

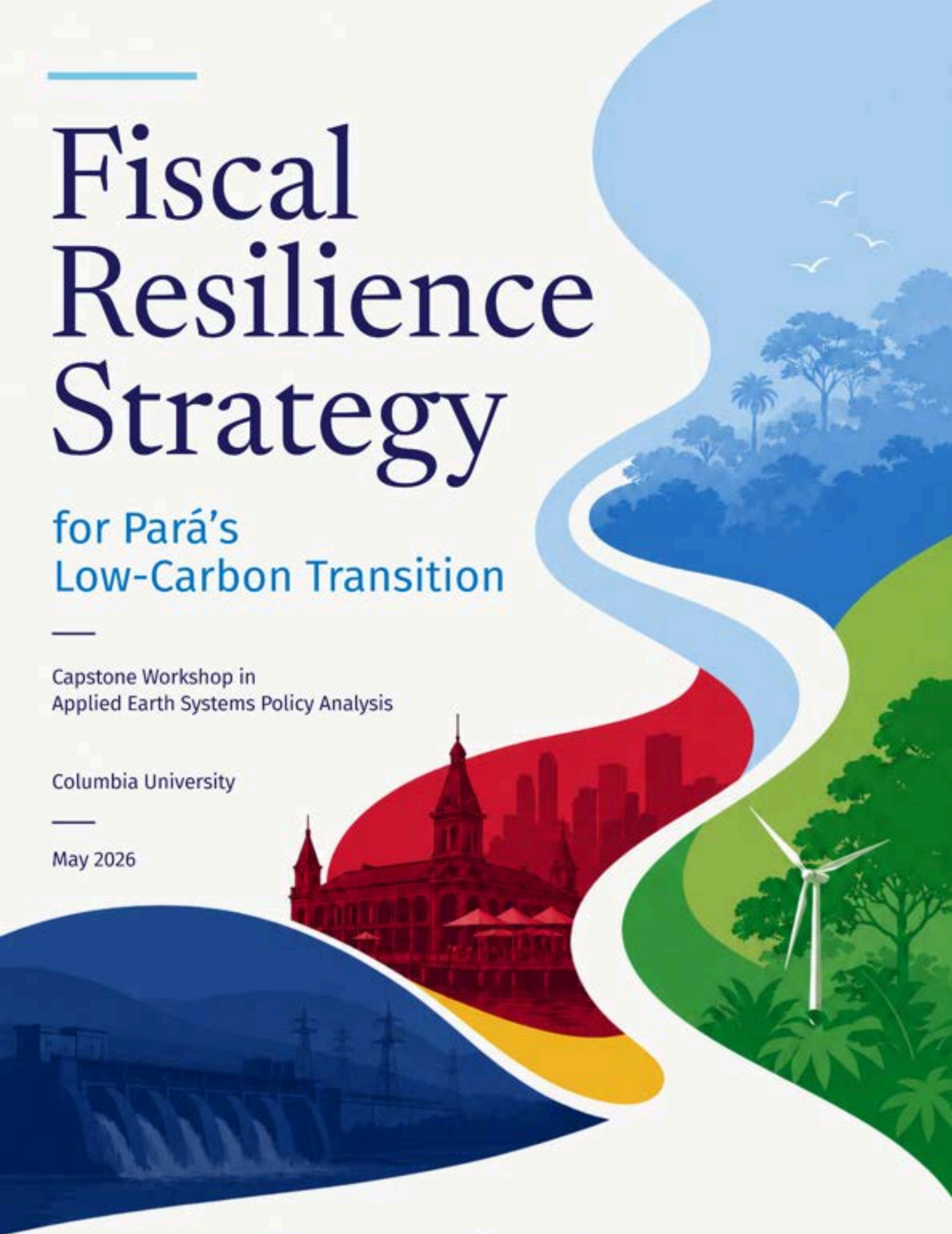
Fiscal Resilience Strategy

for Pará's
Low-Carbon Transition

Capstone Workshop in
Applied Earth Systems Policy Analysis

Columbia University

May 2026



Acknowledgments

This report is possible through the institutional sponsorship of Secretary René de Oliveira e Sousa Júnior and Vice Secretary Eli Sosinho of The State Secretariat of Finance of Pará, SEFA-PA, for the Capstone Team of Columbia University's Master of Public Administration in Environmental Science and Policy (MPA-ESP) Program. Institutional sponsorship included the provision of strategic guidance, access to information, and the engagement of SEFA PA technical staff.

The State Secretariat of Finance of Pará (SEFA) is the governmental authority responsible for fiscal administration and economic management in Pará, Brazil. The agency manages state public finances, including tax collection and budgetary execution, with a mission to promote sustainable development and balanced public accounts.

We also wish to acknowledge Ricardo Leitão, Tax Auditor at SEFA-PA, whose continual guidance and feedback ensured that this report's recommendations are effective and responsive to Pará's unique challenges in achieving carbon neutrality while sustaining socio-economic wellbeing.

The Capstone is the culminating requirement for Columbia University's Master of Public Administration in Environmental Science and Policy (MPA-ESP) program. It's designed to provide graduate students with practical experience in multidisciplinary policy analysis for government entities, detailing expert interviews, fiscal modeling, and case studies.

Capstone Team:

- **Diana Chipak**, Manager
- **Peyton Choo**, Deputy Manager
- **Brendan Chapko**, Fiscal Analysis Team Lead
- **Haejin Kim**
- **Maira de Roussan**, Solutions Team Lead
- **Muskaan Khemani**, Solutions Team Lead
- **Ana Roxana Spanache**
- **Yanrong Li**, Designer
- **Yelena Arkhangelskaya**
- **Yichun Huang**

Faculty Advisor: **Nancy Degnan, PhD**

This report relied heavily on engagement from external experts. Thank you to all individuals and organizations for their insights that guided the development of this report.

This report should be cited as:

Chipak, D., Choo, P., Chapko, B., Kim, H., de Roussan, M., Khemani, M., Spanache, A. R., Li, Y., Arkhangelskaya, Y., & Huang, Y. (2026). Fiscal resilience in a low-carbon transition: A strategy for the State Secretariat of Finance of Pará, Brazil. [Unpublished Capstone Project]. Columbia University, Master of Public Administration in Environmental Science and Policy.

Table of Contents

Acknowledgments	1
Table of Contents	2
Executive Summary	4
Structure of Report	5
List of Figures and Tables	6
Glossary	7
I. Introduction	10
II. Research Methodology	12
2.1 RESEARCH QUESTION	12
2.2 METHODOLOGY	12
III. Expert Interviews	14
IV. Fiscal Challenges of Decarbonization	17
4.1 STRUCTURAL ECONOMIC DEPENDENCY	17
4.2 TRANSITION EXPOSURES IN ICMS INCENTIVES	17
4.3 PROJECTED DECLINE IN FUEL ICMS REVENUE	18
4.4 FINANCIAL MODEL OVERVIEW	20
4.5 SCENARIO MODELING	21
4.6 BRAZIL'S NATIONAL TAX REFORM	22
4.6.1 ICMS Overview	22
4.6.2 IBS Overview	24
4.7 FEDERAL AND STATE REGULATIONS	25
V. Case Studies	29
5.1 CASE STUDY SELECTION METHODOLOGY	29
5.2 GREEN BUDGETING (CATALONIA, SPAIN)	31
5.3 REDD+ PROGRAM (EAST KALIMANTAN, INDONESIA)	32
5.4 TRANSIENT ACCOMMODATIONS TAX (HAWAII, USA)	33
5.5 STATE SOVEREIGN FUND (ESPÍRITO SANTO, BRAZIL)	34
VI. Recommendations for Policymakers	36

6.1 OECD-ALIGNED GREEN BUDGETING FRAMEWORK	36
6.1.1 Expected Impacts	37
6.1.2 Applying Green Budget Tagging to Para's ICMS Tax Breaks	37
6.1.3 Implementation Pathway	39
6.2 STATE SOVEREIGN FUND	40
6.2.1 Fiscal Potential	40
6.2.2 Implementation Pathway	40
6.3 ECO-TOURISM FEE	41
6.3.1 Fiscal Potential	41
6.3.2 Implementation Pathway	42
6.4 NATURE-BASED CLIMATE FINANCE	43
6.4.1 Carbon Credits (REDD+ Program)	43
6.4.2 Forest Restoration Concessions	44
6.4.3 Implementation Pathway	45
6.5 PROJECTED REVENUE SUBSTITUTION	46
6.5.1 Analysis of the 2036 Outlook (Medium-Term)	46
6.5.2 Analysis of the 2050 Outlook (Long-Term)	46
6.5.3 The Persistent Fiscal Gap	47
6.6 RECOMMENDATION PRIORITIZATION MATRIX	48
VII. Potential Risks	51
VIII. Conclusion	53
IX. Bibliography	55
Appendix	57

Executive Summary

The State of Pará - the second-largest in the Brazilian Amazon - has set ambitious goals of achieving net-zero from "Land Use and Forests emissions by 2036 (PEAA, 2020). As Brazil's leading mining state with a booming sector fueled by heavy fuels consumption, Pará faces a "Fiscal Paradox": greenhouse gas reductions are undermining its primary revenue source. Fossil-fuel linked revenue historically comprised 25% of the state's value-added tax (ICMS) and 10% of its total budget in 2024, but this share is rapidly declining - from 23.1% in 2024 to 10.6% by 2035 [Model] - as the state decarbonizes.

This decline, termed an "Efficiency Trap", stems from key sectors like mining shifting to cleaner, more efficient fuel sources such as liquefied natural gas (LNG). LNG delivers up to 37% higher thermal efficiency, which reduces fuel consumption volumes by a third, while cutting GHG emissions by approximately 25%. State incentives Law No. 6,489 that link ICMS tax discounts to carbon reductions further accelerate this transition, inadvertently eroding the taxable fuel base.

This report proposes a 10-year fiscal resilience strategy for Pará's State Secretariat of Finance (SEFA-PA) based on three pillars to manage the low-carbon transition:

- Align the Brazilian Sustainable Taxonomy and institutionalize Green Budgeting to secure National Treasury Guarantees and "Greenium" rates for capital market investment.
- Establish a State Sovereign Fund, capitalized with a suggested 40% floor from mining royalties (CFEM), projected to reach R\$ 50 billion by 2050 [Model], serving as a permanent fiscal buffer against commodity volatility.
- Unlock the R\$ 170 billion potential by 2050 through nature-based climate finance [Model], including jurisdictional carbon markets (REDD+), forest restoration concessions (URTX), and eco-tourism taxation. By diversifying the tax base from industrial consumption to nature-based outputs.

By integrating these mechanisms, Pará can navigate the energy transition not as a revenue vulnerability, but as a catalyst for long-term fiscal resilience and sustained economic growth. While these new revenue streams are vital mitigants, fiscal modeling indicates they serve as supplementary buffers rather than total substitutes for legacy tax revenue, necessitating a broader structural shift toward a value-added bioeconomy.

Structure of Report

This report provides the State Secretary of Finance of Pará with a strategy to strengthen its fiscal resilience as it transitions to a low-carbon economy. We move from analysis to solutions:

- **Section I** Introduces the "Fiscal Paradox" facing Pará—the challenge of maintaining state revenue while pursuing aggressive decarbonization and environmental targets.
- **Section II** Outlines the technical approach, including the Financial Model Structure used for quantitative analysis and the Projected Fiscal Gap Scenarios that model budget expenditures against revenue through 2050.
- **Section III** Summarizes insights from the Expert Interviews, featuring perspectives from eleven structured interviews with participants across various sectors and countries.
- **Section IV** Diagnoses the state's fiscal exposure, focusing on Fuel ICMS Revenue Projections and state GDP impact. This section also analyzes the structural impacts of Brazil's Tax System Reform and the prevailing Legal and Regulatory Frameworks.
- **Section V** Employs a Case Study Selection scorecard to assess international best practices for their fit in Pará, then examines four key case studies:
 - i. Green Budgeting (Catalonia, Spain)
 - ii. REDD+ Program (East Kalimantan, Indonesia)
 - iii. Transient Accommodations Tax (Hawaii, USA)
 - iv. State Sovereign Fund (Espírito Santo, Brazil)
- **Section V** then translates these findings into a specific and actionable set of recommendations for the SEFA-PA, setting out -short, medium-, and long-term actions.
- **Section VI** Translates findings into an actionable roadmap. It covers ICMS Tax Incentive realignments, State Sovereign Fund Growth models, and new revenue streams like Eco-Tourism Fee, Forest Carbon Credits, and Restoration Concessions (URTX).
- **Appendix** Provides A, the original financial model serving as the report's analytical foundation. Table B details the best-practices scorecard and international case study selection methodology. Table C synthesizes the qualitative insights and policy validations derived from eleven expert interviews. Table D outlines methodology behind impact-effort prioritization matrix.

List of Figures and Tables

Figures

Figure 1. Fuel ICMS Revenue Projections (-3% vs. -5%) (2026–2036)

Figure 2. Fuel ICMS Revenue Projections (-3% vs. -5%) (2017–2050)

Figure 3. Fiscal Loss from Fuel-related ICMS Decline vs. GDP (2026–2036)

Figure 4. Fiscal Loss from Fuel-related ICMS Decline vs. GDP (2026–2050)

Figure 5. Top 10 Product Categories by ICMS Tax Incentives

Figure 6. ICMS Tax Incentives by Climate Category (Green/Gray/Brown)

Figure 7. State Sovereign Fund Growth Projections (2028–2050)

Figure 8. Eco-Tourism Fee Revenue Projections (2030–2050)

Figure 9. Carbon Credit Program Revenue Projections (2030–2050)

Figure 10. Monthly Net Impact of Tax Losses and Revenues from Energy Transition in Pará (2036)

Figure 11. Monthly Net Impact of Tax Losses and Revenues from Energy Transition in Pará (2050)

Figure 12. Impact-Effort Prioritization Matrix

Tables

Table 1. Expert Interview Overview: Participants by Sector and Country

Table 2. Financial Model: Excel Workbook Tab Descriptions

Table 3. Projected Fiscal Gap: Budget Expenditures vs. Scenarios (2025–2050) (unit, R\$ billion)

Table 4. ICMS Tax Framework: Key Components and Strategic Impact

Table 5. Dual VAT (IBS) Reform: Structural Components and Benefits

Table 6. Legal and Regulatory Framework: Federal and State Policy Overview

Table 7. Case Study Selection: Indicators and Scorecard Criteria

Table 8. Green Governance Comparison: OECD Framework vs. Brazilian Sustainable Taxonomy

Table 9. Projected Monthly Revenue Substitution Summary (2036 vs. 2050)

Glossary

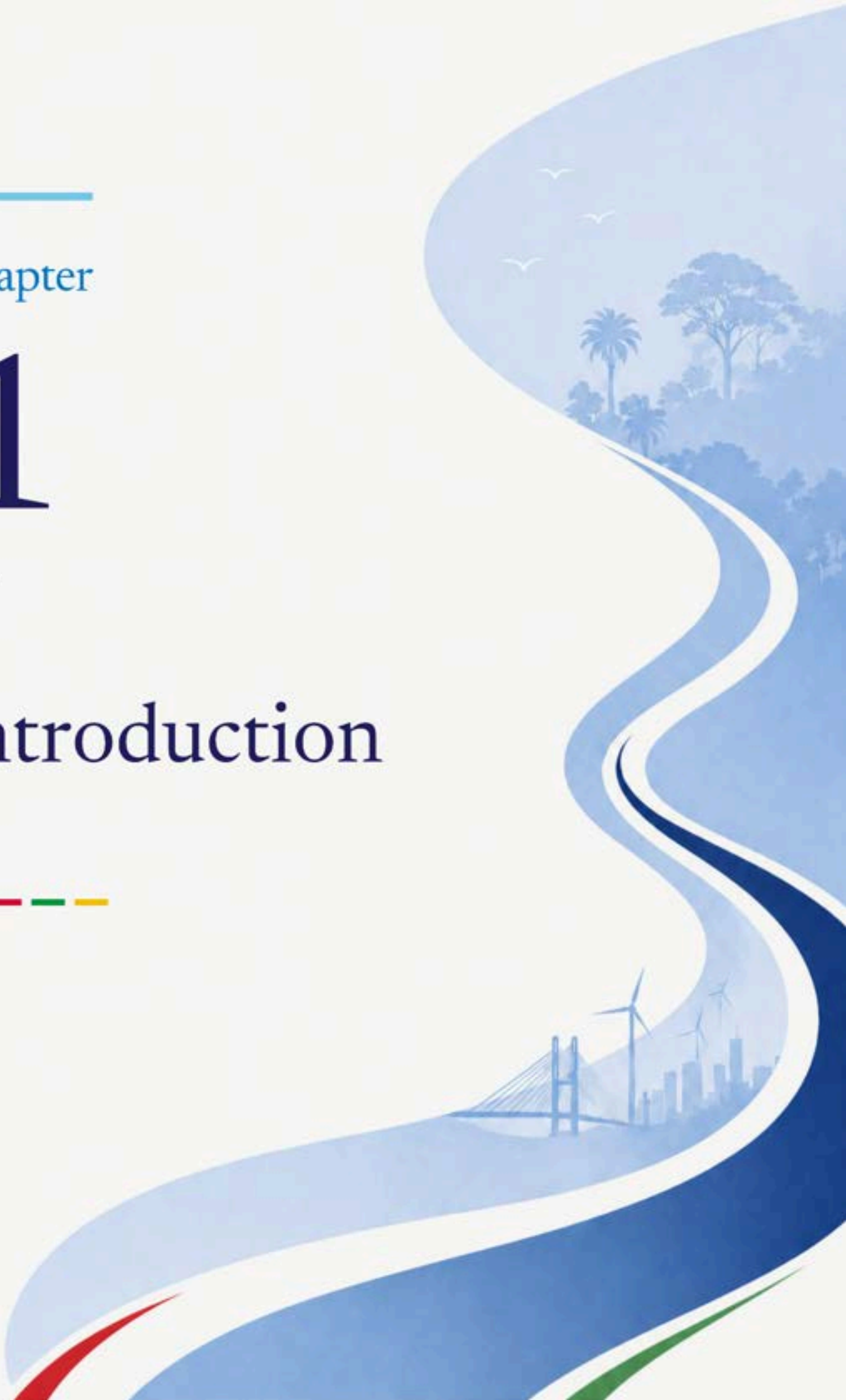
ART TREES	Environmental Excellence Standard
BANDES	State Development Bank of Espírito Santo
BANPARÁ	State of Pará Bank S.A.
BLU-BPDLH	Badan Pengelola Dana Lingkungan Hidup (Indonesian Environment Fund)
BRL or R\$	Brazilian Real
CAGR	Compound Annual Growth Rate
CBS	Contribuição sobre Bens e Serviços (Federal VAT)
CFEM	Financial Compensation for Mineral Exploration (Mining Royalties)
CGIBS	IBS Management Committee
COFOG	Classification of Functions of Government
FAPESPA	Amazon Foundation for Research and Studies
FCPF	Forest Carbon Partnership Facility
FUNSES	State Sovereign Fund of Espírito Santo
GDP	Gross Domestic Product
GHG	Greenhouse Gas Emissions
IBGE	Brazilian Institute of Geography and Statistics
IBS	Imposto sobre Bens e Serviços (State VAT)
ICMS	Imposto sobre Circulação de Mercadorias e Serviços
IDB	Inter-American Development Bank
IPVA	Imposto sobre a Propriedade de Veículos Automotores (State Vehicle VAT)
ISS	Imposto Sobre Serviços (Municipal Services Tax)
LCP	Lei Complementar (Supplementary Law)
LDO	Lei de Diretrizes Orçamentárias (Budget Guidelines Law)

LEAF	Lowering Emissions by Accelerating Forest Finance
LNG	Liquefied Natural Gas
LOA	Lei Orçamentária Anual (Annual Budget Law)
MPO	Ministry of Planning and Budget
MRV	Measurement, Reporting, and Verification
NDC	Nationally Determined Contribution
NPV	Net Present Value
OECD	Organisation for Economic Co-operation and Development
PEAA	Plano Estadual Amazônia Agora (State Plan Amazon Now)
PES	Payments for Ecosystem Services
PlanBio	State Bioeconomy Plan
PPA	Plano Plurianual (Multiannual Plan)
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SEDEME	State Secretariat for Economic Development, Mining and Energy
SEFA-PA	State Secretariat of Finance of Pará
SEMAS	State Secretariat for Environment and Sustainability
SEPLAD	State Secretariat for Planning and Administration
SOF	Federal Budget Secretariat
TAT	Transient Accommodations Tax
TSB	Taxonomia Sustentável Brasileira (Brazilian Sustainable Taxonomy)
URTX	Triunfo do Xingu Recovery Unit (Restoration Concessions)
VAT	Value Added Tax

Chapter

1

Introduction



I. Introduction

Pará is at a pivotal point in its development trajectory. As one of the most environmentally significant states in Brazil nestled in the heart of the Amazon rainforest, it is undergoing a low-carbon transition. In its latest nationally determined contribution (NDC), Brazil has committed to reducing net greenhouse emissions by 67% in 2035 and achieving carbon neutrality by 2050 (Presidência da República, 2024). Pará is also committed to achieving these goals.

Roughly 76% of Pará's territory is covered by native vegetation, giving the state a unique opportunity to leverage its position and resources rather than continue dependence on emissions-intensive activities (Global Forest Watch, n.d.). At the same time, Pará faces a significant low-carbon transition challenge. Pará is Brazil's largest greenhouse gas-emitting state, with emissions heavily concentrated in land use and rural activities (IPAM Amazonia, 2021).

In fact, 80% of emissions come from the conversion of forest into open areas and 15% from livestock activity, meaning that 95% of state greenhouse gas emissions are linked to these activities (SEMAS, 2024). Forest conversion is closely tied to the state's broader productive economy, including agriculture, livestock, mining, logistics, and industrial activity. These sectors shape both the pressure placed on forested land and the revenue streams that support Pará's public finances. As a result, the low-carbon transition must be understood not only as a land-use challenge, but also as an industrial and fiscal transition.

As Pará moves toward cleaner industrial processes and lower-carbon energy sources such as liquified natural gas (LNG), part of the state's existing revenue base may come under pressure. Approximately 25% of Pará's primary revenue comes from its state-level value-added tax Imposto sobre Circulação de Mercadorias e Serviços (ICMS), with a meaningful share linked to the fuel supply chain. In other words, as the state is moving towards decarbonization, a fraction of its revenue base still depends on the activities that the transition aims to reduce.

This transition creates a fiscal paradox, in that it presents a structural imperative to decouple Pará's fiscal health from carbon-intensive activities, establishing a diversified and resilient revenue base that protects the state's capacity to fund essential public services.

This report has been prepared for the State Secretariat of Finance of Pará (SEFA-PA). It examines how the state can address potential revenue losses linked to the low-carbon transition while continuing to support decarbonization and long-term economic development. The report focuses on practical recommendations to help Pará offset fiscal risks, diversify its economic base, and strengthen new sources of low-carbon economic growth.

These recommendations are strategically anchored in the State Bioeconomy Plan (PlanBio, 2024), which defines the bioeconomy as a foundational pathway for low-carbon socioeconomic development. Taken together, these recommendations aim to help Pará navigate the tension between environmental progress and fiscal resilience, and to turn the low-carbon transition into an opportunity for sustained growth.

Chapter

2

Research Methodology



II. Research Methodology

2.1 RESEARCH QUESTION

How can the State of Pará stabilize state revenue as it transitions to a low-carbon economy?

2.2 METHODOLOGY

The report employs a multidimensional approach to design a set of recommendations

- **Fiscal Modeling:** We integrate original fiscal analysis on SEFA-PA historical data to project transition-related revenue pressures and model the potential impacts of proposed recommendations until 2050. We apply scenario-based analysis to capture varying decarbonization rates. Appendix A
- **Case Study Review:** Extensive analysis of client materials, policy documents, and secondary sources establishes the report's analytical framework. This review drives the development of a best-practices scorecard and informs the selection of four state-level case studies. Appendix Table B
- **Expert Interviews:** Eleven semi-structured interviews with stakeholders across state government, academia, development finance, and non-profit sectors validate our implementation assumptions and refine the policy pathways. Appendix Table C

Chapter

3

Expert Interviews



III. Expert Interviews

Because of the complexity and contemporary nature of Pará's fiscal paradox, we conducted 11 expert semi-structured, 30-minute interviews over a two-month period. Of the 11 organizations, three are academic and research based, three are in the public sector, three are NGO's, one is the private sector, and one is an international cooperation platform and education/training initiative. Table 1 lists each interviewee, their organization and role, and the sector and nation they represent.

Table 1. Expert Interview Overview: Participants by Sector and Country

No.	Name	Role	Organization	Sector	Country
1	Ma Jun	Chairman	Capacity-building Alliance of Sustainable Investment (CASI)	Sustainable Development Finance	China
2	Polly Lima	Sr. Engagement Manager	McKinsey & Co.	Management Consulting	Brazil
3	Ana Cláudia Costa	Directora EUA	Conexsus - Instituto Conexões Sustentáveis	NGO / Non-Profit	Brazil
4	Dong Guo	Director & Adjunct Assistant Professor of International and Public Affairs	Earth Institute China Initiative at Columbia University	Academia	China / USA
5	Luciana De Lamare	Co-Founder & President	Aupaba Institute	Research Institute	Brazil
6	Virginia Bagnoli	Senior Program Manager	Climate Group Europe	NGO / Non-Profit	Europe
7	Luis Zamarioli	Technical Consultant	Climate Group	NGO / Non-Profit	Brazil
8	Satyajit Bose	Professor of Practice; Associate Director, M.S. in Sustainability Management Program	Columbia University	Academia	USA
9	Carlos Aragon	Country Director	Governors' Climate and Forests Task Force, Global Committee For Indigenous Peoples & Local Communities	Subnational Coalition	Brazil
10	Renata Ribeiro Souza Nobre	Vice Secretary	Secretariat of Environment and Sustainability of Pará (SEMAS)	Public Sector	Brazil
11	Camille Bendahan Bemerguy	Deputy Secretary of Bioeconomy	Secretariat of Environment and Sustainability of Pará (SEMAS)	Public Sector	Brazil

Because of each interviewee's deep subject matter expertise, interview questions were designed to probe for risks and opportunities Pará currently faces and may continue to face, as it transitions to a low carbon economy. As such, the experts provided context specific insights for decision and policymaking to inform revenue generating approaches while helping to mitigate unintended consequences. Finally, because the questions were semi-structured and specific to this five-month project timeframe [January - May 2026], SEFA may want to engage in ongoing follow-up with the experts as Para continues its transition.

Overall, the experts highlighted the following:

- First, the need for stronger fiscal planning—to allow governments to design effective incentives and make better policy choices.
- Second, the importance of a balanced, phased transition to avoid fiscal shocks and maintain socio-economic stability—a crucial factor for a developing economy.
- Third, the need to replace declining revenues gradually, without increasing the tax burden on households.

The localized perspectives provided by these specialists ensure that the strategic roadmap detailed in Section VI remains technically feasible and contextually aligned with Pará's fiscal requirements. A comprehensive synthesis of these expert contributions is documented in Appendix Table C.

Chapter

4

Fiscal Challenges of Decarbonization



IV. Fiscal Challenges of Decarbonization

4.1 STRUCTURAL ECONOMIC DEPENDENCY

Pará's fiscal resilience may be compromised by a disconnect between economic output and state tax generation. As an example, In 2019, mining exports totaled US\$ 17.3 billion (PlanBio, 2024). Although mining is the state's fastest-growing sector, federal Complementary Law No. 87 limits the state's capacity to collect ICMS tax on raw and semi-manufactured exports.

As a result, the state taxes industrial fuel inputs instead of the actual export value (Lucena Cavalcante & McCall Zancocchi, 2020). The Financial Compensation for Mineral Exploration (CFEM), a 3-4% tax on

net mining sales allocates 75% directly to mining municipalities and 15% to the state, and 10% to the federal government (Climate Policy Initiative & Pontifícia Universidade Católica do Rio de Janeiro, 2022).

The increasing shift of mining operations toward cleaner fuels, while environmentally beneficial, creates an "Efficiency Trap" for the state. As the consumption volume declines due to increased thermal performance per unit of output, a key source of state tax revenue is inadvertently reduced (Estado do Pará, 2013; PlanBio, 2024).

4.2 TRANSITION EXPOSURES IN ICMS INCENTIVES

Pará's ICMS incentive framework Law No. 6,489 (Pará, n.d.) is a key tool for promoting industrial development and maintaining competitiveness. However, the current structure exposes the state to transition risks during decarbonization. The program has relied on broad qualitative criteria, with tax-incentives based on state's economic development goals rather than environmental performance indicators. The 2024 adoption of the state's bioeconomy strategy allows Pará to gradually shift incentives toward measurable outcomes, such as emissions reduction, energy efficiency, and bioeconomy integration.

Our preliminary product-level review of ICMS tax breaks suggests that 52% falls into categories with mixed or uncertain environmental implications, while 27% is linked to more carbon-intensive activities, and only 20% appears aligned with lower-carbon or bioeconomy-oriented activities. [Review] These findings suggest that the current incentive structure is not yet fully aligned with Pará's long-term low-carbon economy objectives. As Brazil transitions away from the ICMS tax system and related incentives, by 2033, the state has a critical opportunity to reassess legacy incentives and introduce environmental performance indicators for future beneficiaries. A detailed discussion is provided in Section 6.1.2.

4.3 PROJECTED DECLINE IN FUEL ICMS REVENUE

We quantified the energy transition's fiscal exposure to Pará's primary revenue instrument, ICMS, by analyzing the impact of annual reductions in Fuel ICMS revenue. Historically, the fossil fuel supply chain has been a critical fiscal anchor, generating ~25% of ICMS revenue. We modeled two scenarios: a -3% annual reduction and a -5% annual reduction in fuel ICMS revenue from 2026–2050, while other ICMS components follow historical baselines.

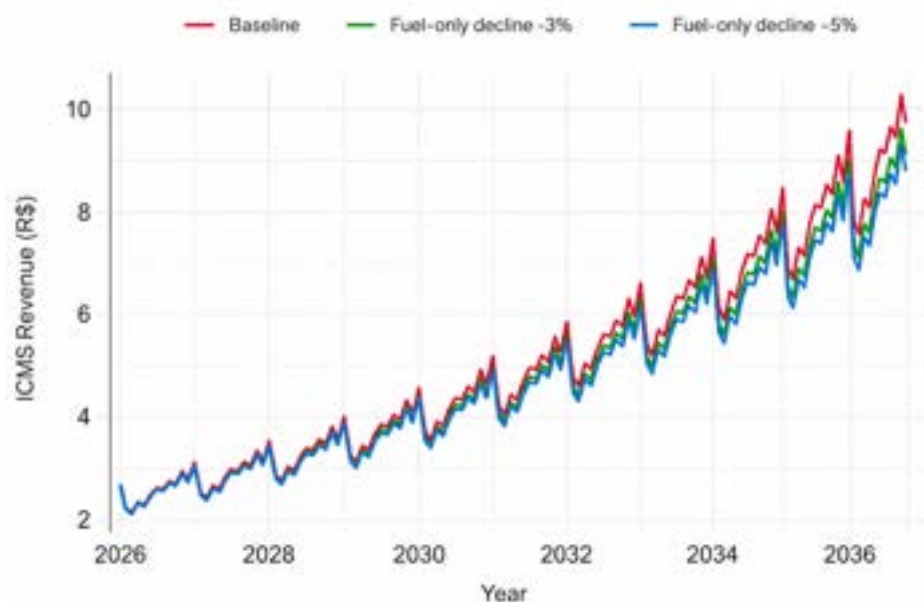


Figure 1. Fuel ICMS Revenue Projections (-3% vs. -5%) (2026–2036)

Total ICMS revenues continue to grow across scenarios, driven by non-fuel components, but transition scenarios show lower trajectories, with divergence after 2030. Cumulative fiscal losses highlight the macroeconomic significance, as fuel-related ICMS decline creates persistent impacts despite being a portion of total revenue.

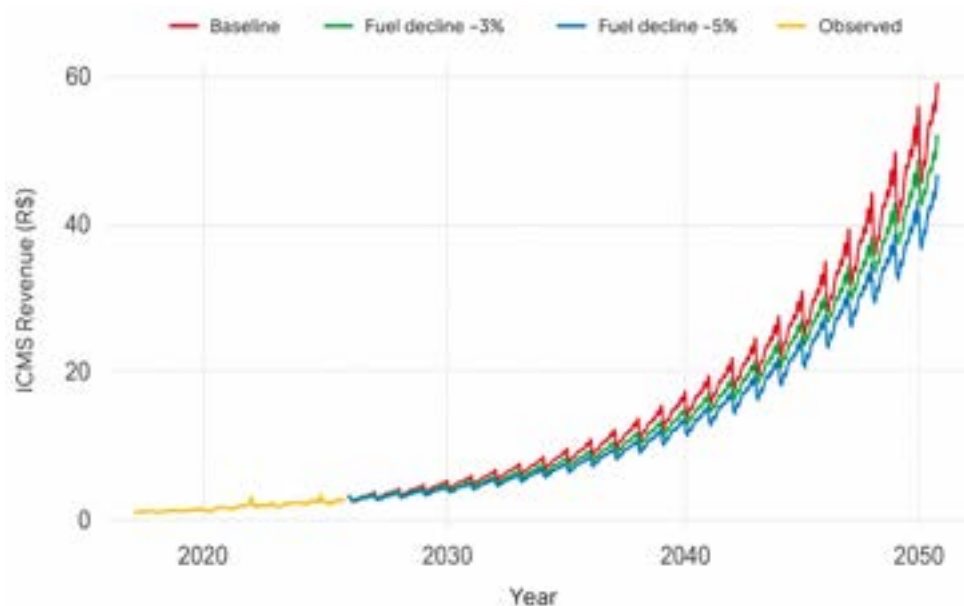


Figure 2. Fuel ICMS Revenue Projections (-3% vs. -5%) (2017–2050)

Fiscal gap analysis includes NPV of losses and GDP comparisons to underscore macroeconomic scale. Cumulative and discounted (NPV) losses show the policy-relevant burden, with state GDP context highlighting adjustment needs.

Figures 3 and 4 highlight the scale of fiscal exposure from declining fuel-related ICMS revenues. While cumulative losses illustrate overall impact, discounted loss (NPV) reflects present-value burden. Comparison with state GDP indicates the economy's required adjustment to absorb the shock. Fuel-related ICMS decline creates disproportionately large impacts due to its scale and persistence.

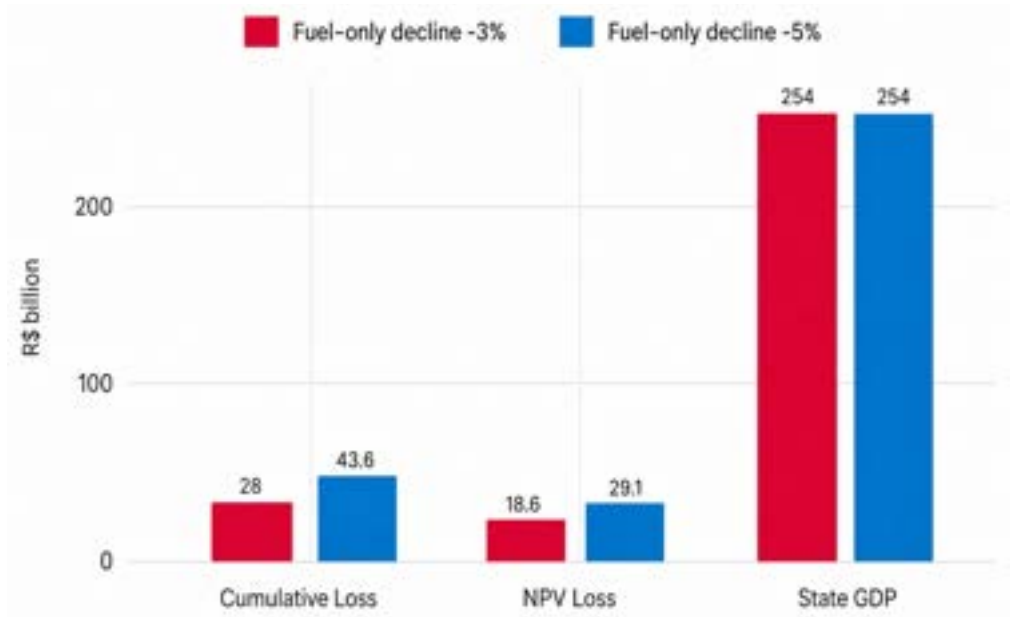


Figure 3. Fiscal Loss from Fuel-related ICMS Decline vs. GDP (2026–2036)

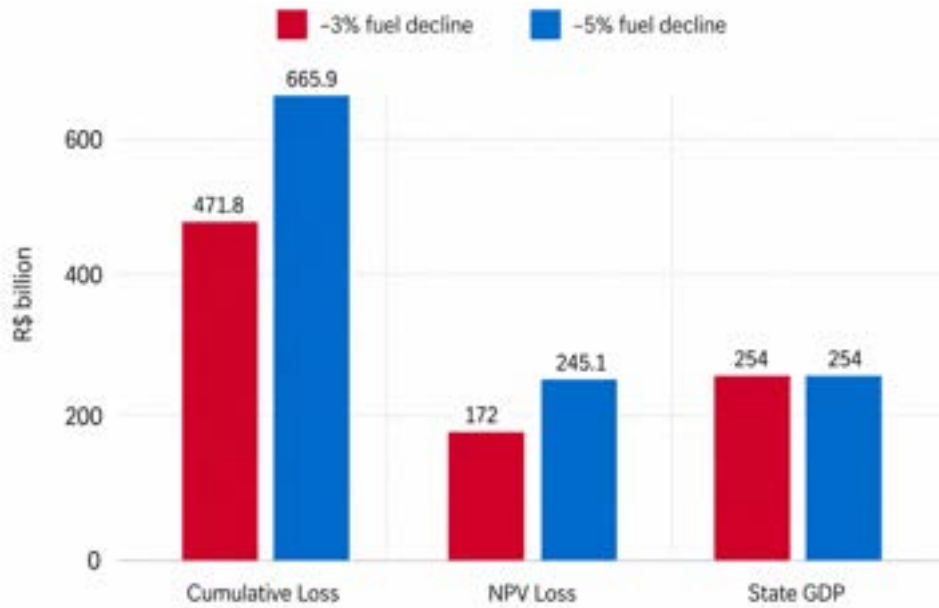


Figure 4. Fiscal Loss from Fuel-related ICMS Decline vs. GDP (2026–2050)

4.4 FINANCIAL MODEL OVERVIEW

The findings of this report are driven by an original quantitative financial model that serves as the analytical backbone for diagnosing Pará's "Fiscal Paradox" and evaluating potential solutions. By projecting revenue trajectories through 2050, the model bridges the gap between the state's environmental goals and the structural necessity for fiscal stability.

The model is designed as a dynamic scenario-testing tool that jointly projects ICMS revenue and budgetary needs. It allows for the systematic evaluation of the state's fiscal position by contrasting historical baselines with future transition shocks and proposed policy interventions. The specific organization and components of the model are detailed in Table 2, which provides a description of the individual workbook tabs.

Table 2. Financial Model Structure: Workbook Tab Descriptions

Tab Name	Description
Summary	A basic overview of projected budget needs, tax revenues, and deficits under multiple scenarios through 2050
Dashboard	Contains all the assumed inputs that inform the model; all edits should be made in this tab
Data Visualization	Highlights and displays overall financial position for 2036 and 2050
Detailed Summary	An expansion of the "summary" tab which breaks revenues into individual components
Budget Projections	A simple model projecting spending needs through 2050
Scenario 1 Total Tax Revenue	A simple model projecting tax revenues under baseline conditions (no tax losses from Fuel ICMS or IPVA exemption for EVs)
Non-Fuel Tax Revenue	A simple model projecting non-fuel dependent tax revenues under baseline conditions
Fuel ICMS	Estimates tax revenues by fuel type through 2050
IPVA Projections	Projects IPVA revenue through 2050, factoring in the new electric vehicle exemption
Tourism Tax Projections	Models the revenue that could be generated by placing a simple fee on international visitors
Carbon Credits (REDD+ Projections)	Estimates the potential financial impact of reducing deforestation in a program
EV Fee	Models the revenue potential of either a direct fee on electric vehicles or a gradual unwinding of the current IPVA exemption for EVs
Sovereign Fund	Projects the earnings and growth of an investment fund capitalized by natural resource royalties
ICMS Subsidy Breakdown	Breaks down Pará's current ICMS tax subsidies by product and sector (Green, Gray, or Brown)

The model's projections are built upon a rigorous foundation of verified data sources, ensuring the recommendations are both transparent and technically sound. Economic drivers include long-term inflation targets from the Banco Central do Brasil (~3.0%) (Banco Central do Brasil, 2025) and historical GDP growth averages from the World Bank (~2.3–2.5%) (World Bank Group, 2025). Demographic trends are informed by population growth projections from IBGE (Instituto Brasileiro de Geografia e Estatística, 2024), while future budgetary needs are modeled to grow at 5-5.5% annually to keep pace with inflation and rising public service demand. Electric Vehicle (EV) adoption and sales volume projections rely on national market data from the (ANFAVEA, 2026) and Pará-specific vehicle registration statistics from Detran-PA (Governo do Pará, 2025). Finally, the model utilizes historical sales and fiscal collection data from the SEFA-PA to establish reliable baselines for the transition analysis detailed below (State Secretariat of Finance of Pará, n.d.).

4.5 SCENARIO MODELING

Three scenarios are considered:

1. **Baseline Scenario (Baseline):** Assumes total tax revenue follows its historical trajectory, summing projected non-fuel, Fuel ICMS, and IPVA, with no energy transition-related structural changes.
2. **Transition Scenario (Scenario 2):** Incorporates energy transition structural changes, causing fuel-related ICMS to decline (most fuels at ~3% annually post-2030)¹ due to reduced consumption. IPVA revenue also declines, reflecting Pará's Law No. 11.223 exempting EVs under R\$ 150,000 from car ownership tax. This is modeled on a growing EV share in new vehicle sales, resulting in a 28% IPVA decline by 2050 relative to Baseline Scenario.
3. **Policy Scenario (Scenario 3):** Builds on Scenario 2 by adding revenue-generating policies to offset transition losses, including new revenue streams (tourism tax, carbon financing mechanisms, and sovereign fund savings) phased in over time, alongside adjusted Fuel ICMS and IPVA.

Table 3. Projected Fiscal Gap: Budget Expenditures vs. Scenarios (2025–2050) (unit, R\$ billion)

Year	Budget Expenditures	Baseline	Transition Revenue	Policy Scenario	Baseline vs. Transition Fiscal Deficit	Baseline vs. Policy Fiscal Deficit
2025	51.0	38.4	38.4	38.4	0.0	0.0
2035	86.1	64.9	62.4	63.2	-2.5	-1.7
2050	189.1	142.5	127.4	134.3	-15.2	-8.2

¹ Hydrous ethanol and Gasoline C are projected to decline by -1.41% annually to match the modeled rise of electric vehicles, as both fuels are primarily used in transportation. Fuel oil is modeled at an accelerated -5% annual decline rate to reflect current trends in Pará. Fuel decline rates are changeable by fuel type in the attached financial model.

Table 3 results show that under Transition (Scenario 2), the fiscal gap widens significantly over time. While tax revenue continues to grow in absolute terms, it fails to match rising expenditures. As a result, a persistent fiscal deficit emerges.

By 2035, the fiscal deficit will reach roughly R\$ 1.8 billion under the Transition (Scenario 2), compared to R\$ 1.1 billion under the Policy (Scenario 3). By 2050 the fiscal gap reaches R\$ 12.8 billion under Transition (Scenario 2) and R\$ 5.8 billion under Policy (Scenario 3) respectively. These findings indicate that although Policy recommendations (Scenario 3) can mitigate fiscal deficit, they are insufficient to fully offset the structural decline in fuel component of the ICMS. As a result, the energy transition highlights the need for a broader economic shift to offset declining dependence on fuel-based revenues.

4.6 BRAZIL'S NATIONAL TAX REFORM

Brazil is undergoing a structural transformation of its fiscal landscape through Constitutional Amendment 132, which addresses the systemic complexities of the national tax framework. As emphasized in OECD research (Arnold et al., 2025), implementing a value-added tax (VAT) within a federalist structure presents significant coordination challenges, requiring a robust subnational alignment to prevent revenue destabilization.

This reform mandates the phased replacement of the existing state-level ICMS and municipal-level Imposto Sobre Serviços (ISS) with a dual VAT system comprised of the federal Contribuição sobre Bens e Serviços (CBS) and the subnational Imposto sobre Bens e Serviços (IBS). Under this dual structure, both taxes share an identical calculation base to drastically simplify corporate compliance, but direct revenues to different jurisdictions. While the subnational IBS secures state and municipal budgets, the federal CBS consolidates legacy national taxes (e.g., PIS and COFINS) to exclusively fund federal social security and national programs.

The legislative framework was established in 2023, the transition is scheduled to occur between 2026 and 2033, fundamentally shifting Brazil's tax base from an origin to a destination-based model.

4.6.1 ICMS Overview

ICMS is Pará's main state-level value-added tax on the circulation of goods, services, transportation and communication activities. In 2025, the ICMS accounted for 75% of Para state revenue (SEFA-PA, n.d.). Businesses are required to pay an ICMS tax on what they purchase (inputs), charge it on what they sell (outputs), and subtract what they paid from what they charged. In doing so, only the value added is being taxed.

The tax incentive system state Law No. 6,489 provides exemptions, reductions in the calculation basis, deferrals, and presumed credits to state's target sectors. Sectors include industries in general, mining, fish, livestock, and agro-industries, with incentive levels ranging from 50% to 95% over a period of 7 to 15 years (SEDEME, 2021).

Mining is central to Pará's economy (Araujo et al., 2022) due to its size, annual growth rate and GDP contribution. Because of the federal Kadmir Law prohibiting state-level revenue capture on primary exports, mining sector ICMS tax incentives further reduce the state's revenue. Although

tax breaks are often justified through job creation, investment attraction and regional competitiveness, these high incentives have a significant fiscal impact on the state budget.

A quarter of total ICMS collections is automatically allocated to the state's 144 municipalities, while the remaining 75% goes to the state budget. At the municipal level, 75% of the ICMS tax revenue is allocated based on population size, while 25% follows a state-defined performance criteria. This mechanism limits the state's direct fiscal control over its largest revenue sources.

Table 4. ICMS Tax Framework: Key Components and Strategic Impact

Component	Description	Fiscal & Strategic Impact
Tax Mechanism	A 19% VAT tax on goods, services, transportation, and communication	Represents ~75% of Pará's state budget
Tax Instrument	ICMS Incentive System Law 6,489 grants incentives ranging from 50% to 95% of ICMS for 7 to 15 years	Potential for significant revenue contribution and job creation across target sectors (General industry, Fish, Livestock, Agro-industry)
Revenue Allocation	25% of ICMS revenue is automatically allocated to municipalities	Limits the state's discretionary revenue retention
Green ICMS (ICMS Ecológico)	An additional 5-8% of the ICMS revenue allocation is distributed to municipalities based on their environmental KPIs	Serves as an incentive mechanism for improved environmental performance at the municipal level

While the standard ICMS framework presents distinct fiscal hurdles for producing states, the Green ICMS (*ICMS Ecológico*) (Agência Pará, n.d.) represents a vital policy innovation for Pará. Rather than merely redistributing funds based on population density, this mechanism proactively aligns subnational fiscal policy with critical environmental goals. By linking municipal revenue streams directly to verifiable metrics—such as reducing deforestation and expanding protected areas—the Green ICMS transforms a traditional tax redistribution formula into an active, localized financial lever for conservation and sustainable development.

Despite this innovation, the origin-based ICMS design creates three systemic challenges driving Brazil's 2033 tax reform:

- **Inequitable Distribution:** It favors high-population consumer states, as revenue depends on local consumption rather than production. For states like Pará, where the population is below the national average, exempt exports translate into low revenue despite one of the largest industrial production in Brazil.
- **Cascading Taxation:** Partial ICMS credits cause tax cascading. Businesses pay ICMS on inputs but recover only part of those credits by deducting them from ICMS collected on sales through the standard VAT mechanism. Consequently, unrecovered tax accumulates at every production step, driving up prices for final consumers.

- Inter-state Fiscal Wars (Guerra Fiscal):** Inter-state fiscal wars are one of the most relevant issues Brazil is facing, and ending it has become a priority for the federal government. Under the ICMS system, states have historically competed by unilaterally lowering tax rates or offering aggressive corporate exemptions to attract businesses. This causes nationwide revenue loss and legal uncertainty (Omnitax, 2025). Ending this competition is crucial for stabilizing state revenues and preventing capital losses.

These compounding flaws make the shift to a unified, modernized tax system crucial for fiscal stability across all 27 Brazilian states.

4.6.2 IBS Overview

The Imposto sobre Bens e Serviços (IBS), established under a Constitutional Amendment No. 32, replaces ICMS and ISS and will be in full implementation by 2033. A primary objective of the reform is to make taxation in Brazil more transparent and consistent with global VAT models. For Pará, as for other states that rely heavily on ICMS revenue, this shift is fundamental to ensuring fiscal stability while the new system is phased in.

The new IBS fundamentally differs from the former ICMS by establishing a centralized governance structure through the IBS Management Committee (CGIBS), which is responsible for both revenue collection and distribution. Crucially, this structural change also resolves the "Efficiency Trap," where a reduction in fossil fuel consumption - driven by shift to cleaner energy - would otherwise lead to an active decrease in state tax collections under the old model.

Table 5. Dual VAT (IBS) Reform: Structural Components and Benefits

Component	Description	Fiscal & Strategic Impact
Tax Base	Shifts the tax burden from the location of production/origin to the location of final consumption/destination	Eliminates reliance on fuel consumption revenue and provides an opportunity to capture growth from the bioeconomy
Rate	~26.5% Total VAT (of that, ~17.7% allocated to the state)	Ensures revenue stability through a 58-year revenue Compensation Fund (Fundo de Compensacao), enhancing predictability
Tax Credits	Full Input Credits	Promotes competitiveness and mitigates cascading taxation by moving from partial to full crediting
Governance	Centralized coordination via CGIBS to harmonize rates and prevent competitive tax incentives	Resolves inter-state fiscal wars by shifting from different state rates to a nationally coordinated system

The synergistic effect of these IBS mechanisms—specifically the combination of a destination-based model with a full input credit system—fundamentally rewrites the economic incentives for local industry. Under the ICMS, partial credits trapped capital in the production chain, while the origin-based model penalized exporting states. By entirely eliminating cascading taxation through full crediting, and harmonizing the system nationally, the IBS

removes artificial tax barriers, making locally manufactured and processed goods structurally more competitive on the national market.

For the State of Pará, the destination-based nature of the IBS is ultimately its most vital feature for ensuring fiscal resilience during decarbonization. By taxing final consumption, it allows the state to sustain and grow revenue generated directly from local consumption and a growing bioeconomy, breaking the historical reliance on taxing extractive inputs. Furthermore, the reform includes robust protections for state budgets via the Compensation Fund (Fundo de Compensacao,n.d). Under this 58-year mechanism, the federal government will cover any revenue shortfalls if IBS receipts drop below prior ICMS baselines during the transition. Ultimately, this reform aligns Brazil's macroeconomic fiscal policy directly with Pará's strategic transition toward a low-carbon, value-added economy.

4.7 FEDERAL AND STATE REGULATIONS

Pará's fiscal and economic landscape is shaped by a complex mix of federal and state policies that influence both revenue generation and development strategy. While some regulations limit the state's ability to diversify its revenue base and implement fiscal reforms, others form the legal basis for advancing a low-carbon transition. Understanding how these frameworks interact is essential for crafting effective, forward-looking fiscal policy that supports both resilience and decarbonization. Key regulations are summarized in Table 6.

Existing regulations provide a strong foundation for Pará's low-carbon transition, with national legislation and the State Bioeconomy Plan setting an ambitious direction. The next step is to operationalize these commitments by strengthening the connection between strategic planning and budgetary allocations.

Pará is taking meaningful steps in this direction, and efforts to review and adapt fiscal policies reflect a pragmatic and forward-looking approach. While frameworks like the Kandir Law continue to shape revenue streams, aligning budget decisions with State Bioeconomy Plan priorities will help the state achieve decarbonization and development goals.

Table 6. Legal and Regulatory Framework: Federal and State Policy Overview

Regulation	Level	Goal	Fiscal Mechanism	Implications for Para	Challenge or Opportunity
Kandir Law Law No. 87 (Brasil, 1996)	Federal	Increases raw/semi-manufactured exports competitiveness on global commodity market	ICMS exemption on exports	Limits Para's ability to capture revenue from extractive sectors, increasing dependence on external markets.	Challenge: Reduces fiscal resilience and diversification capacity for carbon-intensive sectors
The Financial Compensation for the Exploration of Mineral Resources (CFEM,2022)	Federal	Compensates states, municipalities for mineral extraction	Revenue based royalty with varying rates per mineral	Dictates mining royalties allocation	Challenge: CFEM acts as a critical but insufficient substitute for the Kandir Law, which prohibits the state from collecting ICMS on mineral exports
Complimentary Law No. 194 (Law No.194)	Federal	Classifies fuels, natural gas, and electricity as "essential" goods	Caps specific fuels ICMS at state's general 19% rate	Prohibits Para from raising tax rates	Challenge: constrains fiscal autonomy during the energy transition
IBS Tax Reform (Câmara dos Deputados, 2023)	Federal	Simplifies indirect taxation	Replaces ICMS with a shared VAT system	Alters the state revenue structure and reduces control over certain tax incentives	Both: Creates uncertainty, but also an opportunity to redesign fiscal instruments
Brazil NDC (Brasil, 2024)	Federal	Reduces national GHG emissions, achieving Net Zero by 205	Sectoral mitigation and adaptation goals	Signals markets for a transition towards a low-carbon economy	Challenge: It implies that fossil-fuel-linked revenue will decline dramatically

Plano Clima (Brazil, 2026)	Federal	Operationalizes national climate policy	Sectoral mitigation and adaptation strategies	Guides structural economic and political shift with impact on state revenue	Both: It supports the transition, but it lacks concrete tools for fiscal stability
REDD+ National Strategy (Brasil, 2016)	Federal	Reduces deforestation emissions and enable results-based climate finance	Results-based payments	Supports access to climate finance and jurisdictional REDD+ programs	Opportunity: New potential revenue source; Challenge: Current design does not allocate proceeds to state budget
Amazônia Agora (SEDEME, 2021)	State	Reduces deforestation to achieve Net ZeroLand Use & Forestry by 2036	Policy coordination and investment programs	Supports transition away from deforestation-linked activities	Both: Strong policy framework, but lacks fiscal linkage
PlanBio (Pará, 2024)	State	Bioeconomy Plan	Strategic economic development framework	Incentivizes alternative revenue-generating sectors aligned with low-carbon growth	Opportunity: Supports economic diversification and creates a framework for economic transition
ICMS Incentive System Law No. 6,489 (Pará, n.d.)	State	Attract companies to do business in the state	Tax exemptions	Subsidies general industry, fish industry, livestock industry, agro-industry (high-emission sectors) creating fiscal exposure during low-carbon transition	Both: Key lever for expenditure reform focused on green sectors
IPVA Law No. 11.233 (Pantoja, 2025)	State	Accelerate Electric Vehicles (EVs) Adoption	Tax exemption	Vehicle ownership tax exemption on EVs valued under R\$ 150,000	Both: Loss of state revenue, but a lever to accelerate state-wide EV adoption

Chapter

5

Case Studies



V. Case Studies

5.1 CASE STUDY SELECTION METHODOLOGY

The criteria for case study selection were developed as a way to meet the client's priorities that reflect the core policy challenge in Pará: maintaining fiscal stability as decarbonization erodes fuel consumption-based tax revenues.

Thus, each case study considers the following five criteria:

1. Jurisdictional/legal feasibility
2. Economic alignment
3. Energy transition dynamics
4. Fiscal mechanisms/revenue neutrality
5. Social/stakeholder impact

These criteria were further refined into 14 specific indicators with guiding questions to deepen the analysis: subnational tax autonomy, regulatory levers, resource dependency, commodity sensitivity, bioeconomy commitment, industrial "Efficiency Trap" and transport-related revenue erosion, decarbonization stage, revenue protection capability, fiscal mechanisms, and social and stakeholder impacts that consider population of tax burden, equitable benefit sharing and stakeholder balance.

The team compiled a list of 11 case studies, investigating the 14 indicators for each case study identified from desk research and expert interviews. Ultimately, 4 case studies were selected based on iterative feedback from the client, 11 expert interviews, and case study selection criteria. The 4 case studies selected were as follows:

- Carbon Markets (mentioned by 36% of experts)
- Green Budgeting (mentioned by 18% of experts)
- Eco-Tourism Fees (mentioned by 18% of experts)
- State Sovereign Wealth Fund (mentioned by 9% of experts)

Experts also mentioned the development and valorization of the bioeconomy (27%), agricultural (18%) and electric vehicle tax reforms (18%), and mining sector decarbonization and mineral surcharges (18%) as additional solutions.

Table 7. Case Study Selection: Indicators and Scorecard Criteria

Category	Indicator	Guiding question
Jurisdictional & Legal Feasibility	Subnational Tax Autonomy	Does the state/provincial government have autonomy over its own tax rates (similar to ICMS/IPVA)?
	Regulatory Levers at the subnational level	Can it be implemented by SEFA-PA?

Economic Profile Alignment	Resource Dependency	Does the region have a heavy mining or extractive dependency (comparable to ~\$20B mineral revenue)?
	Commodity Sensitivity	Does the revenue base fluctuate on global market prices (e.g., volatile LNG ICMS vs. flat-rate diesel)?
	Bioeconomy Commitment	Is there a documented focus on transitioning from extractive value chains to nature-based solutions (PlanBio)?
Nature of the Energy Transition Paradox	Industrial "Efficiency Trap"	Does it address revenue loss as large industries become more efficient (e.g., switching from fuel oil to LNG/electricity)?
	Transport-Related Revenue Erosion	How does it handle revenue loss from EV exemptions or shifts in massive motorcycle fleets?
	Decarbonization Stage	Is the region in the early stages of transition, with a 10-year planning horizon (2025–2035)?
Fiscal Mechanism & Revenue Neutrality	Revenue Protection	Does the mechanism prioritize protecting public service budgets (education/health) over environmental narratives?
	Consumption Tax Innovation	Does it offer a fix specifically for consumption-based taxes rather than property or income taxes?
	Compensatory Instruments	Does it use Carbon Markets (REDD+), PES, or Selective Taxes to offset fossil fuel tax losses?
Social & Stakeholder Impact	Population Tax Burden	Does the solution avoid increasing the tax burden on the general population (especially low-income/traditional communities)?
	Equitable Benefit Sharing	Are there social safeguards or benefit-sharing mechanisms for Indigenous and traditional populations?
	Stakeholder Balance	How effectively does the policy balance the competitiveness of the mining sector with the state's fiscal needs?

5.2 GREEN BUDGETING (CATALONIA, SPAIN)

The Catalonia Green Budgeting case study is a clear example of a sub-national government systematically integrating environmental considerations into public financial management, thereby strengthening long-term fiscal planning and transparency. Initiated in 2020 as a pilot green-tagging project, the Catalan government formally institutionalized climate considerations into the budget cycle by 2022 through a strategic collaboration between the Ministry of Economy and Finance and the Climate Change Office (The Climate Group, n.d.).

A dedicated technical working group was established to quantify environmental impacts during both the planning and execution phases, with findings consolidated into a comprehensive annual report. The methodology (OECD, 2021) leverages international standards, such as the Rio markers, to classify expenditures and revenues into three distinct categories:

- **Green:** Expenditures directly advancing environmental objectives, such as climate mitigation, biodiversity protection, and sustainable resource management
- **Brown:** Activities characterized as environmentally detrimental or carbon-intensive, including fossil-fuel-linked investments or high-emission sectors
- **Gray:** Activities with indeterminate or mixed impacts, where outcomes are contingent upon specific technologies or regulatory conditions

While this system provides robust diagnostic utility, it faces structural limitations, including classification ambiguity and constraints on data and institutional capacity (OECD, 2021).

The system's inherently diagnostic character restricts its prescriptive influence on fiscal decision-making. Distinguishing “green” from “brown” is a rigorous methodological challenge, as diverse expenditures have mixed or indirect environmental impacts, necessitating the development of granular, localized criteria.



Palau de la Generalitat de Catalunya, the institutional setting for Catalonia's green budgeting framework. Source: Wikimedia Commons, CC BY-SA 3.0 ES.

Furthermore, operational success depends on the availability of disaggregated budget data and robust coordination among multiple government agencies. Although green budgeting significantly enhances fiscal planning, transparency, and monitoring, it does not autonomously mandate resource reallocation; shifts in the fiscal envelope remain subject to prevailing political priorities. Thus, while addressing institutional capacity constraints and classification ambiguities, the framework serves primarily to strengthen the analytical foundation of the budget cycle without guaranteeing immediate adjustments to expenditure patterns.

For Pará, green budgeting offers a pathway to align fiscal architecture with climate objectives. It builds on Brazil's existing momentum toward integrating environmental criteria into fiscal planning - exemplified by pilots in Espírito Santo and Acre- and federal efforts to develop climate budget markers with Inter-American Development Bank (IDB) support.

5.3 REDD+ PROGRAM (EAST KALIMANTAN, INDONESIA)

East Kalimantan, Indonesia, has launched a pioneering jurisdictional program for Reducing Emissions from Deforestation and Forest Degradation (REDD+). This initiative provides results-based payments contingent upon verified reductions in deforestation. Indonesia has already received an initial payment of US\$ 20.9 million under its Emissions Reduction Payment Agreement with the World Bank's Forest Carbon Partnership Facility. The program has the potential to receive up to US\$ 110 million (R\$ 545 million) in total, based on successfully verified reductions in forest degradation (World Bank, 2022).



Forest landscape in Indonesia, illustrating the natural capital base for jurisdictional REDD+. Photo by Tom Fisk on Pexels.

Revenues are channeled through the national environmental fund agency (BLU-BPDLH) and distributed via a formal Benefit Sharing Plan. In this framework, the subnational government at the province/state level of East Kalimantan allocates funds for operational expenditures, policy strengthening, and implementation support, as well as specific allocations for local communities and various tiers of government.

This case is highly relevant to Pará, which in September 2024 executed a landmark agreement with the LEAF Coalition for the

purchase of up to 12 million forest carbon credits (2023–2026) at US\$ 15 per ton of CO₂e, representing a maximum gross value of US\$ 180 million (Emergent, 2024).

In February 2026, the Architecture for REDD+ Transactions (ART) reached a critical regulatory milestone by accepting the State of Pará's TREES registration and monitoring documentation for the 2023–2027 crediting period (ART, 2026). This formal acceptance authorizes the state to proceed with the required independent validation and verification of its jurisdictional emissions reductions.

5.4 TRANSIENT ACCOMMODATIONS TAX (HAWAII, USA)

The Hawai'i Transient Accommodations Tax (TAT) case study illustrates how a sub-national government can leverage an existing tourism-linked fiscal instrument to generate dedicated environmental revenue without increasing the tax burden on local residents, presenting a viable model for Pará's revenue diversification.



Waikiki Beach and its hotel district illustrate the tourism-linked tax base of Hawaii's Transient Accommodations Tax. Photo by Pascal on Pexels.

The legislative context for the reform was shaped by the growing fiscal costs of climate-related disasters, most acutely the 2023 Lahaina wildfires, which exposed the state's vulnerability to environmentally driven shocks and the inadequacy of existing funding mechanisms for climate adaptation. Signed into law on May 27, 2025, as Act 96 of the Senate Bill 1396 (2025), the Hawaii TAT established the nation's first-ever climate impact fee, raising the statewide rate from 10.25% to 11% effective January 2026, while authorizing counties to levy an additional surcharge of up to 3%—an option all four counties (Hawaii, Honolulu, Kauai, Maui) adopted in full (Office of the Governor, 2025).

Officials estimate the measure will generate approximately US\$ 100 million annually, dedicated to environmental stewardship, hazard mitigation, and infrastructure

resilience. To govern the allocation of the new revenue stream, Governor Josh Green established a dedicated Green Fee Advisory Council, engaging communities, businesses, and environmental groups in a participatory process to determine spending priorities (Adams, 2025).

Supporters framed the measure as a means of building environmental resilience while ensuring that the nearly 10 million annual visitors bear a share of the costs of climate adaptation (Honoré, 2025). While the hotel industry broadly welcomed the tax as an investment in Hawaii's long-term tourism appeal, the cruise industry filed a constitutional legal challenge that halted the cruise ship portion of the fee, and some residents and visitors raised concerns that a combined lodging tax approaching 19% risked deterring tourism (Hitt, 2025).



Hawaii's Green Fee logo, representing a visitor-funded conservation model. Photo by Jack Kittinger, Omidyar Fellows.

Ecotourism revenue generation is one component of longer-term fiscal reform, because it offers a resilient development pathway that is less susceptible to commodity cycles. To be fully effective, social benefits can be incorporated into local community sharing mechanisms. In this way, communities derive direct gains from increased visitation, particularly as tourism expands after COP30.

5.5 STATE SOVEREIGN FUND (ESPÍRITO SANTO, BRAZIL)

Established via Complementary Law No. 914 in June 2019, Espírito Santo's FUNSES fund provides a model for the responsible management of extractive revenues beyond the annual budget cycle (Espírito Santo, 2019). Rather than treating oil and gas royalties as ordinary state revenue, the FUNSES channels a mandatory share into a separate fund designed to reduce exposure to commodity price volatility and preserve fiscal capacity over time.



*Espírito Santo announces the use of sovereign fund resources to finance decarbonization and energy transition projects.
Source: Government of Espírito Santo.*

The Fund combines two objectives: fiscal stabilization and strategic development. Resources are managed through the state development bank and deployed across financial instruments such as equity, structured funds, innovation financing, and more recent decarbonization-related investments, allowing the state to both save and invest resource revenues (Fórum de Fundos Soberanos Brasileiros, n.d.).

The fund's revenue model is anchored by a governing council that sets annual contribution rates, subject to a mandatory floor of 40% of royalties and 15% of special participation revenues from the petroleum

sector. This case provides a critical benchmark for Pará as it seeks to capture the mining royalties (CFEM) to fund its low-carbon transition (Brasil, 1997).



*Fundo Soberano do Estado do Espírito Santo (FUNSES) Logo
Source: Government of Espírito Santo.*

Chapter

6

Recommendations for Policymakers



VI. Recommendations for Policymakers

The State of Pará needs a comprehensive, integrated strategy to achieve fiscal resilience during a low-carbon transition. This strategy rests on three key pillars:

1. **Policy Alignment:** Establish an institutional framework for climate-compatible public financial management by incorporating environmental criteria into the budget cycle.
2. **Fiscal Stabilization:** Implement mechanisms to protect the state budget from volatile commodity prices and the structural decrease in extractive revenues.
3. **Revenue Diversification:** Generate new income streams through nature-based climate finance and growth in the bioeconomy.

By integrating these three mechanisms, Pará can manage the energy transition not as a threat to revenue, but as an opportunity for long-term fiscal resilience and sustained economic growth.

6.1 OECD-ALIGNED GREEN BUDGETING FRAMEWORK

- **Type:** Institutional Framework
- **Tax Yield:** None (Diagnostic/Strategic)
- **Parties Involved:** SEFA-PA, SEPLAN, SEMAS, State Legislature
- **Strategic Goal:** Institutionalize low-carbon fiscal governance and secure National Treasury guarantees

By adopting a Green Budget methodology, Pará can align with the Brazilian Sustainable Taxonomy (TSB) (Ministério da Fazenda. Secretaria de Política Econômica, 2024), as the technical foundation for an OECD-inspired green budgeting framework. This is a strategic imperative to secure National Treasury Guarantees (*Garantia da União*) and attract global sustainable capital, in line with Brazil's 2024–2027 fiscal strategy (JA Hub, 2024).

The state's Green Budget methodology must directly mirror the federal framework currently being developed by the Ministry of Planning (MPO) and the Federal Budget Secretariat (SOF) (Ministério do Planejamento e Orçamento, 2025). This federal framework, built in partnership with the Inter-American Development Bank (IDB), utilizes the COFOG Ampliada (Expanded Classification of Functions of Government) to systematically track expenditure across three critical environmental areas:

1. Climate change
2. Biodiversity
3. Disaster risk management

By integrating the TSB with the COFOG Ampliada, Pará can consistently classify revenues and expenditures into green, gray, or brown categories. This alignment ensures consistency and comparability between government levels, facilitating data consolidation with federal systems.

A localized Green Budget methodology will track and classify public spending and revenue to guide decision-making based on clearly defined environmental goals. This OECD-inspired approach (OECD, 2024) includes key fiscal tools such as budget tagging, environmental impact assessments, budgetary carbon assessments, and transition fiscal risk analysis.

6.1.1 Expected Impacts

- Alignment of the state's fiscal planning with existing strategic environmental plans, including PlanBio and Amazon Now;
- Increased transparency regarding brown subsidies and carbon-exposed revenue streams;
- Guidance for the progressive reorientation of public expenditure from gray/brown to green categories;
- Reduced fiscal risk from stranded assets and transition-related revenue shocks;
- Institutionalization of environmental criteria in budget planning across administrations.

Table 8. Green Governance Comparison: OECD Framework vs. Brazilian Sustainable Taxonomy

Feature	OECD Green Budget Framework	Brazilian Sustainable Taxonomy
Nature	Embeds climate goals into public financial management	Brazil's classification of economic activities and projects defined as "green"
Objective	Systematically link budget decisions with low-carbon transition goals	Provide clear, verifiable data for national and international investors
Verification	Focuses on "tagging" budget lines using available qualitative data	Sets technical quantitative Key Performance Indicators (KPIs) (e.g., carbon intensity) for eligible projects
Target Audience	Targets Finance and Planning Secretariats (SEFA/SEPLAN)	Focuses on National Treasury, banks, development agencies, and bond issuers
Implementation Mechanism	Integrates budget instruments into the state's strategic plan	Intends to secure "Greeniums" and better credit terms for infrastructure and strategic capital assets

6.1.2 Applying Green Budget Tagging to Pará's ICMS Tax Breaks

Analyzing company-specific ICMS tax-break records offers a valuable entry point for understanding a significant part of the state's incentive structure. These records identify recipient firms, product categories, and the estimated five-year average subsidy values.

This original analysis offers a preliminary assessment of the transition profile linked to current ICMS tax expenditures. Covering 76 product categories, company-level records were consolidated and classified as green, gray, or brown, reflecting Pará's specific context and climate considerations.

However, the current dataset has limitations. Product categories can be ambiguous, making it

difficult to confidently assign tags without more detailed information on the product mix and the environmental footprint of production. The data captures the economic category, not verified environmental impact.

Nonetheless, this analysis provides an initial view of the transition profile of current ICMS tax expenditures and suggests that Green Budget Tagging can be an effective tool for fiscal resilience. The following categories were used for classification:

- **Green:** Classified for closer alignment with Pará's renewable-energy profile, low-carbon transition, or standing-forest bioeconomy (e.g., electricity, biodiesel, açaí, and derivatives).
- **Gray:** Classified where environmental implications depend heavily on sourcing, production methods, or actual use of the benefit (e.g., palm oil, vegetable oils manufacturing, soft drinks, and beverages).
- **Brown:** Classified due to strong association with emissions-intensive industrial activity, intensive resource use, or environmentally harmful practices (e.g., fertilizers, meat processing, and pig iron).

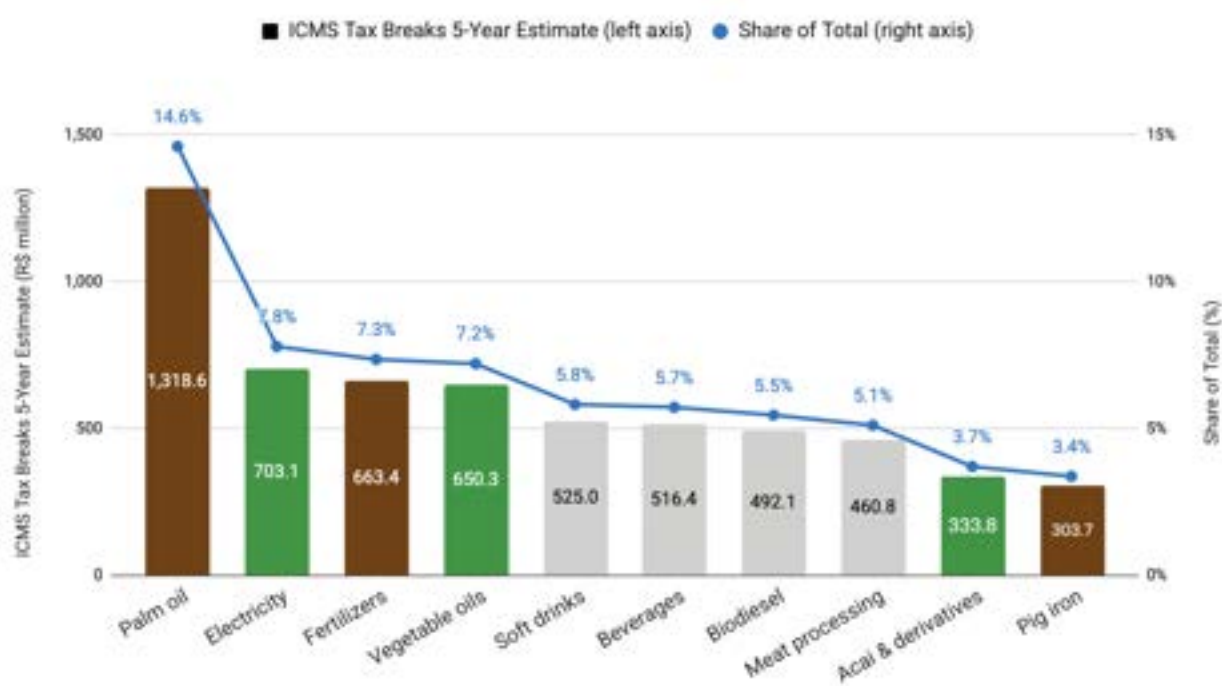


Figure 5. Top 10 Product Categories by ICMS Tax Incentives

Analysis shows ICMS tax breaks are highly concentrated. The top four categories—Palm oil (R\$ 1.32 billion, 14.6%), electricity (R\$ 703 million, 7.79%), fertilizers (R\$ 663 million, 7.35%), and vegetable oil manufacturing (R\$ 650 million, 7.20%)—account for nearly 37% of the total. The remaining highly subsidized products are: soft drinks, beverages, biodiesel, meat processing, acai and derivatives, and pig iron.

Figure 6 shows the main result of the exercise: the distribution of the full R\$ 9.03 billion in estimated ICMS tax breaks across the three climate categories.

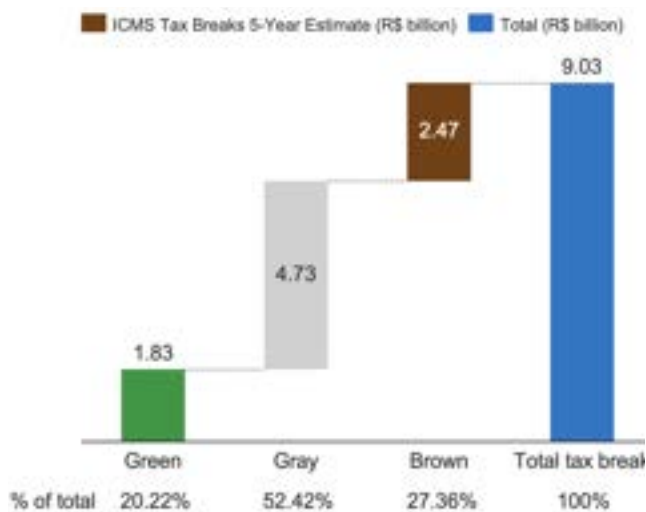


Figure 6. ICMS Tax Incentives by Climate Category (Green/Gray/Brown)

The R\$ 9.03 billion in estimated ICMS tax breaks are distributed as follows:

- **Gray:** R\$ 4.73 billion (52.42%)
- **Brown:** R\$ 2.47 billion (27.36%)
- **Green:** R\$ 1.83 billion (20.22%)

This suggests that only one-fifth of Pará's current tax-incentive structure is green-oriented. The majority of incentives fall into categories with mixed or uncertain environmental impacts (Gray), while a substantial share remains linked to environmentally intensive products (Brown). This highlights the need for policymakers to expand green incentives and strengthen the review of the much larger gray segment.

6.1.3 Implementation Pathway

Short-Term (2027–2030): Administrative Setup

- Secure senior leadership buy-in and position SEFA-PA to lead administrative implementation, in direct coordination with SEPLAN and SEMAS.
- Establish a cross-departmental task force to define objectives, budget scope, priority sectors, and TSB-aligned classifications utilizing the federal COFOG Ampliada methodology.

Medium-Term (2030–2036): Piloting and Capacity Building

- Pilot Pará's Green-Tagging framework across state budget lines and tax expenditures.
- Evaluate the pilot phase to assess the framework's effectiveness, refine criteria, and build the necessary technical capacity for full-scale adoption.

Long-Term (2036–2050): Legislative Institutionalization

- Enact legislation to formalize a comprehensive Green Budget framework that embeds environmental and transition analysis directly into the state budget process (The Climate Group, 2026).
- Establish legislative mechanisms to leverage the IBS design window into TSB criteria from its launch.
- Expand the budgetary tagging system to include environmental impact assessments, carbon-intensity metrics, transition fiscal risk analysis, and climate cost-benefit tools.
- Institutionalize the framework through ongoing technical training and/or the appointment of a dedicated green budgeting manager with cross-agency responsibilities spanning SEFA-PA, SEPLAN, and SEMAS.

6.2 STATE SOVEREIGN FUND

- **Type:** Sovereign Fund
- **Tax Yield:** Indirect, R\$ 50 billion by 2050
- **Parties Involved:** SEFA-PA, SEPLAD, State Legislature, BANPARÁ
- **Strategic Goal:** Protect the state budget against commodity volatility

To address the "Efficiency Trap" identified in Section 4.1, where industrial modernization erodes the taxable fossil-fuel base, Pará can establish a Sovereign Fund through state-level legislation. The Fund would be capitalized by redirecting 40% of the state's CFEM mining royalties.

6.2.1 Fiscal Potential

With 7.93% annual royalty growth and conservative 10% portfolio returns, the 40% allocation generates R\$ 50 billion by 2050.

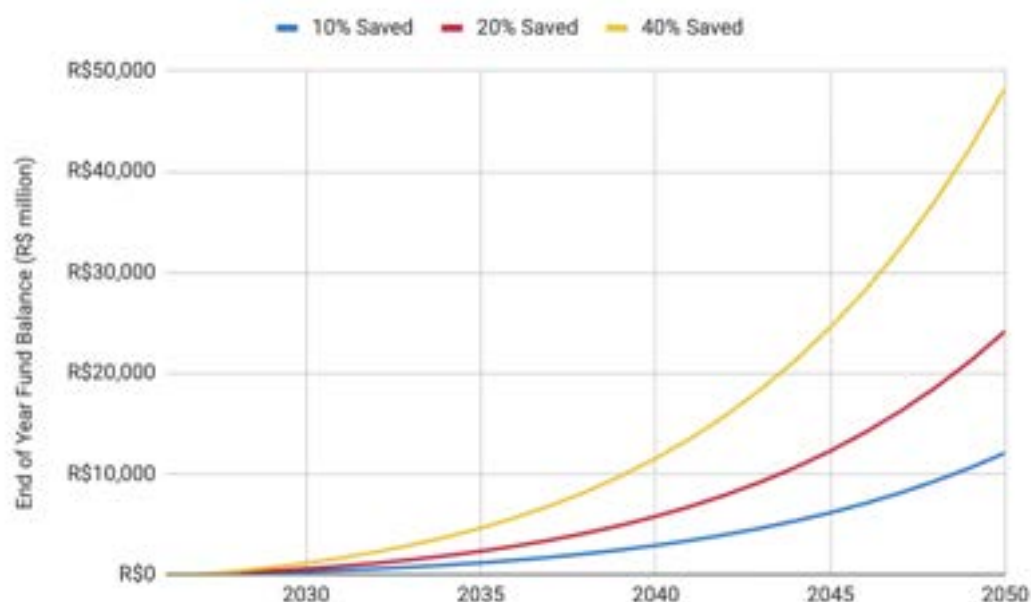


Figure 7. State Sovereign Fund Growth Projections (2028–2050)

6.2.2 Implementation Pathway

Short-Term (2027–2030): Strategic Alignment and Regulatory Benchmarking

- Secure a formal strategic commitment between the Governor's Office and SEFA-PA to integrate the fund into the state's long-term fiscal roadmap.
- Conduct a legal diagnostic to define underlying deposit parameters and fiduciary responsibilities, adapting the governance precedents established by the federal Law 11.887 (Brasil, 2008) to the state context.

Medium-Term (2030–2036): Legislative Institutionalization

- Ratify a complementary state law via an absolute majority in the Legislative Assembly (*Assembleia Legislativa*), codifying the fund's institutional mandate.
- Establish statutory withdrawal protocols that distinguish among liquidity releases for immediate stabilization, strategic-priority investments, and capital preservation for intergenerational savings.
- Create an independent governance council with SEFA-PA/SEPLAD oversight and annual public reporting mechanism.

Long-Term (2036–2050): Permanent Operationalization

- Position fund as state's primary fiscal anchor, insulating tax base from extractive cycle volatility risks.
- Direct investment returns toward bioeconomy under BANPARÁ active management.

6.3 ECO-TOURISM FEE

- **Type:** Eco-Tourism Fee (R\$ 150 per visitor)
- **Tax Yield:** Direct, R\$ 71.9 million by 2050
- **Parties Involved:** SEFA-PA, SEMAS, Municipal Governments
- **Strategic Goal:** Diversify the state tax base through international visitation

Inspired by the Hawaii Transient Tax Model, Pará should implement a dedicated Eco-Tourism Fee for international visitors. This mechanism serves as a strategic revenue-diversification tool, generating new fiscal resources without increasing the tax burden on the state's local residents. By focusing on a primary pathway - a conservation charge levied directly on international arrivals—the state can diversify state revenue.

This direct-fee model requires close coordination between the State Secretariat of Finance (SEFA-PA), the State Secretariat for Environment and Sustainability (SEMAS), and Municipal Governments to ensure efficient collection at key entry points and the effective earmarking of funds for sustainability initiatives.

6.3.1 Fiscal Potential

Based on a 2030 implementation date, a baseline of 100,000 international tourists, and 5% annual growth, an initial inflation-adjusted fee of R\$ 150 is projected to generate R\$ 71.9 million annually by 2050.

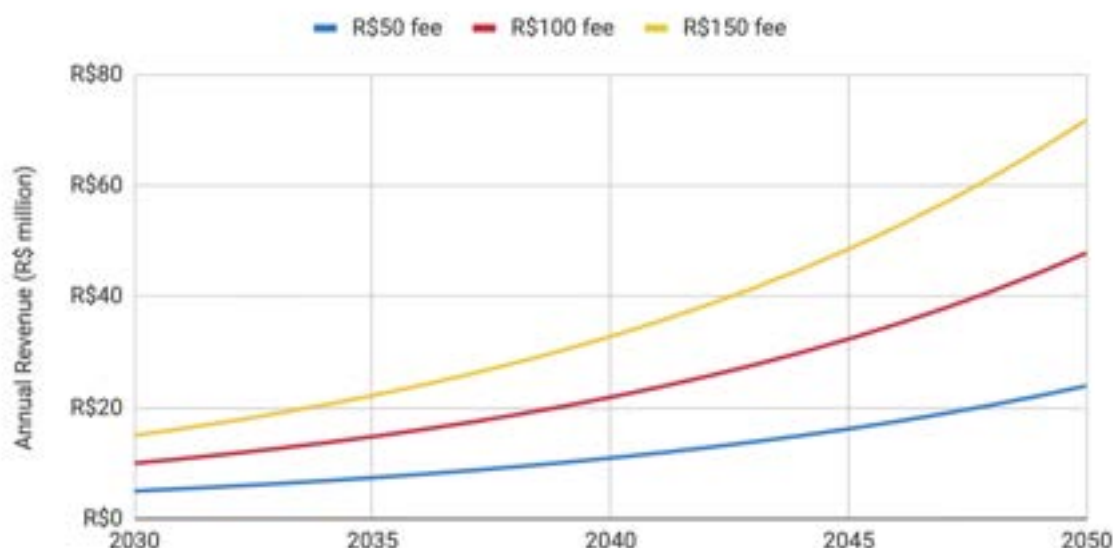


Figure 8. Eco-Tourism Fee Revenue Projections (2030–2050)

**All values assume a 2030 implementation date and 100,000 tourists in year one, increasing at 5% annually.*

These estimates remain conservative, particularly given the anticipated increase in international arrivals associated with COP30 and the potential targeted ecotourism investments under PlanBio to accelerate tourism growth beyond the current baseline scenario.

6.3.2 Implementation Pathway

While the fiscal modeling utilizes a flat entry fee to project the baseline revenue potential of international tourism, the implementation must proactively mitigate potential cybersecurity liabilities. Centralized digital tourist portals inherently act as high-value targets, exposing the state to potential data breaches, scams targeting visitors, and ransomware attacks. Therefore, this implementation pathway focuses on capturing the projected revenue through the ISS tourism surcharge aligned with Hawaiian implementation mechanisms.

Short-Term (2027–2030): Strategic Alignment

- Draft legislation that leverages existing tax infrastructure. This involves designing a transitional tourism surcharge via the municipal ISS on accommodations, effectively utilizing the hospitality sector decentralized collection agent.
- Create a targeted communications strategy emphasizing how capturing tourist revenue supports local conservation and municipal services, ensuring operational buy-in from the hospitality sector prior to rollout.

Medium-Term (2030–2036): Pilot Execution and IBS Transition

- Launch the pilot in 2030 via the municipal ISS surcharge. Establish baseline indicators to evaluate how closely the actual collected revenue aligns with the original flat-fee fiscal projections.

- Systematically sunset the ISS accommodation surcharge by 2033 in accordance with the national tax reform. Transition the municipal tourism revenue collection to align entirely with the new destination-based Imposto sobre Bens e Serviços (IBS), ensuring no disruption in fiscal capture as the legacy tax is extinguished.

Long-Term (2036–2050): Permanent Operationalization and Revenue Sharing

- Codify a permanent revenue-sharing formula for the tourism funds: 30% retained by municipalities for local revenue, 30% allocated to SEMAS for conservation and green investments, and 40% managed by SEFA-PA for administration and fiscal oversight.
- Institutionalize the IBS-aligned tourism fee as the state's permanent revenue mechanism, incorporating periodic reviews by SEFA-PA based on evolving tourism growth, fiscal performance, and conservation indicators to ensure long-term sustainability.

6.4 NATURE-BASED CLIMATE FINANCE

- **Type:** Investment Mechanism
- **Fiscal Yield:** Mixed (Indirect/Direct), R\$ 2.07 billion by 2050
- **Parties Involved:** SEFA-PA, SEMAS, State Legislature, Private Investors, Verification Partners
- **Strategic Goal:** Generate supplementary fiscal resilience through forest conservation and restoration

Given Pará's location within the Amazon and its strategic focus on the bioeconomy, SEFA-PA is able to explore nature-based climate finance mechanisms as part of its broader fiscal transition strategy. The goal is not to rely on one specific instrument, but to assess how Pará's forest assets can generate supplementary fiscal value while also supporting conservation, restoration, local livelihoods, and long-term bioeconomy development.

This recommendation can be understood as a broader strategy rather than a fixed policy design, because different instruments have different levels of fiscal flexibility. SEFA-PA's capacity to evaluate which nature-based finance tools can provide either direct fiscal revenue, indirect fiscal relief, or long-term economic development benefits is core to the effectiveness of the approach.

Carbon credits and forest restoration concessions are two potential models of nature based fiscal and investment mechanisms. These examples are intended as illustrations for Pará as potential focal points for translating credits and concessions into fiscal resilience.

6.4.1 Carbon Credits (REDD+ Program)

While Jurisdictional REDD+ provides a valuable metric for assessing Pará's forest-carbon resources, it does not function as a direct revenue source for the state treasury. Instead, strict benefit-sharing frameworks established under the Jurisdictional REDD+ System (SJREDD+)

ensure that proceeds are channeled directly into forest protection and to the local communities actively reducing deforestation, including Indigenous Peoples, Quilombolas, Traditional Communities, and Family Farmers.

To guarantee transparent and equitable distribution, these funds bypass the state's general budget and are managed through independent, third-party instruments like the Eastern Amazon Fund (*Fundo Amazônia Oriental*), with oversight from multi-stakeholder groups such as the State Committee for Evaluation and Support. Consequently, Pará's fiscal model utilizes REDD+ strictly as a valuation reference point rather than state income.

Fiscal Potential

At an assumed 5% fiscal capture rate, Pará could generate an estimated R\$ 332 million by 2035 and R\$ 2.07 billion by 2050 through the carbon credit program.

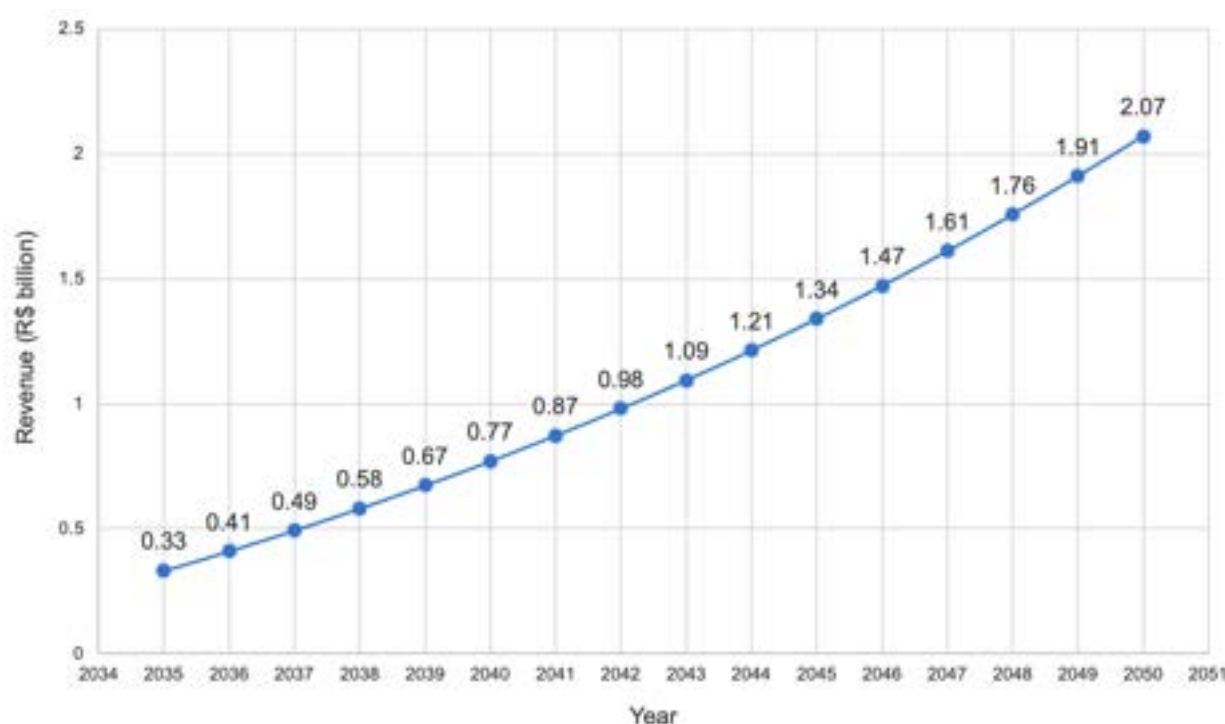


Figure 9. Carbon Credit Program Revenue Projections (2030–2050)

* State 5% REDD+ Revenue Capture at R\$75/1 ton of CO₂e

6.4.2 Forest Restoration Concessions

Forest restoration concessions provide a second example of nature-based climate finance. Pará's concession project (IDB, n.d.) shows how degraded public lands can be organized into Recovery Units and tendered to private operators for restoration and productive forest activities. Under this model, private concessionaires finance restoration, while the state supports implementation through land and environmental regularization, public-service coordination, and institutional support.

Forest restoration concessions can mobilize private investment, reduce the public cost of land restoration, generate carbon value, support local jobs, and build a pipeline of bioeconomy

projects. This example highlights how Pará could convert degraded land recovery into investable low-carbon development.

6.4.3 Implementation Pathway

Short-Term (2027–2030): Strategic Mapping and Interagency Coordination

- Conduct mapping of the nature-based finance universe, explicitly categorizing instruments into three distinct financial streams: mechanisms that generate direct budget revenue, those that create restricted conservation finance, and those that provide indirect fiscal relief.
- Establish a formal coordination framework between SEFA-PA, SEMAS, and any other relevant state agencies to ensure that fiscal capture strategies are inextricably linked to the state's environmental and conservation policy objectives.

Medium-Term (2030–2036): Pilot Execution and Stakeholder Integration

- Launch targeted pilot programs for selected nature-based financial instruments, prioritizing mechanisms that demonstrate the highest operational feasibility and direct fiscal relevance to the state.
- Collaborate with private market operators, local communities, and independent third-party verification partners to ensure financial viability, environmental integrity and market legitimacy.

Long-Term (2036–2050): Permanent Institutionalization and Portfolio Scaling

- Institutionalize nature-based climate finance as a permanent, foundational pillar of Pará's broader fiscal transition and long-term bioeconomy strategy.
- Scale and manage a diversified portfolio of forest protection and restoration mechanisms designed to actively generate structural fiscal resilience, attract private capital, guarantee equitable community benefit-sharing, and anchor the state's low-carbon economic model.

6.5 PROJECTED REVENUE SUBSTITUTION

This section synthesizes the quantitative findings of the **Policy Scenario (Scenario 3)**, illustrating the state's ability to offset transition-related losses through recommended instruments. While the energy transition creates a significant structural deficit, the integrated implementation of new revenue streams partially closes the fiscal gap over the 2036 and 2050 horizons.

6.5.1 Analysis of the 2036 Outlook (Medium-Term)

By 2036, the state faces a monthly Fuel ICMS & IPVA Deficit of R\$ 255 million. At this stage of the transition, the proposed Policy recommendations generate a combined R\$ 74 million monthly in revenue, offsetting 29.3% of the deficit.

- **State Sovereign Fund:** The fund emerges as the strongest individual policy driver by 2036, contributing R\$38 million monthly;
- **Carbon Financing:** State-retained proceeds from Jurisdictional REDD+ provide a vital secondary anchor, contributing R\$34 million monthly;
- **Eco-Tourism:** While in its earlier stages of implementation, the Eco-Tourism Fee contributes R\$2 million monthly.



Figure 10. Monthly Net Impact of Tax Losses and Revenues from Energy Transition in Pará (2036)

6.5.2 Analysis of the 2050 Outlook (Long-Term)

By 2050, the scale of the "Efficiency Trap" becomes fully visible, with the monthly Fuel ICMS & IPVA Deficit rising to R\$1,263 million. However, the compounding growth of the new revenue streams significantly enhances the state's fiscal resilience, with policy revenues at R\$581 million monthly now offsetting 42.1% of the deficit.

- **State Sovereign Fund:** By 2050, the State Sovereign Fund becomes the state's primary transition buffer, contributing R\$353 million monthly. This represents the largest individual policy gain, underscoring the importance of early capitalization through mining royalties (CFEM).

- **Carbon Financing:** Carbon credit revenue grows to R\$173 million monthly, reflecting the long-term appreciation of forest assets.
- **Eco-Tourism Scaling:** Revenue from international visitation triples from 2036 levels to reach R\$6 million monthly.



Figure 11. Monthly Net Impact of Tax Losses and Revenues from Energy Transition in Pará (2050)

6.5.3 The Persistent Fiscal Gap

Despite the success of these policy interventions, a net monthly loss of R\$ 731 million remains by 2050. This confirms a core finding of the report: nature-based revenues and investment funds are vital mitigants but are not total substitutes for legacy fossil-fuel ICMS. This "Fiscal Paradox" necessitates a broader structural shift in Pará’s economy—transitioning from taxing industrial inputs to capturing the value-added growth of a mature, low-carbon bioeconomy.

Table 9. Monthly Projected Revenue Substitution Summary (2036 vs. 2050)

Policy	2036 (Monthly R\$ million)	2050 (Monthly R\$ million)
FuelTax & IPVA Deficit	-255	-1,263
Eco-Tourism Fee	+2	+6
Carbon Credits (REDD+)	+34	+173
State Sovereign Fund	+38	+353
Net Monthly Fiscal Position	-180	-731
Projected Monthly Budget Need	+7,564	+15,754
Deficit Offset %	29.3%	42.1%

6.6 RECOMMENDATION PRIORITIZATION MATRIX



Figure 12. *Impact-Effort Prioritization Matrix*

To address the anticipated revenue erosion from global decarbonization and secure long-term economic stability for the State of Pará, the prioritization matrix proposes a multi-tiered approach. The following recommendations are structured to balance immediate administrative actions with transformative, system-wide fiscal reforms.

I. High Impact, High Effort: Transformative Fiscal Mechanisms

These initiatives represent the core of Pará's long-term transition strategy. While they require significant technical preparation, legislative action, and cross-agency coordination, they are essential for fundamentally reshaping the state's fiscal trajectory.

Pará possesses a distinct comparative advantage in natural capital. By developing robust frameworks for jurisdictional carbon markets and biodiversity credits, the state can generate new, sustainable revenue streams. This requires stringent regulatory redesign and ongoing monitoring to ensure

environmental integrity, but the fiscal payoff offers a material buffer against traditional resource revenue declines.

Transitioning to a green budgeting framework will ensure that public expenditures actively align with the state's decarbonization, sustainability targets and new IBS tax system. This system-wide change requires high coordination across multiple secretariats to establish new tagging and tracking methodologies. Ultimately, it improves expenditure efficiency and signals strong fiscal governance to international investors and climate funds.

II. Medium Impact, Medium Effort: Targeted Revenue and Stabilization Policies

These recommendations are designed to optimize specific revenue streams and provide structural buffers against economic volatility. They require moderate coordination and targeted capacity building.

To mitigate the commodity volatility associated with natural resource extraction, sovereign wealth capitalized using a portion of current mining royalties. This fund will act as a critical stabilization tool, generating long-term investment returns that can be drawn upon as legacy revenues erode.

As Pará transitions its economic base, eco-tourism offers a highly viable growth sector. Implementing a targeted eco-tourism fee captures the value of the state's natural assets directly from visitors. While limited to one specific economic sector, this provides

a clear, dedicated revenue stream that can be reinvested into local conservation and municipal infrastructure.

III. Quick Wins: Foundational Administrative Alignments

These steps are foundational, designed to build institutional capacity and align Pará with broader federal movements, requiring minimal legislative friction.

Aligning Pará's fiscal and economic reporting with the emerging Brazilian National Taxonomy is a low-barrier, high-utility action. It can be implemented largely administratively within SEFA's control. While its direct impact on immediate revenue is modest, standardizing what qualifies as a "green" investment is a necessary prerequisite for attracting private capital and successfully implementing the larger climate finance initiatives in the long term.

Chapter

7

Potential Risks



VII. Potential Risks

While the recommendations outlined in this report provide a practical pathway for strengthening Pará's fiscal resilience, they also carry several cross-cutting risks. These risks do not undermine the overall policy direction, but they may affect the timing, scale, and reliability of the expected fiscal impact. The central challenge is that Pará cannot simply replace one concentrated revenue source with another. Instead, the state will need to manage a diversified portfolio of fiscal tools while ensuring that implementation is legally feasible, institutionally coordinated, and socially legitimate.

- **Revenue Uncertainty:**

Several proposed mechanisms, including eco-tourism taxation and carbon credits revenues depend on market conditions, tourism growth, verification processes, and investor participation. These revenues may be valuable over time, but they should not be treated as guaranteed substitutes for declining fossil-linked ICMS revenue. This is especially important because the fiscal model suggests that policy interventions can reduce, but not fully eliminate, the long-term fiscal gap.

- **Implementation Risks:**

Many recommendations require coordination across SEFA-PA, SEMAS, SEPLAN, municipal governments, and the state legislature. Without clear institutional ownership, timelines, and reporting responsibilities, these measures may remain fragmented initiatives rather than a coherent fiscal transition strategy. Green budgeting in particular depends on technical capacity, reliable budget data, and consistent classification rules.

- **Legal & Political Obstacles:**

There are legal and political risks. Some measures may require new legislation, municipal cooperation, or alignment with Brazil's broader tax reform process. Political resistance may also arise if reforms affect existing beneficiaries of tax incentives, redirect public revenues, or introduce new fees. For this reason, phased implementation and early stakeholder engagement will be important.

- **Social Legitimacy Risks:**

Policies linked to forests, carbon markets, tourism, and land restoration must include credible consultation, benefit-sharing, and safeguards for local, Indigenous, and traditional communities. If communities do not see direct benefits, these policies may face resistance and lose legitimacy.

Chapter

8

Conclusion



VIII. Conclusion

Pará's path to a low-carbon economy is no longer just an environmental mandate; it is a structural fiscal imperative. The current origin-based consumption tax model is uniquely vulnerable to the state energy transition, as the "Efficiency Trap" erodes the state's primary revenue base through industrial modernization and improved fuel performance. Fiscal modeling quantifies this challenge, projecting that fuel-linked revenue's share of the state value-added tax (ICMS) will decline from 23.1% in 2024 to just 10.6 % by 2035. Failure to adapt will result in a significant fiscal gap by 2035 as fossil fuel tax collections continue their projected managed decline.

However, by integrating the State Bioeconomy Plan (PlanBio) with the technical rigor of the National Sustainable Taxonomy and OECD-aligned green budgeting framework, Pará can effectively decouple its fiscal health from carbon-intensive activities. The implementation of a State Sovereign Fund, capitalized by a suggested 40% floor of mining royalties (CFEM), the capture of jurisdictional carbon credit proceeds (REDD+), and the modernization of green incentives provides the state with the necessary liquidity to maintain essential public services. Furthermore, the transition to a destination-based Dual VAT (IBS) by

2033 provides a vital macroeconomic tailwind by resolving the "Efficiency Trap" and securing state budgets through a 58-year Compensation Fund. While these policy interventions are projected to scale and offset 42.1% of the monthly transition deficit by 2050, nature-based revenues and investment earnings serve as supplementary buffers rather than total substitutes for legacy tax collections.

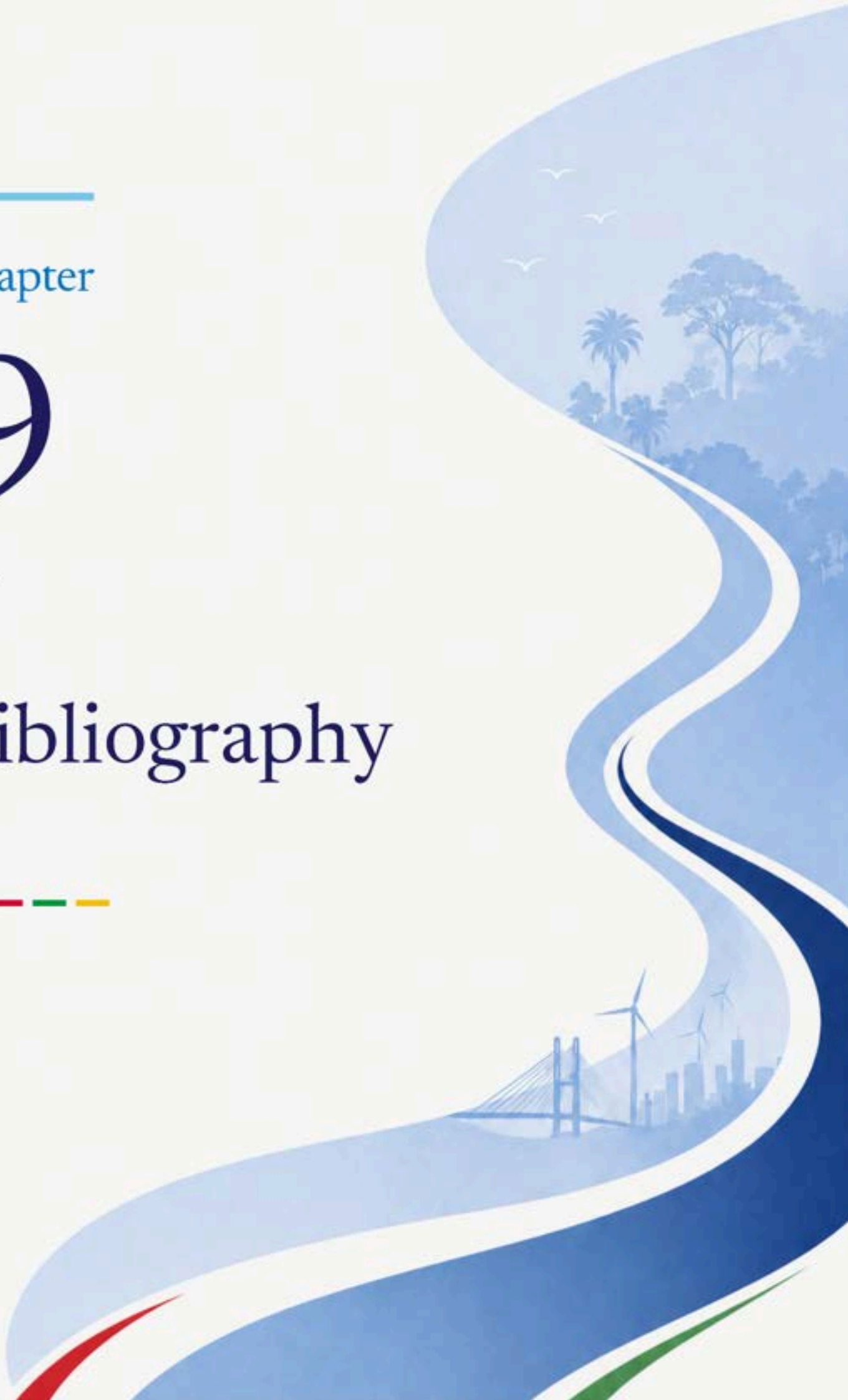
This transition is not without substantial risk; Pará must manage the inherent uncertainty of market-based revenues which depend on evolving market conditions and verification processes. The recommendations' success ultimately hinges on robust coordination among SEFA-PA, SEMAS, and SEPLAD, coupled with securing social legitimacy through transparent benefit-sharing with Indigenous and traditional communities. Failure to implement these crucial safeguards risks political resistance and legal challenges that could obstruct essential fiscal reforms.

Positioned at this pivotal development point, these strategic pillars empower SEFA-PA to guide the state toward achieving zero net emissions from land use by 2036, establishing a resilient, diversified, and sustainable economic base for all citizens of Pará.

Chapter

9

Bibliography



IX. Bibliography

1. Agência Pará. (n.d.). *SEMAS discloses Green ICMS indices for transfers to municipalities in 2026*.
<https://agenciapara.com.br/news/72855/semas-discloses-green-icms-indices-for-transfe-rs-to-municipalities-in-2026>
2. Arnold, J. M., Battiau, P., Fall, F., & Spies, K. (2025). The reform of Brazil's consumption tax system: A historic achievement (OECD Economics Department Working Papers, No. 1848). OECD Publishing. <https://doi.org/10.1787/2a85e559-en>
3. Brasil. (2022, 11 de março). Lei Complementar nº 192, de 11 de março de 2022. Define os combustíveis sobre os quais incidirá uma única vez o Imposto sobre Operações Relativas à Circulação de Mercadorias e sobre Prestações de Serviços de Transporte Interestadual e Intermunicipal e de Comunicação (ICMS), ainda que as operações se iniciem no exterior; e dá outras providências.
https://www.planalto.gov.br/ccivil_03/leis/lcp/lcp192.htm
4. Brazil. Ministério da Fazenda. (2025). Brazilian sustainable taxonomy [PDF].
<https://cebds.org/wp-content/uploads/2025/11/TSB-EN.pdf>
5. Brazil. Ministério da Fazenda & Tesouro Nacional. (2023). Brazil's sovereign sustainable bond framework. Government of Brazil.
<https://www.gov.br/tesouronacional/en/federal-public-debt/sustainable-bonds-files/FW-EN>
6. European Commission. (2022, January 20). List of broadly “brown” budget items [XLSX]. Directorate-General for Economic and Financial Affairs.
https://economy-finance.ec.europa.eu/economic-governance-framework/national-fiscal-frameworks-eu-member-states/green-budgeting-eu_en
7. European Commission. (2022, January 20). List of broadly “green” budget items [XLSX]. Directorate-General for Economic and Financial Affairs.
https://economy-finance.ec.europa.eu/economic-governance-framework/national-fiscal-frameworks-eu-member-states/green-budgeting-eu_en
8. Federal Government of Brazil. (1996). Lei Complementar nº 87, de 13 de setembro de 1996 (Lei Kandir). Presidência da República.
https://www.planalto.gov.br/ccivil_03/leis/lcp/lcp87.htm
9. Federal Government of Brazil. (2008). Lei nº 11.887, de 24 de dezembro de 2008. Presidência da República.
<https://www2.camara.leg.br/legin/fed/lei/2008/lei-11887-24-dezembro-2008-585072-norma-atualizada-pl.pdf>
10. Federal Government of Brazil. (2022). Lei Complementar nº 194, de 23 de junho de 2022. Presidência da República. https://www.planalto.gov.br/ccivil_03/leis/lcp/lcp194.htm
11. Government of Pará. (2013). Mining plan of the Pará state: 2013 to 2030. State Office for the Industry, Commerce and Mining (SEICOM). Lcp 194. (n.d.). Retrieved April 6, 2026, from https://www.planalto.gov.br/ccivil_03/leis/lcp/lcp194.htm
12. Inter-American Development Bank. (n.d.). *BR-U0002 : Program for the Modernization of Fiscal Management of the State of Pará - Profisc II-PA*.
<https://www.iadb.org/en/project/BR-U0002>

13. Lcp87. (n.d.). Retrieved April 6, 2026, from https://www.planalto.gov.br/ccivil_03/leis/lcp/lcp87.htm
14. Lucena Cavalcante, D., & McCall Zanolchi, J. M. (2020). Reflexão necessária sobre os limites constitucionais das desonerações fiscais das exportações no Brasil. *Revista de Direito Administrativo*, 279(1), 193–220. <https://doi.org/10.12660/rda.v279.2020.81389>
15. Ministério da Fazenda. Secretaria de Política Econômica. (2024, dezembro). Plano de ação: Taxonomia Sustentável Brasileira - Pós-consulta pública [PDF]. <https://www.gov.br/fazenda/pt-br/orgaos/spe/taxonomia-sustentavel-brasileira/arquivos-taxonomia/plano-de-acao-pos-consulta-publica.pdf>
16. OECD. (2025). The reform of Brazil's consumption tax system. Organisation for Economic Co-operation and Development. <https://doi.org/10.1787/2ad63eed-en>
17. Pantoja, A. M. (2025, October 28). *Pará encourages the acquisition of electric cars with IPVA exemption for models up to R\$ 150 thousand*. Agência Pará. <https://www.agenciapara.com.br/news/71981/para-encourages-the-acquisition-of-electric-cars-with-ipva-exemption-for-models-up-to-r-150-thousand>
18. Rezende, F. (2013). Brazil's ICMS tax: Origin, changes, current situation, and paths to recovery. Inter-American Development Bank. <https://doi.org/10.18235/0006967>
19. S.B. 1396, 33rd Leg., Reg. Sess. (Haw. 2025). https://www.capitol.hawaii.gov/session/archives/measure_indiv_Archives.aspx?billtype=SB&billnumber=1396&year=2025
20. SEFA - PA. (n.d.-a). Retrieved April 6, 2026, from <https://www.sefa.pa.gov.br/boletim-mensal-de-arrecadacao>
21. State of Pará. (2002). Lei nº 6.489, de 27 de setembro de 2002: Dispõe sobre a política de incentivos fiscais do Estado do Pará. Assembleia Legislativa do Estado do Pará.
22. State Secretariat for Environment and Sustainability (SEMAS). (2022). State bioeconomy plan: PlanBio Pará. Government of the State of Pará.
23. World Bank. (2022). East Kalimantan jurisdictional REDD+ program: Verified emissions reductions results-based payment report. Forest Carbon Partnership Facility

Appendix

This appendix provides supplementary materials supporting research in this report.

Appendix A. Financial Model

Developed by Brandon Chapko

Last Updated: April 27, 2026

Note: The financial model was prepared as a separate client-facing deliverable and is therefore not included in this report. Relevant assumptions and data sources are documented below.

Financial Model Data Sources:

- **Long-Term Inflation** Banco Central do Brasil. (2025). Inflation targeting. <https://www.bcb.gov.br/en/monetarypolicy/Inflationtargeting>
- **Population Projections** Instituto Brasileiro de Geografia e Estatística (IBGE). (2024). Population projection. <https://www.ibge.gov.br/en/statistics/social/population/18176-population-projection.html>
- **GDP Growth Rate** World Bank Group. (2025). GDP growth (annual %) - Brazil. World Bank Open Data. <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=BR&start=2000>
- **EV Sales (Brasil)** Associação Nacional dos Fabricantes de Veículos Automotores (ANFAVEA). (2026). Dados estatísticos para download. <https://anfavea.com.br/site/edicoes-em-excel/>
- **Vehicle Sales (Pará)** Governo do Pará. (2025). Department of Transportation dashboard. Detran-PA. <https://dashboard-frota.detran.pa.gov.br/>
- **Land-Use Emissions** Governo do Pará. (n.d.). State of Pará's bioeconomy plan.
- **Fiscal and Fuel Sales Data** Secretaria de Estado da Fazenda do Pará (SEFA-PA). (n.d.). Boletim mensal de arrecadação. <https://www.sefa.pa.gov.br/boletim-mensal-de-arrecadacao>

Appendix Table B. Case Study Scorecard: Reviewed Best Practices

Appendix Table C. Expert Interview Findings by Policy Solution

Appendix Table D. Impact-Effort Prioritization Matrix Methodology

Appendix Table B. Case Study Scorecard: Reviewed Best Practices

Color legend: **Green**: Strong fit / high relevance to Pará **Yellow**: Partial fit / moderate relevance **Red**: Limited fit / low relevance

No.	Best Practice	Description	Sub-national /Country	Jurisdictional & Legal Feasibility		Economic Profile Alignment			Nature of the Energy Transition Paradox			Fiscal Mechanism & Revenue Neutrality			Social & Stakeholder Impact		
				Subnational Control	Sub-Legal / Regulatory Levers	Resource Dependence	Commodity Sensitivity	Bioeconomy Commitment	Industrial "Efficiency Trap"	Transport Sector Erosion	Decarbonization Stage	Revenue Protection	Consumption Tax Innovation	Compensatory Instruments	Population Tax Burden	Equitable Benefit Sharing	Stakeholder Balance
1	State Legal Framework For Environmental Services	In 2010, the Acre State Government created SISA ('state-wide legal framework for environmental services') by state law and built a jurisdictional framework to reward forest protection with performance-based payments and benefit sharing.	Acre (Brazil)	Green	Green	Red	Red	Green	Red	Red	Green	Yellow	Red	Red	Red	Red	Yellow
2	State Sovereign Fund	The Fundo Soberano de Estado do Espírito Santo (FUNSES), created in 2019, is a Brazilian sovereign wealth fund designed to save oil and gas royalties for future generations and promote sustainable development. Managed by BANESTES, it focuses on conservative investments and venture capital (Funes 1) for regional innovation, holding R\$ 250 million for early-stage companies, managed by Quartzo Capital.	Espírito Santo (Brazil)	Green	Green	Yellow	Green	Red	Yellow	Red	Yellow	Green	Yellow	Red	Green	Red	Yellow
3	Fiscal Reform	In 2024, Ceará secured a US\$542 million Development Policy Financing (DPF) from the World Bank to support a package of fiscal and clean energy reforms. The financing provided budget support tied to policy reforms that strengthened public financial management while accelerating renewable energy deployment.	Ceará (Brazil)	Green	Green	Yellow	Green	Red	Green	Red	Red	Green	Green	Red	Green	Yellow	Yellow
4	TIER System	The 2023 Emissions Reduction and Energy Development Plan identifies the TIER System, implemented by the Alberta Ministry of Environment and Protected Areas via the Emissions Reduction and Energy Development Act, as the province's carbon pricing mechanism, assigning facility-specific emissions benchmarks since 2020 where under-emitters earn tradable credits for revenue while over-emitters buy credits or pay into the TIER Fund, incentivizing low-carbon investment and industrial competitiveness without broad tax hikes.	Alberta (Canada)	Green	Yellow	Green	Green	Red	Red	Yellow	Green	Yellow	Red	Red	Green	Red	Green

10	Green Budget	Integrates climate goals into the annual budget. It seeks to classify and quantify public expenditures according to their contribution to climate mitigation and adaptation goals. Rather than treating climate as a parallel policy agenda, the government embeds climate objectives directly into fiscal decision-making. The Catalan Government's carbon budget proposal establishes decarbonisation target by 2030 to guide economic and territorial planning over the coming years.	Catalonia (Spain)														
11	Electric Vehicle Registration Fee	New Jersey introduced an annual EV registration fee designed to approximate the fuel taxes EV drivers would otherwise pay. It functions as a revenue substitution mechanism, stabilizing infrastructure financing during decarbonization while maintaining a user-pays principle. \$290 per year starting in 2028. Implemented by the New Jersey Motor Vehicle Commission (NJMVC) official registration authority.	New Jersey (USA)														
12	Pay-per-Mile	Implemented by the Oregon Department of Transportation (ODOT), OReGO is a mileage-based user fee program designed to address declining gasoline tax revenues due to improved fuel efficiency and EV adoption. Launched in 2015, the program charges participants ~1.8–2.0 cents per mile driven, with drivers receiving a credit for state fuel taxes paid.	Oregon (USA)														
13	Cap-and-Invest	The Washington State Legislature, implemented by the Washington State Department of Ecology, passed the Climate Commitment Act "Cap-and-Invest" in 2021. It generates dedicated revenue for climate/air-quality investments by setting an emissions cap, and regulated entities buy allowances in auctions. Auctions have generated >\$3B (to date) for state climate accounts and investments.	Washington (USA)														
14	Economic Stabilization Fund	Texas created its Rainy Day Fund in 1988 to manage revenue volatility, especially from oil and gas production. A portion of severance tax revenue is automatically transferred into the fund during high-revenue years. The money is invested and can be used to cover budget gaps during economic downturn.	Texas (USA)														
15	Green Tourism Fee	In May 2025 (Effective Jan 2026), the Hawai'i State Legislature increased the Transient Accommodations Tax (TAT) charged on hotel stays, vacation rentals, and short-term accommodations by 0.75 percentage points (from 10.25 % to 11 %), and counties can add an additional 3%. State officials estimate the measure will generate ~\$100 million per year.	Hawaii (USA)														

Appendix Table C. Expert Interview Findings by Policy Solution

Solutions	Experts Mentions	Key Insight
Carbon Markets (REDD+ & Voluntary Carbon Credits)	4	- Identified carbon markets as a critical near-term revenue source for the state. - Estimated that Pará is roughly 1.5 years away from securing global REDD credits, which could inject approximately \$3 billion over four years, with 15% earmarked for state revenue. - Emphasized that voluntary carbon markets and REDD+ are the primary avenues for attracting investment to the Amazon. - Confirmed that Pará is in the completion stage of its REDD+ design, having conducted extensive consultations with local resident groups. - Discussed carbon credits as a potential source of income for the forestry sector.
Development & Valorization of the Bioeconomy	3	- Broadening the tax base by helping more value be created locally in greener sectors like the bioeconomy. - Tracking the number of local small businesses in the bioeconomy to ensure growth stays within the state. - Identifying growing sectors like the bioeconomy and logistics to determine where future taxes can be applied without distorting early growth. - Highlighting PlanBio, which has already received 1 billion Reais to integrate bioeconomy actions into state plans.
Active Forest Management & Sustainable Land Use	3	- Monetizing natural capital through active management rather than total preservation. - Utilizing forestry waste (leaves, branches, trunks) to generate revenue through biomass energy, fertilizers, biochar, and chemical raw materials. - Changing the relationship between the forest and the land to ensure sustainable use. - Generating revenue by leasing land to companies, targeting 12 million hectares by 2030.
Green Budgeting & Expenditure Tagging	2	- Proposed using green budgeting to identify where current investments are misaligned with climate goals. - Identified green budget tagging as an entry point for governments to analyze proposed budgets and identify investment gaps. - Noted that a green budgeting exercise in Pará revealed that 70% of analyzed subsidies favored "brown and grey" activities, highlighting the need for technical capacity.
Revision & Reform of Agricultural Subsidies	2	- Identified revenue optimization opportunities by reviewing state and federal agricultural subsidies to eliminate "double-subsidizing" the same companies. - Noted the concentration of subsidies in carbon-intensive activities and suggested redirecting these as a more effective alternative to direct tax increases.
Eco-Tourism Fees	2	- Proposed leveraging Pará's natural assets through tourism-specific fiscal tools. - Suggested a conservation surcharge specifically targeting foreign visitors who do not vote locally.

		Proposed an entry tourist fee or infrastructure tax on visitors, citing Hawaii and Chile as successful models for improving community quality through tourism revenue.
Mining Sector Decarbonization & Mineral Surcharges	2	- Targeted the mining sector for both revenue and emissions reductions given its central role in the economy. - Argued for investing in mining decarbonization and advocating for just transition data. - Proposed potential surcharges on copper or mineral profits, modeled after windfall profit taxes used in other jurisdictions.
Green Taxonomy & Disclosure Standards	2	- Advised the state to adopt a national green taxonomy rather than "reinventing the wheel". - Suggested that a classification system would allow developers to label projects as green and unlock cheaper capital market finance. - Noted that a solid climate taxonomy allows the state to inform ministries exactly how much of their budget aligns with climate goals.
EV Adoption Strategies & Infrastructure	2	- Proposed strategies to shift away from fossil-fuel vehicle taxes without social backlash. - Recommended license differentiation to disincentivize fossil fuel vehicle purchases through auctions while giving preferential treatment to EVs. - Suggested a substitution analysis where declining gas tax revenue is replaced by small, equivalent EV registration fees to approximate legacy tax levels.
Command & Control Measures for Deforestation	2	- Cited direct state action against illegal activities as a prerequisite for permanent emissions reductions, requiring combating organized crime and illegal activities driving large-scale deforestation. - Identified "Command & Control" as the first priority in Pará's plan to reach net zero by 2030.
Integrated Assessment Modeling (IAM)	1	- Suggested that Green Bonds could be useful for funding essential logistics and connectivity infrastructure. - Cautioned that bonds increase state debt and cannot serve as a total replacement for a broad industrial policy.
Concession Models with Climate Performance Criteria	1	- Proposed embedding sustainable environmental criteria into state-level concession contracts for logistics, energy infrastructure, and public services. - Suggested this would allow the state to create transition funds or include performance-based payments within those contracts.
Small, Broad-based Payment System Taxes (PIX)	1	- Proposed implementing a minor charge on payment systems like PIX instead of large taxes on specific sectors. - Suggested this would be a broad-based tax affecting many people in a negligible way, serving as an efficient collection point within the financial system.

Appendix Table D. Recommendation Prioritization Matrix Methodology

Dimension	Low	Medium	High
IMPACT Definition: How much the recommendation materially improves Para's fiscal resilience, transition readiness, or implementation capacity	Modest but positive effect at the local or agency level; limited fiscal contribution; supports day-to-day operations or implementation without reshaping incentives or long-term resilience.	Clear positive effect, but limited to one policy area, one revenue stream, or one agency; helps implementation but does not fundamentally change fiscal strategy.	Material effect on revenues, fiscal stability, or expenditure alignment; creates system-wide change across agencies or sectors; improves long-term transition capacity; enables other recommendations.
EFFORT Definition: How difficult it is for Para to design, approve, coordinate, and implement the recommendation	Can be implemented administratively; no/limited legislative change; largely within SEFA's control; low coordination burden; faster rollout.	Requires moderate coordination and technical preparation; may need executive action, decrees, or targeted capacity building.	Requires high coordination (multiple secretaries, municipality or federal coordination) and legislation and/or major regulatory redesign; needs significant technical, legal preparation, and ongoing monitoring; long implementation timeline.



SECRETARIA DA
FAZENDA



COLUMBIA | SIPA
School of International and Public Affairs