

Brazil Initiative

SOCIO-ECONOMIC IMPACTS OF CARBON MARKET FRAMEWORKS FOR BRAZIL

MAKING NET ZERO POSSIBLE

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ABOUT THIS REPORT

This second working paper compiles preliminary results of the quantitative assessment on Carbon Market Frameworks for Brazil, developed on the basis of the qualitative assessment presented in the first working paper published in August 2025.

IETA and EOS Consulting would like to thank S&P Global, Fastmarkets, and AlliedOffsets for their valuable contributions of price estimates, which informed and strengthened the modelling work presented in this report.

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Introduction

Building upon IETA Working Paper on Carbon Market Frameworks for Brazil, which assessed Brazil's emissions profile, economic structure, and climate commitments in light of international carbon market developments, discussed challenges and opportunities to scale up high integrity market-based instruments in the country, and identified carbon market frameworks that could best contribute to the efficient achievement of the country's NDC, IETA has partnered with EOS Consulting to expand the study toward a new quantitative phase, which aims to analyse the economic, environmental and social impacts of the different carbon market frameworks proposed.

By employing the IMACLIM-BR computable general equilibrium model,ⁱⁱⁱ EOS Consulting team analysed the three scenarios initially proposed during the qualitative assessment (figure 1), seeking to translate the conceptual findings of the first phase into measurable outcomes. The analysis explores how various combinations of domestic and international market instruments could contribute to achieving Brazil's Nationally Determined Contribution (NDC) targets while safeguarding industrial competitiveness and expanding access to private climate finance.

This new working paper presents and discusses the initial results of such modelling work with a view to inform the development of regulations, governance and infrastructure required for the operationalization of an efficient and integrated system in the country. We expect that the insights presented here can complement the findings of the qualitative assessment, informing discussions during COP30 and providing learnings that can support the developments of policies and operational arrangements on the topic in the country.

As part of a broader study, such an exercise should be seen as a work under development, in which the feedback collected during COP30 will be crucial to refine the work and indicate potential pathways forward for Brazil's engagement in carbon markets. As next steps, IETA plans to consolidate both the quantitative and qualitative findings into a crosscutting paper, which will include the country's carbon market potential in different sectors and the existing international benchmarks on integrated carbon market approaches that could be consider by Brazil.

Ultimately, such a study aims to provide an evidence-based foundation for policy discussions and market design decisions, supporting the development of a coherent, efficient, and high-integrity carbon market framework capable of advancing Brazil's long-term decarbonization and sustainable growth objectives.

Scenarios and Analytical Approach

The analysis explores three potential pathways for carbon market frameworks in Brazil according to the qualitative assessment developed previously (Figure 1) and aims to estimate the socio-economic impacts that each of them can represent for Brazil.

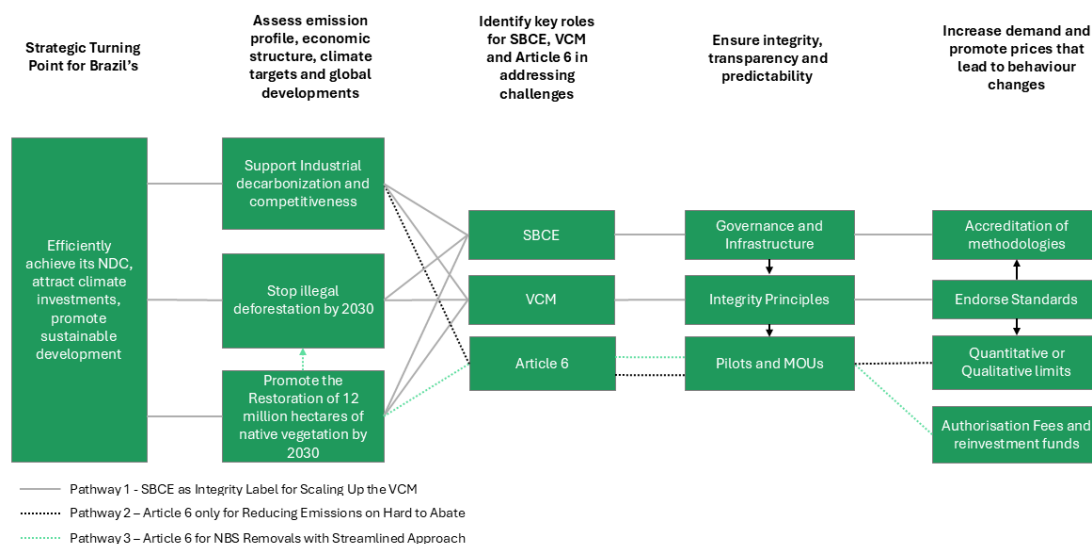


Figure 1: Potential Pathways for Brazil

Source: IETA Working Paper – Carbon Market Frameworks for Brazil (2025)

Considering the sensitivity and nuances of the model and the diverse impacts different alternatives might generate; it is key to detail the scenarios to ensure it considers robust data and reflects practical conditions to support the decision-making process. In that context, below it follows a summary of the design features and specific assumptions adopted for each scenario.

In Pathway 1, ITMO authorizations would only be considered after the country's NDC achievement. Such a framework assumes that the criteria for the accreditation of methodologies under the SBCE would provide an additional layer of integrity, which could contribute to the voluntary and compliance carbon market convergence and increase overall market confidence, scaling up demand for and investments in carbon credits in the country.

Pathway 2 assumes that ITMO exports could be used to support the decarbonization in hard-to-abate sectors, financing projects that would not otherwise occur in the short-term due to its high-costs. In this scenario, the domestic efforts to achieve the NDC would focus on less costly GHG reductions and removals, with ITMO authorization only considered for credits priced above the estimated carbon price needed to achieve the NDC. This scenario calculated the potential for additional reduction beyond the NDC, considering the carbon price trajectory to achieve the Brazilian NDC,ⁱⁱⁱ the EU ETS price trajectory as an upper limit reference for the potential sale value of ITMOs,^{iv} and a marginally inferior price than the EU ETS as ITMO sale price (Figure 2). As a result, the total mitigation potential available in this range reaches 99.7 MtCO₂e in 2030 and 106 MtCO₂e in 2035.

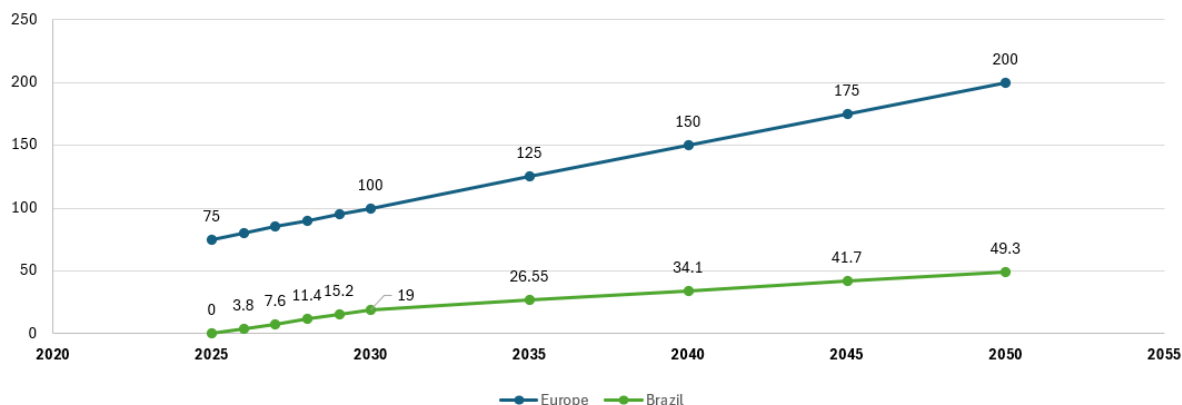


Figure 2: Carbon price trajectory in Brazil and the EU ETS

Source: EOS Consulting based on Centro Clima (2023) and AGORA (2024)

Aligned with Brazil's PLANAVEG goal of restoring 12 million hectares of native vegetation by 2030, the Pathway 3 considers ITMO authorizations for ARR activities, authorizing a share of mitigation outcomes in this sector to attract international investment, scale up projects and stimulate the development of a robust restoration supply chain. It proposes an authorization fee to attract investors and streamline the implementation of native forest restoration projects, with the fee revenues being reinvested to support and scale up complementary high-integrity REDD+ activities domestically, and eventually compensating the impact of the corresponding adjustments applied (Figure 3).^v

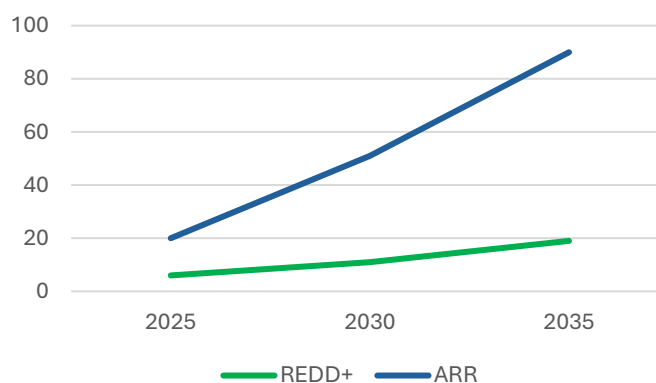


Figure 3: Estimated carbon price trajectory for ARR and REDD+ in the VCM

Source: EOS Consulting based on average market price estimates (S&P Global, Fastmarkets, and AlliedOffsets).

Such scenario assumes that the government could initially authorize the mitigation volume corresponding to 5% of the PLANAVEG target (equivalent to the restoration of 600 thousand hectares of tropical forests), which would result in an estimated authorisation potential of 327 MtCO₂e between 2026-2030. Given the larger amount of domestic mitigations generated by achieving the commitments in the country, by 2035, this authorised volume could increase its share to 10% of the PLANAVEG target to keep the same level of authorisations. For this scenario, it has been assumed an average cost of restoring native vegetation in public and private areas at present value is US\$16.87/tCO₂e in 2030 and US\$19.32/tCO₂e in 2035.^{vi}

Beyond detailing the Pathways, to develop all the scenarios, run the models and estimate impacts in a comparable way, some common assumptions had to be made. Among general assumptions of the model, we can highlight:

- CORSIA already in force from 2027 (second phase) with a price trajectory of US\$24/tCO₂e in 2026, rising to US\$35/tCO₂e in 2030.^{vii}
- Population growth according to data from IBGE Population Projections (Demographic Census, 2022), released in 2024.
- Average real growth of Brazilian GDP at 2.7% per annum between 2025 and 2035, according to National Treasury Fiscal Projections Report from 2025, and 2.6% until 2050 as defined in the Climate Mitigation Plan.
- Adoption of the barrel price trajectory from the 'World Energy Outlook' (IEA, 2024), Announced Pledges scenario: US\$ 72/barrel (2030), US\$ 63/barrel (2040), US\$ 58/barrel (2050);
- Illegal deforestation of native forests reaching zero by 2030, in accordance with Brazil's current commitment.
- The final horizon of the scenarios is 2050, with results every five years.
- For theoretical purposes, the potential and cost of mitigation measures available over the study horizon were extracted from the Mitigation Options study.^{viii}

Preliminary Results and Discussion

The simulations conducted with the IMACLIM-BR model assessed the economic, social, and environmental impacts of the three possible pathways for the integrated implementation of the Brazilian Emissions Trading System (SBCE), the international cooperation mechanisms under Article 6 of the Paris Agreement, and the strengthening of the Voluntary Carbon Market (VCM). Results are presented comparatively, taking Pathway 1, focused on the domestic consolidation of the SBCE and the gradual expansion of the VCM, as the baseline reference for analysing Pathways 2 and 3.

Pathway 1 represents the regulatory reference scenario, in which Brazil focuses on establishing robust rules for carbon credits become CRVEs within the SBCE to increase investments towards mitigation activities in the country, opting to engage in Article 6 only after achieving its NDC.

In this scenario, GDP grows from BRL 11.6 trillion in 2025 to BRL 15.1 trillion in 2035 (2023 BRL), reflecting an average expansion rate of approximately 2.7% per year, consistent with projections from the *Plano Clima Mitigação* and *Plano de Transição Ecológica*. GDP per capita increases from BRL 54.5 thousand to BRL 69.4 thousand over the same period, indicating real gains in income and productivity. The unemployment rate stabilizes between 7.6% and 8.1%, with around 110.7 million full-time equivalent (FTE) jobs by 2035. The trade balance remains slightly positive—about 1.15% of GDP in 2035—and sectoral inflation stays under control.

On the environmental front, net emissions fall from 1,824 MtCO₂e in 2025 to 1,050 MtCO₂e in 2035, consistent with Brazil's NDC target of a 59–67% reduction relative to 2005 levels. The emissions intensity of GDP decreases from 0.16 kg CO₂e/BRL in 2025 to 0.07 kg CO₂e/BRL in 2035, demonstrating a structural decoupling between economic growth and greenhouse gas emissions.

From a social perspective, household purchasing power grows significantly, especially among lower-income groups. The poorest 20% of the population see their purchasing power increase 1.70 times between 2015 and 2035, as a result of expanded domestic consumption, price stability, and increased real income.

Overall, the result for this pathway indicates a framework of macroeconomic and environmental stability, serving as an important reference for the development of regulations that can unlock investments towards the achievement of the NDC and build the basis for the future engagement with Article 6. However, by focusing primarily on the domestic consolidation of the SBCE and its potential to expand demand and investments in the VCM, this pathway limits the potential for additional revenue and investment flows, especially to support the achievement of short-term climate commitments, that could be unlocked through the international cooperation and are explored in Pathways 2 and 3.

Pathway 2 introduces the Article 6 mechanisms as instruments of international financing for mitigation efforts in hard-to-abate industrial and energy sectors, fostering technology transfer, foreign investment, and the acceleration of industrial modernization.

In this scenario, GDP records an incremental gain of 1.07% by 2035 upon the reference scenario, reaching BRL 15.3 trillion, supported by foreign investment inflows of BRL 53.8 billion in 2030 and BRL 71.6 billion in 2035, stemming from ITMO transactions and industrial partnerships. The trade balance

improves slightly, reaching 2.09% of GDP, reflecting the expansion of industrial activities and technological services associated with climate innovation.

The export of ITMOs totals 99.7 MtCO₂e in 2030 and 106.1 MtCO₂e in 2035, with corresponding adjustments ensuring environmental integrity and NDC compliance. Before the application of these adjustments, emissions would reach 944 MtCO₂e in 2035, compared to 1,050 MtCO₂e after adjustment — underscoring the transparency and credibility of the accounting process.

Moreover, the additional revenues generated by ITMO transactions under this scenario should capitalize new mitigation activities in the hard-to-abate sectors, allowing reinvestments and spillover effects that can lead to even further reductions in those sectors.

It is important to note that the measures assessed in this pathway — typically hard-to-abate — do not belong to the least-cost portfolio for achieving Brazil's NDC, as demonstrated in Pathway 1. While not essential for domestic mitigation, they are attractive to developed countries, where marginal abatement costs are significantly higher. In this context, Article 6 enables Brazil to convert cost differentials into financing and technology-learning opportunities.

From a social perspective, household purchasing power follows a trajectory like that of Pathway 1, with a slight income increase among middle-income classes and greater generation of skilled jobs. The technological transition exerts a moderate inflationary effect ($\approx +1.04\%$), while contributing positively to productivity, fiscal revenues, and industrial sophistication.

In summary, while Pathway 2 demonstrates that the strategic use of Article 6 can combine industrial decarbonization, foreign capital attraction, and macroeconomic gains, positioning Brazil as a competitive provider of mitigation outcomes and low-carbon technologies, its benefits tend to be initially concentrated in capital-intensive sectors and may take longer to translate into broad-based social and environmental gains.

To complement the previous approaches, Pathway 3 explores a more inclusive use of international cooperation — one that leverages Brazil's comparative advantages in nature-based solutions to deliver short term, large-scale mitigation outcomes with the potential of fostering rural development, biodiversity protection, and community resilience.

Pathway 3 directs Article 6 cooperation toward nature-based solutions (NBS), especially ARR and REDD+ projects, reinvesting authorization revenues into high-integrity REDD+ activities domestically.

In macroeconomic terms, GDP reaches R\$ 15.34 trillion in 2035, which is 1.40% above Pathway 1, as a result of the dynamism of forestry chains and the multiplier effect of local investments. The trade balance remains in surplus (1.2% of GDP), and the level of employment grows slightly, reaching 111 million FTE jobs in 2035.

The volume of ITMOs exported is 109.2 MtCO₂e in 2030 and keeps the same level for 2035, being relatively small compared to the total mitigations to be generated by achieving the target,^{ix} but the net revenues generated are significant, estimated at R\$ 30.1 billion and R\$ 53.1 billion, respectively, reflecting the high market value of ARR credits (US\$ 51/tCO₂e in 2030; US\$ 90/tCO₂e in 2035).

From a social perspective, the purchasing power of the poorest class achieves the greatest gain among all paths, growing 1.74 times between 2015 and 2035, driven by job creation in forest restoration

(generally requiring lower qualifications), the appreciation of the rural economy, and the socio-environmental co-benefits of community-focused carbon projects.

The inflationary impact is slightly higher (index 1.09 compared to Pathway 1), due to the increase in domestic demand, the increase in average wages as a result of lower unemployment, and the appreciation of agricultural inputs, but it remains within stable and manageable macroeconomic limits.

Pathway 3 confirms that Brazil can consolidate its position as a global provider of high-integrity NCS removals, combining economic gains with environmental conservation and the reduction of regional inequalities. This approach would favour broad social and environmental gains, promoting territorial inclusion, income generation in rural areas, and the strengthening of traditional communities.

This working paper is part of a broader ongoing study to inform Brazil's carbon market strategy. Feedback gathered during COP30 will help refine its findings and shape future directions. Building on these insights, IETA will integrate the quantitative and qualitative results into a comprehensive paper outlining Brazil's sectoral potential and international benchmarks. The ultimate goal is to provide an evidence-based foundation for policies and market design that foster a coherent, efficient, and high-integrity carbon market supporting the country's long-term decarbonization and sustainable growth.

Indicator	2015	2020	2025	Pathway 1 2030	Pathway 1 2035	Pathway 2 2030	Pathway 2 2035	Pathway 3 2030	Pathway 3 2035	Unit
Population (IBGE)	202	209	213	219	218	219	218	219	218	Millions
GDP (R\$ in 2023)	10.00 2	9.767	11.59 9	13.254	15.135	13.282	15.297	13.319	15.343	R\$ bi
GDP per capita	49,5	46,7	54,5	60,5	69,4	60,6	70,2	60,8	70,4	Thousand BRL/hab
Trade Balance	0,40	1,60	0,05	-0,10	1,15	0,28	2,09	-0,02	1,24	% of GDP
Unemployment rate	9,5	7,6	8,1	7,58	8,08	07,60	08,09	07,55	07,81	%
Employment positions	102	108	109	110,70	110,71	110,67	110,78	110,84	111,15	Millions FTE
Price Index (vs ref.)	-	-	-	-	-	1,026	1,046	1,026	1,090	Index
Net Emissions	1.562	1.824	1.824	1.200	1.050	1.200	1.050	1.200	1.050	MtCO ₂ e
Carbon Price	-	-	-	-	-	19	26,55	19	26,55	US\$/tCO ₂ e
ITMO selling price						100	125	51	90	US\$/tCO ₂ e
Exported ITMOs	-	-	-	-	-	99,71	106,1	109,2	109,2	MtCO ₂ e
Balance of Emissions after CAs	-	-	-	-	-	1.100	944	1.0908	940	MtCO ₂ e
Foreign Investments	-	-	-	-	-	53,8	71,6	30,1	53,1	BRL bi
Emissions per capita	7,7	8,7	8,6	5,5	4,8	5,5	4,8	5,5	4,8	tCO ₂ e/hab
Emissions Intensity	0,16	0,19	0,16	0,09	0,07	0,09	0,07	0,09	0,07	kgCO ₂ e/BRL
Purchase Power- Class 1	1,00	1,08	1,26	1,48	1,70	1,48	1,70	1,49	1,74	2015=1
Purchase Power a - Class 2	1,00	1,04	1,21	1,43	1,61	1,42	1,61	1,43	1,64	2015=1
Purchase Power - Class 3	1,00	1,04	1,21	1,35	1,51	1,35	1,51	1,36	1,54	2015=1
Purchase Power - Class 4	1,00	1,01	1,15	1,28	1,44	1,28	1,44	1,29	1,46	2015=1

Table 1: Comparative Summary of Modelling Results

Source: EOS Consulting based on IMACLIM-BR results

Conclusion

The quantitative and qualitative results indicate that consolidating Pathway 1 is an important condition for ensuring the integrity, predictability, and credibility of the Brazilian carbon market. This robust integration between the VCM and SBCE can establish the institutional, legal, and methodological foundations on which international instruments can also rely safely and efficiently.

However, the results of Pathways 2 and 3 demonstrate that engagement with Article 6 significantly expands the country's economic, social, and environmental potential, in line with international comparative studies that indicate that the savings obtained from the cooperative implementation of NDCs, if reinvested in greater climate ambition, could more than double emissions reductions.^x In the Brazilian context, the results demonstrate the potential to convert efficiency gains into climate leadership, strengthening the country's role as a net provider of high-integrity mitigation and a benchmark in international cooperation policies.

More than alternative trajectories, Pathways 2 and 3 should be seen as parallel, complementary and synergistic approaches. While Pathway 2 promotes industrial and technological modernization, it allows access to technologies and the reduction of emissions from industries that, in the future, are likely to be regulated by the SBCE, facilitating its eventual implementation and leveraging Brazil's competitiveness as a supplier of low-carbon mitigation and technology, Pathway 3 can generate short-term territorial, social, and environmental benefits, diversifying the economy and stimulating regional development through nature-based solutions.

It is worth highlighting the need to confirm the assumptions through dialogues with actors from the public and private sectors in order to refine both the proposed scenarios and explore new scenarios to be considered. In this sense, the preliminary results presented here also indicate the potential to explore the impacts of combining scenarios. Together, the three paths can form a fair, competitive, and sustainable transition strategy that combines climate ambition, technological innovation, social inclusion, and economic growth.

Finally, the results show that Brazil has an unprecedented strategic opportunity to consolidate itself as a global leader in carbon market governance, reconciling economic growth, energy transition, and social justice. The integration between the Brazilian Emissions Trading System (SBCE), the cooperation mechanisms of Article 6 of the Paris Agreement, and the strengthening of the Voluntary Carbon Market (VCM) can create a climate policy architecture that, if well structured, will produce substantial gains in economic efficiency, technological innovation, and environmental sustainability.

Adopting a constructive approach to Article 6, developed through an inclusive process and based on robust data, is therefore a strategic opportunity for Brazil—not only to leverage investments and accelerate its own decarbonization, but also to contribute decisively to the global mitigation effort.

With its clean energy matrix, extensive forest base, and recognized technical capacity, the country is uniquely positioned to offer high-integrity mitigation at competitive costs, enabling other economies to achieve their climate goals more efficiently.

This cooperative vision transforms Article 6 into a double-benefit instrument: it attracts resources and technology to Brazil, while reducing the total cost of the global climate transition, and can consolidate the country as a constructive and pragmatic leader in the implementation of the Paris Agreement.

This study represents an ongoing effort to inform Brazil's carbon market strategy. Feedback gathered during COP30 will help refine its findings and shape future directions. Building on these insights, IETA will integrate the quantitative and qualitative results into a comprehensive paper outlining Brazil's sectoral potential and international benchmarks. The goal is to provide an evidence-based foundation for policies and market design that foster a coherent, efficient, and high-integrity carbon market supporting the country's long-term decarbonization and sustainable growth.

Endnotes

ⁱ [ANNEX I - Computable General Equilibrium \(CGE\) Modelling – IMACLIM-BR](#)

ⁱⁱ Wills et al (2021) Economic and social effectiveness of carbon pricing schemes to meet Brazilian NDC targets. Climate Policy, 2021. <https://doi.org/10.1080/14693062.2021.1981212>

ⁱⁱⁱ [CENTRO CLIMA/ COPPE / UFRJ \(2023\). Uma Estratégia de Descarbonização para uma Economia Brasileira de Zero Carbono Líquido em 2050: Instrumentos de Política e Planos Setoriais de Mitigação - Projeto DecarBoost.](#)

^{iv} Agora Energiewende (2024): EU climate policy between economic opportunities and fiscal risks. Assessing the macroeconomic impacts of Europe's transition to climate neutrality (baseline scenario).

^v Based on average market price estimates, the price difference between REDD+ credit prices tend to be about 20% of ARR credit prices. Considering this trend and that authorizations will lead to a price premium, such percentage was used as reference for establishing the authorization fee in this scenario.

^{vi} CENTRO CLIMA/ COPPE / UFRJ (2023). Uma Estratégia de Descarbonização para uma Economia Brasileira de Zero Carbono Líquido em 2050: Instrumentos de Política e Planos Setoriais de Mitigação - Projeto DecarBoost.

^{vii} Based on average market price estimates from public studies and data providers that contributed to this work.

^{viii} BRASIL. Ministério da Ciência, Tecnologia, Inovações e Comunicações (MCTIC). Opções de Mitigação de Emissões de Gases de Efeito Estufa (GEE) em Setores-Chave do Brasil.

^{ix} Considering authorizations for estimated removals to be generated by the restoration of 600 thousand hectares of tropical forest, or the equivalent of 5% of PLANAVEG's reforestation target by 2030.

^x IETA; Edmonds, J.; George, M.; Yu, S.; Forrister, D.; Bonzanni, A. *Modelling the Economics of Article 6: A Capstone Report*. [S.l.], 2023. Disponível em: https://www.ieta.org/uploads/wp-content/Resources/Reports/IETAA6_CapstoneReport_2023.pdf