

Brazil's Climate Change Policy Evolution Between COP 21 (2015) and COP 27 (2022)

国際平和学研究科国際平和学専攻修士課程修了

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Abstract

The research assesses Brazil's climate action from a policy perspective. The Paris Agreement Nationally Determined Contributions (NDC) are used to evaluate the evolution of the Brazilian ambition to mitigate the effects of climate change and reach the commitments made to the United Nations Framework Convention on Climate Change. This article uses data from Brazil's greenhouse gas emissions and deforestation rates, to determine if the current policies are adequate to implement measures aligned with the targets, projects, instruments, and funding for the achievement of the Paris Agreement goals. It is fair to say that Brazil needs more ambitious commitments and more importantly requires persistent and tenacious policies and political will to transform commitments made in reports and conferences into actual benefits for the planet's future.

Keywords : climate change, Paris Agreement, Brazil, NDC, policies, greenhouse gas emissions, deforestation.

Introduction

Climate change is not a problem of the future. Each day we are witnessing an increased number of extreme weather events that are threatening human lives. The disrupted Earth's ecosystem with hotter temperatures, weather patterns, and rising sea levels will affect food security and increase health risks. It is a silent war between humans and the earth where we all have plenty to lose. “Neoliberalism and globalization have made life more convenient and brought a great deal of material wealth to a limited group of people, but they have also caused great harm.”¹ Yet, the same humans who created this ecological problem are the ones who can avoid the collapse.

To date, the global efforts to combat the climate adverse effects were agreed upon in 2015 at the 21st Conference of Parties (COP21) with the Paris Agreement on Climate Change. The goal is to hold the increase in the global average temperature to “well below” 2°C above pre-industrial levels. At the heart of the Paris Agreement are the Nationally Determined Contributions (NDCs) where each country will communicate their commitments to reduce emissions and adaptation plans for the impacts of climate change.²

This article aims to evaluate Brazil's progress in achieving the NDCs and correlated policies implemented since the Paris Agreement. Brazil submitted the first NDC to the United Nations Framework Convention on Climate Change (UNFCCC) in September 2016, updated its submission in December 2020, and presented the latest version in March 2022.

Since hosting the historical Earth Summit in 1992, Brazil with its rich natural resources, abundant freshwater rivers, rainforests, minerals, fauna, and original indigenous peoples has been at the forefront of the global environmental agenda. Despite the belief that Brazil's resources are endless, research shows that it is ranked as the fourth largest carbon dioxide (CO₂) emitter from fossil fuels, cement, land use, and forestry in the global cumulative since the industrial revolution. If only land use and forestry CO₂ emissions are considered, Brazil is in first place globally.³

This research is based on primary and secondary data from Brazilian government reports, national policies, media publications, international organization reports, think tanks, and Non-Governmental Organization (NGO) reports. First, it evaluates the NDC pledges and climate change policies implemented between Paris COP21 and Sharm El-Sheikh COP27 held in 2022.

¹ Ernst Ulrich Von Weizsacker and Daisaku Ikeda, *Knowing Our Worth: Conversations on Energy and Sustainability*, Dialogue Path Press, 2016, 15.

² “Nationally Determined Contributions (NDCs)”, United Nations Climate Change, accessed August 18, 2023, <https://unfccc.int/process-and-meetings/the-paris-agreement/nationally-determined-contributions-ndcs>.

³ Simon Evans, “Analysis: Which Countries Are Historically Responsible for Climate Change?,” Carbon Brief, May 12, 2022, <https://www.carbonbrief.org/analysis-which-countries-are-historically-responsible-for-climate-change/>.

Second, it assesses the role of UNFCCC reports and how those reports are developed into public policies. Third, this analysis shows some of the strengths and gaps in the Brazilian achievement of NDC commitments.

Brazilian NDCs and decreased ambition to the Paris Agreement

The NDCs are essential for achieving the Paris Agreement's long-term goals. For Brazil, it is an essential instrument of foreign and national policy on climate change. The first NDC version was submitted to the UNFCCC in September 2016 and was the 'intended' NDC (iNDC) with a broad scope including mitigation, adaptation, and means of implementation. The preparation for the Brazilian iNDC started in June 2014, and a national survey was conducted to understand the Brazilian society's expectations about an international climate agreement. The result was a mitigation contribution to reduce GHG emissions by 37% below 2005 levels in 2025 and a subsequent contribution to reduce GHG emissions by 43% below 2005 levels in 2030.⁴

The December 2020 version kept the GHG emissions reduction percentages from the previous iNDC and added a long-term objective of reaching climate neutrality in 2060 was added. The Brazilian Ministry of Foreign Affairs claimed that this NDC is one of the most ambitious in the world.⁵

The third update to the Brazilian NDC was communicated in March 2022. This time, GHG emission reduction was kept at 37% in 2025, but an improved reduction of 50% was set by 2030. The long-term objective to achieve climate neutrality was brought forward by 10 years, from 2060 to 2050. The communication starts with a statement that "as a developing country, Brazil's historical contribution to the global problem of climate change has been small. This NDC, therefore, largely exceeds the level of ambition expected of a country with a small historical responsibility for the increase in the global mean surface temperature resulting from anthropogenic greenhouse gas emissions".⁶

This statement that the historical contribution of Brazil to the global problem is minor, contradicts a new study from CarbonBrief on historical emissions released in October 2021. The

⁴ Federative Republic of Brazil, "Intended Nationally Determined Contribution (iNDC)," September 28, 2015, accessed January 2, 2023, <https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Brazil/1/BRAZIL%20iNDC%20english%20FINAL.pdf>.

⁵ Federative Republic of Brazil, "Nationally Determined Contribution (NDC) 2020," December 8, 2020, this NDC version is no longer available at <https://unfccc.int/NDCREG>.

⁶ Federative Republic of Brazil, "Nationally Determined Contribution (NDC) 2022," March 21, 2022, accessed January 2, 2023, <https://unfccc.int/sites/default/files/NDC/2022-06/Updated%20-%20First%20NDC%20-%20%20FINAL%20-%20PDF.pdf>.

CarbonBrief report presents a ranking of the countries with the most significant cumulative CO₂ emissions, including land use and forestry. When the land emissions are included, Brazil becomes the 4th largest cumulative CO₂ emitter from 1850 to 2021.⁷

The NDC statement that it ‘largely’ exceeds the level of ambition is incorrect. The emission reduction percentage might have increased, but it will be applied over the net emissions reference level in 2005. The total net emissions of GHG are estimated based on the methodologies described by the IPCC and reported to the UNFCCC. In the National Communication (NC) report, the inventories of anthropogenic emissions by sources and removals by sinks of all GHG not controlled by the Montreal Protocol are being constantly updated. The values of the total inventory of anthropogenic emissions of all GHG estimated on each NC for the base year 2005. Global Warming Potential (GWP) is used to level the global warming impacts of different gases and the time period is usually 100 years.⁸

In 2016 the iNDC was submitted to UNFCCC using the baseline estimated fixed emissions levels in 2005 (GWP-100; IPCC AR5). The GHG emissions in 2005 were equal to 2.1 GtCO₂eq and numerically described in the additional information section of the iNDC.⁹ This number is close to the reported in the most updated data of 2016 which is from the Second NC. For 2025, the iNDC pledge is to reduce GHG emissions by 37% below 2005 levels, equivalent to a 1.30 GtCO₂eq maximum emission. For 2030, reduce GHG emissions by 43% below 2005 levels, which is a 1.2 GtCO₂eq maximum emission.

The 2020 NDC version’s baseline estimated fixed emissions levels in 2005 (GWP-100; IPCC AR5) that equaled 2.84 GtCO₂eq, as per the “Third National Communication from Brazil to the UNFCCC.”¹⁰ Note that the baseline value for the 2005 emissions has increased from the previous values stated on the iNDC. On the other hand, the reduction targets remained the same, 37% for 2025 and 43% for 2030. As a result, the maximum GHG emissions targets have increased in GtCO₂eq, with a total of 1.79 GtCO₂eq in 2025 and 1.62 GtCO₂eq in 2030, according to the updated levels of 2005. As a result, the 2020 NDC presented a less ambitious commitment to the convention, which goes against the Paris Agreement Article 4, item 3, which describes that each

⁷ Simon Evans, “Analysis: Which Countries Are Historically Responsible for Climate Change?” Carbon Brief, May 12, 2022, accessed January 2, 2023, <https://www.carbonbrief.org/analysis-which-countries-are-historically-responsible-for-climate-change/>.

⁸ US EPA, “Understanding Global Warming Potentials,” May 5, 2022, accessed January 2, 2023, <https://www.epa.gov/ghgemissions/understanding-global-warming-potentials>.

⁹ Federative Republic of Brazil, “Intended Nationally Determined Contribution (iNDC).”

¹⁰ Federative Republic of Brazil, “Nationally Determined Contribution (NDC) 2020.”

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Party successive NDC will represent a progression beyond the Party's current NDC, reflecting the highest possible ambition.¹¹

However, this NDC added a new pledge to achieve climate neutrality in 2060, conditioned to the proper functioning of the market mechanism provided in the Paris Agreement. Therefore, the National Adaptation Plan (NAP) and further measures listed in the previous 2016 iNDC were excluded from this first official version of the Brazilian NDC. After evaluating the 2020 NDC version, The Climate Action Tracker downgraded Brazil from the 'Insufficient' category to 'Highly Insufficient' due to NDC's failure to increase the ambition.¹²

In 2022, Brazil sent an updated NDC right after COP26. The baseline estimated fixed emissions levels in 2005 (GWP-100; IPCC AR5) increased to 2.56 GtCO₂eq since the NDC level of GHG emissions is based on the "Fourth National Communication from Brazil to the UNFCCC." The NDC wording was updated to refer to the latest "National Inventory Report available and submitted to the UNFCCC." The reduction percentage goal was maintained for 2025 by 37% below 2005 levels (1.61 GtCO₂eq maximum emission), but for 2030, the reduction target increased by 50% below 2005 levels (1.28 GtCO₂eq maximum emission).¹³

Climate neutrality commitment shifted forward to 2050 and the condition for a proper function of the market mechanism provided in the Paris Agreement was removed. The revised NDC reincludes the NAP and further measures listed in the previous 2016 iNDC and mentions a new target to end illegal deforestation in 2028. These updates provided an upgraded status at the Climate Action Tracker back to the "Insufficient" rating, which is currently Brazil's status on this independent scientific analysis platform.¹⁴ This indicates that a country's climate policies and commitments need substantial improvements consistent with the Paris Agreement's 1.5°C temperature limit.¹⁵

Table 1 summarizes the Brazilian NDCs' contribution to the Paris Agreement. The differences between the total emissions from the 2016 iNDC and 2020 NDC are comparable to one

¹¹ "PARIS AGREEMENT," *UNFCCC*, 2015, accessed January 2, 2023, https://unfccc.int/sites/default/files/english_paris_agreement.pdf.

¹² Climate Action Tracker, "Brazil," December 9, 2020, accessed January 2, 2023, <https://climateactiontracker.org/climate-target-update-tracker/brazil/>.

¹³ Federative Republic of Brazil, "Nationally Determined Contribution (NDC) 2022."

¹⁴ Climate Action Tracker, "Brazil," September 5, 2022, accessed January 2, 2023, <https://climateactiontracker.org/countries/brazil/>.

¹⁵ Climate Action Tracker, "CAT Rating Methodology," accessed January 2, 2023, <https://climateactiontracker.org/methodology/cat-rating-methodology/>.

year of emission from countries like Poland (310 MtCO₂eq) in 2025 and Colombia (80 MtCO₂eq) in 2030.¹⁶

Table 1 - Brazilian NDCs Commitments Summary

	iNDC 2016	NDC 2020	NDC 2022
2025 target reduction	37%	37%	37%
2025 target emissions	1.30 GtCO ₂ eq	1.79 GtCO ₂ eq	1.61 GtCO ₂ eq
2030 target reduction	43%	43%	50%
2030 target emissions	1.2 GtCO ₂ eq	1.62 GtCO ₂ eq	1.28 GtCO ₂ eq
Climate neutrality	-	2060	2050
Zero illegal deforestation	2030	-	2028
National Adaptation Plan	included	excluded	included

The Brazilian NDC Credibility report published by the Brazilian think tank Instituto Talanoa and World Wide Fund for Nature (WWF) presents seventeen analyses by national and international groups and organizations about the latest NDC updates. The report emphasizes the importance of the NDC as an instrument that constructs the expectations for the private sector, civil society, public policies, future investments, and development of the country.¹⁷

The WWF made a #NDCsWeWant¹⁸ assessment comprising several NDCs worldwide, categorizing them according to a checklist¹⁹ with 20 primarily qualitative factors. Brazil's NDC has been classified in the worst category as 'NDC We Don't Want'. According to this assessment, many other South American countries have better NDCs, such as Colombia, Chile, and Argentina.²⁰

Under the Convention, Brazil has submitted four NC and four Biennial Update Report (BUR) that are part of the previous Measurement, Reporting, and Verification (MRV) framework agreed on in COP13. At COP21, this framework has evolved to be part of the new Enhanced Transparency Framework (ETF), described in Article 13 as part of the global effort of climate change mitigation. The ETF is crucial for building trust and confidence among the Paris

¹⁶ Unterstell & Martins, 2022, NDC: Analysis of the 2022 update submitted by the Government of Brazil, Analysis Report, Rio de Janeiro, Brasil, Talanoa, 2022, accessed January 2, 2023, https://talanoainstitute.org/wp-content/uploads/2022/11/Brazils-NDC-2022-analysis_V0.pdf.

¹⁷ Unterstell & Watanabe Jr, Credibilidade, Série "NDC brasileira", Rio de Janeiro, Brasil, TALANOIA, 2022, accessed January 2, 2023, https://talanoainstitute.org/wp-content/uploads/2022/11/Diagramacao_Serie-NDC-brasileira-12.pdf.

¹⁸ WWF, "Brazil: NDC We Don't Want," July 2022, accessed January 2, 2023, https://wwfint.awsassets.panda.org/downloads/ndcs_we_want_assessment_brazil_2022.pdf.

¹⁹ WWF, "WWF Releases Checklist to Assess #NDCsWeWant," accessed January 2, 2023, https://wwf.panda.org/discover/our_focus/climate_and_energy_practice/ndcs_we_want/?364143/NDCsWeWant-WWF-climate-ambition-checklist.

²⁰ WWF, "The NDCs We Want," accessed January 2, 2023, https://wwf.panda.org/discover/our_focus/climate_and_energy_practice/ndcs_we_want/.

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Agreement signatory countries.²¹ After 2024, the BURs will be superseded by the Biennial Transparency Report (BTR) for all the Paris Agreement Parties.

Additionally, a technical annex report according to decision 14/CP.19²² is submitted as an annex in the BUR to comply with results-based payments for Reducing Emissions from Deforestation and forest Degradation (REDD+) and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries. It is a framework with voluntary activities implementation, recognized in Article 5 of the Paris Agreement, where Parties re-iterated the encouragement to implement REDD+ activities.²³

The BUR updates the mitigation actions defined in 2012 at COP18 in Doha.²⁴ Developing country Parties will take Nationally Appropriate Mitigation Actions (NAMAs) in the context of sustainable development, with CO₂ emission targets by 2020. Brazilian NAMAs in BUR3 and BUR4 presented an estimated reduction related to each NAMA with a summary of the estimated GHG reduction by 2020 per sector. The total GHG reduction of all NAMAs is a minimum of 974 MtCO₂e and a maximum of 1,051 MtCO₂e.

All the NAMAs reported were set to be completed by 2020, and no other NAMA's reduction emissions goal was released after that. NAMAs are a pivotal element of the BURs and should be used as a target for national policies in those different mitigation areas. With clear targets, it is easier to define what actions should be taken and how each NAMA field should plan its emissions reduction.

The Brazilian NDC should be updated as soon as possible to be compatible with the Paris Agreement's ambition. In May 2021, a group of young activists from Engajamundo and Fridays for Future sued the Brazilian Federal Government and the Environmental Ministry for the violation of the Paris Agreement progression of ambition on the NDC.²⁵ Finally, the new Brazilian federal government has determined climate action as one of its main priorities and is committed to

²¹ UNFCCC, "Reporting and Review under the Paris Agreement," accessed January 2, 2023, <https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-paris-agreement>.

²² UNFCCC, "Decision 14/CP.19 Modalities for Measuring, Reporting and Verifying," accessed January 2, 2023, <https://unfccc.int/resource/docs/2013/cop19/eng/10a01.pdf#page=39>.

²³ UNFCCC, "What Is REDD+?," accessed January 2, 2023, <https://unfccc.int/topics/land-use/workstreams/redd/what-is-redd>.

²⁴ UNFCCC, "Nationally Appropriate Mitigation Actions (NAMAs)," accessed January 2, 2023, <https://unfccc.int/topics/mitigation/workstreams/nationally-appropriate-mitigation-actions>.

²⁵ G1, "Jovens processam governo por 'pedalada' climática e pedem anulação de meta brasileira no Acordo de Paris," April 14, 2021, accessed August 25th, 2023, <https://g1.globo.com/natureza/noticia/2021/04/14/jovens-processam-governo-por-pedalada-climatica-e-pedem-anulacao-de-meta-brasileira-no-acordo-de-paris.ghtml>.

creating a new NDC with the participation of different sectors of society and with increased ambition for GHG emissions reduction.²⁶

Brazil's National Policies on Climate Change

Brazilian Law No 12.187 of 2009²⁷ instituted the National Policy on Climate Change (PNMC in Portuguese), seven years before the Paris Agreement. This law establishes the principles, goals, guidelines, and instruments of the Brazilian climate change policy. Additionally, Brazilian Law No 12.114 of 2009²⁸ created the National Fund for Climate Change (FNMC in Portuguese) bound to the Ministry of the Environment to ensure resources to implement the PNMC by supporting studies, projects, and finance for mitigation and adaptation measures.

Article 11 establishes the climate change mitigation and adaptation sectoral plans to consolidate the low carbon economy, including the goal to achieve the NAMAs. Then, Article 12 adopts a voluntary PNMC goal to reduce between 36.1% and 38.9% of the GHG emissions projected up until 2020.

In 2017, Decree 9.073²⁹ enacted the Paris Agreement, which was signed in April 2016. However, this decree presents only the agreement content and confirms that Brazil has ratified it with the UNFCCC.

In 2018, Decree 9.578 revoked Decree 7.390 but maintained the numerical goals from the original decree from 2010. The decree estimated that the national emissions for 2020 were at 3,236 MtCO₂eq. Based on the PNMC goal to reduce 36.1% and 38.9%, the total emissions for 2020 would be between 1,977 and 2,068 million tCO₂eq.

About the 3,236 MtCO₂eq estimated in 2010, the Instituto Talanoa's report on the PNMC in 2020 says that the forecast for 2020 was based on an unrealistic growth of emissions based on the assumption that the GDP would grow 5% per year until 2020 and the lack of public policies would cause an increase of fossil fuels in the energy sector.³⁰

²⁶ Ana Carolina Amaral, "Meio Ambiente quer corrigir 'pedalada climática' de Bolsonaro e criar nova meta participativa," *Folha De S.Paulo*, May 24, 2023, accessed August 25th, 2023, <https://www1.folha.uol.com.br/ambiente/2023/05/meio-ambiente-quer-corrigir-pedalada-climatica-de-bolsonaro-e-criar-nova-meta-participativa.shtml>.

²⁷ Federative Republic of Brazil, "LEI Nº 12.187, DE 29 DE DEZEMBRO DE 2009", accessed January 2, 2023, http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2009/lei/l12187.htm.

²⁸ Federative Republic of Brazil, "LEI Nº 12.114, DE 9 DE DEZEMBRO DE 2009", accessed January 2, 2023, http://www.planalto.gov.br/ccivil_03/_Ato2007-2010/2009/Lei/L12114.htm.

²⁹ Federative Republic of Brazil, "DECRETO Nº 9.073, DE 5 DE JUNHO DE 2017", accessed January 2, 2023, https://www.planalto.gov.br/ccivil_03/_ato2015-2018/2017/decreto/d9073.htm.

³⁰ Talanoa, "A Política Nacional de Mudança Do Clima Em 2020: Estado de Metas, Mercados e Governança Assumidos Na Lei 12.187/2009," 2020, accessed January 2, 2023, https://talanoainstitute.org/wp-content/uploads/2022/11/Talanoa_Politica-Nacional-de-Mudanca-de-Clima_V5.pdf.

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In 2022, the Brazilian Federal Government released the 6th edition of the annual estimates of GHG emissions report prepared by the Ministry of Science, Technology, and Innovation (MCTI in Portuguese). This report provides the annual estimates of net GHG emissions from 1990 to 2020 and the results of the accomplishment of the PNMC national voluntary commitment. Chapter 1.3 provides the analysis based on Decree 9.578/2018, concluding that the result for the voluntary reduction commitment of PNMC for 2020 was achieved. The report presents Figure 1 with the yearly net emissions and the maximum and minimum emissions commitment for 2020.³¹

Brazil's PNMC voluntary commitments for 2020 connected to the NAMAs at COP15 in 2009 was a pioneering commitment from a developing country. The emissions in 2009 had significantly dropped from previous years, and the predicted emissions for 2020 were too high compared to the 30-year span presented in Figure 1. Emissions mitigation commitments intention is to reduce the level of GHG emissions. If the reference set for emissions uses such a high forecast number, achieving the goal might be reasonably accessible. In the PNMC case, the goal was to reduce 36.1% and 38.9%. Therefore, the excellent result of a 48.2% reduction presented does not mean that the GHG emissions in Brazil have significantly reduced. The total net emissions in 2020 were the highest in 12 years. Coincidentally this is the highest result since the PNMC commitment in 2009; there was no actual reduction and benefit from this goal.

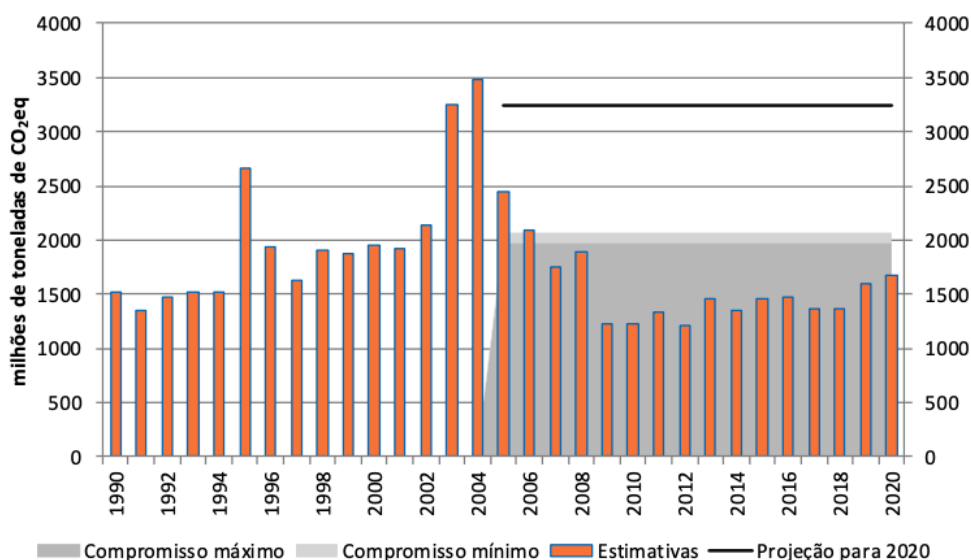


Figure 1 – Net GHG emissions, GWP, IPCC-SAR with 2020 PNMC commitments

³¹ Ministério da Ciência, Tecnologia e Inovações, “Estimativas Anuais de Emissões de Gases de Efeito Estufa no Brasil (6ª EDIÇÃO),” Brasil, 2022, accessed January 2, 2023, <https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/sirene/publicacoes/estimativas-anuais-de-emissoes-gee/arquivos/6a-ed-estimativas-anuais.pdf>.

The National REDD+ Strategy (ENREDD+ in Portuguese) uses the PNMC and the Forest Code as strategic perspectives to provide overarching guidelines. The tactical-operational level is done by the action plans for the prevention and control of deforestation on the biome scale. The Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm in Portuguese) was created in 2004. In 2010, the Action Plan for the Prevention and Control of Deforestation and Forest Fires in the Cerrado (PPCerrado in Portuguese). The Amazon Fund and FNMC are the main financial instruments for financing REDD+ mitigation actions.³²

According to the Greenhouse Gas Emission and Removal Estimating System (SEEG in Portuguese) infographic on GHG emissions in Brazil in 2021³³, land use change accounted for 49% of all the gross GHG emissions in 2021. Almost half of Brazil's GHG emissions come from land use change. For this reason, the strategy to achieve the GHG emissions reduction commitments to the Paris Agreement should focus on forest conservation.

Brazil's PNMC has included plans for REDD+ actions to prevent and combat deforestation at the biome scale. Released in 2016, The ENREDD+ strategy describes the Brazilian initiatives for reducing the emissions caused by deforestation, reducing emissions from forest degradation, conserving, sustainable management of forests, and enhancement of forest carbon stocks.³⁴

Even though the BUR4 presented an annex with the REDD+ results for the Amazon and Cerrado biomes, the Brazilian ENREDD+ plan has yet to be updated since 2020. The disconnect between the current NDC goals and ENREDD+ implies that ENREDD+ should be updated to provide the necessary plan for monitoring deforestation and using financial mechanisms.

The Amazon fund became operational in 2009 to promote conservation, sustainability, preventive actions, monitoring, and fight deforestation in Brazil's Legal Amazon, using non-reimbursed resources. It has received donations from foreign governments and companies, Norway being the primary donor with 93.8%.³⁵ The fund was restarted when President Luiz Inácio Lula da Silva took office in January 2023 and new donations were pledged by the United States of America and the United Kingdom.³⁶

³² Ministério do Meio Ambiente, "Legal and Public Policy Framework," REDD+ Brasil, October 11, 2018, accessed January 2, 2023, <http://redd.mma.gov.br/en/legal-and-public-policy-framework>.

³³ SEEG, GHG BRAZIL 2021, November 2022, <https://Seeg.Eco.Br/Category/Infograficos/>, <https://seeg-br.s3.amazonaws.com/Infograficos/ENG/2021/SEEG-infografico-Brasil-EN-2021-1.jpg>.

³⁴ Ministério do Meio Ambiente, "ENREDD+ National REDD+ Strategy," REDD+ Brasil, 2016, accessed January 2, 2023, http://redd.mma.gov.br/images/publicacoes/enredd_english_web.pdf.

³⁵ BNDES, "Fundo Amazônia - Relatório de Atividades," Fundo Amazônia, 2021, accessed January 2, 2023, https://www.fundoamazonia.gov.br/export/sites/default/pt/galleries/documentos/rafa/RAFA_2021_port.pdf.

³⁶ André Schröder, "Boosted with Fresh Donations, Amazon Fund Reboots Stalled Projects," Mongabay Environmental News, June 5, 2023, <https://news.mongabay.com/2023/06/boosted-with-fresh-donations-amazon-fund-reboots-stalled-projects/>.

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Brazil has failed to reduce deforestation, and since 2012, the land use change has steadily risen, reaching the highest number in 2021 in the last 15 years. At COP26 in 2021, Brazil signed the Glasgow Declaration on Forests with a commitment to end illegal deforestation until 2028. However, in the middle of 2022, the National Institute for Space Research (INPE) alerted about deforestation happening in the most extensive area seen in 7 years in the Legal Amazon. According to the INPE Amazon monitoring program, there has been an increase in the last eight years.³⁷

The latest action plan report for PPCDam and PPCerrado was released in 2018 for 2016-2020.³⁸ The PPCDam is in the 4th phase, and PPCerrado is in the 3rd phase. The report highlights the significant advances in fighting deforestation since 2004. Compared to the reference average in the PNMC, deforestation was reduced by 59.3% in 2016. The results brought national and international recognition to the country as a leader in climate change mitigation. However, since 2017, deforestation rates have risen 29% from the previous year. The report points out the challenges to effectively implementing public policies to reduce deforestation due to the requirement of coordination of different actors.

As part of the actions to reach the PNMC voluntary commitments of emissions reduction in 2020, it was planned a reduction of 80% of annual deforestation rates in the Legal Amazon in relation to the average rate between 1996 and 2005. The PNMC 2020 target rate of 3,925 km² could easily be achieved since the 2012 rate was close to the PNMC goal. Instead, the real deforestation rate in 2020 was 10,851 km², 2.76 times larger.

The Basin Restoration Program (PRODES in Portuguese) project performs satellite monitoring of clear-cut deforestation in the Legal Amazon. Figure 2 shows the PRODES updated rates from 1988 to 2022. The 2022 rate was estimated and updated by 2022/11/30.³⁹

³⁷ Folha de S.Paulo, "Brasil está longe da meta de zerar desmatamento ilegal até 2028," August 29, 2022, accessed January 2, 2023, <https://www1.folha.uol.com.br/ambiente/2022/08/brasil-esta-longe-da-meta-de-zerar-desmatamento-ilegal-ate-2028.shtml>.

³⁸ Departamento de Florestas e de Combate ao Desmatamento, "Plano de Ação Para Prevenção e Controle Do Desmatamento e Das Queimadas No Cerrado (PPCerrado) e Plano de Ação Para Prevenção e Controle Do Desmatamento Na Amazônia Legal (PPCDam): Fase 2016-2020," Ministério Do Meio Ambiente, 2018, accessed January 2, 2023, http://combateaodesmatamento.mma.gov.br/images/conteudo/Livro-PPCDam-e-PPCerrado_WEB_1.pdf.

³⁹ TerraBrasilis, "TerraBrasilis Deforestation Dashboard PRODES," accessed January 2, 2023, http://terrabrasilis.dpi.inpe.br/app/dashboard/deforestation/biomes/legal_amazon/rates.

Deforestation rates - Legal Amazon - States

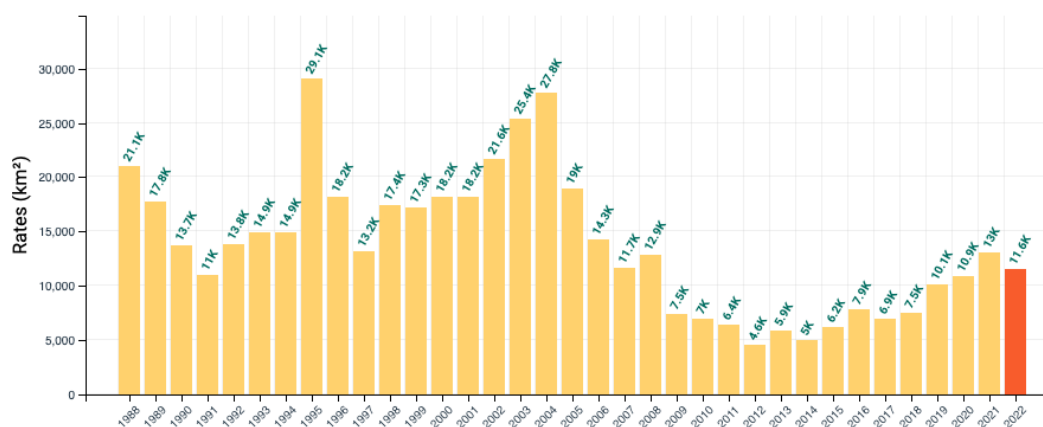


Figure 2 - PRODES Deforestation Rates - Legal Amazon (estimated rate for 2022)

The Paris Agreement was officially decreed in Brazil five years ago; however, the commitments have been included in the PNMC. Not even 2025 and 2030 NDC commitments for GHG emissions reduction have been translated into the national policy. The Brazilian House of Representatives is working on Law Project PL6539/2019⁴⁰ and PL1539/2021⁴¹ with the proposal to update the PNMC Law 12.187/2009.

The PNMC is the central law for the national environmental policy. Still, it requires an updated plan with clear goals. In the previous Jair Bolsonaro's presidential term, Brazil's policies, investments, and planning improvements were deconstructed. The executive branch is responsible for implementing and executing the environmental legislation. The expectation is for the new government with Lula da Silva, to make the environmental agenda a real priority. On June 5th, 2023, he approved decree 11.550 that attributes the Climate Change Interministerial Committee (CIM in Portuguese) to be responsible for updating and implementing the public policies of the PNMC.⁴²

Brazilian GHG Emissions Data

There are two primary sources of the estimated rates of GHG emissions in Brazil. The first data source is the system from the Brazilian MCTI called the National Emissions Registration

⁴⁰ Senado Federal, "Projeto de Lei nº 6539, de 2019 (PL 6539/2019)", 2019, accessed January 2, 2023, <https://www25.senado.leg.br/web/atividade/materias/-/materia/140343>

⁴¹ Senado Federal, "Projeto de Lei nº 1539, de 2021 (PL 1539/2021)", 2019, accessed January 2, 2023, <https://www25.senado.leg.br/web/atividade/materias/-/materia/148186>.

⁴² Federative Republic of Brazil, "DECRETO Nº 9.073, DE 5 DE JUNHO DE 2017", accessed August 24, 2023, http://www.planalto.gov.br/ccivil_03/_ato2023-2026/2023/decreto/D11550.htm.

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System (SIRENE in Portuguese)⁴³, which is the data source used to prepare the NCs. However, the SIRENE updates need to catch up, and the currently available data on the platform is from 2016. The second data source is the SEEG⁴⁴, with a more interactive web platform and regular yearly updates.

Created in 2013, the SEEG produces annual estimates of GHG emissions according to the guidelines of the Intergovernmental Panel on Climate Change (IPCC), based on the methodology of the Brazilian Inventories of Anthropogenic Greenhouse Gas Emissions and Removals prepared by the MCTI, and in data obtained from government reports, institutes, research centers, sector entities, and non-governmental organizations. The SEEG methodology was published in the journal NATURE in 2018.⁴⁵

The SEEG historical amount of total net GHG emissions in tCO₂e (GWP-100 IPCC AR5) in Brazil from 1990 until 2021 is shown in Figure 3. The colors separate the main emitter sectors in Brazil: waste (blue), industrial processes (brown), energy (red), agricultural (yellow) and Land Use, Land-Use Change and Forestry (LULUCF) (green).

The Global Warming Potential (GWP) is a metric to compare the warming impact of each greenhouse gas. The PNMC emissions reduction targets for 2020 were based on GWP-100 IPCC SAR which is the second assessment report published in 1995. The iNDC emission target was based on GWP-100 IPCC AR5, the fifth assessment report from 2014. The total net GHG emissions in the country in the early 2000s reduced considerably, however, they have been increasing yearly since 2017 despite the NDC commitments to reduce the GHG emissions.

⁴³ Ministério Da Ciência, Tecnologia E Inovações, “SIRENE,” accessed January 2, 2023, <https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/sirene>.

⁴⁴ SEEG - Sistema De Estimativa De Emissão De Gases, “TOTAL EMISSIONS,” accessed January 2, 2023, https://plataforma.seeg.eco.br/total_emission.

⁴⁵ SEEG - Sistema De Estimativa De Emissão De Gases, “Seeg Brasil | What Is SEEG?,” accessed January 2, 2023, <http://seeg.eco.br/en/o-que-e-o-seeg>.

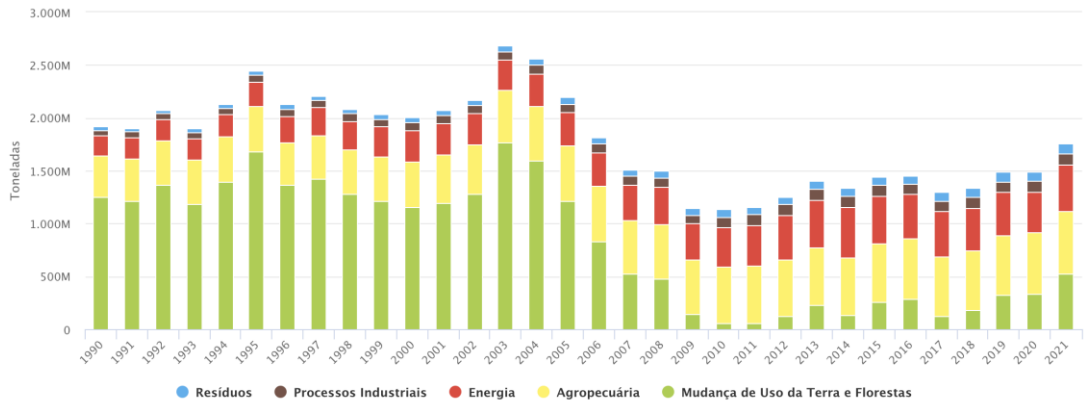


Figure 3 - Total Net GHG Emissions GWP-100, IPCC AR5

Figure 4 compares the net emissions results for each sector during the Paris Agreement period to better assess emissions by sector. The most significant increase in GHG emissions is in the LULUCF (green), followed by the agricultural (yellow) sector. The emitter sectors waste (blue), industrial processes (brown), and energy (red) had a small increase during this period but had no significant variation. To reduce the overall GHG emissions, Brazil's policies must establish detailed targets for each sector. The challenge is to reduce emissions from the largest emitters: agriculture, LULUCF, and energy.

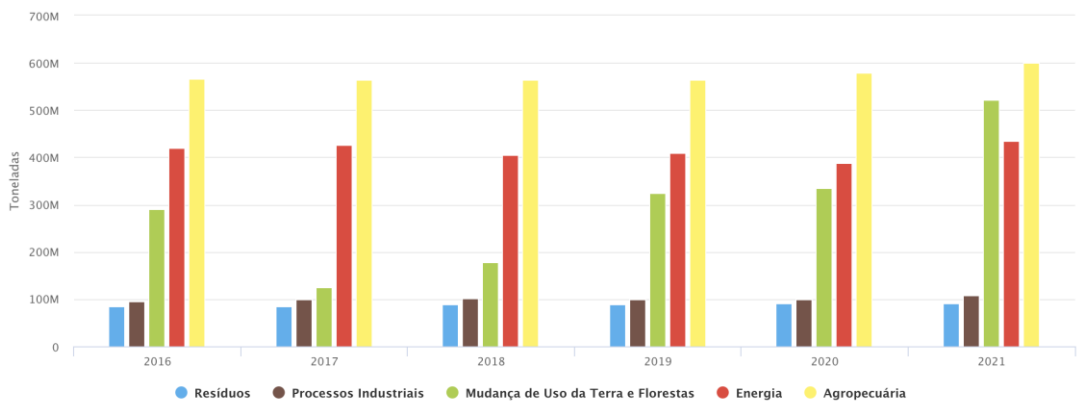


Figure 4 - Net GHG Emissions by sector 2016-2021 (GWP-100, IPCC AR5)

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Decree 9.172/2017 establishes the SIRENE. The PNMC Article 5 determines that the MCTI shall provide annual results from SIRENE. In fact, there are annual reports prepared by MCTI with estimates of GHG emissions. The 6th report released in 2022 provides the historical emissions data per sector from 1990 until 2020 based on GWP-100, IPCC SAR.⁴⁶ The SIRENE and SEEG emissions data present some small discrepancies due to differences in the methodology used to estimate the emissions. According to the SEEG 9 analysis of GHG emissions 2021 report, the methodology is constantly being upgraded. Then the entire series of annual emissions is updated, causing discrepancies with other databases.⁴⁷

The Brazilian Presidential Terms and the Environmental Agenda

During the Paris Agreement period analyzed in this thesis, Brazil had three different presidents in office. The Ministry of the Environment completed 30 years in 2022 and is part of the Brazilian executive branch, which means that the president defines the priorities and assigns the minister to lead the environmental agenda. Over the COP21 to COP27 period, Brazil had three different heads of government. From 2015 to 2016, Dilma Rousseff was at the end of her second presidential term, and after being impeached, the vice-president Michel Temer took office from 2016 to 2018. From 2019 to 2022, Jair Bolsonaro was the head of state and after losing the 2022 presidential elections, Lula da Silva once again took office last January 1st, 2023, as the president of Brazil.

From the center-left Workers Party, Rousseff started her first term in 2011. Her term was criticized for prioritizing developmental goals focused on implementing infrastructure projects with considerable environmental impact and expansion of dependence on fossil fuel for energy, with effects on the territory of local native peoples. In addition, her administration was accused of controversial revisions to the Forest Code that would benefit agribusiness, causing environmental protests. Further, fewer conservation units were created, totaling 15, compared to other governments. Another controversial plan was constructing the Tapajos hydroelectric plant, which

⁴⁶ Ministério da Ciência, Tecnologia e Inovações, “Estimativas Anuais de Emissões de Gases de Efeito Estufa (6a Edição),” accessed January 2, 2023, <https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/sirene/publicacoes/estimativas-anuais-de-emissoes-de-gases-arquivos/6a-ed-estimativas-anuais.pdf>.

⁴⁷ SEEG, “Análise Das Emissões Brasileiras de Gases de Efeito Estufa e Suas Implicações Para as Metas Climáticas Do Brasil 1970 – 2020,” Observatório Do Clima, October 28, 2021, accessed January 2, 2023, <https://www.oc.eco.br/seeg-9-analise-das-emissoes-de-gases-de-efeito-estufa-do-brasil-1970-2020/>.

would affect an area located at national parks. The construction environmental license was archived in 2016.⁴⁸

In November 2015, Rousseff gave an opening speech at COP21 and presented the government's climate goals to reforest 120,000 km² and end illegal deforestation until 2030. The best NDC Brazil ever had, the iNDC was prepared during her term. The deforestation and net emissions rates during her leadership period were the best seen in the last 30 years. However, they started to increase by the end of her administration.

The center-right former vice-president Temer took office in May 2016, during a period of political turbulence. His agenda included a reduction of environmental crime fines and a scale-down of the environmental protection budget. During his government, there was also strong pressure from the agribusiness to reduce protected land areas, but environmentalists succeeded in blocking such measures. In 2017, Norway threatened to cut donations to the Amazon Fund, concerned with the increase in deforestation rate. Temer's positive achievements in the environmental field included creating new marine conservation units made of large mosaics of protected marine areas that cover about 25% of Brazilian waters.⁴⁹

Bolsonaro's government never hid its intentions to weaken the national environmental laws moving in the opposite direction to the rest of the world where climate issues are becoming more urgent. During his term, Bolsonaro has never been to a COP, and his denialist agenda reflected on his government's climate policies, resulting in an increase in deforestation rate never seen in 15 years. As a result, the Amazon Fund was halted by its donor nations, and the international image of Brazil as a climate partner was under intense criticism.

The total GHG emissions started to increase in 2019, coincidentally when the Bolsonaro government started. The land and forest emissions have increased yearly when it should be reduced to move towards the NDC goals in 2025 and 2030. The dismantling of the progress gained in previous years on the climate agenda was rapidly visible, and it will take time to recover it. On December 31st, 2022, Bolsonaro left office with a legacy of climate change denialism and regression of Brazil's environmental identity as a protagonist in the environmental agenda.

In one of the most polarized elections of Brazil's democratic history, former president Lula da Silva defeated Bolsonaro in October 2022. His election caused an immediate response from the

⁴⁸ Impacto Ambiental, "A questão ambiental nos governos Lula, Dilma e Temer," June 3, 2020, accessed January 2, 2023, <https://www.impactounesp.com.br/post/a-quest%C3%A3o-ambiental-nos-governos-lula-dilma-e-temer>.

⁴⁹ IUCN, "Brazil Increases Marine Protection to over 25%," March 28, 2018, accessed January 2, 2023, <https://www.iucn.org/news/protected-areas/201803/brazil-increases-marine-protection-over-25>.

international community with a renewed hope that the Brazilian climate change leadership was back. This hope was confirmed in his election victory discourse that mentioned climate action as a priority in his government, pledging a commitment to end illegal deforestation. Followed by an invitation to participate at COP27 in Egypt a couple of days after being elected. In his speech at Sharm El-Sheikh, Lula reaffirmed Brazil's commitment to climate change mitigation and would combine opportunities for sustainable development.⁵⁰

Lula has also appointed his first-term former minister of the environment Marina Silva to lead the ministry of the environment. Despite past political issues, Marina's experience brings confidence to the government since she was responsible for halving the deforestation rate between 2004 and 2007. Another strong signal that Lula returned with a renewed commitment to the environment is the creation of a new ministry for Indigenous peoples.⁵¹ During his participation at COP27, Lula suggested that COP30 be held at the Amazon rainforest so people can get to know it. Six months later it is confirmed that Brazil will host the world's most important climate event in Belém, the capital of Pará state.⁵²

Despite the optimism around this new term, Lula's term will face many challenges on the environmental agenda. From reverting all the damages from Bolsonaro's administration to controversial development projects connected to the acceleration of the economic growth agenda such as oil and mining exploitation in the Amazon region, automotive incentives, and transportation infrastructure that would increase deforestation.⁵³

Conclusion

This research aimed to assess how Brazil's climate change pledges and policies evolved during the Paris Agreement period. Is it possible to identify if these commitments were ambitious enough? Based on a quantitative and qualitative analysis of official UNFCCC reports and national policies, it can be concluded that Brazil's pledges are falling behind the country's potential for mitigation. The NDC commitments require strengthened mitigation targets, transparency, and an

⁵⁰ Manuela Andreoni, "What Lula's Victory in Brazil Means for Climate," *The New York Times*, November 1, 2022, <https://www.nytimes.com/2022/10/31/climate/brazil-election-lula-bolsonaro-climate.html>.

⁵¹ Tom Phillips, "Lula Names Staunch Amazon Defenders as Ministers in Brazil," *The Guardian*, December 29, 2022, accessed August 25, 2023, <https://www.theguardian.com/world/2022/dec/29/brazils-president-lula-picks-staunch-amazon-defenders-for-ministry>.

⁵² "UN Confirms Belém to Host the COP 30 Climate Conference," Federative Republic of Brazil, May 28, 2023, accessed August 27, 2023, <https://www.gov.br/planalto/en/latest-news/un-confirms-belem-is-to-host-the-cop-30-climate-conference>.

⁵³ Lucas Lacerda Nascimento, "De carro popular à Foz do Amazonas, projetos colocam política ambiental de Lula em xeque," *Folha De S.Paulo*, May 29, 2023, <https://www1.folha.uol.com.br/ambiente/2023/05/de-carro-popular-a-foz-do-amazonas-projetos-colocam-politica-ambiental-de-lula-em-xeque.shtml>.

implementation plan. In addition, there needs to be more clarity between the NDC pledges and their implementation into national policies. The former national policy goals were planned in 2009, with goals for 2020. After that, there were no further updates to these policies. As a result of the lack of domestic commitment, GHG emissions and deforestation rates increased to numbers not seen in the last 15 years.

The historical GHG emissions and deforestation rates confirm that Brazil has proven that with the right public policies, it is possible to considerably reduce these rates and move towards more ambitious goals and future climate neutrality. However, when Brazil abandoned its engagement with environmental goals, the retrocession in those rates was evident. The environmental agenda is crucial for Brazil's diplomacy but is susceptible to climate change denialism that can manifest in the interests of the federal president.

This research focused on assessing the NDC pledges and national policies related to land use change due to its relevant contribution to the GHG emissions in the Brazilian context. In addition, several other mitigation areas are to be explored as projects in Brazil that contribute to achieving the Paris Agreement goals. The recommendations from this research are the revision of the NDC with a more ambitious pledge, the modification of the PNMC law to include the Paris Agreement goals, the recreation of environmental committees that support the Amazon Fund, an update of several plans such as the NAMAs, ENREDD+, PPCDAm, and PPCerrado.

The regression and insecurity caused by the last presidential term have damaged Brazil's image within the international community. Reconstructing new policies and plans toward achieving the Paris Agreement commitments will take time and effort from the new president and his team. Nevertheless, the world is optimistic about the return of Lula and the emphasis he has given to climate change mitigation. The expectation is for the new government to work on more robust mitigation goals and not just keep them in the documents forwarded to the UNFCCC. Brazil has the potential and resources to develop innovative solutions that can bring social justice and progress, without compromising the environment.

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