


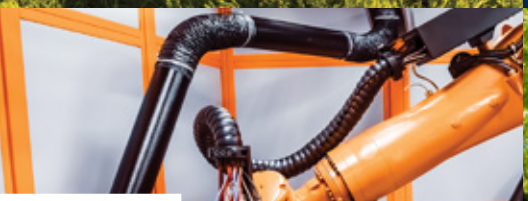

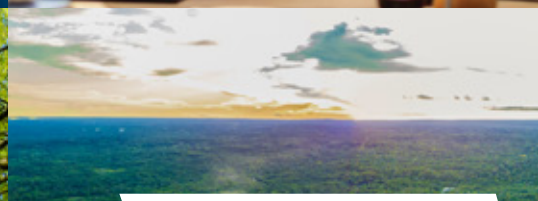

NOVO BRASIL

ECOLOGICAL TRANSFORMATION PLAN

A NEW ECONOMY. A NEW FUTURE.

MINISTRY OF FINANCE

BRAZILIAN GOVERNMENT
BRASIL
UNITING AND REBUILDING

A NEW ECONOMY. A NEW FUTURE.

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4. Inovação e adensamento tecnológico.

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ECOLOGICAL TRANSFORMATION PLAN


A NEW
ECONOMY.
A NEW
FUTURE.

EXECUTIVE SUMMARY

Climate change is **already here**

Until recently, climate change was seen as a risk for future generations. Now we know that it is no longer a future threat - it is already here. Its impacts are already changing everyone's lives: extreme weather events are affecting city dwellers, workers and farmers in the field, and indigenous peoples living in the forests. Scientists say that we will see an increase in these critical events over the next few years, both in quantity and intensity, as well as other climate-related disruptions.

We cannot stand still and wait for the drastic consequences that will affect the population and the entire economy.

To respond to this huge challenge, the federal government is already working on the transition to a more prosperous, sustainable and equitable economic model. Getting there will require us to quickly find a new economic arrangement that encourages the development of new technologies, the rational use of natural resources to reduce the environmental footprint, and more balanced wealth distribution mechanisms.

Ecological transformation is not a cost, it is an **opportunity!**

In many countries, dealing with climate change only brings to mind the costs of redesigning their economies. The investments needed to change the energy mix, restructure the national industrial sector, modify consumption patterns, and promote the restoration of ecosystems are huge.

However, anyone who believes that the transition to a low-carbon economy is just a burden to bear is mistaken.

Within this enormous climate drama, there are great opportunities. There is no longer any doubt about this understanding of the course of the global economy. The world's major nations have been implementing huge government programs related to ecological transformation, with financial incentives worth trillions of dollars. To put this into perspective, in 2024 global investment in clean energy is set to reach almost double the amount going to fossil fuels (IEA, 2024a).

In this context, Brazil - due to its competitive advantages over other nations - can become a leader in strategic areas of this new low-carbon economy.

Brazil is already an environmental powerhouse with a clean energy mix, strategic minerals for the energy transition, biofuels, abundant forests and biodiversity.

Now, faced with the inevitable transformation the country will have to go through, there is an opportunity to develop economically and socially, with prosperity for the country and income for all. Brazil can also become an economic powerhouse, a pride in sustainability, and a model of social justice that Brazilians have always dreamed of and deserve to be.

The time has come to turn opportunity into a dream, a dream into a project, and a project into action.

Brazil

AN ENVIRONMENTAL POWERHOUSE

Renewable Electric Matrix

89,2% Brazil

29% World[1]

Renewable Energy Matrix

49,1% Brazil

15% World[1]

Biodiversity

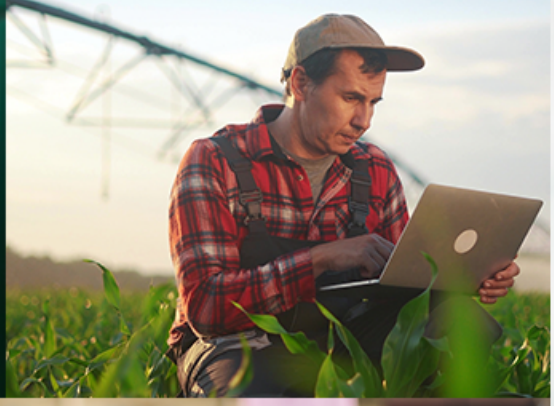
20%

of the planet's biodiversity[2]

Renewable Potential

Among the best solar and wind conditions in the planet[3]

1. Empresa de Pesquisa Energética
2. Ministry of Environment and Climate Change
3. Global Wind Atlas, Global Solar Atlas








VOLUNTE


It is good **for the planet.**

GOOD FOR THE ECONOMY

New business opportunities, increased productivity and innovation.

Promotion of neo-industrialization, agroindustry, bioeconomy, biotechnology, circular economy and renewable energy, among others.

More public and private investment in the production sector and in research and development.

GOOD FOR THE PEOPLE

Opportunities for students and workers in new skilled professions and better-paid jobs.

Increased income for families and workers, especially the poorest.

Better quality of life and adaptation to climate change.

GOOD FOR NATURE

Restoration and conservation of Brazilian biodiversity.

Reduction in greenhouse gas emissions.

Attention and conservation In climate adaptation.

GOOD FOR BRAZIL

Global sustainability leadership.

New cycle of investment and economic growth.

Country prepared for climate crisis prevention and response.

It is good **for everyone.**

NOVO BRASIL

ECOLOGICAL TRANSFORMATION PLAN

A NEW ECONOMY. A NEW FUTURE.

The federal government presents the New Brazil – Ecological Transformation Plan, which is already building the sustainable and productive foundations of a developed Brazilian society of today and tomorrow.

The plan establishes instruments for our industry, agriculture, livestock, energy, infrastructure, finance and society to be pushed to a higher level of sustainable and technological development, creating prosperity with fairer income distribution for the population.

New Brazil seeks to leverage areas in which the country has a privileged position or outstanding potential compared to other countries. It also aims to encourage national production of higher value added and complexity in these segments, with specific subsidies focused on new industrialization and national technology development. In this way, we create high-quality jobs with higher wages, increase the economy's productivity and competitiveness, and enable global leadership in strategic areas for the emerging low-carbon economy.

To become a developed country, ensuring the well-being of all, Brazil must produce and export products with more technology and value added.

Past experiences of fostering national technology development such as Embraer, Embrapa and Petrobras – which have created greater income and quality jobs by integrating the public and private sectors with national technology production centers – prove that Brazil is able to reproduce this type of partnership, which has been successful here and in other countries.

The country can combine demand for cutting-edge products from the new low-carbon economy, support for research and technology development activities, engagement and partnership with the private sector and subsidies for strategic investments in the new medium- and high-complexity production ecosystems.


NO

Objectives of New Brazil

Technology and Quality Jobs

Increase productivity and the creation of high-quality jobs through subsidies for technology development and dissemination, workforce capacity building, and improved conditions for new public and private investment. Expand production in activities with more value added and technological complexity, and cutting-edge research that can push back the frontiers in areas where Brazil has strategic advantages in the new low-carbon economy, thus promoting better jobs with higher wages, as well as increased productivity and sustainable economic growth.

Environmental Sustainability

Reduce the environmental footprint of economic development, especially greenhouse gas (GHG) emissions, through sustainable use of natural resources and protection of ecosystems. For too long, GDP growth has been associated with increased environmental impact, but the tools being built by New Brazil will demonstrate that it is possible to create wealth sustainably, reconciling economic prosperity with lower environmental impact.

Income Distribution and Fair Transition

Promote fair distribution of the wealth created by the new development model, with benefits shared by the entire population and reduction of inequalities of all kinds, including regional, gender and race ones. Reduce the impacts of climate change on the lives of the population, especially the poorest and, therefore, most vulnerable to the impacts of new climate conditions.

6 Learn about the six pillars of the New Brazil

New Brazil acts simultaneously on six economic pillars, covering production, research and development as well as consumption and capacity building, proposing a transformation of cultural and behavioral patterns in our society. The six pillars that make up the plan are: Sustainable Finance, Strengthening of Technological Capabilities, Bioeconomy and Agri-food Systems, Energy Transition, Circular Economy and New Green Infrastructure and Adaptation.

The plan is made up of a broad set of public policies implemented jointly and articulated by various ministries, such as the Office of the Chief of Staff, Ministry of Agriculture, Livestock and Food Supply (MAPA), Ministry of Science, Technology and Innovation (MCTI), Ministry of Finance (MF), Ministry of Management and Innovation in Public Services (MGI), Ministry of Integration and Regional Development (MIDR), Ministry of Mines and Energy (MME), Ministry of Development, Industry, Trade and Services (MDIC), Ministry of Agrarian Development and Family Farming (MDA), Ministry of the Environment and Climate Change (MMA), among others. It also includes the legislative and judicial branches, federal, state and local levels, the national systems of development, scientific and technological development agencies, regulatory agencies, and broad participation of the productive sector and civil society. It is Brazil's plan for a New Brazil..

Sustainable Finance

A new era for the productive sector with sustainable finance. Directing public and private funds to sustainable projects, with incentives tied to environmental impact, development potential, and equity gains.

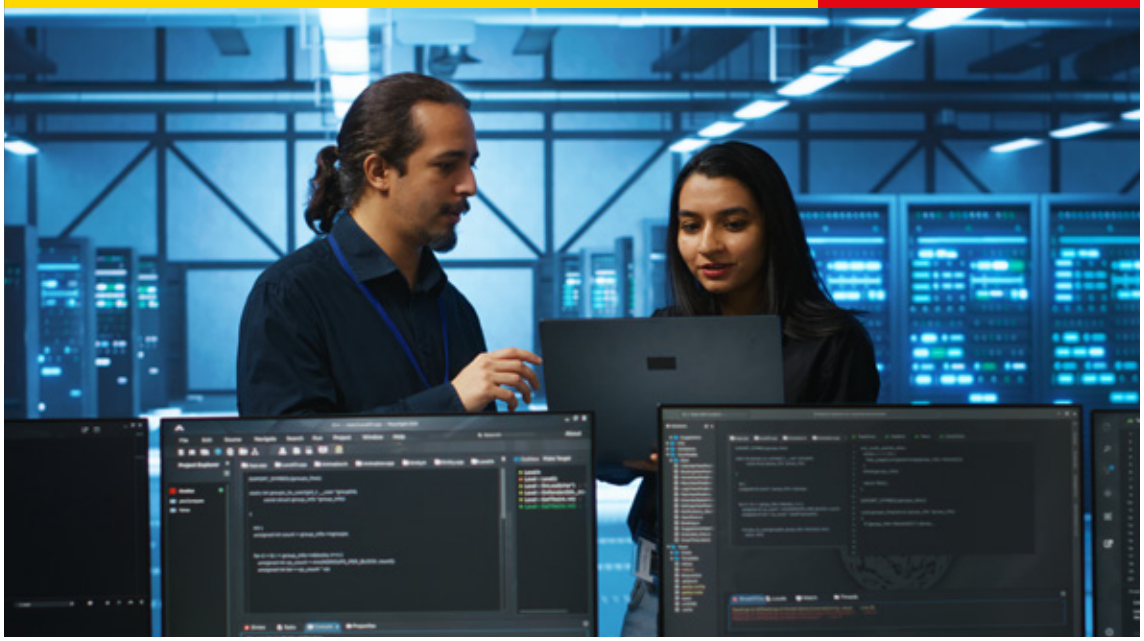
In the **Sustainable Finance** pillar, Brazil adopts mainly the strategy to channel public and private resources towards sustainable activities, adopting incentives and disincentives according to their environmental impact, ability to promote development and reduce inequalities. One of the main actions is the establishment of the **Brazilian Emissions Trading System** to create a regulated carbon market, with a greenhouse gas emissions cap, with a gradual reduction in emissions, establishing a legal framework for carbon credits, stimulating investments in new technologies and expanding economic alternatives that emit less, capture and store greenhouse gases, such as forest management, forest restoration, energy transition, among others.

The **Brazilian Sustainable Taxonomy** establishes a standardized classification of economic activities in relation to their environmental impact and to social standards, based on scientific methods. This tool will guide incentives for more sustainable and socially fair activities, through appropriate stimuli for financing investments in the country.

Sovereign Sustainable Bonds, budget-backed public debt instruments, have already raised R$20 billion and will continue to attract funds to finance sustainable economic activities in Brazil at more competitive interest rates through the Climate Fund (MMA and BNDES).

The strengthening of BNDES and Finep - including the use of the more competitive interest rates of the **Referential Rate (TR)** for innovation activities - is providing credit lines to finance energy transition, reforestation, research and development of low-carbon technologies and climate adaptation in the city, the field and the forest. The introduction of the **Development Credit Notes (LCDs)**, in turn, will maximize fundraising by development banks for the long-term financing of Brazilian industry. Along the same lines, regional funds and banks are being mobilized to ensure that incentives promote this new, less resource-intensive and more technology-intensive model in all regions of the country.

With a focus on attracting long-term investments, the **Eco Invest Brazil** program was launched aimed at reducing the risk of exchange rate volatility for long-term investment projects, including industrial plants and infrastructure projects. This initiative creates a catalytic effect on foreign



private investment in sustainable projects in the country.

Last but not least, the **Tax Reform** is a groundbreaking achievement that updates the country's tax system, making it more isonomic and less bureaucratic. It will reduce the tax burden for higher value-added products and make industrial chains longer, more technology intensive, and with higher quality jobs. In addition, the new tax system drives production and consumption towards an increasingly sustainable path, favoring less polluting activities.

Strengthening of Technological Capabilities of the Productive sector

Higher value added to the national production. Leveraging state support to increase productivity and innovation, boost new industrialization and deepen national supply chains.

The **Strengthening of Technological Capabilities of the Productive sector** pillar includes actions that move the economy towards greater **productivity and technological innovation**, using the government's capabilities to boost new industrialization in the segments with the greatest potential for a low-carbon economy. These measures include expanding and refocusing public **research and development** funding, the use of new tools such as technological orders, as well as carefully balanced rules focused on **national content in government procurement**. This set of actions also includes the creation of incentives for the national processing of strategic minerals and agricultural products and inputs, stimulating the **strengthening of our production chain** and the creation of skilled jobs. There are also specific programs for the integration of public research institutes and private companies, such as structuring technological innovation centers through programs for **Sustainable and Innovative Universities**, as well as training workforce in synergy with local production arrangements. The initiatives under this pillar take place in cooperation with the actions of the **New Industry Brazil (NIB)**, which includes specific missions to promote sustainable agriculture, bioeconomy, decarbonization and energy transition.

Bioeconomy and Agri-food Systems

Sustainability in the use of natural resources, food production and biotechnology. Solutions for generating income and development for local populations, with social prosperity, respect for biomes and more technological production. Support for agri-food systems to add more value and technology to their production, with a smaller environmental footprint.

In the Bioeconomy and Agri-food Systems pillar, there are solutions for generating income and development so that local populations can prosper socially while respecting national biomes, as well as providing support for our agri-food systems to add more value and technology to their production, with a smaller environmental footprint. While enforcement against illegal deforestation is vital, it is not enough. It is necessary to create a model for **generating wealth through standing forests**, establishing economic alternatives to legal and illegal deforestation. Actions for this new economic arrangement include the gradual integration of more sustainable agricultural criteria and practices into the Harvest Plan, incorporating technical support and differentiated interest rates for best practices. The **use of bio-based inputs** – such as biofertilizers, biopesticides and probiotics for livestock – plays a key role in **improving productivity and sustainability**. Biotechnology is increasingly integrated into these processes, enabling the development of second-, third- and even fourth-generation bio-based inputs, which offer greater effectiveness, adaptability, and **efficiency in the use of resources**.

Through specific programs, various sustainable agricultural practices are also being promoted, such as the recovery or transformation of degraded pastures into High Productivity Pastures, No-Tillage System, Agroforestry Systems (AFS), Crop-Livestock-Forestry Integration (CLFI), as well as the creation of productive forests with the **Restoration Arch** (BNDES). And to ensure that the standing forest generates income, Brazil is seeking to guarantee investments in R&D for the sustainable management of biomes, expansion of forest concessions, design of an export program for non-timber forest products and payment for environmental services (PES). At the international level, the country is working on the implementation of a fund to mobilize significant resources for countries that conserve their **tropical forests**.

Energy Transition

Expansion of cost-competitive renewable energy sources and national development of related value chains. Promotion of cutting-edge national technologies in the area, clean energy production and energy transition of all transportation systems.

In **Energy Transition**, to benefit from our advantages, the country is promoting cutting-edge national technologies in the area, with incentives for **green diesel, second-generation ethanol and low-carbon hydrogen** for cleaner industrial production and exports of products with a smaller environmental footprint. The federal government's actions also include guaranteeing the expansion of **wind and solar energy, associated with the growing industrialization** of the segment, as well as replacing oil-fired generation in isolated systems through the **Amazon Energies Program** (MME).

In the transportation segment, Brazil is advancing in the electrification of urban buses with local content rules and, through the **Green Mobility and Innovation Program** (Mover), has been enabling major new investments in car production with incentives to reduce pollution and make materials more recyclable. In aviation, the emission reduction goal and incentives for the **use of Sustainable Aviation Fuel** (SAF), as well as fuel for marine transportation, can contribute to the development of national technologies with high potential for export. It is also worth noting the production chains of **biomass and its derivatives**, such as second-generation biofuels (like bioethanol and biodiesel

produced from different sources of plant biomass), third-generation biofuels (like those derived from microalgae) and even **fourth-generation biofuels**, which involve carbon capture and use processes.

Circular economy

A new production model that generates less waste and requires fewer natural resources. Transition from the linear model of the economy, which is intensive in the use of natural resources and generation of waste, to the circular model through initiatives that favor reuse, remanufacturing, product redesign, recycling and recovery of waste.

In the area of **Circular economy**, Brazil aims to abandon the linear model of the economy, which requires a lot of natural resources and produces a lot of waste, to promote the circularity of the production structure through regulatory measures that favor **reuse, remanufacturing, recycling and recovery of waste**. As a result, fewer natural resources are extracted and less waste is disposed of. In this sense, with regard to waste, the country supports through tax incentives and regulatory measures the **expansion of selective collection**, recycling and the use of **biodigesters**; and, through technical and financial support, waste picker cooperatives and **closure of dumpsites**, as well as wastewater reuse in the basic sanitation sector. Brazil also supports programs to stimulate **circular economy in the industrial sector**, so that products already consider the circular economy model from the outset, enabling less demand for new resources and **less waste generation**.

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Green Infrastructure and Adaptation

Safety, prevention and adaptation to climate crises and climate change. Enabling mechanisms to finance infrastructure works with a smaller environmental footprint and which promote greater resilience to extreme weather events, including public works to reduce the risks and impacts of natural disasters, such as landslides and flooding, as well as adaptation to new climate patterns in agriculture, energy production and public health impacts.

Finally, the **New Green Infrastructure and Adaptation** pillar seeks to enable mechanisms for financing infrastructure works with a smaller environmental footprint, as well as for resilience and reducing the impact of extreme weather events, including public works to reduce the risk of natural disasters, such as landslides and flooding. The New Growth Acceleration Program (PAC) prioritizes sustainable, low-impact investments, incorporating more and more parameters of sustainability. Public policy alternatives are also being developed for risk prevention and mitigation, and preparedness for extreme situations, including resource transfer programs and environmental emergency decrees to reduce impacts in the most vulnerable municipalities, as well as partnerships with Civil Defense for immediate response and reconstruction. It also has a strategy for agricultural, energy and sanitation security and resilience.

This set of measures will enable a significant increase in income for the Brazilian population, as well as reductions in greenhouse gas emissions and in inequalities. Various studies carried out by independent institutions show that the ecological transformation in Brazil, with the right public policies, can be an opportunity for development, rather than a cost. All these actions coordinated along six pillars allow us to envision scenarios with a 10% increase in GDP per capita by 2026 and double the figure by 2050, taking 2022 as a base year. Together with other tax and regulatory measures, they make it possible to aim for the Gini index of inequality to be below 0.5 by 2026 and, at least, below 0.4 by 2050.

The plan makes it possible to meet Brazil's greenhouse gas emission reduction goal set in the Nationally Determined Contribution (NDC), reducing emissions by 48% by 2025 (compared to 2005) and reaching net-zero by 2050.

New Brazil, as the name implies, is not just a government program, but an economic development project for a new nation.

By activating the sectors of the economy in unison, the initiative can create a movement of technological progress that feeds back and reinforces itself. The plan sets the entire economy in motion in the same direction, producing a catalytic effect for exponential economic gains and for a sustainable consumption pattern. It calls on Brazil to assume its position as a global leader in new low-carbon technologies, especially in the sectors in which it already plays a leading role and in which it can experience a technological leap forward. It is our passport to a future that is already being built by the federal government, so that this people full of pride and potential can enjoy a prosperous economy, with respect for the planet and with fair income distribution.

THE PLAN IN NUMBERS

Scenarios for the Brazilian economy with the adoption of the Ecological Transformation Plan

INCREASE IN INCOME

Increase in GPD *per capita* of 10% by 2026 and 100% by 2050.[4]

LOWER ENVIRONMENTAL IMPACT

48% reduction in greenhouse gas emissions by 2025 and more robust gradual goals to reach net-zero emissions by 2050.[5]

REDUCTION OF INEQUALITIES

Gini index to be, at least, 0,5 by 2025 and below 0,40 by 2050.[6]

4 Scenarios developed from projections of the Ministry of Finance, using 2022 as base year.
5 Fulfillment of the Brazilian NDC to the Paris Agreement, with a 48% reduction in greenhouse gas emissions by 2025, compared to 2005 emissions, and net-zero emissions by 2050.
6 Scenarios developed from projections of the Ministry of Finance, using 2022 as base year. The Gini index is used to measure the concentration of income in a country. Its scale ranges from zero to one. The lower the index, the lower the inequality level.

1 Climate Crisis: Challenges and Opportunities

There is a scientific consensus on the effects of carbon dioxide and other greenhouse gas emissions on the rise in global temperatures and the consequent changes in climate patterns[7]. In recent years, there has been an unprecedented concentration of carbon dioxide (CO2) in the atmosphere (Figure 1). This increase in emissions, which has intensified in recent decades, has been accompanied by an increase in the planet's average temperature.

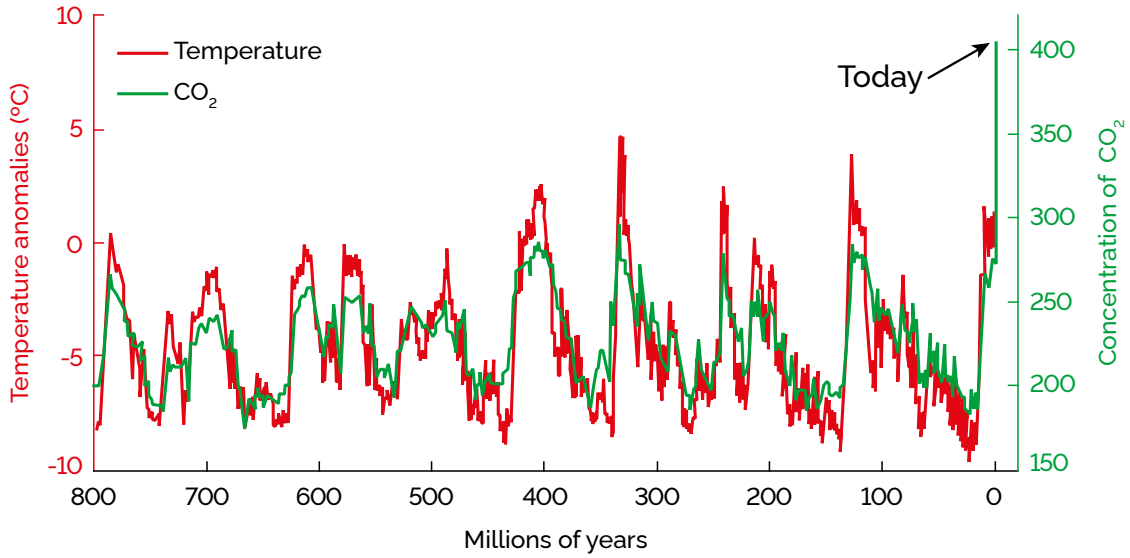

Figure 1. Correlation between variation in greenhouse gas emissions and temperature (Henley and Abram, 2017).

The Intergovernmental Panel on Climate Change (IPCC) recommends limiting the increase in global temperature to a maximum of 2.0°C above pre-industrial levels (period between 1850 and 1900). Above this level, irreversible impacts on the climate and on ecosystems that are crucial to human life are very likely.

According to the most recent IPCC projections (IPCC, 2023), between 2011-2020 the average global surface temperature already reached a value 1.1°C higher than in the period 1850-1900, resulting in an increase in the occurrence of extreme weather events, including heatwaves, droughts and more intense and frequent floods.

Mitigating climate change and its adverse effects requires the urgent adoption of coordinated global actions to reduce greenhouse gas emissions and preserve the

7. The main scientific studies and articles on climate change, its most relevant causes, implications and future risks are gathered under the Intergovernmental Panel on Climate Change (IPCC), created by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in 1988. Through its assessments, IPCC consolidates the current state of knowledge of climate change, identifies consensus in the scientific community and possible areas where further research is needed. IPCC publications can be accessed on <https://www.ipcc.ch/>.

natural resources responsible for absorbing them. Under the United Nations Framework Convention on Climate Change (UNFCCC), the commitments made in the 1997 Kyoto Protocol and the 2015 Paris Agreement stand out.

The Kyoto Protocol was the first international agreement to control greenhouse gas emissions. However, developed countries were the only ones responsible for reducing emissions, while developing countries only had non-binding targets[8].

The Paris Agreement, in turn, represented a paradigm shift in climate governance by establishing the primacy of self-determined goals and signaling a new interpretation of the principle of 'common but differentiated responsibilities', assigning environmental commitments between developed and developing countries based on equity and in accordance with their respective capabilities[9].

All the countries that signed the Paris Agreement have committed to submitting NDCs every five years. Although these goals are voluntary and non-binding, signatory countries must update NDCs on a regular basis, communicate their goals to the UNFCCC Secretariat and report on their degree of implementation. The Paris Agreement therefore introduces a logic of climate action based on accountability to the international community and civil society in each country, with the aim of encouraging countries to meet their goals even in the absence of legal enforcement mechanisms (Falkner, 2016).

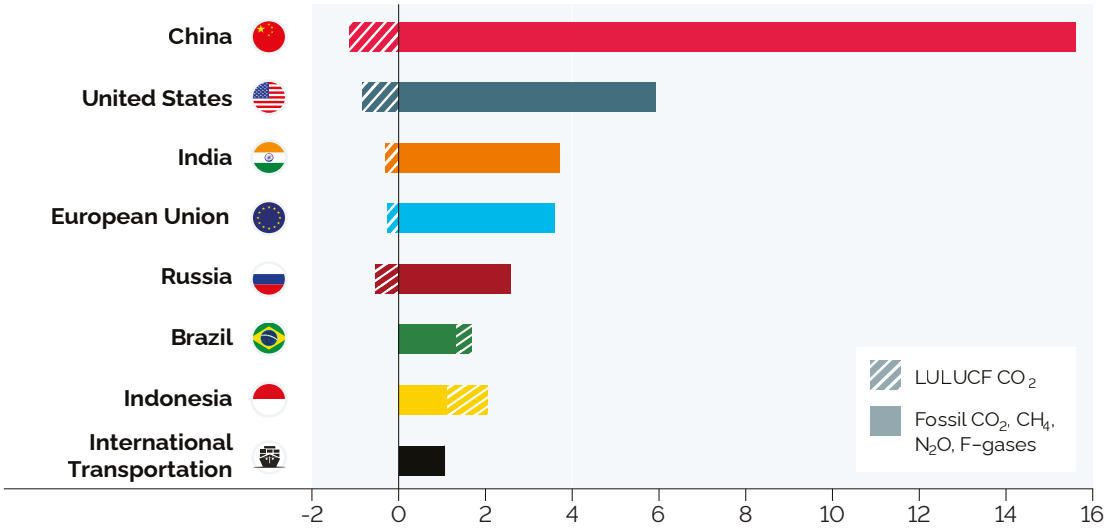

Figure 2. Greenhouse gas emissions in 2021 (tCO2e) (UNEP, 2023).

Although Brazil is not among the world's main per capita emitters, given its considerable population, it has an important role to play in reducing total greenhouse gas emissions. The country is currently the sixth largest global emitter (Figure 2), responsible for 4% of emissions, while its Gross Domestic Product (GDP) accounts for 1.9% of the world's GDP[10].

8. The Kyoto Protocol was approved internally in Brazil by Legislative Decree no. 144/2002 (Brazil, 2002) and enacted by Executive Order no. 5445/2005 (Brazil, 2005).

9. The Paris Agreement was approved internally in Brazil by Legislative Decree no. 140/2016 (Brazil, 2016a) and enacted by Executive Order no. 9073/2017 (Brazil, 2017).

10. Proportion of the Brazilian GDP in relation to world GDP calculated based on data provided by the International Monetary Fund in The World Economic Outlook Database – April 2024 (IMF, 2024). GDP calculated at constant 2022 prices, in US dollars.

However, Brazil has very favorable conditions for reversing this situation and promoting a significant reduction in its emissions.

The main causes of national emissions are changes in land-use and forestry (notably deforestation, or LULUCF) and agricultural activity, which, together, account for 66.5% of the greenhouse gases emitted in the country (MCTI, 2022). In this context, the most important measures include eliminating illegal deforestation, creating economic alternatives to legal deforestation, reducing emissions from agriculture, and restoring native vegetation at scale.

The Brazilian energy mix, in turn, is comprised predominantly of renewable sources, which already account for more than 89.2% of domestic electricity supply, whereas the world average is 28.7% and, among OECD countries, 32.5% (EPE, 2024). The country also has control over the technologies and inputs needed to produce biofuels. These factors place Brazil on the world stage as one of the main leaders in low-carbon energy generation.

Given its potential, Brazil has set robust climate goals, which are among the most ambitious in the world. Brazil's NDC, revised in October 2023, forecasts a 48.4% reduction in emissions by 2025 compared to 2005 levels, followed by a 53.1% reduction by 2030, resulting in total emissions of 1.2 GT CO2e, with a commitment to achieving net-zero emissions by 2050 (Figure 3). In November 2024, at COP-29, Brazil again updated its NDC by adding a new intermediate goal by 2050 to reduce net greenhouse gas emissions by 59%-67% by 2035 compared to 2005 levels, which is equivalent to cutting between 850 million and 1.05 billion tons of CO_2.

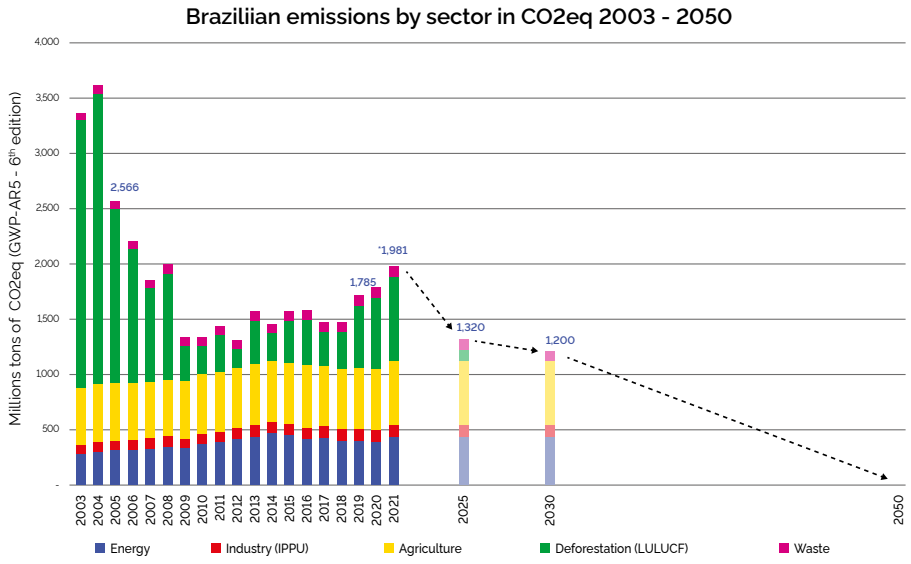

Figura 3. Current Brazilian commitment. 2021 data estimated based on correlation with emissions calculated by the Climate Observatory / SEEG. Source: Historical data from SIRENE (National Emissions Registration System) (MCTI, 2022) and own estimates.

Brazilian emissions fell significantly between 2003 and 2009, driven by a sharp decline in deforestation rates, but have increased again since then. To continue meeting its climate commitments, the Brazilian government has pledged to bring illegal deforestation to zero by 2030. The latest figures show that in 2023 there was a reduction of around 50% in deforestation in the Amazon, as a result of the efforts included in the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDam), relaunched in 2023 (MMA, 2023).

According to data from the Real-Time Deforestation Detection System (Deter) of the National Institute for Space Research (INPE), the area with deforestation alerts in the Legal Amazon in 2023 was 5,152 km^2, while in 2022 the figure had reached 10,278 km^2 (MMA, 2024a).

With regard to emission reduction initiatives in the agricultural sector, the HARVEST Plan's credit lines include the Program for Financing Sustainable Agricultural Production Systems – RenovAgro (the new name for the ABC Plan), with actions for recovery of degraded pastures, restoration of native vegetation, biological nitrogen fixation, increased accumulation of organic matter in the soil, no-tillage farming, crop-livestock-forestry integration, agroforestry and forest planting.

In addition, the current government has given special prominence to the environmental agenda in the 2024-2027 Multi-Year Plan (PPA), the main medium-term budget planning instrument. In fact, out of a total of 88 programs contained in the 2024-2027 PPA, 50 of them are part of the cross-cutting environmental agenda.

It is also worth noting that the Interministerial Committee on Climate Change (CIM), comprised of representatives from 22 ministries, the Climate Network and the Brazilian Climate Change Forum, has been working on the Climate Plan since the end of 2023.

The plan will guide Brazilian climate policy until 2035 based on two core pillars: the National Strategy for Mitigation, focused on reducing greenhouse gas emissions, and the National Adaptation Strategy, aimed at reducing the vulnerability of cities and natural environments to climate change, as well as dealing with extreme weather events (MMA, 2024b).

Joining forces with these initiatives, New Brazil provides an extensive set of economic measures for ecological transformation, aimed at consolidating and expanding sources of financing for sustainable projects; renewing our production structure, with a focus on developing strategic technologies for decarbonization; sustainable exploitation of Brazil's biomes, with intensive use of biotechnology and generation of income alternatives for local communities; expansion and use of the potential for producing clean energy and biofuels; strengthening circular economy and creating incentives for the reuse and treatment of waste; and building an infrastructure aimed at reduction of the risks of natural disasters and adaptation to the effects of climate change.

This is a key instrument for the country to meet its climate goals and take advantage of the opportunities created by the necessary transition to a more sustainable economy.

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2 Transition to a Sustainable Economy and Construction of a New Development Project for Brazil

2.1 Reshaping the global economic order

The transition to a new low-carbon economy requires the implementation of a wide range of initiatives aimed at restructuring production on an environmentally sustainable basis.

Public policies are central in this process, including tax incentives for low-emission sectors and activities; direct financing and regulations to boost funding for sustainable projects, with climate risk transparency; support for strategic decarbonization technologies; and enforcement against illegal activities.

Government leadership becomes even more critical amid the reconfiguration of global value chains. Events such as the COVID-19 pandemic, growing geopolitical and trade tensions between the United States and China and the conflict between Russia and Ukraine have resulted in significant changes in international trade flows, with shifts in global economic paradigms (MF/ABDI, 2024)[11].

Under reshoring, nearshoring and friendshoring principles, strategic relevance is now given to domestic production, neighboring countries and geopolitical allies, respectively. The cost of production is no longer the only relevant criterion for choosing trading partners: *where* production takes place also matters. Just as relevant as economic efficiency is the production chain's resilience.

More recently, the push for sustainable production has spurred the concept of powershoring referring to the transfer of industrial facilities to locations where renewable energy is more readily available, with the aim of reducing the industrial sector's carbon footprint.

The development of new data and information processing-intensive technologies, such as Artificial Intelligence, has also increased the demand for locations with stable and abundant energy sources for the establishment of datacenter infrastructures, indicating new opportunities for the Brazilian economy in these segments.

The revival of economic nationalism and the emergence of a new green industrialization paradigm have resulted in the return of ambitious industrial

11. Report of the *Grupo de Trabalho Interinstitucional sobre Resiliência em Cadeias de Valor* (Interinstitutional Working Group on Resilience of Value Chains) (2024).

plans by the governments of developed countries (MF/ABDI, 2024), with strong protectionist characteristics.

The U.S. Inflation Reduction Act (IRA), signed into law in August 2022, provided significant economic stimulus for the development of low-carbon technologies, with public and private investment estimated at $1.7 trillion over the next 10 years, especially in the energy ($580 billion), industrial ($522 billion) and green financing ($245 billion) sectors.

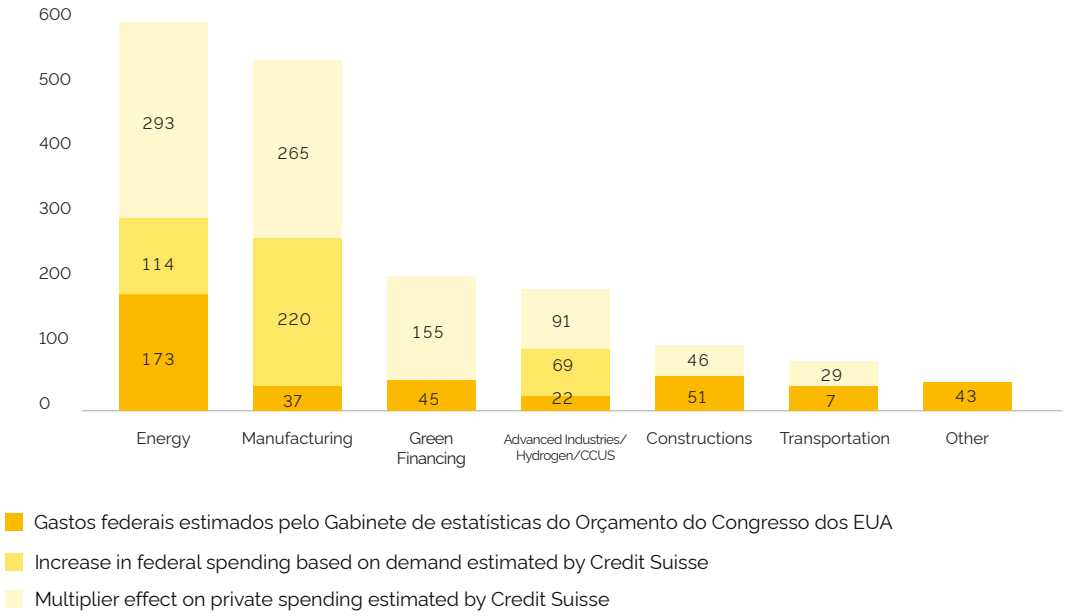

Figure 4 – Potential public and private investment due to IRA incentives. Credit Suisse estimation in $ billions (Credit Suisse, 2022)

The measures provided for by IRA are in addition to other initiatives to boost the US economy, such as the 2021 Bipartisan Infrastructure Law (BIL), which also introduced actions for climate adaptation and electrification of the vehicle fleet, and the CHIPS and Science Act, which aims to promote technological development in semiconductors and other high-tech industries.

The magnitude of the funding provided for in these actions has the potential to reposition the American industry, infrastructure and innovation system in strategic sectors for a new low-carbon economy. Several projects on clean energy generation, research and production of electric vehicles, batteries and semiconductors have been redirected to the United States in search of these incentives.

The European Union (EU) has also sought to link the emission reduction agenda to incentives for the development of new industries and technologies. The European Green Deal, launched in 2019, contrasts with the American plans by placing greater emphasis on regulation than on subsidies and by being broken down into various regulatory measures and legislative projects at European and national level, covering different areas of climate action (European Commission, 2019).

With specific regard to the industrial sector, as a response to the IRA, in February 2023 the EU launched the Green Deal Industrial Plan, which is based on four pillars to foster innovation in clean industries and technologies: **(i)** a predictable and

simplified regulatory environment; **(ii)** faster access to funding; **(iii)** enhancing the necessary skills for green transition; and **(iv)** open trade for resilient supply chains (European Commission, 2023).

Although the fragmentation of the European Green Deal makes expenditure projections difficult, it is estimated that its dimensions are similar to, or even greater than, those of the IRA, but that its main differences are the absence of local content requirements, the greater bureaucratization and shorter duration of European subsidies and the focus on innovation, rather than the simple adoption of renewable technologies that prevails in the IRA.

China, on the other hand, has shown greater continuity in its policy of developing renewable energy sources than its European or North American counterparts. As of the second half of the 2000s, China once again embarked on industrial policy with the aim of being a pioneer in emerging industries considered strategic. At the same time, the first National Climate Change Program (2007) and the most recent five-year plans have fueled the adoption of renewable energies and the development of associated technologies.

According to estimates by the International Energy Agency (IEA), China's renewable electricity capacity growth will triple between 2023 and 2028, compared with the previous five years, with the country accounting for 56% of global expansion of renewables in the electric sector (IEA, 2024b). It is also estimated that, in the period in question, China will deploy almost four times more renewable energy generation capacity than the European Union and five times more than the United States.

Currently, China already dominates the global solar PV supply chains, with around 80% of global solar panel production capacity (IEA, 2022). It also has the largest installed wind power capacity, with 42.7% of the world's generation capacity for this source of energy (IEA, 2023a).

Despite these outstanding results, China continues to have 60.6% of its energy demand met by coal-fired power stations (IEA, 2023b), contributing to its position as the world's largest emitter.

China's 14th Five-Year Plan (2021-2025) continues the policies implemented in previous years, with the aim of reducing the energy intensity of economic growth, strengthening technology capacity, and ensuring what it calls 'high-quality green development'.

The scale of production restructuring plans adopted by the world's main economies and the changes in international trade flows require that Brazil also implements a broad set of policies to promote ecological transformation by strategic sectors, otherwise it will fall behind in the reconfiguration of global value chains.

2.2 Recovery of growth and new industrialization

Since the 1980s, Brazil has faced premature and rapid deindustrialization, marked by a declining industrial share of GDP, a shift towards primary products and weaker production chains (MDIC, 2024).

Brazilian exports are more restricted to products of low technological complexity, limiting domestic value addition and Brazil's trade gains (MDIC, 2024).

This is reflected in Brazil's steady decline in the Economic Complexity Index ranking[12]. In the last 20 years, Brazil has dropped 44 positions, from 26th place in 2000 to just 70th in 2021. In this period, Brazil was outperformed by countries such as China, India and Vietnam (Instituto Aya/Systemiq, 2023).

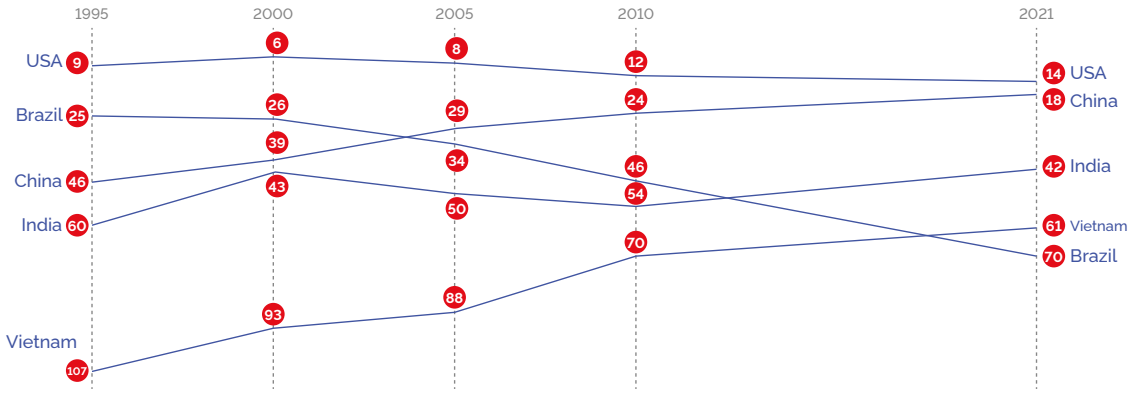

Figure 5. Country complexity ranking 1995-2021 (Harvard Growth Lab, 2021).

Premature deindustrialization has harmed Brazil's economic development, reducing innovation potential and slowing technological progress.

The process of deindustrialization has also led to a change in the labor market structure, with fewer jobs related to higher value-added activities, typical of manufacturing, especially in high and medium complexity industries.

The transition to a new low-carbon economy, however, presents a unique opportunity for Brazil to reverse the process of deindustrialization and resume its economic and social development project with new, more inclusive and sustainable foundations.

As we will see below, the country has strategic advantages in key sectors in the transition to a sustainable economy, presenting new investment opportunities, development of low-emission technologies, creation of skilled jobs and income alternatives for activities aimed at environmental conservation.

The initiatives proposed by the New Brazil – Ecological Transformation Plan, together with other measures to improve the economic environment already implemented by the federal government, such as the new fiscal framework, the approval of the proposed constitutional amendment for tax reform, the New Growth Acceleration Plan and the New Industry Brazil Program, have the potential to reverse Brazilian economy's loss of complexity and promote the country's new industrialization.

12. Calculated by Harvard Growth Lab, the Economic Complexity Index ranks countries based on the diversity and complexity of their exports (Harvard Growth Lab, 2021).

2.3 Brazil's strategic advantages

Brazil has several advantages that position it as a leader in a new sustainable economy, such as the high availability of renewable energy sources, significant biomass production for bioenergy generation, biofuel and biogas production, vast reserves of critical minerals for the energy transition, as well as extensive areas of forest cover and the greatest biodiversity on the planet.

Renewable energies

According to Empresa de Pesquisa Energética – EPE (Energy Research Company) (EPE, 2024), renewable sources account for 89.2% of Brazil's domestic electricity supply, especially hydroelectric (58.9%), wind (13.2%), biomass (8.0%) and solar (7.0%) sources.

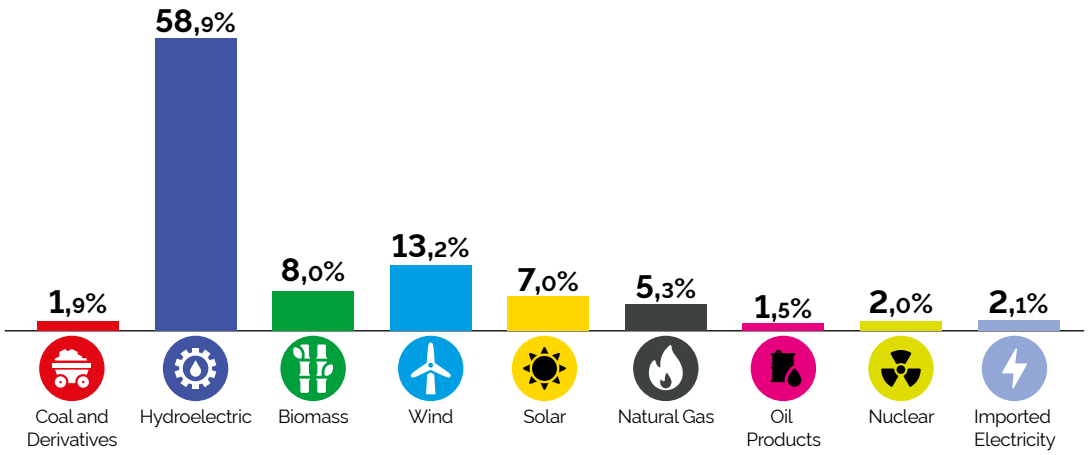

Figure 6. Main sources of the Brazilian energy mix in 2023 (EPE, 2024)

The country's climate and geographical conditions provide high-quality sunlight and good wind speed and constancy, resulting in significant potential for expanding clean energy generation (INPE, 2017; EPE, 2020).

Between 2018 and 2022, wind power increased by around 68% and solar by an astonishing 770% (EPE, 2023), with even stronger growth ahead. The potential for generation of projects already approved by the National Electric Energy Agency (ANEEL) relating to new photovoltaic (PV) and wind power units totals more than 156 GW, of which 143.6 GW are projects yet to begin construction, and 12.7 GW are already under construction. In other words, the country has the potential to increase its current electricity generation capacity by more than 80%, taking into account only the solar and wind sources already granted by ANEEL that are not yet in operation.

This great potential for expanding wind and solar energy generation presents an important opportunity for the development of domestic production of materials and equipment used in wind turbines and PV panels.

A significant number of wind turbines installed in the country are already produced locally. According to data from the Brazilian Association of Wind Energy and New Technologies (ABEEólica), more than $ 42.4 billion was invested in the installation of new wind farms in Brazil between 2012 and 2022 (ABEEólica, 2023). The continued

expansion of wind power generation has the potential to further increase our capacity to produce this equipment, with the development of new technologies for the sector, such as the utilization of offshore wind farms.

Regarding solar energy, Brazil still imports a significant portion of the PV panels installed in the country. Current world production is concentrated in Asia, especially China, due to its mastery of associated technologies, such as semiconductors.

This raises the complexity of national development in this segment. As Brazil does not have a consolidated supply network for the technologies and equipment that make up the value chain for PV panel production, the domestic industry has been limited to assembling imported equipment here in the country.

The capacity for growth of the Brazilian solar energy generation market, however, does not allow us to ignore the potential for development in this sector. In this context, the national development strategy to produce PV panels must combine the need to expand the production of this energy source at competitive prices with a national effort to develop associated technologies and equipment that integrate the other stages of the value chain.

Biofuels

Brazil is also one of the world's leading producers of biofuels, being the second largest producer of ethanol and the fourth largest producer of biodiesel, accounting for 26.7% and 12.2% of the global production of these products, respectively.

This is a sustainable alternative to dependence on fossil fuels, with significant potential for growth in demand due to the emission reduction goals in the European Union and the United States.

In addition to their use in the automotive sector, biofuels are a low-emission alternative in the aviation (SAF) and marine transportation sectors.

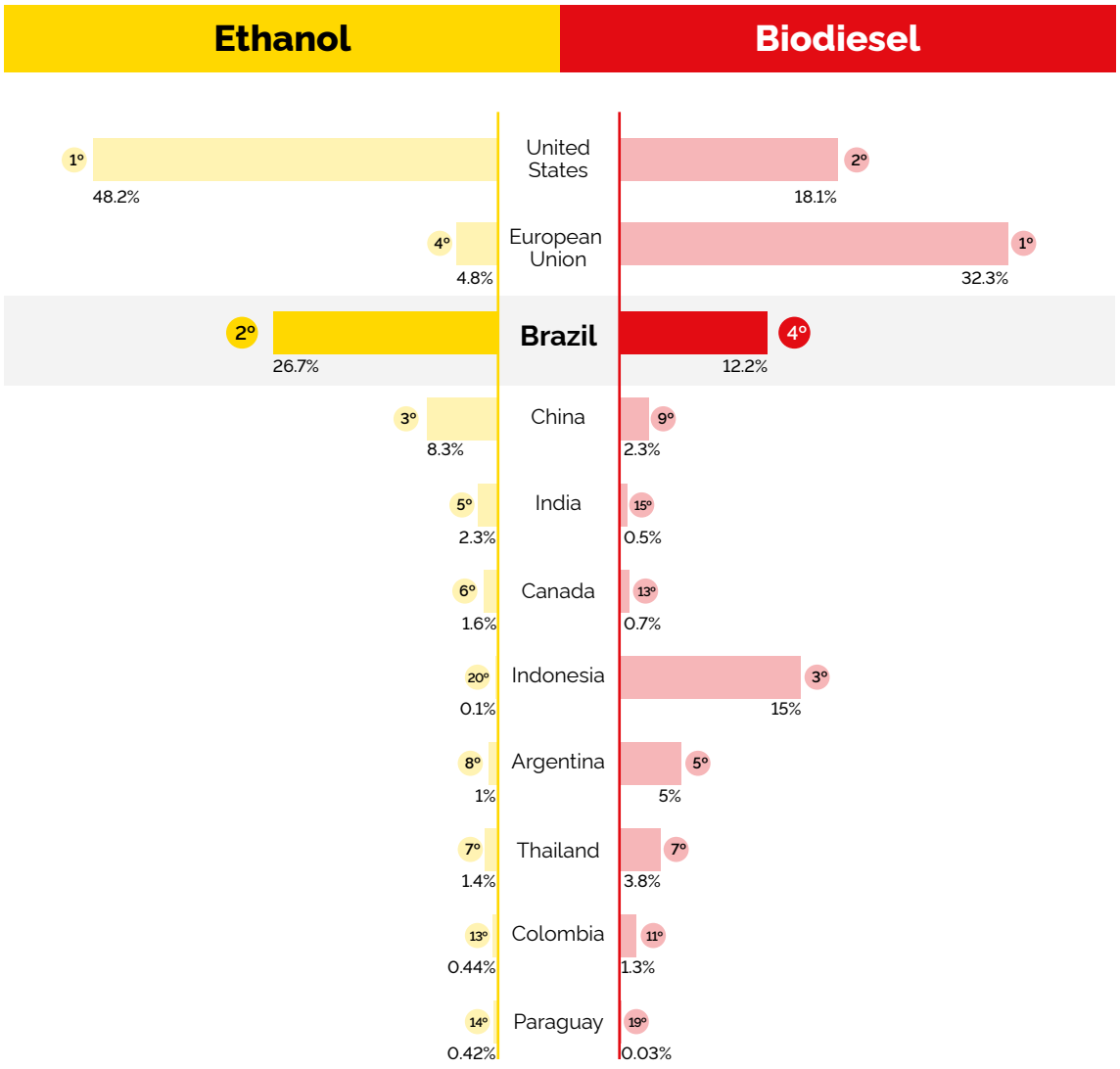

Figure 7 - Biofuel production ranking and major feedstock (OECD/FAO, 2021).

Low-carbon hydrogen

Besides biofuels, the use of low-emission hydrogen as an alternative to fossil fuels also represents a significant potential for Brazil, as one of the world's leading producers of low-carbon energy.

The global hydrogen market is significant, corresponding to approximately 95 million tons in 2022. Its current use, however, is mostly geared to non-energy applications, such as the production of intermediates for fertilizers, the chemical industry, the steel industry, the food industry and the production of oil derivatives, among others (IEA, 2023c).

In addition, hydrogen production still predominantly uses polluting sources, so that natural gas without Carbon Capture, Utilization, and Storage (CCUS) accounts for 62% of global production, coal for 21% and refinery/petrochemical by-products for 16% (IEA, 2023c).

The expectation of growth, however, is significant in the coming years due to the prospect of using hydrogen as an energy source to enable the decarbonization of the economy aimed at reaching the Paris Agreement goals for 2050. This will result in new possibilities for hydrogen application and changes in the energy sources used in its production (MME/EPE, 2022).

Hydrogen has been included among the priority energy strategies of several countries, above all because it provides alternatives for sectors where carbon emissions are difficult to reduce and because it is also a clean energy storage technology, making it viable for use in industry and transportation. IEA estimates that these new applications of hydrogen will boost its use, increasing annual production to 200 million tons in 2030 (IEA, 2021a).

The expansion of the global market for low-carbon hydrogen, driven by climate goals, increases the chance that Brazil will be able to export its renewable energy surplus to countries that have a low-carbon energy deficit, especially European countries

In addition, the development of new applications of hydrogen, such as the production of low carbon ammonia and fertilizers, and its use in industrial processes in the country, such as the production of green steel, have the potential to add more technology and value to its production chain.

There are already several initiatives aimed at building low-carbon hydrogen production plants in Brazil to take advantage of our potential to produce hydrogen from clean sources.

Strategic minerals

The energy transition agenda also presents economic development opportunities for Brazil regarding mineral production. The geological complexity of the Brazilian territory places the country among the nations with the largest mineral reserves in the world, with the capacity to meet the growing demand generated by the energy transition, given that clean energy technologies are much more mineral intensive.

The construction of solar PV power plants and wind farms, as well as the production of electric vehicles, for example, require a much greater use of minerals than their fossil fuel-based counterparts.

According to IEA, the production of an electric vehicle requires six times more minerals than a conventional car, and wind energy production technologies consume nine times more mineral resources to produce each megawatt of electricity than natural gas energy production units (IEA, 2021b).

Minerals such as lithium, nickel, cobalt, manganese, and graphite are crucial to battery performance, longevity, and energy density. Rare earth elements are essential for

wind turbines and EV motors. Electricity networks need a huge amount of copper and aluminum, with copper being a cornerstone for all electricity-related technologies.

According to IEA, a concerted effort to reach the goals of the Paris Agreement would mean a quadrupling of mineral requirements for clean energy technologies by 2040. An even faster transition, to hit net-zero globally by 2050, would require six times more mineral inputs in 2040 than today (IEA, 2021b).

Mineral demand for use in EVs and battery storage is a major force, growing at least thirty times to 2040. Lithium sees the fastest growth, with demand growing by over 40 times in the SDS (Sustainable Development Scenario) by 2040, followed by graphite, cobalt and nickel (around 20-25 times). The expansion of electricity networks means that copper demand for grid lines more than doubles over the same period (IEA, 2021b).

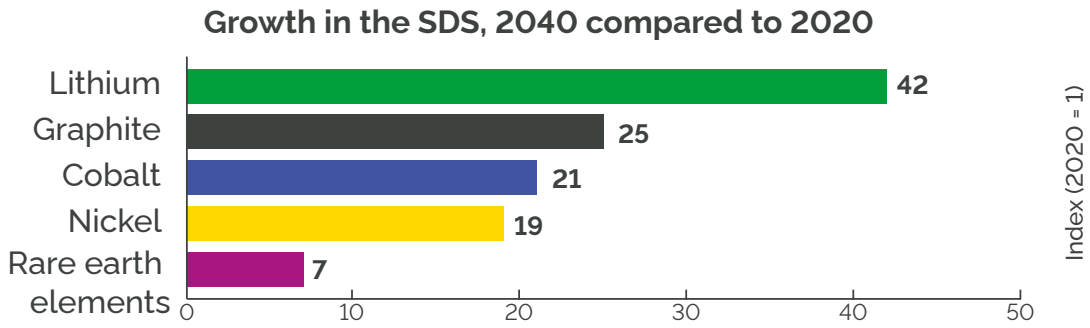

Figure 8. Growth in demand for selected minerals from clean energy technologies by scenario, 2040 relative to 2020 (IEA, 2021b).

This is therefore a significant growth potential in a segment in which Brazil already plays a key role. According to data from the Serviço Geológico do Brasil – SGB (Geological Survey of Brazil), the country currently has the world's third largest nickel and graphite reserves, the seventh largest uranium reserves and is among the top five countries in global lithium extraction (SGB, 2023).

Bioeconomy and agri-food systems

Brazil has the second largest forest cover on the planet and ranks first in tropical forest area in the world, totaling 500 million hectares (59% of its territory) (IBAMA, 2022). The ecosystems that comprise Brazil's biomes cover around 20% of the world's biodiversity, making Brazil the most biodiverse country in the world (MMA, 2017). The country also has an extremely rich sociobiodiversity, made up of indigenous peoples and traditional communities with vast knowledge related to nature conservation.

The conservation of forests and ecosystems found in Brazilian biomes is essential not only for our society, but also for ecological balance and well-being at a global level, helping to maintain water resources, regulate the climate, absorb greenhouse gases and protect against extreme weather events.

The conservation of Brazil's forest cover and biomes, however, requires the creation of economic incentives that favor the adoption of sustainable practices. Policies based on command-and-control actions, although relevant, are not enough to

fully ensure environmental conservation. In fact, they must be supplemented by incentive mechanisms to make environmental conservation more economically attractive.

Efforts to promote biotechnology are in line with this, with a view to the sustainable exploitation of Brazilian biomes through investment in research and development, with the possibility of creating new value chains, new products and new materials, as in sectors like bioindustry, bio-based inputs, biohealth and biocosmetics.

It is also necessary to promote the transition to more sustainable farming in Brazil - by providing technical support and funds for the development of low environmental impact technologies - as well as the expansion of agroforestry systems.

Initiatives such as expanding the export of non-timber forest products - to increase Brazil's share of the global market in this segment -, the creation of mechanisms aimed at payment for environmental services in forest areas most vulnerable to pressure for deforestation, and the expansion of forest concessions and conservation units can also contribute to the conservation of forests and biodiversity.

There is therefore a wide range of development alternatives resulting from the richness of the Brazilian ecosystem. These advantages, however, should not limit the country to the mere exploitation of natural assets.

One of the main challenges of this Ecological Transformation Plan is to make the country take advantage of its natural potential to increase the complexity of Brazil's production structure and promote the strengthening of technological capabilities in key sectors for a low-carbon economy.

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3

Climate Justice and Overcoming Poverty and Social and Regional Inequalities

Brazil: a socially unequal country

Brazil is characterized by high levels of social and regional inequalities.

According to data for 2022 from the Brazilian Institute of Geography and Statistics' PNAD Contínua (Continuous National Household Sample Survey), the 10% of the Brazilian population with the highest per capita household incomes had an average income 14.4 times higher than the average income of the poorest 40% (IBGE, 2023). In fact, while the top 10% of earners had an average monthly per capita income of R$ 6,448, the bottom 40% earned only R$ 448 on average (IBGE, 2023).

The high level of income inequality in Brazil becomes even more evident when analyzing the proportion of national income held by the highest income decile. In 2022, the richest 10% concentrated 40.7% of the country's total income, whereas the poorest 40% held only 11.3% (IBGE, 2023).

Besides being extremely unequal, Brazil still has a significant portion of its population living below the poverty line and even in extreme poverty. According to the criteria currently adopted by the World Bank, the number of poor and extremely poor people in 2022 amounted to 31.6% and 5.9% of the Brazilian population (IBGE, 2023).

Inequalities and poverty are aggravated when intersected with ethnic-racial and gender criteria. Among the poor, 70.3% are black or brown and only 28.3% are white. Furthermore, among the poor, 52.2% are women and 47.8% men. In other words, poverty and its adverse consequences fall more heavily on women and black and brown people (IBGE, 2023).

Brazil: a regionally unequal country

Social inequalities and poverty also have a strong regional component. The percentage of inhabitants living in extreme poverty is 11.8% in the Northeast and 8.0% in the North, far higher than in the Southeast (3.3%), Midwest (2.8%) and South (2.5%) (IBGE, 2023).

Regional disparities remain in relation to the proportions of the poor population, which amount to a significant 51.0% in the Northeast and 46.2% in the North. In the other regions of the country, this share drops to 23% in the Southeast, 21.3% in the Midwest and 17.1% in the South (IBGE, 2023).

IBGE data also show significant regional inequalities in terms of average per capita income. The South (R$1,927), Southeast (R$1,891) and Midwest (R$1,857) have

much higher average per capita household incomes when compared to the North (R$1,096) and Northeast (R$1,011) regions. As can be seen, the average income of the regions with the highest incomes exceeds that of the Northeast by at least 83.7% and that of the North by at least 69.4% (IBGE, 2023).

Climate inequality

The disparities between regions, classes and social groups are equally reflected in other important determinants of the population's quality of life and well-being, such as health, life expectancy, education, professional qualifications and access to basic sanitation, among others.

Additionally, a new dimension of inequality has become more visible: asymmetries regarding the effects of extreme weather events. The poorest social groups with more limited access to basic services and resources are more vulnerable to climate risks (IPCC, 2022).

Low-income people tend to live in more precarious housing, without access to sewage and drainage systems, located near rivers or in areas of hills and slopes, which are more susceptible to landslides, collapses, and floods.

In rural areas, family farmers and small producers also have more limited means and resources to protect their production against the negative effects of events such as soil erosion, prolonged droughts or strong storms.

In this context, one of the core objectives of the New Brazil – Ecological Transformation Plan is to overcome poverty and reduce inequalities between regions, social classes and groups.

Overcoming poverty and social inequalities

Overcoming poverty requires an increase in the productivity of our economy and the creation of quality, knowledge-intensive jobs, without which improvements in people's living conditions may not be sustainable over time.

The actions under the Plan should therefore encourage and support the development and incorporation of new technologies into production processes, especially in strategic sectors for the transition to a more sustainable economy. As indicated in chapter 3, it is necessary to build on the country's advantages in the environmental area to promote the strengthening of technological capabilities of the production chains associated with these sectors, as well as to expand and upgrade the national production structure.

However, as Brazil has already experienced at other times in its history, economic growth and even technological progress alone are not enough to improve social welfare.

Actions are also needed to create quality, knowledge-intensive jobs to increase workers' share of national income. In fact, the higher the quality and complexity of the jobs created in an economy, the more equitable the social distribution of productivity gains tends to be.

The coordination of measures to increase productivity, create more complex jobs and income alternatives compatible with environmental conservation, with a focus on the poorest and most vulnerable social groups, is critical to increase the country's average income and the quality of life of the population. The New Brazil - Ecological Transformation Plan thus represents an essential instrument for the resumption of national development, overcoming of poverty and reduction of inequalities.

Balanced regional development

The implementation of New Brazil should also seek balanced regional development, taking advantage of the natural potential of each region to promote the strengthening of technological capabilities of their respective production chains, especially in the North and Northeast regions, which currently have the lowest income levels.

The Northeast has a natural characteristic that favors the large-scale production of renewable energy from wind and solar sources. The region has a higher and longer incidence of sunlight and favorable wind speed and constancy, which ensure greater stability for energy generation (INPE, 2017; EPE, 2020).

Besides promoting the domestic production of materials and equipment used in PV panels and wind turbines, the New Brazil - Ecological Transformation Plan will foster the development of associated production chains, such as low-carbon hydrogen. As highlighted before, the industrial-scale production of low-carbon hydrogen will bring a strong growth in the demand for energy from renewable sources, increasing the possibilities for expanding this sector.

The great potential for generating energy from renewable sources, the local port structure and the closer proximity to European and North American consumer markets are also important assets for the Northeast region to attract new manufacturers looking to decarbonize their production.

In addition, there are important initiatives for the technological development of new alternatives aimed at producing biofuels from plants that are abundant in the caatinga region, such as agave and macaúba.

For its part, the Northern region also has strategic natural assets for ecological transformation, which should be harnessed to boost the development of the local economy.

The Amazon rainforest is one of the most biodiverse areas in the world, with significant potential to drive advancements in biotechnology with the development of new bio-based inputs for healthcare, pharmaceuticals and cosmetics.

In addition, New Brazil proposes the development of financial mechanisms that compensate for the conservation and recovery of native vegetation, such as payment for environmental services and the generation of carbon credits, creating economic alternatives especially for the lower-income population.

Other important initiatives are the regulation of forest concessions and the strengthening of the non-timber forest products chain, increasing exports of these products.

These are actions with a positive impact on the production structure of the Northern region, and which seek to reconcile economic development and environmental conservation.

Another important pillar of the Plan involves actions to build resilient infrastructure and adapt to climate change, with priority given to assisting the most vulnerable and at-risk populations.

Further detailed in the next chapter, these measures will include retaining walls for hills and slopes, urban drainage, expanding water, sewage and waste collection systems, upgrading slums, and strengthening civil defense systems.

Brazil and the defense of climate justice at the global level

Ecological transformation as an instrument for overcoming poverty and reducing inequalities also has an important potential for projecting Brazil internationally as a relevant leader among poor and middle-income countries in the eyes of multilateral organizations.

Indeed, Brazil has been actively engaged in global efforts to establish financial mechanisms that enable developing nations to prepare for climate change –with funding to be provided by developed countries, which bear historical responsibility for the majority of cumulative greenhouse gas emissions.

In the 2015 Paris Agreement, rich countries reiterated a commitment made in 2009 at COP15 in Copenhagen to make $100 billion available annually from 2020 onwards for climate finance to poorer or developing countries. Brazil has been a leading voice before international organizations for the effective fulfillment of this commitment.

The country has also been involved in the establishment of an international fund to finance the conservation of tropical forests around the world. The fund shall pay countries with tropical forests according to the area conserved and that its main sources of funding should include investments from the Sovereign Wealth Funds, as well as international reserves and donations.

The ecological transformation agenda also offers opportunities for international scientific and technological cooperation agreements between Brazil and other poor or developing countries in the areas of biotechnology, bio-based inputs, renewable energies, biofuels, agroecology and social technologies for poverty reduction.

The New Brazil – Ecological Transformation Plan follows the principles of climate justice as a guideline for both domestic public policy and Brazil's actions abroad, seeking to improve the living conditions of the most vulnerable populations and promote the assumption of obligations by higher-income countries and social segments for the costs of climate mitigation, adaptation and reparation for loss and damage caused by climate change in proportion to their respective responsibilities.

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4

New Brazil – Ecological Transformation Plan

Ecological transformation entails a shift in economic, technological, financial and cultural paradigms toward development based on sustainable relations with nature and its biomes, enabling fairly and equitably distributed wealth creation in a fair and shared way, with a better quality of life for present and future generations.

The New Brazil - Ecological Transformation Plan is a major innovation in the country's approach to the environmental agenda, integrating it as a structuring dimension for economic and social development.

To address these challenges, the Plan is structured into three tiers, with objectives translated into implementation pillars, as outlined in Figure 9..

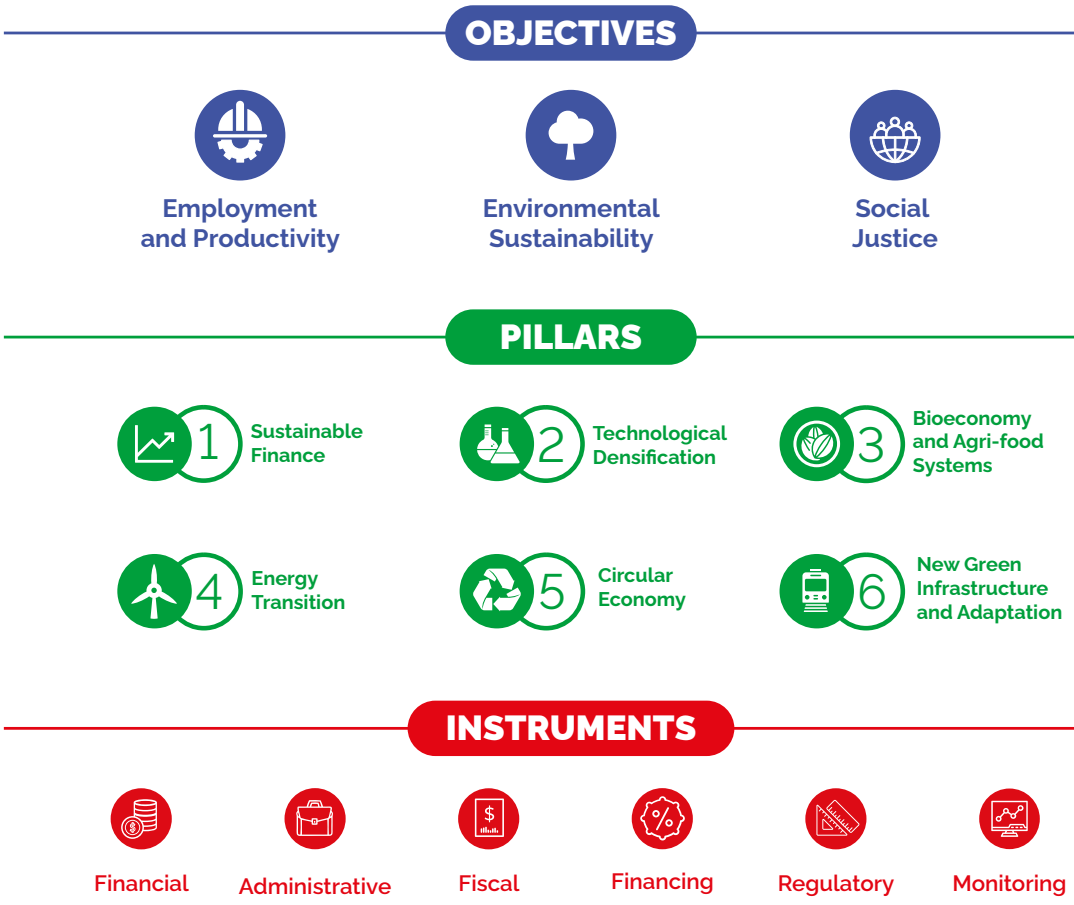

Figure 9. Implementation framework of the Ecological Transformation Plan.

- As highlighted in the previous chapters, New Brazil has three general objectives:

- promote quality job creation through productivity gains, driven by technological innovation in industrial processes and natural resource management, alongside increased public and private investment;;
- boost environmental sustainability by reducing the environmental footprint of development, reducing greenhouse gas emissions and enhancing biodiversity;
- guarantee social, environmental and climate justice, by reducing inequalities, mitigating climate change impacts on vulnerable populations and extending development benefits to all.

These objectives are cross-cutting, reflecting Brazil's key macro-level challenges. They will guide the policies and actions under the Plan's six pillars: Sustainable Finance, Strengthening of Technological Capabilities, Bioeconomy and Agri-Food Systems, Energy Transition, Circular Economy and New Green Infrastructure and Adaptation.

Each of these pillars will be implemented through financial, fiscal, regulatory, administrative and monitoring instruments.

The main initiatives under these pillars are detailed below.

Pillar 1 - Sustainable Finance

The ecological transformation of the economy will be based on a broad set of fiscal, tax, financing, regulatory and financial measures to encourage the allocation of resources to sustainable, innovative and inclusive activities, reducing environmental and climate risks.

By seeking to secure the resources needed to make large-scale changes to the economic structure, the Sustainable Finance pillar constitutes an important foundation for the implementation of the other pillars that make up the New Brazil.

Compliance Carbon Market – The carbon market regulation aims to encourage the reduction of greenhouse gas emissions and the promotion of low-carbon technological innovations, in order to meet the requirements of the National Climate Change Policy (Brazil, 2009), the international agreements signed by Brazil, and the new business opportunities that the decarbonization agenda makes possible.

The Brazilian Emissions Trading System (SBCE) will define the distribution of annual carbon credits among operators.

Highly polluting emission sources will be subject to the SBCE. Those that emit more than 10,000 tCO_2e will have to monitor their emissions and those that emit more than 25,000 tCO_2e will be subject to a cap-and-trade system..

Those who manage to reduce their emissions will be able to obtain credits and sell them to operators who do not meet their quotas. In addition, the project fosters the voluntary carbon market by enabling offsets for regulated agents to meet their

quotas. In this sense, one of the law's fundamental contributions will be to define the legal nature of SBCE's assets and of the carbon credits traded in organized markets.

The carbon market policy is concerned with preserving the rights of indigenous peoples and traditional communities by establishing additional mechanisms and guarantees for the trading of carbon credits generated from the development of projects in the territories they traditionally inhabit.

Any funds raised shall be used for activities that seek new solutions for decarbonizing the economy, with a focus on technological innovation and sustainability, for compensating indigenous peoples and traditional communities for conserving vegetation and ecosystem services, and for guaranteeing the operation of the SBCE itself.

Sovereign Sustainable Bonds – Debt instruments issued by governments within the international market with the aim of financing projects that create positive environmental and/or social impacts.

In September 2023, the federal government established the Sovereign Sustainable Bond Framework, a reference document containing the rules that Brazil must comply with to issue sustainable bonds, such as transparency in the definition and selection of the expenses to be financed and in the allocation of the funds raised, disclosure of qualitative and quantitative indicators measuring the environmental and/or social impacts of these expenses, among others (MF/STN, 2023).

Shortly afterwards, in November 2023, Brazil successfully launched a $2 billion sovereign sustainable bond. In June 2024 there was a new issue of these bonds, also in the amount of $2 billion, with the prospect of annual issues.

These transactions will make it possible to extend the maturity of the debt and expand the existing investor base, in line with Brazil's public debt management strategy.

The funds raised by these issues will be earmarked for deforestation control, biodiversity conservation, the National Climate Change Fund, with a focus on renewable energy and clean transportation, and for programs to reduce poverty and hunger, such as Bolsa Família, Continuous Cash Benefits and the Food Acquisition Program (MF/STN, 2023; MF/STN, 2024).

Besides making it possible to finance sustainability projects, sovereign bond issues in Brazil will serve as a benchmark for new sustainable bond issued by the corporate sector.

Cimate Fund – Created by Law no. 12114/2009, the Climate Fund was revised in 2023. The new Fund version expanded the new credit lines designed to accelerate renewable energy, promote sustainable urban mobility, encourage energy efficiency in strategic sectors, develop clean technologies and protect biodiversity.

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Funds are available in two forms: non-repayable, managed by the Ministry of the Environment and Climate Change (MMA), and repayable, operationalized by the National Bank for Economic and Social Development (BNDES).

For 2024, R$10.4 billion is expected to be allocated to projects, studies and undertakings in the repayable form. Part of these funds was raised in 2023 with the issuance of the first Brazilian sovereign sustainable bonds.

Financing rates vary from 1% per year, in the case of native forests and water resources, to 8% per year, for solar and wind power generation, as defined by the National Monetary Council (CMN)[13].

Its differentiated rates and amount of funds offered make the Climate Fund one of the main instruments for financing Brazil's ecological transformation.

Brazilian Foreign Private Capital Mobilization and Currency Hedging for Ecological Transformation Program (Eco Invest Brazil Program) – To make ecological transformation viable, significant investments are needed, which will only happen with the joint participation of the private sector (national and foreign) and the public sector. According to Persaud (2023), in developed countries 81% of investments in green transformation are financed by the private sector, whereas in developing countries this rate is only 14%. One of the causes of this low private sector participation in developing countries is the relatively high cost of capital for private investment, particularly foreign direct investment.

Exchange rate volatility in Brazil, though highly correlated with international markets, is around 2.2 times higher, peaking at four times during periods like the COVID-19 pandemic. Given the volatility of the exchange rate, investors rely on currency derivatives to mitigate their risks. However, these instruments for longer terms are either non-existent or expensive in the domestic market.

Eco Invest Brazil, launched under the National Climate Change Fund[14], aims to address barriers to attracting long-term foreign private investment.

The Program's objectives are: **(i)** fostering and encouraging sustainable investments in projects that promote ecological transformation, especially in the pillars of strengthening of technological capabilities, bioeconomy, energy transition, circular economy and green infrastructure and adaptation; **(ii)** mobilizing sustainable foreign private capital for the country's ecological transformation; and **(iii)** supporting the development, liquidity and efficiency of the long-term foreign currency hedge market in Brazil.

The program establishes a credit line and involves the joint and coordinated action of the National Treasury Secretariat and the Executive Secretariat of the Ministry of Finance (MF), the National Climate Change Secretariat of the Ministry of Environment and Climate Change (MMA) – which are part of its governance structure –, and the

13. The rates and other conditions for financing backed by resources from the Climate Fund are defined by CMN Resolution no. 5095/2023 (CMN, 2023)

14. Provisional Executive Order no. 1213, dated 22 April 2024 (Brazil, 2024a).

Central Bank of Brazil (BCB). The Eco Invest Line will be subdivided into four credit lines, with specific objectives:

1) Blended Finance:[15]: offers partial financing for credit operations aligned with ecological transformation that use fundraising abroad, fostering the integration of Brazilian companies with investors and the international financial system.

2) Long-Term Foreign Exchange Liquidity: designed to address foreign exchange volatility events that could compromise the company's or investor's liquidity. Ultimately, it aims to mitigate the challenges faced by companies with debts in foreign currency and revenues generated in Brazilian Reais, in cases of significant devaluation, allowing for effective cash management and credit enhancement..

3) Encouraging Exchange Rate Protection: supports the offer or viability of foreign exchange derivatives or other financial assets, with the aim of partial or full mitigation of investors' exchange rate risk, thus attracting foreign direct investment for green projects.

4) Project Structuring: for credit operations that finance sustainable studies and projects in specific sectors. This line is expected to leverage the development of major sustainable initiatives in Brazil, filling the current gap in the country's green project portfolio.

Funds from the Eco Invest Line will be allocated via auctions conducted by the National Treasury Secretariat. Authorized financial institutions will bid for these funds, assuming all operational risks, including credit risk[16].

Brazilian Sustainable Taxonomy – IEstablishment of a classification system that objectively and scientifically defines activities, assets and project categories that contribute to climate, environmental and social objectives, using specific criteria.

Sustainable taxonomy provides common terminology for companies, financial institutions, investors, regulators, governments and other stakeholders, aligning investment decisions with public policy development.

By offering robust and uniform criteria for categorizing projects, the sustainable taxonomy also facilitates the disclosure and monitoring of the use of resources mobilized by thematic sovereign bonds and currency protection instruments.

The establishment of a sustainable taxonomy will facilitate differentiated regulatory incentives according to projects' sustainability.

Its action plan, submitted to public consultation, was launched in December 2023 (MF/SPE, 2023), presenting in detail the objectives, principles and sectors of the taxonomy. The governance structure for taxonomy development is defined in Executive Order no. 11961, dated 22 March 2024.

15. Ministry of Finance Directive no. 964, dated 11 June 2024 (MF, 2024).

16. National Monetary Council Resolution no. 5130, dated 25 April 2024 (CMN, 2024).

Tax Reform – Constitutional Amendment no. 132/2023 promoted extensive restructuring and simplification of the country's consumption tax system. The measure also included important mechanisms related to ecological transformation.

The National Regional Development Fund was created, with the aim of reducing regional and social inequalities by allocating federal funds to the states and the Federal District, with priority given to projects and actions aimed at environmental sustainability and greenhouse gas emission reduction.

The Tax Reform also provides for an Excise Tax on the production, extraction, sale or import of goods and services that are harmful to health or the environment.

The measure discourages consumption of goods with negative externalities, i.e. where social and environmental costs are not reflected in market prices.

The supplementary legislation on the Tax Reform establishes the incidence of an Excise Tax on motor vehicles, vessels and aircrafts because they emit pollutants that cause damage to the environment (Brazil, 2024b).

For vehicles, tax rates will consider when defining the respective Excise Duty rates: the vehicle's power, its energy efficiency, its structural performance and driver assistance technologies, the recyclability of its materials, its carbon footprint and its advanced technology integration.

Sustainable vehicles qualifying under these criteria will be exempt: carbon dioxide emissions (energy-environmental efficiency), considering full life cycle emissions; vehicle recyclability; completion of manufacturing stages in the country; and vehicle category.

The Tax Reform regulations also establish a competitive edge in the calculation of IBS (Sub-national Tax on Goods and Services) and CBS (Federal Contribution on Goods and Services) rates of taxation for biofuels consumed in their pure form and for low-carbon hydrogen, ensuring that they are taxed less than fossil fuels.

In addition, incentives are provided in the form of automatic tax credits for IBS and CBS purposes for the purchase of waste and other materials directed to recycling, reuse or reverse logistics from individuals, cooperatives or other forms of grassroots organization.

These sustainable Tax Reform provisions are cornerstones for Brazil's ecological transformation.

Pillar 2 – Strengthening of Technological Capabilities

The Strengthening of Technological Capabilities pillar comprises a set of measures designed to increase the competitiveness of the Brazilian economy through scientific, technological and innovation development.

TIt also aims to increase the value added of economic activities, making production chains more technology intensive, achieving productivity gains, multiplier effects and well-paid jobs.

As already pointed out, Brazil plays a leading role in the ecological transformation agenda, especially because of its natural resources. Also worth noting is the excellence of the installed capacity in the country's Scientific, Technological and Innovation Institutions (ICTs).

However, it is crucial to harness this potential to boost technological innovation, the increasing sophistication of our production structure and the creation of knowledge-intensive jobs.

The initiatives under this pillar are linked to the actions of the New Industry Brazil Program (NIB), which includes the following related missions:

- Sustainable and digital agroindustry chains for food, nutritional and energy security;
- Sustainable infrastructure, sanitation, housing and mobility solutions;
- Industrial digital transformation for increased productivity; and

Bioeconomy, decarbonization and energy transition and security to guarantee resources for future generations.

It is also worth noting the growing importance of new digital technologies in reconfiguring the production structure, with gains in productivity and sustainability in various industrial segments. In fact, incorporating digital technologies into production processes allows for more efficient management of resource consumption, reducing waste and waste generation, optimizing processes and promoting more sustainable practices throughout the value chain.

New digital technologies are critical to the performance of strategic sectors for ecological transformation, such as the use of Artificial Intelligence to develop biotechnology, monitor deforestation and detect fires, incorporation of new information systems to improve the generation of renewable energy and management of electricity grids, technologies for automated selection of materials for recycling, among many others.

In this sense, strengthening and supporting the development of new digital technologies in Brazil is essential for policies aimed at the strengthening of technological capabilities of production chains.

Research and Development Funds aimed at strategic technologies for ecological transformation — Brazil has important public funds earmarked for investment in Research and Development (R&D), especially the National Fund for Scientific and Technological Development (FNDCT) and the Sectoral Funds it comprises.

FNDCT finances scientific and technological development programs and projects aligned with national development policies.

FNDCT's funds are earmarked, on a non-repayable basis, for financing projects of Scientific, Technological and Innovation Institutions (ICTs) and of cooperation between ICTs and companies; for granting innovation subsidies directly to companies to share the costs and risks inherent in innovation activities; and for interest rate subsidies in credit operations. This will allow startups access to financing at lower interest rates; and for financing programs developed by social organizations that have a management agreement with the Ministry of Science, Technology and Innovation.

FNDCT's funds can also be used to invest in Equity Investment Funds (FIP) and Mutual Investment Funds in Emerging Companies (FMIEE), with the aim of acquiring stakes in innovation companies with high growth potential.

In the repayable form, FNDCT's funds finance the technological development of companies that comply with the federal government's technology and industrial policy and are in line with the operating policy of FINEP, which serves as the Fund's Executive Secretariat.

FNDCT is also made up of the so-called Sectoral Funds. There are currently fifteen Sectoral Funds in operation in the country, thirteen of which are related to specific economic sectors: Aviation, Agribusiness, Marine Transportation and Shipbuilding, Biotechnology, Space, Water Resources, Information Technology, Minerals, Oil and Natural Gas, Health, Road and Water Transportation, Energy, and one that focuses on the Legal Amazon.

The other two Sectoral Funds have a cross-cutting nature, with funds that can be invested in projects of any economic sector: the Green-Yellow Fund, aimed at university-business interaction, and the Infrastructure Fund, aimed at supporting and improving the infrastructure of ICTs.

FNDCT had its financing capacity strongly resumed in 2023 with the allocation of around R$10 billion, being reformulated into 10 structuring programs aimed at the country's science, technology and innovation sector, aligned with the missions and guidelines of the New Industry Brazil Program.

In 2024, there will be another significant influx of funds. FNDCT's Annual Investment Plan provides for the disbursement of R$12.7 billion in non-repayable and repayable funds (FNDCT/FINEP, 2024).

It is a key source of funds to finance the development of strategic technologies for ecological transformation, with clear missions integrated with the productive setor, based on the definitions of its Board and of the National Council for Industrial Development (CNDI), responsible for the guidelines of the New Industry Brazil Program.

Local Content Policies – The establishment of local content requirements in government procurement and public instruments to promote and encourage sectors related to ecological transformation aims to increase the participation of technologies and industrial products developed in the country, the diversification of the national industrial sector and the development of technology-intensive sectors with high growth potential.

Executive Order no. 11630/2023 established the Interministerial Commission for Innovations and Acquisitions of the Growth Acceleration Program (CIIA-PAC) with the aim of fostering the strengthening of technological capabilities and innovations in the production chains and sectors addressed by New PAC. This commission is responsible for guiding the use of the government's purchasing power to stimulate production and technology development, and environmentally and socially sustainable innovation. This will contribute to the processes of new industrialization and ecological transformation (Brazil, 2023a).

In its turn, Executive Order no. 11889/2024 defined the production chains and sectors addressed by New PAC that may be subject to requirements for the acquisition of national manufactured products and services, as well as the setting of price advantages for national manufactured products and services (Brazil, 2024c).

However, local content policies must contain defined deadlines and be accompanied by competitiveness goals and transparent monitoring of the evolution of the technological learning process, in order to avoid market protectionism and unjustified protection of inefficient sectors.

These are, in fact, temporary incentives to ensure the growth, consolidation and technological learning of production chains related to ecological transformation until they reach global standards of competitiveness.

Green Mobility and Innovation Program - MOVER – Launched in December 2023, the Program corresponds to the new industrial policy aimed at decarbonizing the mobility and logistics sectors, with emphasis on the production of electric and hybrid vehicles, through the adoption of tariffs and tax measures and the provision of funds for research and development (R&D).

Estimated at more than R$19 billion by the end of 2028, the incentives will be provided to companies that develop research, development, innovation or engineering services related to the mobility and logistics production chain in Brazil, for the purpose of upgrading their industrial sector (Brazil, 2024d).

The Program also establishes additional obligations to be met when selling and importing new vehicles in Brazil, with targets and requirements for energy efficiency, carbon dioxide emissions, vehicle recycling and driver assistance technologies, among others. The rates of the Tax on Manufactured Products (IPI) will be set differently according to these requirements.

The program also includes the creation of the National Industrial and Technological Development Fund (FNDIT), to be managed by the National Bank for Economic and Social Development (BNDES). The program aims to raise funds from industrial policies for use in financial support for priority industrial, scientific and technological development programs and projects, especially in the mobility and logistics industries, as defined by the Ministry of Development, Industry, Trade and Services.

National processing of strategic minerals — Brazil plays a key role in the global minerals market, being one of the main producers of niobium, iron ore, aluminum, vanadium, graphite, lithium, chromium and nickel.

As highlighted in chapter 3, the new decarbonization and energy transition technologies will substantially increase the demand for strategic minerals, presenting an opportunity for Brazil to further expand its share in this economic sector.

However, the country cannot merely export these minerals in their raw form. It is necessary to strengthen initiatives aimed at the national processing of ores that are strategic to the energy transition, encouraging value addition in the country through the development of new technologies, bearing in mind that FNDCT already has specific lines aimed at financing the development of mineral processing technologies.

It is also important to highlight the inclusion of transformation of strategic minerals for the energy transition among the priority sectors covered by the benefits related to the issuance of infrastructure bonds and incentivized bonds, such as the income tax exemption for individuals (Brazil, 2024e).

Sustainable and Innovative Federal Universities – EThis program deals with the structuring and strengthening of Technological Innovation Centers (NITs) at Federal Higher Education Institutions (IFES), Federal Institutes (IFs) and other Scientific, Technological and Innovation Institutions (ICTs), with incentives for technological production and innovation in the pillars that make up the New Brazil – Ecological Transformation Plan and the New Industry Brazil.

Brazil has a consistent scientific literature, ranking among the countries with the highest number of scientific articles published in internationally indexed journals[17]. However, technological innovation has not kept up with this evolution, and one of the country's main challenges today is the practical application of the results of scientific production, with the development of new technologies and innovations that can benefit the productive sector and society.

In order to overcome these challenges, the new legal framework for innovations (Brazil, 2016b) established a broad set of instruments aimed at collaboration between the public and private sectors, streamlining bureaucratic processes related to research and innovation, protection of intellectual property and promotion of technology transfer between research institutions and companies.

The new law on innovation[18] assigns NITs a strategic role in the management of ICTs' institutional innovation policy, especially in the interactions of ICTs with the productive sector being responsible for the protection of inventions, licensing, innovation and other forms of technology transfer.

In this context, strengthening NITs is a key measure for the strengthening of technological capabilities of production chains related to ecological transformation, with the incorporation of locally developed technological innovations.

17. In 2023, Brazil ranked 14th among the countries with the highest number of scientific publications indexed by SCImago, with 88,827 papers published, just one position behind South Korea, which had a total of 101,404 publications (SCImago, 2024).

18. Law no. 13243, dated 11 January 2016 (Brazil, 2016b).

Technology Orders (public procurement for innovation) – Public procurement of research, development and innovation, involving R&D risk, to solve a specific technical problem or obtain an innovative product, service or process not available in the market, to be used or owned by the State, which may include the subsequent acquisition of the final product on a large scale.

Technology Orders allow payments to be made based on cost reimbursement, rather than a pre-defined fixed amount. They also authorize the simultaneous contracting of more than one agent for the same object, considering that the development effort may be unsuccessful along some routes - which will only become clear at the end of the contractual period.

Even unsuccessful contracts will not incur penalties, if the research effort has been demonstrated, but this is considered inherent in activities related to cutting-edge technologies.

Technology Orders are also characterized by the criteria for choosing the contractor, who does not necessarily have to seek the lowest price, but rather the highest probability of achieving the desired result.

Technology Orders under the New Brazil – Ecological Transformation Plan aim to use the purchasing power of the Brazilian government to support innovation in sectors that are strategic for the transition to a more sustainable economy in Brazil and that are aligned with the country's new industrialization policy.

Regional Funds with Sustainability Criteria – The Constitutional Midwest Financing Fund (FCO), Constitutional Northeast Financing Fund (FNE) and Constitutional North Financing Fund (FNO), as well as the Midwest Development Fund (FDCO), Northeast Development Fund (FDNE), and Amazon Development Fund (FDA) are currently the main financing instruments of the National Policy for Regional Development (PNDR).

Through these funds, significant amounts of the federal tax resources are earmarked for implementing policies for regional development and reduction of the country's inter-regional inequalities, being allocated to investments in infrastructure, public services and production undertakings with a high capacity for developing new businesses and new production activities.

In this sense, it is essential that the financing policies adopted by the Regional Funds be aligned with the guidelines of the New Brazil – Ecological Transformation Plan, incorporating sustainability criteria and promoting the strengthening of technological capabilities of strategic production chains for a new, more sustainable economy.

Pillar 3 – Bioeconomy and Agri-food Systems

The Bioeconomy and Agri-food Systems pillar comprises a set of measures to generate products, processes and services through sustainable use of land and natural resources, with intensive use of science, technology and innovation, and promoting food, nutrition and energy security.

Conserving Brazil's biomes plays a central role in preserving human life, as these regulate climate, produce oxygen and sequester greenhouse gases, preserve biodiversity, and maintain the soil and water cycle.

Biome degradation and biodiversity loss can result in the imbalance of ecosystems, with negative effects on food production and air and water quality. In addition, the main sources of greenhouse gas emissions in Brazil are deforestation and agriculture.

In this context, it is essential to create economic and technological solutions that offer alternative income and prosperity alternatives to deforestation – both legal and illegal – reconciling economic development and environmental conservation. It is also necessary to incorporate more sustainable production systems, practices, products, and processes into agricultural activities, thus reducing their environmental impact and greenhouse gas emissions.

National Bioeconomy Plan — Bioeconomy means sustainable use of biological resources, involving activities aimed at developing new bio-based production processes and transforming natural resources into sustainable products and services. It seeks to promote the transition from a linear economy based on fossil and finite input materials to a circular economy based on the use of renewable biological inputs.

It is directly related to the application of scientific knowledge, technologies and innovations in the field of biotechnology to develop new plant and animal varieties, as well as more efficient and less resource- and energy-intensive production processes.

Bioeconomy has the potential to contribute to the development of solutions in the areas of human health, increased agricultural productivity and water, energy and food security, including new sectors for pharmaceuticals, cosmetics, vaccines, industrial enzymes, bio-based chemicals and fibers, bioplastics, bio-based inputs, food and biofuels.

Brazil currently meets the main requirements to make significant progress in bioeconomy, with abundant inputs for biomass production, one of the richest areas of biodiversity on the planet, world-class expertise in biorefining and biomass utilization, solid scientific production in the area, and a high capacity to develop new substances with high value added.

With the aim of strengthening the development of bioeconomy in the country with a fair and equitable sharing of benefits from access to genetic heritage and traditional knowledge, respecting the rights of indigenous peoples and traditional communities and seeking to reduce inequalities, Executive Order no. 12044/2024 established the National Bioeconomy Strategy, setting the respective guidelines and objectives. It also established that the National Bioeconomy Development Plan will be drawn up by the National Bioeconomy Commission, to be set up by a joint act of the Ministry of Environment and Climate Change, the Ministry of Development, Industry, Trade and Services, and the Ministry of Finance (Brazil, 2024f).

The National Bioeconomy Development Plan will establish the resources, actions, responsibilities, targets and indicators for the development of bioeconomy.

Bioeconomy development requires expanding of the innovation network, integrating public and private research and development (R&D) centers to generate new technologies and higher value-added products. The sources of financing for biotechnology shall also be expanded, especially within the FNDCT (National Fund for Scientific and Technological Development).

An important action to strengthen innovation in bioeconomy is the recent restructuring of the Amazon Biobusiness Center (CBA), which was converted into a Social Organization with a flexible legal regime and a new institutional mission.

CBA plays a central role in the development of technologies and new businesses based on the sustainable use of natural resources from the biodiversity of the Amazon region, working in an integrated manner with public and private research centers, incubators, accelerators and technology-based companies to carry out research, development and innovation projects.

HARVEST Plan and RenovAgro — The Harvest Plan is the federal government's main program for supporting and financing the agricultural sector through credit lines, subsidies and agricultural policies for rural producers, from family farmers to large-scale producers.

Various credit lines are offered to meet the needs of rural producers in terms of investment and other expenditure on costing, sale, and industrialization.

In turn, the Program for Financing Sustainable Agricultural Production Systems (RenovAgro), the new name given to the former ABC Program credit line, aims to promote sustainability, reduce the environmental impact of agricultural production and mitigate the negative effects of climate change on these activities. Increasing the adaptability of the different agricultural production chains is fundamental to maintaining this activity and guaranteeing food security.

The sustainability of agricultural activity requires the implementation of a set of systems, technologies, products and processes for low-carbon agriculture, such as No-Tillage System (NTS), Recovery of Degraded Pastures (RDP), Crop-Livestock-Forestry Integration (CLFI), Biological Nitrogen Fixation (BNF), Planted Forests (PF) and Animal Waste Treatment (AWT). These are practices and technologies that effectively reduce GHG emissions and, at the same time, help to ensure the sector's resilience and productivity gains.

With total funds amounting to nearly R$475.5 billion, the 2024-2025 Harvest Plan, as had already occurred in the 2023-2024 Harvest Plan, incorporated specific mechanisms to strengthen environmentally sustainable production systems, with a reduction in interest rates for rural producers whose Rural Environmental Registry has been reviewed (Brazil, 2024g).

As of January 2025, rural producers with certification of conformity issued for organic production, for the Ministry of Agriculture and Livestock's Integrated Production Program (PI-Brasil-Mapa), for the Ministry of Agriculture and Livestock's

Best Agricultural Practices Program (BPA-Mapa), and farmers and livestock farmers who have already accessed RenovAgro credit for investment in the last five years (except Renovagro Ambiental), will benefit from a 0.5% reduction in interest rates on costing operations. This interest reduction is cumulative with that of properties that have the CAR validated, adding up to a 1% discount on the financing interest rate, and it is certain that these discounts are only applicable to producers who do not fall under the National Program to Strengthen Family Farming (Pronaf) or the National Program for Support to Medium-Sized Farmers (Pronamp).

2024-2025 Harvest Plan also includes credit lines with more attractive interest rates for organic, sociobiodiversity and agroecological producers under Pronaf Costing. From the 2022-2023 Harvest Plan to the 2024-2025 harvest, the reduction was from 5% p.a. to 2% p.a. Pronaf Bioeconomy and Pronaf Agroecology also had significant interest rate reductions. There was also an increase in funding for agroforestry systems under Pronaf Forest and a greater amount of funds for the RenovAgro Program (an increase of more than 10% compared to the previous Harvest Plan).

Considering the importance of technical support for small producers in the bioeconomy, the 2024-2025 Harvest Plan stipulates that rural credit agents accredited by MMA and MDA on the list of sociobioeconomy and agroecology professionals shall have the task of providing technical support to producers. It will include assistance in the preparation of credit projects for sociobiodiversity products, guidance on the application of sustainable soil exploitation principles and the maintenance of biodiversity, among other aspects related to the production of ecologically-based systems.

From the second half of 2023 to the beginning of 2024, credit was not allowed to enterprises not registered in the CAR, properties in conservation units, land occupied by indigenous people, and embargoed areas, among others. As for the 2024-2025 Harvest Plan, producers with areas of their property under embargo were allowed to access credit under the Pronaf Forest, Pronaf Bioeconomy and RenovAgro Environmental lines, provided that the sole purpose was to recover the native vegetation in the embargoed area, under the Environmental Regularization Program (PRA) (Brazil, 2024g).

The New Brazil – Ecological Transformation Plan adopts as its central guideline in the Bioeconomy and Agri-food Systems pillar the strengthening of RenovAgro and the expansion of more sustainable criteria and practices to make Brazilian agriculture increasingly resilient and environmentally sustainable.

Payment for Environmental Services— Granting economic and financial incentives to those responsible for environmental conservation. It represents a more modern and innovative instrument for environmental conservation compared to traditional 'command and control' models, restricted to inspection actions and the levying of fines.

Enacted in January 2021, Law no. 14119 established the National Payment for Environmental Services Policy and the Federal Payment for Environmental Services Program. According to the law, payment for environmental services consists of a transaction of a voluntary nature, whereby a payer of environmental services

transfers financial resources or another form of remuneration to a provider of these services, under agreed conditions (Brazil, 2021a).

Environmental services, in turn, correspond to a set of defined and effective activities that provide relevant ecosystem benefits, resulting in the improvement, conservation, restoration and protection of native vegetation.

They can be provided by an individual or legal entity, under public or private law, or a family or community group that maintains, restores or improves the environmental conditions of ecosystems, including territorial surveillance, protection and monitoring, as well as soil, water and biodiversity conservation.

Law no. 14119/2021 acknowledges the important role played by traditional communities, indigenous peoples and family farmers in the provision of environmental services, including them as priority stakeholders for the Federal Payment for Environmental Services Program (Brazil, 2021a).

The regulation of Law no. 14119/2021 is one of the federal government's priorities.

Tropical Forest Forever Facility (TFFF) — At COP-28 in Dubai, Brazil presented the global community with a proposal to establish a multilateral investment fund to encourage tropical forest nations to keep their forests standing, contributing to the global goal of achieving net zero deforestation.

Deforestation and forest degradation – especially in tropical regions – account for more annual CO2 emissions into the atmosphere than any other human activity except for energy production and consumption.

The fund will prospectively reward countries with tropical forests for protecting these natural forests, which offer enormous benefits for development and are essential in the fight against climate change. By providing an explicit payment for the conservation of tropical forests, TFFF will address an important market failure by assigning value to the ecosystem services that these forests provide, such as water management, biodiversity conservation, soil protection, nutrient cycling, continental and global climate regulation and climate resilience. Correcting this market failure will also help to reduce poverty and promote economic development, both in forest countries and globally.

TFFF will offer long-term remuneration for forest nations that preserve their forests, without increasing funding demands on government budgets. It seeks to establish financial transfers that do not depend on contributions from donations. It is important to highlight that while the TFFF offers a great incentive for forest nations to conserve their tropical forests, it complements and does not replace other policies and initiatives needed to achieve this goal, including the REDD+ program, carbon markets and changes in agricultural policies and practices.

Forest and Conservation Unit Concession Program — A form of management of public forests and conservation units in which the government grants legal entities, including companies, cooperatives and associations of local communities, the right to carry out sustainable forest management and the provision of tourism services.

Sustainable forest management consists of the exploitation of timber and non-timber forest products and forest services using exploitation techniques with a low environmental impact, keeping the forest standing and contributing to the conservation of its biodiversity.

It is important to note that, during the concession period, ownership of the forest remains public, and the concessionaire is limited to exploiting the activities provided for in the concession contract in return for financial compensation and other legal and contractual obligations, including the duty to respect the rights and needs of traditional peoples and communities.

In addition to environmental conservation, forest concessions result in other benefits for the municipalities and communities surrounding the concession areas, such as job creation, investment in services and infrastructure, funds transferred to pay for the products exploited and other benefits guaranteed by the concession contract.

According to data from the Brazilian Forest Service (SFB), the country has 327.3 million hectares of federal, state, municipal and Federal District public forests, comprising 38.4% of the national territory (MMA/SFB, 2023a). Out of this total, 31 million hectares are federal and state forests that can be subject to forest concessions.

There are currently 22 federal public forest concession contracts signed, totaling 1.3 million hectares of forest management area (MMA/SFB, 2023b). There is, therefore, significant potential for expanding forest concessions, including conservation units.

In June 2023, the Ministry of Environment and Climate Change, through the Brazilian Forest Service and in partnership with the National Bank for Economic and Social Development (BNDES), launched a call for tenders for the concession of the Irati, Três Barras and Chapecó National Forests, in the south of the country, with the main objective of recovering the Atlantic Forest biome.

The initiative provides for the reforestation of more than 6,000 hectares of forest, with restoration and silviculture of native species, with investments estimated at R$430 million, to be applied in the forestry operation and in the restoration chain over the 35 years that the contracts are in force.

In May 2024, the Brazilian Forest Service and the BNDES signed a Technical Cooperation Agreement with the aim of structuring new forest concession projects in the country.

With resources from the Climate Fund, strengthened with new annual contributions of R$10 billion, and the Finem – Environment credit line, BNDES has the necessary instruments to finance forest concessions, representing a fundamental initiative for the sustainable management of Brazilian forests.

Program to promote forest restoration (Arco da Restauração — Amazon Restoration Arch) — In addition to measures to conserve forests, with the creation of economic alternatives that jointly ensure the prosperity of their inhabitants and environmental sustainability, initiatives aimed at forest restoration and recovery of degraded areas are equally fundamental.

Launched at the 28th United Nations Conference on Climate Change (COP-28), the Restoration Arch is the main program to promote forest restoration in the Legal Amazon region.

This initiative results from a partnership between the Ministry of Environment and Climate Change and BNDES, and aims to finance the restoration of 24 million hectares of deforested or degraded areas in the Amazon by 2050, with the recovery of biodiversity and the expansion of natural means of carbon capture (MMA, 2024c).

The program is structured in two stages. The first stage involves the restoration of six million hectares by 2030, with an estimated investment of $10 billion (approximately R$51 billion). The second stage encompasses the restoration of an additional 18 million hectares between 2031 and 2050, with a further $30 billion in investments (around R$ 153 billion) (MMA, 2024c).

In addition to seeking solutions for the environmental and climate crises, the program also aims to promote regional economic development, with the potential to create 10 million jobs in the region during the two stages of implementation (MMA, 2024c).

BNDES will make the first contributions to the project, with initial investment of R$1 billion, of which R$450 million will come from the Amazon Fund and R$550 million from the new Climate Fund.

The Amazon Fund's resources, of a non-repayable nature, will be invested in ecological restoration projects related to Conservation Units, indigenous lands and territories of traditional peoples and communities, undesignated public areas and Permanent Preservation Areas (APP) and Legal Reserves (RL) of settlements or smallholdings (under 4 fiscal modules).

In turn, financing granted with resources from the new Climate Fund will have reduced interest rates and will be earmarked for restoring forests in private areas.

EExports of non-timber forest products — Non-timber forest extraction refers to products that come from the forest other than timber, such as leaves, fruits, flowers, seeds, nuts, palm hearts, roots, bark, fibers, essential oils, fixed oils, latex, resins, gums, herbs, bamboos, ornamental plants, fungi and animal products. These products offer an important alternative for reconciling economic development in forest regions with environmental conservation.

In addition to non-timber forest extraction, agroforestry systems, tropical fishing and fish farming activities, and tropical horticulture and fruit production are also possibilities for keeping the expansion of economic activity compatible with the forest and its inhabitants.

Although Brazil has the second largest forest area in the world (IBAMA, 2022), it still has a very limited share of the world market for these products.

A study by the Amazônia 2030 project shows that 'the global market for the 64 forest-compatible products on the Amazon's export agenda in the three-year period 2017-2019 averaged $176.6 billion per year' (Amazônia 2030, 2021). On average

over this period, however, exports from producers based in the Amazon amounted to $298 million per year, equivalent to just 0.17% of the global market.

Among the products classified as forest compatible with the largest share of the global market are 'other palm oil, whether or not refined' ($23 billion), 'green coffee beans' ($19 billion), 'other frozen [tropical] shrimp' ($18 billion) and 'other chocolates and foods containing cocoa' ($14 billion), with a combined turnover of $74 billion per year between 2017 and 2019 (Amazônia 2030, 2021).

There is, therefore, significant potential for growth in exports of non-timber forest products, expanding alternative sources of income for the populations of these regions.

In this sense, it is necessary to promote policies to support the sector within the framework of New Brazil, through expanded credit lines, strengthened programs to improve and disseminate existing technical capabilities, logistical support with the expansion of points to store and distribute products, mapping of new markets and technical support for exports.

National Bio-Based Inputs Program – Established by Executive Order no. 10375, dated 26 May 2020, the program aims to expand and strengthen the use of bio-based inputs through investments in science, technology and innovation, credit granting, capacity building, implementation of bio-based factories and incentives for the development of state bio-based input programs (Brazil, 2020a).

Coordinated by MAPA and with actions carried out by ministries MDA, MMA, MDIC and MCTI, the program is managed by a strategic council, which also includes representatives from the public and private sectors.

As home to the greatest biodiversity on the planet, Brazil is well positioned to become the world's leading player in the field of bio-based input research and technological innovation. The focus of the program is to take advantage of this potential to reduce the dependence of Brazilian agriculture on imported inputs, bring more quality and reliability to the products, thus benefiting both the producer and the consumer.

National Program for the Conversion of Degraded Pastures into Sustainable Agricultural and Forestry Production Systems – The program aims to promote and coordinate public policies aimed at recovering and converting up to 40 million degraded pastures into sustainable systems in 10 years, with a view to promoting best agricultural practices that lead to carbon capture.

With the advance of agricultural and environmental scientific and technological knowledge, with the decisive contribution of Embrapa, INPE and IBAMA, it was possible to identify and qualify the lands in the national territory occupied by degraded pastures. Of the 160 million hectares of degraded pastures in Brazil, around 40 million hectares are highly suitable for conversion into agricultural areas and intensive livestock farming, adopting models in line with sustainable production.

Recovering a potential area of 40 million hectares of pastures could meet animal protein demands and boost grain and other food production in Brazil over the next

10 years, without the need to open up new areas that are currently conserved with forests and other forms of native vegetation.

Of the 40 million hectares covered by the Program, 12 million hectares are expected to be restored to native vegetation, resulting in the recovery of water production and biodiversity, and in the mitigation of greenhouse gas emissions.

National Policy for the Conservation and Sustainable Use of Genetic Resources for Food, Agriculture and Livestock (PNRGAA) – Established by Executive Order no. 12097, dated 3 July 2024, the initiative is an important instrument in the discussion on Bioeconomy and its main purpose is to establish a medium- and long-term strategy to promote conservation, valorization and sustainable use of agricultural biodiversity in Brazil (Brazil, 2024h).

PNRGAA will be implemented in cooperation with states, the Federal District, municipalities, civil society organizations and private entities, to guarantee food sovereignty and security, promote adequate and healthy food for the population, increase knowledge about genetic resources for food and agriculture, and strengthen national breeding programs.

Pillar 4 – Energy Transition

The Energy Transition pillar comprises a set of measures to promote energy security, at a competitive cost, keeping the greenhouse gas emissions low. Energy Transition contributes to the development of production and technological value chains in the country.

The initiatives in this pillar are in line with the National Energy Transition Policy guidelines, launched by the National Energy Policy Council in August 2024.

Brazil already has one of the cleanest electric mixes in the world and has favorable natural conditions to further expand the generation of renewable energy from solar and wind sources. The country is also emerging as a leading producer of biofuels, an important alternative for decarbonization in the transportation sector.

At the 28th United Nations Conference on Climate Change (COP-28), where Brazil played a prominent role, the United Nations adopted an agreement for the first time in history in which its members agreed to phase down fossil fuels. To avoid the most serious consequences of climate change, almost 200 countries present at COP-28 agreed to make a transition away from fossil fuels.

New technologies such as Sustainable Aviation Fuel (SAF), marine transportation fuel (biobunker), biomethane and low-carbon hydrogen present opportunities for the country to export its clean energy surplus, develop the associated local production chains and attract new energy-intensive industries.

It should be stressed that, until the complete phase-out of fossil fuels and the completion of the transition process to the use of clean energy sources, as approved by COP-28, fossil fuels will still play a relevant role in guaranteeing the energy security necessary for economic and social development.

In this transition process, in addition to emerging as a central player in the development of new clean technologies, Brazil also stands out for its ability to extract, process and refine oil at a low cost and with emissions below the world average (IEA, 2023d).

Petrobras, a Brazilian world-leading company in deepwater drilling, reduced the intensity of GHG emissions in exploration and production activities by 54% between 2009 and 2023, reaching 14.2 kg of CO2 equivalent per barrel (Petrobras, 2024), while the world average is approximately 18 kg of CO2 per barrel. It should be highlighted that in the Tupi and Búzios fields, where the main pre-salt oil streams are located, carbon intensities are even lower, with GHG emissions of 9.9 kgCO2e/boe and 10.2 kgCO2e/boe (Petrobras, 2024).

In addition to reducing its emissions in the oil and gas production process, Petrobras has sought to expand its investments in new energies, such as offshore wind power, low-carbon hydrogen, new biorefining technologies, among others.

In addition to developing initiatives that strengthen Brazil's position in the development of new clean energy technologies, policies for the sector must take into account the country's relevance to energy security until fossil fuels are phased out, due to the low cost of production and low emissions in the oil extraction and processing in our territory.

Renewable fuels — Brazil already has advanced technological capacity in the production of biofuels, such as ethanol and biodiesel, a sustainable alternative to fossil fuels. Biofuels have significant potential for a growing demand due to the emission reduction goals set by other countries, opening the market for Brazilian products.

In addition to their use in the automotive sector, biofuels are a low-emission alternative in the aviation (SAF) and marine transportation (biobunker) sectors. A great potential for growth lies within the development of second-generation biofuels, which have a lower environmental impact and do not harm food production.

The Fuel of the Future Program, proposed by the National Energy Policy Council (CNPE, 2021), aims to reduce the average carbon intensity of the fuel mix, reduce emissions in all modes of transportation, and increase national energy efficiency. The program also seeks to assess energy and environmental efficiency through a complete full life cycle analysis of the various modes of transportation, as well as to stimulate technological development and innovation in the sector.

Based on the guidelines of the Fuel of the Future Program, the federal government has been working with the National Congress to approve measures that promote sustainable low-carbon mobility through the establishment of the National Sustainable Aviation Fuel Program, the National Green Diesel Program, and the legal framework for Carbon Capture and Storage.

Measures shall encourage the production of biomethane, a renewable gas produced from organic waste, with a gradual system of mandatory blend in natural gas.

Additionally, in December 2023, CNPE approved bringing forward the increase in the mandatory biodiesel blend in automotive diesel to 14% in 2024 and 15% in 2025, thus avoiding the emission of 5 million tons of carbon dioxide and reducing fossil diesel imports by around R$7.2 billion (CNPE, 2023). Studies are also being carried out on the technical feasibility of increasing the percentage of ethanol in gasoline from 27.5% to 30% (E30).

National Hydrogen Program — Hydrogen produced from renewable energy sources also presents an important alternative for replacing fossil fuels, especially in sectors where it is difficult to reduce CO2 emissions, such as industry and transportation.

The use of hydrogen as an energy storage technology broadens the scope of possible strategies for diversifying renewable sources, allowing for a more efficient integration of energy produced from solar and wind sources into the Brazilian energy mix.

The country's leading role in the energy transition through low-carbon hydrogen is not, however, restricted to the national scene. In fact, the expansion of the global hydrogen market, due to its potential use in meeting climate goals, opens up an opportunity for Brazil to develop locally important stages in the production and use of hydrogen.

The hydrogen value chain involves the need for investment in storage and transportation infrastructure, and the structuring of hydrogen production hubs is a trend in the sector. Several Brazilian ports have mobilized new investments in hydrogen production plants, such as the Port of Pecém (Ceará), the Port of Suape (Pernambuco), the Port of Açu (Rio de Janeiro) and the Port of Rio Grande (Rio Grande do Sul) (MME, 2023a).

Low-carbon hydrogen can be used in the production of new fuels and/or compounds that carry the molecule, including ammonia, methanol and synthetic liquid hydrocarbons. Likewise, it can be used when producing low carbon fertilizers, which today rely heavily on fossil fuels.

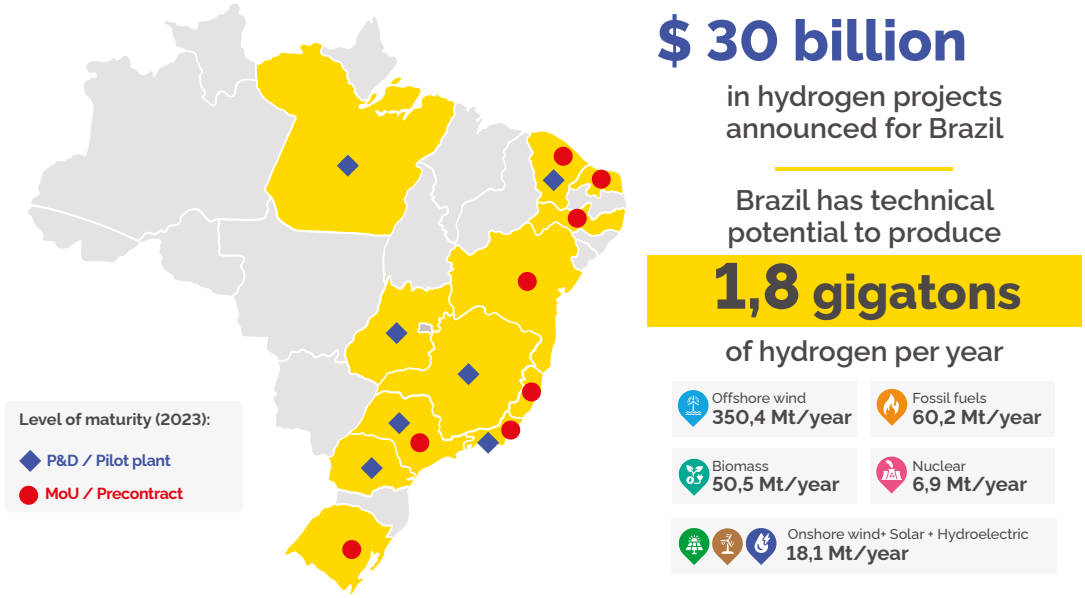


Figure 10. Technical potential for hydrogen production in Brazil and Brazilian states with announced low-carbon hydrogen projects (MME/EPE, 2022; EPE, 2023b).

In August 2023, the Steering Committee of the National Hydrogen Program launched the 2023-2025 Three-Year Work Plan (MME, 2023a), with a broad set of initiatives: **(1)** Strengthening Technological Bases; **(2)** Capacity Building for Human Resources; **(3)** Energy Planning; **(4)** Legal and Regulatory Framework; **(5)** New industrialization, Market and Competitiveness; and **(6)** International Cooperation.

The federal government, in conjunction with the National Congress, has also contributed to the formulation of the new legal framework for low-carbon hydrogen, with the provision of mechanisms to support the consolidation and strengthening of this sector in the country.

Electrification of Public Transportation— Electromobility is an important low-carbon energy solution, and it is essential to set up initiatives to support the electrification of urban bus fleets for public transportation.

The Urban Mobility pillar of New PAC Selections provides for the purchase of electric buses, with local content rules. Specific credit lines for the electrification of bus fleets are also included, using resources from the Climate Fund and the FGTS (Employee Severance Fund).

In May 2024, the results of New PAC Selections were released, with 98 Brazilian municipalities receiving investments of R$10.6 billion for the purchase of 2,296 electric buses, 3,015 Euro 6 standard buses and 39 rail vehicles (Office of the Chief of Staff, 2024).

The vehicles will be financed by BNDES, with funds from the Climate Fund (R$4.5 billion), and by the federal bank Caixa Econômica Federal, with funds from the FGTS (R$6 billion).

Expansion of wind and solar energy generation with local content components— Brazil has a significant potential for expanding energy production from solar and wind sources, especially with the possibility of developing low-carbon hydrogen on a commercial scale in the country.

In order to make better use of the potential for wind and solar generation, it is necessary to overcome the obstacles to their exploration, especially in the Northeast region, which has the greatest availability of these energy sources.

The legal regulation of offshore wind energy exploration provides greater legal certainty for new investments in this segment.

Offshore wind energy production stands out for having a generation capacity well in excess of the onshore wind potential. On the high seas, the intensity and constancy of the winds are more favorable, since there are no barriers to their action, and larger and more powerful turbines can be used.

According to a study released by Empresa de Pesquisa Energética – EPE (Energy Research Company) in 2020, Brazil has the technical potential to generate up to 700 GW of energy through wind turbines installed at sea, in areas up to 50 meters deep (EPE, 2020). This generation potential triplicates the current installed capacity in the country.

However, the country needs to coordinate the growing demand for wind and solar energy sources with the expansion and strengthening of production chains in these segments.

In January 2024, the Executive Committee of the Chamber of Foreign Trade, linked to the Ministry of Development, Industry, Trade and Services (MDIC), imposed an import tariff of 10.8% on assembled photovoltaic modules and wind turbines of up to 7.5 MW, since there is already a similar production of this equipment in Brazil (MDIC, 2023).

It is worth mentioning the intermittency of electricity generation from solar and wind sources, which must also be addressed with low-carbon solutions. This creates new opportunities in the energy storage sector, with the potential to connect with the verticalization of the strategic mineral exploration value chain.

Additional initiatives to support the sector could be introduced, such as credit lines for local production from the Climate Fund and for research and development (R&D) projects with resources from the National Fund for Scientific and Technological Development (FNDCT).

Decarbonization of Isolated Systems — Isolated systems are public electricity distribution service systems that are not connected to the National Interconnected System (SIN) for technical or economic reasons.

In general, the lack of economies of scale, low population density and geographical distance make it economically unfeasible to connect these systems to the SIN via transmission lines.

To ensure the supply of electricity, each isolated system has its own generation plant, predominantly using diesel oil, with estimated annual emissions of 2.3 million tons of CO2. Currently, there are around 211 locations in the country served by Isolated Systems, most of which are located in the North region, totaling almost 3 million inhabitants (MME, 2023b).

In August 2023, the Amazon Energies Program was launched with the aim of reducing the use of diesel oil in energy production in the Legal Amazon region and, consequently, reducing greenhouse gas emissions by replacing the energy generation process with renewable sources or by interconnecting it to the SIN through electricity transmission or distribution networks (Brazil, 2023b).

To enable the energy transition and decarbonization of the region's Isolated Systems, around R$5 billion in investments are planned (MME, 2023b).

Eixo 5 – Circular Economy

The Circular Economy pillar comprises a set of initiatives to promote the reduction of waste, reuse of finite natural resources and restoration of ecosystems through incentives for the redesign and reuse of products, recycling of materials, energy recovery and restoration of ecosystems.

The currently predominant linear model of production is characterized by the stages of extraction, processing and disposal of materials, with intensive demand for new natural resources, continuous extraction of raw materials for production and excessive generation of waste.

As a result, there has been an increase in the emission of greenhouse gases and solid waste, leading to intense air, water and soil pollution, the depletion of non-renewable natural resources, as well as the occurrence of climate change-related problems and the loss of biodiversity and ecosystem services.

The circular economy is an alternative to the current linear model and aims to reduce waste and maximize the efficient use of resources through the reuse, recycling and regeneration of materials and products. The aim is to continuously reuse materials in a closed loop to minimize the need to extract new resources.

The New Brazil – Ecological Transformation Plan aims to promote the circularity of the production structure through regulatory measures and the granting of incentives that promote the reuse, remanufacturing, recycling and recovery of waste, as well as the less intensive use of resources.

These objectives are consolidated in the National Circular Economy Strategy (ENEC), which creates a regulatory and institutional environment favorable to the circular economy and to the development of markets for reusable, upcycled, and recycled products.

ENEC provides for the promotion of innovation, culture, education and the development of skills to reduce, reuse and promote the circular redesign of production. The strategy encourages the reduction of resource use and waste generation, preserving the value

of materials, and proposes financial instruments and financing for the circular economy. It also promotes coordination among all federal entities and the involvement of workers in the circular economy.

Encouraging the Circular Economy – Reverse logistics is a core circular economy instrument streamlining waste collection and reuse by businesses.

Reverse logistics is closely related to recycling initiatives, as it facilitates the reuse of collected materials and allows them to be returned to different production centers in the form of raw materials.

However, the recycling sector is very vulnerable to the price of virgin raw materials. In fact, the reduction in the price of inputs such as paper and oil by-products used to make plastic has a direct impact on the competitiveness of recyclable materials.

In this sense, it is essential to implement initiatives aimed at promoting reverse logistics and making the recycling sector viable, especially by granting incentives, financing on easy terms, supporting the work of waste pickers and collectors of reusable and recyclable materials, and making it compulsory for sectors with the greatest impact on waste production to incorporate reverse logistics mechanisms, setting minimum recycling percentages in relation to the quantities of material brought into the domestic market.

As for incentives, Law no. 14260/2021 provides for income tax deductions for companies and individuals carrying out recycling projects (Brazil, 2021b). The regulations for the initiative are currently being drafted by the federal government.

In turn, as highlighted in Pillar 1, the proposal to regulate the Tax Reform provides for the granting of presumptive credits of the Tax on Goods and Services (IBS) and the Contribution on Goods and Services (CBS) to purchasers of waste and other materials directed to recycling, reuse or reverse logistics sold by incentivized collectors, their cooperatives and associations.

The Climate Fund has special credit lines, operated by the National Bank for Economic and Social Development (BNDES), for projects aimed at resilient and sustainable urban development, including waste treatment systems and reverse logistics.

The actions to support the work of waste pickers and collectors of reusable and recyclable materials are detailed in the next topic about the Diogo de Sant´Ana Waste Pickers Program for Popular Recycling.

The National Solid Waste Policy (PNRS), launched by Law no. 12305/2010 and currently regulated by Executive Order no. 10936/2022, establishes, among other measures, that reverse logistics systems shall be implemented and made operational by means of regulations issued by the government, sectoral agreements and agreed-upon terms of commitment within the scope of the segments responsible for the greatest production of non-organic urban solid waste, such as plastic, glass, steel, aluminum and paper (Brazil, 2022a).

There are currently thirteen reverse logistics systems in operation in the country, regulated by Executive Orders, CONAMA rules, sectoral agreements and terms of commitment. The objective is to transform the sectoral agreements and terms of commitment into executive orders to give them greater normative force. Proposals for executive orders to replace the agreements and terms of commitment relating to the plastic packaging, metals, paper and cardboard sectors are being evaluated.

Regulations already cover the implementation of a reverse logistics system for household electrical and electronic products and their components (Brazil, 2020b), the reverse logistics system for household medicines and their packaging (Brazil, 2020c) and the reverse logistics system for glass packaging (Brazil, 2022b).

The aforementioned regulations set targets with recycling percentages, staggered over time, ensuring minimum demand for companies, individuals and cooperatives responsible for collecting and recycling their respective materials.

These regulatory measures have promoted the emergence, consolidation and expansion of startups and innovative companies. These companies are responsible for connecting, on the one hand, the companies responsible for carrying out the reverse logistics of their produced materials and, on the other, the individuals and entities responsible for collecting and recycling these materials. This connection takes place through recycling credit certificates, which are negotiable securities derived from the registration of invoices issued by landfills, private collection operators, and waste picker cooperatives.

This allows companies to meet their reverse logistics targets by purchasing recycling credit certificates, in a business model like that of carbon credits purchased to offset GHG emissions.

In order to provide legal certainty for these activities, the Executive Order no. 11413/2023 regulates the Reverse Logistics Recycling Credit Certificate, the General Packaging Structuring and Recycling Certificate, and the Future Mass Credit Certificate (Brazil, 2023c). This is a fundamental measure to provide economies of scale in waste recycling, connecting the different players involved in this production chain.

Diogo de Sant'Ana Waste Pickers Program for Popular Recycling – Established by Executive Order no. 11414/2023, the Program aims to integrate and coordinate actions, projects and programs of the federal, state, district and local public administration, promoting and upholding the human rights of waste pickers and collectors of reusable and recyclable materials (Brazil, 2023d).

The Program acknowledges the central role played by waste pickers and collectors of reusable and recyclable materials in the implementation of the National Solid Waste Policy (PNRS), with special emphasis on the activities of selective collection, separation, sorting, classification, processing, recovery, recycling and sale of solid waste (Brazil, 2023d).

Collectors of reusable and recyclable materials contribute decisively to the recycling value chain in Brazil, increasing the lifetime of landfills and reducing the demand for natural resources, since they provide recycling entities with waste to be

used in their production activities, thus replacing the use of new natural resources extracted from the environment.

The Diogo de Sant'Ana Waste Pickers Program for Popular Recycling provides for actions to strengthen associations, cooperatives and other forms of grassroots organization, improve working conditions, promote public financing, socioeconomic inclusion and the expansion of selective solid waste collection, solidarity selective collection, as well as the expansion of reuse, recycling, reverse logistics and environmental education actions.

Closure of Dumpsites — Dumpsites are characterized by the disorderly disposal of waste on the ground, without any control over the material deposited, planning or measures to protect the environment or public health. It is an environmentally unsuitable option for the final disposal of waste.

On the other hand, sanitary landfills are an environmentally suitable alternative for receiving, treating, and disposing of urban waste. They are built to prevent soil, water and air contamination by means of structures designed to capture, store and treat the leachate and biogas produced by the tailings, as well as upper and lower waterproofing systems, minimizing environmental impacts and preventing damage to public health.

The new legal framework for sanitation, established by Law no. 14026/2020, set August 2024 as the deadline for the closure of dumpsites in municipalities with a population of less than 50,000 inhabitants according to the 2010 Census, the last stage planned for the elimination of dumpsites in the country (Brazil, 2020d).

However, according to data from the National Sanitation Information System – Solid Waste Module – reference year 2022 (SNIS-RS 2022), there were still 1,572 dumpsites and 598 controlled landfills in the 5,060 municipalities participating in SNIS-RS 2022, against 626 sanitary landfills.

Also according to the aforementioned survey, in 2022, 70.1 million tons of urban waste were directed to land disposal units (final disposal sites for solid waste classified as tailings, with no possibility and/or viability of use), of which 49.2 million tons were directed to sanitary landfills (70.2% of the total), 10.4 million tons to dumpsites (14.8%) and 10.5 million tons to controlled landfills (15%).

Almost 30% of urban waste is still disposed of in environmentally unsuitable facilities. Controlled landfills, despite taking certain precautions, especially regarding worker safety and the flow of people, are still considered to be an inadequate way of disposing of urban waste. They are an intermediate stage between the dumpsite and the sanitary landfill.

Most dumpsites are in the Northeast region, with 883 sites, followed by the North and Midwest, with 299 and 231 sites, respectively. The Southeast region comes next, with 134 units, and the South region last, with 25 (SNIS-RS 2022).

Aiming to contribute to the elimination of dumpsites and to support states and municipalities, especially smaller ones, so that they can carry out environmentally appropriate disposal of their waste, New PAC carried out in 2023 a selection of

projects for new solid waste management works and actions, totaling – at this stage – investments of R$940 million. For the period 2023-2026, total investments of R$1.7 billion are expected (Office of the Chief of Staff, 2023a).

The Office of the Chief of Staff to the President, the bank Caixa Econômica Federal and the National Bank for Economic and Social Development (BNDES) selected nine inter-municipal consortia, with a total of 109 municipalities located in the states of Bahia, Minas Gerais, Pernambuco, Paraná and Rio Grande do Norte, to structure projects aimed at the concession of dumpsites, turning them into sanitary landfills (BNDES, 2023).

Financial institutions shall take between 12 and 24 months to define viable models, prepare public tenders and hold the auctions, with estimates of R$5.6 billion in private investment in the new sanitary landfills.

Biorefineries and biodigesters — Biorefineries are industrial complexes with highly integrated processes and equipment that transform biomass into a variety of products with high value added, such as biofuels, chemical inputs, materials, energy, food and feed.

Like oil refineries, biorefineries seek to optimize the use of inputs and reduce the amount of waste produced, making better use of biomass and its energy. For this purpose, different conversion routes are used, such as biochemical, microbial, chemical, and thermochemical technologies.

Examples of biorefineries already in operation include those producing sugar, ethanol and bioelectricity from sugar cane, and oil, feed and biodiesel from soybeans.

In addition to sugar cane, soybeans, corn and other cereals, waste produced by the food industry, such as flour, pasta and sugars unfit for consumption, can be used as biorefinery inputs. Biorefineries can also reuse cooking oil to produce biofuels, especially Sustainable Aviation Fuel (SAF).

Biodigesters, on the other hand, are equipment used to produce biogas and biofertilizers from the decomposition of organic matter, such as waste from plants (leaves, straw, crop residues), livestock (manure), human activities (human waste and domestic waste), as well as industrial waste.

Both biorefineries and biodigesters play a fundamental role in the development of the Circular Economy, as they enable the reuse and economic destination of organic waste.

To boost these activities, New Brazil proposes increasing financial support from public development agencies for research and development (R&D) activities and using the government's purchasing power through technological orders aimed at treating organic waste, identifying new materials to be used as inputs, developing new by-products, as well as increasing efficiency and improving the energy use of biorefineries and biodigesters.

The financing of projects to set up new biorefineries and biodigesters can count on public funding under favorable conditions through the Climate Fund. Petrobras has started to include new projects for renewable fuel biorefining and co-processing in its investments, boosting the mobilization of investments in the sector and the development of new supply chains.

Legislation dealing with the so-called 'fuels of the future' also establishes a set of incentives and regulatory measures that increase the demand and encourage the production of biogas, biofuels and Sustainable Aviation Fuel (SAF), stimulating the installation of new biorefineries and biodigesters in the country.

Expansion of water and sewage networks — The Ecological Transformation Plan includes initiatives aimed at expanding water supply coverage and access to the sewage network.

According to the National Sanitation Information System – Water and Sewerage Module – reference year 2022 (SNIS-AE 2022), the public water supply networks cover 84.9% of the population, serving 171 million inhabitants.

Through the Water for All pillar, New PAC carried out two selection processes for states and municipalities to submit proposals aimed at expanding access to and improving the quality of supply services in urban and rural areas, with total investments estimated at R$4.8 billion. For the period 2023-2026, investments totaling R$25.4 billion are expected (Office of the Chief of Staff, 2023b).

With regard to sewage, according to the SNIS-AE 2022, the public sewage networks cover 56% of the population, serving 112.8 million inhabitants.

SNIS-AE also monitors two indices related to sewage treatment. The first index corresponds to the volume of sewage treated in relation to the total generated, in an attempt to assess the coverage of infrastructures for collection of water that becomes sewage after domestic use. According to SNIS-AE 2022, only 52.2% of the total sewage generated is treated. The second index seeks to measure the proportion of treatment in relation to the volume collected, reflecting treatment capacity. SNIS-AE 2022 shows that 81.6% of the sewage collected is treated. It can, therefore, be seen that the country still has a long way to go in terms of both sewage network coverage and treatment capacity.

In 2023, New PAC prioritized the resumption and completion of 234 projects that had not been started, were at a standstill or were at a slow pace by the end of 2022, with a total expected investment of R$7.8 billion (Office of the Chief of Staff, 2023c).

At the end of 2023, New PAC also carried out a selection process for states and municipalities to submit projects for new works to expand sanitary sewage collection and treatment services, with total investments of R$9.7 billion, R$2 billion of which would come from the Federal Budget and R$7 billion from FGTS financing (Office of the Chief of Staff, 2023c).

The Ministry for the Cities updated the rules of the Sanitation for All Program and included the possibility of using the program's resources to have Basic Sanitation Plans prepared by other federative units (MCID, 2023). It is a central instrument for

planning, implementing and monitoring sanitation policies, and is mandatory for contracting and concession of these services.

Pillar 6 – New Green Infrastructure and Adaptation

Pillar 6 includes a set of measures that promote the resilience of the economy and communities in the face of climate change, and the expansion of low-carbon infrastructure.

According to recent assessments by IPCC, even if the climate goals are achieved and the concentration of GHG in the atmosphere stabilizes, several extreme weather events are already inevitable. They have caused loss of human life and irreversible damage to economic and social infrastructures, such as the recent devastating floods in the State of Rio Grande do Sul and the droughts in the Amazon and Pantanal.

In this context, it is essential to promote resilient infrastructures to adapt to the impacts of climate change, especially regarding the most vulnerable communities and regions. Comprehensive risk prevention and reduction strategies are needed through preparedness, early warning systems and response measures to address disasters and extreme weather events. Brazil cannot limit itself to just responding to disasters, but must act preventively to mitigate and avoid them and have structured action plans for such extreme weather events.

Among the drivers of development and ecological transformation is the need to leverage public and private investments in low-carbon and resilient infrastructures. Constitutional amendments have ensured an increase in public investments, such as the New Fiscal Framework. The economic measures that make up the New Brazil, such as the expansion of the Climate Fund, Eco Invest Brazil and infrastructure debentures, are also key to making the required investments viable.

Public works program to reduce the risk of natural disasters — In view of the increasingly frequent occurrence of extreme weather events in Brazil, it is necessary to increase public investment in new initiatives aimed at preventing natural disasters.

In 2023 New PAC prioritized the resumption and completion of 86 retaining walls and urban drainage works that were at a standstill, with total investments for these works of R$3.3 billion (Office of the Chief of Staff, 2023d).

New PAC also received new proposals related to retaining walls in around 350 municipalities and urban drainage in more than 400 municipalities, covering all regions of the country. The initiatives selected in this initial stage will receive investments estimated at R$6.4 billion (Office of the Chief of Staff, 2023d).

Actions comprising the disaster prevention pillar will receive total investments of R$15.3 billion, of which R$10.9 billion in the period 2023-2026, covering studies, monitoring, mapping, projects and works for retaining walls and sustainable urban drainage (Office of the Chief of Staff, 2023d).

Slum upgrading will contribute to disaster prevention, as these areas are more vulnerable to the adverse effects of climate change.

A total of 85 projects that had not started, were at a standstill or at a slow pace were resumed in 2023, amounting to R$1.4 billion in new investments. 150 municipalities sent proposals for new slum upgrading projects, with investments of R$5.2 billion (Office of the Chief of Staff, 2023e).

The Living Periphery – Slum Upgrading pillar aims to provide peripheral areas with basic sanitation, drainage to reduce the risk of natural disasters, a road system, electricity distribution networks and public lighting, as well as housing improvements and land tenure regularization. Total investments of R$11.7 billion are expected for this pillar, of which R$8 billion in the period 2023-2026 (Office of the Chief of Staff, 2023e).

The disaster prevention and slum upgrading pillars include a significant set of social infrastructure measures to improve the quality of life of the most vulnerable population, especially those people who live in precarious housing and occupy territories that are more prone to extreme events, contributing to the resilience of communities to climate change.

Resilience and impact reduction in the country's major infrastructure projects — The construction of major infrastructure projects often causes significant environmental impacts, such as the suppression of vegetation, biodiversity loss, soil erosion, air and water pollution, as well as the intensive consumption of natural resources, water and energy.

The Ecological Transformation Plan proposes the incorporation of sustainability instruments into these projects, with a reduction in the damage caused to the environment, protection of the ecosystems present at the construction sites, efficiency in the use of water, energy, materials and other natural resources.

To this end, it is essential to plan the work in a sustainable way, carefully selecting the best location and evaluating possible alternatives, such as using existing structures. It is also important to adopt new technologies with a lower environmental impact and more resistant, durable, and sustainable construction materials.

Also noteworthy is the incorporation of practices that reduce energy consumption, including the use of renewable sources and more efficient lighting projects, as well as the intelligent use of water, with the use of reclaimed water and rainwater. It is also necessary to promote recycling and the environmentally appropriate disposal of construction and demolition waste.

Infrastructure works must also ensure resilience to climate change, making constructions capable of withstanding, absorbing, accommodating and recovering from natural disasters quickly and efficiently, preserving and restoring their essential structures and functions, and ensuring the protection of the local community.

In addition to actions aimed specifically at climate adaptation and resilience, it is also necessary to expand low-carbon infrastructure to reduce greenhouse gas emissions. Construction and financing plans for urban mobility infrastructure (subways, LRTs,

BRTs, etc.) and new modes of interstate transportation (including railroads, waterways and ports) will serve this purpose.

New PAC includes investment in modes of transportation that reduce CO2 emissions. Other infrastructure projects are already being planned with elements of climate resilience and environmental sustainability in mind.

Climate emergency and civil defense plans in the most vulnerable municipalities — Currently, the National Center for Natural Disaster Monitoring and Alerts (CEMADEN) is permanently monitoring 1,133 municipalities that are particularly affected by climate change (MCTI/CEMADEN, 2024).

These are places that have historically suffered large-scale natural disasters, such as landslides, rockslides, erosive processes, as well as more severe hydrological processes, such as prolonged droughts, floods, flash floods, and major flooding.

Analysis of data generated by CEMADEN can already predict the occurrence of extreme events. Based on the historical basis, it is possible to recognize a permanent state of climate emergency in the most vulnerable municipalities. Continuous preventive actions must be taken.

In fact, declaring a climate emergency would enable faster and easier access to resources and early infrastructure works, such as retaining walls and drainage, restoration of riparian forests, development of civil defense plans, guidance on climate risks, resettlement of people living in vulnerable areas and social work actions.

The federal government is currently working on the National Civil Protection and Defense Plan (PNPDC), which aims to improve the governance of civil defense institutions, with federal integration to better serve communities living in risk areas or subject to natural disasters. PNPDC establishes a set of guidelines and directives to strengthen disaster response, recovery actions, and the programs and strategies aimed at prevention, mitigation, and preparedness.

The federal government has also sought to support sub-national entities in drawing up their respective Civil Protection and Defense Plans, defining warning and monitoring systems; organizing drills and simulated training with the participation of the population; defining an emergency care system and shelter points after disasters occur; planning medical, hospital and psychological care for victims; locating reception centers and organizing a strategy for distributing donations and supplies.

Strategy for agricultural, energy and health security and resilience — In addition to infrastructure resilience, climate change requires the adoption of adaptation measures in important areas such as the agricultural, energy and health sectors.

Indeed, the agricultural sector will need to adjust to the increased variability in productivity resulting from changes in temperature and rainfall deriving from global warming. There are also growing risks of new pests and diseases with the potential to affect crops and livestock, as well as native fauna and flora.

Resilience in the energy sector, meanwhile, will need to adapt to changes in rainfall patterns, which could affect hydroelectric generation, for example.

The health sector is also facing new challenges associated with climate change, such as increased air pollution, impacts on water quality and food production, as well as the development of epidemics and the spread of new disease vectors.

In order to tackle these challenges, working groups have been set up within the Interministerial Committee on Climate Change (CIM) to draw up action plans and specific adaptation strategies for each of these segments.

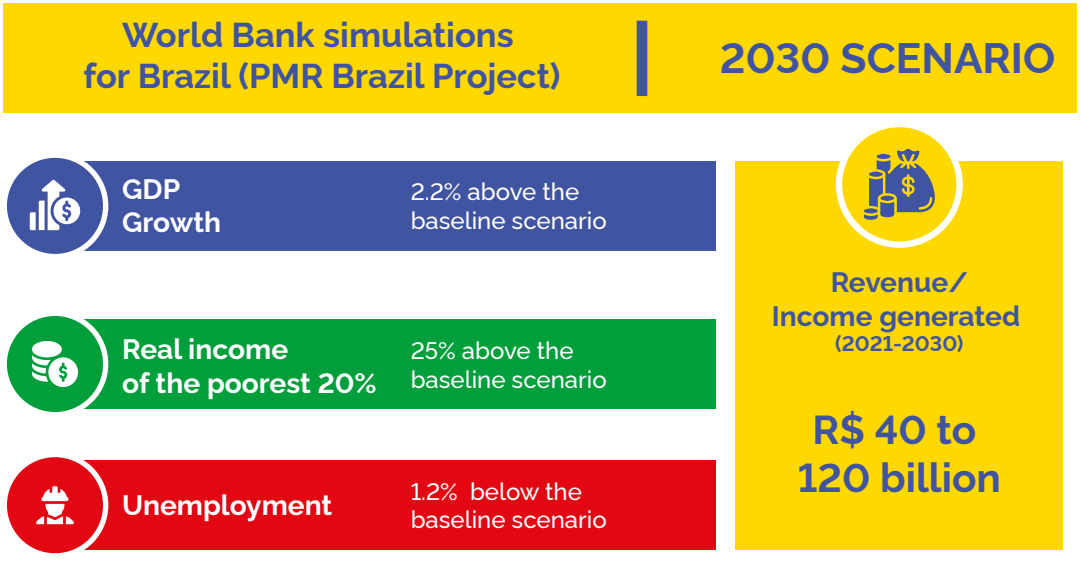
5

Potential Results of Ecological Transformation

Important studies on the potential impacts of initiatives related to ecological transformation suggest significant improvements in the economic and social indicators resulting from these actions, thus contributing to achieving the Sustainable Development Goals in their economic, social and environmental dimensions (General Secretariat of the Presidency of the Republic, NVR 2024).

The result of a partnership between the federal government and the World Bank, the Partnership for Market Readiness (PMR) Brazil Project developed a set of analyses on the convenience and opportunity of including GHG emissions pricing among the instruments of the National Policy on Climate Change (PNMC), assessing its potential impacts in the 2021-2030 period (MDIC, 2020).

The PMR Brazil Project's research points out that, in the aforementioned period, the creation and regulation of the domestic carbon market has the potential to promote a GDP growth of 2.25% and an increase in the real income of the poorest 20% of Brazilian society by up to 25% above the baseline scenario, in addition to an unemployment rate 1.2% lower than the baseline scenario (PMR Brazil Project, 2020).



Note: Figures show the difference between the scenario with the carbon market and the baseline scenario, without the system.

Figure 11. Results of the PMR Brazil Project

New studies carried out jointly by the Ministry of Finance's Secretariat of Economic Policy and the World Bank are broadening the scope of the analysis to also include the potential results of other measures that make up the Ecological Transformation Plan (MF/SPE, 2024).

In addition to regulating the carbon market, the measures being considered include impacts of public investments in key sectors for the energy and climate transition, risk mitigation policies for investments in renewable energy and biofuels, risk premium reduction for green sectors with the introduction of the Brazilian Sustainable Taxonomy and the Eco Invest Brazil Program, actions to reduce deforestation, and interest rate reductions for sustainable agricultural practices.

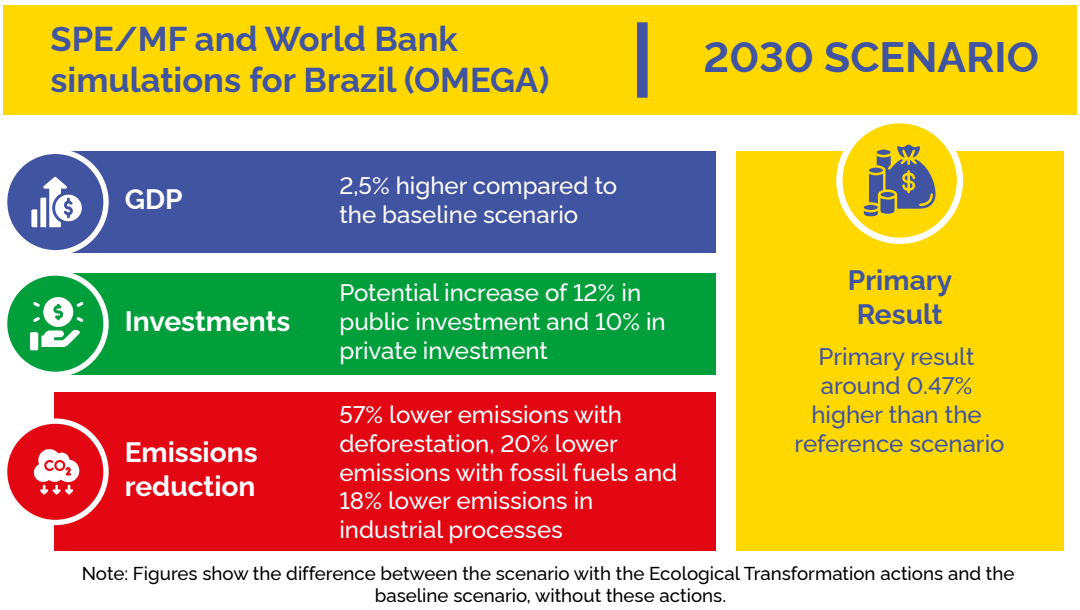
Preliminary results of these studies indicate an additional significant reduction in emissions, which will bring in 2030 57% less emissions from deforestation, 20% less from fossil fuel and 18% less from industrial processes when compared to the baseline scenario (without the adoption of ecological transformation measures).

Preliminary results of these studies project that the Ecological Transformation Plan will boost the GDP by around 3% in the first few years, and remain 2% higher than the baseline scenario until 2050. This GDP growth occurs above all in the first few years, because of the increase in investments associated with ecological transformation.

In fact, prospects show a potential increase of 12% in public investment and 10% in private investment, compared to the level of investment in the baseline scenario up to the year 2030.

Another positive consequence of the economic scenario promoted by the Ecological Transformation Plan is the improvement in the fiscal scenario, amongst others obtained by the revenues associated with the carbon market. This positive effect, according to the OMEGA model's projections, leads to a primary result around 0.47% higher than the baseline scenario.

The results presented by the OMEGA model show that the policies associated with the Ecological Transformation Plan are effective from a climate point of view, enabling substantial reductions in emissions, and confirm the central guideline of the Plan in the sense that, without giving up fiscal responsibility, the decarbonization agenda presents a significant economic development opportunity for Brazil.



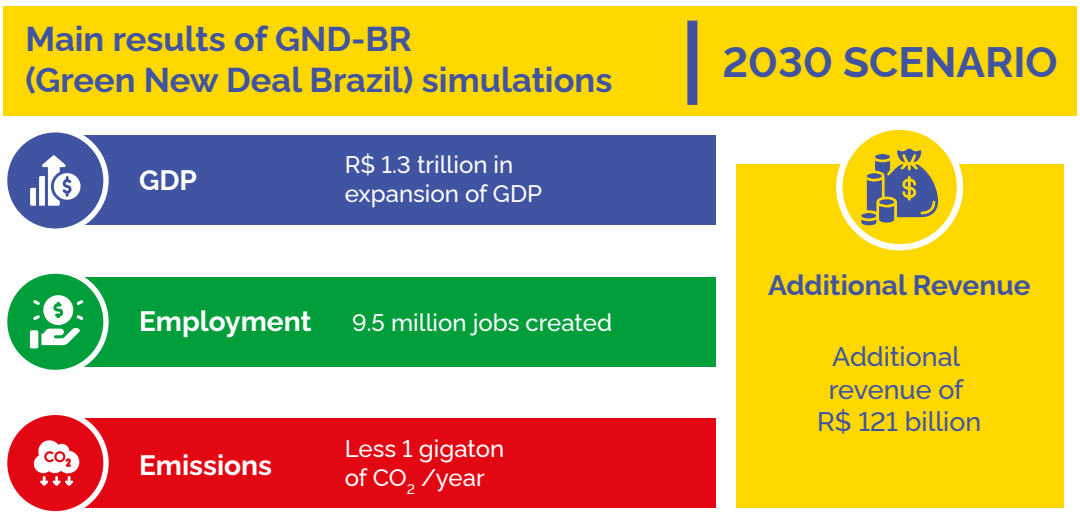
Note: Figures show the difference between the scenario with the Ecological Transformation actions and the baseline scenario, without these actions.

FigurE 12. OMEGA model results

The Brazilian Green New Deal proposes the adoption of a set of initiatives aimed at resuming economic growth with equal priority for the economic, social and environmental agendas (Green New Deal Brasil, 2020).

Consisting of five thematic pillars bringing together thirty actions to be implemented by 2030, the Green Deal seeks to promote integration among different agendas in order to generate growth in income and employment based on a set of investments in low-carbon economic sectors and activities, the construction of resilient infrastructure, the expansion of public services and environmental conservation (Alvarenga Jr. et al., 2022).

A study indicates that the adoption, by 2030, of actions related to those of the New Brazil - Ecological Transformation Plan would result in the expansion of GDP by up to R$ 1.3 trillion, with a reduction in the emission of 1 gigaton of CO2 per year, additional revenue of R$ 121 billion and the creation of 9.5 million new jobs (Alvarenga Jr. et al., 2022).



Note: Figures show the difference between the scenario with the suggested actions and the baseline scenario.

Figure 13. Results of the Brazilian Green New Deal

The IES-Brazil Project, coordinated by the Climate Center – Integrated Studies Center on Environment and Climate Change at COPPE/UFRJ, within the framework of the Brazilian Forum on Climate Change (FBMC), also regularly carries out scenario studies on Brazil's transition to a low-carbon economy.

The Climate Center's research finds that it is possible for Brazil to achieve the goal of net-zero emissions by 2050, while preserving economic and social progress, with an increase in GDP of more than 90% compared to 2020 and growth in the real income of the poorest 20% of the population of more than 130% compared to 2020.

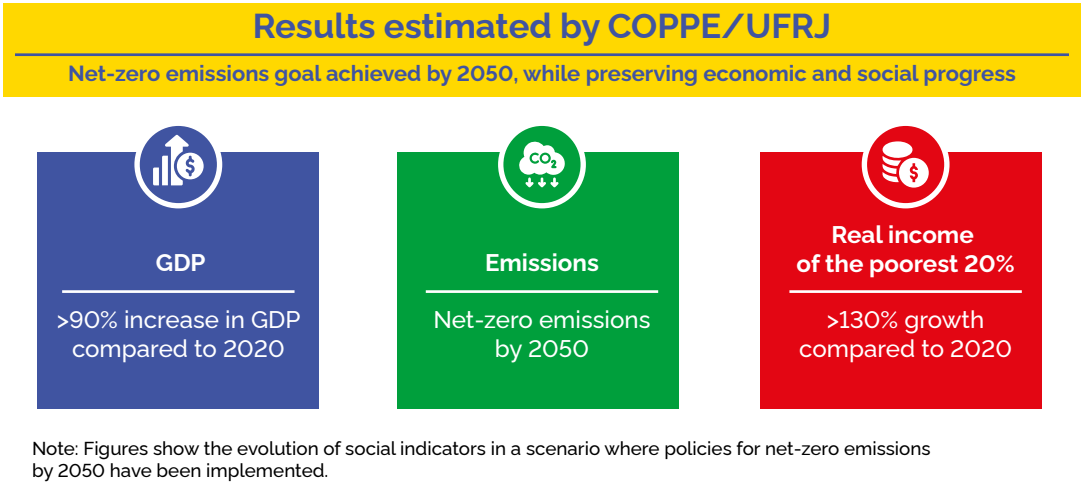


Figure 14. Results of Climate Center / COPPE-UFRJ studies

The report Caminhos para a Transformação Ecológica do Brasil (Pathways for Brazil's Ecological Transformation), prepared by Aya Institute and Systemiq (2023), shows that there is an opportunity to generate additional value added of between $230 and $430 billion to the country's GDP by 2030, and that the country's average GDP growth rate could double by 2030, reaching up to 5.5% per year:

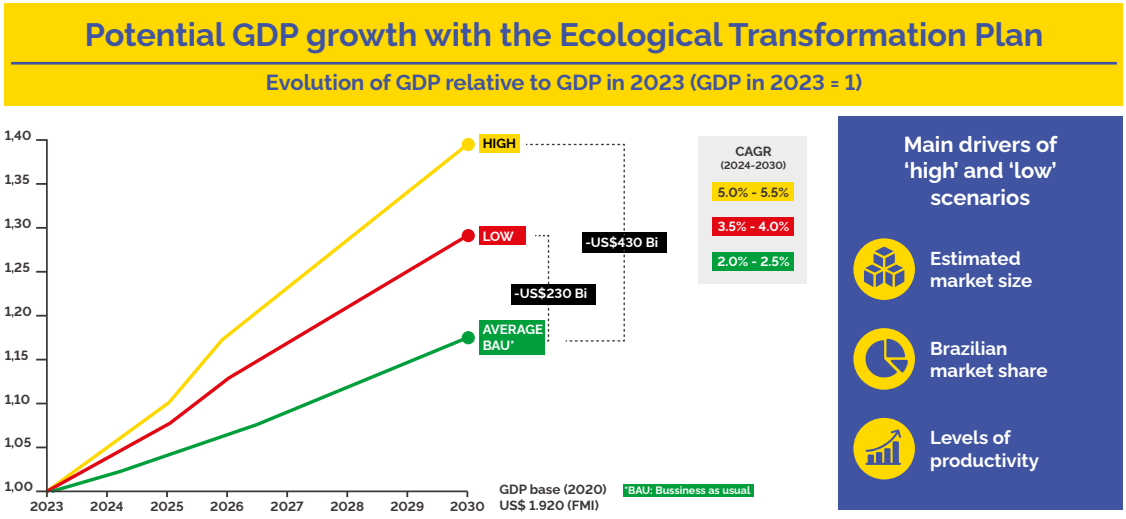


Figure 15. Potential GDP growth scenarios with the implementation of the Ecological Transformation Plan

The study also highlights, as a result of implementing actions equivalent to those set out in the New Brazil – Ecological Transformation Plan, the expectation of creating

between 7.5 and 10 million jobs by 2030.

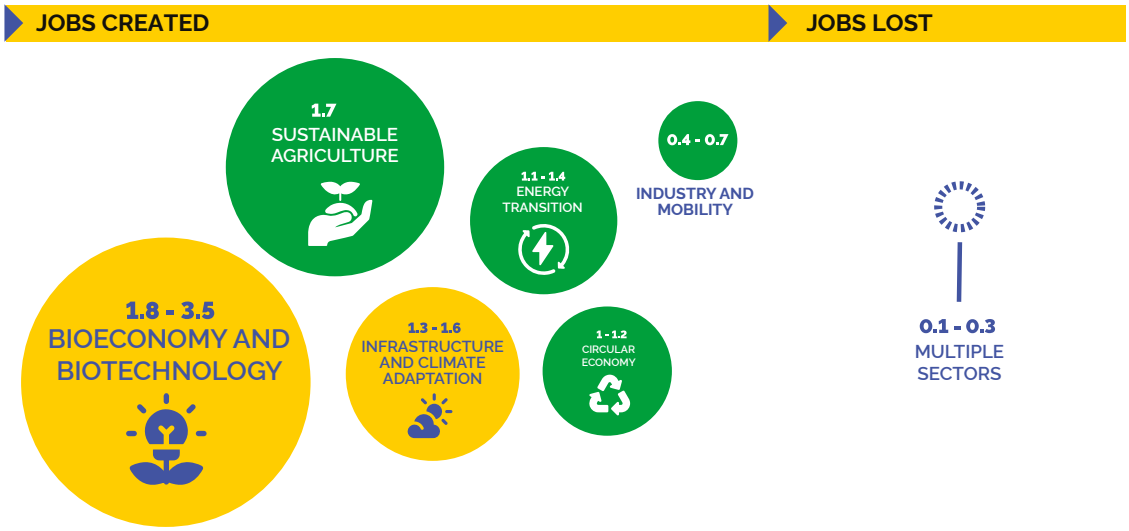


Figure 16. New jobs expected to be created with the implementation of the Ecological Transformation Plan.

In the light of the aforementioned studies and analyses regarding the implementation of the actions and initiatives covered by New Brazil, it appears feasible to fulfill the commitment made by Brazil in its last NDC: to reduce greenhouse gas emissions by 48% by 2025, 53% by 2030, and between 59% and 67% by 2035, compared to 2005 emissions, achieving net-zero emissions by 2050, without thereby compromising its economic development while reducing its social and regional inequalities.

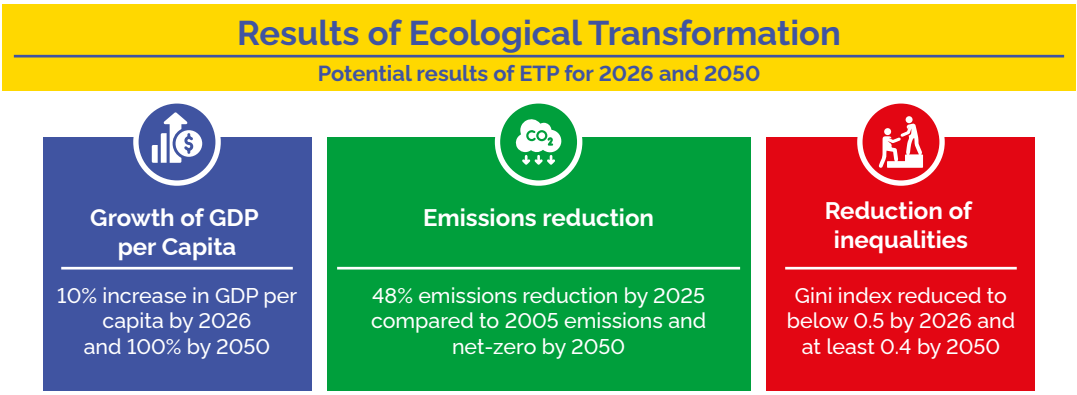


Figure 17. Potential results of the actions that make up the New Brazil – Ecological Transformation Plan.

New Brazil has the potential to drive robust economic and social development progress, with GDP per capita projected to grow by 10% by 2026 and 100% by 2050 (relative to 2022). By doubling per capita wealth, this growth aligns with Brazil's net-zero emissions target, expected by 2050.

With regard to reducing the level of inequality, it is possible to aspire to a reduction in the Gini index in Brazil below 0.5 by 2026 and to at least 0.4 by 2050.

These challenges reflect New Brazil's commitment to overcoming the country's main environmental, economic and social problems.


NO










References

AMAZÔNIA 2030. **Oportunidades para Exportação de Produtos Compatíveis com a Floresta na Amazônia Brasileira**. Available and accessed on 6 July 2024 at: http://doi.org/10.59346/report.amazonia2030.202104.ed2

ALVARENGA JR., M., COSTA, L. A. N., & YOUNG, C. E. F. (2022). **Um Green New Deal para o Brasil**. GV Executivo. V. 21. N. 1. Getúlio Vargas Foundation. Available and accessed on 6 July 2024 at: https://doi.org/10.12660/gvexec.v21n1.2022.85513

BRAZILIAN ASSOCIATION OF WIND ENERGY AND NEW TECHNOLOGIES - ABEEólica (2023). **Annual newsletter, 2022**. Available and accessed on 6 July 2024 at:https://abeeolica.org.br/energia-eolica/dados-abeeolica/

NATIONAL BANK FOR ECONOMIC AND SOCIAL DEVELOPMENT (2023). **Resíduos sólidos urbanos: BNDES, Caixa e Seppi apoiarão 109 municípios, organizados em 9 consórcios**. Rio de Janeiro: BNDES. Available and accessed on 28 March 2024 at: https://www.bndes.gov.br/wps/portal/site/home/imprensa/noticias/conteudo/residuos-solidos-urbanos-bndes-caixa-e-seppi-apoiarao-109-municipios-organizados-em-9-consorcios

BRAZIL (2002). **Legislative Decree no. 144, dated 20 June 2002**. Approves the text of the Kyoto Protocol to the United Nations Framework Convention on Climate Change open to signatures in Kyoto, Japan, on 11 December 1997 at the Third session of the Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC). Brasília: National Congress. Available and accessed on 28 March 2024 at: https://legis.senado.leg.br/norma/570177/publicacao/15722654

BRAZIL (2005). **Executive Order no. 5445, dated 12 May 2005**. Enacts the Kyoto Protocol to the United Nations Framework Convention on Climate Change, open to signatures in Kyoto, Japan, on 11 December 1997 at the Third session of the Conference of the Parties of the United Nations Framework Convention on Climate Change [UNFCCC]. Brasília: Presidency of the Republic. Available and accessed on 28 March 2024 at: https://www.planalto.gov.br/ccivil_03/_ato2004-2006/2005/decreto/d5445.htm

BRAZIL (2009). **Law no. 12187, dated 29 December 2009**. Establishes the National Policy on Climate Change - PNMC and makes other provisions. Brasília: Presidency of the Republic. Available and accessed on 28 March 2024 at: https://www.planalto.gov.br/ccivil_03/_ato2007-2010/2009/lei/l12187.htm

BRAZIL (2016a). **Legislative Decree no. 140, dated 16 August 2016**. Approves the text of the Paris Agreement under the United Nations Framework Convention on Climate Change [FCCC] adopted in Paris, on 12 December 2015, and signed in New York, on 22 April 2016. Brasília: National Congress. Available and accessed on 28 March 2024 athttps://legis.senado.leg.br/norma/588274/publicacao/15642126

BRAZIL (2016b). **Law no. 11243, dated 11 January 2016**. Provides for incentives for scientific development, research, scientific and technological capacity building and innovation. Brasília: Presidency of the Republic. Available and accessed on 28 March 2024 at: https://www.planalto.gov.br/ccivil_03/_Ato2015-2018/2016/Lei/L13243.htm

BRAZIL (2017). **Executive Order no. 9073, dated 5 June 2017**. Enacts the Paris Agreement under the United Nations Framework Convention on Climate Change [UNFCCC] adopted in Paris on 12 December 2015, and signed in New York, on 22 April 2016 Brasília: Presidency of the Republic. Available and accessed on 28 March 2024 at: https://www.planalto.gov.br/ccivil_03/_ato2015-2018/2017/decreto/d9073.htm

BRAZIL (2020a). **Executive Order No. 10375, dated 26 May 2020**. Establishes the National Bio-Based inputs Program and the National Bio-Based inputs Program Strategic Council. Brasília: Presidency of the Republic. Available and accessed on 29 August 2024 at: https://www.planalto.gov.br/ccivil_03/_ato2019-2022/2020/decreto/d10375.htm

BRAZIL (2020b). **Executive Order no. 10240, dated 12 February 2020**. Regulates item VI in the head provision of Article 33 and Article 56 of Law no. 12305, dated 2 August 2010, and complements Executive Order no. 9177, date 23 October 2017, on implementing a reverse logistics system for electrical and electronic products and their components for domestic use. Brasília: Presidency of the Republic. Available and accessed on 28 March 2024 at: https://www.planalto.gov.br/ccivil_03/_ato2019-2022/2020/decreto/d10240.htm

BRAZIL (2020c). **Executive Order no. 10388, dated 5 June 2020**. Regulates paragraph 1 of the head provision of art. 33 of Law no. 12305, dated 2 August 2010, and establishes the reverse logistics system for expired or unused household medicines for human use, industrialized and compounded medication, and their packaging after disposal by consumers. Brasília: Presidency of the Republic. Available and accessed on 28 March 2024 at: https://www.planalto.gov.br/ccivil_03/_ato2019-2022/2020/decreto/d10388.htm

BRAZIL (2020d). **Law no. 14026, dated 15 July 2020**. Updates the legal framework for basic sanitation and makes other provisions. Brasília: Presidency of the Republic. Available and accessed on 28 March 2024 at: https://www.planalto.gov.br/ccivil_03/_Ato2019-2022/2020/Lei/L14026.htm

BRAZIL (2021a). **Law no. 14119, dated 13 January 2021**. Establishes the National Policy for Payment for Environmental Services; and amends Laws no. 8212, dated 24 July 1991, no. 8629, dated 25 February 1993, and no. 6019, dated 31 December 1973, to bring them into line with the new policy. Brasília: Presidency of the Republic. Available and accessed on 5 July 2024 at: https://www.planalto.gov.br/ccivil_03/_ato2019-2022/2021/lei/l14119.htm

BRAZIL (2021b). **Law no. 14260, dated 8 December 2021**. Establishes incentives for the recycling industry; and creates the Support Fund for Recycling Actions (Favorecicle) and Investment Funds for Recycling Projects (ProRecicle). Brasília: Presidency of the Republic. Available and accessed on 5 July 2024 at: https://www.planalto.gov.br/ccivil_03/_ato2019-2022/2021/lei/l14260.htm

BRAZIL (2022a). **Executive Order no. 10936, dated 12 January 2022**. Regulates Law no. 12305, dated 2 August 2010, which establishes the National Solid Waste Policy. Brasília: Presidency of the Republic. Available and accessed on 28 March 2024 at: https://www.planalto.gov.br/ccivil_03/_ato2019-2022/2022/decreto/d10936.htm

BRAZIL (2022b). **Executive Order no. 11300, dated 21 December 2022**. Regulates the paragraph 2 of article 32 and paragraph 1 of article 33 of Law no. 12305, dated 2 August 2010, and establishes the reverse logistics system for glass packaging. Brasília: Presidency of the Republic. Available and accessed on 28 March 2024 at: https://www.planalto.gov.br/ccivil_03/_ato2019-2022/2022/decreto/D11300.htm

BRAZIL (2023a). **Executive Order no. 11630, dated 11 August 2023**. Establishes the Interministerial Committee on Innovations and Acquisitions of the Growth Acceleration Program - CIIA-PAC Brasília: Presidency of the Republic. Available and accessed on 28 March 2024 at: https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2023/decreto/d11630.htm

BRAZIL (2023b). **Executive Order no. 11648, dated 16 August 2023**. Establishes the Amazon Energies Program. Brasília: Presidency of the Republic. Available and accessed on 28 March 2024 at: https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2023/decreto/D11648.htm

BRAZIL (2023c). **Executive Order no. 11413, dated 13 February 2023**. Establishes the Reverse Logistics Recycling Credit Certificate, the General Packaging Structuring and Recycling Certificate and the Future Mass Credit Certificate within the scope of the reverse logistics systems referred to in art. 33 of Law no. 12305, dated 2 August 2010. Available and accessed on 28 March 2024 at: https://www.planalto.gov.br/ccivil_03/_Ato2023-2026/2023/Decreto/D11413.htm

BRAZIL (2023d). **Executive Order no. 11414, dated 13 February 2023**. Establishes the Diogo de Sant´Ana Waste Pickers Program for Popular Recycling and the Interministerial Committee on Socioeconomic Inclusion of Waste Pickers and Collectors of Reusable and Recyclable materials. Available and accessed on 28 March 2024 at: https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2023/decreto/D11414.htm

BRAZIL (2024a). **Medida Provisória no. 1213, dated 22 April 2014**. Establishes the Believe in the Next Steps Program, the Foreign Private Capital Mobilization and Currency Hedging Program – Eco Invest Brazil and makes other provisions. Brasília: Presidency of the Republic. Available and accessed on 5 July 2024 at: https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2024/mpv/mpv1213.htm

BRAZIL (2024b). **Bill of Supplementary Law no. 68/2024**. Establishes the Tax on Goods and Services - IBS, the Contribution on Goods and Services - CBS and the Excise Tax - IS and makes other provisions. Available and accessed on 28 March 2024 at: https://www.camara.leg.br/proposicoesWeb/fichadetramitacao?idProposicao=2430143&fichaAmigavel=nao

BRAZIL (2024c). **Executive Order no. 11889, dated 22 January 2024**. Provides for the production chains and sectors articulated by the Growth Acceleration Program - New PAC, which may be subject to the requirements for the acquisition of domestic manufactured products and domestic services, or the setting of price advantages for domestic manufactured products and domestic services. Brasília: Presidency of the Republic. Available and accessed on 28 March 2024 at: https://www.planalto.gov.br/ccivil_03/_Ato2023-2026/2024/Decreto/D11889.htm

BRAZIL (2024d). **Law no. 14902, dated 27 June 2024**. Establishes the Green Mobility and Innovation Program (Mover); and amends the Decree-Law no. 1.804, dated 3 September 1980; and repels the provisions of Law no. 13.755, dated 10 December 2018. Brasília: Presidency of the Republic. Available and accessed on 28 March 2024 at:https://www.planalto.gov.br/ccivil_03/_Ato2023-2026/2024/Lei/L14902.htm

BRAZIL (2024e). **Executive Order no. 11964, dated 26 March 2024**. Regulates the criteria and conditions for framing and monitoring investment projects considered to be a priority in the area of infrastructure or intensive economic production in research, development and innovation, for the purposes of issuing the securities referred to in art. 2 of Law no. 12431, dated 24 June 2011, and Law no. 14801, dated 9 January 2024, and repels Executive Order no. 8874, dated 11 October 2016. Brasília: Presidency of the Republic. Available and accessed on 28 June 2024 at: https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2024/decreto/D11964.htm

BRAZIL (2024f). **Executive Order no. 12044, dated 5 June 2024**. Establishes the National Bioeconomy Strategy Brasília: Presidency of the Republic. Available and accessed on 28 June 2024 at: https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2024/decreto/D12044.htm

BRAZIL (2024g). Agência Gov. **Governo Federal lança Plano Safra 24/25 com R$ 400 bi a agricultura empresarial.** Available and accessed on 5 July 2024 at: https://agenciagov.ebc.com.br/noticias/202407/governo-federal-lanca-plano-safra-24-25-com-r-400-59-bilhoes-para-agricultura-empresarial

BRAZIL (2024h). **Executive Order no. 12097, dated 3 July 2024**. Establishes the National Policy for the Conservation and Sustainable Use of Genetic Resources for Food, Agriculture and Livestock. Available and accessed on 29 August 2024 at: https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2024/decreto/D12097.htm

OFFICE OF THE CHIEF OF STAFF (2023a). **Novo PAC. Gestão de resíduos sólidos**. Brasília: Office of the Chief of Staff. Available and accessed on 5 July 2024 at: https://www.gov.br/casacivil/pt-br/novopac/cidades-sustentaveis-e-resilientes/gestao-de-residuos-solidos

OFFICE OF THE CHIEF OF STAFF (2023b). **Novo PAC. Água para todos. Brasília**: Office of the Chief of Staff. Available and accessed on 5 July 2024 at: https://www.gov.br/casacivil/pt-br/novopac/agua-para-todos

OFFICE OF THE CHIEF OF STAFF (2023c). **Novo PAC. Esgotamento sanitário**. Brasília: Office of the Chief of Staff. Available and accessed on 5 July 2024 at: https://www.gov.br/casacivil/pt-br/novopac/cidades-sustentaveis-e-resilientes/esgotamento-sanitario

OFFICE OF THE CHIEF OF STAFF (2023d). **Novo PAC. Prevenção a Desastres: Contenção de Encostas e Drenagem**. Brasília: Office of the Chief of Staff. Available and accessed on 5 July 2024 at: https://www.gov.br/casacivil/pt-br/novopac/cidades-sustentaveis-e-resilientes/prevencao-a-desastres-contencao-de-encostas-e-drenagem

OFFICE OF THE CHIEF OF STAFF (2023e). **Novo PAC. Periferia Viva - Urbanização de Favelas**. Brasília: Office of the Chief of Staff. Available and accessed on 5 July 2024 at: https://www.gov.br/casacivil/pt-br/novopac/cidades-sustentaveis-e-resilientes/periferia-viva-urbanizacao-de-favelas

OFFICE OF THE CHIEF OF STAFF (2024). **Mobilidade Urbana Sustentável. Selections 2023 – Fleet renewal**. Brasília: Office of the Chief of Staff. Available and accessed on 5 July 2024 at: https://www.gov.br/casacivil/pt-br/novopac/selecoes/eixos/cidades-sustentaveis-e-resilientes/renovacao-de-frota

BRAZILIAN SECURITIES COMMISSION (2023) **CVM Resolution no. 193, dated 20 October 2023**. Provides for the preparation and disclosure of the financial information report related to sustainability, based on the international standard issued by the International Sustainability Standards Board - ISSB. Rio de Janeiro: CVM. Available and accessed on 6 May 2024 at:https://conteudo.cvm.gov.br/legislacao/resolucoes/resol193.html

NATIONAL MONETARY COUNCIL (2023) **CMN Resolution no. 5095, dated 24 August 2023**. Provides for funding from the National Climate Change Fund (FNMC). Brasília: CMN. Available and accessed on 23 June 2024 at: https://www.bcb.gov.br/estabilidadefinanceira/exibenormativo?tipo=Resolu%C3%A7%C3%A3o%20CMN&numero=5095

NATIONAL MONETARY COUNCIL (2024) **CMN Resolution no. 5130, dated 25 April 2024**. Provides for financing under the Foreign Private Capital Mobilization and Currency Hedging Program - Eco Invest Brazil Line -, within the scope of the National Climate Change Fund (FNMC). Brasília: CMN. Available and accessed on 23 June 2024 at: https://www.bcb.gov.br/estabilidadefinanceira/exibenormativo?tipo=Resolu%C3%A7%C3%A3o%20CMN&numero=5130

NATIONAL ENERGY POLICY COUNCIL (2023). **Resolution no. 7, dated 20 April 2021**. Establishes the Fuel of the Future Program, creates the Fuel of the Future Technical Committee and makes other provisions. Brasília: CNPE. Available and accessed on 23 June 2024 at: https://www.gov.br/mme/pt-br/assuntos/conselhos-e-comites/cnpe/resolucoes-do-cnpe/resolucoes-2021

NATIONAL ENERGY POLICY COUNCIL (2023). **Resolution no. 8, dated 19 December 2023**. Reduces the deadline for the increases in biodiesel content provided for in CNPE Resolution no. 16, dated 29 October 2018, amended by Resolution CNPE no. 3, dated 20 March 2023, based on studies of supply, demand and economic impacts. Brasília: CNPE. Available and accessed on 23 June 2024 at: https://www.gov.br/mme/pt-br/assuntos/conselhos-e-comites/cnpe/resolucoes-do-cnpe/2023

CREDIT SUISSE (2022). **US Inflation Reduction Act – A tipping point in climate action**. Available and accessed on 23 June 2024 at: https://www.credit-suisse.com/about-us-news/en/articles/news-and-expertise/us-inflation-reduction-act-a-catalyst-for-climate-action-202211.html

EMPRESA DE PESQUISA ENERGÉTICA (ENERGY RESEARCH COMPANY) (2020). **Roadmap Eólica Offshore Brasil. Perspectivas e caminhos para a energia eólica marítima.** Brasília: EPE. Available and accessed on 22 June 2024 at: https://www.epe.gov.br/pt/publicacoes-dados-abertos/publicacoes/roadmap-eolica-offshore-brasil

EMPRESA DE PESQUISA ENERGÉTICA (ENERGY RESEARCH COMPANY) (2023a). **Balanço Energético Nacional 2023. Ano base 2022.** Brasília: EPE. Available and accessed on 22 June 2024 at: https://www.epe.gov.br/pt/publicacoes-dados-abertos/publicacoes/balanco-energetico-nacional-2023

EMPRESA DE PESQUISA ENERGÉTICA (ENERGY RESEARCH COMPANY) (2023b). **Hidrogênio no Brasil. Potencial técnico de produção de hidrogênio de baixo carbono no Brasil.** Brasília: EPE. Available and accessed on 22 June 2024 at: https://gisepeprd2.epe.gov.br/arcgisportal/apps/storymaps/stories/68332aaa3fc64524a656583e1367daa3

EMPRESA DE PESQUISA ENERGÉTICA (ENERGY RESEARCH COMPANY) (2024). **Balanço Energético Nacional. Relatório Síntese 2024 - Ano base 2023**. Brasília: EPE. Available and accessed on 22 June 2024 at: https://www.epe.gov.br/pt/publicacoes-dados-abertos/publicacoes/balanco-energetico-nacional-2024

EUROPEAN COMMISSION (2019). **The European Green Deal.** Brussels, European Commission. Available and accessed on 22 June 2024 at: https://commission.europa.eu/document/daef3e5c-a456-4fbb-a067-8f1cbe8d9c78_en

EUROPEAN COMMISSION (2023). A Green Deal Industrial Plan for the Net-Zero Age. Brussels, European Commission. Available and accessed on 22 June 2024 at: https://commission.europa.eu/document/41514677-9598-4d89-a572-abe21cb037f4_en

FALKNER, Robert. **The Paris Agreement and the new logic of international climate politics.** International Affairs, Oxford University Press (OUP), v. 92, n. 5, p. 1107-1125, 31 Aug 2016.

NATIONAL FUND FOR SCIENTIFIC AND TECHNOLOGICAL DEVELOPMENT. FUNDING AUTHORITY FOR STUDIES AND PROJECTS (2024). Plano Anual de Investimentos 2024. Recursos não reembolsáveis. Brasília: FNDCT/FINEP. Available and accessed on 22 June 2024 at: https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/fndct/arquivos/pdf/conselho-diretor/plano-de-investimento-fndct/copy_of_PlanoAnualdeInvestimento2024NoReembolsvelajustado.pdf

GREEN NEW DEAL BRASIL (2021). **30 ações até 2030 para um desenvolvimento justo e sustentável. Sumário Executivo.** Available and accessed on 22 June 2024 at: https://congressoemfoco.uol.com.br/wp-content/uploads/2021/11/GND-BR_final_digital.pdf

HARVARD GROWTH LAB (2021). **The Atlas of Economic Complexity.** Available and accessed on 22 June 2024 at: https://atlas.cid.harvard.edu/

HENLEY, Ben; ABRAM, Nerilie (2017). **The three-minute story of 800,000 years of climate change with a sting in the tail.** The Conversation. Available and accessed on 4 July 2024 at: https://theconversation.com/the-three-minute-story-of-800-000-years-of-climate-change-with-a-sting-in-the-tail-73368

INSTITUTO AYA. SYSTEMIQ (2023) **Caminhos para o Plano de Transformação Ecológica do Brasil.** Uma contribuição da Força Tarefa Voluntária para o Plano de Transformação Ecológica. Available and accessed on 22 June 2024 at: https://ayahub.com.br/en/content/

BRAZILIAN INSTITUTE OF GEOGRAPHY AND STATISTICS - IBGE (2023). **Síntese de indicadores sociais: uma análise das condições de vida da população brasileira.** Tabelas sobre padrão de vida e distribuição de rendimentos com dados da Pesquisa Nacional por Amostra de Domicílios Contínua 2022. Rio de Janeiro: IBGE. Available and accessed on 1 June 2024 at: https://www.ibge.gov.br/estatisticas/sociais/populacao/9221-sintese-de-indicadores-sociais.html

NATIONAL INSTITUTE FOR SPACE RESEARCH - INPE (2017) **Atlas brasileiro de energia solar. 2. ed.** São José dos Campos: INPE. Available and accessed on 6 July 2024 at: https://labren.ccst.inpe.br/atlas_2017.html

BRAZILIAN INSTITUTE FOR THE ENVIRONMENT AND RENEWABLE NATURAL RESOURCES - IBAMA (2022). **Relatório de qualidade do meio ambiente: RQMA: Brasil 2020. Cap. 5.** Brasília: IBAMA. Available and accessed on 6 July 2024 at: http://www.alice.cnptia.embrapa.br/alice/handle/doc/1143844

INTERNATIONAL ENERGY AGENCY (2021a). **Net Zero by 2050. A Roadmap for the Global Energy Sector.** Paris: IEA. Available and accessed on 22 April 2024 at: https://www.iea.org/reports/net-zero-by-2050

INTERNATIONAL ENERGY AGENCY (2021b). **The Role of Critical Minerals in Clean Energy Transitions.** Paris: IEA. Available and accessed on 22 April 2024 at: https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions

INTERNATIONAL ENERGY AGENCY (2022). **Solar PV Global Supply Chains.** Paris: IEA. Available and accessed on 3 April 2024 at: https://www.iea.org/reports/solar-pv-global-supply-chains

INTERNATIONAL ENERGY AGENCY (2023a). **IEA Wind Annual Report 2022. Data Sheet.** Available and accessed on 22 June 2024 at: https://iea-wind.org/iea-publications/

INTERNATIONAL ENERGY AGENCY (2023b). **Energy Statistics Data Browser.** Paris: IEA. Available and accessed on 22 June 2024 at: https://www.iea.org/data-and-statistics/data-tools/energy-statistics-data-browser

INTERNATIONAL ENERGY AGENCY (2023c). **Global Hydrogen Review 2023.** Paris: IEA. Available and accessed on 22 April 2024 at: https://www.iea.org/reports/global-hydrogen-review-2023

INTERNATIONAL ENERGY AGENCY (2023d). **The Oil and Gas Industry in Net Zero Transitions.** Paris: IEA. Available and accessed on 25 August 2024 at: https://www.iea.org/reports/the-oil-and-gas-industry-in-net-zero-transitions

INTERNATIONAL ENERGY AGENCY (2024a). **World Energy Investment 2024.** Paris: IEA. Available and accessed on 24 August 2024 at: https://www.iea.org/reports/world-energy-investment-2024

INTERNATIONAL ENERGY AGENCY (2024b). **Renewables 2023.** Paris: IEA. Available and accessed on 22 June 2024 at: https://www.iea.org/reports/renewables-2023

INTERNATIONAL MONETARY FUND (2024). **The World Economic Outlook Database – April 2024.** Washington: IMF. Available and accessed on 21 June 2024 at: https://www.imf.org/en/Publications/WEO/weo-database/2024/April/

IPCC (2022): **Climate Change 2022: Impacts, Adaptation, and Vulnerability.** Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK, and New York, NY, USA, pp. 3-33. Available and accessed on 1 June 2024 at: https://www.ipcc.ch/report/ar6/wg2/chapter/summary-for-policymakers/

IPCC (2023). **Summary for Policymakers**. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. Geneva, Switzerland: IPCC. Available and accessed on 20 May 2024 at: https://www.ipcc.ch/report/ar6/syr/

MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION (2022). **Estimativas Anuais de Emissões de Gases de Efeito Estufa no Brasil.** 6ª Edição. Brasília: MCTI. Available and accessed on 22 June 2024 at: https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/sirene/publicacoes/estimativas-anuais-de-emissoes-gee

MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION. NATIONAL CENTER FOR NATURAL DISASTER MONITORING AND ALERTS (2024). **Cemaden amplia a lista de municípios monitorados, de 1038 para 1133.** Available and accessed on 22 June 2024 at: https://www.gov.br/cemaden/pt-br/assuntos/noticias-cemaden/cemaden-amplia-a-lista-de-municipios-monitorados-de-1038-para-1133

MINISTRY OF FINANCE. BRAZILIAN AGENCY FOR INDUSTRIAL DEVELOPMENT - ABDI **Grupo de Trabalho Resiliência em Cadeias de Valor.** Brasília, MF/ABDI. Available at: https://www.gov.br/fazenda/pt-br/orgaos/spe/desenvolvimento-economico-sustentavel/gt-resiliencia-em-cadeias-de-valor

MINISTRY OF FINANCE. SECRETARIAT OF ECONOMIC POLICY (2023). **Plano de Ação da Taxonomia Sustentável Brasileira.** Brasília, MF/SPE. Available and accessed on 22 June 2024 at: https://www.gov.br/fazenda/pt-br/orgaos/spe/taxonomia-sustentavel-brasileira

MINISTRY OF FINANCE. SECRETARIAT OF ECONOMIC POLICY (2024). **Análise preliminar de impactos macroeconômicos do Plano de Transformação Ecológica através do Modelo OMEGA.** Draft document, not published.

MINISTRY OF FINANCE. NATIONAL TREASURY SECRETARIAT (2023). **1º Relatório Pré-Emissão com Alocação Indicativa de Recursos.** Brasília, MF/STN. Available and accessed on 22 June 2024 at:https://www.tesourotransparente.gov.br/publicacoes/relatorio-pre-emissao-com-alocacao-indicativa-de-recursos/2023/26

MINISTRY OF FINANCE. NATIONAL TREASURY SECRETARIAT (2023). **2º Relatório Pré-Emissão com Alocação Indicativa de Recursos.** Brasília, MF/STN. Available and accessed on 22 June 2024 at: https://www.tesourotransparente.gov.br/publicacoes/relatorio-pre-emissao-com-alocacao-indicativa-de-recursos/2023/26

MINISTRY OF FINANCE. **Ministry of Finance Directive no. 964, dated 11 June 2024.** Regulates the provisions of Chapter VI of Medida Provisória no. 1213, dated 22 April 2024, to establish the criteria for the eligibility of investments to the Eco Invest Brazil Program, the allocation of resources, the processes for the qualification of financial agents and the rendering of accounts, as well as the governance structure of the Foreign Private Capital Mobilization and Currency Hedging Credit Line, within the scope of the Program; establishes the composition and powers of the Program's Executive Committee; and makes other provisions. Brasília, MF. Available and accessed on 5 July 2024 at: https://www.in.gov.br/en/web/dou/-/portaria-mf-n-964-de-11-de-junho-de-2024-565122740

MINISTRY OF THE CITIES (2023). **Normative Instruction no. 42, dated 30 November 2023.** Amends the procedures and provisions relating to credit operations under the Sanitation for All Program - Public Borrowers. Brasília: MCID. Available and accessed on 28 March 2024 at: https://www.in.gov.br/en/web/dou/-/instrucao-normativa-n-42-de-30-de-novembro-de-2023-527022023

MINISTRY OF MINES AND ENERGY (2023a). **Programa Nacional do Hidrogênio. Plano de Trabalho Trienal 2023-2025.** Brasília, MME. Available and accessed on 5 July 2024 at: https://www.gov.br/mme/pt-br/assuntos/noticias/PlanodeTrabalhoTrienalPNH2.pdf

MINISTRY OF MINES AND ENERGY (2023b). **Decreto que institui programa Energias da Amazônia é assinado pelo presidente Lula.** Brasília, MME. Available and accessed on 5 July 2024 at: https://www.gov.br/mme/pt-br/assuntos/noticias/decreto-que-institui-programa-energias-da-amazonia-e-assinado-pelo-presidente-lula

MINISTRY OF MINES AND ENERGY (2023a). EMPRESA DE PESQUISA ENERGÉTICA (ENERGY RESEARCH COMPANY) (2022). **Plano Decenal de Expansão de Energia 2031.** Brasília, MME/EPE. Available and accessed on 22 April 2024 at: https://www.epe.gov.br/pt/publicacoes-dados-abertos/publicacoes/Plano-Nacional-de-Energia-PNE-2030

MINISTRY OF DEVELOPMENT, INDUSTRY, TRADE AND SERVICES (2020). **Partnership for Market Readiness (PMR).** Brasília, MDIC. Available and accessed on 22 April 2024 at: https://www.gov.br/mdic/pt-br/assuntos/competitividade-industrial/pmr/partnership-for-market-readines-pmr

MINISTRY OF DEVELOPMENT, INDUSTRY, TRADE AND SERVICES (2023). **Recomposição tarifária estimula produção nacional de painéis solares e aerogeradores.** Brasília, MDIC. Available and accessed on 22 April 2024 at: https://www.gov.br/mdic/pt-br/assuntos/noticias/2023/dezembro/recomposicao-tarifaria-estimula-producao-nacional-de-paineis-solares-e-aerogeradores

MINISTRY OF DEVELOPMENT, INDUSTRY, TRADE AND SERVICES (2024). **Nova Indústria Brasil – forte, transformadora e sustentável: Plano de Ação para a neoindustrialização 2024-2026.** Brasília: MDIC. Available and accessed on 22 April 2024 at: https://www.gov.br/mdic/pt-br/composicao/se/cndi/plano-de-acao

MINISTRY OF ENVIRONMENT (2017). **National Biodiversity Strategy and Action Plan – EPANB: 2016-2020.** Brasília: MMA. Available and accessed on 4 July 2024 at: https://www.gov.br/mma/pt-br/assuntos/biodiversidade-e-biomas/ecossistemas/biomas/arquivos-biomas/estrategia-e-plano-de-acao-nacionais-para-a-biodiversidade-epanb.pdf/view

MINISTRY OF ENVIRONMENT AND CLIMATE CHANGE (2023) **Plano de Ação para Prevenção e Controle do Desmatamento na Amazônia Legal. 5ª Fase (2023-2027).** Brasília: MMA. Available and accessed on 3 April 2024 at: https://www.gov.br/mma/pt-br/assuntos/prevencao-e-controle-do-desmatamento/amazonia-ppcdam-1

MINISTRY OF ENVIRONMENT AND CLIMATE CHANGE (2024a). **Área sob alertas de desmatamento na Amazônia cai 50% em 2023.** Brasília, MMA. Available and accessed on 25 May 2024 at: https://www.gov.br/mma/pt-br/area-sob-alertas-de-desmatamento-na-amazonia-cai-50-em-2023

MINISTRY OF ENVIRONMENT AND CLIMATE CHANGE (2024b). **Plano Clima.** Brasília, MMA. Available and accessed on 23 August 2024 athttps://www.gov.br/mma/pt-br/composicao/smc/plano-clima

MINISTRY OF ENVIRONMENT AND CLIMATE CHANGE (2024c). **MMA e BNDES anunciam resultado de edital do Fundo Amazônia para restauração florestal.** Brasília, MMA. Available and accessed on 25 May 2024 at: https://www.gov.br/mma/pt-br/assuntos/noticias/mma-e-bndes-anunciam-resultado-de-edital-do-fundo-amazonia-para-restauracao-florestal#

MINISTRY OF ENVIRONMENT AND CLIMATE CHANGE. BRAZILIAN FOREST SERVICE (2023a.) **Cadastro Nacional de Florestas Públicas: Atualização 2022.** Brasília: MMA/SFB. Available and accessed on 5 July 2024: https://www.gov.br/florestal/pt-br/assuntos/cadastro-nacional-de-florestas-publicas/cadastro-nacional-de-florestas-publicas-atualizacao-2022/cnfp-2022

MINISTRY OF ENVIRONMENT AND CLIMATE CHANGE. BRAZILIAN FOREST SERVICE (2023b.) **Concessões Florestais em Andamento.** Brasília: MMA/SFB. Available and accessed on 5 July 2024 at: https://www.gov.br/florestal/pt-br/assuntos/concessoes-e-monitoramento/concessoes-florestais-em-andamento

CLIMATE OBSERVATORY. **Sistema de Estimativas de Emissões e Remoções de Gases de Efeito Estufa (SEEG).** Available and accessed on 6 July 2024 at: https://seeg.eco.br/

OECD/FAO (2021). **OECD-FAO Agricultural Outlook 2021-2030.** Paris: OECD Publishing. Available and accessed on 5 July 2024 at: https://doi.org/10.1787/47a9fa44-es

PERSAUD, A. (2023). Unblocking the green transformation in developing countries with a pratical foreign exchange guarantee. Available at: https://www.climatepolicyinitiative.org/wp-content/uploads/2023/06/An-FX-Guarantee-Mechanism-for-the-Green-Transformation-in-Developing-Countries.pdf Acessado em 08/07/2024

PROJETO PMR BRASIL (PMR BRAZIL PROJECT) (2020). **Síntese das análises e resultados do Projeto PMR Brasil. Dezembro de 2020.** Available and accessed on 5 July 2024 at: https://www.gov.br/mdic/pt-br/assuntos/competitividade-industrial/pmr/relatorio-sintese-pmr.pdf/view

SCHODER, C., & TERCIOGLU, R. B. (2023). **A Climate-Fiscal Policy Mix to Achieve Türkiye's Net-Zero Ambition under Feasibility Constraints** (Nº 10551). The World Bank.

SCImago (2024). SJR — SCImago Journal & Country Rank. Available and accessed on 3 April 2024 at: http://www.scimagojr.com

GENERAL SECRETARIAT OF THE PRESIDENCY OF THE REPUBLIC (2024). **RNV 2024 – Relatório Nacional Voluntário.** Available and accessed on 23 August 2024 at:https://www.gov.br/secretariageral/pt-br/cnods/RNV_Brasil/portugues

SERVIÇO GEOLÓGICO DO BRASIL (GEOLOGICAL SERVICE OF BRAZIL) (2023). **An overview of Critical Minerals Potential of Brazil.** [Silva, G.F.; Cunha, I.A.; Costa, I.S.L. (Orgs.)]. Brasília: SGB. Available and accessed on 3 April 2024 at: https://www.sgb.gov.br/pdac/media/critical_minerals_potential.pdf

SERVIÇO NACIONAL DE INFORMAÇÕES SOBRE SANEAMENTO – SNIS (NATIONAL SANITATION INFORMATION SYSTEM) (2023a). **Diagnóstico Temático: Manejo de Resíduos Sólidos Urbanos. Visão Geral. Ano de referência: 2022.** Brasil: Ministério das Cidades. Available and accessed on 3 April 2024 at: https://www.gov.br/cidades/pt-br/acesso-a-informacao/acoes-e-programas/saneamento/snis/produtos-do-snis/diagnosticos-snis

SERVIÇO NACIONAL DE INFORMAÇÕES SOBRE SANEAMENTO – SNIS (NATIONAL SANITATION INFORMATION SYSTEM) (2023b). **Diagnóstico Temático: Serviços de Água e Esgoto. Visão Geral. Ano de referência: 2022.** Brasil: Ministério das Cidades. Available and accessed on 3 April 2024 at: https://www.gov.br/cidades/pt-br/acesso-a-informacao/acoes-e-programas/saneamento/snis/produtos-do-snis/diagnosticos-snis

UNITED NATIONS ENVIRONMENT PROGRAMME (2023). **Emissions Gap Report 2023: Broken Record – Temperatures hit new highs, yet world fails to cut emissions (again)**. Nairobi: UNEP. Available and accessed on 28 March 2024 at: https://doi.org/10.59117/20.500.11822/43922

WORLD BANK (2022). **Poverty and shared prosperity 2022 —Correcting course**. Washington: World Bank. Available and accessed on 1 June 2024 at: https://www.worldbank.org/en/publication/poverty-and-shared-prosperity

BRAZILIAN GOVERNMENT

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UNITING AND REBUILDING