion of tropical forests to alternative land uses, and more subject to pressure from the economic sector for regulatory weakening.

- **Dimension 2: Regulation and governance**

This dimension assesses the normative and regulatory aspects of each sector. The first category examines the clarity and comprehensiveness of legal definitions of illicit activity in the mining, forestry, livestock, and land sectors (indicator 2.1). The second evaluates the robustness of the sector's legal framework, including its comprehensiveness, autonomy, and stability (indicator 2.2). The third measures the severity of penalties applicable to crimes related to the sector, excluding related offenses such as organized crime or fraud, compared to the global average severity for similar offenses (indicator 2.3). The fourth category assesses the range and diversity of administrative sanctions applicable to actors who violate existing regulations (indicator 2.4). Finally, the fifth considers the institutional architecture for regulation and oversight, the competence of authorities, and the degree of inter-institutional cooperation (indicator 2.5).

- **Dimension 3: Monitoring and transparency**

In this dimension, the assessment begins with the control of equipment and supplies used in the production chain (indicator 3.1). The second indicator evaluates the information transparency and the recording of data across distinct stages of the activity — production, marketing, and transportation — assessing whether the databases are public and whether a transparency policy exists (indicator 3.2). The third indicator considers aspects of due diligence, certifications, and initiatives to promote best sectoral practices, in addition to the role of civil society organizations (indicator 3.3). For the gold mining sector, a fourth indicator (3.4) was developed to assess mercury regulation.

- **Dimension 4: Law enforcement**

The first indicator in this dimension refers to actions to combat illicit practices, such as police operations, strategies, policies and programmes to counter crime, and technological innovations for mapping and detecting irregularities (indicator 4.1). The second indicator evaluates public integrity, that is, the degree of exposure of public agencies corruption and to regulatory capture (indicator 4.2).

How to Interpret the Dashboard

For each of the 14 indicators, the data collected was compared with reference criteria to assign values. Dashboards were developed using a color system in which light blue represents low performance, medium blue indicates moderate performance, and dark blue corresponds to high performance:

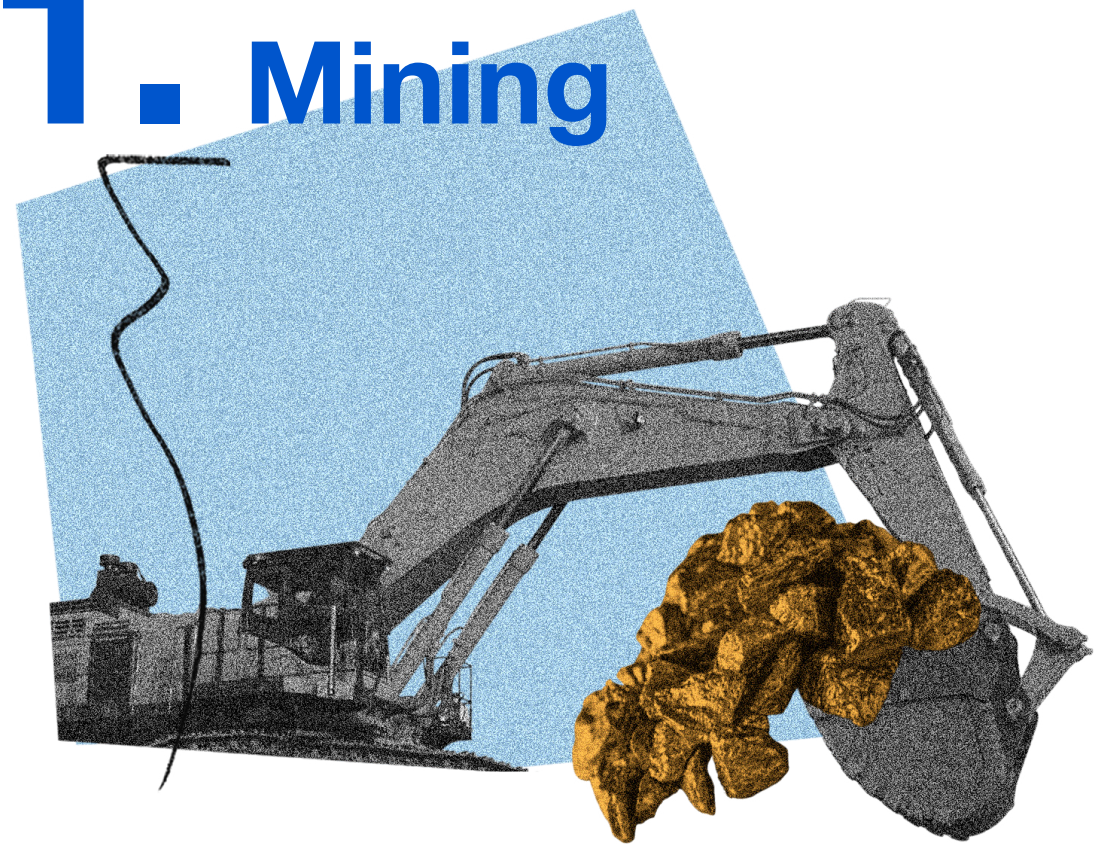
- **Low** (Light blue) – Low score. Indicates limited presence of the assessed metric and poor performance. **Requires improvement.**
- **Medium** (Medium blue) – Moderate score. Indicates an intermediate level of the assessed metric and average performance. **Can be improved.**
- **High** (Dark blue) – High score. Indicates strong presence of the assessed metric and solid performance. **Should be maintained and further enhanced.**

Low = 0 **Medium = 1** **High = 2**

This classification system allows for comparability of each country's performance against the benchmark categories. Descriptive information was collected from all sectors and countries, prioritizing those that enabled comparability.

In the following chapters, we present the Scorecards for each market. These summarize the analysis derived from the categorization of each indicator, illustrated with selected examples, without intending to provide an exhaustive account of each market.

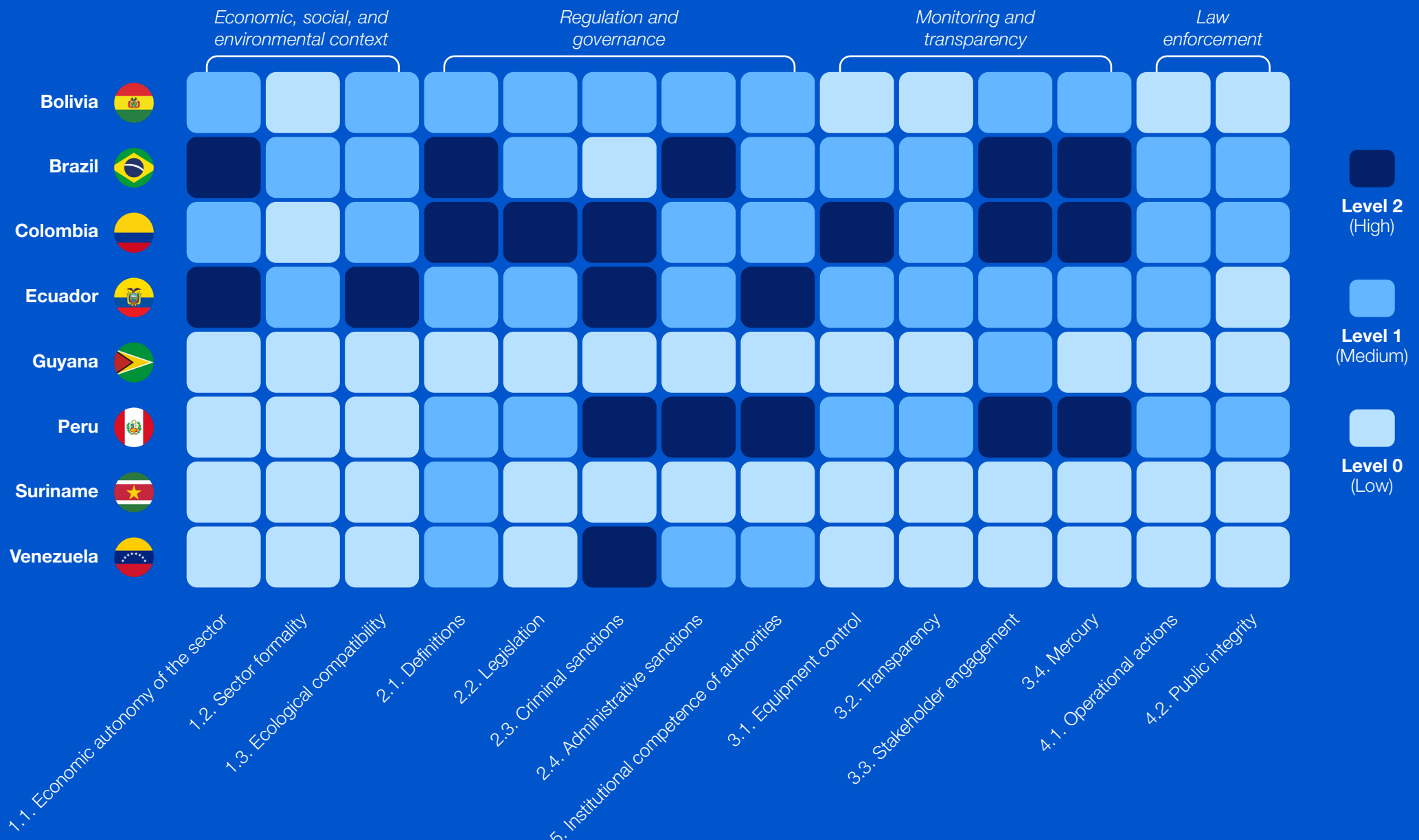
1. Mining



Gold mining is one of the most impactful economic activities in the Amazon Basin, both due to its contribution to national revenue and the environmental and social damage it can cause. The sector is broad and encompasses everything from large industrial operations to artisanal and subsistence mining, often under irregular conditions. Gold mining propels the economies of countries like Brazil, Peru, and Colombia, but is also strongly associated with informality, deforestation, and illicit activities.

The study assessed the performance of Amazon countries across four dimensions. Below is the performance dashboard for the gold mining sector, considering each indicator:

Performance Dashboard - Gold Mining Regulation



Source: Internal data processed by the Igarapé Institute

1.1. Economic, Social, and Environmental Context

Rising above USD 3,395 per troy ounce[2] in April 2025, the price of gold has reached all-time highs and is expected to maintain an upward trajectory as investors seek stability amid rising geopolitical risks.[3] Gold is a commodity whose international price is set by the main clearinghouses in Chicago and London, reflecting supply and demand, futures contract prices, macroeconomic risks, and the monetary policy of global central banks. In this context, production in the Amazon region responds to international pressures, with illegal or irregular production supplementing legal supply, given the sector's high profitability in export chains. The higher the global price, the greater the incentive for new players to enter production, often circumventing current regulations and local oversight.

Countries' autonomy from the gold market was measured by their sectorial economic share (indicator 1.1). Peru has the largest gold export market (USD 10 billion annually) and, therefore, performed poorly in terms of autonomy. Although its economy is more diversified than that of Guyana and Suriname, all three countries were classified as having low autonomy, a category that also includes Venezuela. Although the main mineral product exported by Peru is copper, gold exports show an upward trend compared to 2024, with an exponential growth of 56% (while the copper market grew by only 1% over the same period).[4] The country exports more tons of gold than any of its neighbors in the region and, for this reason, was classified as having low autonomy.

In countries where the sector generates high revenues, the activity must be treated with caution so that irregularities and illegalities do not provide easy advantages for economic or political actors. The gold sector's share of national revenue is crucial to its ability to maintain political independence in effective regulation, as the influence of interest groups can increase pressure for regulatory changes or environmental policies that affect gold mining.[5] These are some of the risks faced by Guyana, Suriname, Peru, and Venezuela. Countries such as Bolivia and Colombia, classified as having moderate autonomy, also require attention, given the increase in mining production and gold exports in recent years.[6]

Informality in gold mining in the Amazon Basin is high, which is why indicator 1.2 (formality) ranges from low to moderate. No country is outside the zone of alert. The global informality rate in mining ranges from 40% to 50%, while in the Amazon it ranges from 75% to 85%.[7] In this context, sex work is common in Guyana and armed groups — known as mining syndicates in Venezuela — exploit the labor of migrants and Indigenous communities.[8]

Artisanal and small-scale gold mining (ASGM), a widespread practice throughout the Pan-Amazon region, is not synonymous with informality. "Informal" refers to artisanal miners who operate in violation of legal requirements, without paying taxes or holding formal licenses and/or titles for their concessions, even though they may be in the process of formalization.[9] This distinction is important, as some attribute the violent criminalization of these miners to international pressure to control artisanal and small-scale mining in the Amazon region. This pressure, however, has not succeeded in controlling the activity: in Brazil, the "grileiros"[10] dispersed to more remote and environmentally vulnerable locations in the region.[11]

The environmental impact of metal mining (indicator 1.3) is direct. In the Amazon, gold mining accounts for 10 to 15% of total deforestation, which is considerably higher than the share of global deforestation attributed to this activity (between 7 and 10%).[12] Ecuador stands out in the high compatibility classification, where mining has the lowest impact on deforestation among the countries in the region. Even so, the increase in mining activity in this country suggests that compatibility may not last long. The countries with the worst performance are Guyana, Peru, Suriname, and Venezuela. In the descriptive data, there are records of

gold mining in protected areas and Indigenous territories across all countries in the region, such as the Isiboro Sécure Indigenous Territory and National Park in Bolivia, and the *Quilombola*[13] community and Brownsberg National Park in Suriname. Another location known for illegal mining is the Madre de Díos region in the Peruvian Amazon, specifically the buffer zone of the Tambopata Reserve.[14] This low ecological compatibility highlights the need to make the activity more sustainable in the Amazon Basin and reinforces the importance of alternatives with a lower environmental impact.[15]

Considering the Context dimension, composed of three indicators related to the activity's context, Ecuador scored highest, with two scores of 2 and one score of 1, followed by Brazil. The most concerning cases are those of Guyana, Peru, Suriname, and Venezuela: countries with low autonomy from gold mining revenues, low labor market formality, and significant levels of deforestation linked to the activity. There are also signs of increasing criminality in the sector.

1.2. Regulation and Governance

The regulation of gold mining in the Amazon Basin countries varies significantly, affecting their capacity to control the activity and to distinguish between legal and illegal mining. This dimension assesses the clarity of legal definitions, the existence of solid regulatory frameworks, the severity of sanctions, and the competence of authorities in overseeing the sector. While some countries have more structured legislation and stricter penalties, others present regulatory gaps and difficulties in law enforcement, which facilitate mineral exploitation in protected areas and Indigenous territories.

The Regulation and Governance Dimension shows that the definition of what constitutes illegal mining is advanced in two countries, Brazil and Colombia, but in the others the concept remains vague (indicator 2.1). Gold mining in the Amazon Basin is heterogeneous, classified according to different criteria: *i)* **Scale of operation**, covering small, medium, and large scales, with some countries, such as Guyana, establishing minimum and maximum limits of area in hectares for each category; *ii)* **Extraction Method**, including surface (open-pit), underground, and alluvial mining. In the Amazon, the alluvial method, with techniques such as river dredging and hydraulic disaggregation of terrestrial sediments, is the most common; *iii)* **Profile of miners**, ranging from local communities, miners' cooperatives, state-owned companies, and private enterprises; and *iv)* **Technique used**, ranging from simple, manual tools for family subsistence to large-scale mechanized equipment.

The legal classification of mining activity also differs across countries. In Colombia, for example, there is a distinction between legal, illegal, and traditional or subsistence mining, with the latter exempt from environmental licensing and restricted to alluvial mining carried out by ethnic communities. However, the boundaries between these categories are often blurred, creating challenges for regulation and oversight.

The Colombian example illustrates the degree of discretion authorities have in determining whether activity is legal or illegal. Article 21 of Law No. 1753 of 2015 defined "subsistence" mining as that carried out manually, without equipment or mechanized machinery. This definition creates ambiguity, particularly when compared with concepts such as "traditional" or "artisanal" mining, since some artisanal miners use limited mechanized support for the extraction, without necessarily causing major environmental impacts.

Additionally, Decree 1666 of 2016 classified mining into small, medium, and large scales, according to the number of hectares in the exploration or development phase and the maximum annual production values in the exploitation phase. Subsistence mining is assumed to fall below the threshold for small-scale production, but without specific criteria or characteristics to define it. In practice, the artisanal mining sector in Colombia remains in a regulatory limbo, leaving environmental authorities with wide interpretative leeway and enabling the criminalization of miners deemed noncompliant.[16]

In Ecuador, there is also inconsistency over what is considered illegal in artisanal mining. The Mining Law (Law No. 45 of 2009) defines illegal mining in Art. 56 and authorizes artisanal and subsistence mining in Art. 134. However, the Organic Comprehensive Criminal Code classifies artisanal mining as a crime, punishable by 1 to 3 years in prison (Art. 260).[17] In other words, a clear legal definition is not enough if the interpretation of what constitutes criminal activity remains ambiguous.

In this case, indicator 2.1 (Definition) was rated as moderate in Ecuador and high in Colombia: in the former, inconsistency stems directly from the legislation itself; in the latter, it results from the broad discretion granted to authorities in classifying artisanal mining.

In Brazil, the definition of illegal mining is also clear, earning a high rating. However, while Colombia allows mining in Indigenous territories, Brazil prohibits it. Guyana, rated low in this regard, likewise allows mining in Amerindian territories (Amerindian Act of 2006, Art. 48). Still, ambiguity persists regarding what is considered legal and illegal in regulations and in the decisions of the Guyana Geology and Mines Commission (GGMC).[18]

In the Legislation category (indicator 2.2), Colombia performs well, with a high rating in this regard. Legislation in Bolivia, Brazil, Ecuador, and Peru was rated moderate. In Bolivia, the current legal framework, Law No. 535 of 2014, could be amended if the Ministry of Mines and Metallurgy's draft initiative is approved, as it proposes relaxing restrictions on mining activity in areas strategic for environmental balance.[19]

Guyana, Suriname, and Venezuela have mining laws rated as low. In Venezuela, since Decree No. 2,165 of 2015,[20] which established the country's mining legal framework, a series of regulations have been approved to expand gold exploitation activities, such as Presidential Decree No. 2248, which created the Orinoco Mining Arc National Strategic Development Zone. Overall, there is still room for progress to ensure more stable and autonomous legislation.

Half of the Amazon Basin countries apply criminal sanctions (indicator 2.3) above the world average for illegal mining, currently set at 7 years in prison.[21] Colombia, Ecuador, Peru, and Venezuela establish maximum penalties of 10 years or more for certain mining offenses, earning them a high rating in this respect.

Examples of criminal legislation applicable in Peru: 

- **Legislative Decree No. 1100 of 2012, Art. 3. Illegal mining**

Mining activity exercised by a person, natural or legal, or group of people using unauthorized equipment and machinery that does not comply with the administrative, technical, social, and environmental laws that govern these activities, or that is carried out in prohibited areas.

- **Criminal Code of 1991, amended by Decree No. 1102 of 2012 and Decree No. 1351 of 2017. Article 307-A – Crime of illegal mining**

Anyone who conducts prospecting, exploration, extraction, exploitation or other similar acts of mineral resources, metallic or non-metallic, without the authorization of the competent administrative entity, which causes or may cause damage, alteration or harm to the environment or its components, environmental quality or environmental health, shall be punished with imprisonment of not less than four nor more than 8 years and a fine of one hundred to six hundred day-fines.

The same penalty shall apply to anyone who conducts exploration, extraction, utilization, or other similar activity of metallic and non-metallic mineral resources outside the formalization process, which causes or may cause harm, alteration, or damage to the environment and its components, to environmental quality, or to environmental health.

Regarding disincentives to irregular economic activity, the Peruvian case is noteworthy:

- **Criminal Code. 307-C – Crime of financing illegal mining**

Whoever finances the commission of the crimes provided for in Article 307-A or its aggravated forms shall be punished with imprisonment of not less than 4 years and not more than 12 years, in addition to a fine of 100 to 600 day-fines.

In Brazil, the maximum penalty is 5 years for the crime of illegal extraction by usurpation against the Union (Art. 2 of Law No. 8,176/1991), which places the country in the low classification, alongside Guyana and Suriname. In Guyana, extracting minerals without a license, sending material outside the mining district where it was extracted, or obtaining mining licenses through false information is punishable by up to one year in prison (Articles 123 and 124, Mining Act of 1989). In Suriname, the 1986 Mining Law establishes a penalty of up to 2 years in prison for those who conduct mining operations without granted mining rights or engage in related acts (Art. 71, Mining Decree).

Table 2. Comparison of the maximum criminal penalties applicable to illegal mining across the eight countries analyzed (in years)

Country	Penalty	Offense	Law
Bolivia	4 to 8 years	Illegal exploitation of mineral resources	Article 232 ter of the Criminal Code (as amended by Law No. 367 of 2013)
Brazil	1 to 5 years	Usurpation of Union assets	Article 2, Law No. 8,176 of 1991
Colombia	5 to 12 years	Illegal exploitation of mineral resources and other materials	Article 332, Criminal Code (as amended by Law No. 2,111 of 2021)
Ecuador	7 to 10 years	Illicit activity involving mineral resources (aggravated by environmental damage)	Article 260, Comprehensive Organic Criminal Code
Guyana	5 years	Prohibition of mineral alienation	Article 70, Mining Law
Peru	4 to 12 years	Financing illegal mining	Article 307-C, Criminal Code (as amended by Decree No. 1,102 of 2012)
Suriname	up to 2 years	Violations of mining operations	Article 71, Mining Decree of 1986
Venezuela	5 to 10 years	Illegal mining activities in national parks	Article 44, Decree No. 2,165 of 2015

The application of administrative sanctions and confiscations measures (indicator 2.4) is essential to curb recidivism and disrupt illegal mining operations. Brazil and Peru apply fines, embargoes on areas, and seizures of assets, which is why they were rated high in this regard. Colombia and Ecuador, classified as moderate, have sanction mechanisms in place but with less financial disincentives — that is, those aimed at decapitalizing companies that violate regulations.[22]

Brazil and Peru also provide for account freezing, asset forfeiture, and/or restriction on access to credit and financing when a mining company is considered high-risk or has a history of non-compliance. In Brazil, for example, Article 14 of the National Environmental Policy provides for the loss, restriction, or suspension of tax incentives and benefits, as well as credit lines. Guyana and Suriname, on the other hand, lack an efficient system of administrative sanctions, classifying low in this regard. Despite this, in the case of Guyana, it is worth noting the provision of fines and even prison sentences for those who provide false information when applying for mining licenses (Article 124 of the Mining Law of 1989, amended in 2010).

An interesting example of the application of administrative sanctions is found in Colombia:

- **2001 Mining Code, Article 161 - Confiscation**

Mayors shall provisionally confiscate minerals transported or sold without an invoice or proof of their origin. If the minerals are proven to be of illicit origin, they shall be handed over to the criminal prosecution authority responsible for the case. The provisions of this article do not apply to subsistence mining.

- **Article 163 - Special impediment**

Anyone convicted of illicit use or exploitation of mineral resources shall be barred from obtaining mining concessions for a period of 5 years.

The implementation of these measures, such as account freezing and asset forfeiture (including gold), still faces challenges due to the judicialization of processes and the lack of integration between financial and environmental oversight agencies.

For indicator 2.5 (Institutional competence of authorities), innovative initiatives for inter-institutional cooperation and strengthened oversight stand out:

In Ecuador, the Special Commission for the Control of Illegal Mining (Cecmi) is led by the Ministry of the Interior and includes administrative agencies, police, and tax authorities.[23] In Peru, the High Commission for Combating Illegal Mining, appointed by the Presidency of the Council of Ministers, forms part of the Permanent Multisectoral Commission for Monitoring Government Actions against Illegal Mining and the Development of the Formalization Process, created by Legislative Decree No. 1105 of 2012.

These initiatives place Ecuador and Peru in the high category in terms of competent authorities, setting them apart from other countries. The most critical situations are those of Guyana and Suriname: although responsibility for the sector lies with the Ministry of Natural Resources and oversight is assigned to the police, institutional competencies are weak and require improvement.

1.3. Monitoring and Transparency

The ability of Amazon Basin countries to monitor, record, and track gold production and trade is critical to curbing illegal mining.

The regulation of equipment used in mining varies across countries in the region (indicator 3.1), but overall the rules lack monitoring and enforcement. Bolivia, Guyana, Suriname, and Venezuela require more effective mechanisms to prevent the use of heavy machinery in mining, which makes these nations more vulnerable to predatory exploitation. Brazil, Ecuador, and Peru, by contrast, are more advanced in controlling the possession and use of barges, excavators, and other equipment, and are therefore classified as moderate in this category.

In Brazil, restrictions apply to the use of dredges and barges in Amazonian rivers, especially in protected areas. The use of unlicensed equipment may result in confiscation during operations against illegal mining, reinforced by Decree No. 10,965 of 2022, which authorizes the Brazilian Institute of the Environment and Renewable Natural Resources (Ibama) and the Army to destroy irregular machinery and to monitor the sector with drones and satellites.[24]

In Colombia, similar provisions are established in Decree No. 1035 of 2024, which empowers the police, army, or navy to destroy and deactivate heavy machinery used in illegal mining.[25] Decree No. 2261 of 2012 regulates, registers, and controls the importation of certain machines. Classified as high in equipment control, Colombia requires the registration and monitoring of so-called “yellow machines,” some of which can also be used in other economic sectors.[26]

In Ecuador, Article 261 of the Comprehensive Organic Criminal Code punishes with imprisonment of 3 to 5 years the financing or supply of machines, equipment, tools, and more generally, any instrument used for the illicit extraction of mineral resources. In addition, under the responsibility of the Ministry of Transport and Public Works, the legal framework for granting mining concessions is Ministerial Agreement No. 002 of December 2016, which regulates the use of machinery and heavy equipment in mining (Articles 10 and 17). Compliance with this regulation by mining rights holders is overseen by the Agency for Mining Regulation and Control (Arcom). A common challenge throughout the region is the enforcement of restrictive norms on equipment use, due to corruption and the difficulty of oversight in remote areas such as the Amazon.

In terms of transparency (indicator 3.2), the classification assesses whether recorded data on gold production, trade, and transport are public, and/or whether they can be requested from institutions or accessed in official systems. The classification does not consider whether this information is integrated, i.e., an all-in-one system for handling gold mining data. None of the Amazonian countries achieves a high rating.

Brazil is recognized for the transparency of open data, such as those related to mercury contamination, classifying as moderate in this indicator, alongside Colombia, Ecuador, and Peru. In Ecuador, for example, the rule is that reports on gold trade at all stages of the supply chain must be public, whether produced by private companies or government institutions. In practice, transparency needs to be expanded in all countries classified as moderate; there are some positive initiatives, but little implementation and integration among monitoring systems across the mining chain. In Bolivia, Guyana, Suriname, and Venezuela, transparency is low, and the challenge is even greater.

The involvement of stakeholders in monitoring mining and promoting good practices (indicator 3.3) is another relevant aspect for reducing the sector's vulnerability to environmental crime. Brazil, Colombia, and Peru participate in international initiatives such as the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals, which sets standards for tracing the origin of gold and mitigating the risks of illegal mining. In addition, programs such as Fairmined[27] encourage the certification of responsibly extracted gold.

In Bolivia, Ecuador, and Guyana, some initiatives have been implemented, but without significant impact on oversight or on strengthening governance in the sector, justifying their moderate classification. Guyana, in particular, has been participating in efforts led by the UNODC to improve its legislation.[28] By contrast, Venezuela and Suriname have low participation of NGOs and international organizations in mining governance, which makes them more susceptible to illegal extraction and uncertified gold trade.[29]

In terms of supplies, the control and oversight of mercury are key factors in assessing the mining sector in the region (indicator 3.4). Venezuela has signed but not ratified the Minamata Convention. Brazil, Colombia, and Peru have national legislation on mercury, reflecting stronger commitment to the Convention's terms; therefore, they were classified as high in the input-related criterion. Guyana and Suriname lack specific regulation but are in the process of approval, classifying, along with Venezuela, as low in the category. Rules without effective enforcement do not prevent the illegal entry or use of mercury, as in Bolivia and Ecuador, classified as moderate. In Bolivia, the input is used in diesel-powered rotary drums known as *chanchas* to separate gold from crushed rock.[30]

There are, however, good examples that can orient regulatory changes in the Amazon Basin. One of them is Colombia's Law No. 1658 of 2013, which prohibited the use of mercury in any mineral extraction activity, and Decree No. 419 of 2021, which prohibited the manufacture, import, and export of the input, not only its use.

In the monitoring and transparency dimension, Suriname and Venezuela are far behind Brazil, Colombia, and Peru. The analysis of monitoring capacity of mining in the Amazon countries shows that countries have different levels of control and transparency, but all still face challenges in enforcing rules and integrating information. Bolivia and Ecuador involve external stakeholders in supply chain monitoring but show gaps in transparency, input regulation, and enforcement effectiveness, resulting in identical overall ratings in this dimension. Venezuela and Suriname, meanwhile, display the greatest weaknesses, with no equipment regulation, poor traceability in the production chain, and little participation of external institutions in controlling the activity. The lack of efficient monitoring in these countries fosters illicit flows, facilitates money laundering, and intensifies the environmental impacts of illegal mining.

1.4. Law Enforcement

The effectiveness of actions to combat illegal mining depends on oversight capacity, the application of sanctions, and the existence of institutional mechanisms capable of curbing illicit activities. The fourth dimension assesses two main aspects among the countries: the deployment of operations to suppress illegal mining and the existence of institutional obstacles that favor impunity and regulatory capture. The greater the evidence of corruption, the lower the public integrity, and the greater the challenges and risks of illegality and irregularity in the sector.

The fight against illegal mining varies among Amazonian countries (indicator 4.1). Brazil, Colombia, Ecuador, and Peru have carried out police operations, seizures, and closures of mining areas, being classified as moderate in this indicator. Taken together, these four countries have conducted operations and legal proceedings in the last years, but their enforcement capacities have been overwhelmed by the scale of the problem.

In Brazil, operations such as Operation Yanomami and Operation Green Brazil have demonstrated efforts to dismantle criminal networks associated with illegal mining, although the continuity of these actions has been hampered by political and logistical factors. In Peru, large-scale operations, such as the crackdown on mining in the Madre de Dios region during a military intervention in 2022, resulted in the destruction of equipment and the closure of illegal mines.[31] Colombia has also intensified actions against illegal mining linked to armed groups but faces difficulties in areas dominated by guerrillas and other criminal organizations. In Ecuador, enforcement operations such as the military Operation Manatí have been reported. On the other hand, Bolivia, Guyana, Suriname, and Venezuela, rated low: the lack of effective oversight in these countries has allowed illegal mining to proliferate without any significant intervention.

Corruption and institutional obstacles represent one of the greatest challenges to countering illegal mining in the region, reflected in the public integrity aspect (indicator 4.2). Regulatory capture, the complicity of public agents, and the influence of criminal groups on political decisions are factors that hinder the fight against illegal mining in several Amazonian countries. Brazil, Colombia, and Peru have institutional mechanisms to investigate cases of corruption but still face difficulties in punishing those responsible and in dismantling political protection schemes for illegal mining. In Ecuador, the lack of coordination between environmental and public security agencies undermines effective enforcement.

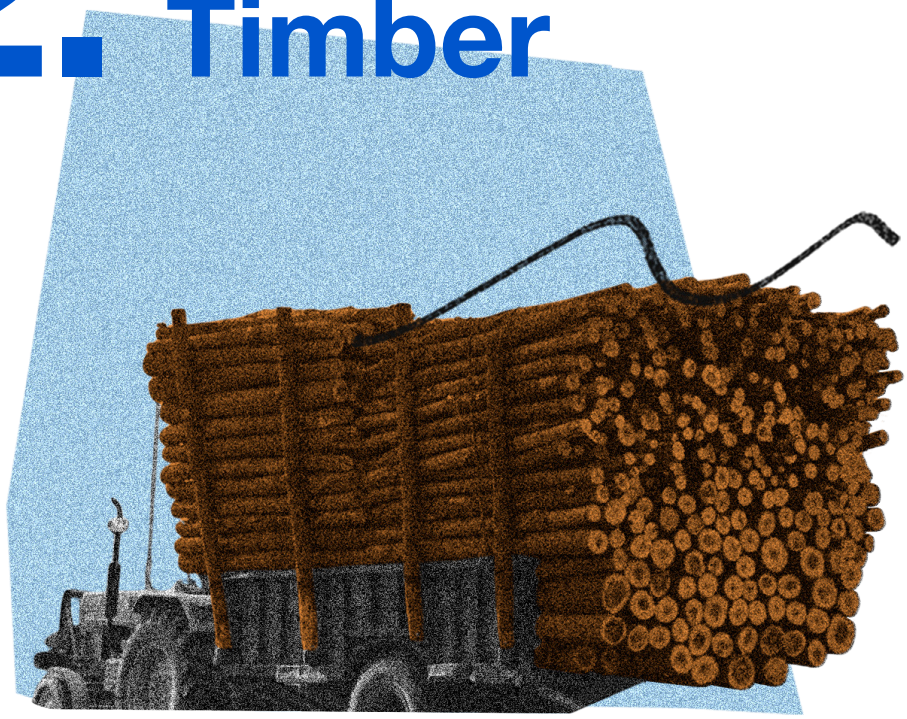
Overall, there is room to improve public integrity in all eight countries. However, in Bolivia, Ecuador, Guyana, Suriname, and Venezuela, corruption is deeply entrenched, justifying the low rating in the public integrity category. There is compelling evidence of local authorities being involved in facilitating illegal activity, making oversight practically nonexistent. Reports have noted, for example, the payment of bribes in gold to corrupt police in Guyana.

An illustrative example of promoting public integrity from a regulatory perspective is Ecuador's mining law, which establishes administrative, civil, and criminal liability, in addition to sanctions for any person who, in the exercise of competent public functions, fails to comply with legal obligations (Art. 119, Mining Law). In Colombia, there is provision for sanctioning a type of embezzlement or perjury applied to the mining sector. Article 403 of the Criminal Code addresses the "allocation of treasury resources for the undue encouragement or benefit of explorers and traders of precious metals." This occurs when a public servant fails to collect financial contributions (mining royalties) based on false declarations about the origin of precious metals.[32]

Greater attention to transportation routes and points where gold is traded and exported is one of the key points recommended to authorities in all eight countries, particularly in those, as Peru, invest little in this stage of the production chain — that is, in the verification of the legal origin of the gold at the first sale.

The analysis of law enforcement related to Amazonian mining shows that Brazil, Colombia, and Peru have comparatively stronger mechanisms to address illegal mining; however, they lack integration and continuity in enforcement actions. Ecuador shows occasional efforts, but with limited systemic impact. Bolivia, Guyana, Suriname, and Venezuela are the most vulnerable countries, with no consistent operations, ineffective sanctions, and high levels of corruption, allowing illegal mining to thrive with few obstacles.

2. Timber

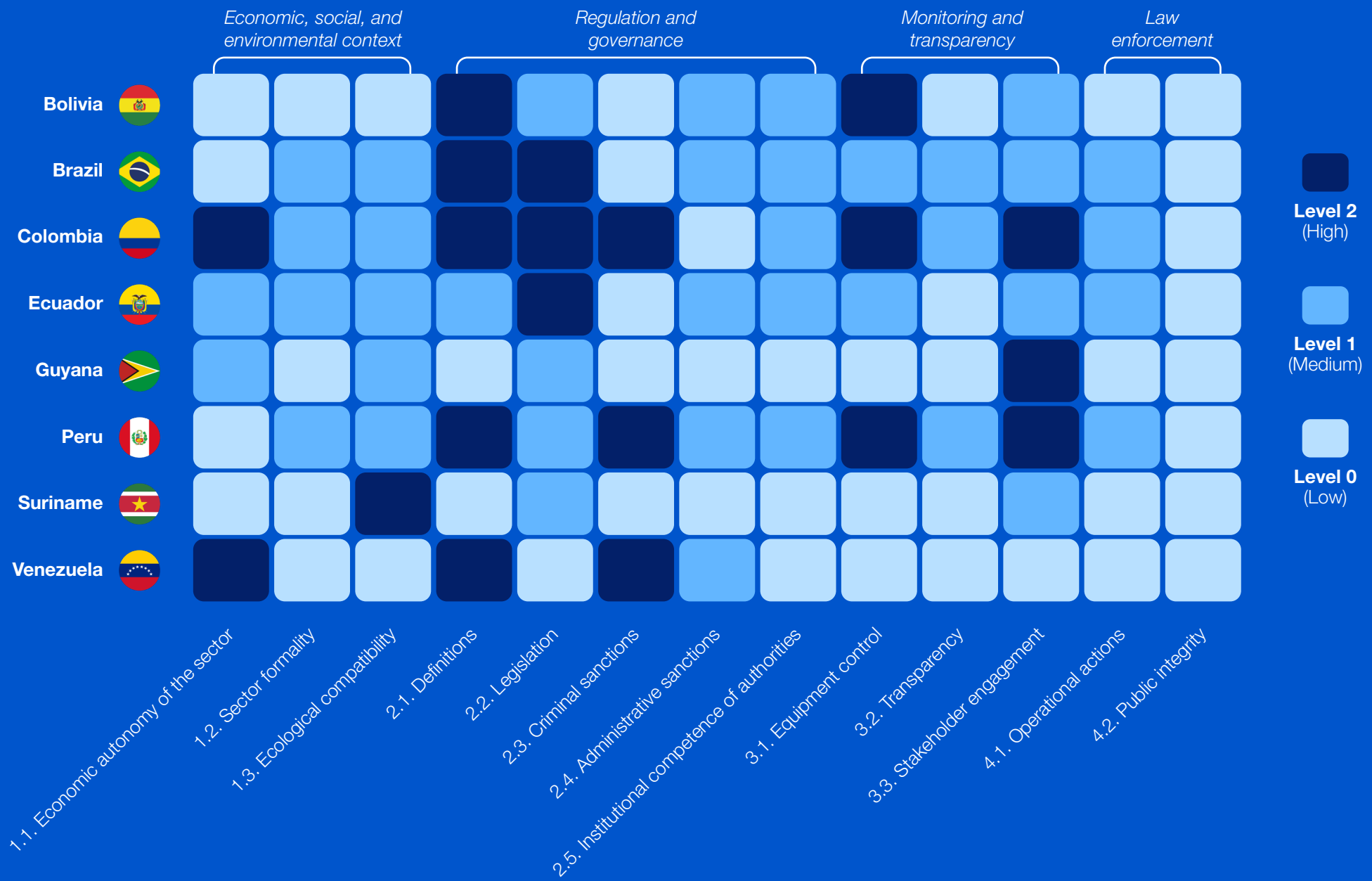


Logging represents both a significant economic sector and a central driver of socio-environmental impacts across the eight countries of the Amazon Basin. According to Interpol, the market for illegal logging and trade is estimated to generate between USD 50 and 150 billion annually.[33] Despite efforts to strengthen controls during the timber commercialization phase, the situation in the Amazon Basin remains concerning: a considerable portion of timber extraction continues to occur illegally. Studies indicate that 38% of the timber harvested in the Brazilian Amazon is of irregular origin, a pattern repeated in other countries of the region.[34]

Illegal practices also persist, such as timber laundering, which consists of disguising the illicit origin of timber extraction — whether from protected forests, protected species, or in volumes that exceed authorization documents — thus giving the appearance of legality to the sale of native forest products. This process involves document fraud at different stages of the production chain, including the extraction, transportation, and storage of forest products and byproducts. Therefore, a comparative analysis of this sector in the eight countries of the Amazon Basin is crucial.

Below, we present the Scorecard for the timber sector, with the color-coded classification assigned to each of the dimensions in each country (Context, Regulation, Monitoring and Law Enforcement):

Performance Dashboard - Timber Regulation



Source: Internal data processed by the Igarapé Institute

2.1. Economic, Social, and Environmental Context

In indicator 1.1 (economic autonomy), Bolivia, Brazil, Peru, and Suriname were classified as having low autonomy, considering the sector's contribution to each country's GDP and the dollar value of timber and forest product exports. The first three are the main exporters of wooden flooring among Amazonian countries. In Bolivia, one risk factor is the export of species listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Approximately 35% of exports in 2019 did not declare any species information in shipment data, and 2% were reported as a "mix" of species. A closer review of "undeclared" exports listed in U.S. import data revealed that many corresponded to cumaru and ipê, two species protected under CITES.[35]

Brazil is one of the world's leading exporters of tropical timber, with about 90% of production destined for the domestic market and only 10% for export,[36] China being the main buyer of raw logs.[37] The sector's economic contribution in Colombia and Venezuela is quite limited compared to other productive sectors, justifying their classification as high autonomy. In Ecuador and Guyana, economic participation is rated as moderate.

Formality in the timber sector (indicator 1.2) in Amazon Basin countries is relatively low, with rates above the global informality average, estimated at 55% for the sector by official agencies. The situation is particularly severe in Bolivia, Guyana, Suriname, and Venezuela, which were classified as low. In Venezuela, labor market data show that the informality rate increased from 48.5% in 2015 to 84.5% in 2020,[38] negatively affecting the living conditions of forestry workers and undermining sustainable natural resource management. The other four countries — Brazil, Colombia, Ecuador, and Peru — are classified as moderate.

Qualitative data from this study also indicate the use of slave and migrant labor in forestry activities in countries such as Brazil and Colombia.[39] Workers are subjected to economic and gender-based violence, sometimes under threats from armed groups, as in Colombia, through the practice of "apadrinhamento" ("sponsorship"), in which financiers handle logistics for transportation and marketing, creating dependency relationships with local communities.

Better training of the workforce could promote sustainable exploitation of native forests, as shown by successful experiences in Brazil in disseminating and improving techniques for Sustainable Forest Management (SFM), supported by resources from the Amazon Fund.[40] In Guyana and Suriname, however, informal hiring and precarious working conditions were reported, including long workdays, low wages, unsafe situations, and limited oversight of labor relations — justifying the low classification in this category.

The environmental context (indicator 1.3) in which the timber sector operates, especially its relationship with protected areas in the Amazon, is concerning. Research found that illegal logging occurs in protected areas in all the countries studied, with conflicts involving Indigenous and traditional communities affected by the environmental and social damage of unauthorized timber exploitation. Examples include Yasuní National Park and Cofán Bermejo Ecological Reserve in Ecuador, which lost 1.16 million hectares of natural forest between 1985 and 2022, 40% of it within protected areas.[41]

Half of the Basin countries were classifyed as moderate in this indicator: Colombia, Ecuador, Guyana, and Peru. Only Suriname was classified as high ecological compatibility, as traditional small-scale exploitation predominates there, and both the percentage of deforestation attributed to the timber sector and the environmental impact, measured in GHG emissions, remain within the global average. Still, given the increasing pressures to clear primary forests for agricultural activities, Suriname's classification should be interpreted with caution.

The impact of illegal timber exploitation goes beyond the loss of vegetation cover: it affects hydrological cycles, biodiversity, and carbon emissions, since logging accounts for more than half of global emissions from forest degradation.

In Bolivia, Brazil, and Venezuela, the low classification is a warning sign, as deforestation rates attributed to the timber sector are at least 10% above the global average.

2.2. Regulation and Governance

In the first category of this dimension, concerning the definition of illegal activity (indicator 2.1), Guyana and Suriname received low scores, since the definition of what is legal is not explicit and there is a lack of clarity on what constitutes illegal logging in these two countries. Ecuador, classified as moderate, considers forest use without a title or exploitation permit a serious or very serious offense under its Organic Environmental Code.

- **Organic Environmental Code of 2017. Article 318 – Very serious infractions.**

The following infractions will be considered very serious and, in addition to economic fines, the following sanctions will be applied:

1. The exploitation, possession, use, transport, movement, storage, processing, and commercialization of timber and non-timber forest products from native species that are under some category of threat, conditioned or restricted, without administrative authorization. For this infraction, the sanction provided for in item no. 2 of Article 320 will apply, as appropriate; (...);

3. Irregular settlements that affect biodiversity within protected areas or National Forest Heritage areas. For this infraction, the sanction provided in no. 7 of Article 320 will apply; (...);

5. Providing incorrect information, or information not corresponding to the truth of facts or persons, in order to obtain administrative authorization or to comply with monitoring and control mechanisms, thereby inducing the competent Environmental Authority to make errors. For this infraction, the sanction provided in item no. 5 of Article 320 will apply, as appropriate; (...);

9. Establishing forest plantations in prohibited locations, according to the provisions of this Code. For this infraction, the sanction provided in no. 2 of Article 320 may apply, as appropriate;

10. Exporting timber from native species under some category of threat, conditioned or restricted, without administrative authorization, or exceeding authorized amounts even with authorization. For this infraction, the sanction provided in no. 2 of Article 320 will apply as appropriate.

There is a legal framework defining illegal logging in Ecuador's environmental law and penal code. However, it is restricted to wild species protected by law or international treaties, excluding other species of economic value not legally protected. Therefore, there is room for improvements and more comprehensive definitions of what constitutes illegal timber.

- **Organic Comprehensive Penal Code. Article 247 – Crimes against wild flora and fauna**.

A person who hunts, fishes, fells, captures, collects, extracts, possesses, transports, introduces, stores, traffics, supplies, mistreats, benefits, trades, or markets specimens — or their parts, components, products, or derivatives — of terrestrial, marine, or aquatic wild flora or fauna species listed as protected by the National Environmental Authority or by international treaties ratified by the State, will be punished with imprisonment of 1 to 3 years. The maximum penalty will be applied if any of the following circumstances occur:

- The act is committed during periods or in zones of seed production, reproduction, incubation, nesting, birth, rearing, or species growth, or during a prohibition period.
- The act is committed against threatened, endangered, endemic, transboundary, or migratory species.
- The act is committed within the National System of Protected Areas, special areas for biodiversity conservation, national forest heritage, or fragile ecosystems.
- The act causes severe damage to biodiversity or natural resources.
- The act is committed using techniques or means not permitted by national legislation.

The timber sector's legal framework was evaluated as sufficiently strong in five of the eight countries in the region, including Bolivia and Colombia, which were classified as high. The most comprehensive definition of what constitutes illegal activity among the countries assessed in this study includes cutting, extracting, transporting, buying, or selling timber or other forest products without the necessary authorizations; exceeding the limits of concessions, granted areas, or management plans; operating in protected areas; or violating current environmental laws on forest resource use, including through fraud and corruption in the authorization process to legitimize illicit operations.

Document falsification, which can facilitate environmental crime, is not always included in the definition of timber-related offenses. A specific example is Article 314-B of the Peruvian Penal Code, which establishes liability for providing false information to evade monitoring and oversight procedures in forestry and wildlife matters, including tax, customs, and other controls.

In indicator 2.2, which considered the legislation applicable to the forestry sector, Brazil, Colombia, and Ecuador were classified as high. Brazilian legislation includes rules on the management of public forests and environmental crimes, as well as infra-legal provisions such as decrees on administrative environmental sanctions and their investigation, and Ibama's normative instructions instituting monitoring systems for authorizations. Colombia has stable and comprehensive rules, with the most recent legislation from 2021 creating six new environmental crimes, establishing a reference threshold for illegal deforestation — equal to or greater than one continuous hectare (Art. 330, Law No. 2111 of 2021) — and criminalizing, in the same law, the financing of deforestation.

Peru, which already had an established framework, recently underwent a reform with the approval of Law 31.973 (which modifies Law 29.763 of 2011, the Forestry and Wildlife Law), considered an environmental setback for legalizing practices previously treated as illegal. The legislative change transferred the authority to designate forests from the Ministry of Environment to the Ministry of Agrarian Development and Irrigation, which is why the country was classified as moderate. This intermediate classification is also justified by the Decree for Community Forest Management, which leaves communities vulnerable to exploitation by illegal networks. Venezuela's low classification is linked to the regulatory sector's limited autonomy from the Executive.

In indicator 2.3, the penalties for offenses related to irregular exploitation of forest resources were compared to the global average sentence for such crimes, which is 8.5 years. Colombia, Peru, and Venezuela were classified as high, as their maximum penalties for forest-related crimes are 10 years or more. The other countries received a low classification, as their penalties reach up to 6 years, below the global average. Aggravating circumstances can increase penalties in Bolivia, under Art. 109 of the Environmental Law if the crime affects protected areas or violates conservation standards.

Table 3. Comparison of the highest criminal penalties applicable to illegal logging among the eight countries analyzed (in years)

Country	Penalty	Offense	Law
Bolivia	2 to 4 years	Cutting down forests without authorization, causing damage to the environment	Article 109, Environmental Law
Brazil	3 to 6 years	Preparation or presentation of false data in licensing	Article 69-A, Environmental Crimes Law
Colombia	8 to 15 years	Promotion and financing of deforestation	Article 330-A, Criminal Code, as amended by Law No. 2,111 of 2021
Ecuador	1 to 3 years	Crimes against wild flora and fauna	Article 247, Comprehensive Organic Criminal Code
Guyana	5 years	Severe damage to the environment	Annex of Environmental Protection Law No. 11 of 1996 (Article 39, paragraph h)
Peru	8 to 10 years	Aggravated forms of forestry offenses	Article 310-C, Criminal Code, as amended by Decree No. 1,102 of 2012
Suriname	up to 4 years	Forging documents related to logging; cutting down or ordering the removal of trees on public lands	Article 51, Suriname Criminal Code (Forest Management Act – Wet Bosbeheer) of 1992
Venezuela	1 to 5 years 6 to 10 years	Use of species from forest heritage; falsification of identification documents	Articles 71 and 73, Environmental Criminal Code

To improve the quality of sanctions and law enforcement, two areas for improvement were identified: a) countries that only sanction the extraction of protected species, disregarding unprotected timber of high economic value, should adapt their regulations; and b) countries that jointly regulate fauna and flora crimes in their penal codes should promote the separation and individual sanctions for each offense. This is the case with Ecuador's Comprehensive Organic Penal Code (Art. 247), for example.[42]

Administrative sanctions (indicator 2.4) exist in all countries, ranging from low to moderate. Colombia, Guyana, and Suriname impose fines, embargoes, and infrastructure demolitions and are classified as low in this regard. The other five countries perform better, providing for more comprehensive sanctions designed to increase the costs of those who act irregularly.

Ecuadorian legislation provides, among administrative sanctions, the seizure of species, tools, and inputs; the destruction of products and means of transportation; the suspension of activities or operating permits (Organic Environmental Code, Art. 320); and the revocation of permits. Similar measures exist in the other countries classified as moderate, in addition to the return, suspension, or loss of financial incentives.

In Peru, Legislative Decree No. 1319 of 2017, which establishes measures to promote trade in forestry products and wildlife of legal origin, provides for the precautionary suspension of the license of "forest regents" who prepare or sign management plans using false information.[43] Brazil also provides for disincentive measures by determining the loss of tax benefits and financing lines, in addition to the prohibition of entering into contracts with the public administration, according to Decree No. 6,514 of 2008.

The lack of integration between forestry sector control bodies and financial bodies, however, is an issue that must be addressed so that countries classified as moderate, such as Brazil and Ecuador, can raise their ratings to high in this regard.

In terms of competent authorities (indicator 2.5), all countries exercise governance over the timber sector, typically assigning the Ministry of the Environment and the ministries responsible for land management and agriculture the responsibility for regulating the sector.[44] Inspection and investigation of irregularities are typically carried out by the police, environmental authorities (such as Ibama in Brazil), customs authorities (such as Sunat in Peru, or the Federal Revenue Service in Brazil), as well as the Public Prosecutor's Office or equivalent departments in the justice system (such as the Specialized Environmental Prosecutor's Offices).

To be effective, regulation and oversight must occur throughout the entire chain, covering resource exploitation, processing, transportation, and marketing (including import and export) of forest products. This chain of responsibilities prevents illegally harvested timber from entering the market under unreliable documentation.

The jurisdiction of regional or subnational authorities is another relevant aspect of sector regulation. In Colombia, the Regional Autonomous Corporations can impose administrative fines, seize timber and inputs, and destroy machinery or equipment used in the activity, with a mandate complementary to that of the authorities responsible for applying criminal sanctions (according to Law No. 99 of 1993). Decentralized governance must be accompanied by public integrity, as it does not guarantee that local authorities are immune to the influence of local elites. Experiences in interinstitutional cooperation should be valued, and for this reason, Bolivia, Brazil, Colombia, Ecuador, and Peru were rated moderate in this regard.

In Peru, the National Forestry and Wildlife Service (Serfor), linked to the Ministry of Agriculture and Irrigation (Minagri), is responsible for: a) managing and promoting the sustainable use of forest resources and wildlife; b) adopting control and inspection measures for the management and use of forest resources and wildlife protected by international treaties; c) controlling the export and import of species mentioned in CITES; and d) authorizing the use of machinery and equipment in the development of forestry use activities, subject to prior registration with the National Superintendence of Public Records (Sunarp).

The Forest Resources and Wildlife Supervision Agency (Osinfor) oversees and monitors forest use when granted through enabling titles (forestry licenses or concessions). The forestry system is institutionalized at the national and regional levels,[45] and there is debate about the independence of some of the agencies responsible for the sector in Peru.[46] The country also has an Environmental Oversight Tribunal (Environmental Assessment and Oversight Agency (OEFA) for violations under the General Environmental Law (Law No. 28611 of 2005), as well as the Permanent Multisectoral Commission to Combat Illegal Logging, made up of 15 government entities and chaired by Minagri, represented by the High Commissioner for Affairs of Combating Illegal Logging (*Alto Comisionado en Asuntos de Lucha contra la Tala Ilegal*).[47]

2.3. Monitoring and Transparency

The control of machinery and equipment (indicator 3.1) is limited in Guyana, Suriname, and Venezuela, which is why they are classified as low performance. Venezuela's Forest Law (Ley de Bosques), in its Art. 74, establishes that the use of certain types of machines, inputs and equipment may be regulated and restricted to ensure the conservation of forest heritage. This generic determination justifies the low classification.

In Ecuador, Ministerial Agreement No. 001, of January 2015, regulates the use of heavy machinery and equipment in mining, forestry and related activities, leaving the country with a moderate rating in this regard. Brazil is also classified as moderate, as it establishes the mandatory registration of chainsaws and considers the irregular commercialization and use of the equipment in forests to be an environmental crime.[48]

Bolivia, Colombia, and Peru are rated high. In Bolivia, Supreme Decree No. 24.453, of 1997, prohibits the use of chainsaws in squaring cuts (cross-cutting) for commercial purposes. In Peru, chainsaws and similar equipment are also prohibited in the longitudinal cutting of wood, according to Supreme Decree No. 039-99-AG. In addition, there is the Registry of Portable Sawmills (*Registro de Asseraderos Portatiles*), intended for individuals and legal entities that use portable wood-cutting equipment for the processing of forest products. This registry is subject to control and monitoring by Serfor, requiring the use of GPS devices or other tracking systems.[49]

In Colombia, Resolution No. 1196, of 2018, from the Ministry of Environment and Sustainable Development, establishes the registration of chainsaws in regions affected by deforestation, such as the Amazonian departments, assigning local authorities the responsibility for registering the machines.[50] Despite the existence of rules, even in countries

classified as high in this category, more effective monitoring of equipment is still necessary. **Transparency practices (indicator 3.2) show promising mechanisms** adopted by Brazil, Colombia, and Peru, classified as moderate. These countries maintain records and monitor the timber sector with the support of technological tools. In Peru, the National System for Forest and Wildlife Control and Surveillance (SNCVFFS) and the National Information System on Forests and Wildlife (SNIFFS)[51] include a satellite monitoring platform to track timber from the forest to the market. Since 2020, the Ministry of Agriculture and Irrigation (Minagri) has implemented this strategy through the National Forest and Wildlife Service (Serfor), enabling the National Forestry and Wildlife Authority, as well as regional forestry and wildlife authorities (ARFFS), to make management decisions. Users, license holders and regional authorities can access the National Registry of Forestry and Wildlife Regents, which makes it possible to verify, for example, the list of professionals with valid or suspended licenses.

In Colombia, the platform "Choose Legal Timber"[52] is a technological tool that connects producers of forest products (timber and non-timber) that comply with current legislation to national and international buyers, with the objective of combating the illegal trafficking of forest resources. In Brazil, the DOF+ Traceability System ensures detailed control of each log of wood, from its point of origin to its final destination.

In Guyana, the Legality Assurance System (LAS)[53] requires that all wood products be traced from the forest concession to the point of export, accompanied by a valid export license and other documents. The system, which is part of the partnership with the European Union, is designed to ensure that all wood products exported from Guyana are legal and traceable. As it is still not fully implemented, the country's classification remains low.

For indicator 3.3, concerning the involvement of other stakeholders, the dissemination of sectoral rules stands out, such as the Forest Stewardship Council (FSC) label, which certifies good practices, in addition to other certifications of the chain of custody of forest-based products. With the exception of Venezuela, these initiatives were reported in all Amazonian countries. However, the application of guidelines is more limited in Bolivia, Brazil, Ecuador, and Suriname, which are classified as moderate in this respect. An example of engagement in the sector is the Sustainable Timber in Suriname (Susteme) project by IDB Lab, which seeks to promote environmental, economic, and social sustainability of the forestry sector in Suriname.

The application of guidelines is more effective in Colombia, Guyana, and Peru. The Guyana Forestry Commission (GFC) has a Code of Practice for Forest Operations (2018), which establishes mandatory compliance standards for logging and good practices. Other rules, such as the Code of Practice for Wood Processing of the GFC (2012), were developed in partnership with the International Tropical Timber Organization (ITTO), placing the country in a prominent position regarding the rules and implementation practices adopted in the forestry sector. In Colombia, in 2022, the Ministry of the Environment and the Colombian Chamber of Construction (Camacol) developed a guide with tools and guidelines for builders so that architects and suppliers adopt measures to ensure the acquisition and subsequent use of wood from legal and sustainable sources in the sector.[54]

Global demand for timber exerts pressure on native forests, and investments in traceability are necessary to prevent illegally harvested timber from circulating in the market. Still under the stakeholder-related indicator, special mention should be made of the Voluntary Partnership Agreement (VPA) signed between Guyana and the European Union to improve forest governance and contribute to the fight against illegal logging.

In 2009, it was estimated that between 6% and 13% of timber imports into the EU came from illegal sources, justifying the partnership with Guyana, as well as the adoption of the European Timber Regulation (EUTR), of 2013, designed to prevent the trade of illegally harvested timber in the European market. Foreign regulations applicable to the sector, such as those of the European Union and the United States Lacey Act, establish the responsibility of purchasing companies when acquiring timber of illegal origin. Such measures may result in infringers losing customers, but the process of confirming that timber products originate from sources that comply with all applicable laws depends on a joint implementation between exporting and importing countries.

As seen in the previous dimension, regarding regulation, there are differences in official guidelines on how to conduct forestry in a non-predatory manner. Indicator 3.3 shows that there are also divergences regarding unofficial guidelines, but among the good practices identified, there is potential for learning to guide regional cooperation.

2.4. Law Enforcement

Entering the law enforcement dimension**, indicator 4.1 (operational actions) shows that half of the countries are classified as low and the other half as moderate**. Initiatives to combat crimes and irregularities in the timber sector were reported in all countries. In Colombia, the 2022 Artemisa Campaign stands out, an intervention strategy of the National Council for the Fight against Deforestation (Conaldef), composed of the Ministry of the Environment, Justice and Defense, the Office of the Attorney General, the Office of the Prosecutor General, the Armed Forces, and the National Police. More than two dozen operations to combat deforestation were carried out, with seizures of illegal timber and control of vessels that did not present the documentation or environmental licenses required for timber transport, in accordance with current regulations.

In Peru, joint operations between Osinfor, the National Service of Natural Protected Areas (Sernanp) and the Ministry of the Environment stand out, with the support of Interpol to deal with cross-border routes of illegal timber movement.

Brazil, Colombia, Ecuador, and Peru are classified as moderate in operational actions, while Bolivia, Guyana, Suriname, and Venezuela appear as low performance. According to an investigation by Amazon Underworld, at least six operations against illegal logging were carried out in Bolivian territory between 2020 and 2025, with the participation of the Authority for the Supervision and Social Control of Forests and Lands (ABT), the Army and forest rangers of the Manuripi Reserve. The Public Prosecutor's Office of the Department of Pando, however, filed formal charges in only one of the cases.[55]

Measures such as improving timber traceability, stricter enforcement and increased transparency in production chains are essential. However, corruption and the limited effectiveness of sanctions against environmental crimes hinder efforts to combat illegal exploitation in Amazonian countries. These aspects are assessed under **indicator 4.2 (public integrity), which highlights the opacity in the functioning of institutions**. All countries received a low rating in this regard, indicating that illegal exploitation is facilitated by deficiencies, deliberate omission, or corruption in regulatory and/or enforcement agencies. This manifests itself, for example, through bribery of competent authorities, manipulation and fraud of documents, or phantom shipments.

As an example, reports of corruption in the Bolivian Forest Agency (ABT) undermine sectoral policies in the country. Nevertheless, this reality coexists with positive practices. In the last five years, Bolivia approved a National Voluntary Forest Certification Program (2020), the National Plan for Integral Management of Forests and Land (2021), the Plurinational Strategy for Forests and Climate Change (2024), and institutionalized the "Forest, Life Systems and Climate Crisis Roundtable," aimed at strengthening inter-institutional coordination and promoting intercultural dialogue on climate territorial governance.

The process of "laundering" timber takes multiple forms: through falsification of management plans, fraud in declaration of origin (such as the DOF in Brazil) when involving a forest species protected by the State and of high economic value; or through the distribution of large lots of illegal timber in small shipments, in order to attract less attention from the authorities.

It is insufficient to invest in regulation alone. A poorly implemented regulatory model can even favor the expansion of illegal logging and disguised exports, with one species substituted for another. An example of this was the ban on the trade of mahogany, one of the most valuable species in the world, which was not accompanied by effective monitoring. This gap resulted in an increase in exports of "other tropical timber species," used to mask the origin of mahogany destined for the foreign market. It also exacerbated violence in municipalities in Pará (Brazilian Amazon), due to insufficient supervisory capacity.[56]

Among the main catalysts of forest crime are falsification, fraud and corruption, which allow criminal networks to circumvent legal requirements and transport shipments of timber products across borders.[57] In this sense, it is important to advance in the regulation of the sector so that the different links in the chain, from licensing to export, are supervised. This reduces the margin of doubt about what is illegal, strengthens institutional capacities so that authorities can monitor economic activity, investigate and sanction irregularities, and reward integrity practices along the production chain.

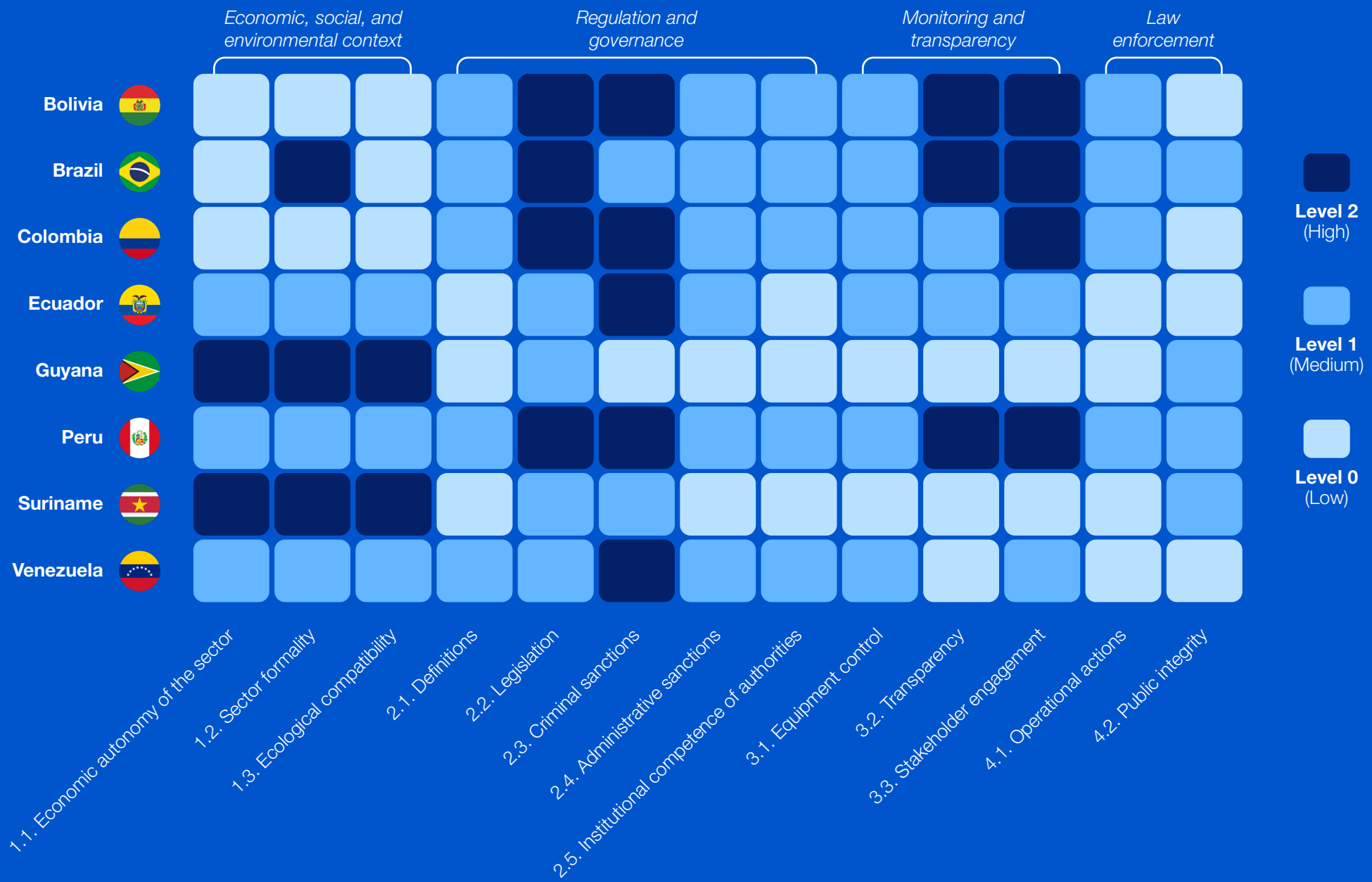
3. Cattle Ranching

Among agricultural commodities, cattle production is the main driver of deforestation in the Amazon. Globally, between 2001 and 2015, most forest replacement occurred for cattle ranching, surpassing land-use changes for soybean, timber, palm oil, or cocoa production.[58] The conversion of forests to pasture occurs despite the small profit margins of cattle ranching for producers, whether because it represents a form of real estate speculation, a means of securing land tenure, or other reasons beyond immediate profit. In the Amazon, according to ranchers' calculations, each cow requires, on average, one hectare of pasture, and each pasture is laid out by clearing the forest.[59]

Livestock farming, both around and within protected areas, is closely linked to the expansion of road networks and the conversion of forest cover into pastureland for livestock and agribusiness.[60] Attempts to conceal the association of cattle with illegally occupied areas throughout the production chain constitute another challenge for the sector. Monitoring remains limited — in Brazil, it is restricted to suppliers who sell directly to slaughterhouses — reinforcing the need to expand traceability and subject the activity to stricter regulatory oversight by the relevant authorities.[61]

Below, we present the Scorecard for the livestock sector in all eight Amazon countries, with low, moderate, and high scores assigned for each of the thirteen indicators.

Performance Dashboard - Cattle Ranching Regulation



Source: Internal data processed by the Igarapé Institute

3.1. Economic, Social, and Environmental Context

Livestock farming represents a vital sector for many Amazonian countries, both for its contribution to GDP and for ensuring food sovereignty. With vast territories and a history of agricultural development, Amazon Basin countries such as Bolivia, Brazil, and Colombia participate directly in the international production of animal products. For this reason, they were classified as having low autonomy in terms of **economic participation (indicator 1.1)**. Understanding the economic context of this chain and its characteristics helps assess the degree of autonomy these countries hold over the livestock economy.

Brazil stands out as the world's largest exporter of beef and the holder of the largest live herd, making livestock a major contributor to national revenue. As a leader in the sector, agribusiness — of which livestock farming is a part — represents about 21% of Brazilian GDP, with a market valued at USD 18 billion in beef exports. Accordingly, Brazil was classified with low autonomy.

In addition to Brazil, the complexity of livestock chains in Bolivia and Colombia also led to a low classification for this indicator, highlighting that more attention needs to be directed to prevent irregular and illicit practices. The situation is different in Guyana and Suriname, which were classified with high autonomy. In these countries, the industrial sector is quite limited and meat consumption is reduced,[62] whether due to religious factors (such as among Hindu communities) or non-religious ones.

The average level of formality in livestock farming (indicator 1.2) is low, with an informality rate around 60%. In Amazonian countries, the situation is even more concerning. In Bolivia and Colombia, classified with low formality, informality reaches 80% and 85%, respectively. This situation is linked to low worker qualifications and precarious working conditions. Informal activity is especially concentrated in inland and remote regions, making oversight difficult for the relevant institutions.

In Colombia, dissident groups from the Revolutionary Armed Forces of Colombia — People's Army (Farc-EP), such as the Jorge Briceño Suárez Bloc (BJBS), are involved in livestock in two ways. First, by charging "taxes" and "vaccines" from farmers (*colonos*), they generate revenue to offset losses from the decline in coca cultivation in the region. Second, the presence of *colonos* allows these groups to establish a social base, which is fundamental to maintaining territorial control in areas where they operate, including obstructing police operations.[63]

Formality is high in Brazil, Guyana, and Suriname. In Brazil, livestock has generated formal jobs, supported by public policies.[64] In Guyana, the activity is linked to subsistence farming involving Amerindian populations, while in Suriname it is tied to family-based production. A key point is the role of cooperatives and producer associations, which bring together small informal farmers, enabling a more efficient distribution of production and protecting their rights. Venezuela, in turn, was classified with moderate formality.

In the Amazon region, forest conversion into pasture for intensive livestock is the main driver of deforestation. Of the 39 million hectares (Mha) of deforested Amazon land between 2001 and 2022, 38 Mha are attributable to agriculture and forestry; of this, 83% corresponds to pasture expansion and the rest to agriculture.[65] Six of the eight countries were classified with low or moderate **ecological compatibility (indicator 1.3)**, showing how much still needs to be done to reduce livestock's impact on biodiversity.

In countries where livestock has significant economic weight, cattle raising is associated with extensive pastures that require vast land areas for beef production. This is the case in Bolivia (55%), Brazil (65%), and Colombia (50%), all above the global average of deforestation attributable to the sector (45%). Brazil leads in absolute GHG emissions, with livestock emitting 503.5 MtCO2 in 2023, equivalent to 80% of emissions from agriculture and livestock — the sector that emits the most CO2 — while agriculture alone represents only 20% of total emissions. Since 1970, agricultural emissions have nearly tripled in Brazil, with the cattle herd as the main source of sectoral carbon emissions.[66]

In Colombia's Amazon, the cattle herd doubled in eight municipalities of the Caquetá, Guaviare, and Meta departments, rising from 1.143 million in 2016 to 2.091 million in 2021. In one protected area, Chiribiquete National Natural Park, the herd grew from 14,200 in 2016 to 28,200 recorded in vaccination campaigns in 2023. This expansion has driven deforestation, which accumulated 8,180 hectares between 2017 and 2022 in the same region.[67]

Pressure from livestock on protected areas and Indigenous lands has been reported in all eight countries analyzed, such as the Isiboro Sécure Indigenous Territory and National Park (TIPNIS) in Bolivia and the Nukak National Natural Park in Colombia. In terms of ecological incompatibility, one problem identified was livestock activity in buffer zones of environmental protection areas — an issue that must be addressed by the competent authorities in each country.

Peru, Ecuador, and Venezuela were classified as moderate, as they have fewer pasture areas dedicated to cattle raising within the Amazon portion of their territories. By contrast, livestock's ecological compatibility is high in Suriname and Guyana, where deforestation is more associated with mining than with agriculture or cattle raising, unlike the rest of the Amazon Basin.[68]

Considering the economic and social dimension, which addresses the context of the activity, the best-classified countries are Guyana and Suriname, with high autonomy of economic activity, high formality, and high ecological compatibility. On the other hand, the countries requiring the most progress — Bolivia, Brazil, and Colombia — were classified with low performance across different indicators, characterized by high deforestation rates and pressure on protected areas, factors that point to a risk of expanding criminal activities.

3.2. Regulation and Governance

The regulation of livestock in the Amazon Basin countries has specificities that distinguish it from the other extractive chains analyzed, involving sanitary, land, and environmental aspects that directly impact the ability to control the activity. While some countries have more structured legislation and higher penalties covering various elements of the chain, others face normative gaps and difficulties in law enforcement, requiring greater regulatory effort for the sector.

There is little clarity about how illegal livestock is defined (indicator 2.1) in the eight countries analyzed, all of which were classified between low and moderate in this item. Indirectly, illegal livestock is understood to mean any productive activity that violates current legal regulations, in contravention of environmental, sanitary, fiscal, and land use laws. The expression "livestock with contamination in the chain" more precisely reflects what was found in the analysis of this sector in the region. Five of the countries are classified as moderate in terms of definition.

In Amazon Basin countries with an export-oriented market, the sector's economic participation increases the scale of production and the size of the land used for cattle ranching, encouraging stricter control methods on sanitary issues. In others, the focus on food sovereignty and production to meet domestic demand stimulates small informal producers, who often operate outside the law.

Suriname, classified as low in regulatory definition, deals exclusively with livestock in protected areas. In Ecuador, also classified as low, the concept of illegality is equally imprecise, and the responsible authorities (Customs and the Ecuadorian Agency for Agricultural Health — Agrocalidad) focus their efforts on combating smuggling.

As for the *modus operandi* of smugglers acting in Ecuador, one practice identified is the entry of Peruvian cattle through illegal border crossings, later transferred to farms that raise animals destined for meat production. These farms send the smuggled cattle both to legal and illegal slaughterhouses. When sold to legal slaughterhouses, the documentation is falsified or tampered with, allowing the meat to be marketed at low prices but without any sanitary control.

For indicator 2.2, which classifies legislation on the activity, Bolivia, Brazil, Colombia, and Peru were evaluated as high, indicating legal stability and detailed regulation of the chain. Legislation considered includes land tenure, environmental protection, and sanitary regulations. In general, these standards address problems and irregularities in cattle raising and trading, in addition to establishing sanctions that criminalize cattle theft. Venezuela, classified as moderate in this regard, has been discussing since 2023 a proposal to reform the Criminal Law on Livestock Protection.[69]

Examples of applicable legislation in Colombia:

- **Decree No. 1500 of 2007**

Establishes the creation of the Official System of Inspection, Surveillance and Control of Meat, Edible Meat Products and Derivatives Intended for Human Consumption (*Sistema Oficial de Inspección, Vigilancia y Control de la Carne, Productos Cárnicos Comestibles y Derivados Cárnicos Destinados para el Consumo Humano*), defining sanitary and food safety requirements to be met in the productive stages of the livestock chain.

- **Law No. 1944 of 2018, Art. 243**

Establishes that anyone who appropriates, for themselves or others, large or small cattle species, equines, or swine, shall incur imprisonment of sixty (60) to one hundred and twenty (120) months and a fine.

Furthermore, Colombian legislation considers livestock in protected areas to be illegal.

- **Law No. 2111 of 2021, Art. 336**

Condemns livestock in protected areas with imprisonment from forty-eight (48) to one hundred and forty-four (144) months and a fine.

The regulation of cattle transport is an essential element in the rules applicable to the sector. Colombia has infra-legal norms on the subject, as does Brazil, where the Animal Transit Guide (GTA), a document that informs the origin, destination, and purpose of the transport, is mandatory and must be issued by state animal health control agencies.[70]

In Bolivia, animal movement guides are regulated by Supreme Decree No. 27291 of 2003. In addition, Law No. 1333 on the Environment of 1992 provides that "agricultural production must be developed in such a way as to allow sustainable production and use systems" and determines that the land use must be subject to the conservation of agroecosystems (Art. 66). The country was classified as high since, in addition to these regulations, the Law on Protected Natural Areas (Supreme Decree No. 038-2001-AG) establishes that certain protected areas depend on authorization for local populations to carry out agricultural and livestock activities of an integral nature, on land with such aptitude.

The analysis of laws applicable to livestock highlights a lack of regulation of the production chain beyond cattle raising. Greater control over the transport and marketing of animals could raise the classification of some countries from moderate to high in this regard.

In the Amazon Basin countries, criminal sanctions (indicator 2.3) related to livestock are associated with land misuse, environmental and water contamination, mistreatment of wild and domestic animals, and cattle theft. In comparative terms, the average global penalty for illegal livestock offenses is 6 years in prison. Five

countries were classified as high. Bolivia (Art. 105, Environmental Law) and Colombia (Art. 331, Penal Code)[71] have the highest penalties associated with environmental contamination, ranging from 1 (one) to 10 years of imprisonment and from 5 to 9 years, respectively. Venezuela punishes certain types of cattle appropriation with up to 16 years in prison when carried out under serious threat (Art. 7, Criminal Law on Livestock Protection — *Ley Penal de Protección a la Actividad Ganadera* of 1997), and for this reason was also classified as high. The same law punishes the falsification of animal transport documents with 4 to 6 years of imprisonment.

Examples of applicable legislation in Colombia:

- **Criminal Law on Livestock Protection (*Ley Penal de Protección a la Actividad Ganadera*).** Art. 13

Shall be punished with imprisonment of 4 to 6 years: 1. Whoever provides false documents or alters genuine documents to obtain cattle transport guides or subproduct permits derived from them; and 2. Whoever uses falsified or altered purchase, sale, or transport documents or guides with the objective of transporting cattle or disposing of them, or their derivatives.

Peru punishes qualified cattle theft (*abigeato*) in its Penal Code, which can carry up to 25 years of imprisonment when committed by a leader of a criminal organization (Art. 189-C, Penal Code). Ecuador also provides criminal punishment for cattle theft, with a minimum sentence of 1 year, which can reach up to 26 years when committed with violence and resulting in death. For this reason, Ecuador and Peru are also classified as high.

Brazil and Suriname are classified as moderate. In Suriname, violation of the Meat and Other Animal-Origin Products Inspection Law is punishable by up to 4 years of imprisonment.[72] Brazil, in turn, provides milder penalties for environmental crimes (Law No. 9.605 of 1998), with imprisonment not exceeding 4 years, and cattle theft (*abigeato*) (Law No. 13.330 of 2016) with imprisonment from 2 to 5 years. Classified as low, Guyana has lenient penalties. The country's legislation provides for up to 5 years of imprisonment in cases of environmental damage (Environmental Protection Law – Law No. 11 of 1996), but does not mention livestock. The environmental impact of this activity is sanctioned under another provision of the same act, with imprisonment of 6 months.

Table 4. Comparison of the highest criminal sanctions applicable to livestock farming among the eight countries analyzed (in years)

Country	Penalty	Offense	Law
Bolivia	1 to 10 years	Poisoning of water intended for agricultural purposes and violation of animal health standards	Article 105, Environmental Law of 1992
Brazil	2 to 5 years	Cattle theft/qualified theft; receiving stolen animals	Articles 155, § 6, and 180-A, Criminal Code, as amended by Law No. 13,330 of 2016
Colombia	4 to 12 years	Cattle ranching in protected areas	Article 336, Criminal Code as amended by Law No. 2111 of 2021
Ecuador	22 to 26 years	Cattle theft resulting in death	Article 199, Comprehensive Organic Penal Code
Guyana	6 months	Non-compliance with environmental licensing	Article 4, § 4, Annex of Environmental Protection Law No. 11 of 1996
Peru	15 to 25 years	Aggravated form of cattle theft committed by the head of a criminal organization	Article 189-C, Criminal Code (amended by Law 26326, of 1994)
Suriname	up to 6 years	Cattle theft in pasture	Article 371, § 1, Criminal Code (Wetboek van Strafrecht - GB 1911)
Venezuela	8 to 16 years	Aggravated cattle theft	Article 7, Criminal Law for the Protection of Livestock

In indicator 2.4 (administrative sanctions), most countries show moderate performance, applying temporary or definitive suspension (revocation) of the operating license as a response to environmental and sanitary violations. Guyana and Suriname received the worst evaluation, classified as low in this regard. In Ecuador, classified as moderate, the focus of sanctions is on non-compliance with sanitary production regulations. The Organic Law on Agricultural Health (2017) establishes in its Art. 75 sanctions such as: fine; temporary suspension of registration; definitive cancellation of registration; seizure of animals and destruction of products that pose a risk to human health; temporary or definitive revocation of authorization for export, import and marketing of derived products; temporary or definitive closure of the establishment. The same law punishes the illegal use of sanitary movement certificates with a fine of up to 6 (six) minimum wages (Art. 78).

Bolivia, also classified as moderate, imposes fines on producers, owners, transporters, distributors, or any individual or legal entity that falsifies or adulterates official National Service of Agricultural Health and Food Safety (Senasag) documents, without prejudice to a complaint to the Public Prosecutor's Office for legal action in ordinary justice. The same regulation (Decree No. 27291 of 2003) punishes the diversion of cattle transport from official routes without prior authorization, as well as the transport of cattle without carrying the corresponding Animal Movement Guide.

None of the eight countries was classified as high in terms of administrative sanctions, because non-compliance with regulations is not associated with restrictions on access to credit and financing if the enterprise or company is considered high risk. In Venezuela, Decree No. 1.257 of 1996 requires financial institutions to demand environmental licenses (the administrative authorization for land occupation and authorization for the use of renewable natural resources) as a prerequisite for financing productive projects. Non-compliance with these rules can generate administrative sanctions, such as suspension of registrations or closure of activities, which in practice can limit access to financing and other formal services. However, disincentives applicable to livestock entrepreneurs who commit irregularities and crimes in their activity call for greater policy attention.

Indicator 2.5 evaluates the competence of authorities in relation to the activity and coordination among agencies operating in the sector. None of the eight countries evaluated achieved a high classification. The assignment of specific authorities to the livestock chain is generally linked to the Ministry of Agriculture, and control of irregular activities is carried out from the perspective of environmental, land, and zoosanitary rules.

Countries such as Ecuador, Guyana, and Suriname received **low** classification in this regard, as they have little or no competence to monitor the regularity of activities and compliance with the rules. In Guyana, there are authorities linked to the Ministry of Agriculture, such as the Guyana Livestock Development Authority (GLDA) and the Guyana Food Safety Authority (GFSA), but their powers are limited to animal health regulation.

Bolivia, Brazil, Colombia, Peru, and Venezuela have more structured competent authorities and, therefore, were classified as moderate in this regard. Agencies responsible for managing protected areas, such as the National Service of Environment and Ecosystem Protection (Sernap) in Bolivia and the National Service of Natural Protected Areas by the State (Sernanp) in Peru, are responsible for supervising and ensuring that, when livestock is authorized, it complies with the rules applicable to protected areas.

In Venezuela, entities such as the National Federation of Venezuelan Cattle Ranchers (Fedenaga) and the Confederation of Associations of Agricultural Producers (Fedeagro) support and help coordinate the actions of the public authorities responsible for the sector. In Brazil, the Sectoral Chamber of the Beef Production Chain, coordinated by the Ministry of Agriculture and Livestock, brings together public and private institutions and functions as a relevant forum for inter-institutional cooperation.

In the case of Colombia, the formulation and execution of agricultural policies are the responsibility of the Ministry of Agriculture and Rural Development, while sanitary oversight of the activity is carried out by the Colombian Agricultural Institute (ICA). The granting of environmental licenses and monitoring of activities falls under the authority of the National Authority of Environmental Licenses (Anla). The National Tax and Customs Directorate (Dian) oversees taxation and regulation of foreign trade in livestock products. Investigations and legal actions are conducted by the Attorney General's Office. Compliance with animal welfare legislation and the fight against illegal transport and cattle theft are the responsibility of the National Police and the Environmental and Ecological Police, as established by Law No. 1.774 of 2016.

Although several countries have a set of competent authorities in the livestock sector, inspection and control of illicit activities in the production chain are still insufficient to guarantee a high classification.

3.3. Monitoring and Transparency

The monitoring and inspection of the livestock sector in the Amazon Basin countries are critical to curbing the illegal raising of cattle in protected areas and the expansion of pastures in non-compliance with regulation.

The regulation of equipment (indicator 3.1) varies between low and moderate in countries where there is some control over certain equipment, heavy machinery, or transport. In Ecuador, Agrocalidad oversees the sector and maintains, under the supervision of the Ministry of Public Works and Transport (MTOP), a registry of heavy machinery and equipment. The country also has the National Agricultural Registry (Renagro), managed by the Ministry of Agriculture and Livestock, which gathers information on producers, machinery use, labor, and geographical location of land, among other aspects. Renagro, however, is still under implementation and will not serve tax or sanctioning purposes.[73] In Brazil, the registration of agricultural tractors is required in a specific registry of the Ministry of Agriculture, Livestock and Supply, also called Renagro.

Brazil, Bolivia, Colombia, Ecuador, Peru, and Venezuela were classified as moderate in monitoring and inspection. In Peru, the entity responsible for controlling animal transport vehicles is Senasa; in Bolivia, this function falls to Senasag.[74] Bolivia, through the initiative of the Ministry of Rural Development and Lands, is implementing a GPS control system in cattle transport vehicles to prevent smuggling, in addition to adopting digital movement guides designed to reduce document falsification.[75]

In Venezuela, the National Institute of Comprehensive Agricultural Health (Insai) is the entity responsible for supervising and certifying equipment related to animal health, ensuring it complies with current standards to prevent diseases and guarantee the quality of animal-origin products. The Ministry of

Popular Power for Productive Agriculture and Lands (MPPAPT) establishes guidelines for the proper use of agricultural machinery, promoting practices that optimize production and minimize environmental impact. A guide with detailed information on the product, load, transport, transporter, and route to be followed is mandatory. Since the end of 2023, transport authorizations have been processed through the Comprehensive Agricultural Health Information, Management and Statistics System (Sigesai), which aims to simplify procedures and facilitate the issuance of licenses, providing users with a QR code that certifies authorization for the transport of animals in national territory. In Guyana, by contrast, equipment used is smaller in scale, and activities are carried out with traditional production techniques. Together with Guyana, Suriname was classified as low in equipment control.

In terms of transparency (indicator 3.2), Guyana, Suriname, and Venezuela are classified as low. In some countries, there are records and monitoring of information on trade and companies in the sector, as well as data on the export and import of meat products and inputs for the livestock chain. However, when available, this information is presented broadly and without much detail, while more specific data on the production chain remain restricted to the responsible authorities or accessible only upon request.

The countries classified as high in this regard were: Bolivia, which provides data on trade and transport of animals, as well as management reports aimed at small peasant and Indigenous producers; Brazil, which makes available detailed information on trade, the number of animals and their destination, as well as the establishments (meat plants) eligible to export; and Peru, which publishes data on the export of meat products, reports on purchase values and merchandise acquisition, and maintains a registry of rural workers, considering their productivity, formality, and other aspects.

A relevant point of integration in the Brazilian system, with practical consequences, is the integration of the Rural Environmental Registry (CAR) into the Animal Transport Guide (GTA) for tracking and monitoring cattle from deforested areas, cross-referencing information that may condition access to rural credit by agricultural producers. In terms of individual animal traceability, a requirement for export to certain markets, Brazil, which exports about 20% of the beef produced,[76] has the Brazilian System of Individual Identification of Cattle and Buffaloes (Sisbov),[77] with voluntary adherence by rural producers. In Bolivia, the authority responsible in the Ministry of Rural Development and Lands, the Senasag, administers the National Program of Cattle and Buffalo Traceability.[78]

Colombia and Ecuador were classified as moderate in transparency. In Colombia, Law No. 914 of 2004 created the National System of Identification and Information of Cattle (*Sinigan*), which operates as a subsystem of the National System of Animal Identification, Information, and Traceability (*Sniita*). However, traceability processes still have a long way to go. A bill under discussion for the creation of the “deforestation-free beef” certificate proposes the integration and interoperability of these systems of the Colombian Agricultural Institute (ICA) with the forest and carbon monitoring system of the Institute of Hydrology, Meteorology and Environmental Studies (Ideam), with the multipurpose cadastre, with the COBOL system of the Agustín Codazzi Geographic Institute (Igac), and with the property registry of the Superintendency of Notaries and Registry.[79]

The involvement of stakeholders in indicator 3.3 (activity monitoring) and in the promotion of good livestock management practices is a key aspect for reducing risks in the sector. This involvement occurs mainly in the zoo-sanitary aspect, ensuring international quality standards. Bolivia, Brazil, Ecuador, Peru, and Venezuela follow the guidelines of the Livestock

Development Commission for Latin America and the Caribbean, developed by the United Nations Food and Agriculture Organization (FAO), which support the formulation of policy frameworks for the sector and promote dialogue between governments and the private sector in defining cooperation strategies.

While Ecuador and Venezuela were rated moderate in this regard, Bolivia, Brazil, Colombia, and Peru received a high rating due to civil society involvement in livestock farming in protected areas, especially in the Amazon. Highlights of good sector sustainability practices that encourage entrepreneurs include, in Brazil, the Sustainable Livestock Indicators Guide (GIPS)[80] and the Guidelines for Meatpacking Plants of the Consumer Goods Forum Forest Positive Coalition (CGF-FPC);[81] and, in Colombia, the Policy Guidelines for Sustainable Cattle Ranching[82] promoted by the country's Ministry of Agriculture and Rural Development. Both examples foster cooperation between national and international entities in the development of appropriate technologies. In contrast, Guyana, and Suriname show a **low** presence, or poor visibility, of stakeholders working to promote best practices in livestock farming.

3.4. Law Enforcement

Effective action against illegal livestock farming depends on oversight capacity, coordination among stakeholders in the supply chain, and the availability of a clear and enforceable legal framework. The fourth and final dimension considers operations and initiatives aimed at curbing illicit activities in the beef cattle sector, as well as the existence of institutional barriers that favor illegality.

Operational actions (indicator 4.1) involving the livestock chain were recorded in countries where economic activity is more significant, classified as moderate. These include Bolivia, Brazil, Colombia, and Peru, which carried out operations to seize cattle raised in protected and/or embargoed areas, in addition to confiscating illegally produced meat products. Interinstitutional collaboration in combating these illegal activities is a relevant factor.

In Colombia, actions involving various actors were undertaken against illegal cattle farming, including officials from the Attorney General's Office, the National Police, the National Army, the Colombian Air Force, the Special Assets Society (SAE), and the Colombian National Parks Unit. In Brazil, in 2024, Federal Police operations led to the seizure of 550 animals raised illegally in the Apyterewa Indigenous Territory.[83] That same year, during Operation *Carne Fria*, the police fined 23 meatpacking plants that purchased cattle from embargoed areas.[84] Active oversight and effective regulation can curb predatory practices in the sector and should be promoted regionally. The other four countries were rated **low** in this regard.

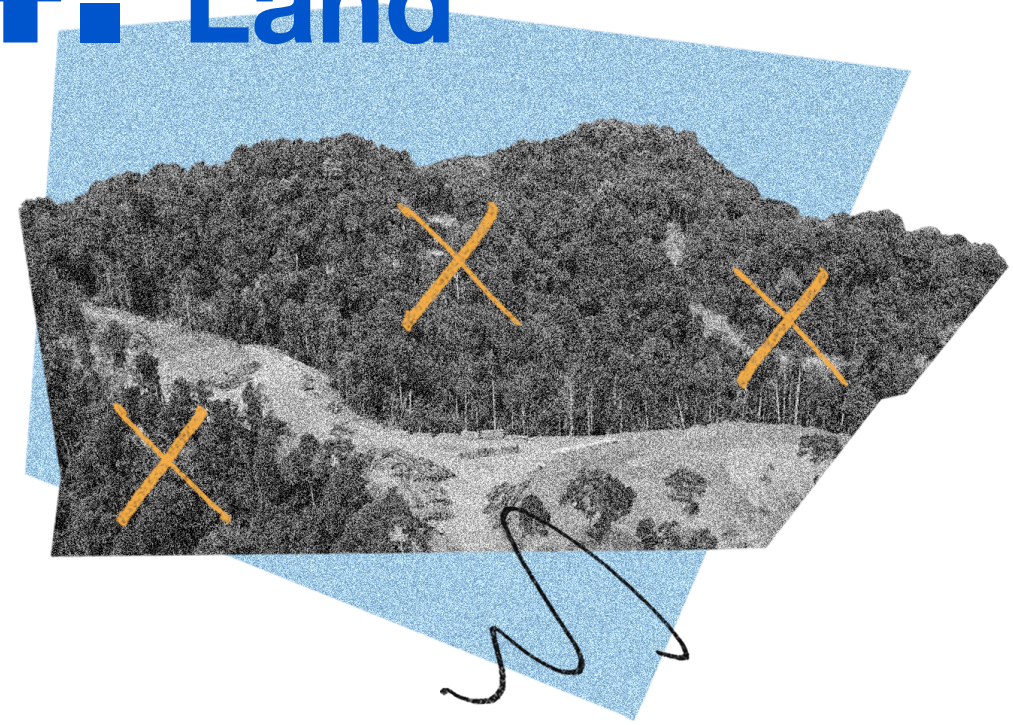
In terms of public integrity (indicator 4.2), the low level of territorial oversight, the incidence of corruption, and the lack of registration of processes and goods require greater efforts to address irregularities in livestock farming. Bolivia, Colombia, Ecuador, and Venezuela were classified as having low integrity. In Ecuador, excessive bureaucracy in obtaining certificates

or licenses in the livestock sector leads users to falsify or alter legal documents and bribe officials in regulatory agencies, according to experts interviewed. Another point mentioned was the understaffing of government agencies, which facilitates the falsification or alteration of legal documents. In Colombia, there is evidence of corruption, abuse of political power, and bribery of authorities to falsify animal identification and traceability records.

The remaining countries — Brazil, Guyana, Peru, and Suriname — perform moderately in this regard, as the challenges reported involve limited government capacity, but not necessarily corruption. In Peru, issues identified include cattle trade non-compliant with health regulations, lack of inter-institutional coordination and monitoring in protected areas, and weak implementation of laws against the invasion of public lands. A similar situation was observed in Brazil, which faces difficulties in monitoring and enforcing land misuse. Insufficient government action in Guyana and Suriname justifies the moderate rating.

Cattle ranching, a competitive economic sector, is strongly associated with land-use changes. Therefore, it is essential to close regulatory gaps and correct flaws in the application of rules to prevent the land market from being negatively affected. As will be seen below, more effective control of public lands requires preventing malicious actors or land traffickers from using this economic activity to assert property rights.

4. Land

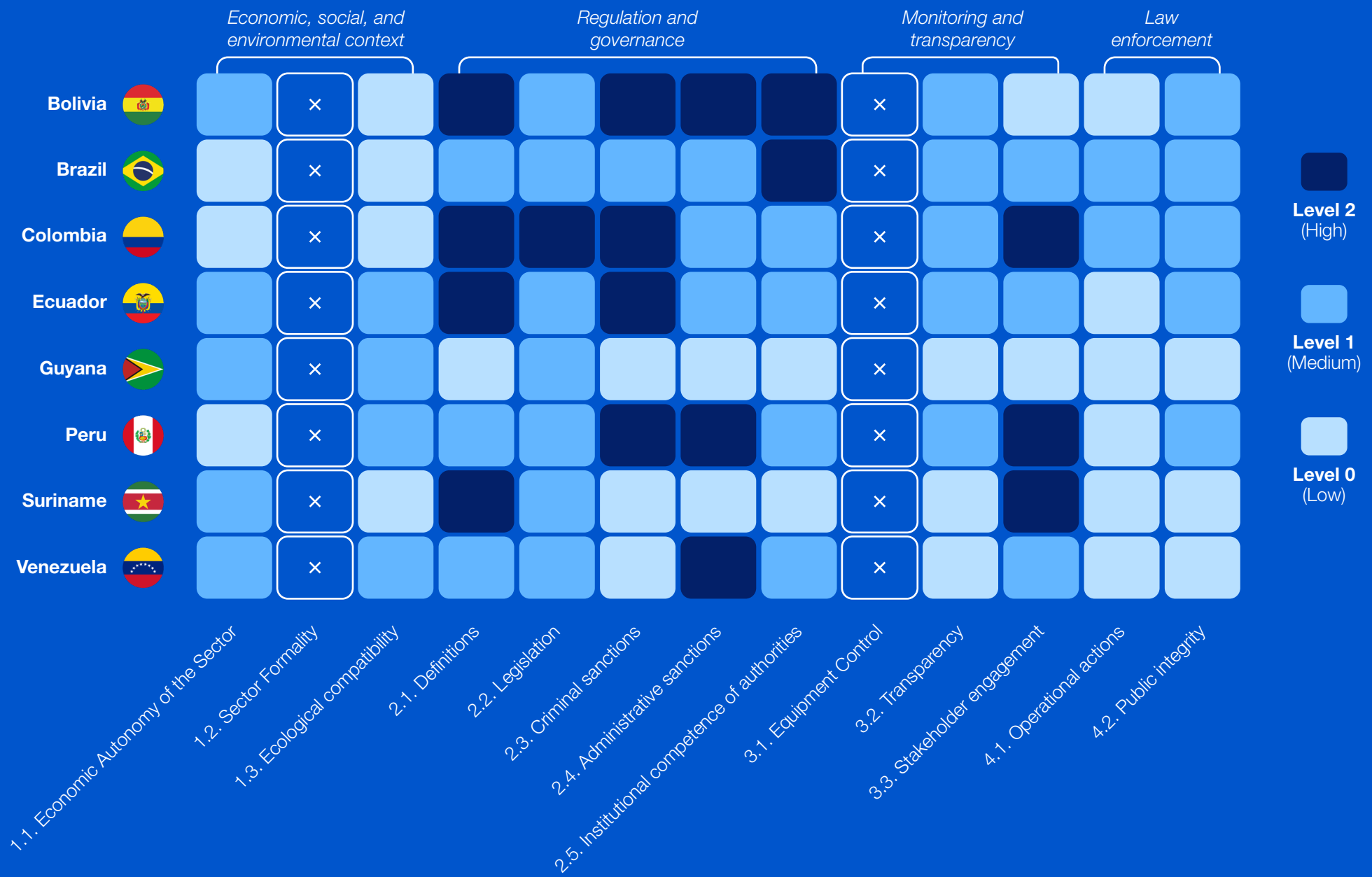


Land governance in the Amazon affects a wide range of productive activities and actors who can claim property, access, or use rights, such as possession, demarcation, titling, exploration, and extraction, whether of soil or subsoil, and their respective resources. Historically, the concentration of land in a few hands, the lack of a solid framework for its management and use, uncertainty regarding property rights, and limited state action have made the region unattractive to high-integrity investors. Individuals involved in the illegal land market may falsify authorizations and licenses to access and appropriate public areas (*baldíos*, in Spanish), finance extractive activities in protected or state-owned areas, pay bribes to local authorities — such as those in charge of public records — or negotiate irregularly occupied or untitled areas. These practices fuel conflicts within communities and open loopholes for criminal networks to operate.

Illegal land acquisition is linked to related crimes, as is the case in the other value chains analyzed in this study. One of the most common land-use changes is the conversion of forests into pasture for livestock, even though the cost of deforestation is high and livestock productivity in the Amazon is low.[85] According to data from MapBiomas, 90% of the deforested area in the Brazilian Amazon over the last 39 years was primarily used for pasture.[86]

Below, we present the Scorecard for the land market in all Amazon Basin countries, considering the different dimensions — Context, Regulation, Monitoring, and Law Enforcement — color-coded as appropriate:

Performance Dashboard - Land Regulation



Source: Internal data processed by the Igarapé Institute

4.1. Economic, Social, and Environmental Context

Low market autonomy implies that a greater economic share of this sector contributes to total GDP (indicator 1.1), while high autonomy indicates less dependence on revenues from this sector. Brazil leads the Amazon land market, both in terms of the average price of land and the area available for commercialization, followed by Colombia and Peru. These countries, classified as low autonomy, show high economic dependence on the land sector.

In economic terms, Brazil has the highest value associated with the land market (USD 6,000/ha),[87] compared to other Amazon Basin countries, although this value corresponds to half of the global average (USD 12,000/ha).[88] Despite the unique natural wealth of the Amazon region, other elements influence land valuation, such as lack of infrastructure, logistical access difficulties, inefficient governance, uncertainty about land regularization, and conflicts over land and natural resources.

The price of land in countries such as Bolivia, Guyana, and Suriname is lower than in those classified as low autonomy, but the sector's economic participation is still moderate, maintaining pressure on this resource. Lower economic autonomy represents a greater risk of irregularities and illegalities, such as the illegal occupation of protected areas and land grabbing of public lands — practices reported in all eight countries of the region, which fall only between classifications of low and moderate economic autonomy.

The formality criterion in the production chain (indicator 1.2) does not apply to the land market,[89] which is why this indicator was nos evaluated. For the other economies related to this market and involving land use, such as gold mining, cattle ranching, and timber exploitation, the results have already been presented.

The land market and ecological conservation are closely linked (indicator 1.3), though not always in a compatible way in the Amazon. For this reason, the eight countries fall between low and moderate classifications for this indicator. Bolivia, Brazil, Colombia, and Suriname were classified as low compatibility, highlighting the risk of the economic sector advancing over the Amazon biome.

Illegal deforestation often precedes illegal appropriation and the consequent appreciation of land. The illicit appropriation of natural resources and the expansion of the agricultural frontier occur mainly in public forests, state-protected areas, and Indigenous territories. The absence of adequate monitoring and protection of these territories, combined with corruption and weak state control, facilitates both deforestation and the expansion of illegal activities.

In Bolivia, in the last 15 years, more than 225,740 hectares were irregularly sold in the lowland regions, especially in the Chiquitania area.[90] In Brazil, in 2022, 2,789 registrations overlapping with Indigenous lands were identified, totaling 380,500 hectares, concentrated in the states of Mato Grosso, Pará, and Rondônia.[91] Similarly, in Colombia, land grabbing by large landowners fragmented protected ecosystems, such as the Cerro Los Picachos National Natural Park and the Serranía de Chiribiquete, for the establishment of pastures. According to the descriptive data collected, all countries reported land grabbing in protected areas and Indigenous territories, due to monitoring difficulties and barriers associated with land regularization.

The forest economy in protected areas and Indigenous territories

To illustrate the presence of the economic activities analyzed in the Amazon region, we prepared a map of the localities mentioned in the study. From the collected material and after filtering the observations related to Indigenous territories, national parks, and other conservation units, we arrived at 131 protected areas and Indigenous lands cited. Discarding geographic units mentioned more than once, we reached a total of 109 unique localities, complemented with georeferenced information from other sources.[92]

The following map shows the 96 Protected Areas and Indigenous Territories where gold mining, timber exploitation, cattle ranching, or land grabbing — or a combination of two or more of these activities — were reported during the research.

Source: Prepared by Igarapé based on the GIS project. Available at: https://geoigarape.online/portal/home/webmap/viewer.html?webmap=d63f9f8aaac24027916426ddc6bc2829&extent=-69.5182,-12.7623,-64.1294,-9.7619

The four economic activities analyzed are present in protected areas across the eight Amazon Basin countries, in addition to French Guiana. Points were identified in border regions between Colombia and Peru, Ecuador and Peru, Peru and Bolivia, and Bolivia and Brazil. There are also records in protected areas of triple border regions: Venezuela, Brazil, and Guyana (near Mount Roraima); Brazil, Suriname, and French Guiana (Tumucumaque Mountains); and Colombia, Peru, and Brazil (between the Solimões and Içá rivers).

Some protected areas are located in transitional zones between biomes (or ecotones), such as Canaima National Park, which combines tropical forest and savanna. The park, larger than Belgium or Armenia, is located in the Venezuelan portion of the Guiana Shield, making the territory favorable for gold mining. In addition to this activity, timber and land exploitation were also mentioned.

Another park in a biome transition zone is Noel Kempff Mercado National Park in Bolivia, connected by the Guaporé River to Serra Ricardo Franco State Park in Brazil. This transition region between Amazon, Cerrado, and Pantanal records timber exploitation, cattle ranching, and land appropriation activities.

At least three dozen natural areas and Indigenous Lands were cited across the studied sectors — mining (30), timber (37), cattle ranching (36), and land (39). In different locations in Bolivia, all four activities were reported (brown category in the legend). Among them are Madidi National Park, Isiboro Securé Indigenous Land and National Park, Tariquía Flora and Fauna National Reserve, and Manuripi Reserve, between the Beni and Madidi rivers.

The border region between Peru and Bolivia shows a concentration of protected areas including Bahuaja Sonene National Park, Manú National Park, and Tambopata Reserve in southern Peru, as well as Madidi, Manuripi Reserve, and Tacana Indigenous Territory in northern Bolivia. This cross-border zone, where mining, cattle ranching, timber, and land appropriation are recorded, requires attention, investments from authorities, and regional cooperation efforts to strengthen security in the Amazonian portions of Peru and Bolivia.

The illicit exploitation of biodiversity resources in the Amazon affects Indigenous peoples living in vast territories with limited state presence, a condition that favors market entry and exploitation by criminal groups. One example is the Tacana people, present on the Peruvian, Bolivian, and Brazilian sides of the border. Another example of an Indigenous territory under risk is Igarapé Lage Indigenous Land in Rondônia, near the border with Bolivia. The territory of the Wari people, surrounded by farms, has been impacted by environmental crimes and was recently the target of a Federal Police operation against land grabbing.[93]

An important aspect, reflected in the environmental context of the four sectoral markets (indicator 1.3), is that the study focused specifically on the Amazon. For this reason, the map does not show mining in the Ecuadorian provinces of Azuay, El Oro, Esmeraldas, and Imbabura, nor cattle ranching in the Peruvian departments of Piura, La Libertad, and Cajamarca, even though these localities have records of gold mining and extensive cattle ranching. The risks of illegality, irregularity, and informality in the activities analyzed here tend to be greater in the Amazonian portion of the countries than in other regions.

4.2. Regulation and Governance

The definition of what constitutes illegal land is not clear (indicator 2.1), though it is generally understood as any land acquired or occupied improperly. In practice, this translates into the commercialization of public lands, protected areas, and territories demarcated for Indigenous peoples, as well as the falsification of land titles.

In Suriname, illegality is defined as the sale, lease, or transfer of land without official documents — a practice that can occur in Indigenous Territories, protected areas, or public concessions, generating land disputes and unauthorized deforestation. In Bolivia, Law No. 477 of 2013 added land trafficking and land grabbing to the catalog of crimes in the Penal Code (Arts. 337 bis and 351 bis). The Penal Code of Ecuador also typifies the crime of "occupation, illegal use of land, or land trafficking".[94]

Bolivia, Colombia, Ecuador, and Suriname were classified as high performers for this indicator. Guyana, whose legislation only addresses irregular land trade, was classified as low. The other countries — Brazil, Peru, and Venezuela — were classified as moderate.

The legal framework (indicator 2.2) of the land market in the countries analyzed encompasses land titling, the regulation and demarcation of protected areas and Indigenous Territories, and, in certain cases, the expropriation of private land for agrarian reform purposes. Legislative instability explains the classification of some countries as moderate. An example of pressure for reforms to land laws occurs in Suriname, where arguments around protecting Indigenous and tribal communities and ensuring autonomy over natural resources have paradoxically been used to justify the opposite: placing communal lands on the market. This explains its moderate classification.[95]

In Colombia, classified as high, the main laws address agrarian reform, land restitution, and redistribution, with the armed conflict forming the backdrop for part of this legislation.[96] A bill currently under discussion in the Colombian Congress (Bill No. 183, 2024) seeks to define the competencies of the Agrarian and Rural Jurisdiction and to establish a special agrarian and rural procedure.[97]

A reform that led to Brazil's classification as moderate was the approval of Law No. 14,701 of 2023 (the "Marco Temporal" Law), which stipulates that Indigenous peoples have the right to exclusively occupy the lands they inhabited or disputed at the time of the promulgation of the 1988 Federal Constitution. The new law is considered a setback for the demarcation of Indigenous Lands.

Peru was also classified as moderate. The new Agrarian Law of 2024 has been linked to fostering land trafficking, as it allows invaders of uncultivated public lands occupied until December 2023 to register them in their own name or acquire them for 30% of the market value.[98]

Regarding criminal sanctions applicable to land-related offenses (indicator 2.3), Guyana, Suriname, and Venezuela were classified as low, due to weak or nonexistent punishments.[99] With high ratings, Bolivia, Colombia, Ecuador, and Peru impose maximum penalties exceeding 7 years.[100] Brazil was classified as moderate, with penalties ranging from 6 months to 3 years in prison for the crime of usurpation of federal, state, or municipal lands with the intent to occupy them (Law No. 4,947 of 1966, Art. 20).

Colombia has the maximum penalty compared to other countries, which can reach up to 15 years in prison. Law No. 2,111 of 2021 amended the Colombian Penal Code to criminalize the illegal appropriation of state-owned lands and the financing of land grabbing, holding accountable anyone who directly or indirectly provides, collects, delivers,

receives, manages, contributes, stores funds, goods, or resources, or performs any act that promotes, organizes, supports, finances, sponsors, induces, orders, or directs the illegal appropriation of public lands.[101]

The same Colombian law also criminalizes the promotion and financing of deforestation, and provides for increased penalties when deforestation is carried out to appropriate land, cultivate illicit crops, prospect and exploit minerals illegally, or build unlawful infrastructure.[102] This provision makes explicit the connection between the four economic activities analyzed in this study and other economies, both licit and illicit, such as drugs, as well as other drivers of deforestation that affect Amazonian communities.

Table 5. Comparison of the highest criminal sanctions applicable to land among the eight countries analyzed (in years)

Country	Penalty	Offense	Law
Bolivia	3 to 8 years	Land trafficking	Article 337 b, Penal Code as amended by Law No. 477 of 2013
Brazil	6 months to 3 years	Invasion of public lands	Article 20, Agrarian Law No. 4,947 of 1966
Colombia	8 to 15 years	Financing the illegal appropriation of public lands	Article 337-A, Criminal Code as amended by Law No. 2,111 of 2021
Ecuador	5 to 7 years	Occupation, illegal use of land or land trafficking	Article 201, Comprehensive Organic Criminal Code
Guyana	2 months	Invasion of public lands	Article 20, State Land Act
Peru	5 to 12 years	Aggravated forms of usurpation of real estate	Article 204, Criminal Code, as amended by Law No. 30,556 of 2017
Suriname	up to 1 year	Trespassing/Property invasion	Article 412, Criminal Code (Wetboek van Strafrecht – GB 1911)
Venezuela	5 to 10 years	Aggravated land invasion	Article 471-A, Criminal Code

Colombia, Ecuador, and Peru also impose sanctions on financiers who facilitate illicit access to land. In Colombia, criminal law applies the harshest penalty among offenses associated with the land market and increases sentencing by one-third to one-half when the conduct is linked to money laundering (Art. 323, Penal Code). In Ecuador, Article 245 of the Comprehensive Organic Penal Code establishes a three-year sentence for anyone who promotes, finances, or directs the invasion of ecological protection areas, exploiting individuals through deception or false promises. In Peru, legislation punishes those who organize, finance, facilitate, promote, direct, provoke, or instigate land usurpations of public or private property with prison terms of 5 to 12 years, as set forth in Article 204 of the Penal Code.

Regarding administrative sanctions (indicator 2.4) applicable to land market illegalities, notable measures include suspension of activities, revocation of permits, confiscation of assets and land, and obligations to repair environmental damage. Most of the countries analyzed impose fines for failure to comply with tax and environmental regulations. In Guyana and Suriname, however, fines are relatively low compared to countries such as Colombia and Ecuador, which link penalties to the minimum wage or other economic metrics.

In Bolivia, Peru, and Venezuela, noncompliance with legal norms can lead to restrictions on access to credit and financing, which is why these countries were rated as high performers. According to Venezuela's Land and Rural Development Law, amended in 2010, anyone who violates land use rules (Articles 147 and 148), including through simulation or fraud, may lose rights granted by the National Land Institute (Inti) and be barred from obtaining loans from public agencies or governmental financial entities.[103] By contrast, Guyana and Suriname were classified as low due to weak or nonexistent administrative penalties. Overall, the landscape of sanctions in Amazonian countries reveals a lack of robust administrative disincentives capable of preventing the sale of public lands and increasing the accountability of intermediaries who facilitate land registration and manage property chains.

As for the authorities responsible for land market oversight (indicator 2.5), the Amazon Basin countries show significant differences in structure and distribution of responsibilities. Some maintain more centralized administrative networks, while others distribute responsibilities among multiple agencies operating at various levels. Bolivia has regulatory bodies spanning administrative, fiscal, environmental, and legal sectors, such as the National Institute of Agrarian Reform (Inra) and the Agro-Environmental Court, created under the 2009 Plurinational Constitution. Brazil has a robust network of institutions, including agencies for land regulation (Incra), environment (Ibama, ICMBio, Funai), cultural heritage (Iphan, Fundação Palmares), and the Public Prosecutor's Office. Both countries, Brazil and Bolivia, were classified as high.

Ecuador, on the other hand, has a relatively lean structure, concentrating responsibilities in the Subsecretariat of Lands and Agrarian Reform and the Ministry of Agriculture and Livestock, and was thus classified as moderate. Colombia, where the Agustín Codazzi Geographic Institute plays a role, was also rated as moderate. Guyana and Suriname, by contrast, were classified as low due to the absence or inefficiency of their land governance systems, plagued by reports of inspector recruitment, excessive bureaucracy, and favoritism toward interest groups in governmental institutions, such as cases involving the Guyana Lands and Surveys Commission (GLSC).[104]

A relevant aspect is the role of the judiciary in land governance decisions. In Suriname, a court granted an injunction filed on behalf of twelve Indigenous and Maroon groups who claimed the loss of approximately 535,000 hectares of rainforest to Mennonite agricultural development projects, the Ministry of Agriculture, and private entities.[105] In Brazil, the "Marco Temporal" Law, mentioned under indicator 2.2, is also under judicial review.

4.3. Monitoring and Transparency

The equipment used for land exploitation (indicator 3.1) is associated with deforestation and timber extraction, livestock raising, and illegal mining. Since this information was already covered in previous analyses, it was not repeated here.

With respect to transparency (indicator 3.2), all countries record land market transactions, although none reached a high classification. The structuring of this information and its availability in public sources remain significant challenges. In Venezuela, for example, in addition to restrictions on public information, data from the Mercantile Registry, which documents legal transactions, has not been fully digitized. This limits access to information, and the country also lacks specific regulation obliging real estate sector entities to report suspicious operations to the FIU, leading to a low classification.

By contrast, Bolivia has a National System of Rural Environmental Cadastre (Sinacar), developed by the Inra in partnership with the Inter-American Development Bank. Although the information is not fully public, it is accessible to the competent authorities. Similarly, Peru has specific registries for land market intermediaries, demonstrating a structured information system with detailed records of transactions, though still restricted to the competent authorities.

In Ecuador, the Organic Law to Prevent, Detect, and Combat Money Laundering and the Financing of Other Crimes assigns responsibility to multiple entities, including notaries, to report suspicious activities to the FIU, which earned the country a moderate rating. In addition to Bolivia, Ecuador, and Peru, Brazil and Colombia were also classified as moderate in terms of information availability. In all cases, access may still be hindered by bureaucratic restrictions, revealing room for improvement in transparency and system integration.

The involvement of stakeholders in monitoring activity (indicator 3.3) varies among countries. Owing to the greater presence of actors engaged in monitoring, Colombia, Ecuador, Peru, and Suriname were classified as high. While Colombia, Ecuador, and Peru promote the integration of multiple actors, Bolivia and Guyana present more fragmented models or limited engagement in land monitoring.

Actors involved include government agencies, Indigenous organizations, international NGOs, multilateral organizations (such as the World Bank and FAO), and technological monitoring systems such as MAAP, maintained by Amazon Conservation. Peru stands out for its good practices aligned with international guidelines and for already having implemented ambitious projects aimed at land regularization.[106]

Comparatively, Ecuador and Suriname have court cases at both the federal and regional levels and are notable for strong civil society engagement.[107] In the regional context, traditional communities play an active role in defending their territories, especially in Colombia and Peru, where there is explicit mention of community councils and autonomous territorial monitoring.

4.4. Law Enforcement

The protection of land and the proper use of soil and natural resources depend not only on a specific and functional legal framework, but also on efficient and inter-institutional action. As in other markets, **indicator 4.1 in the land sector ranges only between low and moderate**. In Ecuador, for example, law enforcement is limited, with few complaints and a small number of cases resulting in penalties. By contrast, in Brazil, 39 Federal Police operations were identified between 2019 and 2025 related to the illegal appropriation of public lands, justifying its moderate classification. In 2024, Brazil's Ministry of the Environment and Climate Change (MMA), the National Council of Justice (CNJ), and the National Real Estate Registry Operator (ONR) signed an agreement to strengthen inter-institutional cooperation to combat deforestation and land grabbing.

Another noteworthy initiative involving notary offices was an official directive issued by the Colombian Attorney General's Office, which linked sectoral entities, including the Superintendency of Notaries and Registry, to develop an action plan against land grabbing in the country.[108] Only Brazil and Colombia were rated as moderate. There is therefore scope for progress in law enforcement and in the implementation of public policies that strengthen land oversight, particularly in the Amazon.

On public integrity (indicator 4.2), the outlook is quite negative, marked by the capture of administrative bodies through bribery or co-option by actors with interests in the land market.

This situation reported in all countries analyzed, with the most critical cases in Guyana, Suriname, and Venezuela, classified as having low integrity. In some instances, land grabbing may be linked to illegal cattle ranching, illicit crop cultivation, corruption networks, and money laundering.

The problem is particularly severe in border regions, which are poorly supervised, difficult to access, but rich in biodiversity — areas where the expansion of illegal agriculture, cattle ranching, and mining is alarming and requires stronger action by the eight countries.

Given this outlook, efforts should focus on improving land governance, bringing greater clarity and transparency to land registries, implementing information systems capable of monitoring irregularities in land use, and promoting greater coordination among responsible authorities so that they feed into, use, and act upon intelligence regarding land governance. It is also necessary to recognize that groups and individuals interested in changes to land use also interfere in the drafting and implementation of land and environmental laws and policies, protecting their interests and ensuring impunity. In the context of new carbon projects and reduced emissions through deforestation — which carry risks of "green land grabbing"[109] — it is urgent to address the improvement of land governance in the Amazon Basin.

Conclusion

This study sought to understand the extent to which Amazon Basin countries possess institutional and regulatory conditions to confront the illicit economies associated with deforestation, focusing on the four sectors that exert the greatest pressure on the Amazon rainforest: gold, timber, cattle, and land. Using 13 indicators, structured around four central dimensions — economic, social and environmental context; regulation and governance; monitoring and transparency; and law enforcement — we developed a comparative dashboard that helps to understand the relevance of each economic sector in the countries analyzed, how they are regulated, including from an environmental perspective, and the existing mechanisms that enable the State to exercise effective control over these activities.

Our starting point was the recognition that environmental crime presents particular challenge since the boundary between the legal and the illegal is tenuous. Regulation is the instrument that defines the frontier of legality and, at the same time, is capable of creating incentives and disincentives that can foster sustainable practices or, conversely, facilitate abuses and irregularities. As each country adopts its own regulations, comparing them is essential to mapping the gaps that crime exploits.

Given the importance of the Amazon rainforest for global climate regulation and the risk of reaching a point of no return, we chose to examine the economies that most drive forest loss. We worked from the premise that analyzing the role of these sectors and their regulatory regimes — their flaws, overlaps, and contradictions — makes it possible to understand how countries position themselves in the face of economic pressures and what capacities they do (or do not) have to contain illicit markets. To carry out a comparative study, we prioritized a broad overview of these sectors, rather than a deep dive into each specificity. In addition, the lens adopted for the classification presented in the dashboards was to assess the extent to which regulatory frameworks allow for the adequate prevention and/or accountability of irregularities and illegalities.

Our objective was not to detail implementation strategies nor to provide an in-depth assessment of the concrete application of legal frameworks. An assessment of their enforcement appeared only indirectly, within the scope of the law enforcement indicators, but we did not go further into analyses of operational effectiveness or the day-to-day functioning of control institutions. This limitation was deliberate: our goal was to build a diagnostic tool that could serve as a comparative basis between countries, rather than to design specific action plans. The sources used to develop the tool were stored and catalogued in a digital repository, which can be made available for consultation and should inform future initiatives aimed at improving the regulation of the sectors that drive deforestation.

We believe that the value of the performance dashboards and the indicators lies precisely in their ability to offer a common baseline. Just as satellite monitoring systems allow to track the advance of deforestation in the Amazon Basin in real time, a shared repository of data on State capacities in economic sectors paves the way for regular, comparable, and verifiable diagnostics, while also serving as an essential instrument to strengthen regional cooperation and the work of civil society.

Ultimately, this study reaffirms the urgency of strengthening not only the repression of illicit activities but also the regulatory arrangements that shape the dynamics of markets in the Amazon. Reducing environmental degradation and weakening the organized crime that profits from these flows will require progress in building robust regulatory regimes that are compatible with economic sectors. This is a task that demands regional coordination, normative alignment, and, above all, political commitment to the protection of the forest, its populations, and the rule of law.

Appendix I. Methodology

The study of production chains and country classifications was organized in three steps. First, we consulted partner organizations to broaden the analytical framework and consider the specificities of countries in the region, avoiding an excessive focus in a specific country. Next, we developed a structured data collection form to ensure that the sectors could be mapped coherently and that relevant information was gathered according to our objectives, covering contextual, regulatory, and institutional aspects of the mining, timber, livestock, and land markets in each country. We also conducted a pre-test to verify the availability of information in official sources and search engines.

In the second step, we selected consultants — experts from each country with experience in the markets under analysis — to collect the data and complete the assessment form in line with the guidelines.[110] Finally, in the third step, we processed the collected information using a coding system, categorizing the relevant data into the four dimensions of the dashboards presented. We conducted the analysis using qualitative software, discussed the reference categories internally, and validated the results with the experts.

Step 1: Mapping and Structuring

- Mapping the field and consulting with partner organizations
- Creating a structured form for data collection
- Pre-testing to verify availability of information

Step 2: Data Collection

- Recruitment of specialized consultants in each country
- Data collection using the structured data collection form
- Applying specialists' expertise for completing the information

Step 3: Processing and Analysis

- Processing of collected information with a coding system
- Using qualitative software to categorize data into dimensions
- Validation of performance dashboards with experts

These three steps — data collection, cataloging and processing, and data analysis — provided an in-depth understanding of each sector and the realities of each country.

Each country's assessment form included responses to 26 questions about each sector, divided into four broad categories: 1) Context and location; 2) Standards and regulations; 3) Actors and routes; and 4) Law enforcement. The experts answered questions such as: "Are there specific controls for this economic activity, such as guidelines or good due diligence practices established in the sector?" and "Is there a procedure for registering multiple intermediaries involved in the trade of the commodity (gold, timber, cattle or land)?"

For each economic sector, the same questions were answered; therefore, we received 208 responses for Mining, Timber, Livestock, and Land, totaling 832 responses processed in this publication. For each country, we received 104 responses covering the four economic sectors. Since there are eight countries in the Amazon Basin, we ultimately evaluated 832 data fields.

In the third step of the methodology, it was necessary to standardize the collected information since the collection tool does not eliminate researchers' subjectivity when completing it. Therefore, we reviewed the data internally and requested clarifications from experts in an effort to expand data coverage. We carried out this step with the analytical framework already defined — that is, with the coding system ready to classify countries as low (0), moderate (1), or high (2). Thus, when information such as the maximum penalty in years provided for by law for mining or illegal logging crimes was missing, we requested additional details from experts. Whenever possible, we accessed the original legislation to verify the information provided, downloading and storing the original documents and cataloging all legislation and regulatory acts applicable to each sector studied.

One of the challenges of this research, based on original sources in English (Guyana), Portuguese (Brazil), Spanish (Bolivia, Colombia, Ecuador, Peru, Venezuela), and Dutch (Suriname), was precisely identifying the regulatory frameworks and understanding the applicable rules in each country, which are not found in a single legal provision but rather in a complex regulatory tangle.

The validation stage of the results — that is, the score assigned to each country for each of the indicators evaluated — was crucial to calibrating the values of Low, Medium, or High, according to the opinions of professionals working in the field. To this end, we engaged with stakeholders from the justice system, civil society, academia, and regional organizations, aiming to confirm, recategorize, or complement the objective information classified according to the established criteria, while incorporating qualitative data that situates the findings in the local context of the eight Amazon Basin countries.

Endnotes

1. Igarapé Institute (2022). Strategic Paper 55, The ecosystem of environmental crime in the Amazon: an analysis of illicit rainforest economies in Brazil
2. The troy ounce is equivalent to 31.103 g and is the international standard unit for the trade of precious metals, distinct from the avoirdupois ounce (28.35 g), which is used in the United States for common goods.
3. Business Upturn (2025). Gold price hits new all-time high at $3,395, up 30% in 2025 – What's fueling the rally?
4. Ministry of Energy and Mines of Peru (2025). La minería metálica y no metálica alcanzó la cifra récord de US$ 47 mil millones en exportaciones en 2024
5. Our national-scale analysis fails to capture, for example, the influence of mining actors on local politics, as in Brazil, which is classified as highly autonomous but where certain municipalities depend heavily on revenue from illegal mining. The performance dashboard also includes Suriname, whose per capita gold exports are much higher than Peru's, in the same category of low economic autonomy, although the situation is more critical in the former than in the latter from a population perspective.
6. In 2022, mining production in Bolivia increased by 7.5% compared to the previous year, reaching a record US$ 6,761.5 million, while imports grew by 18.5%, according to official 2022 data from the Anuario Estadístico y Situación de la Minería
7. PlanetGOLD data for Colombia estimates that 87% of the country's gold is produced by informal miners and 46% by artisanal miners. Ferreira Neto et al. (2024) estimate that in 2022, 77% of mining sites showed clear signs of illegality.
8. Like the collapse of a gold mine in Suriname, which resulted in the death of 14 miners in 2023. Although the mine was operated by a Chinese company, the initial aid came from fellow miners, while government rescue efforts were slow to arrive. G1 (2023). Desabamento em mina de ouro mata 14 garimpeiros no Suriname
9. For a definition of small-scale mining and the boundaries of informal and illegal, see the United Nations Office on Drugs and Crime (UNODC) 2025 study, Global Analysis on Crimes that Affect the Environment – Part 2b: Minerals Crime: Illegal Gold Mining
10. According to the Miner Statute, "grileiro" is defined as "any individual of Brazilian nationality who, individually or in an association, acts directly in the process of extracting minable mineral substances". (Art. 2, Law No. 11,685/08).
11. Cortes-McPherson, D. (2019). Expansion of small-scale gold mining in Madre de Dios: 'capital interests and the emergence of a new elite of entrepreneurs in the Peruvian Amazon. The Extractive Industries and Society, Volume 6, Número 2, 2019, pp 382-389; Villanueva, A. e Vila Benites, G. (2022). Performing traceability: Unpacking the artisanal and small-scale gold mining (ASGM) trade circuit in Peru, Journal of Rural Studies, Volume 102, 2023; McKay, S. (2025). Entering the Critical Era: A Review of Contemporary Research on Artisanal and Small-Scale Mining. The Extractive Industries and Society, Volume 21, 2025.
12. Data on the impact of gold mining on Amazon deforestation are not definitive: some methodologies may underestimate it, and the consequences of mining-related infrastructure should also be considered. Notably, 99% of the deforested area associated with mining in Brazil in 2024 was located in the Amazon, indicating low compatibility, according to the Annual Report on Deforestation in Brazil - 2024, by the MapBiomas network. See also the article Global demand for gold is another threat for tropical forests by Nora L. Alvarez-Berríos and T. Mitchell Aide, for Environmental Research Letter, 2015.
13. Quilombola: term used in Brazil to refer to descendants of communities originally formed by enslaved people who escaped and settled in collective territories known as quilombos.
14. Ojo Público. El oro de la destrucción: una década de minería ilegal y lavado
15. An example cited in the publication Transforming the Economy in the Amazon: Lessons from Community-Led Initiatives, by the Igarapé Institute (2025), is the Ochroma project, in the Brazilian Amazon, which promotes the use of balsa wood as an alternative to mercury in artisanal mining.
16. Statement by the Colombian Minister of Environment in 2023 on the situation of artisanal mining in the country: Código de Minas condenou a mineração artesanal à ilegalidade

17. Article 260. Illegal activity involving mineral resources. Any person who, without authorization from the competent authority, extracts, exploits, processes, transports, markets, or stores mineral resources shall be subject to a custodial sentence of 5 to 7 years. In the case of artisanal mining, the person shall be punished with a custodial sentence of 1 to 3 years. If such illicit activity results in environmental damage, the person shall be punished with a custodial sentence of 7 to 10 years.
18. Argument presented by Andrew Hook based on a field study conducted in Guyana: Fluid formalities: insights on small-scale gold mining dynamics, informal practices, and mining governance in Guyana, University of Sussex, 2019.
19. Agência de Notícias Fides (2025). Cedib denuncia intento de flexibilizar normativa minera y alerta sobre riesgos ambientales
20. Decree No. 2,165 with Rank, Value and Force of Organic Law that reserves to the State the activities of exploration of Gold and other strategic minerals (2015).
21. In countries like Indonesia, penalties for illegal mining in forest areas can reach 15 years (Act 18 of 2013, Sections 17 and 89). In Australia, mining without a permit can result in up to 5 years in prison (Section 5 of the Mining Act 1992).
22. In Colombia, legal companies that fail to report their mining activities may be sanctioned by the National Tax and Customs Directorate (Dian), facing interest on arrears, additional surcharges, and fines equivalent to the value of the extracted material in cases of royalty evasion. Furthermore, serious environmental damage may lead to environmental fines, closure of operations by the National Environmental Licensing Authority (ANLA), restoration obligations, and even imprisonment, as established in Article 331 of the Penal Code.
23. Executive Decree No. 1172 of May 17, 2012: Creacion de la Comision especial para control de la minería ilegal
24. Folha de S. Paulo (2025). Dragas do garimpo no rio Madeira extraíram R$ 245 milhões em ouro ilegal em 7 meses, diz PF
25. Previously, Decree No. 2235 of 2012 regulated the destruction of heavy machinery and its parts used in mineral exploration or exploitation activities without the authorizations and requirements provided by law, in the context of Decision No. 774 of 2012 of the Andean Community, which adopted the Andean Policy to Combat Illegal Mining.
26. Art. 6 of Decree No. 723 of 2014, of the Ministry of Transport, establishes mandatory registration and the requirement for a GPS monitoring system on registered machines.
27. An example of the seal and sale of certified gold in Peru: Historic Milestone for Miners in the Amazon: First Fairmined Gold Sale in Peru, Fairmined.
28. YouTube (2023). UNODC Guide on Illegal Mining: Teshana James-Lake, Guyana's AD of Public Prosecutions
29. Suriname was once a member of the Extractive Industries Transparency Initiative (iniciativa EITI), which promotes international governance standards in the mining sector, but was suspended for failing to submit monitoring reports. In Venezuela, civil society organizations such as Transparência Internacional ceased operations in the country after the passage of legislation restricting the work of independent CSOs.
30. Bolivia, which is part of the Andean Community (CAN), is bound by Decision No. 774 of 2012, which establishes the Andean Policy to Combat Illegal Mining, and in 2023 approved Supreme Decree No. 4959, focusing on the registration of importers and exporters and the requirement of prior authorization for the import and export of mercury.
31. Ojo Público (2025). Madre de Dios: los operativos contra la minería ilegal se han reducido
32. The full text of Artigo 403 of the Penal Code of Colombia.
33. Nellemann, C. et al (2016). The Rise of Environmental Crime, Unep-Interpol Rapid Response Assessment.
34. Data from the Simex Network (Imazon, Idesam, Imaflora and ICV) between 2020 and 2021. Quase 40% da extração de madeira na Amazônia não é autorizada, mostra pesquisa inédita
35. Norman, M. e Zunino, A. (2021). Bolivian Exports of Wooden Flooring What Do We Know About the Risks of Illegal Logging and Trade?, Forest Policy Trade and Finance Initiative, Forest Trends.
36. The International Tropical Timber Organization (ITTO) estimates the export share at 10%, while data from Imazon indicates a higher figure (14%). The Institute of Agricultural and Forest Management and Certification (Imaflora)'s estimates for Amazonian timber, based on DOF data and more recent exports, indicate that exports accounts for between 16% and 25%, while the domestic market represents between 84% and 75%. See Imaflora's publication Acertando o alvo 4: Panorama atual e tendências para mercados sustentáveis de madeira da Amazônia

37. Raw timber export data come from Comex
38. Lanzieri, D. (2021). La informalidad laboral en Venezuela: definiciones, medición y desafíos, Institute for Economic and Social research, Andres Bello Catholic University, Notes from the Venezuelan Economy, n° 11.
39. Mongabay (2025). Así es cómo los grupos armados de Colombia administran el negocio ilegal de tráfico de madera; Por debaixo da floresta: Amazônia Paraense saqueada com trabalho escravo, Center for the Defense of Life and Human Rights Carmen Bascarán & Pastoral Land Commission.
40. Tropical Forest Institute (2018). Relatório de avaliação de efetividade de projeto disseminação e aprimoramento das técnicas de Manejo Florestal Sustentável
41. MapBiomas Ecuador (2023). Aspectos destacos del mapeo anual de la cobertura y uso del suelo en ecuador entre 1985 y 2022, MapBiomas Ecuador Project – Collection 1.0 of the Annual Series of Land Cover and Land Use Maps of Ecuador.
42. Art. 247. Crimes against wild flora and fauna - Any person who hunts, fishes, cuts, captures, collects, extracts, possesses, transports, introduces, stores, traffics, supplies, mistreats, benefits from, exchanges or commercializes specimens or their parts, their constituent elements, products and derivatives of terrestrial, marine or aquatic wild flora or fauna, of species listed as protected by the National Environmental Authority or by international instruments or treaties ratified by the State, shall be punished with a custodial sentence of 1 to 3 years.
43. Precautionary suspensions of licenses have already been applied to forestry administrators responsible for submitting and implementing management plans in Peru. See a report from Andina - Peruvian News Agency: Minagri suspende licencia de cuatro regentes forestales. This type of sanction is recognized by Peruvian civil society organizations as an essential attribution of Serfor, as shown by the Proetica study, Abordando el primer delito ambiental: Tala ilegal - Los seis momentos del crimen
44. In Suriname, the Ministry of Urban Planning, Land Management, and Forestry (Ministerie van Ruimtelijke Ordening, Gronden Bosbeheer) is responsible for approving logging concessions and implementing the Forest Management Law (Wet Bosbeheer). In Ecuador, the Ministry of Environment, Water, and Ecological Transition is responsible for timber harvested from protected areas. In Venezuela, these responsibilities fall to the Ministry of People's Power for Ecosocialism, which oversees forest management and environmental regulation.
45. With responsibilities falling to the Regional Governments (Gore) and the Regional Forestry and Wildlife Authorities (ARFFS).
46. To learn more about the debate on Osinfor's administrative structure and its relationship with the Ministry of the Environment, read ¿Independientes y separados por los bosques del Perú?
47. The Multisectoral Commission was created by Decreto Supremo N° 052-2002-AG, amended by Supreme Decree No. 011-2003-AG.
48. Ordinance No. 149 of December 30, 1992, issued by Ibama (Brazilian Institute of Environmental Protection) establishes the mandatory registration of chainsaws and considers the illegal sale and use of such equipment in forests an environmental crime. This provision is supplemented by Article 51 of Federal Law No. 9,605 of 1998 and Article 57 of Federal Decree No. 6,514 of 2008
49. Booklet "productive Forests for Life" on mobile sawmills
50. An example of a responsible local authority is the Corporación para el Desarrollo Sostenible del Sur de la Amazonia, CORPOAMAZONIA
51. National Information System on Forests and Wildlife (SNIFFS)
52. Colombian "Choose Legal Timber" platform
53. Guyana is the first South American country to implement the Voluntary Partnership Agreement (VPA) of the Forest Law Enforcement, Governance and Trade (FLEGT) program. Guyana Timber Legality Assurance System
54. Ministry of Environment and Sustainable development of Colombia (2022). Guia para la compra responsable de madera en el sector de la construcción
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58. Goldman, E. & Weisse, M. (2024). Deforestation Linked to Agriculture, World Resources Institute (WRI).

59. Centro Latinoamericando de Investigación Periodista (2021). El ganado acorrala a la Amazonía
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61. Candino et al. (2024). Protected Areas in the Brazilian Amazon Threatened by Cycles of Property Registration, Cattle Ranching, and Deforestation
62. For a comparison with other countries in the region, see Livestock farming in the Andean Amazon and the rest of the Amazon. Mongabay, 2023.
63. Fundación para la Conservación y el Desarrollo Sostenible - FCDS (2024). Ganadería como motor de deforestación: Condiciones habilitantes y dinámicas territoriales en el Guaviare
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66. Data from the Greenhouse Gas Emissions and Removals Estimation System (SEEG): Análise das emissões de gases de efeito estufa e suas implicações para as metas climáticas do Brasil 1970-2023
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68. Killeen, T.J. (2024). Mining Gold in the Greenstone Belt of Panamazonia, Mongabay.
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110. We thank the consultants who participated in the data collection, without whom this work would not have been as thorough as it was.

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How to cite:

IGARAPÉ INSTITUTE. Markets and Forest: Comparative Analysis of the Economic Sectors that Pressure the Amazon Basin. Rio de Janeiro. Igarapé Institute, 2025. Available at: https://igarape.org.br/publicacoes

DOI Number:

10.5281/zenodo.17529304

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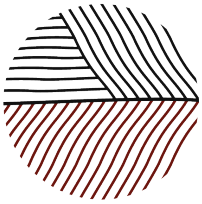

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