Initiative for Climate Action Transparency - ICAT -

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

Work plan

ICAT Phase 3 Project

April 2023

CENTRO BRASIL NO CLIMA

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1. Introduction

Centro Brasil no Clima (CBC), in partnership with Centro Clima/COPPE/UFRJ, and with support from the Initiative for Climate Action Transparency (ICAT), completed two phases of a 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 renewable energy generation capacity in Brazil, and will assess the potential expansion of variable renewable energies and biomass, apply the ICAT's Sustainable Development Methodology, and make an assessment of just transition related to this expansion.

Brazil has been an active player in the global climate change agenda and engaged in the transparency issue. In 2009 the country issued its Climate Change Law (12187/2009) and in 2010 an Executive Decree (7390/2010) created the legal base for MRV actions and procedures. In addition, Brazil has already published four National Communications (CN) and four Biennial Update Reports (BURs) to the UNFCCC, the last of which was delivered in 2020. Recently the country received support from ICAT to enhance its transparency framework by developing MRV indicators to assess climate policies and actions at the national (1st phase) and subnational (2nd phase) level.

In 2010 Brazil published its Nationally Appropriate Mitigation Actions (NAMAs) with targets for 2020. In 2015 the country issued its first Nationally Determined Contribution (NDC) to the Paris Agreement with an economy-wide target of emission reduction of 37% by 2025 and an indicative target of 43% by 2030, with 2005 as the base year. The NDC is formulated around a national target and does not stipulate specific actions. More recently, in 2020 Brazil updated its NDC turning the 2030 target official but without changing the ambition. This new version of the NDC also introduced an indicative target of achieving net-zero emissions by 2060. Finally, in November 2021 during the COP26 the Brazilian government announced a commitment with a 50% reduction by 2050, also with 2005 as the base year.

Brazil achieved significant results in GHG mitigation between 2004 and 2009 when emissions decreased about 65% mostly driven by the efforts to halt deforestation. Because of this reduction in GHG emissions from LULUCF, other sectors became more important to achieving the national level mitigation targets. For example, the energy sector was responsible for approximately 29% of Brazilian emissions in 2016 (the last year available in the 4th National Inventory). The energy sector was then the second in GHG emissions after agriculture (33%).

The results of the ICAT Brazil phase 1 project showed that, under a baseline scenario, emissions from energy supply are expected to increase by 89% between 2005 and 2030, whereas in a scenario with more mitigation actions the expected increase is 73%. This difference is provided mostly by the emission reduction in electricity generation due to the higher penetration of renewable sources, such as wind and solar photovoltaic, besides the no expansion of fossil fuel power generation capacity beyond the plants that won energy auctions until 2017.

The ICAT Brazil Project phase 2 switched the focus to the subnational level aiming to assess the contribution of states actions to the achievement of the Brazilian NDC. Reference and mitigation scenarios were developed for three states (Amazonas, Minas Gerais and Rio de Janeiro) and MRV indicators were proposed to track the emissions in each of them. In addition, it was conducted an assessment of transformational impacts of the State Policy for the Energy Transition (PETE) in the state of Minas Gerais. The results show that the PETE could trigger moderate transformational impacts, partly because of income and job creation. The region of the state that concentrates the potential for solar power generation is one of the poorest of the country. We consider the work under phase 1 and 2 to have successfully concluded.

The analysis from phase 1 and 2 of the ICAT project highlighted the importance of the energy sector not only to meeting the national emission reduction target, but also to promote the sustainable development. Therefore, the work under phase 3 is focused on the electricity generation sector, assessing the potential expansion of variable renewable energy and biomass, and the co-benefits (in addition to GHG mitigation) associated with these sources.

2. Scope of Work

To achieve the specific objectives of the project the work will be arranged in three components:

1. Evaluation of the prospects of expanding electricity generation with renewable sources in Brazil by 2050 employing mathematical models to identify public policies that maximize the production and use of intermittent renewable energy in Brazil. A current policy scenario (CPS) and a deep decarbonization scenario (DDS) will be developed;

2. Analysis of the impact of CPS and DDS on the NDC implementation and achievement of targets;

3. Assessment of the sustainable development impacts of the VRE and biomass expansion in the DDS Brazil in comparison with the expansion under the current policy scenario. This assessment will be done by applying the ICAT Sustainable Development Methodology and will include stakeholder consultation processes. This will include the qualitative assessment of SD impacts, whereas a quantitative assessment will depend on the data availability.

The horizon adopted for the assessment will be 2050.

3. Objectives

The objective of the ICAT Brazil Project Phase 3 is to conduct an impact assessment of Brazilian policies on the future expansion of electricity production from variable renewable energy sources (wind, solar photovoltaic, and biomass) up to 2050, alignment with the NDC targets and contribution to the sustainable development goals. The specific objectives are:

1. To estimate the potential expansion of variable renewable energy (VRE) and biomass sources and its impact in the national grid up to 2050;

2. To assess the sustainable development impacts of the VRE and biomass expansion in the Deep Decarbonization Scenario (DDS Brazil) in comparison with the expansion under the current policy scenario. This assessment will be done by applying the ICAT Sustainable Development Methodology and will include stakeholder consultation processes;

3. 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.

4. Methodology

This work will adopt the recommendations and tools of the following methodologies and materials:

- MATRIZ (Energy Optimising Model)
- ICAT Sustainable Development Methodology
- ICAT Stakeholder Participation Methodology
- ICAT Methodology on Managing Transparency of Just Transitions (under development)

The methodology is divided in three axes, in accordance with the set specific objectives:

(A) Potential expansion of variable renewable energy (VRE) and biomass sources

(B) Sustainable development impacts of this expansion and just transitions

(C) Partnership with stakeholders

The next subsections are segmented in accordance with the three axes, given that they use different ICAT methodologies and approaches to produce the expected outputs. Considering that the axis activities will be developed in parallel, Figure 1 illustrates in a diagram the summary of the steps to be described in the next subsections, highlighting the complementarity between axis and activities.

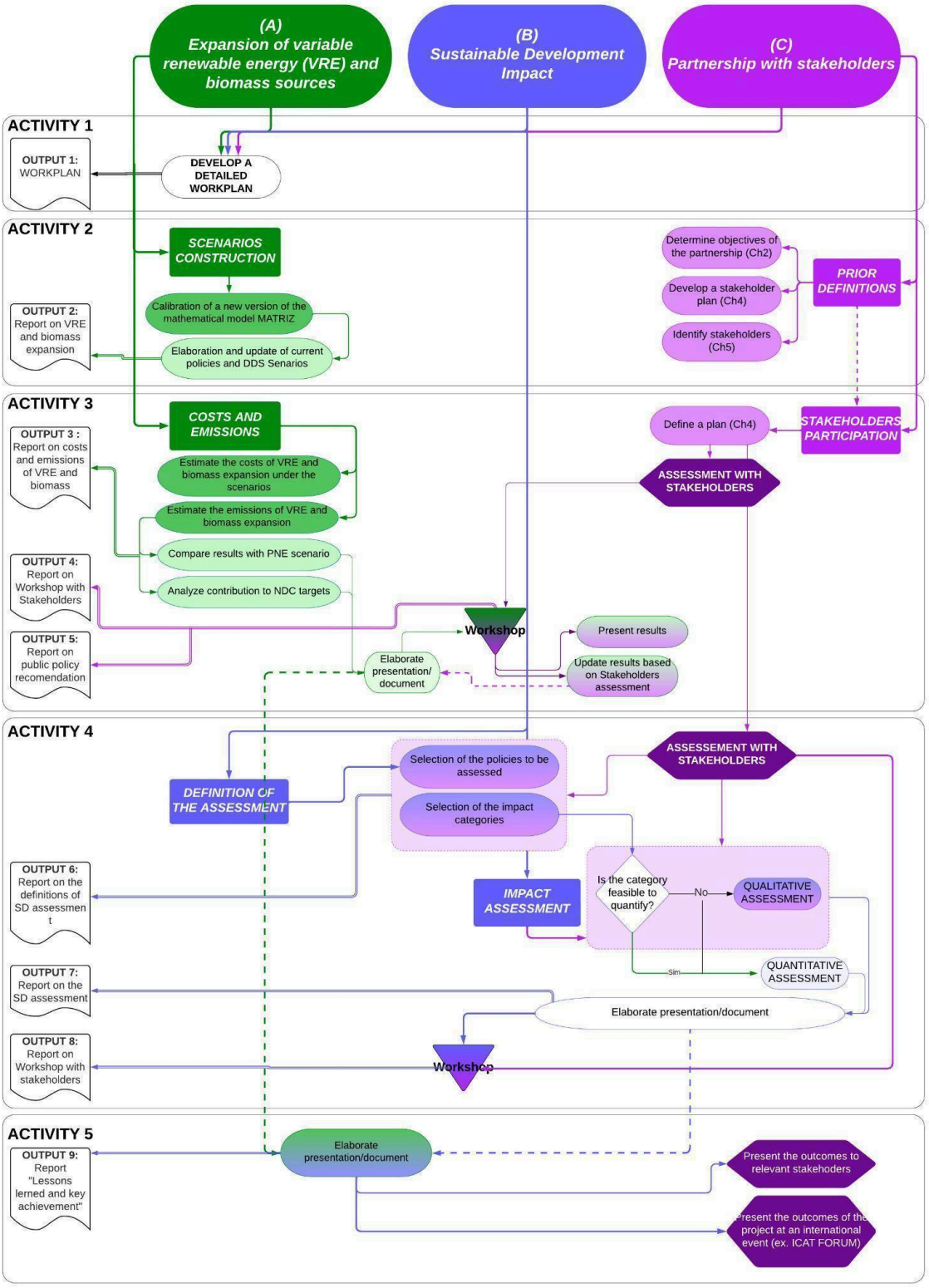

Figure 1 – Diagram of the methodological steps

(A) Potential expansion of variable renewable energy (VRE) and biomass sources

This project axis will be developed by Centro Clima / COPPE / UFRJ and aims to evaluate the prospects of expanding electricity generation with renewable sources in Brazil by 2050 to contribute to the achievement of the Sustainable Development Goals and the country's goals in the Paris Agreement of the United Nations Climate Convention.

A1. Construction of the scenarios

For the construction of the scenarios to be analyzed, the first step is to calibrate a new version of the mathematical model MATRIZ, used thanks to a cooperation between Centro Clima / COPPE / UFRJ and CEPEL (Electric Energy Research Center), which allows a greater granularity in the analysis of the balance between electricity supply and demand, according to temporal and spatial variations. MATRIZ is an optimization model that minimizes the supply cost of meeting an energy demand projection, similar to MARKAL.

Once calibrated, the second step is to proceed with the elaboration of electricity generation scenarios for Brazil by updating the previous ones carried out by Centro Clima / COPPE / UFRJ: the CPS scenario (current policies) and the DDS scenario (deep decarbonization of the Brazilian economy).

Main outcomes and activities:

- Report on VRE and biomass expansion under current policies.

A2. Costs and emissions assessment

Once the scenarios are created, the project proceeds with the comparative analysis of the results of the new scenarios regarding the electric matrix, its costs, and emissions of greenhouse gases – GHG, highlighting the "gap" between CPS and DDS in terms of VRE penetration and GHG emissions.

A workshop with stakeholders (previously selected through the work executed so far by the project axes A and B) is expected to present the results and collect their inputs to the identification, discussion, and recommendation of public policy tools to help the

implementation of the new DDS for the power sector. Instruments already used to take off the penetration of onshore wind energy and photovoltaic solar energy in the Brazilian market (such as specific auctions by source, incentives for decentralized electricity generation, etc.) and their application to new technologies (offshore wind energy, for example) will be included in the analysis.

Main outcomes and activities:

- Report on VRE and biomass expansion impact under current policies (costs and emissions);
- Workshop with stakeholders followed by a report on this activity;
- Report with recommendations for policymakers to improve the existing legal and regulatory framework.

(B) Sustainable development impacts and just transition

This methodological step will use ICAT's Sustainable Development Methodology and ICAT's Methodology on Managing Transparency of Just Transitions. The second is currently under development, and its applicability will depend on its progress. The steps used to develop the axis B of the methodology of this study are presented in the next subsections.

B1. Definition of the assessment

The first step in the definition of the SD assessment is the selection of the policies to be assessed in the study based on the analysis of the existing legal and regulatory framework. CBC team will be responsible for the assessment of the existing public policies that will be selected for the study based on their relevance and in consultation with stakeholders of the sector, in accordance with the Stakeholder Participation Methodology (as described in more details in the Axis C).

This step also includes the definition on which impact categories and indicators to assess within these policies, which will also require consultation with the stakeholders. In the selection of the impact categories, stakeholders will be asked to analyze what are the environmental, social and economical impacts of the chosen policies and to evaluate whether they are relevant, significant and should be included in the assessment.

Main outcomes and activities:

- Report ‘Defining the objectives, policy framework, impact categories, and indicators for the sustainable development assessment’.

B2. Impact Assessment

Ideally, the SD impact assessment will be both qualitative and quantitative. This will depend on the definition of the assessment and the nature of the chosen impact categories. In case there is no data available, we will apply only the qualitative approach described in ICAT Sustainable Development Methodology.

For the qualitative impact assessment, together with stakeholders of the sector (more details in Axis C), all impact categories will be characterized based on the likelihood that each impact will occur, the magnitude of each impact and the nature of the change (positive or negative), so that their significance to the assessment can me defined.

In case any impact category proves to be feasible to quantify, for each of them, one or two relevant indicators will be defined. These indicators should be feasible to measure and will be analyzed under the most appropriate method throughout a given period (to be defined in accordance with specific aspects of the policy under assessment). To assess the impact category quantitatively, the study will define a baseline scenario, considered to be the most likely one and, thus, the net impact of a policy scenario.

Once the SD Impact Assessment is complete, a workshop will be held with stakeholders so that the results are validated, and their final inputs are collected.

Main outcomes and activities:

- The report ‘Defining the objectives, policy framework, impact categories, and indicators for the sustainable development assessment’
- Workshop with stakeholders followed by a report on this activity;
- Report ‘Results of the sustainable development impacts assessment’;
- Report ‘Lessons learned and key achievements’.

(C) Partnership with stakeholders

This methodological step will use ICAT’s Stakeholder participation guide. Axis C should be understood as transversal to the other axes, given that it will support decisions required for the assessments to be conducted. In this sense, the main product it offers are consultations per se.

The steps used to develop the Part C of this study are presented in the next subsections.

C1. Definitions of the consultation

The first step in this methodological axis is to establish the main definitions which will guide the consultations with the stakeholders.

These definitions are:

- To determine the objectives of the consultation;
- To develop a plan for the consultation, including the method and the kind of consultation;
- To identify the stakeholders.

Considering the goal to include a just transition approach to the impact assessment, in this methodological step a special attention will be applied to ensure that we are attentive to those social actors who suffer from climate inequality and injustice.

C2. Consultation

Once defined, the second step is to conduct the assessments. This step is intrinsically related to the steps in methodological axis A and B, given that these consultations will be used to define the ideal policies to analyze the expansion of the VRE and biomass production (Axis A) and the impact assessment of the selected policies (Axis B). All the assessments will be planned and conducted based on the principles of inclusiveness, transparency, responsiveness, accountability and respect for rights. The results of the study will be presented to stakeholders and policymakers in a final workshop to be organized with those institutions involved in the assessment.

5. Outputs

The project's outputs consist of nine deliverable activities, consistent with the three axis of action. The first output being this detailed work plan.

Output	**Description**	**Axis**
Output 1	Detailed Workplan	Synergic with all
Output 2	Report on VRE and biomass expansion under current policies	A
Output 3	Report on VRE and biomass expansion impact under current policies (costs and emissions)	A

Output 4	Report on workshop with stakeholders	C
Output 5	Report 'Recommendations for policymakers on how to improve the existing legal and regulatory framework'	A
Output 6	Report 'Defining the objectives, policy framework, impact categories, and indicators for the sustainable development assessment'	B
Output 7	Report on workshop with stakeholders	C
Output 8	Report 'Results of the sustainable development impacts assessment'	B
Output 9	Report 'Lessons learned and key achievements'.	Synergic with all

6. Support requested to UNEP CCC

UNEP Copenhagen Climate Centre (UNEP CCC) is a leading international advisory institution on energy, climate and sustainable development. Its work focuses on assisting developing countries and emerging economies transition towards more low carbon development paths, and supports integration of climate-resilience in national development. The Centre is actively engaged in implementing UN Environment's Climate Change Strategy and Energy Programme.

UNEP CCC is an implementing partner of ICAT and is responsible for supervising the ICAT Brazil project. As part of that, over the implementation of the project CBC, Centro Clima and UNEP CCC will meet regularly (at least once a month) to discuss the progress of the project.

Moreover, given the expertise of UNEP CCC team on the assessments proposed in the document, it is expected that this partner will provide valuable inputs either during the assessment or reviewing the reports, both on:

- Assessment of VRE and biomass expansion; and
- Assessment of sustainable development impacts and just transitions.

Finally, the UNEP CCC team can provide significant contributions to the report 'Lessons learned and key achievements' considering the experience with other countries that are supported by ICAT.

7. Specific Activities Timetable

The project's activities will be completed in 12 months counted from the signature of the contract, according to the time plan below.

			2023										2024	
Activity	**Sub-Act.**	**Description**	03	04	05	06	07	08	09	10	11	12	01	02
1	1.1	Develop a detailed workplan												
	Output 1	**Workplan**		x										
2	2.1	Analyze the existing policies and their impact on VRE and biomass expansion												
	2.2	Construct the 'current policies' scenario												
	2.3	Compare the results of the previous sub-activity with the scenario developed by PNE and scenario by DDS Brazil												
	Output 2	**Report on VRE and biomass expansion under current policies**			x									
3	3.1	Estimate the costs of VRE and biomass expansion and the total GHG emissions under the 'current policies' scenario and under the DDS scenario by using the MATRIZ model												
	3.2	Compare the results of the previous sub-activity with the scenario developed by PNE												
	3.3	Analyze how the VRE and biomass expansion under the different scenarios contributes to the NDC target												
	3.4	Present the results at the stakeholder workshop												
	3.5	Update the results based on the inputs from the stakeholder workshop												
	Output 3	**Report on VRE and biomass expansion impact under current policies (costs and emissions)**								x				
	Output 4	**Report on workshop with stakeholders**								x				
	Output 5	**Report 'Recommendations for policymakers on how to improve the existing legal and regulatory framework'**								x				

4	4.1	Select the policies for the SD impact assessment in consultation with the stakeholders														
	4.2	Apply the ICAT Sustainable Development Methodology for the selected policies														
	4.3	Apply the methodology for the ICAT Guide on Managing Transparency of Just Transitions														
	4.4	Validate the results of the assessment in the stakeholder workshop														
	4.5	Update the results based on the inputs from the stakeholder workshop														
	Output 6	**Report 'Defining the objectives, policy framework, impact categories, and indicators for the sustainable development assessment'**				**x**										
	Output 7	**Report on workshop with stakeholders**												**x**		
	Output 8	**Report 'Results of the sustainable development impacts assessment'**												**x**		
5	5.1	Present the outcomes of the project to the relevant policymakers – final workshop														
	5.2	Develop the lessons learned and key achievements report														
	5.3	Present the outcomes of the project at one of the international events, e.g. ICAT Partner Forum														
	Output 9	**The report 'Lessons learned and key achievements'**														**x**