Assessment of the policy framework's impact on the renewable energy generation expansion in the Brazilian power grid

ICAT Initiative for Climate Action Transparency

Initiative for Climate Action Transparency – ICAT

ICAT Brazil Project phase 3

Assessment of the policy framework impact on the renewable energy generation expansion in the Brazilian power grid

Output 6 - Defining the objectives, policy framework, impact categories, and indicators for the sustainable development assessment and planning a just transition assessment

August 2023

Initiative for Climate Action Transparency - ICAT

Defining the objectives, policy framework, impact categories, and indicators for the sustainable development assessment and planning a just transition assessment

Deliverable #6

AUTHORS

Centro Brasil no Clima (in alphabetic order):

Beatriz Araújo
Guilherme Lima
Raiana Soares
Samara Andrade
Tamar Bakman
William Wills

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Forewords

This report is part of the ICAT Brazil Project phase 3, hereafter referred to as ICAT project, which is implemented by Centro Brasil no Clima (Brazil Climate Centre – CBC) in partnership with Centro Clima (PPE/COPPE/UFRJ) with support from the Initiative for Climate Action Transparency (ICAT) and technical support from the UNEP Copenhagen Climate Centre (UNEP CCC).

The previous phases of the ICAT project aimed at the enhancement of the transparency framework in Brazil by developing MRV indicators to assess climate policies and actions at the national (1st phase) and subnational (2nd phase) level. These phases developed mitigation scenarios that provide critical insight for policy development at the national and sub-national levels and proposed MRV indicators to track the implementation of the Brazilian NDC.

The third phase of the ICAT Brazil project, which started in March 2023, builds off insight gained from the first two phases by providing a detailed analysis of the energy sector in Brazil. The project assesses the potential expansion of the power sector in the country through variable renewable energies (wind and solar photovoltaic) and biomass, the sustainable development impacts of sectoral policies by applying the ICAT's Sustainable Development Methodology, and contributes for the Just Energy Transition planning in Brazil.

This report is the Output 6 of the ICAT project, prepared by CBC, and is aimed at presenting the objectives, the policy framework, impact categories, and indicators for the sustainable development assessment. The report includes the activities developed to assure stakeholder participation in the assessment. Finally, this report presents a proposal for planning a just transition in Brazil.

1 Introduction

Brazil has been historically an active and important player in the international climate change agenda. The country submitted its first NDC in 2016 aiming to contribute to the goals of the Paris Agreement. Since then, the federal government has already released two updates (in 2020 and 2022) and is currently undergoing a new update to increase the ambition of its NDC. Besides the short and medium-term targets of 37% and 50% reduction in GHG emissions by 2025 and 2030 respectively (the Brazilian NDC is economy-wide and has no sectoral targets in terms of GHG emission), the last review of the commitment introduced the goal of achieving net-zero GHG emission by 2050.

Although most of the country's GHG emissions derive from the AFOLU sector, particularly from deforestation, it is expected that in the next years this driver reduces its contribution to the overall GHG emission, given Brazilian commitment to a target of zero illegal deforestation by 2030. Considering that a significant portion of Brazil's deforestation activities take place within the confines of legal regulations, the task of reducing deforestation becomes inherently intricate. This circumstance intensifies the strain on the country's decarbonization endeavours and its commitment to achieving a net-zero emissions target. In this scenario, other sectors, such as energy and industry, become increasingly important both due to projections of GHG emissions increase in both sectors as well due to their relevance in Brazil's net-zero target achievement.

The share of renewable energy sources in the Brazilian energy sector is contrastingly higher in comparison to the global average and to most developed countries, as illustrated in Figure 1. Amongst the sources, biofuels, hydroelectricity, and wood/charcoal consumption are the main responsible for such a high renewable matrix. In addition, according to the projections conducted by Centro Clima (PPE/Coppe/UFRJ), the current policy framework for the energy sector in Brazil is aligned with a Net Zero scenario in the horizon 2050.

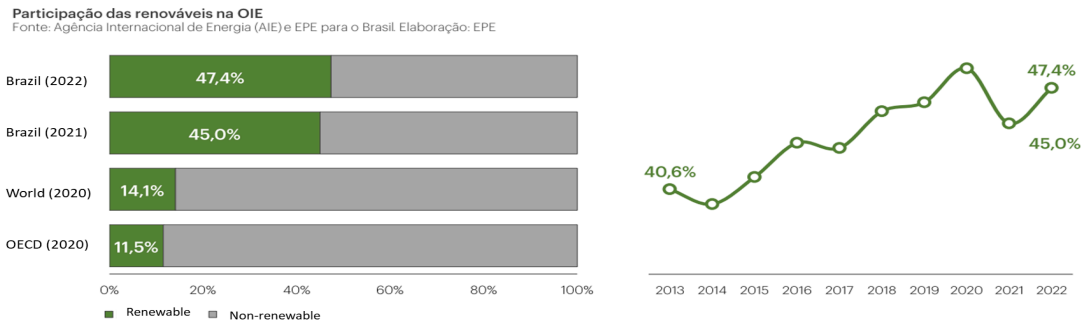


Figure 1 – Renewable Energy share in Total Final Energy Consumption (%)
Source: Energy Research Office.

However, the mitigation of GHG emissions is not the only impact related to the expansion of renewables, as there are many other environmental, social and economic changes impacted by the

scaling of renewables in the country. In fact, rather than the need to increase the share of renewable sources in the Brazilian energy matrix, there is a strong urge to focus on other dimensions of the energy transition in Brazil, such as the need to eradicate energy poverty, increase energy efficiency, enhance energy security, and intertwine Brazilian energy transition with real and just social transformation. This is also aligned with the Paris Agreement, which recognises the importance of promoting the sustainable development through the implementation of climate action. Therefore, it is relevant that climate policies and actions that contribute to GHG emission reduction are assessed regarding their impacts on sustainable development goals.

Considering that, Centro Brasil no Clima (CBC) will assess the sustainable development impacts of policies in Brazil which are considered most relevant in terms of fomenting the expansion of variable renewable energy (VRE) sources (wind, solar photovoltaic) and biomass. This assessment will be conducted using ICAT Sustainable Development (SD) Methodology and ICAT Stakeholder Participation Guide. In addition, an assessment of just energy transition is planned to take place via ICAT's Methodology on Managing Transparency of Just Transitions[1] with inputs from other methodologies and experiences from other countries.

This report presents the first step of this assessment, which includes the selection of policies to be assessed and the impact categories. Regarding the just transition assessment, the report presents a preliminary planning of activities that must be implemented. The report is divided in two parts. Part 1 presents the planning of the SD assessment, including the policies chosen to be assessed, the impact categories and indicators. It also presents a stakeholder engagement plan, including the mapping of stakeholders which will be assessed in order to qualitatively assess the chosen indicators. Considering the project's goal to also address the Just Transition theme, Part 2 presents a contextualization of the just transition in Brazil and a suggestion for planning the assessment process.

[1] The ICAT Methodology on Managing Transparency of Just Transitions is currently under elaboration and a draft was provided by WRI to contribute to this assessment.

PART 1: DEFINING THE OBJECTIVES, POLICY FRAMEWORK, IMPACT CATEGORIES, AND INDICATORS FOR THE SUSTAINABLE DEVELOPMENT ASSESSMENT

2 Objectives of the assessment

The objective of the ICAT Brazil Project Phase 3 is to assess the potential expansion of renewable energy sources in Brazil up to 2050, in particular variable renewable energies (VRE) (wind and solar photovoltaic) and biomass, its alignment with the NDC targets, and the sustainable development impacts of the policy framework related to those sources.

Regarding the Sustainable Development Impact Assessment, the objective of the project is to assess the sustainable development impacts of policies that are currently driving the expansion of the VRE and biomass in Brazil and which may contribute to a Net Zero or Deep Decarbonization Scenario (DDS Brazil) in 2050. This assessment will be done by applying ICAT's Sustainable Development Methodology and will include stakeholder consultation processes.

A second objective, which is transversal to the former, is to consolidate a partnership network with stakeholders that can contribute to the assessments and to spread the results of the project for the effective use in policies design and implementation.

3 Stakeholders' participation

Even though the assessment of the sustainable development impacts of the energy policies in Brazil was still being planned in the first months of the project, the ICAT SD Guidance (Table B.1 of the guidance) recommends engaging with stakeholders in every step of the assessment and to give them the opportunity to contribute with the drawing of the assessment since the first steps. This engagement was prepared taking into account the ICAT Stakeholder Participation Guide and involves the following steps: definition of the policies to be assessed; definition of the impact categories and their indicators; and mapping of other stakeholders. It was considered important to provide the selected stakeholders with this possibility given the principles of inclusiveness, transparency and responsiveness.

Figure 2 illustrates the main steps in the stakeholder participation taken so far, which will be further explained in the next subsections.

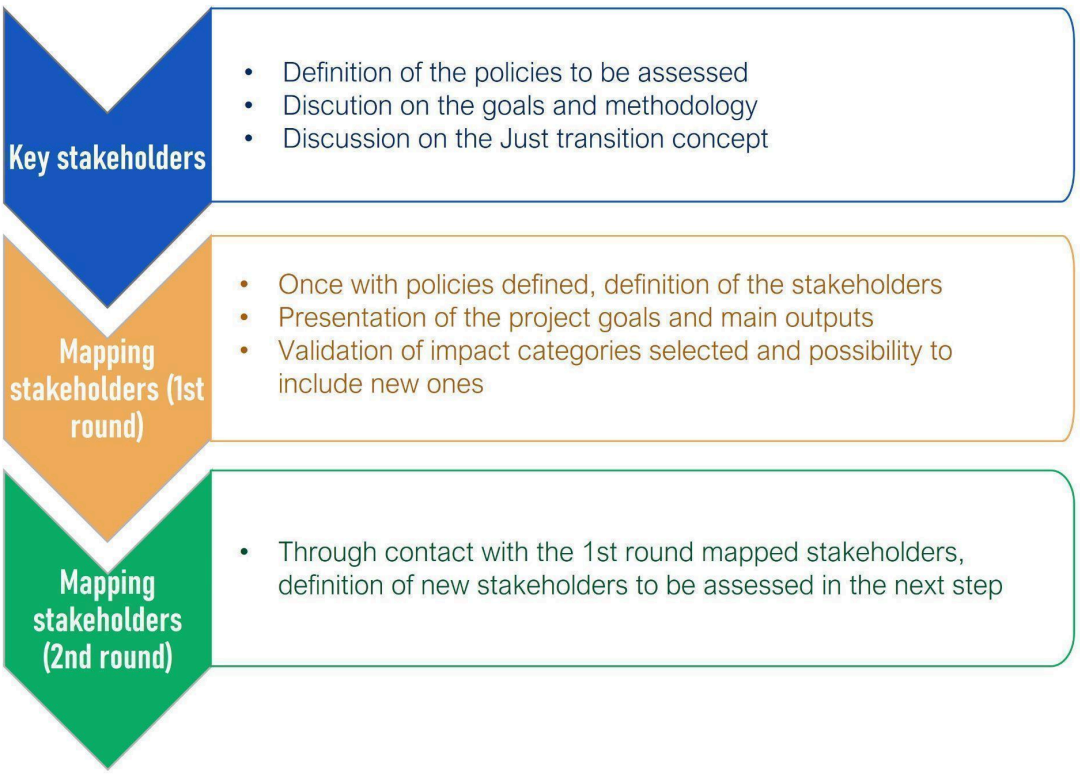


Figure 2 - Main steps in the stakeholder participation
Source: Prepared by the authors.

3.1 First definitions: selection of key stakeholders

As a first step, initial meetings were conducted with key stakeholders within the energy sector to present the project, obtain their feedback on the project's goals and methodology, incorporate their suggestions and/or needs, assess the project's possible risks, and define the policies to be assessed.

The need to define key stakeholders to contact at the beginning of the project relates to a changing political environment in the country. With the newly elected federal government at the end of 2022 an effort to empower federal institutions and enhance the commitment to mitigate environmental issues and deal with social challenges was perceived. Therefore, it was appropriate to start a closer dialogue with these institutions, given the setting of a momentum for the topic addressed by the project and for the engagement with the sector. These stakeholders are listed and presented below.

a) Ministry of Science, Technology, and Innovation (MCTI – Ministério de Ciência, Tecnologia e Inovação)

MCTI is a key stakeholder, as it holds the responsibility for formulating national policies related to sciences, technologies, and innovation in Brazil. The ministry plays a central role in the climate change agenda coordinating the National Communications, the National GHG Inventories and the BURs. In addition to its core responsibilities, MCTI is also in charge of digital transformation, automation development, biosecurity, spatial, and nuclear policies at the national level. Among its

competencies, the ministry is involved in overseeing the exportation of sensitive goods and services. It also engages in collaboration with state governments, municipalities, civil society, and other federal government bodies to establish guidelines for national science, technology, and innovation policies.

b) Ministry of Environment and Climate Change (MMA – Ministério do Meio Ambiente e Mudança do Clima)

MMA holds significant responsibility for various national policies in Brazil, being a crucial stakeholder in the country's environmental governance. These policies include the National Policy on Climate Change (PNMC – Law n. 12,187/2009) and policies for integrating environmental protection in energy sector. MMA is responsible for devising strategies, mechanisms, regulatory frameworks, and economic instruments aimed at improving environmental quality and promoting the sustainable use of natural resources. Furthermore, MMA plays a pivotal role in coordinating policies and instruments for environmental management in Brazil.

c) Ministry of Mines and Energy (MME – Ministério de Minas e Energia)

MME is responsible for formulating policies and regulations for the mining and energy sectors. This includes policies for the use of hydro, wind, photovoltaic, and other sources for power generation, as well as the national policy for oil, fuel, biofuel, natural gas, and electricity, including nuclear power. The ministry is also instrumental in developing national policies for the sustainability and economic, social, and environmental development of electrical, energy, and mineral resources, among others.

d) Energy Research Office (EPE – Empresa de Pesquisa Energética)

EPE is tasked with delivering studies and research to support energy sector planning to MME. EPE is a key stakeholder for its active involvement in major discussions concerning the Brazilian energy sector and its substantial contributions to policy and guideline definition, as well as its coordination with various bodies and institutions within the sector. EPE operates in several domains, including electricity, statistics, energy conservation, oil, gas, and biofuels, as well as socio-environmental studies and energy planning.

e) Center for Strategic Studies and Management and Management (CGEE – Centro de Gestão e Estudos Estratégicos)

CGEE holds the responsibility for promoting and conducting studies and research in the fields of education, science, technology, and innovation, thus providing technical and strategic information for the energy and other sectors. It plays a vital role in fostering activities to assess strategies and the economic and social impacts of policies, programs, and projects related to science, technology, innovation, and human resource training. One of CGEE's projects is called Energy Big Push, which since 2019 has acted to promote more investments in sustainable energy in Brazil, energy security and

low-carbon development, by providing strategic information to support decision-making in projects, programs and policies of the energy sector.

f) Brazilian Electricity Regulatory Agency (ANEEL – Agência Nacional de Energia Elétrica)[2]

ANEEL is responsible for regulating electric energy generation, transmission, distribution, and commercialization. It also plays a significant role in implementing federal government policies and guidelines concerning electric energy exploitation and the utilisation of hydraulic potential. The agency's responsibilities encompass overseeing concessions, permissions, and electric energy services, setting tariffs, resolving administrative discrepancies between stakeholders and consumers, and facilitating the activities related to granting concessions, permissions, and authorizations for electric energy projects and services.

3.2 Stakeholders mapping

3.2.1 Methodology

In addition to the initial contact with key stakeholders, the process of mapping stakeholders involved two phases. In the first phase, CBC's technical team analysed the specificities of the policies to be assessed and identified organizations and groups of stakeholders considered to either be impacted, have interest in, or have influence over those policies. In the second phase, CBC contacted the selected stakeholders (including key stakeholders) to deepen the mapping process and to ensure the best possible identification of stakeholders. This contact was made through email and, in some cases, through virtual calls. The stakeholders were invited to fill a form containing both the stakeholder mapping questions and the questions related to the SD impact assessment initial steps, i.e., about the selected policies and the impact categories.

To identify stakeholders through this second mapping round, the following questions were presented to the stakeholders[3]:

(1) Are there specific communities, groups, or individuals that can be affected by the policy or impact assessment? Which communities, groups, and individuals are more dependent on or have an interest in the policy or its impact assessments?

(2) Are there entrepreneurs or industrial sectors that can be positively or negatively affected by the policy, impact assessment, and other decisions related to the policy? Who, including the companies, have invested in the economic activities that will be affected?

[2] It was still not possible to reach Aneel's representatives. However, in order to provide the highest level of transparency, given that they were mapped as key stakeholders and are considered foundational for the electricity sector, they were still mentioned.
[3] The questions listed in Box 5.2 (pg. 19) of the ICAT Stakeholder Participation Guide were adapted.

(3) Are there projects, experts, research programs, development, conservation, mitigation, or adaptation efforts that need to be considered?

(4) Which government agencies are officially responsible for the policy? Are there national or international bodies involved due to specific laws or treaty obligations?

(5) Are there non-governmental organizations involved in actions or activities related to or impacted by the policy?

(6) Thinking in terms of a just transition, is there any stakeholder that you would recommend to participate in the study?[4]

3.2.2 Mapped stakeholders

As mentioned in the section above, the stakeholder mapping was elaborated for each of the policies selected, namely, Renovabio, Law 14,300 and Energy Auctions (these policies will be further explained in section 4). Selected stakeholders are presented and categorised in Tables 1, 2, and 3 below and for each of them a justification of their relationship with the policy is provided.

Table 1 - Renovabio stakeholders mapping

Family of stakeholder	Stakeholder	Relationship with the policy
National governments, including ministries and agencies responsible for relevant sectors	Ministry of Mines and Energy (MME)	Policy development
	National Agency of Petroleum, Natural Gas, and Biofuels (ANP)	Regulatory agency of the policy
	Energy Research Office (EPE)	Responsible for research related to the energy sector
	Center for Strategic Studies and Management and Management (CGEE)	Provides technical and strategic information
	Secretariat of Decarbonization of the Ministry of Industry, Foreign Trade and Services (MDIC)	Responsible for proposing, implementing, and evaluating public policies that integrate decarbonization strategies.
Individuals	FS Ethanol Industry	Ethanol producers
	Alcoeste	
	Workers	It was suggested the incorporation of the vision of one or more workers to include just transition perspectives
Local governance structures	National Biofuel Policy Committee - RenovaBio Committee (CRBIO)	Responsible for the governance of Renovabio. The committee recommends to CNPE the maximum limits for decarbonization targets

[4] Question (6) was added given the objective to use the lens of the just transition throughout the development of the assessment. It was considered important to highlight within the contact with the stakeholder the necessity to think in terms of the just transition.

	National Council for Energy Policy (CNPE)	Develop the program guidelines and establishes decarbonization targets
	Brazilian Agricultural Research Corporation (Embrapa)	Embrapa is a public company focused on research in the field of agriculture production. They represent the public interest in the field, including the field of biofuels production.
National interest organizations (e.g., workers' unions or people's associations, women's groups)	Mulheres do Biogás (Women in Biogas)	Women of biogas is a network that aims to connect women working with biogas to advocate for women's rights in the sector.
	Diaconia	Social organization (non-profit) defending the human rights of people working in the agricultural production.
Businesses and commercial enterprises (from local cooperatives to international corporations), and business associations	Brazilian Union of Biodiesel and Biokerosene (Ubrabio)	Representation of interests of biodiesel and biokerosene producers
	Brazilian Association of Vegetable Oils Industries (ABIOVE)	Representation of interests of vegetable oil and biodiesel producers
	Brazilian Association of Fuel Importers (ABICOM)	Representation of interests of fuel importers
	Association of Biofuel Producers in Brazil (APROBIO)	Representation of interests of biofuel producers
	National Federation of Fuel, Natural Gas, and Biofuels Distributors (BRASILCOM)	Representation of interests of fuel, natural gas and biofuel distributors
	National Federation of Fuel and Lubricant Commerce (Fecombustíveis)	Representation of interests of fuel retailers
	Union of the Sugarcane Industry (UNICA)	Representation of interests of sugarcane producers
	Brazilian Association of Biogas (Abiogas)	Representation of interests of biogas producers
	CIBiogas	Business group focused on producing knowledge, publishing news and information regarding the biogas sector
	Raízen	Integrated energy company producer of ethanol, fuel, and bioenergy
	Amplum biogas	Company that offers courses and consultancy for people to invest or to work with biogas
	Any fuel distributor	Negative Impact - Mandatory individual target achievement
	Any biofuel producer	Positive Impact - Carbon credit issuance
	Gerdau	Largest steel producer in the country, manufactures parts for the energy sector. Promotes the program "Social Bioenergy" with the aim of converting cooking oil into biofuel
	Comgas	Natural gas distributor
Universities and research organizations, and technical or professional organizations or agencies	Bioenergy Research Group (IEE/USP)	Important research group whose works have helped to shape knowledge on the policy but also and mostly on the biofuels production in Brazil
	National Laboratory of Bioethanol Science and Technology (CTBE)	Researcher for innovations and technologies in the sector

Local banks and credit institutions, and national banks	National Bank for Economic and Social Development (BNDES)	Carbon credit issuance incentive
NGOs that link different communities	Institute for Climate and Society (iCS)	Interested in and influenced by the policy as an NGO that was created with the aim to finance and drive the climate agenda in Brazil
	Arayara	NGO focused in producing knowledge on the climate change which would provide important insights on the just transition perspective given their production throughout the years
Relevant NGOs at the local, national or international levels	Institute E+	It's interested in and influenced by the policy as an NGO that discusses the energy transition in Brazil
	Institute 17 (I17)	NGO focused on the sustainable development goals which has mainly worked with biogas initiatives
Traditional groups	Quilombolas[5]	Given that they are mostly rural communities, they may be impacted by the expansion of biofuels production.
	Landless Workers Movement (MST)	MST may be affected in many different ways by the expansion of biofuels production, including: facing even more difficulties to fight monocultures production; facing difficulties to produce organic food in the surrounding areas of biofuels production and owning even more protagonist in the production of organic food.

Source: Prepared by the authors.

Table 2 - Law 14,300 stakeholders mapping

Family of stakeholder	Stakeholder	Relationship with the policy
National governments, including ministries and agencies responsible for relevant sectors	Ministry of Mines and Energy (MME)	Participated in the process of drafting the law, supported its sanction and participated in the regulatory process by ANEEL, together with CNPE, ONS, EPE and other bodies and entities in the electricity sector, seeking to guarantee legal certainty, transparency and balance in the sector, in addition to encouraging the use of renewable energy sources.
		Launched a public consultation in June 2022, to collect contributions to the guidelines for calculating the costs and benefits of distributed microgeneration and minigeneration.
		MME also has the role of coordinating and implementing public policies related to distributed generation of electricity, in articulation with the other bodies involved.
	Ministry of Environment and Climate Change (MMA)	Supported the approval of the law as it considers an advance for the country's environmental policy and for the energy transition to a cleaner and more sustainable matrix.
	Energy Research Office (EPE)	Conducts studies on the impact of distributed generation on the national electricity system, considering different growth scenarios, costs and benefits, and proposing regulatory alternatives for the sector. Participated in the public consultations promoted by the MME and ANEEL on the legal framework for distributed generation, presenting the results of the studies and contributing suggestions and criticisms to the text of the law.

[5] Quilombolas are the remnants of ethnic-racial groups that share the presumption of black ancestry, specific territorial relationships and a history of resistance to the oppressions suffered by their communities.

		Launched a public consultation in January 2023 to address improvements to the Distributed Micro and Mini-Generation Market Model, which is the company's model for projecting the spread of DG in Brazil.
	National Electric System Operator (ONS)	Contributes to the definition of the rules and technical criteria for the connection and operation of distributed generation to the interconnected electrical system, considering the aspects of safety, reliability, quality and efficiency.
		Participated in the public consultations promoted by MME and ANEEL on the legal framework for distributed generation, presenting the challenges and opportunities of integrating distributed generation into the interconnected electricity system.
Local governance structures	Brazilian Power Trade Chamber (CCEE)	CCEE has an interest in regulating and monitoring the Electric Energy Compensation System (SCEE), whose rules and conditions are established by Law 14.300. The SCEE is the mechanism that allows consumers who generate their own electricity from renewable sources to inject the surplus into the distribution network and receive credits to be deducted from their electricity bill.
	Brazilian Council for Energy Policy (CNPE)	Responsible for establishing the guidelines for valuing the costs and benefits of distributed microgeneration and minigeneration, considering technical, economic, social and environmental aspects (§ 2 of art. 17 of the law).
Agencies with legal jurisdiction over natural resources, land and water	Brazilian Electricity Regulatory Agency (ANEEL)	Established the Normative Resolution No. 482/2012 that started the GD in Brazil and since then it leads and oversees the whole process.
		Regulated the law through Normative Resolution 1059/2023 and is responsible for defining the tariff modalities applicable to consumer units with distributed generation, taking into account the costs and benefits of distributed generation for the electricity system.
NGOs that link different communities	Institute for the Development of Alternative Energies in Latin America (IDEAL)	Works to promote renewable energy and energy integration policies in Latin America. The institute is interested in the law because it is a milestone for the expansion of distributed generation in Brazil especially from solar photovoltaic sources, which is one of the institute's areas of activity.
Relevant NGOs at the local, national or international levels	Institute for Climate and Society (iCS)	The institute was created with the aim of financing and driving the climate agenda in Brazil. It is interested in the law because it encourages the diversification of the Brazilian energy matrix, reducing dependence on fossil sources and increasing the participation of renewable sources, such as solar and wind.
	National Institute for Clean Energy (INEL)	Its mission is to promote the sustainable development of the clean energy sector in Brazil. Supports the law as it brings benefits to consumers, the environment and the economy. INEL considers that the law creates clear and coherent rules for self-generation of renewable energy, especially solar PV, which is the most used by consumer-generators.

	Revolusolar	It aims to promote the sustainable development of low-income communities through solar energy and currently operates in 2 communities in Rio de Janeiro. It is interested in the law because it facilitates access to distributed renewable energy generation for low-income communities through the Social Renewable Energy Program (PERS).
	Liter of Light	It brings solar lighting to communities without access to electricity. The solutions (solar lamppost, lamplight and indoor lighting) are composed of simple materials, such as PET bottles and PVC pipes, as well as solar panel, battery and LED. It has already directly impacted the lives of more than 25 thousand Brazilians, through more than 4,000 solutions, reaching more than 120 communities throughout Brazil.
		It is also interested in the law with regard to the Social Renewable Energy Program (PERS), which encourages the distributed generation of renewable energy for low-income families, cooperatives, associations and solidarity economy enterprises.
	Pólis Institute	It's interested in the policy as an NGO that performs research, advisory work, and policy evaluation activities aiming at fostering local development and contributing to the creation of more equitable, sustainable, and democratic cities.
	Institute E+	It's interested in the policy as an NGO that discusses the energy transition in Brazil.
	Photovoltaics - Federal University of Santa Catarina	It's interested in the policy as an academic group that studies photovoltaic systems integrated into the built environment and connected to the public electrical grid.
National interest organizations (e.g. workers' unions or people's associations, women's groups)	Brazilian Network of Women in Solar Energy (MESol)	It is interested in the law as an initiative that aims to make visible the women who work in the solar energy sector in Brazil, whether in the scientific, technological, business or industrial fields.
	Consumer Council of CEMIG	The Council followed the regulation of the law by ANEEL and seeks to ensure that the interests of consumers are respected and met.
		It is interested in the law because it establishes new rules for distributed generation of renewable energy, which can benefit consumers who opt for this modality.
	Consumer Council of the Concession Area of Energisa Sergipe (CONCESE)	Foundational in the shaping of the policy advocating for final consumers rights.
	Consumer Council of the Concession Area of Energisa Mato Grosso do Sul CONCEN)	Foundational in the shaping of the policy advocating for final consumers rights.
	Consumer Council of Cooperaliança	Foundational in the shaping of the policy advocating for final consumers rights.
Businesses and commercial enterprises (from local cooperatives to international	Brazilian Association of Photovoltaic Solar Energy (ABSOLAR)	It's interested in and influenced by the policy as an organization that represents and promotes the photovoltaic solar sector in Brazil.

corporations), and business associations		Supported Bill No. 5829/2019, which gave rise to Law 14300 and contributed with suggestions and proposals to improve the text of the law and guarantee the rights of consumers who opt for distributed generation.
		Defended the overturning of the veto of the sole paragraph of article 28 of the Law, which now makes it clear that distributed mini-generation projects will also be considered electricity generation infrastructure, for the purposes of framing the benefit of the Special Incentive Regime for the Development of Infrastructure.
		It considers that the law creates a stable and balanced legal framework for the use of clean and sustainable sources such as solar PV.
	Brazilian Association of Distributed Generation (ABGD)	It represents the interests of the distributed generation sector and defended the regulation of the law.
		It also supported Bill No. 5829/2019, which gave rise to Law 14300 and contributed with suggestions and proposals to improve the text of the law and guarantee the rights of consumers who opt for distributed generation.
	Brazilian Association of Electric Energy Distributors (ABRADEE)	It's interested in the policy as an association of energy distributors companies that provides support services to its member companies and facilitates communication and coordination among the Granting Authority, regulatory bodies, parliament, and various stakeholders within the electric sector.
		It actively participated in the discussions and negotiations that led to the approval of the law, defending the interests of energy distributors and consumers who do not adhere to distributed generation.
		It continues to monitor and contribute to the process of regulation of the law by ANEEL, seeking to ensure the economic and financial sustainability of energy distributors and tariff modicity for consumers.
	Greener	It's interested in the policy as a stakeholder that promotes studies regarding the energy sector and consulting to companies related to the sector. It prepared a study showing the importance of having the DG market consolidated in law and believes that the legal framework provides more legal certainty and regulatory stability.
Universities and research organizations, and technical or professional organizations or agencies	Climate Center - COPPE/ UFRJ	It is a research center that works in the area of climate change, with a focus on mitigation and adaptation. It is interested in the law because it encourages distributed generation of renewable energy, which is a way to reduce greenhouse gas emissions and contribute to sustainable development.
Individuals	Consumers of the Low-Income Residential Subclass (Law 12.212/2010)	It was suggested the inclusion of one/more final consumers who benefit from the subsidy directed to low-income households. They are left behind energy transition from the DG perspective and their interests should be considered, when thinking in terms of just transition.

Source: Prepared by the authors.

Table 3 - Energy auctions stakeholders mapping

Family of stakeholder	Stakeholder	Relationship with the policy
NGOs that link different communities	Institute for the Development of Alternative Energies in Latin America (IDEAL)	It's interested in and influenced by the policy as an organization that works to promote renewable energies and energy integration policies in Latin America.
Local governance structures	Brazilian Council for Energy Policy (CNPE - Conselho Nacional de Política Energética)	As an advisory body to the President of the Republic for the formulation of energy policies and guidelines, it has played a role in shaping the policy. Its practical responsibilities are outlined in the law 10,848/04, which includes proposing general criteria for supply assurance to ensure a suitable balance between supply reliability and cost-effectiveness of tariffs and prices.
	Brazilian Power Trade Chamber (CCEE - Câmara de Comercialização de Energia Elétrica)	Oversees the auction process and acts on administrative functions regarding the energy auctions.
Agencies with legal jurisdiction over natural resources, land and water	Brazilian Electricity Regulatory Agency (ANEEL - Agência Nacional de Energia Elétrica)	Oversees the auction process, publishes the notice and contract drafts, and acts on administrative functions regarding the energy auctions;
		Formulates related regulation;
		Established the Normative Resolution No. 1009/2022 that establishes the rules related to energy procurement by agents in the regulated and free markets.
Relevant NGOs at the local, national or international levels	Institute for Climate and Society (iCS - Instituto Clima e Sociedade)	It's interested in and influenced by the policy as an NGO that was created with the aim to finance and drive the climate agenda in Brazil.
	Pólis Institute	It's interested in the policy as an NGO that performs research, advisory work, and policy evaluation activities aiming at fostering local development and contributing to the creation of more equitable, sustainable, and democratic cities.
	Institute E+	It's interested in and influenced by the policy as an NGO that discusses the energy transition in Brazil.
National interest organizations (e.g. workers' unions or people's associations, women's groups)	National Front of Energy Consumers	It's interested in the policy as an association of consumers that engages in discussions concerning the future of the Brazilian electrical sector.
	Consumer Defense Institute (IDEC - Instituto de Defesa do Consumidor)	As an organization that advocates for consumer interests, it holds a vested interest in the policy.
	AS-PTA Family Agriculture and Agroecology (AS-PTA Agricultura Familiar e Agroecologia)	It's interested in the policy as an organization that works towards strengthening family farming and promoting sustainable rural development in Brazil and has supported the March for Women's Lives and Agroecology, which denounces the impacts of solar and wind energy in Paraíba.
Businesses and commercial enterprises (from local cooperatives to international corporations), and business associations	Brazilian Association of Electric Energy Traders (ABRACEEL - Associação Brasileira de Comercializadores de Energia Elétrica)	It's interested in the policy as an organization of energy traders that disseminates the best practices and national and international experiences in energy market regulation and development, explores and discloses the best practices in energy trading, and advocates for the enhancement of legal and regulatory frameworks.

	Brazilian Association of Electric Energy Distributors (ABRADEE - Associação Brasileira de Distribuidores de Energia Elétrica)	It's interested in and influenced by the policy as an association of energy distributors companies that provides support services to its member companies and facilitates communication and coordination among the Granting Authority, regulatory bodies, parliament, and various stakeholders within the electric sector.
	Brazilian Association of Photovoltaic Solar Energy (ABSOLAR - Associação Brasileira de Energia Solar Fotovoltaica)	It's interested in and influenced by the policy as an organization that represents and promotes the photovoltaic solar sector in Brazil.
	Brazilian Wind Energy Association (ABEEólica - Associação Brasileira de Energia Eólica)	It's interested in and influenced by the policy as an organization that represents and promotes the wind energy sector in Brazil.
	Brazilian Association of Thermoelectric Generators (ABRAGET – Associação Brasileira de Geradoras Termelétricas)	It's interested in and influenced by the policy as an association of thermoelectric generators influenced by the dynamic of the Brazilian electricity sector. Is also a sector with significant influence in the energy sector.
	Brazilian Association of Electric Power Transmission Companies (ABRATE - Associação Brasileira das Empresas de Transmissão de Energia Elétrica)	It's interested in and influenced by the policy as it comprises companies that are concessionaires and licensees of electric power transmission.
	Greener	It's interested in the policy as a stakeholder that promotes studies regarding the energy sector and consulting to companies related to the sector.
Universities and research organizations, and technical or professional organizations or agencies	Wind Energy Observatory - Post-Graduate Program in Geography at the Federal University of Ceará (Observatório da Energia Eólica - Programa de Pós-Graduação em Geografia da Universidade Federal do Ceará)	It's interested in the policy as an academic group that studies wind energy and its impacts in Northeast Brazil.
	Photovoltaics - Federal University of Santa Catarina (Fotovoltaica - Universidade Federal de Santa Catarina)	It's interested in the policy as an academic group that studies photovoltaic systems integrated into the built environment and connected to the public electrical grid.
	Electric Sector Study Group (GESEL - Grupo de Estudos do Setor Elétrico)	It's interested in the policy as an academic group that conducts research and economic analyses on both the Brazilian and global electricity sectors.

Local banks and credit institutions, and national banks	Brazilian Development Bank (BNDES - Banco Nacional de Desenvolvimento Econômico e Social)	The BNDES is an active stakeholder that both influences and is influenced by energy policies. This is exemplified through its financing of various energy generation methods such as wind and biomass, alongside its support for energy transmission, distribution, and rationalisation. Moreover, the BNDES provides assistance to both federal and state governments in structuring concessions for private enterprises and public-private partnerships, offering support to a range of ventures that have been tendered through public auctions.
National governments, including ministries and agencies responsible for relevant sectors	Ministry of Mines and Energy (MME - Ministério de Minas e Energia)	Influences the policy as a ministry responsible for formulating guidelines for planning the energy sector. The MME coordinates the energy auctions, establishes a schedule for energy auctions, and has practical responsibilities in the auctions processes.
	Energy Research Office (EPE - Empresa de Pesquisa Energética)	Influences the policy as it is responsible for delivering to the MME studies and research to support the energy sector planning. Has practical duties in the auctions processes, such as providing information about the projects eligible to participate in the auction.
	National Electric System Operator (ONS - Operador Nacional do Sistema Elétrico)	The ONS is an active stakeholder in the energy sector as it operates the National Interconnected System and ensures its operational security, thus being directly interested in, influenced by the policy, as well as an important party in the process.
	Ministry of Environment and Climate Change (MMA - Ministério do Meio Ambiente e Mudança do Clima)	Influences the policy as a ministry that is directly involved in climate and environmental policies, also being an interested stakeholder. It is responsible for environmental licences, an essential grant to energy ventures operation.
	Center for Strategic Studies and Management (CGEE - Centro de Gestão e Estudos Estratégicos)	Is an important stakeholder that provides studies and research in the fields of education, science, technology, and innovation, which can influence policies and the energy sector.

Source: Prepared by the authors.

Regarding the quantitative perception about the level of influence on the policies and to what extent they are affected by them, it was crucial to include each of the stakeholders' self-perception in order not to produce biased results. Considering that the forms are still opened for continuous contribution and that it was not possible to engage all mapped stakeholders yet, Output 8 ('Report 'Results of the sustainable development impacts assessment') will provide more detailed information and include the Stakeholder matrix or the Stakeholder Rainbow as recommended in the Stakeholder Participation Guide (pg. 20 and pg. 22).

3.2.3 Engagement plan

The first contact established with the mapped stakeholders was through email, presenting the project's goal, highlighting the partnership between ICAT and CBC throughout phases 1 and 2 of ICAT Brazil Project, and explaining their importance to the assessment, whether because they are

impacted by the selected policies or because they are interested and invested in them. Beside this main information, the email contained links to three different forms (for each of the policies selected, see section 3.2.1.), through which they were invited to contribute to mapping stakeholders (as presented in the previous section) and validate the impact categories selected to be included in the assessment (see section 5).

Figure 3 illustrates the layout of the flyer used to invite the stakeholders to engage with the ICAT Project Phase 3.

Figure 3 - Flyer sent to stakeholders
Source: Elaborated by the CBC's communication team.

Besides the contact through email, those stakeholders with which CBC had already an established contact, relationship or partnership were also contacted directly through calls. CBC's technical team also offered the stakeholders guidance for the filling the forms, indicating that they were available to provide support through calls and meetings.

In this first assessment, the level of participation of stakeholders was expected to be low (Table 3.1, pg.9 of the ICAT Stakeholder Participation Guide), given that the objective was both to inform them with the project existence, goals and main expected outcomes and to validate very specific information regarding the chosen policies through consultation.

The next steps of the project, however, are expected both to involve and collaborate with the stakeholders, reaching a mid to high level of stakeholder participation. These plans include a workshop on Just Transition and a workshop on the Sustainable Development Assessment.

4 Selection of policies

The study approached key stakeholders of the energy sector in Brazil (see section 3.1 and 3.2) to select the policies to be assessed using ICAT Sustainable Development Assessment Guide. These policies were selected in accordance with the main goal of the study and considering the energy sources chosen to be assessed (solar PV, wind and biofuels). In the next subsection further details on the policies, their importance to the national energy system and their principles are presented.

4.1 National Biofuel Policy – RenovaBio

Designed to be part of the Brazilian National Energy Policy, RenovaBio was established by the Law 13,576/2017. Arising from the necessity to meet Brazil's commitment under the Paris Agreement, the main objective of the law is to promote the expansion of biofuels in the Brazilian energy matrix.

To analyse Renovabio, it is important to consider Brazil's historic role in the production of biofuels and the associated technology. Brazil has been a major producer of biofuels since the 1970s, a period when the world was facing international oil crises. At the time, the Brazilian "Proálcool" program was developed, an initiative to promote the production and use of fuel alcohol, which encouraged sugarcane production and the use of ethanol-powered cars. After the 1990s, biofuels once again became prominent in Brazil's policy arena, stimulated by the growing discussions on sustainable development and the production of flex-fuel vehicles (capable of running on gasoline and ethanol).

Currently, Brazil is the second-largest producer and consumer of biofuels, mostly ethanol and biodiesel. Regarding ethanol, the country ranks as the second-largest producer, accounting for approximately 27% of the global production. As for biodiesel, Brazil holds the third position in the world, representing 12.2% of the global production. According to National Agency for Petroleum, Natural Gas and Biofuels (ANP), Brazil produced 30.7 billion litres of ethanol and 6.3 billion litres of biodiesel in 2022.

Table 4 - Global biofuels producers and main feedstocks

Biofuel	Country	Global production (%)	Main feedstocks
Ethanol	United States	48.2	Corn
	Brazil	26.7	Sugarcane
	China	8.3	Corn, cassava
	India	2.3	Molasses
	Canada	1.6	Corn, wheat
Biodiesel	United States	18.1	Soybean oil, waste cooking oil
	Indonesia	15.0	Palm oil
	Brazil	12.2	Soybean oil, waste cooking oil

	Argentina	5.0	Soybean oil
	Thailand	3.8	Palm oil
The European Union represents the highest percentage of biodiesel global production (32%). However, for this table each country was considered separately.			

Source: Adapted from Northeast bank (2022).

Therefore, RenovaBio is a state policy that acknowledges the strategic role of all types of biofuels for the country and their contribution for national energy security and the mitigation of greenhouse gas emissions. The policy consists of three strategic pillars (as illustrated in Figure 4): decarbonization targets; certification of biofuel production; and decarbonization credits (CBIOs).

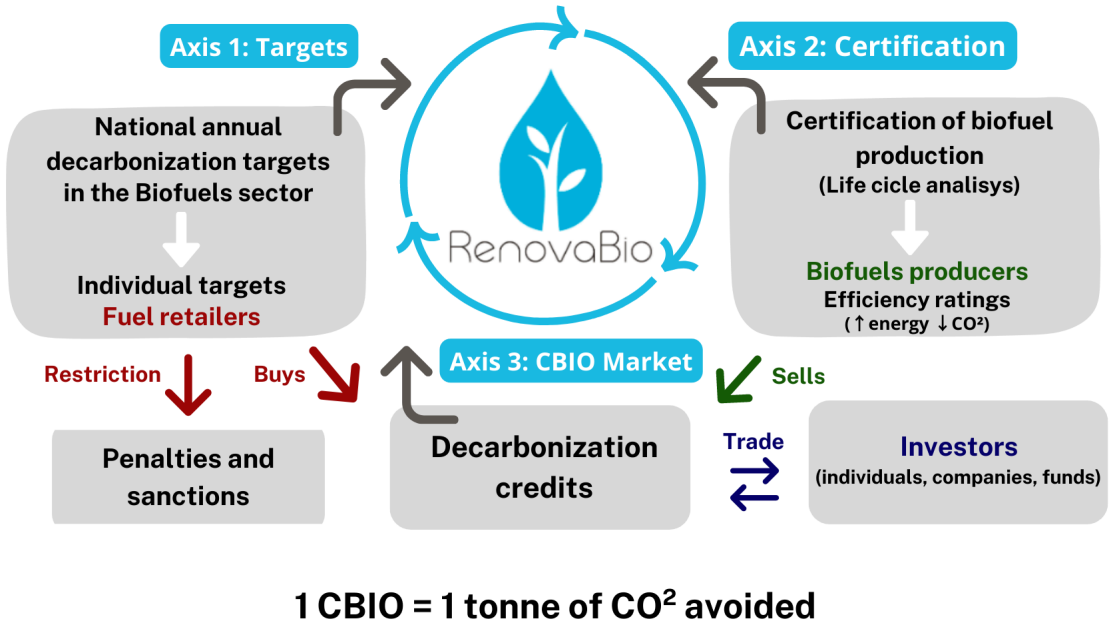


Figure 4 - Conceptual Framework of RenovaBio
Source: Adapted from MME (2023).

According to ANP, the decarbonization targets are the primary instrument of RenovaBio. This thematic strand establishes national annual decarbonization targets for the fuel sector, which incentivizes the expansion of biofuel production and its consumption.

Under the second pillar, RenovaBio sets sustainability criteria for biofuel production, encouraging producers to adopt sustainable practices, which includes topics such as land use, social aspects and environmental impacts. These sustainability measures improve the generation of CBIOs, which represent the reduction of one tonne of CO2e each. The program promotes the use of low-carbon fuels by implementing a scoring system that rewards biofuel producers based on their environmental performance. Producers that exceed the established sustainability criteria earn additional CBIOs, which can be traded in the market.

RenovaBio also encourages the development of new technologies, research, and investments in the biofuels sector. It aims to attract private investments and stimulate competition in the market while fostering the growth of renewable energy sources. The programme provides visibility and stability to the biofuels industry by setting emission reduction targets for the next decade.

Overall, the policy primarily focuses on the biofuels sector. However, the expansion of biofuels can influence the electric energy system through the expansion of biomass for energy production. The biofuel production process generates surplus biomass that can be used for electricity generation. According to the Energy Research Office (EPE), the Brazilian bioelectric sector has an estimated growth potential of 55% by 2030, driven by RenovaBio and a favourable business environment.

With an installed capacity of 17,082 MW, biomass energy – produced from vegetal or animal waste – is the fourth-largest source of electricity in Brazil, accounting for approximately 8.8% of the country's installed power. In 2022, sugarcane biomass was responsible for 72% of all installed capacity in the bioelectric sector, generating a total of 18.4 thousand GWh in that year. The significant participation of sugarcane biomass is due to the prominence of ethanol in the Brazilian biofuels market.

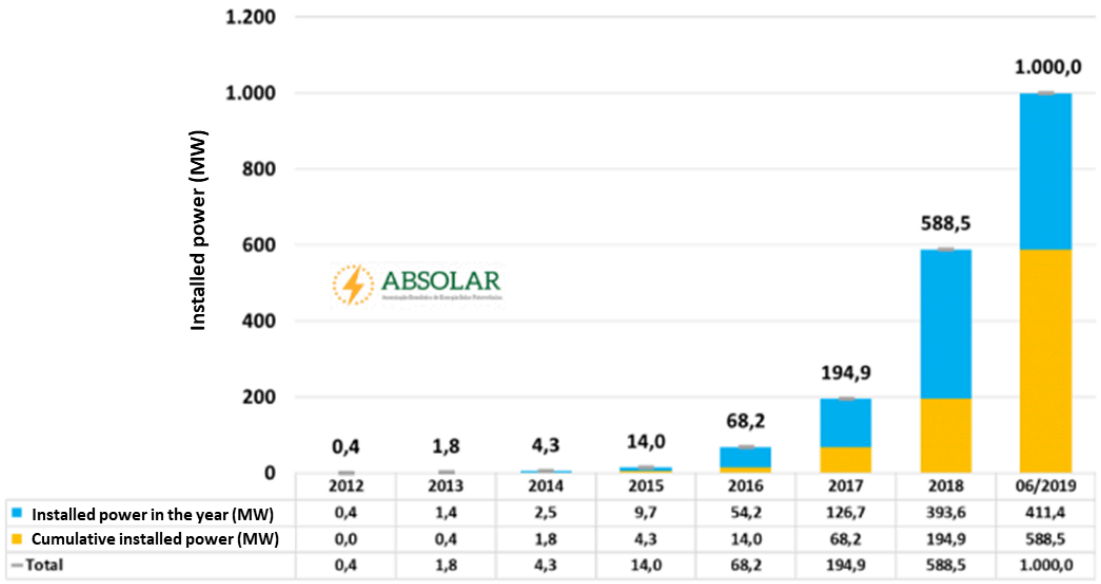
RenovaBio's significance for the energy sector lies in its ability to promote renewable energy sources, reduce emissions, foster sustainable practices, attract investments, and contribute to rural development. Furthermore, the policy contributes to the expansion of biomass energy production in the bioelectric sector.

4.2 Distributed Generation Legal Framework – Law 14,300

Distributed generation in Brazil is a modality of power generation that allows final consumers to generate their own energy while still connected to the national grid. This modality is valid for several renewable energy sources, such as solar, wind and biomass.

In 2012, the Normative Resolution n. 482 defined the regulatory conditions for distributed generation in the Brazilian energy matrix and established the Electric Energy Compensation System (SCEE). Since then, Brazilian consumers can generate their own electricity from renewable sources or qualified cogeneration and can supply the surplus to the distribution grid of their locality, for subsequent compensation of the verified energy consumption. The rules applicable to Distributed Microgeneration and Minigeneration of Electric Energy (MMGD) were amended by the Brazilian Electricity Regulatory Agency (ANEEL), with improvements that modified, among other provisions, the installed power limits and the modalities for participation in the SCEE. This occurred through Normative Resolutions n. 687 of 2015 and n. 786 of 2017.

Since the regulatory framework of 2012, Brazil has taken an important step towards energy decentralisation and the growth of solar PV. Once published, the number of new distributed generation systems increased from 7 in 2012 to 110,299 in 2019. Currently, solar photovoltaic technology is used in more than 98% of all distributed generation connections in the country. The figure below illustrates the growth in relation to installed power over the same period.



	2012	2013	2014	2015	2016	2017	2018	06/2019
Installed power in the year (MW)	0,4	1,4	2,5	9,7	54,2	126,7	393,6	411,4
Cumulative installed power (MW)	0,0	0,4	1,8	4,3	14,0	68,2	194,9	588,5
Total	0,4	1,8	4,3	14,0	68,2	194,9	588,5	1.000,0

Figure 5 - Installed capacity (MW) of solar photovoltaic DG in Brazil
Source: Adapted from ABSOLAR (2019).

Due to the significantly high and unexpected expansion of solar DG from 2012 to 2019, ANEEL and the distributors proposed another modification to the tariff rules, changing the compensation system. The text proposed the end of tariff parity, with the compensation of only a percentage of the energy credit in favour of the consumer, which varied according to the proposed scenarios. The argument for this change was that the incentive could be generating a cross subsidy within the electricity system. This proposal was seen as extremely unfavourable by the solar energy sector, bringing the risk of making investments unfeasible and creating barrier to the segment, which was still small compared to the total consumer market in Brazil.

The reaction of the solar sector to this proposal led to the drafting of a bill to establish a legal framework for DG, which would guarantee legal security to the market, preventing abrupt changes in regulation from affecting the sector. Then Bill 5,829/2019 was presented, proposing the creation of the legal framework for distributed micro and mini generation. The text was processed for two years in Congress and underwent several changes, until a consensus was established between the different agents of the power sector. The final proposal was approved by the Senate and the Chamber of Deputies in December 2021 and sanctioned by the President of the Republic in January 2022, converting PL 5,829/2019 into Law 14,300.

The law establishes some rules for the installation and self-consumption of solar energy, which means that the legislation grants consumers the right to produce their own electricity through renewable sources. In addition to the legal framework for micro and mini-generation of electricity, the law establishes some changes to the Electric Energy Compensation System (SCEE), created by Resolution n. 482, and initiates the Social Renewable Energy Program (PERS).

The SCEE concerns energy credits, which work as follows: if the solar energy system generates surplus energy, this energy is "loaned" to the distributor and returned in the form of credits. In this way, the consumer can use these credits to offset the electricity consumption of the consumer units participating in the system.

These credits, previously not charged, started to be taxed after the Law. This is because it is necessary to cover expenses in relation to infrastructure and investments in the power grid, such as Fio B (costs of the transmission lines from the distributor to the establishments). In addition, this system takes into account environmental, technical and social attributes in the calculation of energy compensation. The law foresees that the transition to this taxation system will happen gradually, increasing the rate each year: 15% after 2023; 30% after 2024; 45% after 2025; 60% after 2026; 75% after 2027; and 90% after 2028.

However, these rules provided for in Law 14,300 are only valid for customers who chose to use solar energy after January 2023. For customers who had installed the solar system before this date, the new rules will enter into force after 2045.

The modalities of participation in the SCEE are:

- Local self-consumption – when energy is generated and compensated at the same location where the MMGD is installed;
- Remote self-consumption – when the energy can be generated in one place and compensated in another, but in consumer units of the same holder;
- Distributed generation in multiple consumer unit developments – the energy generated can be shared among the condominium owners in percentages or order of priority defined by the consumers themselves; and
- Shared generation – several interested parties may join together through a consortium, cooperative, voluntary civil or building condominium or any other form of civil association, established for this purpose to install one or more MMGD plants and use the energy generated to offset the consumption of all participants.

After extensive discussion with sector agents and stakeholders, the Law was regulated by ANEEL in February 2023, through Normative Resolution n. 1,059/2023. Even before the publication of the Law, and after its publication, there was extensive dialogue with all parties involved, evidenced by the

holding of several meetings with consumer-generators, consumers, distributors, sector associations and parliamentarians. As a result of this intense debate, ANEEL launched three public consultations in 2022 on the regulation of the MMGD Legal Framework.

Since the publication of Law 14,300/2022, more than 780,000 connections of distributed micro and mini generation have already been installed throughout Brazil, totalling more than 7.6 GW of installed power (ANEEL data from February 2023). These numbers represent a 60% increase in the connections and a 54% increase in installed capacity of solar DG compared to the 13 months prior to the publication of the Law.

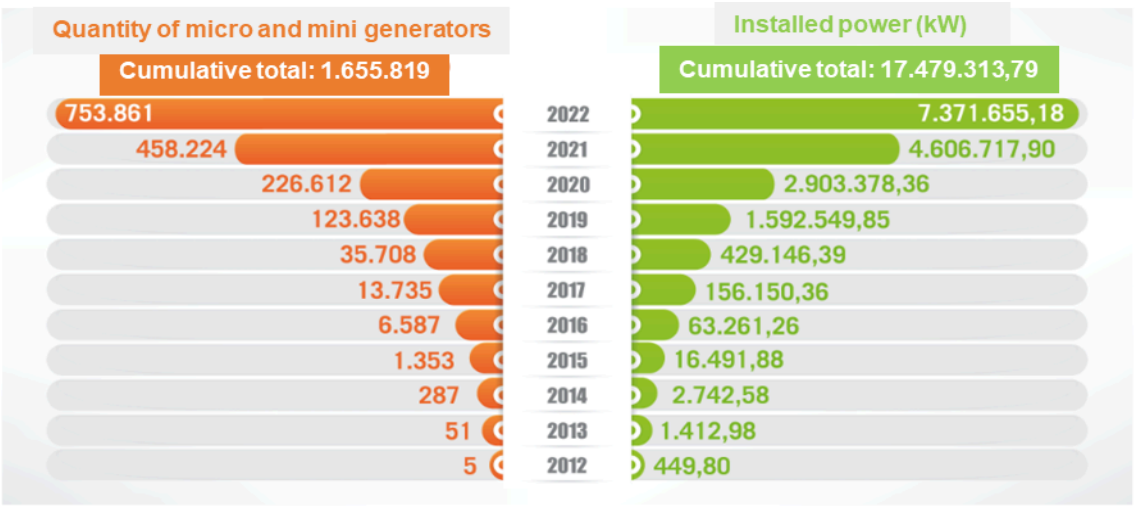


Figure 6 - Evolution of distributed generation growth
Source: Adapted from ANEEL (2023).

The Ministry of Mines and Energy launched in April 2022 the Ten-Year Energy Expansion Plan 2031 (PDE 2031), whose main objective is to indicate what are the plans and perspectives for the energy sector in Brazil over the next ten years (2022 to 2031). The document estimates that the distributed micro and mini-generation segment will reach 37 GW of installed power in Brazil by 2031, benefiting just over four million generation units. The study prepared by the Energy Research Office also highlights that solar will remain the main source in the segment, accounting for about 93% of the entire expansion – just over 34 GW out of the 37 GW projected for the entire modality.

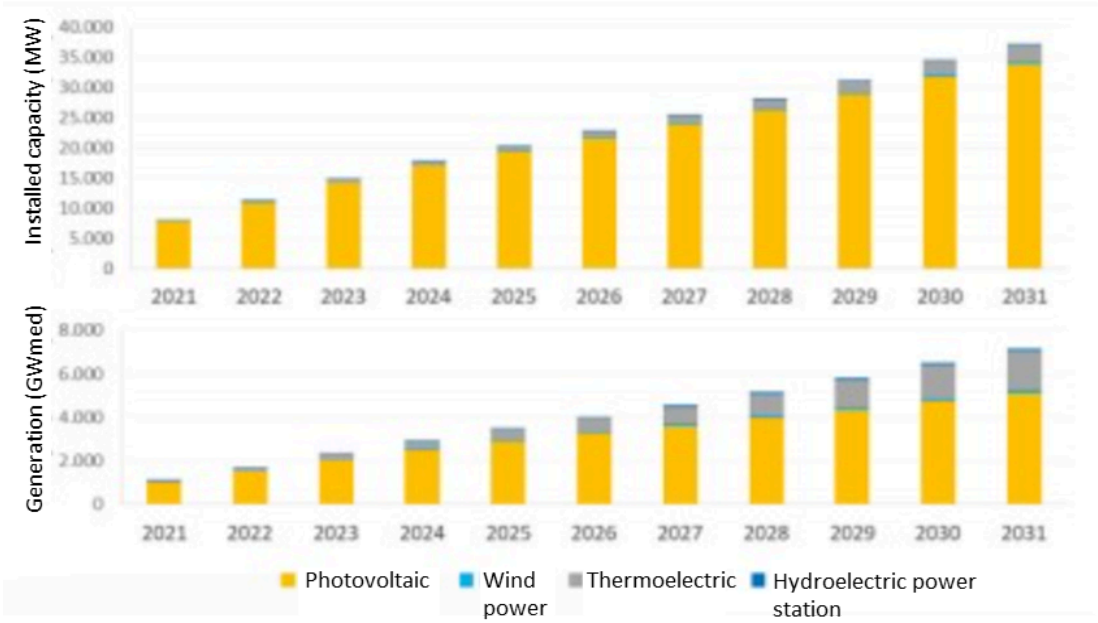


Figure 7 - Capacity and energy expansion of MMGD
Source: Adapted from MME/PDE 2031 (2022).

The projection presented by PDE 2031 for DG represents an increase of about 20% compared to PDE 2030. In this scenario, the segment, together with self-production, will represent 17% of the national electricity matrix, estimated at 275 GW at the end of the ten-year horizon.

4.3 Energy auctions

The Brazilian energy market can be divided into the regulated market and the free market. In the first one, residential and small business customers, known as the captive customers, purchase energy from their local distribution company and do not directly negotiate the acquisition with energy generation and distribution companies. On the other hand, free consumers, who have a minimum demand of 1.5 MW, have the permission to negotiate their electricity supply in the open market directly with energy generators or sellers. This negotiation, however, is still coordinated by national entities.

Energy trading in the regulated market is conducted through auctions, wherein distribution companies acquire long-term energy contracts to meet the demand of captive consumers. The auctions are based on the criterion of lower tariffs to determine the winners. The Ministry of Mines and Energy is responsible for coordinating these auctions, while the Brazilian Electricity Regulatory Agency and the Brazilian Power Trade Chamber (CCEE) are the entities that oversee the auction process.

The adoption of auctions as the primary mechanism for energy trading in the regulated market began with the second reform of the Brazilian energy sector and the enactment of Law 10,848 in March 2004. Other regulations related to energy auctions exist, such as ANEEL Normative Resolution

n. 1,009/2022, which establishes the rules for energy procurement by agents in both the regulated and free markets.

Different types of auctions are conducted, including New Energy Auctions, Existing Energy Auctions, Renewable Energy Auctions, Reserve Energy Auctions, and Adjustment Auctions. The first energy auction was an Existing Energy Auction held in 2004. Since then, there were 26 rounds of Existing Energy Auction, 32 rounds of New Energy Auctions, 9 rounds of Reserve Energy Auctions, 3 rounds of Renewable Energy Auctions, 13 rounds of Adjustment Auctions, and 5 other auctions. These auctions have facilitated the procurement of a total of 10,092.88 TWh[6] since their inception.

The energy auctions encompass a diverse range of energy sources, with hydroelectric, natural gas, and wind being the predominant sources negotiated. Considering exclusively renewable sources, wind energy comprises a significant portion, with a total of 1,426.17 TWh[7] being traded in energy auctions, accounting for approximately 17% of the overall traded amount. The wind power plants associated with these contracts have a combined capacity of 330.95 GW[8], representing 11% of the total capacity of all participating plants in the auctions. Moreover, 90% of the capacity of plants and of the energy negotiated through auctions are in Northeast Brazil.

Wind power represents 13.61% of Brazil's energy matrix. The granted capacity for wind power in 2025 is around 53 GW, considering operational, under construction and planned plants. Currently, there are 947 operational wind plants, 146 under construction, and 483 planned for construction. Almost all wind power plants are located in Northeast Brazil. Out of the total operational plants, 844 are situated in this region, with 285 in Bahia, 16 in Maranhão, 36 in Paraíba, 109 in Piauí, 1 in Sergipe, 100 in Ceará, 42 in Pernambuco, and 255 in Rio Grande do Norte. The total granted capacity of wind power plants in Northeast Brazil for 2025 is 50,255,244.14 kW, which represents 95% of the total capacity granted for the country.

[6] This value pertains to all situations from the auctions that have taken place, not only those without any pending matters.
[7] See footnote 6.
[8] See footnote 6.

Figure 8 - Wind power plants in Northeast Brazil
Source: ANEEL.

The Energy Auctions play a crucial role in the Brazilian energy sector by facilitating the procurement of energy to meet the captive consumers demand and also by ensuring energy security in the National Interconnected System. Furthermore, they have driven the expansion of renewable energy sources, particularly wind power, and have contributed to a clean electricity matrix.

4.4 Summary of the selected policies

Renovabio, Law 14,300 and Energy Auctions were selected in this study to assess the sustainable development impacts of policies that are currently driving the expansion of the VRE and biomass in Brazil. A summary of the three selected policies is presented in Table 5. In terms of Sustainable Development Goals, the three policies contribute directly to SDG 7 (Affordable and Clean Energy), by stimulating VRE and biomass production in Brazil, and to SDG 13 (Climate Action), through GHG mitigation due to a cleaner energy production. The policy also contributes to SDG 8 (Decent Work and Economic Growth) by stimulating job creation in the sector, SDG 9 (Industry, Innovation, and Infrastructure) through the development and growth of the national industry, and SDG 12 (Responsible Consumption and Production) by driving the development of sustainable energy production. Nevertheless, additional links of these policies with other SDGs may be identified as the assessment is conducted.

Table 5 - Summary of the selected policies

Title of the policy or action	Renovabio	Law 14,300	Energy auctions
Type of policy or action	● Regulations and standards ● Emissions trading programmes	● Regulations and standards	● Implementation of technologies, processes or practices
Description of specific interventions	● Establishment of a ten-year national emission reduction targets for the fuel matrix ● Biofuel Certification: a certifying firm accredited by the ANP certifies the biofuel production or importation and assigns grades according to the energy efficiency ● CBIO: carbon-reduction credit emitted by an inspection company to fuel producers/ importers, according to their energy efficiency grade	● Establishment of a legal framework to distribution generation in the electric system ● Electric Energy Compensation System (SCEE): the excess energy generated is transformed into credits for the consumer to compensate for the electricity from the consumer units ● Social Renewable Energy Program (PERS): financing of photovoltaic and other renewable energies for low-income consumers	● Conduction of Energy Auctions by governmental entities providing a space to distribution companies negotiate and by energy with producing companies
Status of the policy or action	● Implemented	● Implemented	● Implemented
Date of implementation	● December 2019 (definition of individual targets) ● April 2020 (CBIOs stock market opened, and negotiations began)	● January 2022	● 2004 (first energy auction)
Date of completion (if applicable)		● 2029: end of the gradually increase of the tax ● 2045: end of free tariffs for solar systems implemented before January 2023	
Implementing entity or entities	● EPE, RenovaBio Committee, CNPE and ANP	● Decree by National Congress and implementation by Presidency	● MME, ANEEL, EPE, CCEE

Objectives and intended impacts or benefits of the policy or action	• Contributes to meeting the country's commitments under the Paris Agreement • Contributes with the appropriate relation of energy efficiency and reduction of greenhouse gas emissions in the production, commercialization, and use of biofuels, including life cycle assessment mechanisms • Promotes the adequate expansion of production and use of biofuels in the national energy matrix, with emphasis on the fuel supply regularity • Contributes with predictability to the competitive participation of the different biofuels in the national fuel market	• Creation of a legal framework for distributed generation in the electric system, particularly regarding the tariff compensation system	• Facilitates the procurement of energy by distribution companies that have to meet the captive consumers demand and provide security of the National Interconnected System (SIN)
Level of the policy or action	• National level	• National – applies to all of those connected to the National Interconnected System	• National
Geographic coverage	• National level	• National	• National
Sectors targeted	• Energy • Transport	• Utilities • Final consumers • Consortiums and cooperatives of final consumers	• Energy • Wind power
Other related policies or actions		• Res 482 (Aneel, 2012) • Res. 687 (Aneel, 2015)	• ANEEL Normative Resolution 1009/2022 • Law 10,848/2004

Source: Prepared by the authors.

5 Impact categories and indicators

Considering that the main objective of the study is set on a horizon of 2050, the study is elaborated through an ex-ante assessment, ideally using both quantitative and qualitative approaches.

For the quantitative approach, given that these policies represent main shifts in the Brazilian energy policy regulatory framework, the study will apply the deemed estimates method, which, according to the ICAT SD Assessment Guide, is a simpler measurement used to assess common or homogeneous policies, where deemed estimate values are reliable and, thus, no baseline should be estimated. Given that the policies have already been implemented, for the quantitative approach, ex-post assessment will also be helpful to, aligned with the projections of the expansion performed and reported in Output 3 of the ICAT Project, provide the best assumptions for the horizon of 2050.

As for the qualitative approach, the assessment will start with a consistent literature review to be discussed, questioned and validated with the mapped stakeholders. All impact categories will be qualitatively assessed, including those that will also be quantified. The engagement with the stakeholders will, thus, play a major role in assessing these impact categories. The development of the Workshop on Just Transitions (see Part 2) will be used as an engagement opportunity as there is a common sense of urge of the selected stakeholders to discuss and address the topic.

The following tables present the chosen impact categories and the suggested indicators for each of the policies under assessment. It is important to emphasise that, because the assessment integrates the methodology described in the ICAT Stakeholder Participation Guide, it establishes a level of continuity in the dialogue with the mapped stakeholders. This would ultimately mean that, in case any of them reaches CBC technical team to provide inputs considered foundational for the assessment, such as the inclusion of a new impact category, they will also be included.

Table 6 - Impact categories and indicators for the RenovaBio policy

Dimension	Impact Category Group	Impact Category	Hypothesis	Feasible to quantify?	Indicator to quantify
Environment	Air	GHG mitigation	The incentive to produce and consume biofuels leads to lower emissions	Yes	Number of CBIOS emitted (Deemed estimates method)
		Air pollution	Lower GHG emissions can improve air quality	Yes	Air quality index
			Bioelectricity production generates emissions	Yes	CO2/kWh generated
		Supply chain	Production closer to distribution leads to lower emissions	No, due to lack of data. Many assumptions would be needed, such as: the distance; emissions per km (varies according to fuel and vehicle).	
	Land	Land use change	The expansion of biofuel production implies more land being allocated for the cultivation of sugarcane (and other crops).	Yes	Agricultural Expansion Rate
		Biodiversity	RenovaBio can have a relationship with biodiversity loss due to the expansion of biofuel production.	Yes	Land Use Sustainability Index Land Use Conversion Index Habitat Fragmentation Index
		Soil pollution	The expansion of biofuels production can increase soil pollution due to monoculture cultivation and the intensive use of fertilisers and pesticides	Yes	Soil quality index
		Indirect deforestation	The expansion of biofuels production can end up pushing other activities, such as livestock farming, into the Amazon and Cerrado biomes	No, because it is an indirect effect strongly connected to other policy arenas. The assessment could not conclude that these other activities were indeed incentivized by Renovabio.	
		Diversity of feedstock	The kind of feedstock grown will have different environmental impacts	Yes	Diversity rate x monocultures

Society	Family's budget	Increase in the price of food	Indirect relationship with the increase in the price of food products due to competition for agricultural land between biofuel production and food production.	No. The assessment could not conclude that the land used to grow crops such as soy would otherwise be used to produce food (ex.: it could be used for solar farms).	
		Income generation	Increased income generation for producers, suppliers, and companies involved in the production chain.	Yes	Per capita income of the agricultural sector
	Jobs	Creation of jobs	The expansion of ethanol production requires labour at various stages of the production chain, from the cultivation of raw materials to the production, distribution, and commercialization of biofuels.	Yes	Employment rate of the sector
	Family farming or Small-scale agriculture.	Change in the scale of family farming practices in the biofuels production	RenovaBio increased the participation of family farming in the supply feedstock	No, due to lack of data on family farming production and their connection to Renovabio policy.	
Economy	Dependency	Oil prices oscillations impact	Incentive to the consumption of biofuels that are not directly linked to global oil prices in the market.	No, due to the qualitative nature of the indicator.	
		Macroeconomic stability	By incentivising the production and consumption of biofuels, the program reduces the country's dependence on fossil fuel imports, which can help balance the trade account and reduce the current account deficit.	Yes	Consumption of biofuels/GDP
	Dynamism	Investments	The policy stimulates investments and innovations in the biofuel sector given that Biofuel producers are incentivized to innovate to achieve a higher rating.	No, due to the qualitative nature of the indicator.	
		Exportation	Higher exportation of biofuels instead of commodities	Yes	Rate of exports

Source: Prepared by the authors.

Table 7 - Impact categories and indicators for the Law 14,300

Dimension	Impact Category Group	Impact Category	Hypothesis	Feasible to quantify?	Indicator to quantify
Environment	Air	GHG mitigation	Promoting distributed generation (GD) implies lower emissions from the energy sector.	Yes	kgCO2e/year saved
		Cities' air quality	Promoting distributed generation (GD) implies a reduced need for the use of thermal power.	No, due to the lack of data on municipal emissions related to power generation.	
	Waste	Electronic waste	The policy will lead to a higher quantity of e-waste (electronic waste).	Yes	Quantity of discarded solar panels per year.
	Land	Land use	By favouring energy generation in residential buildings and consumers' premises, it implies a reduced need for land use in centralised power generation.	Yes	Saved land use (m^2/year)
Society	Access to clean and reliable energy	Access to clean, reliable and affordable solar energy	The policy allows people to have more freedom to choose the source of energy they consume.	No, due to the qualitative nature of the indicator.	
		Less incentives	The policy inhibits the momentum of DG and the expansion of solar energy because it finishes with the parity criteria[9]	Yes	
		Social inequality	The policy increases social inequality within the energy system because it is only accessible for richer people.	Yes	Investment/household income from different social groups
	Knowledge	Energy literacy	The policy enhances knowledge on the relationship between energy production/ consumption and its environmental impacts	No, due to the qualitative nature of the indicator.	

[9] Section **4.2** provides an explanation to this hypothesis.

	Jobs	Creation of jobs	The policy increases job offers	Yes	Added jobs/MWh
		Requirement of higher qualification	The new jobs will require higher qualification and thus will implicate in lower access for vulnerable people and women	Maybe	Women/Men employment rate
	Skills	Professionalising skills	The policy increases the number of courses, extensions, graduations to the solar segment and, thus, capacitates many professionals	Yes	Number of new courses, extensions, graduations to the solar segment Professionals trained per year
	Governance	Multilevel governance	The policy foments new levels of leadership, associations, et al., and provides the energy sector with multiple new stakeholders	Yes	Number of new solar associations Number of new solar consortiums and cooperatives Number of new solar communities
Economy	Industry	National industry	The policy energises the sector and promotes the national industry.	Yes	GDP of the solar GD sector
		Imports	Considering the fact that the wind (and solar) industry is still in early stages in the country, auctions have favoured the energy sources which require technology importation	Yes	National/Import technology investment
		Cheaper technology	As the policy fosters the sector, technological costs are expected to become lower.	Yes	Relative reduction in the price of technology per year.
	New business opportunities	New business related to PV DG	The policy energises a chain of economic sectors.	Yes	New commercial establishments related to PV DG
	Energy security	Energy diversity	The policy enhances complementary PV energy which provides more reliance to the energy system through periods of draughts	No, given that the horizon is 2050, the assessment would have to estimate scenarios of draughts, which is not ideal to the deemed method defined.	

		Energy planning	The policy adds complexity to energy planning	No, due to the qualitative nature of the indicator.

Source: Prepared by the authors.

Table 8 - Impact categories and indicators for the energy auctions policy

Dimension	Impact Category Group	Impact Category	Hypothesis	Feasible to quantify?	Indicator to quantify
Environment	Air	Emissions	The policy favoured the promotion of wind energy which implies lower use of thermal power plants, and thus, lower emissions.	Yes	kgCO2e/year saved
	Land	Land use	Expansion of wind energy implies more land allocated for wind farms.	Yes	Area occupied by the sector per year.
		Biodiversity -	Auctions may have a relationship with biodiversity loss due to the risk offered by the expansion of wind farms to birds and bats.	Yes	Birds and bats mortality rate.
		Dunes landscapes	Expansion of wind farms deforest fixed dunes and affects the mobility of mobile dunes and the recharge of groundwater.	No	
	Landscapes	Visual pollution	Expansion of wind farms along the Northeast coast generates visual pollution on the beaches.	No, due to the qualitative nature of the indicator (perception).	
	Ecosystem	Noise pollution	Expansion of wind farms generates noise pollution to animals and local residents.	No, due to lack of data.	
Society	Poverty	Family's budget (Increase in the price of food)	Indirect relationship with the increase in the price of food products due to competition for agricultural lands between wind farms and food production.	No, the assessment could not conclude that the land used in wind farms would otherwise be used for food production (e.g., it could be used for bioenergy production).	

	Jobs	Creation of jobs	The wind energy production chain requires labour for the construction and maintenance of wind farms.	Yes	Added jobs/MWh
		Requirement of higher qualification	The new jobs will require higher qualification and thus will implicate in lower access for vulnerable people and women.	Maybe	Women/Men employment rate
	Local infrastructure	Better public assets and services	The construction of wind farms demands local infrastructure, such as roads and lighting, improving access for local communities.	No. The assessment would have to understand communities' needs and infrastructure available.	
		Disorganised development.	New wind farms lead to hyper development that has harmful effects on local traditions and cultures.	No. The assessment would have to understand communities' needs and infrastructure available.	
Economy	Industry	National industry	The policy energises the sector and promotes the national industry.	Yes	GDP of the wind sector
		Imports	Considering the fact that wind (and solar) industry is still in early stages in the country, auctions have favoured the energy sources which require technology importation	Yes	National/Import technology investment
		Cheaper technology	As the policy fosters the sector, technological costs are expected to become lower.	yes	Relative reduction in the price of technology per year
	Business	New business	The policy energises a chain of economic sectors.	Yes	New commercial establishments related to wind energy

Source: Prepared by the authors

Part 2: Planning a just transition assessment

The intensification of climate change and the worsening of its impacts have increasingly required society to reduce greenhouse gas (GHG) emissions, thus promoting the transition to a low-carbon economy. In order for the goals of the Paris Agreement to be met, it is necessary for governments to promote this transition by restructuring production and consumption towards a sustainable model. However, policies that aim to promote this transition need to be accompanied by socioeconomic measures that help the population, especially the most vulnerable groups, to cope with the impacts that may also emerge from these changes. In other words, this process must be conducted in an equal and fair manner for all parties involved, under the terms of a just transition.

The need for a just transition process derives from the negative impacts that the changes to a decarbonized economy may generate on some economic sectors, geographical regions, social groups and even the environment. The just transition concept aims to ensure that climate change mitigation policies are implemented in an equitable manner, promoting climate action that protects the planet, people and the economy. The main goals of the process are to identify solutions and promote policies that support all those affected by the transition by providing support, training and opportunities.

The concept of just transition emerged from the demands from workers linked to activities considered hazardous (e.g. chemical industry) and/or the fossil fuel industry, which sought solutions to address the social impacts that the closure of these activities could cause. Over the years the concept has evolved, but it was still closely linked to the aspect of job losses. There has also been an evolution in the approach to the issue at the UNFCCC Conferences of the Parties (COPs), especially at COP26 in Glasgow, when the Declaration on Just Transition was published, which presented six pillars for just transition:

- Support workers in the transition, specially communities and regions that are particularly vulnerable;
- Promote social dialogue and stakeholder engagement;
- Implement sustainable and inclusive economic strategies;
- Create decent local jobs and ensure social protections for workers;
- Ensure human rights are protected in supply chain development;
- Transparently report progress on implementing just transition.

However, the Brazilian context presents other challenges for a just transition, both because of the characteristics of the country's energy sector and the importance of including

other sectors that are relevant in terms of GHG emission, such as land use and forestry and agriculture. In the first case, in addition to the impact of job losses that may be caused by the reduction in the use of fossil fuels, there is a concern about possible impacts caused by the expansion of renewable sources (solar and wind) and even the type of jobs that these sectors can create.

On the other hand, much of the country's efforts to reduce GHG emissions should be directed towards the land use and forestry and agriculture sectors. Thus, it is essential that policies for these sectors take into account vulnerable groups such as smallholders, family producers, rural settlements and traditional communities.

Some key steps for planning the just transition in Brazil will be briefly presented in this section. The topic has been addressed by several groups and organizations, but without coordination and with several aspects being addressed in a dispersed manner. Therefore, it is intended that the beginning of this process will contribute to promoting dialogue between different stakeholders and to achieving cohesion on what is understood and intended by a just transition in the country.

In order to promote this dialogue, CBC is organizing the workshop titled 'Planning the Just Transition in Brazil.' The aim is to bring together stakeholders who have been identified through the SD Assessment, as well as other key stakeholders specifically selected from a Just Transition perspective (which is not exclusive to the energy sector). The objectives are as follows: to enhance the mapping of organizations and initiatives related to just transition in Brazil, present the stages considered relevant for just transition planning, initiate a stakeholder engagement phase crucial for the planning process, and identify the various aspects that need to be considered and monitored for the effective implementation of a just transition.

The framework presented below has been developed mainly based on two references: i) the draft of the ICAT Tracking Just Transition Guide that is being prepared by the Word Research Institute (WRI); and ii) the Just Transition Planning Toolbox prepared by the Climate Investment Funds (CIF). In addition to these references, other countries' experiences with just transition were consulted, in particular the case of South Africa. This framework will be presented to stakeholders of the sector, including the Ministry of Environment and Climate Change (MMA) and the Ministry of Mines and Energy (MME), in order to obtain feedback for improvement, so that activities can then be planned.

6 Stakeholder engagement

When initiating a just transition plan, it is essential that the planning and processes developed are socially inclusive to reveal and understand the conflicts in the dynamics of the transition, mitigating them and the resistance to change. In other words, as with the development of any policy or plan, stakeholder engagement is crucial for just transition planning and should be implemented from the very beginning of the process. This will ensure greater confidence in the outcomes, promote collaboration, allow learning from different experiences, and create a sense of belonging to the process.

For engagement to be effective, it is important to promote spaces for multiple perspectives, ensuring that stakeholders feel comfortable sharing their ideas. Appropriate ways of listening to different groups should be identified, such as public meetings, workshops, focus groups, interviews, questionnaires, among others. Feedback received should be analysed and incorporated transparently into the process, explaining how the contributions will be taken into account.

Stakeholders should be asked about their specific social, economic and environmental concerns, as these are relevant to determining the goals that are intended to be achieved. These aspects will be addressed in more detail in the following sections when defining the just transition goals and selecting impact categories.

It should also be advocated to share information with stakeholders throughout the process, using appropriate channels and in a way that allows time to plan to participate in meetings or to provide input to decisions. To this end, platforms can be created so that information is shared in a clear and transparent manner.

The engagement with energy sector stakeholders already initiated as part of the ICAT project, as presented earlier in this document, represents an initial step in this process. Further activities, such as an initial workshop to raise the main aspects related to the just transition in the country, will be elaborated after the consolidation of this process with some key stakeholders, such as MMA and MME.

6.1 Key recommendations for stakeholder engagement

In addition to the activities mentioned above, the following recommendations are considered crucial to effective stakeholder engagement in just transition planning.

i) Identification of stakeholders and communities at risk

The mapping of stakeholders and communities at risk should be carried out at the beginning of planning and should be broad and diverse, adopting specific engagement strategies according to each stakeholder category. Relevant actors may include representatives from the private sector, civil society, academia, labour organizations, financial entities, among others. Selection can be done in different ways, such as mapping or expert consultation, and should involve local and vulnerable group leaders. It is important to understand the role and interests of each, the relationships between them, how they are affected by the transition and the barriers to participation in the process.

ii) Setting up a committee to coordinate the process

When planning a just transition, a coordination mechanism should be established by organizing an entity that has the necessary resources to coordinate the activities of the process. The coordinating entity is key to engaging with the affected public, which includes mobilizing the different stakeholders, developing expertise that can strengthen the dialogue, ensuring consistent communication and acting together with the government. The existence of such a coordinating committee also helps to ensure representativeness and that policies are implemented in a fair and inclusive manner. The committee should oversee and provide sectoral expertise for strategic planning of the just transition and the adoption of the principles in government and policymaking.

iii) Building a coalition of stakeholders

Complementary to the coordinating committee, a stakeholder coalition can be formed with representatives from all stakeholder groups, helping to present different perspectives, anticipate and address stakeholder concerns, set priorities, disseminate information, promote participation, among other benefits. It is also important to allocate financial resources for the implementation of these spaces promoted by stakeholders.

iv) Develop a stakeholder engagement plan

A recommended strategy to engage stakeholders is to develop a Stakeholder Engagement Plan in order to define strategies to increase support, reduce resistance and minimize negative impacts for stakeholders. The plan should contain details such as: general approach; stakeholders involved; roles and responsibilities; methods and formats for engaging different groups; timeline or schedule for engagement. The mapping and selection of parties should be broad and diverse, adopting specific engagement strategies according to each stakeholder category and taking into account cultural and gender representativeness, the use of accessible language, the organization of meetings so that everyone feels welcomed and without discrimination, among other aspects.

It is important to recognize that not all stakeholders will have the necessary knowledge and skills to participate in the process. Therefore, it is necessary to develop their capacity and understanding of the topic. Capacity development focuses on deepening the understanding that different actors have about the challenges and opportunities ahead and sharing knowledge about lessons learned and best practices from previous transition cases.

v) Establish a grievance redress mechanism for stakeholders and affected communities

This mechanism allows stakeholders to share their concerns, problems and grievances that need resolution. The mechanism should have a structure that avoids fear of reprisals and ensures anonymity, as well as being accessible, appropriate to different cultural contexts and gender sensitive.

6.2 Mapping just transition initiatives in Brazil

A preliminary mapping of just transition initiatives in Brazil is presented in Table 9 below.

Table 9 - Just transition initiatives in Brazil

Organization/Initiative	Description
Joint Parliamentary Group in Defense of a Just Climate Transition	The group aims to work for the transition to a low-carbon economy with an inclusive approach, protecting the most vulnerable, creating new opportunities and new green economy jobs. Composed of 210 parliamentarians, it is structured in the following thematic groups: 1) peoples and populations most vulnerable to climate emergencies; 2) education for climate citizenship; 3) gender and climate; 4) transition to low-emission economic development; 5) energy transition; 6) urban resilience to environmental disasters; 7) integrated solid waste management; 8) carbon market; and 9) sector plans.
Just Energy Transition Program	The Just Energy Transition Program (Law 14.299/2022) aims to promote a just energy transition for the coal region of the state of Santa Catarina, taking into account the environmental, economic and social impacts and the valorization of energy and mineral resources aligned with carbon neutrality to be achieved in accordance with the goals set by the Federal Government. Its main objective is to prepare the coal region of the State of Santa Catarina for the probable closure of the industry by 2040. The program has a technical council, which was responsible for developing the Just Transition Plan.
Network Energy and Communities	Group of organizations that advocate for the right to clean and sustainable energy, as established by Brazilian legislation and the SDG 7 of the United Nations. Partners: WWF Brazil; International Energy Initiative Brazil; Instituto Clima e Sociedade; Instituto Socioambiental; Energy for Life; Litro de Luz Brazil; Coordination of Indigenous Organizations of the Brazilian Amazon; Forum of Renewable Energy; Institute fof Energy and Environment

Clean Energy Coalition – just transition and free from gas	Brazilian group of civil society organizations committed to advocating for a socially just and environmentally sustainable energy transition in Brazil. The Coalition aims to exclude the use of natural gas from the mix of energy sources for electricity generation in Brazil by 2050. Organizations involved: Institute for Energy and Environment (IEMA), Arayara International Institute, Institute for Socioeconomic Studies (INESC), Brazilian Institute for Consumer Protection (Idec) and ClimaInfo..
Environmentalist Group of Bahia (GAMBA)	Non-governmental, non-profit organization with the purpose of promoting environmental conservation, sustainable development and citizenship training, based on democratic principles and social justice. The organization has several programs aimed at monitoring public policies regarding climate change. In addition, GAMBA was a member of the project Nordeste Potência, which aims to promote public debate on post-pandemic economic recovery in the Northeast on a green, fair and inclusive basis, in a system that brings benefits to all groups of society.
Casa Socioenvironmental Fund	Since 2007, the organization has developed the South American Program, which seeks to meet the needs of communities impacted by large energy projects in South America and has since supported hundreds of projects in this subject. The organization promotes collaborative mapping in communities that are in the territories demanded for energy generation.
Unified Workers' Central (CUT)	The Environment Secretariat of CUT has already produced several publications on the theme of just transition, such as "Just transition: a trade union proposal to address the climate and social crisis".
Association of Quilombo Remnants of the Serra dos Rafaéis Community	The association promotes dialogues with the local community regarding the frequent approaches of representatives of wind generation companies. In these spaces they discuss about possible measures to be taken in view of the impacts suffered by the installation of towers on neighboring land. The local community has built in partnership with other organizations the protocol of free, prior and informed consultation, as required by Convention 169 of the International Labour Organization.
Institute for Energy and Environment (IEMA)	The Institute has as its main projects the universalization of access to electricity and the energy transition in transport, in addition to being part of the Clean Energy Coalition.
Arayara International Institute	The Institute promotes several forums on the theme of just energy transition. It also promoted the "International Congress on Coal Obsolescence, Sustainable Energy and Just Transition".
Institute for Socioeconomic Studies (INESC)	The organization works on the theme "Energy transition with social justice" promoting studies and public debates in order to contribute with proposals for policies that favour an energy transition oriented to the realization of human rights. INESC is also part of the Clean Energy Coalition.
Revolusolar	The association developed the "Sustainable Energy Program" promoting the installation of solar photovoltaic energy systems within the communities in which they operate. They provided a letter of commitment to the just energy transition in Rio de Janeiro in 2022, encouraging other associations to commit to the just transition in the state.

Climate and Society Institute (iCS)	iCS has partnered with several institutions promoting studies on just transition in Brazil, such as the "Energy Transition and Labor Project in the Oil Sector " in partnership with the Unified Federation of Oil Workers (FUP).
Climate Policy Initiative	In Brazil, CPI is currently developing the INPUT program (Initiative for Land Use), which aims to promote increased environmental protection and food production, as well as to develop just transition studies in the sector.
Cenergia Lab	The laboratory implements a project focused on the adoption of transition strategies in the fuel sector, funded by the Climate and Society Institute. In addition, the laboratory conducts studies – funded by the Brazilian Institute of Oil and Gas – on the Brazilian oil and gas sector in the context of Zero Carbon, aiming to analyze it from the perspective of the just transition and its implications.

Source: Prepared by the authors.

7 Defining the Just Transition vision and goals

Although they are different elements within the planning process, the just transition vision and goals are quite related and can be worked on together. Creating a vision for just transition in the country is relevant because different stakeholders have different impressions of how just transition affects them or might affect them. Moreover, while some principles may be similar to those present in other countries' visions, each country's context has its own particularities, which should be reflected in its own vision. Goals, on the other hand, should address the concerns expressed by a heterogeneous group of stakeholders.

Planning is best conducted when there is a shared understanding of the transition among stakeholders, so developing and sharing different transition narratives can help reach an understanding. It is critical to understand the broader socio-economic context in which the transition is taking place. This context influences who may be affected by the change and how, who has the power to act, the interests and norms that may guide different groups, as well as the political and institutional context. Understanding the context also means understanding why certain groups may be more vulnerable to change than others, so that interventions can be designed to reduce inequality and empower these groups.

7.1 Vision of just transition

The just transition vision represents the overall goal that the country wishes to achieve as it decarbonizes the economy in a fair, equitable and inclusive manner. Defining the just transition vision in a participatory and inclusive manner allows communities (especially those potentially affected by the transition) and society as a whole to anticipate change, as well as prepares the

government to manage the impacts of change and increase the likelihood of policy support. The following are some important elements to consider in developing a vision for just transition.

i) Integrate the basic principles of just transition into the vision

There are several principles related to just transition that have been elaborated over the years, such as equity and inclusion. While each country may have its own vision, being aligned with globally adopted principles helps to give ambition and credibility. These principles make the vision include aspects such as: decarbonization of the economy while minimizing negative socio-economic impacts; recognition of people's right to a healthy environment and decent work; recognition of existing gender inequalities and disparities; among others.

ii) Developing the vision with stakeholders

Here it was considered the importance of stakeholder participation throughout the process, as previously highlighted. In this sense, it is relevant to make use of the stakeholder participation plan and the stakeholder coalition mentioned in the previous section, seeking to stimulate participation and overcome barriers.

iii) Incorporate the contributions and finalize the vision on just transition with stakeholders

The outcome of the process may be a single-sentence vision on which there is consensus after some consultation, or there may be several proposals that require further interaction. It is important to have transparency in the process and that contributions are taken into account. There should be a group responsible for receiving contributions, organizing and incorporating them, and reporting on how they have been included. If consensus is not reached, it may be necessary to conclude the process with some previously agreed method (e.g., by voting).

7.2 Goals of Just Transition

Just transition goals are linked to the just transition vision. While the vision should be broader and cover a wide range of equity and other considerations, the goals help translate the vision into specific, measurable, achievable, relevant and time-bound indicators. Just transition goals can describe a desired change that needs to be stimulated in order to happen, or they can also be designed to address negative impacts of climate policies that can be prevented or minimized, or they can seek to promote the fair distribution of benefits and opportunities. Some key considerations should be taken into account when designing goals (as per the draft of the ICAT Tracking Just Transition Guide), such as:

- Ensure alignment with the vision on just transition – goals should reflect the main elements contained in the vision;

- Use different categories of goals – process, performance and outcome;
- Pay special attention to specific issues – for example, identify regions, sectors or activities that need to change current practices and set goals for them;
- Develop goals with stakeholders whenever possible – use the recommendations presented in the section on stakeholder engagement;
- Consider good practices when developing goals – there are different approaches that can be used (e.g., SMART or PACT), and one should also aim to set short and long-term goals, as well as propose milestones for monitoring progress.

When developing goals, it is recommended that they are disaggregated so that each one represents only one aspect to be improved or outcome. Outcome goals, in particular, can be developed based on concerns raised by stakeholders or known risks.

8 Impact categories and monitoring indicators

The potential risks and opportunities resulting from the transition to a low-carbon economy should be understood and, where possible, quantified and monitored. This requires analyzing the impacts that may be generated by the transition and proposing indicators that will be used to assess its progress.

The climate transition can create a range of social impacts that affect individuals and households in terms of financial security and livelihoods, personal or property rights, safety of family members (for example, if it leads to an increased risk of domestic violence) or mental health and well-being. The types of environmental problems – and the options available to address them – vary according to environmental and socioeconomic context.

8.1 Impact categories

Climate policies generally have positive and negative impacts on the social, economic and environmental dimensions, but these impacts are often neglected to prioritizing cost and emission reduction criteria. It is therefore important to have an approach to monitor all possible impacts on different groups (communities, workers, regions, etc.). Understanding these impacts in a disaggregated way helps to formulate measures to mitigate negative effects.

8.1.1 Economic dimension

Economic impacts include effects of transition policies on economic activity (GDP), employment, economic diversification, household income (wages), costs of goods and services, among others. These effects differ at the national versus regional and local scale, or public versus private revenues and spending. Even positive impacts may not be perceived fairly if they

are not distributed across the population. An analysis of economic impacts needs to cover a broad spectrum of effects. It should also recognize that economic effects may extend beyond the transition areas. Some concrete examples of economic impacts are:

- Loss of jobs in the fossil fuel industry;
- Increase in electricity costs due to the use of solar and wind sources;
- Loss of revenue for municipalities due to the closure of activities;
- Revenues generated by new activities not providing benefits to the population.

8.1.2 Social dimension

Low carbon transitions and climate resilience, as well as the effects of climate change itself, can create a series of social impacts that fall in different ways on different social groups, and generally those who are most vulnerable are the most negatively affected. In addition, these groups tend to be most impacted by climate policies. This can affect individuals and families in terms of financial security and livelihoods, personal or property rights, safety of family members (e.g., if it leads to a higher risk of domestic violence) or mental health and well-being. Social impacts are also usually linked to economic and environmental issues. Some examples of social impacts are:

- Carbon taxes raising costs disproportionately for low-income population;
- Social and cultural changes due to the elimination of fossil fuel activities;
- Loss of jobs in a more pronounced way in certain groups (e.g., women).

8.1.3 Environmental dimension

Measures to mitigate GHG emissions may be accompanied by environmental impacts, such as increased exploitation of minerals for clean energy technologies, or increased water consumption for green hydrogen production or for irrigation of crops for biofuel production. The types of environmental problems and the options available to address them vary according to the environmental and socio-economic context. In addition, impacts may also be accompanied by a component of environmental injustice, as in the case where polluting activities are concentrated in regions close to the residence of poorer populations, although in aggregate emissions are decreasing. It is therefore crucial to monitor these impacts and plan so that mitigation measures do not cause new impacts or worsen existing ones in certain regions, such as water scarcity.

Table 10 below presents some types of assessments that can be used for the different impact categories.

Table 10 - Methods to assess impact categories for just transition

Impact Category	Assessment type	Description of the assessment
Employment impacts and opportunities	Employment impact assessment	Various types of methods, that can range from project-level assessments to an economy-wide analysis and aim to quantify the potential changes in employment or analyze the effects of public policy decisions or investments on the types and quality of jobs.
	Green jobs analysis	Methods that can support decision-makers in understanding the potential for new sectors and industries to create employment and the existing gaps in education and training opportunities.
	Labor market assessment	This assessment can be used to identify future trends in the job market, skill gaps and needs of employers, and the development of new education and skilling programs. It might be used to guide the design of job creation programs that are demand-driven but also in line with the labor market' needs and to analyze data about the jobs available and working conditions. Moreover, it can help to track progress related to decent jobs in terms of just transition.
	Labor mobility analysis	It can provide information regarding the ease or difficulty find by workers who lose their jobs in the transition and need to find employment in their country or region.
Social impacts	Social impact assessment	This assessment is a process for analyzing and monitoring reforms or other policies and programs positive and negative impacts on society. It analyzes both direct and indirect effects, including the impact of changes in the well-being of population, especially poor, marginalized, and most vulnerable groups. Its methodology can be linked with the assessment of impacts on other areas, as economy, resource access, culture, health, gender, Indigenous rights, and poverty.
Economic impacts and diversification options	Economic impact assessment	Analyzes that might be used to project the effects of a policy change or a transition on economic indicators. These can be related to local, regional, or national economy, as impacts on spending, employment, taxation revenues, and housing, labor costs and other services. The assessment should also include the distribution of impacts.
	Economic diversification assessment	Smart specialization is an assessment approach and policy framework developed in the European Union which central tenet is that strategies for enhancing the scale and effectiveness of entrepreneurial processes should trust in the existing businesses, natural and human capital, and infrastructure strengths of a regions. It can be more helpful in advanced economies with open markets, as it might help to identify the economic strengths and comparative advantages of a particular region.
	Asset repurposing assessment	This assessment might support identifying physical assets used by industries or other businesses that face closure that could be saved and repurposed or upgraded as part of an economic diversification strategy, especially specialized equipment or infrastructure or industrial premises that can be reconfigured to host new businesses or sectors.
Environmental impacts and land rehabilitation	Contamination assessment	This method identifies the type of remediation required due to the contamination to guarantee that the site does not present health risks to surrounding ecosystems or local communities.

	Land repurposing assessment	This assessment is helpful to determine the future uses of an area after the closing of mining and industrial activities. It supports planners to go beyond the environmental regulations requirement that landscape must be restored to a safe condition and provide more beneficial outcomes as allows for a wide range of future economic, recreational, or other community land uses.

Source: CIF (s.d.).

8.2 Indicators

Different types of indicators can be used for different purposes, such as monitoring activities and outputs or communicating progress against goals. Thus, just transition-related indicators can be divided here into four types (as per the draft of the ICAT Tracking Just Transition Guide):

- Input indicators – monitor the resources available and used in policy implementation (e.g., funds spent per year on implementing a policy);
- Activity indicators – monitor the activities carried out by the organizations responsible for the policy and help to assess whether the implementation is taking place as planned (e.g., number of training workshops);
- Output indicators – monitor the delivery of outputs that result directly from the activities (e.g., number of people, by gender, who have received training and capacity building);
- Outcome indicators – help assess the economic, social and environmental impacts of policies through changes in behaviour, technology, processes or practices (e.g., number of jobs created; percentage of households without access to electricity).

Considering what is expected from a just transition, which is mainly related to the impacts that will occur on the population as a whole and on some groups in particular, outcome indicators have greater relevance, as they seek to address precisely these aspects related to impacts. Some recommendations for the selection of indicators are:

- Establish a scope for monitoring, including, for example, the level of government (national, subnational, local) and sectors;
- When choosing the impact categories to be monitored, they should be selected based on whether they are likely to be significantly affected by climate transition policies and whether they are relevant based on the just transition vision and objectives, national context and stakeholder priorities;
- Once impact categories have been selected, indicators should be chosen and monitored based on the results the country would like to see in specific impact areas.

9 Conclusion

Brazil is committed with a net-zero GHG emission target by 2050 and, although the country NDC is economy-wide, it will be necessary to make efforts in all sectors to accomplish it. The Brazilian energy sector has a large share of renewable sources when compared to global average, mostly because of the participation of hydropower. However, this sector also has a high potential to contribute to GHG mitigation through the expansion of variable renewable energy (solar and wind) and biomass.

Nevertheless, this expansion also has a potential to impact sustainable development in different aspects, both positively and negatively. This could include job loss/creation, gender issues, access to water, food security, among others. Therefore, it is important to assess the links between the expansion of those sources and the sustainable development impacts, as well as to start a process to assess the just energy transition in the country.

It is crucial that this assessment is conducted with a strong stakeholder engagement. For this end, a process to promote stakeholder participation in the project started from the very beginning of the project. At this stage of the assessment, inputs were gathered with stakeholders regarding the policies that were relevant to be assessed, impact categories, as well as on other stakeholders that should be consulted. This engagement occurred both through meetings with key stakeholders and through surveys sent to all stakeholders identified.

Three policies were selected as relevant for the assessment considering the energy sources: the National Biofuel Policy (RenovaBio); the Distributed Generation Legal Framework (Law 14,300/2022); and the energy auctions regulation. Impact categories identified for each policy were grouped into three dimensions (environment, society and economy), considering the hypothesis for its interface with the policy and, when a quantitative assessment was considered feasible, indicators were proposed. The next step will be to execute the qualitative and (when possible) quantitative assessment, which will be presented in another report. This will also include a workshop with stakeholders to present and validate the results of the assessment.

Regarding the just energy transition assessment, this document presented an initial proposal for this process, planning the activities for this assessment. It is understood that the aspects just energy transition in Brazil differs from those considered in many other countries, given the specificity of the energy matrix of the country, as well as for the socioeconomic context. In addition, the subject has been addressed by different organizations and social groups under distinct point of views and decentralized. Therefore, there is a need to bring several stakeholders together to discuss and build the vision and the goals for the just energy transition in the country

and to propose indicators for monitoring its progress. This will support the government in the design and implementation of policies for the energy sector in a just and inclusive manner.

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