

GLOBAL RESTORATION INITIATIVE: A FRAMEWORK FOR POLICY ANALYSIS

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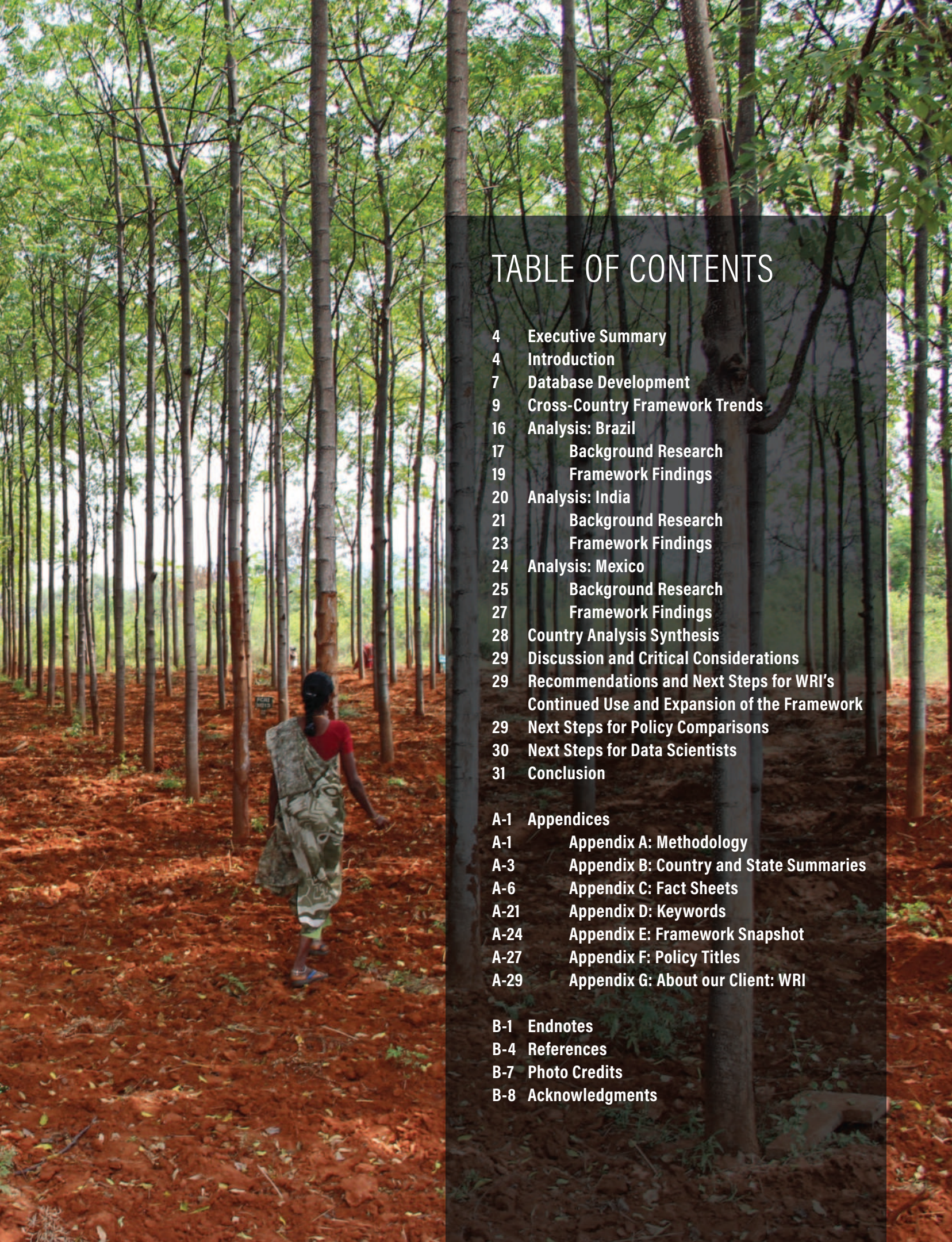


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EXECUTIVE SUMMARY

According to the Intergovernmental Panel on Climate Change (IPCC), countries must adopt varied emissions reductions strategies to limit global warming to 1.5°C above pre-industrial levels in order to avoid catastrophic climate change. By returning land to its peak environmental productivity, restoration of degraded landscapes is a key component of countries' efforts to combat climate change. Restoration takes many forms, like reforestation, sustainable agriculture, and agroforestry.

Our client, the World Resources Institute (WRI), a global research organization, launched the Global Restoration Initiative to help governments implement restoration projects based on sound data and analysis. To support this effort, the team created a policy analysis framework for restoration initiatives over the course of the 2019 Spring semester at Columbia University. This framework will serve as a foundational toolkit to help WRI policy experts identify conflicts, incentives, and alignments across the various policies, laws, and governmental agencies involved in restoration efforts on a global scale. In order to build this framework, the team compiled a database of 89 restoration policies and laws in Brazil, India, and Mexico. This database was converted into a pivot table to define cross-country patterns of alignments, conflicts, incentives, and disincentives. We also created a list of keywords in Spanish, Portuguese, and English to help WRI expedite their policy analyses as they develop an algorithm for Natural Language Processing.

Overall, analysis of our policy database through our framework indicates that there has been an increase in both national and state restoration policies across Brazil, India, and Mexico since 1950. There has also been an evolution in the acknowledgement of climate change in more recent policies. The majority of these new policies are managed by the ministries of environment or natural resources of each country and focus primarily on agricultural land. Although countries may be motivated by restoration, other, often primary, concerns vary. While India's national policies are centered around carbon sequestration, Brazil's policies are primarily focused on restoration for agricultural development and Mexico's policies are driven by biodiversity. Nonetheless, all countries rely on financial mechanisms such as national funds to support restoration efforts.

This report presents the methodology used to develop the restoration policy database and the policy analysis framework, as well as the strategies used to determine cross-country similarities and differences within the policy data. It also contains an overview of the socio-political contexts of Brazil, India, and Mexico, and concludes with our major findings and recommendations. We hope that this report, policy database, framework, and keywords list will help WRI identify global conflicts and alignments in restoration policy to better support national efforts.

INTRODUCTION

Land Degradation

Land degradation has become a global epidemic – a recent report by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)¹ found that **more than 75% of Earth's land areas are substantially degraded**. While several definitions of this phenomenon exist, this assessment will define land degradation as

the temporary or permanent decline in the productive capacity of the land in terms of loss of soil fertility, biodiversity, and the degradation of natural resources.² Examples of land degradation include the loss of native flora and fauna, soil erosion and contamination, topsoil loss, salinization, and nutrient overload.

Deforestation – one of many drivers of **land degradation** – is the destruction of forests

for the purpose of extracting natural resources (such as timber and minerals), and often results in converting the newly cleared land to an alternative use.

Between 1990 and 2016, the world experienced global deforestation of an area roughly the size of South Africa,

equivalent to 1.3 million km² of forest.³ Agricultural expansion is another driver of degradation, involving the conversion of native vegetation into arable land. Globally, more than half of habitable land (almost 51 million km²) is devoted to agricultural production, of which more than three-quarters is used for rearing livestock.⁴ Once converted, agricultural lands are often overused and overfertilized, destabilizing soil and nutrient balances to the point at which crop yields decline dramatically or the land becomes unusable. In tropical climates, such poor management techniques often necessitate additional deforestation (due to low nutrient content in the soil), creating an endless cycle of degradation. Global pasturelands, used for rearing and feeding livestock, account for almost 77% of agricultural land, an area equivalent to North and South America combined.⁵ Overgrazing in such pasturelands can destroy native vegetation, resulting in habitat fragmentation or desertification in extreme cases if left unchecked. While not as impactful at scale, urbanization and pollution are also drivers of land degradation, as anthropogenic activities and infrastructure often fragment the surrounding habitats while introducing harmful byproducts and waste.

Besides ensuring ecological stability, landscapes play an important role in addressing and mitigating the impacts of climate change. When their natural functions have not been compromised or degraded, landscapes are capable of sequestering carbon dioxide from the atmosphere, doubling their functionality as carbon sinks. While there are many actions that are needed to mitigate GHG emissions,

healthy landscapes are the most cost-effective carbon sequestration tool

at our disposal in mitigating climate change.

Land Restoration

Addressing the impacts of land degradation requires employing policies and techniques that promote land restoration. **Restoration is the process of rehabilitating a site to a natural state or habitat.**⁶ However, there is no universal definition of “restoration,” which introduced complexities to identifying restoration-related policies. We utilized

BOX 1 | RESTORATION TERMINOLOGY

Passive regeneration ⁷ (reforestation/ revegetation)	Spontaneous growth of vegetation/tree cover and reversion to natural habitat that occurs when degradation driver is removed
Active regeneration ⁸ (reforestation/ revegetation)	Facilitated growth of vegetation/tree cover and reversion to natural habitat that occurs via human interventions; requires more than the removal of degradation driver
Agroforestry ⁹	Production technique integrating crops and forests on a common site
Silvopasture ¹⁰	Production technique integrating livestock and forest cultivation on a common site
Agro-pastoralism ¹¹	Production technique integrating livestock and crop cultivation on a common site

the definition above to identify policies in a consistent way.

Restoration takes many forms, depending on the cause and degree of land degradation, and includes techniques such as passive (natural) or active (assisted) reforestation/revegetation. Additionally, there are several landscape management techniques that promote restoration, such as agroforestry, silvopasture, and agro-pastoralism.

Project Deliverables

The goal of this project is to develop a global policy analysis framework for restoration initiatives using policies from Brazil, India, and Mexico as case studies. Countries were selected because of existing in-country WRI resources and data, in addition to significant ongoing restoration work in respective country offices. The ambition of this framework and report is to cross-pollinate existing restoration-related research and extract key themes across nations.

This project produced four deliverables:

1. A database of laws and regulations for the case study countries
2. A summary report identifying key patterns and trends
3. A presentation summarizing results and recommendations
4. A keywords list of important words and phrases in the policies examined

This summary report, a detailed narrative of the project, includes the framework policy analysis instructions related to restoration interventions and identifies patterns and differences amongst case study countries.

- The **framework** includes a populated database of 89 national- and state-level policies across 29 chosen variables, with rationales for each variable acting as its primary components. This spreadsheet includes more than 2,000 data points for Brazil, India, and Mexico policies.

- The spreadsheet has been converted into a pivot table, in which its manipulation is the **application** of the framework. The **pivot table** allows for different data points and variables to be compared.

- These comparisons are compiled into **matrices** to identify patterns and differences, with further interpretation gleaned from policy experts' knowledge of the countries. For example, an analyst may want to compare which types of land-use policies to target, and what kind of incentives they employ across multiple countries. These matrices provide an effective combination of direct data from the spreadsheet and user knowledge.

- The **keywords list** contains words in English, Spanish, and Portuguese that were used to search through policy texts. The list will help other policy analysts expedite their research and is intended for potential Natural Language Processing applications.



DATABASE DEVELOPMENT

Framework Construction

The 89 policies populating our database were each identified by using the Ecolex database (United Nations) or were found on the websites for the governments of India, Brazil, and Mexico. Both active and inactive/repealed/lapsed policies were considered and the activity status of the policy is indicated in the spreadsheet. The aim is for WRI to use this framework to examine policies of any type in any region; thus, our framework outlines policies and the categorization of these policies based on our variables, so that additional policies may be entered into the framework and subsequently categorized. For these reasons, the framework was designed to be:

1. **Scalable** – Utilizing standardized classification systems and generic attributes, the framework is built to apply to policies for any jurisdiction or restoration target.
2. **Discrete** – The binary or limited options by which most attributes are defined make the framework easy to use to extract patterns about the data and turn qualitative data into quantifiable trends. If the framework is to be transcribed to an automated or programmatic application, such as those for Natural Language Processing (NLP), the utilization of largely binary or limited option queries provides a discrete number of variable choices to program for, with an emphasis on developing a large number of attributes with restricted options within each one, rather than a few overarching or categorical attributes with open-ended options. Several categories, such as Policy Purpose, Keywords, Notes, etc. allows infinite responses, making the program applicable and engageable when being used creatively or qualitatively.
3. **Dynamic** – The framework includes dropdown selected options that draw a set number of options from editable lists, which can be easily expanded for analysis in a new region. *In an automated or programmatic application*, it will be simple to extrapolate details directly from policy text and tie them to a reference dataset.

Framework development was an iterative process, beginning with basic policy features and adding new factors, such as acknowledgement of indigenous land rights, stemming from research and expert interviews. Some attributes were intuitive, such as the year each policy went into effect. Some arose through our research of WRI's priorities, such as through the examination of the Restoration Opportunities Assessment Methodology (ROAM) developed by WRI and the International Union for the Conservation of Nature (IUCN) defining land-use types. Others were made apparent through our interviews and literature searches (for methods on these, see Appendix A). Included here is a table of the variables utilized according to the type of data (text-entry, drop-down, or binary). The priority column describes, from a data analytics perspective, the importance for population of each variable for each policy. The "priority" reflects the usefulness and difficulty to automatically populate each variable, with high priority given to those that are highly descriptive and difficult to populate without manual input. "Rationale" describes the description and definition of each variable.

When populating the framework, we:

1. Utilized Ecolex and selected keywords to identify relevant policies by region
2. Validated policy details using national or regional government websites
3. Filled out the framework in order from high-to low-priority variables, identified above

Variable	Data Type	Priority	Rationale
Policy Title	Text Entry	High	Basic policy features.
Year	Text Entry	High	
Country	Drop-down	High	
Sub-national Jurisdiction	Drop-down	High	Provides helpful temporal and jurisdictional anchors for understanding the political economy context.
Enacted By Law	Binary (T/F)	High	Whether the policy is enacted by law, unilateral executive authority, or voluntary means (as with international agreements/NDCs) is important to understanding how success is measured and what incentives are at play.
Enacted By Executive Action	Binary (T/F)	High	
Voluntary/NDC	Binary (T/F)	High	
Passed	Binary (T/F)	High	Indicates whether policy was politically viable.
Active	Binary (T/F)	High	Indicates whether policy remains impactful, politically viable.
Executing Ministry	Drop-down	High	Provides context on which ministries have most influence and whether policy has staying power.
Enforcement Mechanism	Binary (T/F)	High	Indicates whether the policy has built-in compliance mechanism, which may influence its success on the ground.
Summary	Text Entry	High	Explains key elements of the policy design in practice and provides training for future automation/NLP processes.
Purpose/Motivation	Text Entry	High	Intent and goals of the policy differ from the pure design elements and can be difficult to infer from a text crawl.
Bottom-up: Engagement	Binary (T/F)	High	Indicates whether policy pursues public outreach & education or acknowledges indigenous land rights, since bottom-up approaches may prove more sustainable.
Bottom-up: Indigenous	Binary (T/F)	High	
Primary Incentive...	Drop-down	High	Incentives, disincentives, and their reference points in the text establish patterns for understanding economic tools, political preferences, and policy efficacy. Patterns are likely to emerge among which types of incentives get passed and generate sustained restoration results.
...Page #	Text Entry	High	
Primary Disincentive...	Drop-down	High	
...Page #	Text Entry	High	
Biome-Specific	Binary (T/F)	Moderate	Whether the policy is specific about their land-use goals, or more general, may influence its restoration outcome.
ROAM: Land Use	Drop-down	Moderate	Uses modified ROAM classification to identify target biomes provides a standardized glossary for land use and interventions utilized in each policy. This can be used to understand patterns of target ecosystems and economic incentives, and allows assessment of whether policies are adequately addressing ecological outcomes.
ROAM: Category	Drop-down	Moderate	
ROAM: Intervention	Drop-down	Moderate	
Specific Geographic Target or Hectare Quantity	Binary (T/F)	Low	Whether the policy provides specific geographic metrics or not may influence its restoration outcome.
Keywords	Drop-down	Low	Indicates patterns in language and themes.
Link	Text Entry	High	Link to PDF of documents provides programmatic access.
Notes	Text Entry	Low	Additional contextual detail not included elsewhere.
Political Economy Score	Formula	N/A	Still in development, this will aggregate non-policy-specific factors, drawn from external research on the political and economic drivers in the given jurisdiction, to understand the political, economic, and public sentiment around this policy.

CROSS-COUNTRY FRAMEWORK TRENDS

Policy Breakdown:

43 Brazilian Policies | 21 Indian Policies | 25 Mexican Policies

Country State		Brazil All (43)	India All (21)	Mexico All (25)
Primary Incentive	<i>Financial Grants</i>	14%	5%	12%
	<i>Financial Subsidies</i>	23%	5%	20%
	<i>Tax Breaks</i>	0%	0%	4%
	<i>Grants & Subsidies</i>	0%	0%	0%
	<i>Legal & Subsidies</i>	2%	0%	0%
	<i>Trade</i>	2%	15%	0%
	<i>Legal</i>	15%	10%	44%
	<i>Political</i>	7%	0%	8%
	<i>Diplomatic</i>	0%	21%	4%
	<i>Other</i>	37%	44%	8%
Primary Disincentive	<i>Financial Fines</i>	7%	20%	16%
	<i>Fines & Legal</i>	2%	0%	0%
	<i>Fines, Legal, & Political</i>	3%	0%	4%
	<i>Imprisonment & Fines</i>	3%	32%	8%
	<i>Legal</i>	4%	0%	0%
	<i>None</i>	8%	0%	0%
	<i>Political</i>	3%	0%	0%
	<i>Procedural/Guidelines</i>	36%	20%	8%
	<i>Other</i>	34%	28%	64%
Top Priorities	<i>Agricultural Development</i>	46%	10%	17%
	<i>Conservation</i>	19%	29%	41%
	<i>Defined Ecological-Economic Zoning</i>	3%	0%	0%
	<i>Governance Framework</i>	8%	0%	0%
	<i>Climate Change</i>	9%	14%	4%
	<i>International Agreement</i>	0%	14%	5%
	<i>Legal Ruling</i>	0%	4%	0%
	<i>Other</i>	15%	29%	33%
Bottom Up Engagement	<i>Yes</i>	68%	80%	80%
	<i>No</i>	32%	20%	20%
Bottom Up Indigenous Rights	<i>Yes</i>	34%	90%	40%
	<i>No</i>	66%	10%	60%
Biome Specific	<i>Yes</i>	80%	25%	44%
	<i>No</i>	20%	75%	56%
Biome	<i>Agricultural Land</i>	0%	22%	12%
	<i>Forested Land</i>	50%	23%	40%
	<i>Forested & Agricultural</i>	18%	5%	8%
	<i>Forested, Agricultural, Protected, & Buffer</i>	2%	30%	16%
	<i>Forested, Protected, & Buffer</i>	4%	5%	4%
	<i>Protected & Buffer</i>	2%	15%	0%
	<i>Other</i>	24%	0%	20%
Enforcement Mechanism	<i>Yes</i>	46%	80%	30%
	<i>No</i>	54%	20%	70%

The following analyses are examples of what may be assessed using data points in the framework, as well as high-level findings for our countries of focus from the assessments we completed. This section is aimed at showing the types of analyses the framework can conduct while also providing findings, particularly on patterns of community engagement, primary incentives, executing ministries, and levels of government, as these were particularly informative when derived from our framework.

National-Level Policy Trends Across Time

Framework data analysis shows how the total number of laws has grown by country at just the federal level (Figure 1c) as well as both federal and state level (Figure 1b). Additionally, we can group together different national ministries to see which regulatory entities oversee and execute the most restoration-focused policies (Figure 1d); overlaid with an understanding of the economic context and political capital, knowing the responsible agencies can be helpful in determining which policies are likely to be successful, allowing WRI to better understand where to focus their restoration support efforts.

BOX 2 | INCENTIVES

Legal	The policy includes some form of penalty or consequence for a regulation. Examples are fines, warnings, arrests, jail time, etc.
Diplomatic	The policy pertains to or invokes some kind of agreement with mutual terms on both sides.
Political	The policy offers a framework or guideline for how to enact policies at a different level of government or how to support a community program to accomplish the end goals desired by the passing agency.
Financial - subsidies	The policy involves the direct allocation of government funds for a program or in support of a community or community initiative. The funding is conditional on the outlays of the policy and the funds have a defined recipient.
Financial - trade	The policy supports private industrial activity in exchange for some kind of protection of a given area or the policy engages industry as a partner in support of mutual gains.
Financial - grants	The policy finances grants that do not yet have a defined recipient in support of a defined goal or objective.

*Incentives labeled in analyses as “other” constitute minor mechanisms or no mechanism beside policy reinforcement. For statistical analysis, this represents a secondary tier of policies with an incentive characteristic.



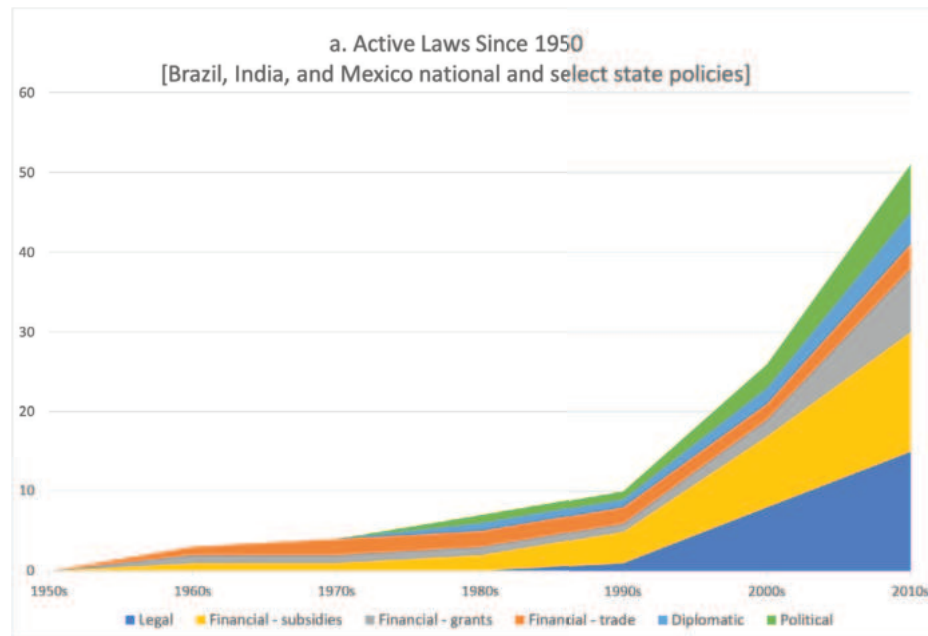


Figure 1a visualizes the changing distribution of policy incentives over time in the sample database, with each unit representing a policy. The progression includes all active laws since 1950 in the countries and states we selected. Beginning in the 1990s, subsidies and legal incentives became the dominant force in new restoration policies; legal incentives consist of designating land use and rights, as with Mexico’s Cadastre Law, suggesting a conscious effort to define ownership and place guardrails around agriculture, forestry, and industry to reduce land degradation.

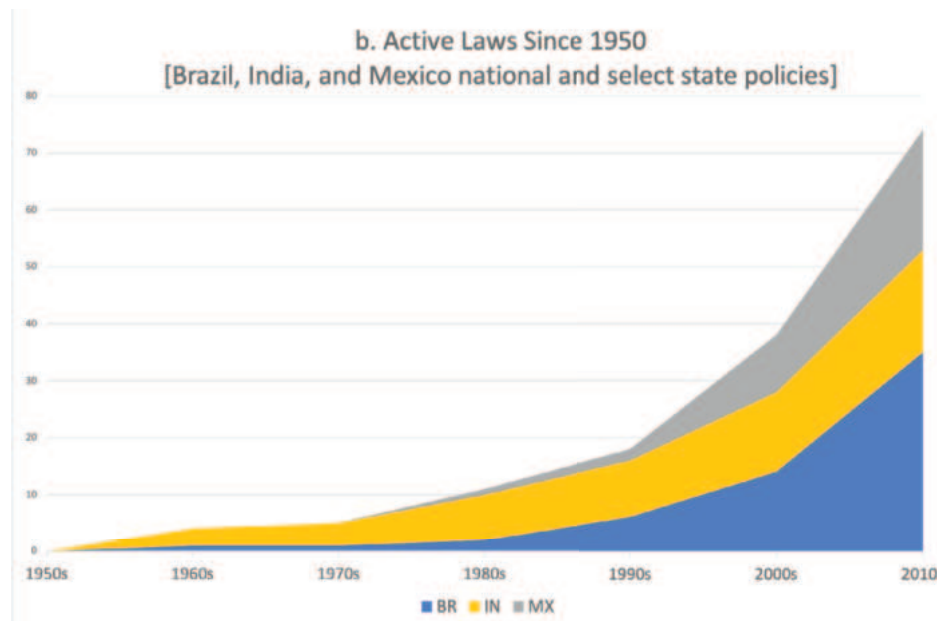


Figure 1b breaks down the growth in active laws by country to show that all three sample nations have accumulated restoration policies over time, rather than one particular country dominating the trend. However, the chart displays all policies in the sample database; given the differences in size and authority of jurisdictions, this helps to reveal directional trends, but is a poor mechanism for comparison of exact numbers. The primary finding here is that India, Brazil, and Mexico have all continued to pass restoration-related policies, while maintaining older laws. Greater numbers of policies may reflect an increased emphasis on the different facets of land degradation and restoration as well as the involvement of more parties, but also create potential for redundancy, confusion, or competing incentives.

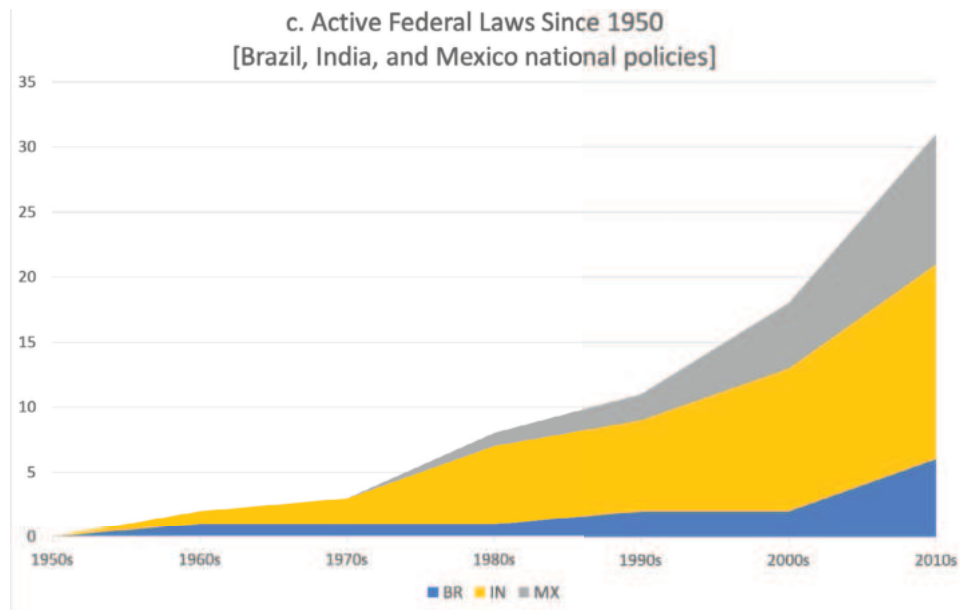


Figure 1c shows the growth in active laws by country again, but restricts only to federal laws to aid in fair transnational comparisons. This reveals that the trend in accumulating restoration policies is consistent across all three nations, but Mexico and Brazil have seen the most rapid acceleration in the 21st century.

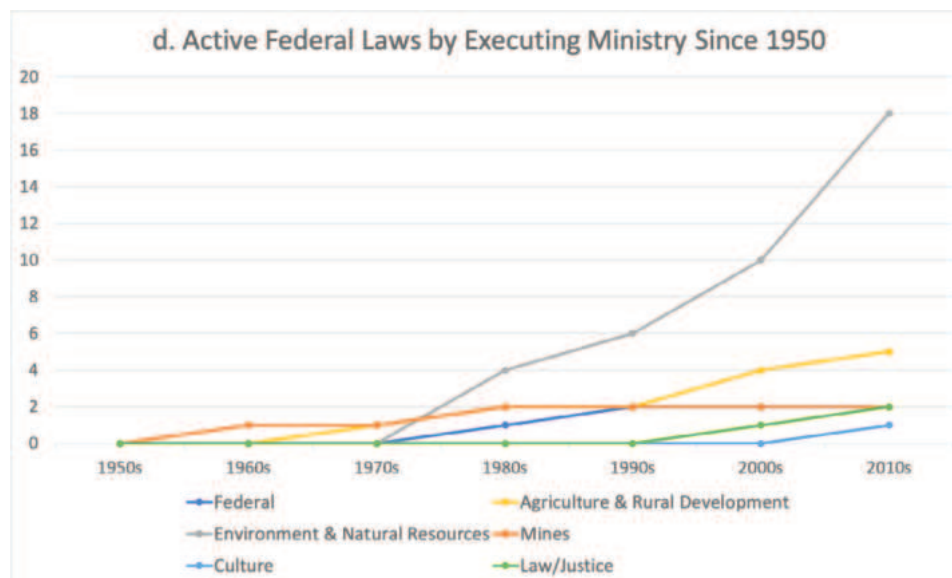


Figure 1d looks at which categories of federal ministries are implementing restoration-related laws, and how this trend has changed over time. The ministries were grouped by general themes seen across all three sample countries, although each country has different names and mandates for their agencies. We see that the majority of policies passed in recent decades are being implemented by environment and natural resources agencies, whereas early laws, many of them foundational forest codes, were operated by mining or agricultural ministries. This reflects a shifting approach to land management over time. Mining and agricultural agencies tend to operate with an economic mandate, to grow, expand, and secure core national industries; as a result, their motivations around land use tend to focus on economic gain. The housing of new restoration in environmental ministries suggests intent to conserve land and develop sustainably, as well as increased concern around climate change. Understanding this temporal trend will allow users of the framework to identify motivations and political capital, and then prioritize policy interventions and recommendations accordingly.

Comparing Policies Across Variables

It is helpful to use graphical representations to identify areas of further exploration by leveraging the framework to move from higher-level to more granular insights. For instance, it is interesting to see the increase in policies employing legal incentives and subsidies in the 21st century, at the same time as environmental ministries are executing most of the new policies. *Are these the same laws? If so, why do certain agencies employ the same types of incentives, even across countries? What are some of the policies that fall into these categories?* A closer look at some of the recent policies (since the turn of the 21st century) at the federal level across all three countries reveal a few initial observations with regard to the recent restoration laws coming out of environmental ministries (Figure 2). By looking at the *Management of Public Forests, Brazilian Forest Service and National Fund for Forest Development* policy (Brazil), the *National Forestry Program* (Mexico), and the *Compensatory Afforestation Fund Act (CAMPA)* (India), we can pull out insights related to motivation, incentives, and other policy variables that are useful for cross-country comparisons. Observations from a localized analysis of these three policies include the following:

- Despite the fact that agricultural land is the most commonly targeted land-use type across the full sample dataset, many recent policies focus solely on forests, including the three in Figure 2.
- Even when legal frameworks serve as the primary incentive, they are still tied to financial mechanisms. Both the Brazil and India policies are written to be legally binding, but also establish guardrails around national afforestation funds.
- All three policies either identify carbon emissions as core to the law's purpose (Brazil and Mexico) or are executed by a climate change-focused ministry (India). Climate was not always acknowledged in older restoration policies or those overseen by industry-centric ministries, like agricultural or mining agencies, but is often cited in more recent years.
- Acknowledgement of indigenous rights and incorporation of community outreach or engagement are not a certainty among recent policies, as seen in India's CAMPA law.

Policy Title	Year	Country	Executing Ministry	Purpose	Primary Incentive	Bottom-up: Community Engagement	Bottom-up: Indigenous Rights
Management of Public Forests, Brazilian Forest Service and National Fund for Forest Development	2006	BR	BR-Environment	Mandates forest management principles based on REDD+ policies, establishes the Brazilian Forest Service, and sets up the National Fund for Forest Development.	Legal	Yes	Yes
National Forestry Program 2016	2015	MX	MX-Environment and Natural Resources	Implement the General Law of Sustainable Forestry Development.	Financial - subsidies	Yes	Yes
The Compensatory Afforestation Fund Act (CAMPA)	2016	IN	IN- Environment, Forests and Climate Change	Establishment of national fund for afforestation	Legal	No	No

Figure 2. A snapshot of the most recent policies in Brazil, India, and Mexico, wherein the environmental ministry leverages subsidies and legal constraints, the most common features of 21st century policies in our framework.



Figure 3. Understanding Community Engagement and “Bottom-Up” Policies

Aggregation of the number of policies accounting for community engagement and indigenous peoples in Brazil (blue), India (red), and Mexico (green). Each colored dot represents a single policy.

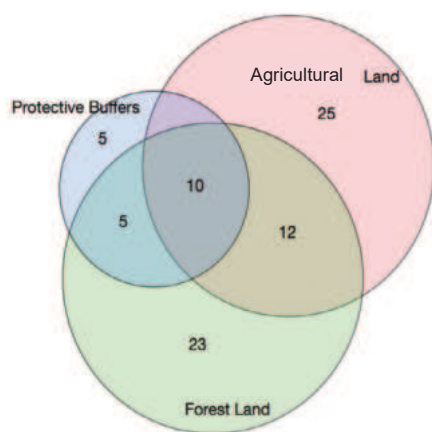


Figure 4. Comparison of land-use types and synergies across Brazil, India, and Mexico.

Across all countries, policies are focused more heavily on forested land and agricultural land (50 and 47 policies respectively), with very few focusing on protective buffers, exclusively or in combination with other land-use focuses. Furthermore, over time, the number of policies addressing more than one land-use type increased, exemplifying a shift to more holistic policy taking into account the connectedness of land types and the need to address them in policy together.

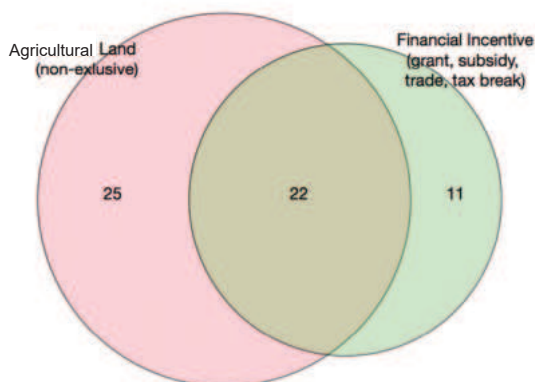


Figure 5. Overlap between agricultural land-use type and financial incentive mechanism for policies across Brazil, India, and Mexico.

Nearly half of all policies specifying the land-use type of agricultural land (either exclusively or combined with other land-use types) utilize financial incentives, such as grants, subsidies, trade, and tax breaks. Similarly, **two-thirds of all policies utilizing financial incentives are for policies related to the management of agricultural land.** The relationship between agricultural land and financial incentives is exemplified in such policies as the Brazilian State Policy for Agroecology and Organic Production (PEAPO), which was established in 2012 to develop a system for the certification of organic agriculture, in part subsidizing production for farmers. Financial mechanisms, like subsidies are a powerful tool in Mexico and India, as well. A similar analysis on forest lands (non-exclusive) and financial incentives shows that 50 of the 67 policies including forested lands and/or financial incentives only pertain to one, with only 17 policies of 67 utilizing a financial incentive for a policy pertaining primarily to forested lands.

Summary

We can use these initial impressions as a start but leverage the broader dataset and our

external research to solidify our results and understand what these insights tell us about the countries' different approaches to restoration policy.

Bottom-Up Approaches:

- Increasing emphasis on community engagement and indigenous land rights: 78% of the policies mentioning either consideration have been implemented since 2000.
- India tends to employ top-down approaches. With 76% of restoration policies implemented federally, high emphasis on legal incentives and disincentives, and few laws mentioning community outreach.
- Mexico incorporates indigenous and community rights in 40% of policies. These considerations are critical for success in Mexico, and thus may indicate which policies are likely to do well elsewhere.

Ministries and Jurisdictions:

- In recent years, across countries, environmental ministries have supplanted agriculture and rural development agencies as the de facto authorities on land management and restoration, reflecting a shift in restoration policy to emphasize conservation and climate action rather than industry-specific ends.
- This finding is also useful for policy experts when assessing which ministries to target when supporting decision-makers in restoration efforts.

Incentives and Land Types:

- Legal incentives and grants are commonly used for forest preservation or afforestation (65% of examined policies with legal incentives pertain to forested lands).
- Subsidies are leveraged for many policies across the board.
- All three countries have relied more on financial mechanisms, including specific national funds, for restoration in recent years (since 2000).
- The number of policies accounting for numerous land-use types has increased over time.
- The recent trend toward financial policy tools presents policy experts in all three countries with an understanding of what kinds of policy mechanisms may prove most useful when targeting restoration interventions. The breakdown of associations between financial incentive type and land type provides even further insight into how specific policies can be leveraged with appropriate incentive types if they focus on certain biomes.

ANALYSIS: BRAZIL

Country		Brazil	Brazil	Brazil	Brazil
State		All (43)	São Paulo (11)	Espirito Santo (7)	Minas Gerais (9)
Primary Incentive	<i>Financial Grants</i>	14%	9%	43%	0%
	<i>Financial Subsidies</i>	23%	36%	0%	11%
	<i>Tax Breaks</i>	0%	0%	0%	0%
	<i>Grants & Subsidies</i>	0%	18%	14%	0%
	<i>Legal & Subsidies</i>	2%	0%	0%	0%
	<i>Trade</i>	2%	0%	14%	0%
	<i>Legal</i>	15%	0%	0%	11%
	<i>Political</i>	7%	18%	29%	0%
	<i>Diplomatic</i>	0%	0%	0%	0%
	<i>Other</i>	37%	19%	0%	78%
Primary Disincentive	<i>Financial Fines</i>	7%	9%	0%	10%
	<i>Fines & Legal</i>	2%	9%	0%	0%
	<i>Fines, Legal, & Political</i>	3%	9%	0%	0%
	<i>Imprisonment & Fines</i>	3%	0%	0%	0%
	<i>Legal</i>	4%	9%	14%	0%
	<i>None</i>	8%	9%	29%	0%
	<i>Political</i>	3%	0%	0%	10%
	<i>Procedural/Guidelines</i>	36%	45%	43%	50%
	<i>Other</i>	34%	10%	14%	30%
Top Priorities	<i>Agricultural Development</i>	46%	64%	86%	33%
	<i>Conservation</i>	19%	9%	14%	56%
	<i>Defined Ecological-Economic Zoning</i>	3%	0%	0%	0%
	<i>Governance Framework</i>	8%	0%	0%	0%
	<i>Climate Change</i>	9%	0%	0%	0%
	<i>International Agreement</i>	0%	0%	0%	0%
	<i>Legal Ruling</i>	0%	0%	0%	0%
	<i>Other</i>	15%	27%	0%	11%
Bottom Up Engagement	<i>Yes</i>	68%	64%	86%	22%
	<i>No</i>	32%	36%	14%	78%
Bottom Up Indigenous Rights	<i>Yes</i>	34%	18%	14%	11%
	<i>No</i>	66%	82%	86%	89%
Biome Specific	<i>Yes</i>	80%	82%	86%	78%
	<i>No</i>	20%	18%	14%	22%
Biome	<i>Agricultural Land</i>	0%	64%	57%	22%
	<i>Forested Land</i>	50%	0%	0%	56%
	<i>Forested & Agricultural</i>	18%	27%	29%	0%
	<i>Forested, Agricultural, Protected, & Buffer</i>	2%	0%	14%	0%
	<i>Forested, Protected, & Buffer</i>	4%	0%	0%	0%
	<i>Protected & Buffer</i>	2%	9%	0%	11%
	<i>Other</i>	24%	0%	0%	11%
Enforcement Mechanism	<i>Yes</i>	46%	27%	0%	22%
	<i>No</i>	54%	73%	100%	78%

Background Research

Our analysis of Brazil focuses on the intersection of federal, state, and municipal policies that impact the conservation of native land vegetation and the revegetation of degraded lands in three states located in the southeast of the country; São Paulo, Espírito Santo, and Minas Gerais. These states are focus areas for WRI within Brazil, and are comprised of the Atlantic Forest, Cerrado, and Caatinga biomes.

In Brazil, indigenous protections often coincide with restoration as states do not always have a native attachment or inherent recognition of an indigenous population beyond how the national assembly asserts recognition. From our analysis, the primary motivator in Brazil is agricultural development. Policies barring slash-and-burn agriculture are also present, but are frequently ignored. 27 of the 43 policies examined do not include an enforcement mechanism, which may prove problematic.

Biomes and Land Use

The **Atlantic Forest**, characterized by tropical and semi-tropical rainforests, is home to greater than

70% of the Brazilian population and is the most heavily deforested biome within the country.

The Cerrado biome is made up of woodlands and savannas and is severely under-protected due to legacy agricultural and land-use policies. The Caatinga is characterized by arid drylands and covers a smaller area than other biomes in the southeast of the country, but is highly vulnerable to climate change. As a highly populated region of the country, native forests in southeast Brazil are important for maintaining a healthy environment and providing critical services, such as clean air and water, for growing populations.

Agriculture, forestry, and other land uses represent the largest share of Brazil's greenhouse gas emissions.¹² Brazil's voluntary commitments in the Paris Agreement and Bonn Challenge include a commitment to reforest 12 million hectares of degraded land, which would sequester 1.14 Gt of carbon dioxide.¹³ Both commitments reference the same target and are not additive. The Paris Agreement is codified through the National Policy for Climate Change, which mandates the development of sectoral plans to implement specific mitigation actions. All three states have laws (passed by legislation) or decrees (passed by executive action) to codify the Paris Agreement goals at a state level. Additionally, in the National Policy for Climate Change, the Cerrado is specifically protected through a federal law, the Action Plan to Prevent and Control Deforestation and Fire in the Cerrado.

Drivers of Degradation

Main drivers of land degradation in Brazil include agriculture, logging, and mining. Agriculture accounts for only 6% of the country's Gross Domestic Product (GDP), but more than 50% of Brazilian native vegetation is on privately-held rural lands. Policies that affect privately-held rural land use are highly significant for larger reforestation and conservation efforts. At the federal level, privately-held rural land is regulated by the Forest Code.¹⁴ The Forest Code establishes "legal reserve debt," which refers to the obligation of landowners to restore portions of their lands to their native vegetative state.

The law requires 80% of privately-held, rural lands in the Amazon to be maintained or returned to their native vegetation,

but only requires 20% of land area in other biomes. A 2012 revision of the Forest Code forgave legal reserve debt for "small" properties, defined as properties with less than 440 hectares of land (this area totals the maximum size of four fiscal modules, areas defined at the municipal level that can sustain one family when fully exploited). Extension services,

BOX 3 | BRAZILIAN POLICIES

In Brazil 12% of policies to date (5 out of 43) include imprisonment and fines as the main mechanisms under a legal framework.

The federal government provides guidelines for how to carry out legal repercussions at the state level.

No policies are biome specific as they deal with multiple land uses and support government oversight of territorial management in all areas subject to restoration potential.

47% of Brazilian policies concern forested land and 63% concern agricultural land.

rural agricultural and land use education cooperatives, are external to the Forest Code but supported through other policies. Because its effective implementation of the Forest Code depends on many small landowners, these services are critical for educating farmers about how to increase yields, while also maintaining legal reserve requirements for native vegetation.

Enforcement and Incentives

Each of the states in our analysis has a unique policy to form agricultural cooperatives within the state, although these are also dependent on nonprofits and nongovernmental agencies. Weak enforcement historically and amnesty for small landowners under the revision have led to the perception that illegal deforesters are unlikely to be prosecuted. This highlights one way in which amnesty measures may be exacerbating degradation. Similarly, forest fires become more likely when lands are degraded and then accelerates the reduction in productivity of land.

Brazil's main economic programs targeting the agricultural sector are various rural credit programs. Historically, these have been motivated by economic development more so than sustainability. This is changing with the introduction of **ABC loans**, credit lines

specifically dedicated to finance agricultural practices with high productivity and low greenhouse gas emissions.¹⁵ Payouts under rural credit programs (such as PRONAF) and the more recent ABC loans are contingent upon farm size measured in fiscal modules, which was established by the National Institute of Colonization and Land Reform (INCRA) in the 1980s. A fiscal module is defined as the minimum area where agricultural activity can sustain a family who invest all their workforce in it. Fiscal modules range in size from five to 110 hectares across different municipalities. Even though agricultural techniques and fertilization technologies have improved since the 1980s, fiscal module sizes have remained constant.¹⁶ In Brazil's southeast, agricultural efficiency of the Cerrado biome has improved greatly with modern fertilizers and other technologies. The large fiscal module size, which allows for greater legal deforestation, plus advancements in fertilizers and other agricultural processes, has led the

Cerrado to be the most coveted biome for agribusiness expansion.

Large-scale conservation efforts have primarily focused within the Amazon. Policy does not differentiate between successional stages of deforestation, leading to ineffective policy implementation.¹⁷ Satellite monitoring technologies have been implemented in the Amazon, but have not been expanded or adapted for other Brazilian biomes, such as the Atlantic Forest or Cerrado.¹⁸

Framework Findings: Brazil

Motivations:

- In Brazil, 7% of policies include climate change as a main motivation of the policy.
- Almost half of policies (21/43) involved agricultural development as their primary motivation, with 23% motivated primarily by conservation.
- Land management is the most substantial stated motivator (conservation, farmland registry, etc.).

Executing Ministries and Government Level:

- State assemblies are the primary engine of all policies examined. The federal Agrarian Development ministry is the second principle engine of these policies.

Disincentives:

- Primary disincentives against policy participation are guideline frameworks (comprising 43% of the primary policy disincentives), financial, and legal recourse.

Incentives:

- Of the policies analyzed in Brazil, none included diplomatic incentives, despite Brazil's international commitments such as the Paris Climate Agreement and the Bonn Challenge.
- The majority of Brazil's policies utilize financial incentives, namely subsidies (representing 28% of the 43 Brazilian policies used in the framework).
- Of the policies that included subsidies, 83% of them included a mention of community engagement, indicating subsidies are a common method of incentivizing bottom-up interventions. Subsidies tend to target agricultural land (100% of Brazilian policies with subsidies are aimed at least in part at agricultural land).
- 89% of Brazilian policies that include financial (grant, subsidy, tax break) incentives include bottom-up engagement. Almost three-quarters of policies in Brazil (31/43) take into account bottom-up engagement, but only 10 of the total 43 policies include indigenous rights.

Land Use:

- 56% of policies in Brazil are biome-specific.
- Two policies include specific hectare requirements.
- 27 policies of the 43 concern agricultural land (non-exclusively), while 20 policies concern at least forested lands. 10 policies overlap and are oriented toward both agricultural and forested land, such as the National Water Resources Policy of 1997.

ANALYSIS: INDIA

Country		India	India	India
State		All (21)	Andhra Pradesh (3)	Madhya Pradesh (2)
Primary Incentive	Financial Grants	5%	0%	0%
	Financial Subsidies	5%	0%	0%
	Tax Breaks	0%	0%	0%
	Grants & Subsidies	0%	0%	0%
	Legal & Subsidies	0%	0%	0%
	Trade	15%	33%	0%
	Legal	10%	0%	0%
	Political	0%	0%	0%
	Diplomatic	21%	33%	50%
	Other	44%	34%	50%
Primary Disincentive	Financial Fines	20%	33%	50%
	Fines & Legal	0%	0%	0%
	Fines, Legal, & Political	0%	0%	0%
	Imprisonment & Fines	32%	33%	0%
	Legal	0%	0%	0%
	None	0%	0%	0%
	Political	0%	0%	0%
	Procedural/Guidelines	20%	0%	0%
	Other	28%	34%	50%
Top Priorities	Agricultural Development	10%	0%	50%
	Conservation	29%	33%	0%
	Defined Ecological-Economic Zoning	0%	0%	0%
	Governance Framework	0%	0%	0%
	Climate Change	14%	33%	50%
	International Agreement	14%	0%	0%
	Legal Ruling	4%	0%	0%
	Other	29%	34%	0%
Bottom Up Engagement	Yes	80%	33%	50%
	No	20%	67%	50%
Bottom Up Indigenous Rights	Yes	90%	0%	0%
	No	10%	100%	100%
Biome Specific	Yes	25%	33%	0%
	No	75%	67%	100%
Biome	Agricultural Land	22%	33%	50%
	Forested Land	23%	33%	0%
	Forested & Agricultural	5%	0%	0%
	Forested, Agricultural, Protected, & Buffer	30%	34%	50%
	Forested, Protected, & Buffer	5%	0%	0%
	Protected & Buffer	15%	0%	0%
	Other	0%	0%	0%
Enforcement Mechanism	Yes	80%	67%	50%
	No	20%	33%	50%

Background Research

From its early civilizations to colonization, and its eventual independence in 1947, India has had a tumultuous history with its land, forests, and people. Hindu tradition shaped public sentiment surrounding nature, including the belief that all living things are sacred.¹⁹ This was reflected in Indians' care for the land and lack of formal, individual ownership of land. But, with British rule came the classification of land as a private good and emphasis on control by the central government. Much of the environmental issues in India are due to the commodification of nature: deforestation, soil erosion, desertification, air pollution, agricultural runoff, a growing population, and biodiversity loss are some of the most pressing problems.²⁰ The framework identified that 62% of Indian policies concern forested land.

Biomes and Land Use

The British used legislation to classify land based on the ability to make a profit, labelling land as “forest” and “non-forest.”²¹ Passed in 1865, the Indian Forest Act banned the livelihoods of forest dwelling tribes, then, the India Forest Act of 1920 made all forest land government-owned and de-legitimized traditional community ownership.²² The passage of these forest laws had a detrimental effect, and from 1880 to 2010, forest cover was lost, cropland expanded, and urbanization increased, with deforestation at its highest rate while under British rule until 1947.²³

India's roots in Hinduism led to the **Chipko movement** in the 1970s. This movement was largely led by women and individuals of low socio-economic status and one of the major protests led to the creation of a committee to investigate deforestation and a 10-year ban on commercial logging in the area.²⁴ Since the Chipko movement, there has been an increase in action at the community level, but change was slow. After decades of community pushback against the British

era Forest Act, the India Forest Rights Act of 2006 was passed, which overrides the 1927 Act, and now allows scheduled tribal communities to apply for the rights to forest land they have been living on and using for generations.²⁵

Unfortunately, this legislation has not led to equitable land distribution, as the decades of colonial rule excluded many groups, and **40% of India's rural population were still landless laborers at the time of independence.**²⁶ In 2010, the National Green Tribunal was formed to address environmental protection and enforce legal rights of people in relation to the environment. The creation of the Tribunal has led to victories against the Ministry for Environment and Forests, specifically for local and poor groups, promoting accessibility for all.²⁷ A key concern is that monocultures have developed as replanting strikes a balance between indigenous interests and reforestation initiatives to comply with national promises on an international stage.

The Forest Act of 1980 sought to balance the developmental needs of the country with the conservation

of natural heritage, and led to the diversion of land for developmental needs such as drinking water, irrigation, transmission, and railway roads.²⁸ Driven by international pressures, India passed the Environmental Protection Act to implement decisions of the United Nations Conference on Human Development,²⁹ created for the central government to coordinate activities among various central and state authorities. According to the Act, the term “environment” includes water, air, and land and the inter-relationship that exists among water, air, and land, and human beings, other living creatures, plants, micro-organisms, and property. Under the Act, the Central Government shall have the power to take all such measures as it

deems necessary or expedient for the purpose of protecting and improving the quality of the environment and preventing, controlling, and abating environmental pollution.

The passage of the Scheduled Tribes and Other Traditional Forest Dwellers Act of 2006 (or the Forest Rights Act 2006), was a culmination of decades of demands for **rights by forest dwellers**. The “forest people” population of India is estimated to be over 275,000,000, and the passage of this bill was an important step forward.³⁰ However, villagers have claimed to encounter resistance from the forest department in implementing this law, leading to delays or refusal of their rights.³¹

In addition, the 2017 amendment of the 1927 Forest Act reclassified bamboo to no longer be considered “timber,” allowing forest communities and private growers to harvest bamboo without obtaining permission.³² Previously, there was a requirement to obtain permission for both felling and transporting anything classified as “timber” which severely limited the rights of forest communities.³³

Drivers of Deforestation

The government launched a series of plantation programs to increase tree and forest cover and regenerate degraded forests through compensatory afforestation, including CAMPA, MGNREGA, Green India Mission, and Aam Jungle Yojana (AJY). However they are controversial, as they are used by the government to further carry out plantation programs, which are not the best way to restore land, often using non-native species.³⁴ The poor quality of compensatory afforestation plantations is one of the reasons behind the decline of quality of forest cover.³⁵ Even greater concerns have been raised about the implications of the Compensatory Afforestation Fund (CAF) Bill 2015, which will release huge funds of about Rs 42,000 crore (approximately \$600 in today's USD) to state **forest departments to carry out plantations on a large scale**.³⁶ The Bill delegates the determination of NPV (value of loss of forest ecosystem) to an expert committee

constituted by the central government.³⁷ In our analysis, we tabulated the number of policies employing legal incentives in India, as we did for Brazil. We found that 10% of policies in India (2 out of 21) utilize a legal mechanism as its primary incentive. When the courts are involved, legal guidelines are imposed as to how fines can be carried out.

Enforcement and Incentives

There are many other issues with land restoration and afforestation in India. A 2013 CAG report noted the state forest department's lack the planning and implementation capacity to carry out compensatory afforestation and forest conservation.³⁸ Additionally, procuring land for compensatory afforestation is difficult as land is limited and required for multiple purposes. Overall, there appears to be a disconnect between the forest communities and the government, including agriculture and industry.³⁹

The central Indian government is motivated by international agreements to sequester carbon and decrease emissions, and thus is pushing for afforestation and conservation of forested areas, while also promoting development and economic growth. Additionally, human rights may conflict with animal rights when expanding **tiger preserves encroach** on areas traditionally occupied by forest peoples. India has many environmental regulations, but has weak enforcement due to widespread corruption and a weak justice department. Additionally, much of the laws and regulations have come from the central government, but major changes in legislation have come from local communities. While state boards exist for pollution and other issues, they are often compromised due to corruption and thus lack public trust.

Framework Findings: India

Motivations:

- Our framework validates that India's primary motivation for restoration policy is conservation (29% of total Indian policies) of forested areas, as discussed above.

Executing Ministries and Government Level:

- 67% of laws in India are executed by the Ministry of Environment, Forests and Climate Change.
- 76% of the policies were federal-level laws.
- Of the 24% that were state policies, all but one were executed by the Ministry of Environment, Forests and Climate Change.
- These findings highlight India's political structure that tends to place the bulk of power in the central government rather than the states.

Disincentives:

- 73% (11 out of 15) of the policies that included some disincentive mechanism were characterized by fines. Of these, seven policies cited imprisonment as a disincentive.

Incentives:

- India is greatly motivated by conservation of forests and international climate commitments, and this is reflected in our framework.
- Of the policies we examined, 24% of Indian policies are driven by diplomatic incentives. Of these, priorities are commitments to international agreements and climate change mitigation. None of these policies include mentions of indigenous rights.
- No state-level Indian policies in the framework contain subsidies as an incentive mechanism.

Land Use:

- 76% of India's policies are not biome-specific, indicative of the country's issues with monocultures.
- Agricultural land (non-exclusive) accounts for 38% of the policies' specified land use, while 62% of policies are (non-exclusive) targeted at forested land, further showing how the country has largely focused on forested areas for its conservation and carbon sequestration goals.

ANALYSIS: MEXICO

Country		Mexico	Mexico	Mexico
State		All (25)	Quintana Roo (5)	Chiapas (6)
Primary Incentive	<i>Financial Grants</i>	12%	20%	0%
	<i>Financial Subsidies</i>	20%	0%	17%
	<i>Tax Breaks</i>	4%	0%	0%
	<i>Grants & Subsidies</i>	0%	0%	0%
	<i>Legal & Subsidies</i>	0%	0%	0%
	<i>Trade</i>	0%	0%	0%
	<i>Legal</i>	44%	80%	50%
	<i>Political</i>	8%	0%	0%
	<i>Diplomatic</i>	4%	0%	16%
	<i>Other</i>	8%	0%	17%
Primary Disincentive	<i>Financial Fines</i>	16%	20%	21%
	<i>Fines & Legal</i>	0%	0%	0%
	<i>Fines, Legal, & Political</i>	4%	0%	21%
	<i>Imprisonment & Fines</i>	8%	0%	37%
	<i>Legal</i>	0%	0%	0%
	<i>None</i>	0%	0%	0%
	<i>Political</i>	0%	0%	0%
	<i>Procedural/Guidelines</i>	8%	0%	0%
	<i>Other</i>	64%	80%	21%
Top Priorities	<i>Agricultural Development</i>	17%	20%	16%
	<i>Conservation</i>	41%	40%	67%
	<i>Defined Ecological-Economic Zoning</i>	0%	0%	0%
	<i>Governance Framework</i>	0%	0%	0%
	<i>Climate Change</i>	4%	20%	0%
	<i>International Agreement</i>	5%	0%	17%
	<i>Legal Ruling</i>	0%	0%	0%
	<i>Other</i>	33%	20%	0%
Bottom Up Engagement	<i>Yes</i>	80%	60%	83%
	<i>No</i>	20%	40%	17%
Bottom Up Indigenous Rights	<i>Yes</i>	40%	40%	100%
	<i>No</i>	60%	60%	0%
Biome Specific	<i>Yes</i>	44%	60%	17%
	<i>No</i>	56%	40%	83%
Biome	<i>Agricultural Land</i>	12%	0%	17%
	<i>Forested Land</i>	40%	50%	0%
	<i>Forested & Agricultural</i>	8%	25%	0%
	<i>Forested, Agricultural, Protected, & Buffer</i>	16%	25%	50%
	<i>Forested, Protected, & Buffer</i>	4%	0%	17%
	<i>Protected & Buffer</i>	0%	0%	0%
	<i>Other</i>	20%	0%	16%
Enforcement Mechanism	<i>Yes</i>	30%	20%	67%
	<i>No</i>	70%	80%	33%

Background Research

Mexico comprises approximately 200 million hectares of land area, much of which has changed in recent years, due to growing urbanization, environmental degradation, and other environmental pressures.⁴⁰

Biomes and Land Use

According to the UN Food and Agriculture Organization, 33% of Mexico's land areas is covered by forests.⁴¹ Mexico's forest biomes include largely tropical and temperate forests. Mexico is undergoing increased deforestation and desertification across the country. For our analyses, we focused on two states, Quintana Roo and Chiapas, because of their high levels of deforestation and large indigenous communities, which offer unique opportunities and challenges to land restoration. Both of these states have set sub-national-level Bonn Challenge goals for afforestation.

Drivers of Deforestation

Tourism, mining, increased agricultural intensification, and increased urbanization are all drivers of deforestation.⁴² Estimates for deforestation in Mexico, one of the five most biodiverse countries in the world, are as large as 1.5 million hectares per annum.⁴³ Since 1976, Mexico has experienced decreased forest cover (for temperate and tropical forests) of approximately 80,000 square kilometers and has seen increased crop and pasture lands, in part in their stead.⁴⁴ In fact, within Latin America, Mexico bears the largest rates of deforestation of any country, signifying the unique challenge that policymakers in Mexico face to combat deforestation, the specific struggle of indigenous communities and diverse landholders who depend on these forests, as well as the complicated dynamics of the many key stakeholders that use forested land in Mexico.⁴⁵

44% of policies in Mexico are biome specific;

9 policies in Mexico concern agricultural land and 27 are aimed at forest land. However, these two categories are not mutually exclusive: 6 of these policies concern both agricultural and forested lands together.

In order to combat these acute and chronic threats, Mexico is also a member of the REDD+ program (Reducing Emissions from Deforestation and Forest Degradation, specifically via Conservation, Sustainable Management of Forests, and Enhancement of Forest Carbon Stocks). Mexico's membership in international groups with the aim of combating climate change, deforestation, and biodiversity loss, such as the REDD+ program, the Bonn Challenge, and ratifying the Kyoto Protocol and the Paris Agreement, is promising in light of the threats Mexico's natural resources are facing.

However, although there have been promising gains, particularly in recent years, for Mexico's land and ecosystem stability, there are still corporate interests that threaten such regions and encroach upon the good political work done. A new "Maya Train" project is being proposed to cut through parts of the Yucatan Peninsula that comprise important habitat for jaguars, as well as through lands prone to earthquakes.⁴⁶ Furthermore, the full environmental impact of such a project may still be yet unknown. One concern for Mexico is the prevalence and pressure put upon the government by industry groups that promise short-run profits.

Enforcement and Incentives

The number of projects related to forest conservation and preservation have increased with time, with more and more regulatory instruments taking into account or explicitly dealing with afforestation. Between 2003 and 2011, the Mexican National Forestry Commission put in place more than 5,000 initiatives relating to Payment for Ecosystem Services (PES) schemes.⁴⁷ These are programs in which payments are provided for the preservation or restoration of natural resources - this incentivizes private actors to promote the responsible maintenance of natural ecosystems and biomes.

PES schemes are often considered powerful ways for making conservation market-competitive,

and help to divert reliance on exploitative or extractive industries for their profit. In 2003, Mexico instituted a major PES system, managing greater than two million hectares, compensating rural landowners over a five year contract for retaining forest in areas with deforestation and water issues.⁴⁸ Brazil has also instituted PES schemes related to biodiversity.

There has been success of the increase in restoration-aimed policy, as well as the presence of market incentives through PES

schemes. In fact, since the late 1990s, the rate at which lands in Mexico are deforested each year has lessened annually.⁴⁹ Furthermore, the presence of

ejidos, communally owned lands, has proved to be correlated with lesser rates of deforestation

than other areas.⁵⁰ Furthermore, the *ejido* community members constitute an extremely important constituency, as they are deeply involved with the landscape and own greater than 80% of forested land.⁵¹ In addition to forestry reform, Mexico has committed to reducing emissions in the atmosphere through carbon sequestration.



Framework Findings (Mexico)

Motivations:

- 8% of policies (2/25) include climate change management as their motivation.
- Nearly a quarter (6/25) of policies are motivated primarily by agricultural development, and even more, 36%, are motivated by conservation.

Executing Ministries and Government Level:

- Environment and natural resources agency is the principal federal agency administering these policies in Mexico at the national level.
- The federal government is the main enforcement mechanism and financial arm while community-based groups participate in the rollout in the presence of community farming or subsistence setups.

Disincentives:

- Only 9 of 25 policies that we analyzed in Mexico included explicit mention of a disincentive, all of which included fines. 6 out of these 9 policies were state-level.

Incentives:

- Legal Incentives – 44% of Mexican restoration policies in the framework have legal mechanisms as their incentive, and of these, conservation and agricultural development are equally cited as primary motivations.
- Community Engagement – 76% of these include mention of community engagement, indicative of Mexico's emphasis on community-owned land. 63% of policies with legal incentives have mention of indigenous rights. 89% of Mexican policies that include financial (grant, subsidy, tax break) incentives include bottom-up engagement. This is the same percentage as in Brazil. Almost all Mexican policies account for community engagement (21 of 25). Furthermore, more than half of policies (15/25) mention indigenous rights. Only one of these 15 policies was passed prior to 2002 (1988), indicating that, over the course of Mexican land-related policy, indigenous rights is accounted for more in recent policies, compared historically.
- Financial Incentives – Another interesting insight is that of Mexican policies that employ subsidies as their primary incentive mechanism, 3/5 are biome specific, and 80% of these include mention of bottom-up community engagement and/or indigenous rights. Only one Mexican policy cites diplomatic reasons as its primary incentive, indicative of Mexico's focus on community-based interventions rather than international commitments, despite the country's participation in international agreements.

Land Use:

- 66% of Mexican policies in the framework were not biome specific.
- Of the 11 policies that were biome specific, the primary motivation for two was agricultural development, and both of these policies were aimed specifically and exclusively at agricultural land.
- 36% of all Mexican policies in the framework target agricultural land (non-exclusive).

COUNTRY ANALYSIS SYNTHESIS

By understanding each country's different motivations, primary executing ministries and jurisdictions, policy incentives and disincentives, and targeted land use, we can begin to identify gaps in restoration interventions. Policy experts can utilize this knowledge when supporting decision makers in advocating for certain restoration policies in their respective countries. On the reverse, this framework can

also provide a better understanding of the types of mechanisms countries tend to employ when passing restoration policies. By identifying gaps and trends over time, policy experts can not only know where restoration needs to be bolstered, but can also begin to understand the efficacy of policies that are passed under common parameters.

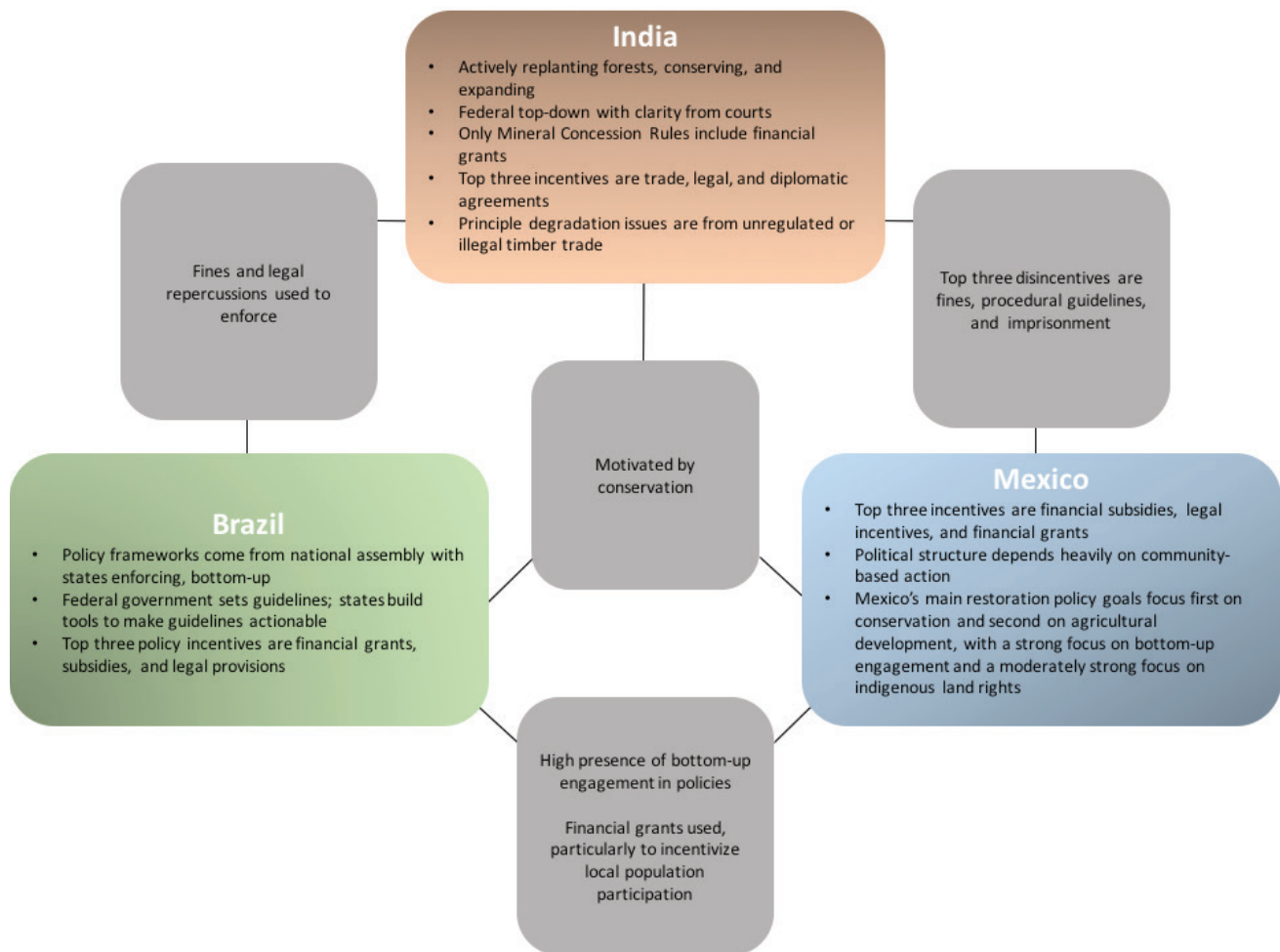


Figure 6: Comparison of country findings for Brazil, Mexico, and India. Connected, grey boxes, represent synergistic findings between locations, derived from our framework.

DISCUSSION AND CRITICAL CONSIDERATIONS

For several of the 89 policies we examined in our framework, our team **had difficulties finding the complete policy text on the internet**. As a result, we relied on summaries to run our analyses of select policies. Our team, when analyzing these policies, relied upon internet translations, translated keyword searches, and on WRI country offices to help with interpretation. Language barriers led to the reliance on translation tools which may have led to simplification or lack of nuance in analysis. Furthermore, many relevant policies

may not be hosted online, making them difficult to access.

Lastly, we **could not analyze specific amendments** to the legislation in many cases and had to limit ourselves to examining policies of two or three states per country, as opposed to all states and all national level policy, both due to the timeline and scope of the project. Further development of the framework and algorithm should include a mechanism for including amendments to existing policies.

RECOMMENDATIONS AND NEXT STEPS FOR WRI'S CONTINUED USE AND EXPANSION OF THE FRAMEWORK

Next Steps for Policy Comparisons: Addition of Other Countries

This framework was designed so that it can be applied to any country, and more countries' policies need to be added in order to develop a fuller and more comprehensive dataset. Scaling up of the framework will aid WRI in garnering a better understanding of cross-country comparisons and be able to better compare across different government structures and economies.

Next Steps for Policy Comparisons: Political Intent and Political Economy

As part of the framework design, WRI will be provided with a template to establish a calculation for Political Intent Score and Political Economy Score (PES).

Political Intent Score: This is a ranking of the comparative intent of the policy's design as it relates to land restoration. The value proposition of assigning a score to political intent is that not all policies are designed to facilitate direct or immediate action toward land restoration nor are all policies designed to be punitive or incentivizing toward a restorative outcome. For

example, Decree No. 58.107 in Brazil approves the strategy for state sustainable development. The Decree provides a legal basis for the state assembly of Espirito Santo to take direct action on sustainable development including defining it, developing progressive action plans towards it, or simply assigning further rules and clarifications to individual city and territory governments. Similar policies at the national level, such as the Brazilian Forest Code, take no direct action. Policies like this have weaker intent in the narrow context of the definition of land restoration. By comparison, the Brazilian Land-Use Registry is expressly designed to control and regulate land-use options through a combination of state- and city-level incentives, disincentives, and progressive and cooperative frameworks.

The Political Intent Score template is provided in a separate tab of the data framework and consists of five core metrics determined for WRI to be the most important towards intent in the context of land restoration. The template is pre-programmed to calculate a singular score based on the weighting and then appropriate that score to a value from 1-3 based on WRI's scorecard for semi-objective evaluations. Intent is objective up to the point that different country site offices

will have different opinions about the actual intent of policies outside of their countries, as well as different opinions about the weighting of the metrics.

Political Economy Score (PES): This is a ranking of the comparative impact of the policy's actual outcome as it relates to land restoration. The PES template consists of five metrics identified through research to be the primary factors that impact and are impacted by land restoration efforts. Within the context of the existing database, for example, an emerging mechanism for land restoration policies includes punitive action for unregistered abuse of forested land, native or planted. A cross-referencing of policies from India and Brazil shows that this mechanism is particularly popular in the context of each country's governance structure. As part of the evaluation of this policy mechanism, WRI would work with its offices in Brazil and India to understand how this mechanism is being used to determine its efficacy. Based on first research, the PES in Brazil may emerge quite high as punitive action is often found to be used in conjunction with the national land-use registry to facilitate progressive controls on land-use conversion and regulation. In India, however, the PES may be lower due to corruption in state- and local-level implementations and the integration of commercial interests with reforestation resulting in monoculture forest development that is not conducive to long-term land restoration. To establish this basis, WRI may solicit input from its site offices to properly weight the PES metrics. The template is pre-programmed to compile the weighting into a singular score that then readjusts to a scale of 1-3.

Next Steps for Data Scientists: *Data Formatting for Natural Language Processing (NLP)*

Modern NLP algorithms: The most robust NLP models now use a combination of statistical relevance and keyword aggregation to enable algorithms to make keywords function like 'Lego bricks' to which other bricks can be added over time. The initial NLP program begins with a set library of keywords that most commonly surface in the sample set of documents or files

under analysis. As the set expands with time, the NLP algorithm latches emerging keywords onto the original set of keywords based on how often the new keywords show up in conjunction with the words housed in the original set.

There are two core components to the current database design that make migration of the existing data possible into an existing Natural Language Processing system.

- 1) The first component is the keyword library. Within the database, there is a keyword library that will form the basis for the initial statistical model to kick off the natural language algorithm. The keywords have been collected based on a case-study analysis of land restoration policies in three target countries and relevant states within those countries.
- 2) The second component is the framework for the determination of both Political Economy Score and Political Intent Score. The scoring framework will rely on the keyword statistical modeling to identify common mechanisms used across diverse and multi-lingual policies that can then be rated by their intent. Political economy will then be scored by the field offices to understand how accurate it is against the known intent of the policy mechanism. The goal of this scoring framework is to determine repeatability and repeated use of a given policy mechanism and then rank that mechanism's feasibility in more specific governing environments.

CONCLUSION

We hope this framework and report will support the current endeavors of WRI's Global Restoration Initiative, and other teams. The framework itself is a tool that can be scaled and translated to examine restoration policies from around the globe, and is malleable in its ability to be altered and tailored to different regions and needs. The analyses outlined in this report represent a sampling of the potential analyses that can be conducted using this framework, including those focusing on land-use type, policy incentives and disincentives, enacting governmental ministries, and others. The goal of this work is to be useful in the comparison of policies and for the supplementing of work done by policy and country experts at WRI and beyond. Furthermore, the flexibility of the framework and analyses will allow our findings to be altered easily with time, as priorities,

focuses, and interests change.

The applications we have outlined, in particular the Political Economy Score and Natural Language Processing algorithm, are natural next steps for the use of this framework. Furthermore, the use of this framework will ease the work of future policy analysts and teams at WRI and pose as a useful populatable tool for those conducting similar analyses, a shortcut for the development of Artificial Intelligence that will circumvent the need for humans to analyze policies with manpower, and an immediate source of information for teams working at present on restoration initiatives in Brazil, Mexico, and India, to draw conclusions and inferences, supplemented with their expert knowledge.



APPENDIX A: METHODOLOGY

Selecting our Countries

To select the territories upon which to focus our analyses, as case studies, two main factors were taken into consideration. First, WRI provided 11 country options to our project group to choose from where restoration initiatives are imperative to meeting substantial carbon emission reductions. WRI provided country options where development is at the forefront of emerging middle classes leading to increased deforestation, land degradation and energy usage. Examples of choices include but were not limited to India, Brazil, Mexico, Indonesia, etc. Second, we evaluated each country based on the breadth of information and resources available to us to conduct our analyses on these countries, the presence of international commitments driving restoration (such as the Bonn Challenge and engagement with the Paris Climate Agreement), and whether or not these countries had WRI teams in those nations. We selected for countries that did have WRI presence on the ground and those with available information for us to conduct our research on policies - countries needed to have information on their legislation and policies available for us to examine when developing our framework, so data access was one key component in our decision-making process. From here, we:

1. Created lists to select from based on literature review
2. Narrowed down based on most information and potential for restoration
3. Selected based on suggestions by country experts
4. Chose countries representing different parts of the world, to ensure generalizability of our framework

Based on these criteria, we selected Brazil, India, and Mexico as our countries of focus. Brazil, India, and Mexico all have a WRI presence with whom we could consult. Brazil is home to the Amazon rainforest, has international restoration commitments and has

a less-environmentally focused administration in office at the moment. India has a massive population that is increasingly at odds with its diminishing natural environment. Mexico has made the largest international restoration commitments and a major communally-held land area, known as ejidos. As a next step to understanding the political economy, geography, and socio-economic context to restoration policy in each of the three countries we created fact sheets for each of the countries. We created one fact sheet for each country and one for each state examined. We included factors, such as GDP, highest grossing sectors, demographic considerations (such as percent indigenous peoples, languages spoken, cultural and religious aspects), international climate and reforestation agreements, geographical characteristics, land use breakdown, governance structure, and overarching themes that make restoration possible or difficult. These fact sheets can act as standalone documents (requiring no additional context), and act to supplement the report writ large. The information included in the fact sheets are necessary to understanding the motivators, hindrances, applicability, and many other factors to the policies developed in the fact sheets. See below appendix for fact sheets.

Selecting our States

India:

Part of the primary reasons for our choosing the states in India that we did, was that Madhya Pradesh and Andhra Pradesh were recommended to us during expert interviews. Andhra Pradesh was one of four states suggested by Dr. Ruchika Singh, which also aligned with a suggestion from Dr. Anand Osuri, a postdoctoral fellow working on land restoration in India, referred to us by Dr. Ruth DeFries at Columbia. He stressed the community aspect of restoration and indicated there are several good examples of local restoration work in this state. We wanted to incorporate community engagement because it was a variable we believed could be easily compared across all three countries for the framework. Madhya

Pradesh was suggested by Dr. Osuri as there is a strong NGO presence in central India, and that the central states are among the most forested in the country and have well-documented forest-plantation policies.

Brazil:

Initial direction in terms of choosing states came from research the team had done (specifically on the Atlantic Forest Zone), and then from a discussion with Dr. Miguel Calmon in which he reiterated the team's focus on the Atlantic Forest biome. Dr. Calmon suggested a number of states, of which the ones we chose were included. We also chose Sao Paulo because of the WRI office presence there.

Mexico:

The team had a long list of states after doing initial research, but upon speaking with Javier Warman and Luciana Gallardo-Lomeli, the list was narrowed down after their suggestions, in part of Chiapas and Quintana Roo. These two states were chosen from this list due to their good examples of restoration policy, their biomes/natural resources, and their restoration potential. Chiapas was also chosen for its concentration of biodiversity and agricultural exports for Mexico.

Conducting Interviews

At the beginning of and throughout our project, we conducted interviews with experts studying or working on restoration initiatives, and particularly those conducting work in Brazil, Mexico, and India. We solicited interviews from WRI's network throughout Washington, D.C. and the aforementioned countries. We spoke with a variety of land use, forestry, land tenure and financial experts (see Acknowledgements section). At Columbia University, interviews were conducted with professors, data scientists, and faculty working on issues surrounding deforestation. We also spoke with experts who have worked or continue to work with the UN-REDD+ program about financial incentives, gaps, and policy implementation.

Throughout the expert interview process, bottom-up approaches and indigenous rights

were themes that came to the forefront of discussion. This made apparent that any substantial political economic analysis would have to incorporate these variables as well as consider at whom the incentives are actually aimed. Experts also discussed that there must be more data-driven approaches to implementing granular solutions within nations, whether it be financial or punitive in nature.

With regard to financing solutions, moneys are best allocated under the jurisdiction of the agricultural ministry rather than an environmental ministry, as the agricultural ministries wield more power (according to one expert in financing of forestry initiatives in Latin America). Unfortunately, different ministries may have conflicting policies over the same lands according to one WRI Mexico expert. Environmental concerns are inextricably intertwined with agricultural expansion considerations especially given the long-term health of ecosystems. That is to say, if the land is degraded, communities depending on it for agricultural productivity will falter. This is something that the inclusion of indigenous rights and experience can address. According to one WRI expert in land tenure and resource rights, in Brazil where indigenous lands are held, there are better environmental outcomes. Hence, increasing inclusivity of indigenous communities in the legislation and implementation process can lead to better environmental and agricultural outcomes.

While the bottom-up approach undoubtedly must be addressed, the top-down is also critical. According to several experts, balancing national targets with states' implementation strategies can be difficult. This could perhaps be avoided if more local stakeholder input is taken into account prior to passage of national policy. Often, financing mechanisms can provide important incentives for preservation and restoration. However, financing mechanisms for scaling up small-scale projects are severely lacking according to UN-REDD+ and WRI Mexico experts. Programs such as WRI's Initiative 20x20 can address these scaling and financing issues by connecting investors with opportunities for restoration. An Initiative

20x20 expert explained one reason investors seek these impactful opportunities is because restoration and environmental health are monetized to show that returns are possible beyond carbon sequestration alone. The investors seek to better the environment and communities, but they still need to see

revenues can be generated. Initiative 20x20 helps investors find market-ready projects and build long-term, potentially fruitful, business relationships. This can address a concern of smallholder farmers where the payback period is unreasonably long and thus not practical for them with government

APPENDIX B: STATE BACKGROUNDS

ESPIRITO SANTO, BRAZIL

Espírito Santo is a champion of environmental and land restoration policies. The state has championed conservation, the national agricultural registry, and policies ranging from state-sponsored containment of plains expansion via land swaps and subsidies followed by taxation for non-compliance.⁵² The state has two main regions consisting of the low-lying coastline and the highland serra area, which is part of the Serra do Caparaó Mountain Range.

The state's geography is a key factor

in its ability to engage in strong, centralized regulatory oversight.

Espírito Santo is Brazil's largest petroleum exporter, but in terms of land-use, the state is confined by its geography such that even its urban expansion has been confined to the colonial outlines of its cities.⁵³ Hence, Espírito Santo has quickly evolved to be one of Brazil's wealthiest and most service-sector oriented economic centers allowing it to export much of its undesirable environmental factors to other neighboring states.⁵⁴

SAO PAULO, BRAZIL

Environmental issues in São Paulo state include pollution, water contamination, waste management, traffic and congestion management, smoke, and the city of São Paulo's ongoing drought and groundwater depletion.⁵⁵ As the state seeks to mitigate these problems, a lack of strong governance and social stability outside of major urban centers is forcing the state assembly to tackle them in small amounts and often

one-by-one. The outcome is that policies exacerbate complex problems, rather than solving or abetting bad practices.⁵⁶ Unsolved environmental issues affect non-urban industries while the continued drought is pushing poorer residents to resort to informal economic sectors or unsustainable land-use practices, such as farm expansion and burning of the peripheral forest.⁵⁷

MINAS GERAIS, BRAZIL

Historically, deforestation and land degradation from mining has severely impacted Minas Gerais. Brazil is the world's second largest producer of iron ore and Minas Gerais is Brazil's mining heartland. Historical expansion of the mining sector resulted in large-scale, uncontrolled deforestation.⁵⁸ Despite policies aimed at limiting the industry's impact, the state has experienced two of the worst global

mining disasters since 2014. The most expansive biome in Minas Gerais is the Cerrado. Historically, the soil in this biome was unsuitable for agriculture, but advances in fertilization and agricultural technologies have enabled increased cultivation.⁵⁹ Inadequate legal protection place Cerrado at high risk for accelerated legal deforestation.⁶⁰

MADHYA PRADESH, INDIA

Madhya Pradesh is the second largest state in India and contains 6% of the population.⁶¹ Much like other states in India, the Governor is the head of state and the territory is separated into districts.⁶² 24 of the 50 districts are tribal districts: the tribal population and influence is important in this country. In addition to having a large percentage of indigenous people, Madhya Pradesh has the most forest cover in the country, with a total of 77,414 km².⁶³ Of the population of Madhya Pradesh, 1/5 are classified as "Scheduled Tribes," or indigenous people who fall outside of the predominant Indian social hierarchy, and three-quarters of the total population live in rural areas.⁶⁴

Despite this large rural population and agriculture being the basis of the economy, less than half the land is cultivable, and the population has remained dependent on low productivity and non-mechanized methods of cultivation.⁶⁵ There is a heavy dependence on rainfall and incorporation of livestock and poultry farming, as well as the harvesting of forest products, primarily teak and sal, bamboo, salai, and tendu.⁶⁶ While

rich in minerals, Madhya Pradesh has yet to exploit them fully and is industrially underdeveloped, save for a few hydroelectric projects with neighboring states.⁶⁷

Madhya Pradesh has a number of national parks and wildlife sanctuaries, and much of the prevention of the success of land restoration in Madhya Pradesh include issues of land tenure and resource rights.⁶⁸ Specifically, the expansion of the Sanjay Dubri Tiger Reserve has led to conflict with the rights of the local people, as local people were previously given rights to harvest bamboo, but post-expansion these rights have been denied.⁶⁹ Additionally, there are Orange Area land disputes – areas of land where both the Revenue and the Forest Departments claim the "orange areas" on the maps and the areas remain in dispute - about 1.2 million hectares in Madhya Pradesh and Chhattisgarh - this affects the rights of locals.⁷⁰ Luckily, WRI created Map Tenure to assess, identify, map and understand these areas.⁷¹ The Madhya Pradesh Act, signed into law in 1999, was created to ensure equitable irrigation for agricultural development in the state.⁷²

ANDHRA PRADESH, INDIA

Andhra Pradesh draws its name from the Andhra people, who have inhabited the area since antiquity and developed Telugu, their own language.⁷³ The Andhra people have contributed substantially to India's cultural heritage, and Andhra leaders played a significant role in the struggle against British rule.⁷⁴ However, Andhra Pradesh as a state only came into existence after independence, after the demand of the Andhras for a separate state. In the 1950s, southern and eastern Andhra portions were incorporated into Madras state, but the region remained divided administratively and linguistically, and the government finally agreed to let Andhras people have their own state on October 1, 1953.⁷⁵ As the 8th largest state, Andhra Pradesh only contains 4.08% of India's population, and nearly one-third of this lives in urban areas.⁷⁶ The Telugu National Party (TDP), which has been in control since 2014 and was in control most of the 20th and 21st centuries, advocated a

reduced role in the national government in state affairs.

Andhra Pradesh's relationship to land is due to it being an agricultural state.

There has been mining and industry activity as well, being the only state in southern India with significant coal reserves. Andhra Pradesh has passed some acts regulating forests and land, including the Andhra Pradesh Forest Act and the Produce and Livestock Markets Act.^{77,78} In addition to legislation, there have been local attempts at restoration including the Vana Samrakshna Samithi (VSS), village organizations formed by local people dedicated to forest restoration. VSS groups have partnered with the state forestry department to restore more than 1.2 million hectares of degraded forests.^{79,80}

CHIAPAS, MEXICO

Chiapas is a southern state of Mexico, bordering Guatemala, against the Pacific Ocean. Approximately half of Chiapas' land cover is forests and the state has seen greater than 10% forest cover loss since 2000.

Chiapas is located centrally within Mexico and contains a large Maya indigenous population. However, growing populations have threatened the previously dominant forms of agriculture in favor of overuse of the landscape, leading to degradation. From 1974-1990, Chiapas' agricultural lands

nearly doubled and in 1990, approximately 50% of forested lands were depleted.⁸¹ One major driver of agricultural expansion and land clearing is for the concentrated growth of maize and similar crops. Surrounding indigenous communities in Chiapas, bands of deforestation exist, particularly where forested lands are depleted for the use of fuel in communities. The nexus between indigenous livelihoods, agricultural expansion, and precious forest habitats poses a unique challenge for the coincident development and maintenance of Chiapas.

QUINTANA ROO, MEXICO

Quintana Roo is one of Mexico's 31 states, which exists against in the Yucatan Peninsula, against the Gulf of Mexico and

Caribbean Sea. Greater than two-thirds of Quintana Roo's land area is covered by forests, which have been largely deforested (approximately 12%) since the turn of the millenium.

In Quintana Roo, there are areas of land set aside as Protected Areas, and these have largely been successful in their goals to conserve the landscape.⁸² In fact, the Protected Areas do succeed in experiencing less deforestation than other areas in the same region. The use of the land in Quintana Roo has a complicated history, dating back to the Mayans of 2000 BC.⁸³ Historically, the land was used by indigenous peoples for a combined agroforestry approach, but

since the Mexican Forest Law of

1986, lands are controlled more by community interests

and expertise than industrial, though logging is still present in Quintana Roo.⁸⁴ The Forest Law also focused on conservation of forest resources. Quintana Roo is, in part, characterized by its logging exports of valuable hardwoods. Quintana Roo serves as a useful example for our framework of how policies work in accordance with or in contrast with industrially and indigenously driven pressures, particularly with a long-standing history in the face of new regulations.



APPENDIX C: FACT SHEETS

BRAZIL

INTRODUCTION

Brazil is the largest country in both South America and Latin America by land and population. It is comprised of the federal district holding its capital (Brasilia) and 26 states, of which Sao Paulo is the most populous (44,035,304 people). Brazil is endowed with diverse and abundant natural resources, including the Amazon and Atlantic Forests, which comprise the Atlantic rainforests, and the Cerrado, Caatinga, and Pampa biomes, which are also highly ecologically diverse and contain important water resources. Just 12% of Atlantic rainforests remain, which provide water resources for 63 million people.¹ Policies have slowed deforestation in the Amazon, but forest loss has shifted to unprotected biomes, like the Cerrado.² The majority of Brazil's native vegetation lies on privately-held rural lands, which shapes the policies that can be used to curb deforestation.³



DEMOGRAPHICS

Population: 208,846,892 (2018)⁴

Population density: 24.66 persons/km²

Urbanization: 86.6% of Brazil's population lives in urban areas, urbanization increases at a 1.05% annual rate.

Languages: Portuguese (official language)

GEOGRAPHY

Total land area (km²): 8,515,770⁵

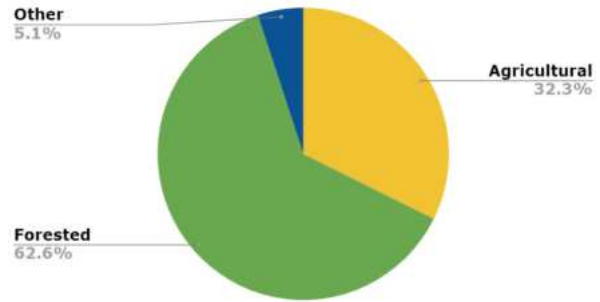
Climate: The diversity of Brazil's biomes impacts the climate; most of the country's climate is tropical but there are also areas of desert, equatorial, semiarid, oceanic and subtropical climates.⁶

Biomes: 6 distinct biomes – the Amazon Forest, Cerrado (tropical savanna), Atlantic Forest, Caatinga (desert vegetation), Pampa (lowlands) and Pantanal (wetlands)⁷

Natural resources: rich in natural resources such as rare metals, petroleum, hydropower and timber⁸

Land use:⁵

- 62% forest
- 32% agricultural (comprised of 8.6% arable land, 0.8% permanent crops, 23.5% permanent pasture)
- 5% urban and industrial⁹



GOVERNMENT

Type:

- Democratic, federal presidential republic

Structure:

- Divided into three branches: the executive, the legislative and the judiciary.
- The president appoints a cabinet comprised of Ministers of State (22 ministries in total) and senior advisors who assist in government.
- State governments are autonomous, sub-national entities with their own governments and municipalities¹¹

International Commitments: Commitments to counter degradation include participation in the Bonn Challenge and Paris Agreement; the country has committed to 12 million hectares of reforestation, which comprises ~1.5% of Brazil's total land area¹²

ECONOMY

Gross Domestic Product: \$3.25 trillion¹³

GDP per capita: \$15,561/capita¹⁴

Important economic centers:¹⁵

- São Paulo (population: 22 million) is Brazil's largest city and largest hub of economic activity. It is the largest business center in Latin America and a global leader in agribusiness and environmental preservation policy. While the city remains a hub for industrial activity, the financial and service sectors have become more prominent, reflecting the Brazilian economy.¹⁶
- Rio de Janeiro (population 13 million)
- Belo Horizonte (population 6 million)
- Brasilia, the country's capital (population 4 million)

Largest sectors and breakdown:¹⁷

- 72% Services
- 21% Industry
- 7% Agriculture

Agricultural products: coffee, soybeans, beef¹⁸

Industries: textiles, chemicals, machinery components

Labor force by sector (2013-14):

Total labor force is comprised of 104 million individuals¹⁹

- Services 58.5%
- Industry 32.1%
- Agriculture 9.4%

Informal economies

- Brazil's informal economy was estimated to account for 17% of GDP in 2011²⁰
- Illegal logging Brazil is the fourth largest roundwood and wood pulp producer in the world. Illegal logging often reflects deeper governance issues, such as land tenure, corruption, or perverse incentives. Brazil has increased its efforts to track reduce illegal logging, but the practice continues²¹

Trading Partners

- Brazil imports \$153.2 billion in goods and services; its primary trading partners include:
 - China (18.1%)
 - United States (16.7%)
 - Argentina (6.3%)
 - Germany (6.1%)
- Brazil exports \$217.2 billion in good and services; its primary trading partners include:
 - China (21.8%)
 - United States (12.5%)
 - Argentina (8.1%)
 - Netherlands (4.3%)

ENVIRONMENT

Current environmental issues: Efforts to extract these abundant resources have resulted in land degradation (deforestation, urbanization), loss of biodiversity and increased pollution²²

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ESPIRITO SANTO, BRAZIL

INTRODUCTION

Espírito Santo is located on Brazil's Atlantic coastline. The capital of and largest city in Espírito Santo is Vitória.¹ Espírito Santo is Brazil's biggest champion of environmental and land restoration policies. Espírito Santo has championed conservation, the national agricultural registry, and policies ranging from state-sponsored containment of plains expansion via land swaps and subsidies followed by taxation for non-compliance.² The state has two main regions consisting of the low-lying coastline and the highland serra area, which is part of the Serra do Caparaó Mountain Range. The state's geography is a key factor in its ability to engage in strong, centralized regulatory oversight. Espírito Santo is Brazil's largest petroleum exporter, but in terms of land-use, the state is confined by its geography such that even its urban expansion has been confined to the colonial outlines of its cities.³ What this means is that Espírito Santo has quickly evolved to be one of Brazil's wealthiest and most service-sector oriented economic centers allowing it to export much of its undesirable environmental factors to other neighboring states.⁴

DEMOGRAPHICS

Population: 3,972,388 (2018)⁵

Population density: 84 persons/km²

Languages: Portuguese (official language)

GEOGRAPHY

Total land area (km²): 40,077.50

Climate: Espírito Santo has two main regions consisting of the low-lying coastline and the highland Serra area, which is part of the Serra do Caparaó Mountain Range

Biomes: The state is in the southeast of Brazil where it is bordered by the Atlantic Ocean; it is entirely comprised of the Atlantic Forest Biome

Land use:⁶

- 15% cultivated land
- 32% pastures
- 17% woodlands/forest
- 35% other

Current environmental issues:

- Espírito Santo has some of the most effective environmental legislation in Brazil using protectionist policies, the national agricultural registry, and strict oversight and enforcement.⁷
- In 2015, Espírito Santo joined the 20X20 initiative to restore and prevent deforestation by at least 20 million hectares of degraded land by 2020.⁸ The state pledged to recover 80,000 hectares in four years relying heavily on the Forest Conservation and Recovery Program, Reforestar.⁹

- The state is considered a success for large-scale actions in forest restoration giving it a viable position as an autonomous policy-maker within Brazil.



GOVERNMENT

- The governorship of Espírito Santo is elected every four years. The state is managed by the unicameral legislative assembly that has 30 state deputies elected by proportional representation.
- At the federal level, Espírito Santo has 10 members in the federal chamber of deputies and is represented by the sustainability network, the popular socialist party, and the national labor party.¹⁰

ECONOMY

Gross State Domestic Product (GSDP): 55 billion USD¹¹

GDP per capita: 16,139 USD¹²

Largest sectors and breakdown (GSDP composition by sector):¹³

- 65% services
- 18% industry
- 15% government services
- 2% agriculture

Agricultural products: sugar cane, maize, coffee, papaya, banana¹⁴

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MINAS GERAIS, BRAZIL

INTRODUCTION

Minas Gerais is a landlocked state in southeastern Brazil. The state's capital is Belo Horizonte. Historically, deforestation and land degradation from mining has severely impacted the state; Brazil is the world's second largest producer of iron ore and Minas Gerais is Brazil's mining heartland. Historical expansion of the mining sector resulted in large-scale, uncontrolled deforestation. Despite policies aimed at limiting the industry's impact, the state has experienced two of the worst global mining disasters since 2014. The most expansive biome in Minas Gerais is the Cerrado. Historically, the soil in this biome was unsuitable for agriculture, but advances in fertilization and agricultural technologies have enabled increased cultivation. Inadequate legal protection place Cerrado at high risk for accelerated legal deforestation.

DEMOGRAPHICS

Population: 21,040,662 (2018)¹

Population density: 33.41 persons/km² ²

Languages: Portuguese (official language)

GEOGRAPHY

Total land area (km²): 586,520³

Climate: fluctuates across diverse biomes:

- Caatinga are semi-arid drylands
- Atlantic Forest comprises tropical and semi-tropical rainforests,
- Cerrado has a semi-humid tropical climate.

Biomes:

- Caatinga, also referred to as Brazilian drylands, found in the north of the state⁴
- Atlantic Forest stretches along the eastern border of the state⁵
- Cerrado is the state's most extensive biome and is located in the central, west, and north of the state⁶

Land use:⁷

- 10% cultivated land
- 33% pastures
- 17% woodlands/forests
- 2% agro-forest systems
- 3% plantations
- 35% other

Current environmental issues:

- The Caatinga biome experienced the worst drought ever recorded from 2010-2016. The semi-arid region is especially vulnerable to climate change.⁸
- Advances in reclamation and revegetation methods hold promise for restoring mined lands, but a lack of long-term land use planning and issues with regulatory compliance remain significant issues.⁹

GOVERNMENT

Governor elected every four years and a unicameral legislative assembly comprised of 77 deputies elected by popular vote.¹⁰

853 municipalities, the highest number of any Brazilian state. Each municipality has an elected mayor and a unicameral chamber.¹¹

Represented in the federal Senate by three senators; as one of Brazil's most populous states, Minas Gerais is represented in the federal Chamber of Deputies by 53 representatives, the second-highest count in the chamber.¹²



ECONOMY

Gross State Domestic

Product (GSDP): 274 billion USD (2016)¹³

GDP per capita: 604.74 USD (2016)¹⁴

Largest sectors and breakdown (GSDP composition by sector):¹⁵

- 60% Services
- 22% Industry
- 12% Government services
- 6% Agriculture

Agricultural products: sugar cane, maize, sorghum, soy¹⁶

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SAO PAULO, BRAZIL

INTRODUCTION

São Paulo is located on Brazil's Atlantic coastline. The capital of São Paulo is the city of São Paulo, Brazil's largest city.¹ Environmental issues in São Paulo state include pollution, water contamination, waste management, traffic and congestion management, smoke and the city of São Paulo's ongoing drought and groundwater depletion.² As the state seeks to mitigate these problems, a lack of strong governance and social stability outside of major urban centers is forcing the state assembly to tackle them in small amounts and often one-by-one. The outcome is that policies exacerbate wicked problems rather than solving or abetting bad practices.³ Unsolved environmental issues affect non-urban industries while the continued drought is pushing poorer residents to resort to informal economic sectors or unsustainable land-use practices, such as farm expansion and burning of the peripheral forest.⁴

DEMOGRAPHICS

Population: 45,595,497 (2018)⁵

Population density: 184 persons/km²

Languages: Portuguese (official language)

GEOGRAPHY

Total land area (km²): 248,222.80

Climate: São Paulo is in Brazil's southeast region with most of the state north of the Tropic of Capricorn. The state has seven different climate types.⁶

Biomes: The state has a varied geography between mountains, serra, tropical savanna, and coastal plains along with the Atlantic forest biome.⁷

Land use:⁸

- 15% cultivated lands
- 32% pastures
- 17% woodlands/forest
- 35% other

Current environmental issues:

- Environmental issues include pollution, water contamination, waste production over-use, traffic, smoke, and São Paulo City's drought and groundwater depletion.⁹
- Drought affects other industries and locations, such as hydroelectric dams that are no longer able to supply as much power. Water rationing has pushed poorer residents to take drastic measures to access clean water diminishing public health and governmental oversight of land use.¹⁰

GOVERNMENT

Lacks strong governance and societal stability outside of its urban centers.

Dominated by the Brazilian Social Democracy Party since 1994. The governor is elected every four years and the state is governed by the unicameral legislative assembly of São Paulo.

Represented in the federal senate by the Brazilian Social Democracy Party, the Social Liberal Party, and Brazilian Social Democracy Party, and in the federal chamber of deputies with 70 delegates.¹¹



ECONOMY

Gross State Domestic

Product (GSDP): 1 trillion USD (2016)¹²

GDP per capita: 24,867 USD¹³

Largest sectors and breakdown (GSDP composition by sector):¹⁴

- 65% Services
- 18% Industry
- 15% Taxes
- 2% Agriculture

Agricultural products: sugar cane, maize, oranges, soy¹⁵

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INDIA

INTRODUCTION

India is the seventh largest country in the world by area and second most populous. From 1880 to 2010 significant forest cover has been lost, cropland expanded, and urbanization increased.¹ Deforestation was at its highest rate during British rule until 1947.²



India has an interesting history of land degradation, along with recent drives toward restoration. India's labor force is primarily in agriculture, services, and the informal economy, with the services industry as the largest driver of the economy.

DEMOGRAPHICS

Population: 1,296,834,042 (July 2018 estimate)³

Population distribution: Very high population density throughout most of the country; the core of the population is in the north along the banks of the Ganges; river valleys and southern coastal areas also have large population concentrations⁴

Languages: English as the most important language for national, political and commercial communication; Hindi as other most spoken; 21 other officially recognized languages⁵

Indigenous Population: Rights of local population - more than 20% of the population of India depends on forests for subsistence

- Forest peoples population: 275,000,000 + ⁶
- Indigenous population: 84,000,000 + ⁷

Urbanization:

- 34% of total population in urban areas (2018)⁸
- 2.37% annual rate of change/rate of urbanization (2015-2020 estimate)⁹

GEOGRAPHY

Total land area (km²): 2,973,193 ¹⁰

Total water area (km²): 314,070 ¹¹

States: 29 states and 7 union territories¹²

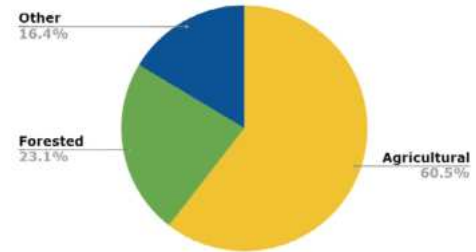
Climate: varies from tropical monsoon in south to temperate in north

Biomes:

- India lies within the Indomalaya ecozone and contains three biodiversity hotspots¹³
- About 20% of the country's landmass is covered by forests (tree canopy density >10%), of which 12.2% comprises moderately or very dense forests (tree canopy density >40%)¹⁴

Natural resources: coal (fourth-largest reserves in the world), antimony, iron ore, manganese, mica, bauxite, rare earth elements, titanium ore, chromite, natural gas, diamonds, petroleum, limestone, arable land¹⁵

Land use:¹⁶



GOVERNMENT

Type:

- Federal parliamentary republic

Structure:

- Modelled after the Westminster system, composed of the executive, the legislature, and the judiciary.
- Common law system based on the English model; separate personal law codes apply to Muslims, Christians and Hindus, judicial review of legislative acts.
- Power is divided between the central and state governments, but the central government has direct control over the state governments (e.g. the national Parliament can dissolve the legislative council of any state/territory).¹⁸

International Commitments:

- Party to (signed, not ratified): Antarctic-Environmental Protocol, Antarctic-Marine Living Resources, Antarctic Treaty, Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Environmental Modification, Hazardous Wastes, Law of the Sea, Ozone Layer Protection, Ship Pollution, Tropical Timber 83, Tropical Timber 94, Wetlands, Whaling¹⁹
- Bonn Challenge
 - 2011 - 2017 India has restored 9.8 million hectares of degraded land as part of the Bonn Challenge (goal - 250 million hectares by 2020 and 350 million hectares by 2030 - worldwide) ²⁰
- Paris Agreement: India's first NDC includes commitments:
 - to reduce the emissions intensity of its GDP by 33-35% from 2005 levels by 2030²¹

ECONOMY

GDP per capita: \$7,200 (2017 estimate);
21.9% below poverty line (2011 estimate)²²

Largest sectors and breakdown (GDP composition by sector):²³

- Agriculture 15.4% of GDP (2016 estimate);
- Industry 23% (2016 estimate);
- Services 61.5% (2016 estimate)

Agricultural products: rice, wheat, oilseed, cotton, jute, tea, sugarcane, lentils, onions, potatoes; dairy products, sheep, goats, poultry; fish²⁴

Industries: textiles, chemicals, food processing, steel, transportation equipment, cement, mining, petroleum, machinery, software, pharmaceuticals²⁵

Labor force by sector (2013-14):

- Informal economy accounts for more than 80% of non-agricultural employment²⁶
- Slightly less than half of the workforce is in agriculture²⁷
- Services are the major source of economic growth, accounting for nearly two-thirds of India's output but employing less than one-third of its labor force²⁸

Important economic centers: Delhi recently replaced Mumbai as the financial capital of India, both are the financial centers²⁹

Trade partners

- Exports: US (15.6%), UAE (10.2%), Hong Kong (4.9%), China (4.3%) (2017)³⁰
- Imports: China (16.3%), US (5.5%), UAE (5.2%), Saudi Arabia (4.8%), Switzerland (4.7%)³¹

Informal Economies

- World's largest producer of licit opium for the pharmaceutical trade, but an undetermined quantity of opium is diverted to illicit international drug markets³²
- Informal economy accounts for more than 80% of non-agricultural employment
- Women are likely more to be engaged in the informal economy but significantly more likely than men to be working as informal workers in the formal sector³³

ENVIRONMENT

Current environmental issues: deforestation;

soil erosion; overgrazing;

desertification; air

pollution from industrial effluents and vehicle

emissions; water pollution from raw sewage and runoff

of agricultural pesticides; tap water is not potable

throughout the country; huge and growing population is

overstraining natural resources; preservation and

quality of forests; biodiversity loss³⁴

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ANDHRA PRADESH, INDIA

INTRODUCTION

Andhra Pradesh is located in the southeast of India. These include the hilly Eastern Ghats (dense tropical forests), the Deccan Plateau (dry tropical forests) and the shoreline along the Bay of Bengal, all of which support a variety of flora and fauna. There are indigenous and forest people communities that depend upon the forests for subsistence. Where tiger reserves have expanded, this has led to human-animal conflict. Andhra Pradesh came into existence in its present form in 1956 as a result of the demand of the Andhras for a separate state. On June 2, 2014, the northwestern part of Andhra Pradesh became the new state of Telangana. It shares its capital of Hyderabad with Telangana.

DEMOGRAPHICS

Population: 49,386,799 per 2011 census²

Population distribution: Nearly one-third of the population lives in urban areas

Languages: Telugu (official language), Urdu, Hindi, Banjara, and English

Indigenous Population: 4.2 million, 6.3% of the population³

Urbanization: 29.47 percent urban population in 2011, up from 24.13 percent in 2001⁴

Density: 304 persons/sq km, less than the national average⁵

GEOGRAPHY

Total land area (km²): 162,970 ⁶

Climate: Tropical savanna climate, Hot semi-arid climate, and Humid subtropical climate, affected by monsoon season

Biomes: Tropical dry evergreen forest, Dry deciduous forests, Moist deciduous forests

Natural resources: Produces a major share of the country's baryte, a mineral that is the main source of barium, and is the only state in southern India with significant coal reserves⁷

Land use: 22.6% forest, 37.3% agricultural (2016-17)⁸

Current environmental issues:

- Pollution, deforestation, soil degradation
- Construction of Amaravati (forests, rivers, floodplains)

GOVERNMENT

13 districts

Governor is appointed by the president and is the executive head of the state administration, but the chief state administration,

minister and a Council of Ministers responsible to state legislature hold the real power⁹

Telugu Nation Party (TDP) advocated a reduced role in the national government in state affairs; TDP was in control most of late 20th and early 21st centuries, and has been in control again since 2014¹⁰



ECONOMY

Gross State Domestic Product (GSDP): 8.26 lakh crore INR = 125 billion USD (2018-19)

GDP per capita: 75 thousand to 1 lakh (*100,000) INR = 1050 to 1400 USD¹¹

Largest sectors and breakdown (GSDP composition by sector):¹²:

- Agriculture contributes 34% to GSDP
- Industries contribute 22% to GSDP

Agricultural products:

- Cereals and millets (rice, wheat, maize)
- Pulses (legumes such as peas, beans, lentils)

Labor force by sector (2013-14):¹³:

- Agriculture, forestry and fishing 55%
- Wholesale/retail trade, food service, information and communication 16%
- Manufacturing 9.1%
- Education, administration, social work 8.9%
- Construction 7.8%

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MADHYA PRADESH, INDIA

INTRODUCTION

Madhya Pradesh contains the most important rivers in India and has access to ample natural resources. More than half of the population works in the agricultural sector, and there is a potential for increased labor in industry through the production of cement and textiles. The dependence of local communities on natural resources poses a direct threat to reforestation and restoration efforts.¹ Government-led efforts such as tax programs, the Compensatory Afforestation Fund Management and Planning Authority (CAMPA) bill, and local Department of Forestry policies incentivize agroforestry, a technique that balances both conservation and economic opportunity.² Unfortunately, many of these practices convert natural landscapes into vast monocultures of teak and sal trees.³

DEMOGRAPHICS

Population: 72,597,565 (2011 census)⁴
79,634,400 (2018 estimate)⁵

Population distribution: uneven; ¾ population is rural; dense rural population at river valleys, 3 major cities

Languages: Hindi, (other dialects include Bagheli, Awadhi, Bundeli, and Malvi)⁶

Indigenous Population: 20%⁷ ≈ 14,519,513 (2011)

Urbanization: largest areas: Bhopal, Indore, Jabalpur⁸

GEOGRAPHY

Total land area (km²): 308,252⁹

Climate: monsoon weather pattern (june to september); annual average rainfall = 44 inches (1100mm)/ summer months are hot and dry and winter months are mild and dry (~50 deg. F)¹⁰

Biomes: Moist deciduous forest, dry evergreen forests¹¹

Natural resources:¹²

- types of trees: teak (for hardwood), sal (for hardwood), bamboo (for construction), salai (for incense/medicine), and tendu (for rolling cigarettes)
- Minerals but not fully exploited: coal, iron ore, manganese ore, bauxite, limestone, dolomite, copper, fireclay, and kaolin (china clay); some diamond reserves

Land use: ~20% area is forested¹³

Current environmental issues:

- Limited forested areas
- Human wildlife conflict¹⁴
- Although the state depends on agriculture, less than half of the land is cultivable¹⁵

GOVERNMENT

52 districts

Governor is appointed by the President, aided by council of ministers¹⁶

District headed by collector (has executive and magisterial power)

Local administration by village panchayats (village councils)



ECONOMY

GDP per capita: 50 to 75 thousand INR = 700 to 1000 USD¹⁷

Largest sectors and breakdown (GDP composition by sector):

- Agriculture (biggest sector)¹⁸
 - Low productivity and non mechanized cultivation
 - Lack of irrigation
- Industry (underdeveloped)
 - Paper milling, cement production, textiles, heavy electrical items, microelectronics, optical fibres

Agricultural products:¹⁹

- Soybeans, wheat, sorghum, corn, rice, and legumes
- Livestock and poultry

Labor force by sector (2013-14)²⁰:

- More than half of the population depends on agriculture directly (farming) or indirectly (food processing) for livelihood (2016)
- About 12% work in construction (2016)

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MEXICO

INTRODUCTION

Mexico is one of three countries in North America, bordering Guatemala, Belize, and most largely, the United States.¹ The country is heavily involved in manufacturing, with key exports being motor vehicle parts, machinery, fuel, and processed goods, like plastics.² As of 2018, greater than 80% of their population lived in an urban setting.³ Mexico is currently experiencing several environmental perils, including desertification and deforestation. Approximately 8% of forests in Mexico are under protection, but nearly a quarter of all forest lands are used for forestry practices, with logging comprising approximately 81% of that use.^{4,5} One complication in Mexico for regulators is that approximately 80% of forested lands are owned privately by community land holdings called *ejidos*, which make it difficult for cohesive forest management practice to pervade.⁶

DEMOGRAPHICS

Population: 125,959,205⁷

Languages: Spanish and indigenous languages⁸

Urbanization:⁹

- 80.2% population (101,019,282 people)
- 1.59% rate of change

GEOGRAPHY

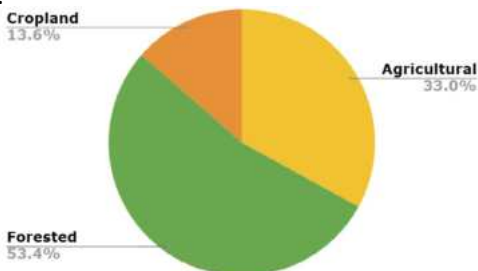
Total land area (km²): 1,943,950¹⁰

Total water area (km²): 20,430¹¹

Natural resources:

- Mexico houses approximately 12% of the world's biodiversity, with 200,000 different species.¹²
- Land types vary between desert and tropical forests

Land use:¹³



GOVERNMENT

Type:

- Federal presidential republic¹⁷

Structure:

- Divided into three branches: judicial, executive, and legislative¹⁸
- The two main bodies of the legislative branch - the Congress - include the Senate and Chamber of Deputies, who are elected to power^{19,20}
- The federal government represents the united Mexican states at the international scale, and state governments are modeled after the federal system

International Commitments:

- Bonn Challenge Commitments: 8,468,284 hectares restored by 2020²¹
- Paris Agreement: ratified in 2016; reducing greenhouse gas emissions by 22% by 2013²²

ECONOMY

GDP per capita: 19,900 USD²³

Largest sectors and breakdown (GDP composition by sector):²⁴

- 4% agriculture (2017)
- 32% industry (2017)
- 65% services (2017)

Agricultural products: Corn, wheat, soybeans, rice, beans, cotton, coffee, produce, beef, dairy, poultry, wood²⁵

Industries:²⁶

- Food and beverage
- Tobacco
- Chemicals, petroleum, iron and steel
- Textiles, clothing

Labor force by sector (2013-14):²⁷

- 13% agriculture
- 24% industry
- 62% services (2011)

Important economic centers:²⁸

- Mexico City is by far the largest city in Mexico, by population, and by industry. Notably, Mexico wields much power and, in fact, the current president was formerly the Mayor of Mexico City.
- However, other critical city hubs include the following:
 - Guadalajara
 - Puebla
 - Ciudad Juarez
 - Tijuana
 - Monterrey

Trade partners^{29,30}

- United States - greatest trade partner by far
- Canada
- Germany
- China

Informal Economies³¹

- Major drug production and trading operations exist (ecstasy, opium, cocaine, marijuana, heroin, methamphetamine)

ENVIRONMENT

Current environmental issues:³²

- Volcanic activity may cause evacuations
- Rare and often polluted freshwater
- Deforestation - Mexico currently has one of the highest rates of deforestation in the world (and particularly amongst developing countries)
- Land erosion and desertification³³
- Air pollution in the urban environment is detrimental to human health³⁴

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CHIAPAS, MEXICO

INTRODUCTION

Chiapas is among the most biodiverse states in Mexico.¹ Unfortunately, it is one of the poorest despite being one of the most resource-rich and bordering Central America as a hub for trade infrastructure.² Chiapas has a strong indigenous presence which adds complexities to the governance structure.³ For example, it was primarily indigenous peoples during the Zapatista movement confronting a few wealthy landowners for equitable access to lands and resources for more widespread economic prosperity. Deforestation can be primarily be attributed to agricultural expansion of coffee, maize, and African palm (used for biofuels), while land degradation can be attributed to the expansion of logging (pine) and cattle farming. Chiapas has unique inequities and resources, and thus potential for restoration initiatives.

DEMOGRAPHICS

Population: 5,217,908 (2015)⁴

Population density: 71.20 persons/km² (2015)⁵

Population distribution: 49% urban and 51% rural⁶

Languages: 27% speak Indigenous languages: Tzeltal, Tzotzil, Chol, Zoque⁷

Indigenous Population: 36.15% (2015)⁸

GEOGRAPHY

Total land area (km²): 73,289 (2015)⁹

Total water area (km²): 30% of Mexico's fresh water¹⁰

Climate: Tropical with tropical and subtropical moist broadleaf forests¹¹

Natural resources:

- 44.5% of Mexico's total hydroelectric production¹²
- Timber, Crude Oil, Gold, Silver¹³

Land use:

- 20% of territory is protected¹⁴
- 58% Pasture, 32% Crops, 2% Urban Area, 1% unvegetated¹⁵
- Total harvested area (hectares) – 1,405,851 (2011)¹⁶
- Total sown area (hectares) – 1,449,954 (2011)¹⁷

Current environmental issues:

- Agricultural pressure towards further deforestation¹⁸
- Land degradation due to expansion of logging and cattle farms¹⁹
- Most protected natural areas in Mexico²⁰

GOVERNMENT

Governor exerts most power over a nonrenewable, six-year term²¹

Unicameral state congress²²

116 municipalities - autonomous local governments often result in opposition to federal power²³

ECONOMY

GDP per capita: 6,636 USD/capita²⁴

Largest sectors and breakdown (GDP

composition by sector in 2016):

- Primary Activities - 7% (Agriculture, Forestry, Fishing and Hunting), Secondary Activities - 21% (Manufacturing), Tertiary Activities - 72% (Wholesale/Retail Trade & Real Estate)²⁵

Labor force by sector (2013-14):

- 1.9 million workers mostly in agriculture and commerce (2017)²⁶
- Agriculture is 8% of the GDP while employing 40% of the economically active population (2014)²⁷

Agricultural products export: 186,727 million USD:

- Coffee, Banana, Mango, Wheat, Onion²⁸
- Largest exporter of coffee and third largest producer of maize²⁹



ENDNOTES

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QUINTANA ROO, MEXICO

INTRODUCTION

Situated on the Yucatan Peninsula, Quintana Roo has a tropical climate and vibrant forest and coastal ecosystems. As Quintana Roo is home to popular destinations like Cancun, heavy investment in tourism since the 1970s has damaged the ecology of the region.¹ While agriculture and forestry are minor economic factors in comparison to tourism and food services, deforestation in particular has been driven by agriculture, with most of Quintana Roo's deforestation from 2001 and 2013 due to livestock-maize production.² Community forest management, particularly through ejidos, has been linked to improved restoration and conservation outcomes in the state.³ Thus, Quintana Roo is a useful case study in how state government is grappling with the impacts of tourism and agricultural land use on tropical deforestation, including incorporating communal landholder engagement, in order to preserve the region's economic potential.

DEMOGRAPHICS

Population: 1,681,650⁴

Languages: 196,050 people (12%) speak indigenous languages⁵

GEOGRAPHY

Total land area (km²): 45,063⁶

Climate: Tropical, sub-humid, average temperature 26C, 1.3 m of rain⁷

Biomes: Tropical forests, savannah, mangroves, coral reefs
Land use:

- 69% of Quintana Roo is tree cover⁸
- Significant protected areas, particularly along coasts, primarily governed by National Commission of Natural Protected Areas⁹

Current environmental issues:

- From 2001 to 2017, Quintana Roo lost 445kha of tree cover (-12%), equivalent to 29.0Mt of CO₂ emissions¹⁰
- Major tourist activity and development

GOVERNMENT

State governor

11 municipalities¹¹ that are administratively independent to the state per Mexico's constitution and select their own presidents¹²

- Municipalities run most public services directly, though most environmental regulations come from state and national levels

ECONOMY

Total GDP:

302B pesos / 15.7B USD¹³

Largest sectors and breakdown:¹⁴

- Vast majority of GDP driven by tertiary sector (services), with just 1% coming from primary sector (agriculture, aquaculture, forestry, hunting)
- Accommodation and food services - 76B pesos
- Retail - 56B pesos
- Agriculture and forestry - 2.3MM pesos (0.3% of national total)

Agricultural products:^{15,16}

- Sugarcane, Maize, Timber, Jalapeno peppers, Corn, Rice, Pineapple

Labor force by sector (2013-14):¹⁷

- Total active labor force - 795,000
- Accommodation and food services - 175,000 (22%)
- Commerce - 137,000 (17%)
- Agriculture, forestry, fishing, hunting - 42,000 (5%)



ENDNOTES

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APPENDIX D: KEYWORDS

ENGLISH Keywords lists are derived from the words/phrases used to both search for the policies themselves and to identify mechanisms within the policies. The keywords help to recognize the mechanism in the policy when it transitions over to the natural language system.

English Terms		
access and benefit sharing	financing	qualification
access right	forest management/conservation	quality
afforestation/reforestation	forest protection	registry
agricultural development	forestry protection measures	regulation
agro-forestry	funding	reporting
air quality/air pollution	fundraising	research
animal welfare	gender and natural resources	reserve
artificial regeneration	governance	resource
authorization/permit	habitat protection	resource damage valuation
biodiversity	integrated management	restriction
biological resources	international agreement-implementation	results-driven
biome	international relations/cooperation	right to clean/healthy environment
biosphere reserves	inventory	rural
capacity building	joint implementation	safeguard
certification	land based credit	social protection
civil and political rights	land reform	social/community forestry
clean	land use	soil conservation/improvement
climate change	land-use planning	soil rehabilitation
coconut	landholder	special fund
community wildlife management	law	species
concession	legal/administrative proceedings	standards
conservation	liability/compensation	subsidy/incentive
control	local government	support
court/tribunal	management/conservation	sustainable development
crops/grasses	measuring	sustainable use
data collection/reporting	mobilization	tax/levy
database	monitoring	technical submission
drainage/land reclamation	national parks	threatened species
ecofriendly processes	natural resources	traditional rights
ecological production/organic production	oversight	transboundary effects
economic/social/cultural rights	ownership of natural resources	urban land
economy and environment	plant breeders	use restrictions
ecosystem preservation	plant protection	variety
education	plants	verification
emissions	policy	wastewater
enforcement	pollution	water
environmental standards	preservation	watershed
environmental indicators	private forest/land	wetlands
environmental planning	produce	wild fauna/flora
erosion	protected area	wild life
ethics and environment	public forest/land	wildlife products
farming	public participation	zoning
federal state	public private partnership	

SPANISH

Spanish Terms	English Translation	Spanish Terms	English Translation
repoblación forestal	afforestation	vigilancia	oversight
agricultura	agriculture	fitomejoradores	plant breeders
bienestar de los animales	animal welfare	plantas	plants
regeneración artificial	artificial regeneration	contaminación	pollution
biodiversidad	biodiversity	preservación	preservation
recursos biológicos	biological resources	Produce	produce
bioma	biome	protección	protection
tablero	board	calificación	qualification
limpiar	clean	calidad	quality
Coco	coconut	registro	registry
conservación	conservation	regulación	regulation
controlar	control	reportando	reporting
base de datos	database	reserva	reserve
aplicación	enforcement	recurso	resource
ambiente	environment	restricción	restriction
granja	farm	impulsado por resultados	results-driven
financiación	financing	rural	rural
bosque	forest	salvaguardia	safeguard
protección forestal	forest protection	especies	species
fondos	funding	apoyo	support
recaudación de fondos	fundraising	sostenible	sustainable

PORTUGUESE

Portuguese Term	English Translation	Portuguese Term	English Translation
ministério	ministry	animais selvagens	wildlife
indígena	indigenous	bioma	biome
comunidade	community	das Alterações Climáticas	climate change
restauração	restoration	execução	enforcement
desmatamento	deforestation	a complacência	compliance
rural	rural	estudo científico	research
conservação	conservation	desenvolvimento	development
reflorestamento	reforestation	agricultura familiar	family farming
agricultura, agrícolas, a lavoura	agriculture	planejamento ambiental	environmental planning
práticas	practices	zoneamento	zoning
preservação	preservation	orgânico	organic
protecção	protection	ecossistema	ecosystem
silvicultura	forestry	manejo florestal	forest management
biodiversidade	biodiversity	captação de recursos	fundraising
monitorar	monitor	mobilização	mobilization
registro	registry	comunicação	reporting
terra	land	salvaguardar	safeguard
cultivar	farm	verificação	verification
rural	rural	de água doce	freshwater
financiamento	financing	poluição da água	water pollution
subvenção	subsidy	proprietário de terras	landholder
os cooperativo	cooperative	restrição	restriction
a recursos financeiros	fund	lei	law
meio Ambiente	environment	terra pública	public land
recursos naturais	natural resources	posse	tenure
a provisão	reserve	autorização	authorization
uso da terra	land use	indústria	business
sustentável	sustainable	produção animal	animal production
águas residuais	wastewater	comércio internacional	international trade
água	water	conhecimento indígena	indigenous knowledge
regulamento	regulation	procedimento legal	legal proceeding
madeira	timber	reforço das capacidades	capacity building
desclassificar	declassify	crédito fiscal	credit
arborização	afforestation	imposto	tax

APPENDIX E: FRAMEWORK SNAPSHOT

On the following pages, we include a partial view of the spreadsheet used to build the framework for this project. While the framework is not usable in this format, the visual spreadsheet allows for the reader to better comprehend the scope of work.

Policy Title	Year	Country	Jurisdiction	Enacted By Law	Enacted By Exec.	Voluntary/NDC	Passed	Active	Executing Ministry	Enforcement Mechanism
Official title of policy.	Year policy was passed.	Select from drop down menu	If national, use country code.	Legislature passes policy into law.	Executive power/ministry enacts regulation unilaterally.	Part or all of policy is nationally-determined, but not enforced by law.	Did it become law?	Is it in use today?	What Ministry is responsible for executing/enforcing the policy on the ground?	Does the policy contain penalties/fines for non-compliance?
Indian Forest Act	1927	IN	IN	Yes	No	No	Yes	Yes	IN- Environment, Forests and Climate Change	Yes
Mineral Concession Rules	1960	IN	IN	Yes	No	No	Yes	Yes	IN- Mines	Yes
Law No. 4829 creating the rural credit (SNCR - National System of Rural Credit)	1965	BR	BR	Yes	No	No	Yes	Yes	BR - Federal Union	Yes
The Andhra Pradesh Forest Act	1967	IN	IN-AP	Yes	No	No	Yes	Yes	IN- Environment, Forests and Climate Change	Yes
Andhra Pradesh (Agricultural Produce and Livestock) Markets Act	1969	IN	IN-AP	Yes	No	No	Yes	Yes	IN- Agriculture	Yes
The Coconut Development Board Act	1979	IN	IN	Yes	No	No	Yes	Yes	IN- Agriculture	Yes
The Forest (Conservation) Act	1980	IN	IN	Yes	No	No	Yes	Yes	IN- Environment, Forests and Climate Change	Yes
Circular Concerning Joint Forest Management	1981	IN	IN	Yes	No	No	Yes	Yes	IN- Environment, Forests and Climate Change	No
Environment (Protection) Act	1986	IN	IN	Yes	No	No	Yes	Yes	IN- Environment, Forests and Climate Change	Yes
Forestry Law	1986	MX	MX	Yes	No	No	Yes	Yes	MX-Agriculture and Rural Development	No
General Law of Ecological Balance and Environmental Protection	1988 (consolidated 2018)	MX	MX	Yes	No	No	Yes	Yes	MX-Environment and Natural Resources	Yes
Creating the State Policy on Food Acquisition of Family Farming (PAAFamiliar)	1988	IN	IN	Yes	No	No	Yes	Yes	IN- Mines	Yes
On the use, conservation, and protection of agricultural land	1988	BR	BR-SP	Yes	No	No	Yes	Yes	BR-Non-Federal, State Ministry	No
Creating the fund for agricultural, livestock, and fisheries development	1992	BR	BR-SP	Yes	No	No	Yes	Yes	BR-Non-Federal, State Ministry	No
The Indian Wildlife (Protection) Act	1993	IN	IN	Yes	No	No	Yes	Yes	IN- Environment, Forests and Climate Change	Yes
Specifications to mitigate the adverse effects on biodiversity caused by the change of land use of agricultural forest lands	1994	MX	MX	Yes	No	No	Yes	No		No
Decree No. 38.182 establishing the Protected Areas Management System	1996	BR	BR-MG	Yes	No	No	Yes	Yes	BR-Non-Federal, State Ministry	Yes
National Water Resources Policy	1997	BR	BR	Yes	No	No	Yes	Yes	BR-Environment	Yes
Guidelines for the granting of subsidies, designed to promote forest development	1998	MX	MX	Yes	No	No	Yes	Yes	MX-Environment and Natural Resources	No
Decree of 21 September 1999 creating the National Forest of "Ritapolis" within the State of Minas Gerais	1999	BR	BR-MG	Yes	No	No	Yes	Yes	BR-Non-Federal, State Ministry	No
Madhya Pradesh Act	1999	IN	IN-MP	Yes	No	No	Yes	Yes	IN- Environment, Forests and Climate Change	Yes
Establishing the National System of Protected Areas Management - SNUC	2000	BR	BR	Yes					BR-Environment	
The Protection of Plant Varieties and Farmers Act	2001	IN	IN	Yes	No	No	Yes	Yes	IN- Agriculture	Yes
Decree of 13 December 2002 instituting the "Pacotuba" Forestry Reserve	2002	BR	BR-ES	No	Yes	No	Yes	Yes	BR-Environment	No
Law No. 14.309 on the State Policies on Forestry and Biodiversity	2002	BR	BR-MG	Yes	No	No	Yes	Yes	BR-Non-Federal, State Ministry	No
Biological Diversity Act	2002	IN	IN	Yes	No	No	Yes	Yes	IN- Environment, Forests and Climate Change	Yes

Summary	Purpose	Motivation	Primary Incentive	Page #	Primary Disincentive	Page #	Bottom-up: Community Engagement	Bottom-up: Indigenous Rights	Biome-Specific	ROAM+: Land Use	Key Words
What does the policy accomplish? What programs are instituted?	What does the policy seek to accomplish?	What is the overarching motivation for the policy?	What is the main incentive used in the policy?		What is the main disincentive used in the policy?		Does the policy mention community engagement or education?	Does the policy acknowledge indigenous land rights?	Does the policy target a specific biome or land-use?	ROAM primary classification. To select multiple: Scripts > Multi-select for this cell... Multi-select for this cell...	To select multiple: Scripts > Multi-select for this cell, Error message cannot be removed
An Act to consolidate the law relating to forests, the transit of forest-produce and the duty leviable on timber and other forest produce.	maximize the profit from the timber and other forest commodities (resins) as much as possible; abolish		Financial - trade	chapter 5	Financial - fines	chapter 9	FALSE	FALSE	No	Forest land	forest protection
These Rules establish the requirements and procedures to be satisfied in order to obtain prospecting mining concessions.	government regulation of mining industry; restoration practices		Financial - grants	3	Imprisonment and Fines	35	FALSE	FALSE	No	Forest land,Agricultural	land use,resource
The government guarantees the availability of agricultural credit resources at preferential interest rates for working capital and	To support national-scale agriculture and provide a win-win means for the government to track	Agricultural Development	Financial - subsidies				TRUE	FALSE	No	Agricultural	agriculture,farm,financing,oversight,qualification,restriction,rural
An Act to consolidate and amend the law relating to the protection and management of forests in the State of Andhra Pradesh.	local application of federal laws	Conservation		chapter 1 section 3	Imprisonment and Fines	Chapter 1 section 20	FALSE	FALSE	Yes	Forest land	forest,forest protection,produce,reserve
This Act provides for the declaration of notified areas to regulate the purchase and sale of agricultural produce, livestock and	government regulation of agriculture products		Financial - trade	4	Financial - fines	15	FALSE	FALSE	No	Agricultural	agriculture,farm,produce,resource
An Act to provide for the development under the control of the Union of the coconut industry and for matters connected	It is hereby declared that it is expedient in the public interest that the Union should take under its control		Financial - trade	page 1	Procedures/Guide lines	chapter 4	FALSE	FALSE	Yes	Agricultural	board,coconut
An Act to provide for the conservation of forests and for matters connected therewith or ancillary or incidental thereto.	Restriction on the desreservation of forests or use of forest land for non-forest purpose	Conservation		page 2	Procedures/Guide lines	Section 4	FALSE	FALSE	Yes	Forest land	conservation,forest
This Circular of the Department of Environment, Forests and Wildlife to Forest Secretaries of all States and other territories	involvement of village communities in restoration practices		Financial - subsidies	2			TRUE	TRUE	No	Forest land	ation,environment,forest,natural resources,plant breeders,plants,resource,sustainable
umbrella legislation which authorizes the Central Government to protect and improve environmental quality,	protecting and improving the human environment according to the decisions taken at the United	International Agreement/C conference	Diplomatic	Introduction	Imprisonment and Fines	chapter 3, paragraph 15	FALSE	FALSE	No	Protective land and buffers	environment,land pollution,protection,quality
"These provisions are of public order and social interest and are intended to order and regulate administration, conservation,							TRUE	FALSE	No	Forest land	forestry
"aims to regulate and promote the integral and sustainable management of the territories forestry, conservation, protection,	Promote and protect ecological balance	Conservation	Legal		Financial - fines		TRUE	TRUE	No		Sustainable use, pollution, protection, health, biodiversity
These Rules lay down guidelines for ensuring mining on a scientific basis and conserving the environment.	conservation post mining activities	Conservation		7	Imprisonment and Fines	30	FALSE	FALSE	Yes	Protective land and buffers	conservation,environment,land,natural resources,regulation
Framework for policy development and program selection for conservation and agricultural land preservation	Develop state practices to be promoted for conservation and preservation of viable agricultural land - reuse	Agricultural Development	Political		Procedures/Guide lines		TRUE	FALSE	Yes	Forest land,Agricultural	Agricultural development; agricultural land; basic legislation; public land; land tenure; land-use planning
Sanctioning and establishing a fund for the regulated development of agricultural, livestock, and fishery site	Increase government oversight for site development	Agricultural Development	Financial - subsidies		Procedures/Guide lines		TRUE	FALSE	Yes	Agricultural	Agricultural development; special fund; financial agricultural measures
An Act to provide for the protection of [Wild animals, birds and plants] and for matters connected therewith or ancillary	to protect wild animals and areas	Conservation		chapter 1	Imprisonment and Fines	chapter 2	FALSE	FALSE	No	Forest land,Agricultural,Protective land and buffers	plants,protection,wild life
"This Official Mexican Standard establishes the specifications to mitigate the adverse effects on biodiversity caused by the change	Protecting biodiversity from agricultural lands (converted)	Agricultural Development	Legal				TRUE	FALSE	Yes	Agricultural	sustainable development, agriculture, biodiversity, forest
This Decree establishes the Protected Areas Management System. It consists of 13 articles creating the aforesaid System,	Creation of a protected environment where the government oversees the coordinated exploitation of	Conservation			Procedures/Guide lines		FALSE	FALSE	Yes	Protective land and buffers	resources,biome,conservation,control,environment,forest,forest protection,land use,law,measuring,natural
1) Ensure that present and future generations have the necessary access to water of a quality adequate for their various uses	Primarily to guarantee water quality but with additional provisos that include environmental protections	Conservation	Legal		Imprisonment and Fines		TRUE	TRUE	No	Forest land,Agricultural,Protective land and buffers	land use,preservation,regulation,resource,sustainable,wastewater,water
This agreement lays out guidelines for subsidies issued to forest producers in Mexico, granted through the Ministries of	guiding subsidy deliverance		Financial - subsidies				TRUE	FALSE	Yes	Forest land	forest management, forest conservation, logging
This Decree creates the National Forest of "Ritapolis" within the State of Minas Gerais. It consists of 5 articles establishing the	Creation of the national forest within the state of Minas Gerais	Conservation			Political		FALSE	TRUE	Yes	Forest land	resources,biome,conservation,environment,forest,forest protection,land use,preservation,protection,regulation
An Act to provide for Farmers' participation in the management of the irrigation System and for matters connected therewith and	equitable irrigation	Agricultural Development		1158(20)	Financial - fines	1158(31)	FALSE	FALSE	No	Agricultural	resources,environment,farm,land use;law,natural resources,plants,quality,rural,sustainable,water
This Law establishes the National System of wildlife protected areas management - SNUC, aimed to the protection of biodiversity and	forms a National System of Nature Conservation Units, with criteria and restrictions for the protection and	Establishes system of Nature Conservation Units	Legal				TRUE	FALSE		Forest land	management/forest conservation Forestry protection measures Protected area Freshwater quality/ freshwater
AN ACT to provide for the establishment of an effective system for protection of plant varieties, the rights of farmers and	promote plant variety	Agricultural Development		Introduction	Imprisonment and Fines	chapter 10	FALSE	FALSE	No	Agricultural	plant breeders,protection,variety
This decree creates the National Forest of Pacotuba, in the Municipality of Cachoeiro de Itapemirim, in the State of	Establish a National Forest (Permanent Preservation Area) to promote management of natural	Conservation	Political		None		TRUE	FALSE	Yes	Forest land,Protective land and buffers	cal resources,biome,conservation,environment,forest,forest protection,preservation,protection
This Law, consisting of 6 Chapters, establishes the State Policies on Forestry and Biodiversity. These policies	The policy establishes the requirements to perform forestry activities in light of a sustainable use of natural	Conservation			Procedures/Guide lines		FALSE	FALSE	Yes	Forest land	resources,conservation,database, enforcement,environment,forest, forest protection,law,natural resources,oversight,preservation,
umbrella legislation aimed at conservation of biological resources and associated knowledge as well as facilitating	states have sovereign rights to use their biological resources; legislation used to help India meet the	International Agreement/C conference	Diplomatic	page 1	Procedures/Guide lines	page 2	TRUE	FALSE	No	Forest land,Agricultural,Protective land and buffers	biological resources,conservation,threatened species

APPENDIX F: POLICY TITLES

Policy Title	Year Passed	Country
Law No. 4.829 creating the rural credit (SNCR - National System of Rural Credit)	1965	BR
On the use, conservation, and protection of agricultural land	1988	BR
Creating the fund for agricultural, livestock, and fisheries development	1992	BR
Decree No. 38.182 establishing the Protected Areas Management System	1996	BR
National Water Resources Policy	1997	BR
Decree of 21 September 1999 creating the National Forest of "Ritópolis" within the State of Minas Gerais	1999	BR
Establishing the National System of Protected Areas Management - SNUC	2000	BR
Establishing the crop insurance-fund for family farmers in minas gerais and espirito santo states	2002	BR
Decree of 13 December 2002 instituting the "Pacotuba" Forestry Reserve	2002	BR
Law No. 14.309 on the State Policies on Forestry and Biodiversity	2002	BR
Regulating the gradual elimination of the practice of burning sugar cane straw	2002	BR
Decree No. 43.710 regulating Law No. 14.309 on the State Policies on Forestry and Biodiversity	2004	BR
Providing for the state policy to support cooperatives within the state of minas gerais	2004	BR
Management of Public Forests, Brazilian Forest Service and National Fund for Forest Development	2006	BR
Creates the state policy to support cooperatives within the state of sao paulo	2006	BR
Creates the state policy to support cooperatives within the state of sao paulo	2006	BR
Creating the Amazon Fund established by the National Bank for Economic and Social Development (BNDES)	2008	BR
National Fund on Climate Change	2009	BR
Law No. 12.187 instituting the National Policy on Climate Change	2009	BR
Ecologic-Economical Zoning of Brazil	2010	BR
Decree No. 7.390 regulating Law No. 12.187, instituting the National Policy on Climate Change	2010	BR
Support Programmes for the Environmental Conservation and for the Promotion of Rural Productive Activities	2011	BR
Forest Code	2012	BR
Creating the state policy for agroecology and organic production (PEAPO)	2012	BR
Decree No. 45.919 amending Decree No. 43.710 regulating Law No. 14.309 on the State Policies on Forestry and Biodiversity	2012	BR
Decree No. 58.107 approving the Strategy for the State Sustainable Development	2012	BR
Establishing the state policy on the technical assistance and rural extension for family farming and agrarian reform of the state of espirito santo (PEATER/ES) and the state programme of technical assistance and rural extension for family agriculture and agrarian reform of the state of espirito santo - PROATERES	2012	BR
Joint Resolution IEF/SEMAD No. 1.906 establishing procedures to regulate harvesting and marketing of exotic forest tree planted within the State of Minas Gerais	2013	BR
Creating the State Policy on Food Acquisition of Family Farming (PAAFamiliar)	2013	BR
On the use, conservation, and protection of agricultural land	2014	BR
Creating the social fund for assistance to family farming within the Espirito Santo state	2014	BR
Creating the fund for agricultural, livestock, and fisheries development	2014	BR
Establishing the crop insurance-fund for family farmers in minas gerais and espirito santo states	2014	BR
Providing for the development fund of espirito santo (FUNDES)	2014	BR
Creating the social fund for assistance to family farming within the espirito santo state	2014	BR
National REDD + Strategy ENREDD	2015	BR
Providing for the state policy to support cooperatives within the state of minas gerais	2015	BR
Regulating the gradual elimination of the practice of burning sugar cane straw	2015	BR
Creating the state fund to fight and eradicate poverty (FECOEP)	2015	BR
Establishing the state programme for sustainable rural development and creating the special state support fund programme for sustainable rural development	2016	BR
Establishing the multi-year plan of governmental action for the quadrennium 2016-2019 (PPAG 2016-2019)	2018	BR
Establishing the state policy on the technical assistance and rural extension for family farming and agrarian reform of the state of espirito santo (PEATER/ES) and the state programme of technical assistance and rural extension for family agriculture and agrarian reform of the state of espirito santo - PROATERES	2018	BR
Establishing the programme for the certification of agricultural, livestock, and agroindustrial products (certifica minas)	2018	BR

Policy Title	Year Passed	Country
Indian Forest Act	1927	IN
Mineral Concession Rules	1960	IN
The Andhra Pradesh Forest Act	1967	IN
Andhra Pradesh (Agricultural Produce and Livestock) Markets Act	1969	IN
The Coconut Development Board Act	1979	IN
The Forest (Conservation) Act	1980	IN
Circular Concerning Joint Forest Management	1981	IN
Environment (Protection) Act	1986	IN
Creating the State Policy on Food Acquisition of Family Farming (PAAFamiliar)	1988	IN
The Indian Wildlife (Protection) Act	1993	IN
Madhya Pradesh Act	1999	IN
The Protection of Plant Varieties and Farmers Act	2001	IN
Biological Diversity Act	2002	IN
Establishing the multi-year plan of governmental action for the quadrennium 2016-2019 (PPAG 2016-2019)	2003	IN
Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act	2006	IN
National Green Tribunal Act	2010	IN
Wetlands (Conservation and Management) Rules	2010	IN
State Action Plan on Climate Change for Andhra Pradesh	2012	IN
National Mission for a Green India	2014	IN
Madhya Pradesh State Action Plan on Climate Change	2014	IN
The Compensatory Afforestation Fund Act (CAMPA)	2016	IN
Forestry Law	1986	MX
Specifications to mitigate the adverse effects on biodiversity caused by the change of land use of agricultural forest lands	1994	MX
Guidelines for the granting of subsidies, designed to promote forest development	1998	MX
Cadastre Law for the State of Chiapas	2002	MX
Program for Forest Development	2003	MX
Program for the Development of Commercial Forest Plantations	2003	MX
Conservation and Restoration of Forest Ecosystems Program	2004	MX
Forest Law of the State of Quintana Roo	2007	MX
Sustainable Forestry Development Law for the State of Chiapas (Decree No. 256	2008	MX
Cadastre Law of the State of Quintana Roo	2008	MX
Regulation of the Cadastre Law of the State of Quintana Roo (separate from original)	2008	MX
Law of Sustainable Rural Cities for the State of Chiapas	2010	MX
Law of Burning and Prevention of Forest Fires for the State of Quintana Roo	2012	MX
Law on climate change action in the State of Quintana Roo	2012	MX
Law for Adaptation and Mitigation of Climate Change in the State of Chiapas	2013	MX
Agreement through which reference costs are issued for reforestation or restoration and maintenance for environmental compensation for land use change in forest land and the methodology for its estimation.	2014	MX
National Forestry Program 2016	2015	MX
Federal Law of Special Economic Zones	2016	MX
General Law of Human Settlements, Territorial Planning and Urban Development	2016	MX
Law of Sustainable Rural Development of the State of Chiapas	2017	MX
Environmental Law For the State of Chiapas	2017	MX
General Law of Sustainable Forest Development	2018	MX
General Law of Ecological Balance and Environmental Protection	1988 (consolidated 2018)	MX
Law of Sustainable Rural Development	2001 (consolidated 2017)	MX
Law for Development of the Competitiveness of Micro, Small and Medium Enterprises	2002 (2017)	MX

APPENDIX G:

ABOUT OUR CLIENT: WORLD RESOURCES INSTITUTE

One of the key groups leading global restoration efforts is the Global Restoration Initiative at the World Resource Institute (WRI).⁸⁵ The Global Restoration Initiative aims to accelerate the restoration of degraded land into sustainable agriculture, agroforestry, and forested landscapes by working with governments and international partners. They promote a three-pronged approach: inspire commitments to restoration, obtain the right enabling conditions in place, and mobilize implementation to achieve results.

WRI's efforts contribute to several restoration initiatives, including **The Bonn Challenge**,⁸⁶ **Initiative 20x20**,⁸⁷ the **New York Declaration on Forests**⁸⁸ and **AFR100**.⁸⁹ **The Bonn Challenge**, established in 2011 by the German government and the International Union for Conservation of Nature (IUCN),⁹⁰ aims to restore 150 million hectares of deforested and degraded forest land using

agroforestry and reforestation globally by 2020. Directly supporting the Bonn Challenge, **Initiative 20x20** is a country-led effort to change land use practices in Latin America and the Caribbean, with its goal of restoring 20 million hectares by 2020 representing almost 15 percent of the overall Bonn Challenge ambition. **The New York Declaration on Forests** is a political declaration among governments, companies, indigenous peoples and civil society that aims to restore 350 million hectares of deforested and degraded land by 2030. **AFR100**, also known as the African Forest Landscape Restoration Initiative, is another country-led initiative with the goal of restoring 100 million hectares of land by 2030. Taken together, the collective ambition of these programs is to restore over 600 million hectares of land. Transforming ambition into action, however, will require better tools and resources for identifying the most effective and efficient restoration policies for any given scenario.



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