REPORT . 2022

OPPORTUNITIES FOR BRAZIL IN CARBON MARKETS

ICC Brasil | WAY CARBON

COVER LETTER

Gabriella Dorlhiac
Executive Director
of ICC Brasil

The year 2021 was certainly a milestone for the global climate agenda. The conclusion of the negotiations on Article 6 of the Paris Agreement during COP 26 represents an important step in the climate journey, although some points remain open. More than an advance in the regulation of a global carbon market, we positively saw the unprecedented engagement of the private sector, positioning itself as an increasingly relevant actor for the implementation of the commitments made.

We cannot ignore, however, that new challenges have emerged in recent months, driven by the war between Russia and Ukraine, which has put pressure on energy supplies globally. Although the current context seems to add new obstacles to the equation, we believe that this could be a new opportunity to rethink the way we produce and in fact accelerate the transition to clean energy sources and to a greener economy.

In this sense, Brazil will certainly play an even more important role in the climate agenda and must be prepared to seize all opportunities and leverage all its competitive advantages. One of the main opportunities that stand out in the country is the carbon credit market. Despite being a transition mechanism, it has the ability to encourage companies to reduce their emissions, becoming credit issuers and helping companies whose transition will take a little longer.

This year, ICC Brasil and WayCarbon joined forces once again to present the concrete potential of our country, bringing in an unprecedented way a map of the national ecosystem of the certified emissions reduction market, based on interviews with its main players. It is known this is the decade of action and that the Sharm El-Sheikh COP 27 will focus on negotiating conditions for public policies to translate into concrete and positive impacts, whether at global or local level, and we hope that the results of this publication can make it clear that, although we have already done a lot, there is still a long way to go and it can be full of good outcomes.

If in 2021 the study of economic potential for Brazil in carbon markets highlighted that the country could earn up to US$ 100 billion in revenues by 2030, having the capacity to supply up to 22% of the global demand of the regulated carbon market and 37 .5% of the global demand of the voluntary market, in 2022's edition, we identify that the potential of Brazil is to supply up to 28% of the global demand of the regulated market and 48.7% of the voluntary market by 2030, obtaining up to US$ 120 billion in revenues – a relevant increase.

We would like to take this opportunity to thank everyone who participated and contributed to the development of the study and, as with the first version of this publication, we hope that the main conclusions can provide input to negotiators, policymakers, the business community and society in general in preparation for COP 27 and other forums, fundamental to the success of the mission to ensure a future that balances economic and social development and environmental responsibility.

As the institutional representative of more than 45 million companies, in more than 130 countries, the International Chamber of Commerce (ICC) operates with a mission to ensure that businesses functions for everyone, every day, everywhere. We are the main voice of the economy in many different intragovernmental organizations – from the World Trade Organization to the UN's climate process – defending the needs of local businesses in decision making processes.

The reach of our global network allows us to define rules and patterns that enables the commerce of more than US$ 10 trillion a year. Moreover, it enables the provision of digital personalized products and services that address directly the real challenges faced by companies that operate globally.

Present in Brazil since 2014, we work to bring the private sector to the center of the international trade agenda in a sustainable way and to amplify the voice of the business community within governments and international organizations by the elaboration of projects for economic and social development and for the improvement of the business environment.

To learn more, visit **iccbrasil.org**

Established in Brazil since 2006, WayCarbon is a technology-based company and is the biggest strategic consultancy with exclusive focus on sustainability and climate change issues in Latin America. The company offer to the market a range of solutions that encompass professional experience, innovation, and technological development with the objective of transforming sustainability topics as a competitive element inside businesses.

WayCarbon is a B-Corp certified company and is reference in assessing topics such as global climate change, asset management and developing business strategies with the aim to catalyze a transition to a low carbon economy.

WayCarbon recognizes that the carbon market agenda is strategic for Brazil. Through its experience and market intelligence, it develops technical knowhow and financial innovation for the success of the implementation of such opportunity in the country, which is a clear motivation of the partnership with ICC Brazil and the deliverable of this project.

To learn more, visit **waycarbon.com**

AUTHORS

Ana Pinheiro

Caio Barreto

Fabiana Assumpção

Laura Albuquerque

Letícia Gavioli

Luciana Garcia

Rafael Marques

TECHNICAL REVIEW

Daniel Nogueira

Sergio Margulis

Quote:

ICC Brasil and WayCarbon. Opportunities for Brazil in Carbon Markets. Executive summary 2022. 2022. Available at: **iccbrasil.org.**

MESSAGES FROM SUPPORTERS

“Low carbon agriculture brings numerous challenges and opportunities for the sector. We believe that collaboration is essential to advance this agenda with science and technology. Thus, we will be able to overcome barriers and explore the potential of agriculture as part of the solution to the climate crisis. The ICC is vital to advancing this agenda as a high-impact collective in generating high-level studies and discussions”.

Malu Nachreiner – CEO of Bayer Brasil

“Brazil has an indisputable role as a protagonist on the global climate agenda. The quality of impact that the country will provoke in the world will depend on the assertiveness and solidity of its environmental actions. This report is another great contribution from ICC Brasil to unlock this positive potential, by support the maturation of the national market for carbon.”

Altair Rossato - CEO of Deloitte Brasil

“The Forestry sector represented by Indústria Brasileira de Árvores has the potential to be one of the main players in the carbon market. It is rooted in sustainable bioeconomy and has several vectors mitigation: remove and store carbon in commercial forests and conservation; avoid emissions in industry and the energy sector; and replace fossil products for renewables.”

Jose Carlos da Fonseca Junior - Ambassador and Executive Director of Ibá

“Brazil has enormous potential to contribute with the reduction of climatic effects. Ramp up solid foundations of a credit trading system of carbon considering the opportunities existing is even more relevant in the current scenario. Companies and Governments will benefit from this study data for its positioning with the stakeholders.”

Miguel Gularte – CEO of Marfrig

“bp is on its way to becoming a carbon neutral company by 2050. We believe on the potential of Brazil and the carbon market to achieve this goal. That is why it is with great satisfaction that we support the second report prepared by ICC and WayCarbon, which will help to foster business possibilities by contributing for the development of the country.”

Carolina Fratta – VP Asset Management Bioenergy of bp Brazil

“This study has the fundamental role of systematizing and bring more light to the consolidation of initiatives in search of a low carbon economy. That’s why we at Eneva, who have mission to lead a fair and inclusive electricity sector transition, generating value. We see the opportunity to be one of the most concrete ways to accelerate the low carbon economy in the creation and strengthening the carbon market .”

Anita Baggio - Director of People, Performance, ESG, HSE, Social Responsibility, Communication & Culture at Eneva

“The accelerated advance of the climate crisis calls for multiple strategies to encourage the reduction of gas emissions into the atmosphere. Carbon markets have great potential to encourage the transition climate. Based on a multisectoral analysis, the present study highlights economic opportunities for Brazil and its companies in the development those markets.”

Luciana Nicola - Director of Institutional Relations and Sustainability of Itaú

“This study carried out by ICC Brasil in partnership with WayCarbon is essential to evaluate the opportunities for Brazil in carbon markets. I believe that the transition to a low economy carbon is one of the biggest business opportunities of our era and the development of this content, supported by Microsoft, brings subsidies for the sectors public and private work together and strategize for the country to have economic benefits, social and environmental issues with carbon markets”.

Tânia Cosentino - President of Microsoft Brazil

MENSAGENS DOS APOIADORES

“The evolution and expansion of the study is essential to demonstrate how companies can evolve and integrate opportunities in carbon market in Brazil. This mapping contributes to the private sector expand its role in the decarbonization of its entire value chain, ensuring the conservation of biomes, integrating people and communities that are essential in the valuation of socio-biodiversity and development of a modern economy of positive impact.”

Denise Hills – Global Sustainability Director of Natura

“Santander believes in vocation and leadership of Brazil in the global carbon market. This study will be instrumental in directing the implementation of public policies and strategies businesses that promote development economic, positive socio-environmental impact and resilience climate.”

Mario Roberto Opice Leão – President Director of Santander Brazil

“Schneider develops global programs of decarbonization, with a strong emphasis on mitigation, use of renewable energy and digitization for the benefit of efficiency and sustainability. In this context, carbon markets play the important role as a transition mechanism, while we look for viable solutions to replace the fossil fuels.”

Marcos Matias - CEO of Schneider Electric in Brazil

“The update of the ICC-WayCarbon study is extremely timely because it contributes to the qualification of the debate and brings fundamentals technical information that underpin the urgent need of action for policies of valorization of our resources, here through the carbon market, bringing tangible social and environmental benefits for the country.”

Cristiano Pinto da Costa – President of Shell Brazil

“It is an honor for us to support a study of such relevance, true provision of services to Brazilian society. We understand that the next steps in the construction and improvement of instruments of carbon pricing, especially with the development of carbon markets, will be decisive to contribute to an adequate inclusion of Brazil in a leading role in the new low-carbon world economic order.”

Luiz Gustavo E. Bezerra - Partner/ Environmental & Climate Change’s Area Head of of Tauil & Checker Advogados associated with Mayer Brown

“The ICC-WayCarbon Study 2022 will be an exceptional tool for the decision making process of investment-oriented on the ESG agenda, in the private and public spheres. Trench Rossi Watanabe supports this initiative because it understands that it is contribuiting with a study that will be the guide important actions aimed at increasing of the carbon market in Brazil.”

Renata Amaral - Leading partner of the Environment, Consumer and Sustainability practice at Trench Rossi Watanabe

ACRONYMS LIST

6.4ER - 6.4 Emission Reduction
ACR – American Carbon Registry
AFOLU – Agriculture, Forestry and Other Land Uses
APD – Avoided Planned Deforestation
ARR – Aforestation, Reforestation and Revegetation
AUD – Avoided Unplanned Deforestation
BNEF – Bloomberg New Energy Finance
CAAP – Climate Action & Adaptation Plan
CAR – Climate Action Reserve
CBAM – Carbon Board Adjustment Mechanism
CCB – Climate, Community and Biodiversity Program
CCER - China Certified Emissions Reductions
CCUS – Carbon Capture, Utilization and Storage
CDM – Clean Development Mechanism
CEBDS – Brazilian Business Council for Sustainable Development
CER/VER – Certified or Verified Emission Reduction
CMA - Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
COP – United Nations' Conference of Parties
CORSIA - Carbon Offsetting and Reduction Scheme for International Aviation
CPFL – *Companhia Paulista de Força e Luz*
CVM - Securities and Exchange Commission
DNA– Designated National Authority
DDL – Data-Driven EnviroLab
ECIU - Energy and Climate Intelligence Unit
EQAO – Education Quality and Accountability Office
ESG – Environmental, Social, Governance
ESPL – Earthood Services Private Limited
ETS – Emission Trading System
FAS – *Fundação Amazônia Sustentável*
FBN - Biological Nitrogen Fixation
FSC – Forest Stewardship Council
GBM – World Bank Group
GCC – Global Carbon Council
GDP - Gross Domestic Product
GFANZ - Glasgow Financial Alliance for Net Zero
GGGI – Global Green Growth Institute
GHG - Greenhouse Gases
GS - Gold Standard
IBOPE – Brazilian Institute of Public Opinion and Statistics
ICAP - Research and Training Institute
ICC - International Chamber of Commerce
ICONTEC – Colombian Institute of Technical Standards and Certification
ICV – *Instituto Centro de Vida*
IDESAM – *Instituto de Conservação e Desenvolvimento Sustentável do Amazonas*
IETA - International Emissions Trading Association
IFM – Improved Forest Management
IIGCC - Institutional Group on Climate Change
ILP - Integration Crop Livestock
ILPF - Integration Crop Livestock Forestry
IPAM - Amazon Environmental Research Institute
IPCC - Intergovernmental Panel on Climate Change
IPEA - Institute of Applied Economic Research.
ITMOs – Internationally transferred mitigation outcomes
MCTI - Ministry of Science, Technology and Innovations
ME - Ministry of Economy
MMA - Ministry of the Environment
MRV - Monitoring, Reporting and Verification
MSCI – Morgan Stanley Capital International
NBS – Nature-based solutions
NDC – Nationally Determined Contributions
OECD - Organization for Economic Cooperation and Development
OMGE - General mitigation in global emissions
PD/PDD - Project Description Document
PL – Bill
PMR – Partnership for Market Readiness
PPA- Permanent Preservation Area
REDD - Reduction of Emissions from Deforestation and Degradation
RL - Legal Reserve
SBI - Subsidiary Body for Implementation
SBSTA - Subsidiary Body for Scientific and Technological Advice
SBTi – Science Based Targets Initiative
SDGs - Sustainable Development Goals
SEA – Swedish Energy Agency
SINARE - National Greenhouse Gas Emissions Reduction System
SIRENE - National Emissions Registry System
SPE - Special Purpose Entity
TCFD - Task-force on Climate-Related Financial Disclosure
tCO_2e – Ton of carbon dioxide equivalent
TCVCM - Task-force on Scaling Voluntary Carbon Market
UN – United Nations
UNFCCC – United Nations Framework Convention on Climate Change
VCMI - Voluntary Carbon Market Integrity Initiative
VCS – Verified Carbon Standard
WRI - World Resources Institute

Browse the summary to go directly to the desired section.

On any page of this report, click this button and return here to summary.

SUMMARY

PRESENTATION

After its publication in 2021, the study 'Opportunities for Brazil in carbon markets' brings an update in 2022 regarding the topic. The first report, besides bringing important concepts about carbon markets, focused on opportunities related to productive sectors in the mechanisms of Article 6 of the Paris Agreement and in the voluntary market. The report also brought recommendations to the Brazilian government, mainly for negotiations on the COP 26, and for the business sector. The present study brings a new perspective with 4 main updates after COP 26, firstly on Article 6 with the negotiations of its regulation and the commitments established during and after the COP, secondly, an updated global overview of the regulated and voluntary carbon markets, thirdly, the mapping of the national ecosystem of voluntary carbon markets, and fourthly an analysis of this ecosystem and new recommendations for the business sector and national government, including a positioning during COP 27.

BACKGROUND

Climate change is the issue of the century. Its relevance can sometimes be overshadowed by catastrophic events for society such as pandemics, economic crises, and wars. But its importance is continually growing and is evidenced by its consequences, such as record high annual temperatures, increasing natural disasters, and declining biodiversity. There is evidence that, considering the climate policies adopted in the world until the end of 2020, the Earth will have a warming of 3.2°C by the end of the century, more than twice the limit of the Paris Agreement. Without immediate and profound reductions in greenhouse gases (GHG) emission across all sectors, limiting global warming to 1.5°C is out of reach. (IPCC, 2022).

In addition to the fundamental efforts to reduce emissions by conducting more sustainable economic activities, is the pricing of carbon through the trading of carbon credits in the regulated and voluntary carbon markets. Moreover, there is the possibility that mitigation output transactions will follow from countries favored by abundant natural resources and sustainable infrastructure and their companies to countries not so favored (IETA, 2019). As one of the countries with the most cost-effective mitigation potential, Brazil has an unique opportunity to use its key low-carbon sectors in these new mechanisms playing a strategic geopolitical role in mitigating climate change (ICC; WAYCARBON, 2021).

Box 1

Resuming definitions on carbon markets

There are 3 coexisting carbon credit trading environments: I) The internationally regulated carbon market that is under the United Nations Framework Convention on Climate Change (UNFCCC). This is where the Paris Agreement is currently in force, whose emissions reduction targets are the NDCs (Nationally Determined Contributions) of each country. II) The regional, national and subnational regulated carbon markets called ETS (emissions trading system). III) The voluntary carbon market.

Article 6 of the Paris Agreement introduces two new market mechanisms that help parties in the agreement to cooperate and meet their NDC targets. This cooperation will result in the transfer of emissions mitigation between countries, from the country hosting the reduction to the country purchasing the reduction. Under the Article 6.2 mechanism, transfers of mitigation units (ITMOs) can be negotiated between countries. The as-yet unnamed Article 6.4 mechanism allows direct transfers of 6.4 Emission Reductions (6.4ER) between countries and the private sector. The implementation of Article 6 and the operation of its mechanisms have the potential to provide a global policy basis for an ETS that serves as an umbrella for national initiatives.

Regulated carbon market refers to an Emission Trading System (ETS) that sets a cap on GHG emissions and the agents that emit below the cap can trade allowances. Thus, the Regulated Market depends on a regulatory framework, in which, in general, allowances are negotiated.

On the other hand, the Voluntary Market refers to an offset mechanism that trades certified GHG emission reductions (Certified or Verified Emission Reduction - CER/VER), known as carbon credits, meeting voluntary, corporate and/or individual targets by trading credits generated from processes certified by third parties and respecting recognized standards.

Under agreements between states, it is possible that credits from the voluntary market can be used partially to meet the targets of a regulated market and be used as a flexibility mechanism. Both markets use the ton of carbon dioxide equivalent (tCO_2e) as the unit of measurement for negotiations (ICC; WAYCARBON, 2021).

COP 26 RESOLUTIONS ABOUT ARTICLE 6

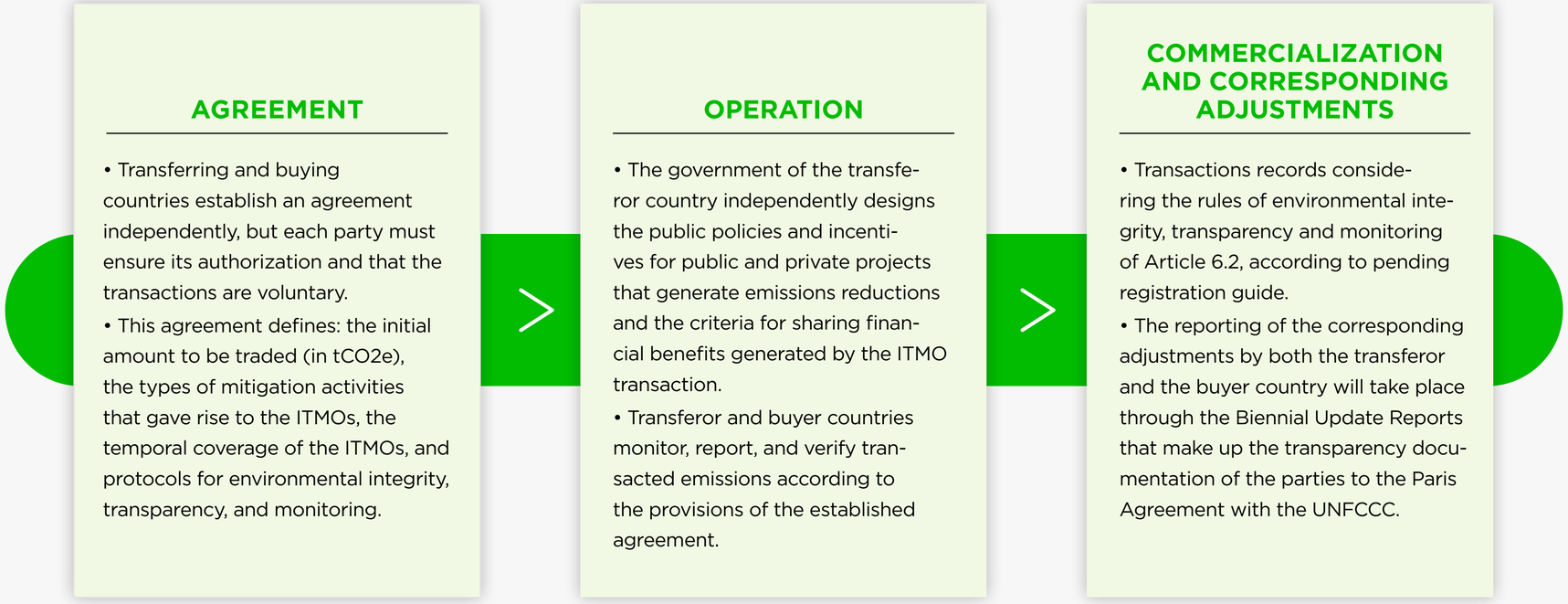
In the last Conference of the Parties of the United Nations Organization - COP 26, which took place in Glasgow in November 2021 - several fundamental points for the climate change agenda were discussed and resolved, especially regarding the issues that were pending on Article 6 of the Paris Agreement. First, **guidelines for cooperative approaches were adopted, referring to Article 6.2 in which Parties in bilateral agreements recognize the transfer of emissions reductions between themselves. This allows mitigation programs, such as country ETSs, to link up with each other**. The follow-up involved rules, modalities and procedures which were adopted for the Article 6.4 mechanism, crediting activities for reducing emissions or enhancing removals. This allows, for example, a company in one country to reduce emissions and have those reductions credited so that it can sell them to a company or government in another country. The buying company will be able to use them to meet its own emissions reduction obligations or to help it achieve net zero emissions. Subsequently, the Parties adopted a program of work to support non-commercial approaches, related to Article 6.8. The work program helps different countries and their institutions and stakeholders to develop cooperation in various areas, such as clean energy generation (UNFCCC, 2021a).

Below are the updated points on the operation of the Article 6 mechanisms and their implications:

THE OPERATION OF THE ARTICLE 6.2 MECHANISM

It was endorsed that the transactions through the Article 6.2 mechanism will be independent between countries. Each country party to the negotiation must ensure that it has arrangements in place to authorize the use of ITMOs (Internationally Transferred Mitigation Outcomes) under Article 6.3 that are consistent with the guidelines and decisions of the CMA (Conference of the Parties serving as the meeting of the Parties to the Paris Agreement) and submit updated national emissions inventories and NDCs. These transactions will occur for the purposes of I) achieving NDCs, II) "other international mitigation purposes" or III) "other purposes" (UNFCCC, 2021b). It is understood that 'other international mitigation purposes' include CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation)[1] and other purposes include domestic voluntary and regulated markets. Note that there is no requirement that the transferor country must have achieved its NDC by trading only its excess of the target. Thus, from the updates, Figure 1 presents the possible process of this mechanism.

Figure 1 - Possible ITMO transaction process



Source: Own elaboration based on Seroa da Motta (2021); UNFCCC (2021b).

1. CORSIA is a global CO_2 emissions offset scheme whereby airlines and other aircraft operators will offset any increase in emissions above 2020 levels. This means net CO_2 emissions from aviation will be stabilized while other emission reduction measures are taken, such as fuel substitution and change in operations and infrastructure options (AVIATION BENEFITS BEYOND BORDERS, 2022).

THE OPERATION OF THE ARTICLE 6.4 MECHANISM

It was decided that the mechanism under Article 6.4 will be operated under the UNFCCC by the Supervisory Body, which will consist of 12 members elected by nominations from the countries in a representative manner, and with a maximum term of office of 2 terms (equivalent to 4 years). As with the Article 6.2 mechanism, transactions under this mechanism will take place for the purposes of I) scope of the NDCs, II) "other international mitigation purposes" or III) "other purposes".

The types of projects under 6.4 and which methodologies from the old CDM mechanism may also be used have not yet been defined. In this way, it can be said that the question raised in the previous edition of this study regarding a possible restriction of projects related to the energy sector in this mechanism has not yet been clarified[2].

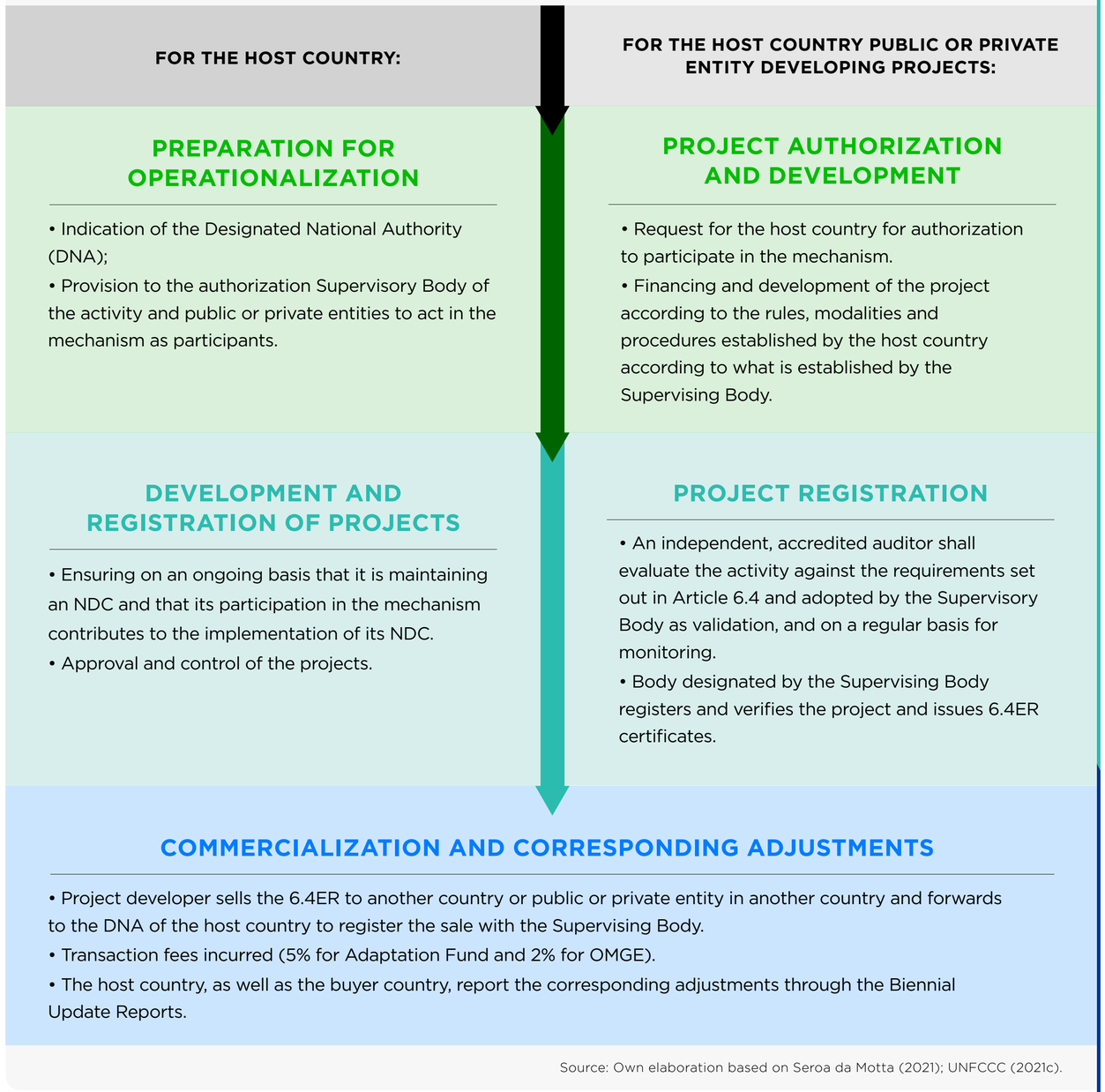
The methodologies and baseline definition of projects under this mechanism should consider a strategic market analysis of the best technologies, but less stringent criteria based on historical emissions may be used if applied at a discount. The additionality of projects should consider mitigation projects whose scope does not contain activities already required by law. The methodologies of the mechanism may be developed by public or private entities participating in the mechanism, by the host country, by interested parties, or by the Supervisory Body. Following their development, the methodologies must be approved by the Supervisory Body according to its requirements and the requirements of article 6.4. (UNFCCC, 2021c).

There are experts who believe that it is unlikely that a host country will specifically authorize project by project. Thus, each host country must establish which types of projects, through domestic legislative framework, will be approved within the mechanism (ZAMAN; QUEK, 2021). However, there are other experts who see much similarity in the governance practiced under the Clean Development Mechanism (CDM), when approval was on a project-by-project basis.

In addition, it has been decided that there will be two taxes levied on credits transacted from the Article 6.4 mechanism: a tax where 5% of the 6.4ER will go to the Adaptation Fund and an additional 2% for overall mitigation purposes on global emissions (OMGE) (UNFCCC, 2021c). The OMGE is an attempt to ensure that the mechanism's activities achieve overall net mitigation in global emissions and do not simply allow emissions leakage. Both measures are not mandatory in ITMO transactions, but are encouraged (ZAMAN; QUEK, 2021)[3].

The Figure 2 presents a summary of the possible process of the 6.4 mechanism.

Figure 2 - Possible process for generating and selling 6.4ER



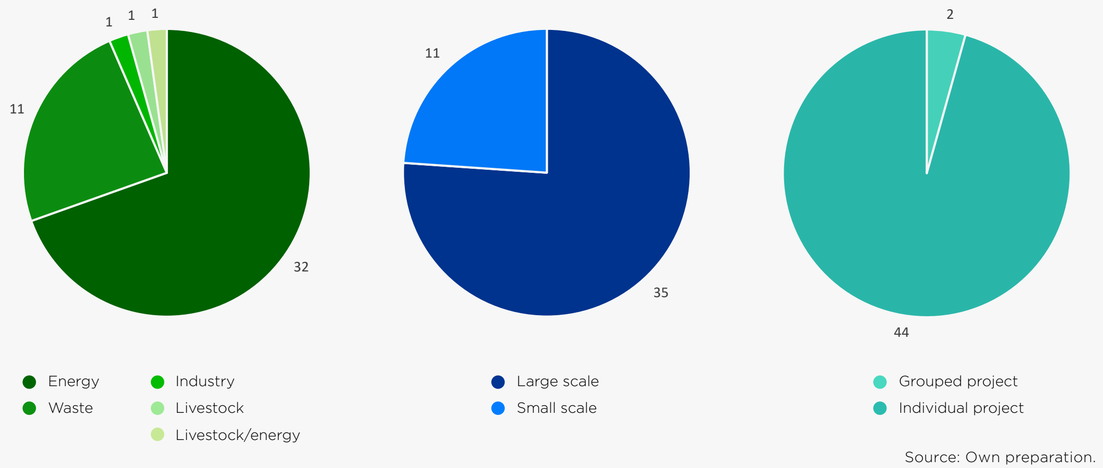
Source: Own elaboration based on Seroa da Motta (2021); UNFCCC (2021c).

2. Although energy sector projects are no longer accepted by the VCS and Gold Standard, which are the largest voluntary market standard programs, there are expectations that they will be accepted in the Article 6.4 mechanism due to the mitigation potential in the energy sector mapped for Brazil containing technological innovation to be explored. This assumption is in line with current discussions regarding the types of projects accepted under the UNFCCC (SEROA DA MOTTA, 2021b). Some emerging standards, such as the GCC and Biocarbon Registry, still accept renewable energy projects.
3. The Annex A presents a summary of the main differences between these mechanisms.

CDM CREDITS

It was defined that credits from CDM projects, originated under the Kyoto Protocol, can be uploaded to the Paris Agreement within the following requirements: CERs from projects registered on or after 2013, and identified as pre-2021 emission reductions, may be used only for compliance with NDCs until the year 2030 without undergoing corresponding adjustments. And, in the case of projects that have not yet issued CERs, projects whose request for transition to the Article 6.4 mechanism are made until 2023 and approved until 2025, if they are consistent with the criteria of the new mechanism, are allowed to continue (UNFCCC, 2021c). As recommended in the 2021 version of this study, regarding this topic on the acceptance of credits from CDM projects, Brazil had positioned itself in favor since it has CDM projects underway. Historically, through the CDM, Brazil has made US$ 32 billion in investments with about 340 projects (IPEA, 2018). Thus, the acceptance of CDM credits in the Article 6.4 mechanism can be very positive for project proponents in the country. According to the CDM project registry data extraction performed in April 2022, there are 46 CDM projects registered in Brazil as of 2013 that would have the potential to support compliance with the NDCs of Brazil and other countries (UNFCCC, 2022a). The distribution of projects by scope, scale[4] and type[5] is as shown in grapht 1 below.

Graph 1 - Number of projects registered in the CDM after 2013, by scope, scale and type



Source: Own preparation.

Based on the data extracted from the CDM database and considering the non-issued credits from the 46 projects mentioned and identified as emission reductions pre-2021, there is a generation potential of approximately 40.75 million credits that could be used to comply with the NDCs by the year 2030. Considering the remaining crediting period for the 46 projects registered as of 2021, 42.74 million credits are added to this potential, totaling 83.50 million credits that could be used to comply with the NDCs by the year 2030. However, it is important to consider that the credits generated by the CDM, before or after 2013, can also be traded on the voluntary market.

CORRESPONDING ADJUSTMENTS

Another point defined at COP 26 was the acceptance of matching adjustments to avoid the possibility of double counting in the emission reductions. Without matching adjustments, there is a risk of two countries deducting the same carbon credits from their NDCs, going in the opposite direction of a global reduction of GHG emissions. In this regard, it was decided that when a country sells an amount of ITMOs or 6.4ERs, it must subtract the amount sold from the emission reductions accounted for in its NDC. In the same way, the buying country must include the quantity purchased in the emission reductions accounted for in its NDC considering the existing rates in each mechanism (UNFCCC, 2021b). Thus, the value transacted is not double counted by the buying country or by the transferring/hosting country. The reporting of the corresponding adjustments at the national level will happen through the Biennial Update Reports (starting in 2024). The corresponding adjustments do not apply to CERs transferred from the CDM and if the host country of the project under Article 6.4 does not issue the letter of authorization for its use intended for NDC compliance or other international mitigation purposes (UNFCCC, 2021b, 2021c).

Thus, it is defined that the corresponding adjustments apply to all units transferred from both the Article 6.2 and 6.4 mechanisms, whether for sectors and gases, policies, and measures within or outside the NDC (UNFCCC, 2021b, 2021c). They are, however, optional for transactions in the voluntary market. That is, **it is considered that the corresponding adjustment is not only a tool that can be applied for transfers between two countries, but the National Authority of a host country, to comply with its NDC, can also choose to apply an accounting adjustment to mitigation projects carried out by private entities** – including voluntary carbon market projects (GOLD STANDARD, 2021; UNFCCC, 2021c, 2021b). This is an important fact, **given the growing recognition that a matching adjustment can provide greater assurance to buyers that there will be no double counting in relation to their credits and that their claim for compensation will not be prejudiced by other transactions within the host country**. It is expected that there will be an increase in the market value of carbon credits that are included in the matching adjustment mechanism. As also expected, the Article 6 decision recognized that not all carbon credits will be correspondingly adjusted and that there will continue to be carbon credits that do not represent mitigation that contributes to local NDC (GOLD STANDARD, 2021).

4. Large-scale projects are projects with installed capacity of more than 15MW, energy efficiency projects with consumption reduction of up to 60 GWh/year, projects that generate more than 60 ktCO2e/year, or forestry projects with generation of more than 8ktCO2e per monitored period.
5. Clustered projects are projects that share similar characteristics, such as the same proponent and the same implemented technology, and that are therefore registered together. As such, clustered projects are composed of instances, which correspond to each of the individual projects that make up the clustered project. The two mentioned clustered projects are composed of 8 and 9 instances.

Table 1 below illustrates the application times for the corresponding adjustments.

Table 1 - Timing of application of the corresponding adjustments

	Scope of NDC	Corresponding Adjustment
Article 6 Transactions	Covered by NDC	Requested by the UNFCCC
	Not covered by NDC	Requested by the UNFCCC
Voluntary Transactions	Covered by NDC	Requested as long as it is covered by NDC
	Não cobertas pela NDC	Not required

Source: Own elaboration based on UNFCCC (2021c; 2021b).

USE OF AVOIDED MISSIONS CREDITS

Not all the outstanding points in Article 6 have been resolved. Although the importance of forests in achieving the goals of the Paris Agreement is recognized and the framework for forest projects that include avoided emissions is recognized in Article 5 of the Paris (ZWICK, 2015) Agreement, there is still no consensus on the use of Reducing Emissions from Deforestation and Degradation (REDD) credits in accounting for credits traded under Article 6 mechanisms. Its inclusion was expected to be discussed at the June 2022 SBSTA (Subsidiary Body for Scientific and Technological Advice) technical meeting, but this item is still pending. Additionally, it is considered that the inclusion of these credits in the Article 6.4 mechanism also depends on the approval of specific methodologies.

PRACTICAL PROGRESS IN THE IMPLEMENTATION OF THE ARTICLE 6.2 MECHANISM

Some countries have already started to establish partnerships under Article 6.2 forms through bilateral agreements or programs even before COP26. Among the purchasing countries, Switzerland and Sweden stand out.

Switzerland has signed agreements with Peru, Ghana, Senegal, Georgia, Vanuatu, and Dominica providing frameworks for these countries to produce verifiable carbon reduction credits that will be used as part of their NDC compliance. Some of the agreements were signed before and others during COP 26. Notably, by law, Switzerland has determined that 75% of the reduction in GHG emissions for its NDC must be achieved through measures implemented in the country, limiting the use of ITMOs to no more than 25% of emissions. Furthermore, it has committed to use the purchased ITMOs to offset emissions from imported goods, these which countries do not normally consider as part of their NDC. Thus, Switzerland is the first country to follow this model and indeed sign agreements, but Japan and Sweden have announced intentions to establish programs on similar lines (ADLER, 2021).

In late 2019, the Swedish Energy Agency (SEA) published a global call for proposals on international climate collaborations under Article 6. More than 60 proposals for suggested projects and activities were received, of which six proposals from different countries were selected for further development. These selected proposals serve as a basis for future decisions on funding and implementation by contributing to the development of methodological frameworks for the ITMO. They are:

- Biogas production in Argentina
- Biogas production in the Dominican Republic
- Landfill gas collection in Colombia
- Efficient domestic stoves in Ethiopia
- Photovoltaic solar panels in health centers in Ghana
- Green hydrogen production in South Africa

Sweden has also partnered with the Gold Standard to apply the rules and use the structure and infrastructure of the registration program (standard) in the country's activities under Article 6 mechanisms (HATHERICK, 2021). This is expected to reduce transaction costs, increase certainty about supply to the government, reduce risk for project developers, and provide assurance to all stakeholders that stringent requirements are in place to ensure integrity and quality. It is believed that, beyond the climate impact, using the Gold Standard principles will enable the delivery of quantified and verified contributions of the related Sustainable Development Goals (SDGs) (GOLD STANDARD; SWEDISH ENERGY AGENCY, 2021). To foster ongoing dialogues with the respective transferring countries on how bilateral collaborations should be designed, SEA has joined a program of the Global Green Growth Institute (GGGI)[6] to receive support in finding new international collaborations and in the development of the six selected proposals (PERSSON, 2021).

Among the experiences with Article 6 is the partnership between Chile and Canada with the simulation of an Article 6 pilot, which began in 2018 as a bilateral learning process. It was identified through this partnership that domestic actions for mitigation should be at the core of strategies to achieve the NDC, even though ITMOs can complement national transformation, decarbonization strategies and make important contributions to the SDGs. That said, it is believed that the mitigation activities that are most appropriate for ITMOs are generally those measures that are most difficult for the transferor country to implement due to financial problems and technical barriers. This pilot helped Chile revise its NDC with new strategies to better capture the potential benefits of using Article 6 mechanisms and in drafting an internal document outlining national guidelines on Chile's participation in the mechanisms. As for Canada, the potential of ITMOs to achieve its NDC is still being explored and the country is working on developing a framework to guide ITMO

6. It is an intergovernmental, treaty-based international development organization based in Seoul, South Korea. The organization aims to promote green growth, which is characterized by a balance between economic growth and environmental sustainability.

transfers and promote international engagement on the Article 6 mechanisms and its potential operation (THE PACIFIC ALLIANCE, 2021).

Transparency will be key to ensuring the environmental integrity of ITMOs, especially since cooperative approaches under Article 6.2 are not subject to international oversight by a regulatory body. Transparency in market-based cooperation refers to: availability of information on mitigation activities generating complete, comparable and robust ITMOs, showing the environmental integrity of the activity and its promotion of sustainable development; tracking and reporting of authorizations and transfers of ITMOs, considering their different purposes of use; availability of information on accounting for authorizations and transfers showing how double counting has been avoided (KESSLER *et al*., 2021).

Switzerland will only enter partnerships that have project types involving climate protection that would not have occurred in the transferor country without these investments (ADLER, 2021). However, the New Climate Initiative[7] warns that Switzerland's bilateral agreements under Article 6 focus on project types that are easier for transferor countries to implement, and because of the partnerships, these countries would be unable to use these emissions reductions for their own NDCs, making it harder for them to achieve their own targets (JARDINE, 2021). In this way, the overall result of emissions reductions would be undermined as a whole. This critique is in line with the lessons learned from the Chile-Canada partnership.

It is considered risky for a transferor country that has not yet reached its NDC or achieved neutrality to commit to selling mitigation results. At COP26, only 3 countries were considered carbon neutral, balancing the amounts of carbon they absorb and release into the atmosphere. These countries are even carbon negative, absorbing more carbon than they emit. For these countries, the emission reductions from new projects would generate a surplus that could be traded without harm to the country. Namely: **Bhutan**, an Asian country with 72% of its territory covered by forests that absorb about 9 million tons of carbon a year, while the country's total emissions are just under 4 million tons; **Suriname**, located in South America, is the country with the highest percentage of forests in the world, 97% of the country's coverage is tropical forests, which absorb all greenhouse gases and generate carbon credits; and **Panama**, a Central American country, the last to enter the club of carbon neutral countries, which, although does not have the same percentage of forests as the other countries, its forest coverage is able to absorb more carbon than is emitted in all its operations (ECORESPONSE, 2022).

COMMITMENTS MADE DURING AND AFTER COP 26

Besides the discussions on Article 6, several other issues were discussed during COP 26 and commitments were established. And while there was relatively little funding commitment in the decision texts, the Leaders' Summit that took place during the first two days of COP 26 included several funding pledges, while seeing the launch of many bilateral and multilateral initiatives (IETA, 2021):

- Glasgow Climate Pact: features decisions that lead Parties to submit further improved NDCs in 2022, with targets for 2030 aligned with the Paris Agreement temperature targets. This pact also asks governments to accelerate the energy transition, including phasing out coal-fired power and phasing out fossil fuel subsidies.
- Countries were encouraged to use common time frames for their commitments by updating their NDCs every five years and each set of updated NDCs should cover a 10-year period.
- India has set a net zero emissions target for 2070. Furthermore, India has pledged to increase the use of renewable energy sources, decrease carbon intensity, and reduce the country's emissions by 1 billion tCO_2e by 2030 (VAIDYANATHAN, 2021).
- Participation of the Glasgow Financial Alliance for Net Zero (GFANZ), established in April 2021, which brings together net zero finance initiatives in a sector coalition, provides a forum for financial institutions to accelerate the transition to a global net zero economy and provides support for companies to become net zero[8] (GFANZ, 2021).
- Glasgow Leaders' Declaration on Forests and Land Use: commitment to work collectively to halt and reverse forest loss and land degradation by 2030, delivering sustainable development and promoting inclusive rural transformation. This is an initiative that Brazil has joined (United Nations Climate Change; UK GOVERNMENT, 2021).
- Global Methane Pledge: United States and the European Union call on countries to take voluntary action to contribute to a collective effort to reduce global methane emissions by at least 30 percent from 2020 levels by 2030, which could eliminate warming of more than 0.2˚C by 2050.
- Methodological improvement: Parties commit to using the IPCC's (Intergovernmental Panel on Climate Change) best practice inventory methodologies which has greater technical rigor, as well as working to improve the accuracy, transparency, consistency, comparability and completeness of national GHG inventory reports under the UNFCCC and the Paris Agreement and provide greater transparency in key sectors (EUROPEAN COMMISSION; UNITED STATES OF AMERICA, 2021).

In Madrid, all governments solemnly promised to go to COP 26 bringing more ambitious commitments to close the huge gap, already evident in 2015,

7. An initiative of German origin that supports sustainable development through research, policy making, and knowledge sharing.
8. Currently, members include more than 450 financial firms in 45 countries, responsible for assets of more than $130 trillion. It is focused on broadening, deepening and increasing the ambitions of net zero across the financial system and demonstrating the collective commitments of firms to support companies and countries to achieve the goals of the Paris Agreement. In Brazil, there are 28 financial services companies that are members of GFANZ, of which, 5 are Brazilian and have approximately $300 billion in assets under management, representing about 30% of the Brazilian fund industry.

between the global goal of reducing global warming to 1.5°C by 2100 and the sum of the NDCs of the Paris Agreement signatory countries that would provide a larger temperature increase. However, the NDCs presented in Glasgow have reduced this gap by only 15 to 17%. The largest absolute contributions to this tightening came from China, the European Union, and the United States, although other countries with lower emissions levels have also improved their NDCs. Contrary to the Paris Agreement requirement, that each NDC update is a progression beyond the previous one, several governments, either only resubmitted the same 2015 target (Australia, Indonesia, Russia, Singapore, Switzerland, Thailand, and Vietnam) or submitted less ambitious targets (Brazil and Mexico). Some countries have not made new submissions (Turkey and Kazakhstan), and Iran has not yet ratified the Paris Agreement. **Even with all the new promises from Glasgow, considering only the commitments set until 2030 by the NDCs, the temperature increase in 2100 could still range from 1.9 to 3.0°C**. (CLIMATE ACTION TRACKER; CLIMATE ANALYTICS; NEW CLIMATE, 2021).

Regarding climate finance, the COP26 negotiations led developed nations to at least double their collective provision of adaptation finance from 2019 levels to 2025 to achieve a balance between adaptation and mitigation. At COP 26, Parties presented new funding pledges made to the Adaptation Fund (totaling more than $350 million) and the Least Developed Countries Fund (totaling more than $600 million) that will translate into helping vulnerable populations build resilience towards the worsening impacts of climate change[9]. **By 2025, a new collective quantified target on climate finance will be defined, starting from a floor of $100 billion per year and considering the needs and priorities of developing countries** (UNFCCC, 2021a). Additionally, an $8.5 billion climate finance initiative was undertaken by a group of donor countries working together with South Africa for an accelerated and just transition away from coal (MASON; SHALAL; RUMNEY, 2021).

The net zero commitments made by countries cover about 90% of global emissions. While these targets are an important signal and some have accelerated government climate action, the quality of most remains questionable. Experts have evaluated that if all the announced commitments or net zero targets are implemented, there will be a reduction in the estimated increase in the planet's temperature to 1.8°C by 2100, with a peak warming of 1.9°C. However, only 40 countries, representing 6% of global emissions, are covered by more detailed and plausible targets according to the technical rigor of these experts. Brazil is among the countries that do not have adequate net zero targets. (CLIMATE ACTION TRACKER; CLIMATE ANALYTICS; NEW CLIMATE, 2021).

REFLECTIONS ON THE VOLUNTARY MARKET AND PRIVATE SECTOR

The outcome of the COP 26 negotiations was also reflected in the voluntary carbon market with the announcement of the first letters of authorization - commitment to apply the corresponding adjustment - granted to projects that will generate credits for the voluntary market, as well as the indication of several large companies, which would seek to obtain correspondingly adjusted credits.

The Gold Standard will soon introduce a new process that will allow credits authorized under Article 6 to be issued and transacted through its registry, with provisions for marking authorized credits, tracking the application of corresponding adjustments, and avoiding double counting (GOLD STANDARD, 2021). Originally, the voluntary market does not consider Article 6 accounting tools, but they are available to host countries. The voluntary market should not impact host countries' mitigation efforts (VERRA, 2021).

Several companies and financial institutions have made commitments against climate change:

- With its **Climate Change Action Plan 2021-25** (CCAP), the World Bank Group (WBG) has made a commitment to mobilize more private capital for climate action and prioritize adaptation efforts, recognizing that developing countries are suffering from the effects of climate change (WORLD BANK, 2021).
- The **Net-Zero Banking Alliance**, with 95 member banks from 39 countries and that collectively represent $66 trillion in assets - over 43% of banking assets worldwide, has established a commitment to which they agree to achieve net zero emissions by 2050, in alignment with the Paris Agreement's 1.5°C temperature limit; and through a scientific model aimed at not exceeding that temperature limit (UNEPFI, 2021).
- The **Race to zero** campaign mobilizes a coalition of the main net zero initiatives, representing 1,049 cities, 67 regions, 5,235 companies, 441 major investors, and 1,039 higher education institutions, who join 120 countries allied to achieve net zero by 2050. Collectively, these players now cover nearly 25% of global CO2 emissions and more than 50% of global GDP (UNFCCC, 2022b). When it comes to deforestation and forests, more than 30 financial institutions, managing over $8.7 trillion in assets and belonging to the campaign, have committed to using best efforts to eliminate commodity-based deforestation risks in their investment and lending portfolios by 2025. As for the energy sector, industry companies involved in the campaign have pledged to achieve 750 gigawatts of installed renewable energy capacity by 2030 and 61 investors (responsible for $10 trillion in assets) have committed to phase out much of the thermal coal assets by 2030 for industrialized countries and globally by 2040.
- Ten global companies with combined annual revenues of $500 billion have published a statement of purpose, pledging to establish a shared roadmap for improved supply chain actions consistent with a 1.5°C pathway by COP27.

9. In Annex B, there is a list of funding commitments made by countries at COP 26 that may directly or indirectly influence Brazil's carbon market.

- A total of $19.2 billion was pledged for halting deforestation and restoring forests - $7.2 billion of this funding came from private investment.
- Also on net zero commitments, the UN Global Compact and the Science Based Target Initiative (SBTi) announced that 1,045 companies representing more than $23 trillion in market capitalization (larger than the US GDP) have joined the **Business Ambition 1.5°C** campaign. Half of these companies have committed to achieving net zero using the SBTi framework by 2050[10].
- The **Net Zero Asset Managers** initiative announced 92 new signatories for a total of 220 investors managing $57 trillion in assets.
- More than 35 auto companies signed a legally non-binding declaration to accelerate the transition to 100% electric, zero-emission cars and vans.
- In addition, the **First Movers Coalition**, a public-private partnership of more than 30 companies with a market value of more than $8 trillion, was launched with the goal of making emerging clean energy technologies affordable and scalable. (WRI, 2021).

NATIONAL CONTEXT

The progress of the regulation of article 6 at COP 26 was positive for Brazil, since it was highlighted in the previous edition of this study the great potential of Brazil in the mechanisms of this article, especially regarding the energy sector and the Nature-Based Solutions (NBS) with projects in the forestry and agriculture sectors. It is noteworthy that the previous edition brought as recommendations for the Brazilian government at COP 26 the defense of the acceptance of CDM credits, collaboration towards a consensus on the need for the corresponding adjustments, and support for the equivalence of taxes in the Article 6 mechanisms. Moreover, the price increase resulting from the adoption of fees in the transactions of the mechanism is advantageous for countries like Brazil that have lower costs to meet and exceed the targets of their NDCs. And, specifically, the acceptance of CDM credits in the 6.4 mechanism is also beneficial for Brazil, since credits from several existing projects in the country can be traded in this mechanism (ICC; WAYCARBON, 2021).

It is important to highlight that there is Brazilian participation in commitments established in the climate agenda recently. Besides several multinational companies that operate in Brazil, 25 Brazilian companies have joined the Business Ambition 1.5°C campaign (SCIENCE BASED TARGETS, 2021). More than 100 companies, 12 cities and 4 states have already signed the Race to Zero commitment in Brazil. It is believed that if the country adds up the efforts of those who have committed to Race to Zero, it represents about 50% of all emissions in Brazil and 50% of the economy (ICLEI, 2021). Additionally, it is considered that at least nine banks operating in Brazil have already joined the Net Zero Banking Alliance initiative, committing to neutralize emissions by 2050 (FEBRABAN, 2021), which can help leverage the climate strategy of Brazilian companies in their portfolios.

Furthermore, the Brazilian government has worked to advance the climate agenda by presenting the new NDC and Decree 11075, which will be presented below.

THE NEW BRAZILIAN NDC

In its NDC, updated in March 2022, the Brazilian government confirmed its commitment to reduce the country's GHG emissions in 2025 by 37% from 2005 levels. Furthermore, it committed to reduce its emissions by 50% by 2030. And, for 2050, the commitments established by the country aim to achieve climate neutrality by 2050. Brazil's updated NDC includes considerations on means of implementation and the implementation of mitigation and adaptation actions in all economic sectors (REPÚBLICA FEDERATIVA DO BRASIL, 2022).

Note that this new Brazilian NDC did not correct the methodological distortions of the document presented by the country in late 2020, when experts pointed out a change in the baseline of the country's mitigation commitments (ROMEIRO; GENIN; FELIN, 2021). It allows more emissions over the 2016 commitment, 314 $MtCO_2e$ more for 2025 and 81 $MtCO_2e$ for 2030[11] (UNTERSTEL; MARTINS, 2022). Thus, although the 2022 version of the NDC brings a reduction in emissions from what was presented in 2020, there is still an increase from the commitment set by the country in 2016.

Additionally, this NDC encompasses the commitment assumed by the Brazilian government in relation to zero illegal deforestation in 2028 (BRASIL, 2022a), but does not internalize as binding the commitment made at the COP to reduce methane emissions by 30% by the end of the decade (UNTERSTEL; MARTINS, 2022). In this way, in 2022, Brazil presented an already outdated NDC in relation to a commitment established by the country without advancing in progressively ambitious climate commitments.

DECREE 11075/2022

On May 19, 2022, Decree 11075 was signed, which, contrary to what many imagined, did not create a regulated carbon market in Brazil. The objective of the decree was to establish the procedures for the elaboration of the Sectorial Plans for Climate Change Mitigation foreseen in the National Policy on Climate Change ("PNMC", instituted by Federal Law 12187/2009) and to institute the National System for the Reduction of Greenhouse Gas Emissions (SINARE). The purpose of SINARE is to serve as a single central registry of GHG emissions, removals, reductions and offsets, and of trading, transferring, transacting and retiring certified emission reduction credits (BRASIL, 2022b). This system corroborates what was recommended in the previous edition of this study "Opportunities for Brazil in carbon markets", published in 2021, on the creation of a national emissions reporting system of easy access

10. Several companies joining the Business Ambition 1.5°C campaign are also part of the Race to Zero, which brings together companies with various commitments to achieve net zero by 2050.
11. The measure of 1 $MtCO_2e$ is equivalent to one million tons of CO_2 equivalent.

and integration with other systems, which provides transparency in data (ICC; WAYCARBON, 2021).

In this decree, the carbon credit was defined as a financial, environmental, transferable asset representing the reduction or removal of one ton of carbon dioxide equivalent, which has been recognized and issued as a credit on the voluntary or regulated market (BRASIL, 2022b). This definition differs from the PNMC that treated it as a security asset (BRASIL, 2009), and from Bill (PL) 528 that treated it as a title of law (RAMOS, 2021). With the market gaining scale, it is important to establish the legal definition to unlock financing mechanisms and provide legal security, especially if it will be possible to consider the credits fungible with each other, which would increase liquidity in this market (PROLO, 2022). Also, according to Prolo (2022), in a regulated market, the classification of emissions permits as financial assets seems to be the most appropriate classification, especially if the permits are booked by a financial institution.

Furthermore, among other definitions, carbon stock and methane credit were also defined as financial assets (BRASIL, 2022b). Since there is a differentiation between carbon and methane credits, this measure will possibly facilitate the accounting of methane emissions to monitor the achievement of the methane emission reduction target assumed by the country, as mentioned above.

Important to highlight those decrees, even when they issue regulations, can only be issued to ensure the faithful execution of the law (MELLO, 2012). In other words, a decree has no force of law in Brazil, and can only reinforce an establishment made in law. Thus, although this decree has been published, the creation of a regulated market in Brazil still depends on the approval of a law.

In this sense, there are bills being processed in the National Congress aiming to establish rules for the Brazilian carbon market (the most relevant of them being the Bill 2148/2015, which is in the House of Representatives, to which was attached the Bill 528/2021; and the Bill 412/2022, presented this year in the Senate).

WHAT IS EXPECTED UNTIL COP 27 AND WHAT IS NOT YET DEFINED

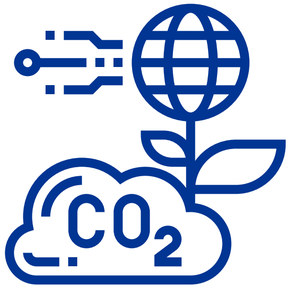
For the next COP, in November 2022, it is expected that pending topics in the negotiations will be defined. In June 2022, the Climate Change Conference was held in Bonn with the 56th section for the SBSTA and 56th section for the SBI (Subsidiary Body for Implementation) (United Nations Climate Change, 2022). The following topics related to Article 6 were discussed:

- SBSTA recognized the importance and urgency of capacity building to operationalize the guidance on cooperative approaches in the 6.2 mechanism and brought recommendations to the register as a connection between the 6.2 and 6.4 registers and the use of schemes and visual elements to facilitate the work of Parties (UNFCCC, 2022c).
- SBSTA requested that the secretariat work on defining processes for implementing the transition of activities from the clean development mechanism to the Article 6.4 mechanism and the operation of the 6.4 mechanism registry. SBSTA also recognized the importance and urgency of capacity building to operationalize the Article 6.4 mechanism (UNFCCC, 2022d).

Thus, until the COP, it is expected that there will be a greater understanding of the functioning of these mechanisms. At the national level, it is expected that there will be a definition of the institution that will be the national entity that will act as Designated National Authority before the UNFCCC before 2023, which is the deadline for requesting the transition of credits from the old CDM to the new Article 6.4 mechanism. This entity will be responsible for approving the public and private parties that will participate in the mechanism, as well as on the process and criteria for submission by letters of approval. It is important that this definition be consistent with the current regulatory framework.

Also, progress is expected in discussions regarding climate finance. As the host country of the COP, Egypt wants to focus on how the most vulnerable nations can obtain financing for energy transition and climate change adaptation. The commitment by rich countries to provide $100 billion annually for climate action in emerging countries made in 2009 was supposed to be fulfilled in 2020 and sustained until 2025. However, according to the Organization for Economic Cooperation and Development (OECD), developed countries mobilized $83.3 billion in climate finance for emerging or vulnerable countries in 2020, still below $100 billion. Scenarios showed that the $100 billion level would only be reached in 2023 (MACHADO, 2022).

GLOBAL OVERVIEW OF CARBON MARKETS



The carbon markets have undergone several changes over the course of 2021, with increased exposure, new international agreements, and greater private sector engagement, as seen above. As such, this chapter provides an update on the coverage of the jurisdictional markets, and discusses the supply, demand, prices, and characteristics of the credits traded in the voluntary market.

REGULATED MARKETS ADVANCING

From 2021 to 2022, the coverage of global emissions by regulated carbon markets increased from 21.5 to 23% - equivalent to 12 $GtCO_2e$ - due to the establishment of three new mechanisms: two sub-national ETS implemented in New Brunswick (USA) and Ontario (Canada); and a carbon tax in Uruguay (WORLD BANK, 2022a).

In October 2021, **China** released a framework with its emission reduction targets, which includes increasing the use of renewable fuels to about 25% of total energy consumption by 2030 and to more than 80% by 2060. The document also predicts rapid growth in the use of renewable energy and forest carbon so that by 2030 the total installed capacity of wind and solar energy will exceed 1,200 gigawatts. Moreover, forest cover will extend to about 25 % of the national territory, and forest carbon stock will increase to 19 billion cubic meters. An important announcement for the emissions trading market is the strong influence of the forest sector for the national ETS emissions offsets (ICAP, 2021).

China also wants to resume the domestic voluntary market through China Certified Emissions Reductions (CCER), domestically certified carbon credits that can be traded on the voluntary market but can also offset up to 5% of the emissions of companies in the regulated market. The State Council announced on November 26, 2021, that the Beijing Green Exchange will host the national trading platform for CCERs, and that the Beijing exchange will also be open to global investors and upgraded to be China's green finance center (S&P GLOBAL, 2022). CCER offsets will be the only ones accepted for the Chinese ETS, with no restrictions on the type and period of certificate issuance (ICAP, 2022a).

In 2021, **Germany** also launched its ETS, which will complement the EU ETS, covering distributors of transport and heating fuels such as petroleum products, diesel, liquefied gas, and natural gas. The commercialization of hard coal will enter the ETS as of the year 2023. Unlike the EU-ETS (European Union ETS), where the certificate is acquired in the location the emission occurs (industries, power plants, or aviation), the German system obliges fuel distributors to acquire pollution rights certificates, and there is no overlap between the two ETS. The price per ton of CO2 started at 25 euros and will be set until the year 2026, when it will change to a price band system, varying between 55 and 65 euros, according to the demand for the certificates (DEHST, 2021).

Meanwhile, **Indonesia**, in October 2021, launched a regulation that will be the legal basis for the country's carbon pricing framework, with the aim of meeting its NDC targets. The country had already been considering the implementation of a market mechanism for emissions reductions for several years, but the movement gained momentum in 2017, when the government regulation on environmental economic instruments came into force. Already in 2018, the World Bank's Partnership for Market Readiness (PMR) study examined four possible market mechanisms to be implemented in the country: an ETS for the power and industrial sector; an energy efficiency certification system for industry; a mixed system between ETS and a carbon tax; and a voluntary offset system (ICAP, 2022b). Between April and August 2021, a voluntary, intensity-based pilot ETS for the energy sector was implemented in the country, where 26 coal-fired energy plants agreed to participate and negotiated allowances and compensation credits from renewable energy generation. The pilot program should continue with new phases in the coming years, until 2024, when ETS will be mandatory (ICAP, 2022b).

In **Colombia**, the Climate Action Law that came into effect in December 2021 consolidates the commit-

ments made in the country's NDC and sets the goal of fully implementing the ETS by the year 2030. The law established the obligation for companies to report their direct and indirect emissions, following criteria established by the Ministry of Environment and appointed experts to generate recommendations and develop the market (ICAP, 2022a).

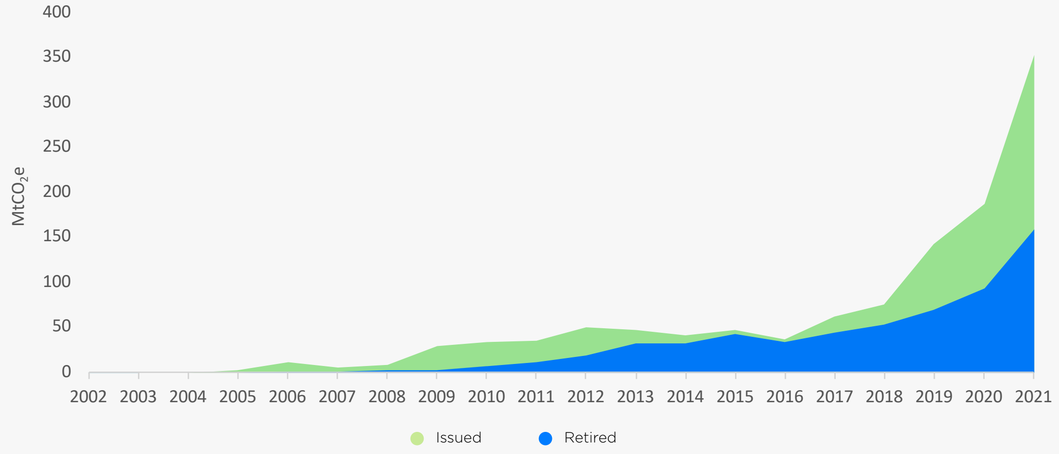
Additional to national initiatives, the **International Maritime Organization**[12] intends to include the pricing of GHG emissions in international shipping. The organization already committed in 2018 to reduce emissions relative to the year 2008 by 50 percent by 2050. Now the focus of the negotiations is on medium-term measures, which include market initiatives such as an ETS. The cap would be set on bunker[13] oil, with a price starting at US$ 100/tCO2 from 2025, with a review cycle every 5 years. Another stakeholder, the **International Chamber of Shipping**, the largest association of shipping companies, also expresses its support for carbon pricing in international transport and has outlined its own idea for carbon pricing in the sector. The potential revenues from such trading systems in international shipping are estimated to be between $40-60 billion annually (WORLD BANK, 2022b).

Brazil, besides launching Decree 11075 on May 2022, that aims to regulate the national carbon market, which is currently characterized as a voluntary market, also established this year a partnership with the Japanese government to conclude a bilateral agreement between the countries to foster a regulated market for carbon credits. The countries emphasized the importance of the pricing mechanism and the importance of creating opportunities in solid waste treatment projects for clean energy generation. Based on the agreement, the governments hope to promote the exchange of information, best practices, and experiences on market mechanisms for emissions reductions (BRASIL, 2022c).

VOLUNTARY MARKET

The voluntary carbon market reached its highest volume of emissions in 2021, with a growth of approximately 65% compared to 2020, as shown in Graph 2 below (CLIMATE FOCUS, 2022). The increase was possibly influenced by the growth in interest due to COP 26 and various voluntary initiative activities such as: SBTi; Taskforce on Scaling Voluntary Carbon Market (TSVCM); Taskforce on Climate-Related Financial Disclosure (TCFD), and Voluntary Carbon Market Integrity Initiative (VCMI). Retirement loans grew by 70% in relation to 2020, an increase greater than the growth in issued loans, but still in a smaller volume. Even if there is a mismatch between emissions and retirements due to market inefficiency, it is important to consider the market momentum, as well as the challenges in making a credit available, which requires time for monitoring and processing deadlines within the registration platforms, for example. For this reason, one can understand the continuity of increasing emissions y over retirements as expectations to meet the future demand already expected by the market, allowing the supply players to be prepared to make the credits available for the demanders as soon as they are requested. In addition, other transactions may have been missed in the data survey, since some companies purchase credits in advance to offset their future emissions, or other players purchase these credits without retiring them, such as Traders, for example.

Chart 2 - Credits issued and retained in the voluntary market worldwide (VCS, GS, ACR and CAR)



Source: Climate Focus (2022).

12. United Nations specialized agency responsible for the safety and security of maritime transport. The organization aims to provide mechanisms for cooperation among governments in the field of government regulation and practice relating to technical matters of all kinds affecting shipping engaged in international trade, to encourage and facilitate the adoption of standards relating to maritime safety, efficiency of navigation and the prevention and control of pollution from ships. It currently has 175 member states (IMO, *[s. d.]*).
13. Bunker is the main fuel used in the main engines of large ships' propulsion systems (EPE, 2019).

This growth in carbon credit emissions would have been driven by Forestry and Land Use projects, which grew four times more in relation to 2020, reaching 227,7 $MtCO_2$ negotiated - outpacing the volume of credits from renewable energy projects, which reached 211,4 $MtCO_2e$ in 2021 (Forest Trends' Ecosystem Marketplace, 2022).

Referring once again to the mismatch between emissions and retirements of for carbon credits in the voluntary market can be explained by two reasons that occur simultaneously. First, it is possible that at the current price level, the supply of credits has high price elasticity, i.e., the quantity supplied grows more than proportionally to the price increase. This may happen due to the number of projects with low marginal abatement costs, especially with REDD projects. In this way, it is possible that a small price increase makes possible a series of new projects that were not viable before and that now offer a large quantity of credits.

Second, the voluntary market is an inefficient market - in the sense that the price of the good sold does not fully incorporate all available information - due to informational asymmetries present in this market[14]. The buyer of the credits does not have enough information about the quantity and quality of the available credits, so he or she accepts to pay more to a middleman that has access to this information, causing the price of the credit to rise sharply in the over-the-counter markets.

The negotiation process in over-the-counter markets is another factor that contributes to the inefficiency of the market, as the meeting between an individual buyer and a supplier is a lengthy process (MCKINSEY, 2021).

According to an article published in the Financial Times, in some cases, the margins charged by carbon credit resellers are up to 10 times higher than the price of the credit. In one of the cases reported by the article, credits from a Brazilian project initially sold at US$ 2.75 were offered at a range of 15 to 20 euros (US$ 15.7 to US$ 21)[15] after one year of the initial purchase (HODGSON, 2022).

Emphasis on the fact that carbon reduction credits had a trading volume almost 10 times greater than credit removals in 2020 and 2021, but with prices about five times inferior[16] . Donofrio et al. (2021) points out that this award for removal credits is mainly driven by Agriculture and Land Use projects (reforestation, restoration, and management of wetlands) and not by more expensive projects such as credits from Carbon Capture, Storage and Use projects[17]. Table 2 shows the volumes and prices of the credits comparing removal and reduction values between 2020 and 2021.

Table 1 – World voluntary market negotiated volumes and prices, by sector, 2019 to 2021*

Sectors	2019		2020		2021*	
	$MtCO_2e$	PM (USD)	$MtCO_2e$	PM (USD)	$MtCO_2e$	PM
Forest and Land Use	36,70	$4,33	57,80	$5,40	227,70	$5,80
Agriculture	-	-	0,50	$10,38	1,00	$8,81
Renewable Energy	42,40	$1,42	93,80	$1,08	211,40	$2,26
Energy Efficiency / Fuel Replacement	3,10	$3,87	30,90	$0,98	10,90	$1,99
Waste Disposal	7,30	$2,45	8,50	$2,69	11,40	$3,62
Chemical Processes/Industry and Manufacturing	4,10	$1,90	1,80	$2,15	17,30	$3,12
Transport	0,40	$1,70	1,10	$0,64	5,40	$1,16
Household community devices	6,40	$3,84	8,30	$4,34	8,00	$5,36
TOTAL	**100,40**	**$1,90**	**202,70**	**$2,53**	**493,10**	**$4,00**

PM = Average Price

Source: Donofrio et al. (2021); Forest Trends' Ecosystem Marketplace (2022)

Table 2 - Volume and prices of removal and reduction credits, 2020 and 2021

Credit Type	2020		2021 (até agosto)	
	Volume* $MtCO_2e$	Price	Volume* $MtCO_2e$	Price
Removals	9,00	$7,93	5,60	$7,98
Reductions	84,40	$1,60	52,90	$1,17

* Volumes are calculated from respondents reporting data as of the reference date. However, these respondents do not always answer all questions, so there may be differences between annual volumes and between removals and reductions credit volumes.

Source: Donofrio *et al.* (2021).

14. Fama (1970) defines efficient markets as those in which: 1) there are no transaction costs; 2) all information is available and free of charge to market participants; 3) all agents agree on the implications of current information on pricing. These conditions are sufficient, but not necessary, to guarantee the efficiency of the market – the market can be considered efficient if a significant number of agents have access to the information and disagreements about the implications of the information will not be a problem if some agents do not do, so consistently better ratings than those that are reflected in prices.
15. Considering the exchange rate on 05/02/2022, the date of publication of the article.
16. Removal credits come from projects that remove carbon from the atmosphere, while reduction credits are those that prevent the emission of more carbon into the atmosphere (DONOFRIO et al., 2021).
17. Carbon Capture, Utilization and Storage (CCUS).

Also, according to Donofrio et al. (2021), this difference between prices can also be explained by the engagement of groups such as the Oxford Principles for Net Zero Aligned Carbon Offsetting[18] and the Institutional Investors Group on Climate Change (IIGCC)[19], which expresses their preferences regarding offsetting emissions focused on removal of carbon from the atmosphere, besides the SBTi's incentive for this type of credit to offset residual emissions.

Box 2

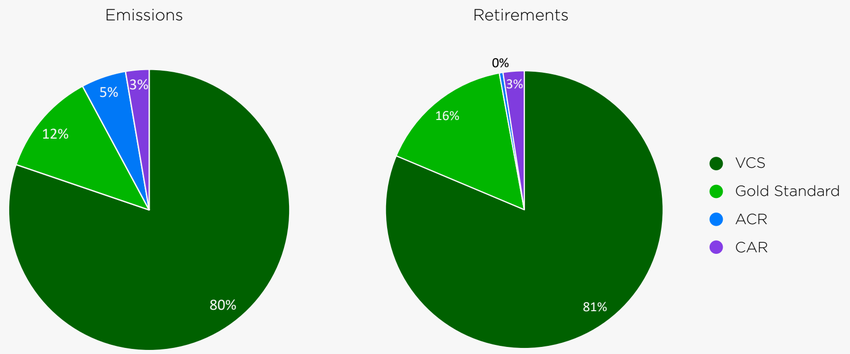
Prices of Carbon Credits

Despite the price estimate carried out by Donofrio *et al*. (2021) until August 2021, other platforms that track prices indicate greater growth in credit prices in 2021. According to the average price published by OPIS[20] (2022), a subsidiary of Dow Jones, the price of REDD+ project credits grew by about 122% in 2021, from US$5.73 to US$12.72. The prices of credits from nature-based solutions projects estimated by S&P reached US$13.8 at the end of the year. The difference between the prices recorded may be due to the different sources of data collection by these organizations. In addition, one source addresses prices for credits from REDD+ projects and the other also includes other NBS projects.

Source: Compiled data provided by Carbonext.

Among the standards, the Verified Carbon Standard (VCS) credits continue to be the majority of credits issued in the year 2021, corresponding to 80% of the credits issued worldwide, followed by the Gold Standard, with 12% and the American Carbon Registry (ACR) with 5%, as presented in Chart 3. Among retired credits, VCS credits follow with 89% of total retired credits, followed by Gold Standard with 9% and Climate Action Reserve (CAR) with only 2% in the period (TROVE INTELLIGENCE, 2022).

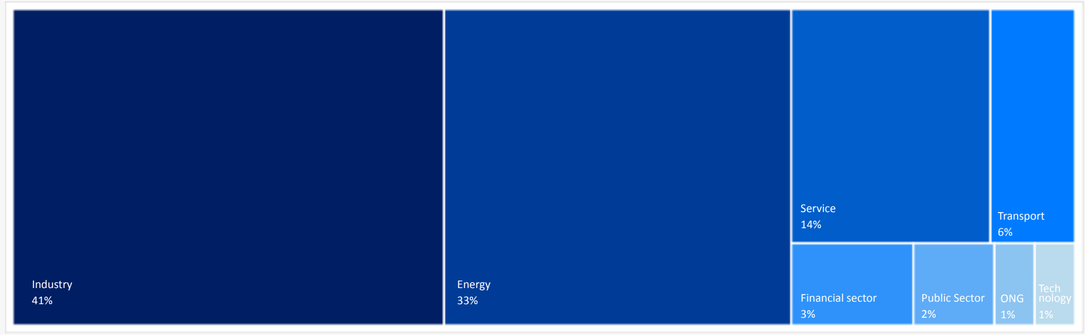
Chart 3 - Emissions and retirements by standards (2021)



Source: Own preparation based on Verra (2022a); Gold Standard (2022a); American Carbon Registry (2022); Climate Action Reserve (2022).

Chart 4, below, demonstrates that, on the demand side, the main beneficiaries of retired credits in 2021 are from the industry sectors, with approximately 41% of retired credits with beneficiary identification, followed by the energy sector with 33% and services with 14%[21]. More than 52% of the credits do not have identification of the beneficiaries of the retirements.

Chart 4 - Credit retirements in the world by sector (in 2021)



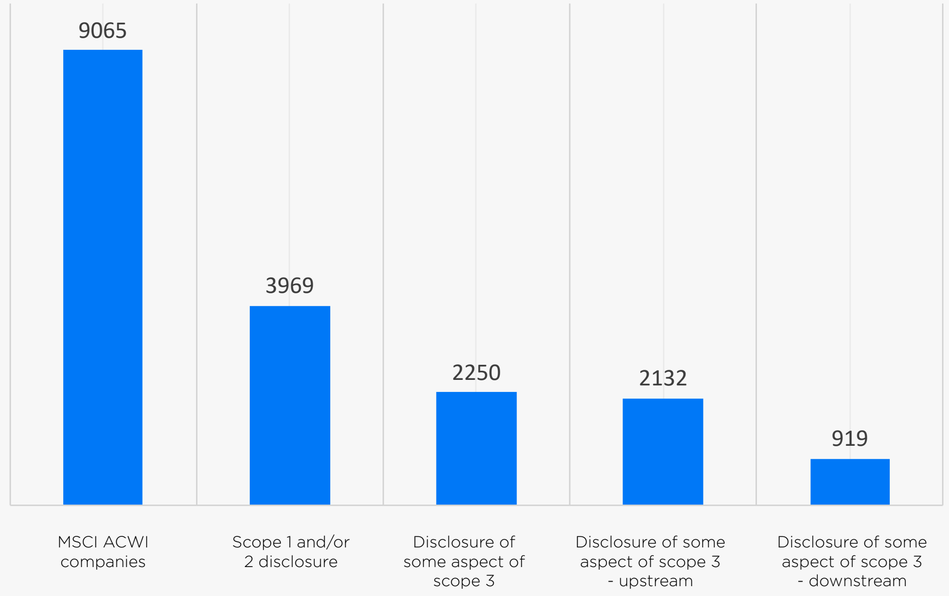
Source: Own preparation based on Verra (2022a); Gold Standard (2022a); American Carbon Registry (2022); Climate Action Reserve (2022).

18. A multidisciplinary guide released by professionals at the University of Oxford, which provides guidelines for emission offsets (UNIVERSITY OF OXFORD, 2021).
19. The IIGCC is a European organization for collaboration of investors in the area of change. The IIGCC has more than 375 members, mainly pension funds and asset managers, in 23 countries, with more than €51 trillion in assets under management (IIGCC, 2022).
20. Oil Price Information Service (OPIS), a subsidiary of Dow Jones.
21. The sector division was carried out for those credits in which the beneficiary of pension is explained in the database provided by the certifiers.

Additionally, as seen in the previous chapter, the number of new net zero emissions commitments increased. In 2021, major companies such as Coca-Cola HBC, Sasol, Sinopec, General Motors, Engie, Nippon Steel and Boral adhered to net zero targets by 2050. According to Bloomberg, the 111 focused companies of the Climate Action 100+ initiative have set a net zero or equivalent emissions target to reduce and/or offset their emissions, which correspond to 80% of global industrial GHG emissions (BNEF, 2021), implying increased demand for credits in the future.

However, most publicly traded companies still do not measure their scope 3 completely (about 75%), leaving part of the production chain out of accounting for emissions. According to the MSCI Net Zero Tracker[22] report, only a quarter of publicly traded companies tracked by the study disclose any information about their scope 3 emissions. **Most of these companies (56.2%) still do not disclose their scope 1 and 2 emissions (MSCI ESG RESEARCH, 2022)**. Chart 5 shows this data.

Chart 5 - Disclosure of emissions by MSCI Companies



Source: MSCI, ESG Research (2022).

Additionally, there is still a lack of transparency in the emission reduction plans of many companies. From approximately 4,000 organizations listed on the Net Zero Tracker[23] – an initiative resulting from a partnership between the Energy & Climate Intelligence Unit (ECIU), Data-Driven EnviroLab (DDL), NewClimate Institute and Oxford Net Zero to map net zero emissions commitments of companies, cities and countries – 90% of the companies mapped did not specify whether they intend to use offsets, while of the 10% that announced their intention to use them, almost three-quarters did not specify the conditions (MACQUARIE, 2022).

According to Black *et al*. (2021), the existence of a plan, its scope and clarity regarding the scopes covered, short-term goals, the use of offsets and the commitment to publish the progress of the goals are among the main factors that determine the credibility of a net zero emissions goal. In this sense, offsets gain special attention, as the company pays for emission reductions in carbon credit projects out of its business, instead of reducing its emissions directly in its production. **However, dependence on carbon credits can pose risks to the effective mitigation of GHG emissions, given the physical limitation for carbon removals from the atmosphere**. The authors also mention a study by the Greenpeace institute (2021), which claims that only two global companies, ENI and International Airlines Group, could "deplete" up to 12% of the total CO2 available for offsetting through new forests.

22. The MSCI ACWI Investable Market Index covers 9,300 companies, representing 99% of the world's publicly traded companies.
23. The Net Zero Tracker initiative differs from the aforementioned MSCI Net Zero Tracker.

NATIONAL CARBON MARKET ECOSYSTEM

To understand the maturity of Brazil in carbon markets that are coherent with the reality of those who work in the Brazilian market and the projects implemented in the country, the need to map the carbon market in the country was identified, knowing its players, ways of performance and perspectives and understanding the portrait of the maturity of carbon projects in Brazil. As a complement to the literature data and databases of the (standard) project registration programs and to obtain an integrated view of the market, targeted research was carried out on the carbon market in Brazil through interviews with strategic market players and online research[25].

CARBON MARKET PLAYERS

To understand the ecosystem of carbon markets, it is necessary to know the roles and responsibilities of each of the players. The process of generating and buying/selling carbon credits in the voluntary market is composed of different players who work by financing, designing, implementing, reporting, and verifying projects, generating, buying or even intermediating carbon credits. In this study, the players will be classified by the types of action between supply players, demand players and transversal players, whose participation can be fundamental or optional.

SUPPLY PLAYERS

The following players in the carbon market in Brazil were listed: the project proponent, the financier, the project developer, the project implementing partner and suppliers of technologies for mitigation.

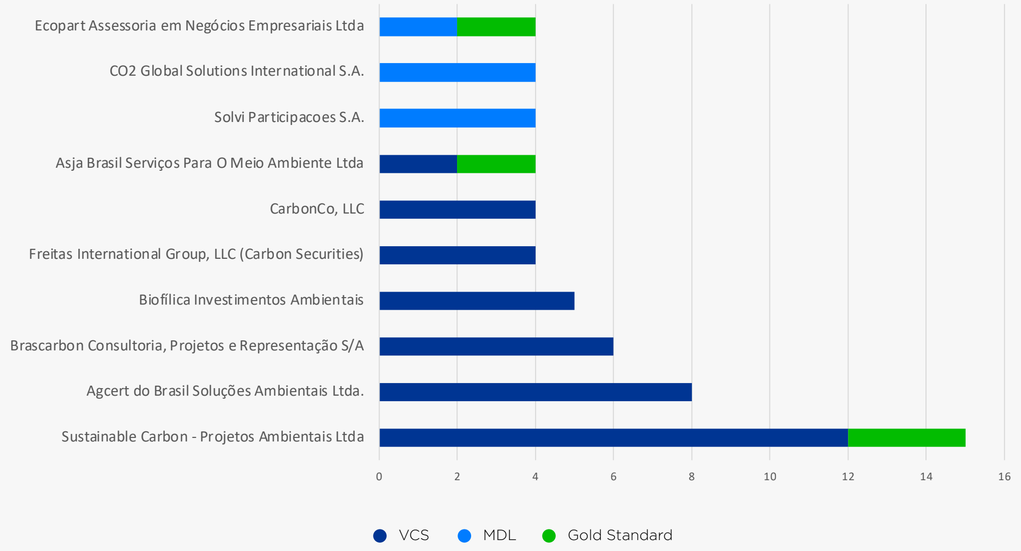
Project proponent

The project proponent is the individual or organization that has control and overall responsibility for the project. The project owner is the owner of the site or technology to be implemented in the project activity, called the Project Owner. In this sense, the landowner does not necessarily enter as a proponent. It is possible that an institution proposing a project has an agreement with landowners to use the land as a resource, as it is also possible for a cooperative that brings together small owners to act as a project proponent.

The same project can have more than one proponent and, when this occurs, it is necessary to choose a representative from the registration program (standard), usually, an individual part of one of the companies involved in the project, being either a proponent, or a developer. This representative will be responsible for the entire process until the credits are retired.

Within the MDL, VCS and Gold Standard programs the main project proponents are also project developers and sometimes project implementing partners. Chart 6 below identifies the main proponents:

Chart 6 - Main proponents[26] in Brazil and their participation by standard, considering the number of registered projects



Source: Own preparation based on VERRA (2022b); GOLD STANDARD (2022b); UNFCCC (2022a). Extraction in April 2022
Note: The 10 proponents with the highest number of registered projects were presented, so the graph is not exhaustive.

24. The selection of interview invitations was made based on the nominations of members of ICC and WayCarbon so that all types of actors defined in the study could be heard. In all, 25 companies agreed to contribute to the collection of primary data through interviews. The name of the 41 respondents and their respective companies can be found in Annex C. The interviews were conducted by the WayCarbon team between April 12 and May 4, 2022. As a methodology for the interviews, a specific script was structured for each type of player, with quantitative and qualitative questions, aiming to understand the participation of each type of player.
25. Prepared by WayCarbon and published by ICC and WayCarbon on their networks, between May 2 and 31, 2022, aiming at a greater reach of the vision of market players. The questionnaire questions were prepared in a predominantly optional format, online and in a complementary way to the questions posed during the interviews. Another 18 companies, in addition to those interviewed, collaborated through the online research.
26. Projects registered in the CDM from 2013 onwards, projects registered with the VCS and the Gold Standard were considered, according to the self-statements present in the documents available on the registration platforms. Proponents with 4 or more identified projects were indicated, according to the secondary data obtained. This cut was applied to the CDM considering the possibility of project migration or credit to the new mechanism of article 6.4. However, most Brazilian projects registered in the CDM were registered before 2013, and credits from such projects can still be traded on the voluntary market, albeit with an older vintage. Also, it is worth highlighting the flexibility of the voluntary market in relation to projects registered and to be registered, hence the consideration of all projects in the voluntary programs.

An important topic to be considered, however, is that, sometimes, large companies responsible for the projects may not have been mapped, since they may use Special Purpose Entities (SPEs) for the implementation, development, and registration of activities, making their identification as project proponents.

During the interviews, proponents identified that they value technical knowledge, delivery capacity, experience, time, costs, and compliance in the selection of their partners, such as project developers and implementing partners.

Financier

Investors play a critical role and can benefit from the role of financer of carbon credit projects. In both compliance (in the regulated market) and voluntary markets, investors and financial institutions play an essential role in the sheer volume of capital they can mobilize and allocate. They can connect supply and demand and help build market depth and liquidity. In the voluntary market, they can promote decarbonization efforts by investing in reduction or removal carbon credits, either directly or through third-party funds. Financial institutions can also exert significant influence over companies in their portfolio to prioritize decarbonization and share best practices (GIC; EBD SINGAPURE; MCKINSEY, 2021). Additionally, there are also entities that work with financiers, connecting them to projects that need funding to execute their projects. These players were also considered in this study as financiers.

Box 3

Financing possibilities for projects identified during the interviews

The interviews presented different possibilities and ways to finance carbon projects: Prepayment of credits through the purchase in advance of the constitution of the credit issued; Conventional lines of credit; Possible financing with land collateral; Financing of the development stage of the projects (Project Descriptive Document and registration) or co-participation in the credits generated by the project developer; Financing of technologies; Investment in companies that develop and purchase technologies; Possible development of funds so that interested people can directly invest in certain projects; matchfunding[27] between the project proponent's investment and other financial institutions; and debt financing or on-demand projects.

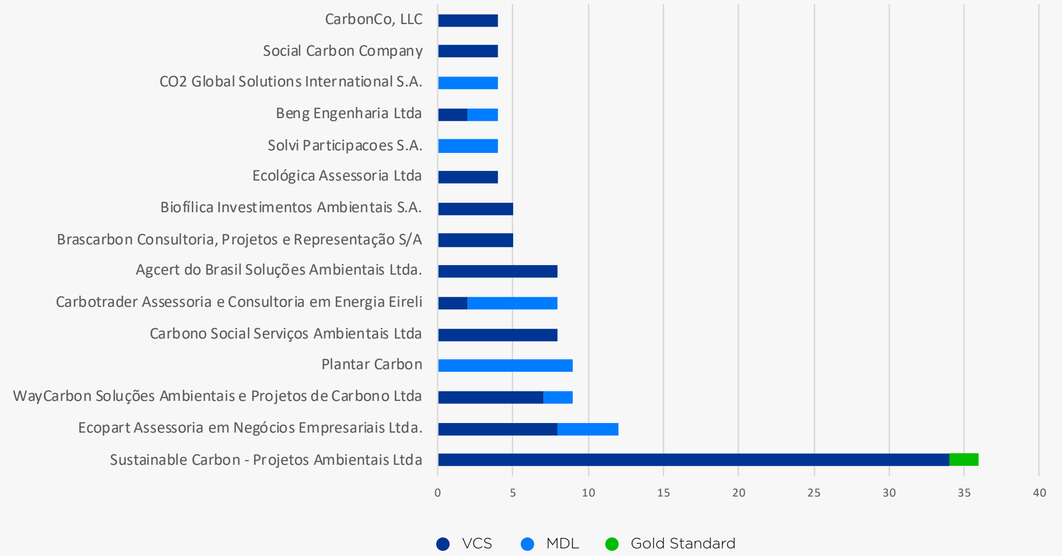
It is noteworthy that, in NBS projects, there are models in which the landowner has a share in the credits and can negotiate his/her share in the market, although the concern with the insufficient or not properly shared return of revenues from the credits to landowners and the local population.

Project developer

For the registration, the action of a project developer is necessary, which is the person or entity that gathers the data, evaluates the application of the methodologies for the project and that prepares the documents necessary for the registration of the project, therefore, the person responsible for demonstrating compliance with the requirements upon which the registration program certification (standard) is based upon (GOLD STANDARD, 2022c).

Based on the evaluated projects, it was possible to identify the main project developers in the market, considering the developers involved not only in the preparation of the descriptive documents of the project, but also in the development of monitoring reports, presented in Chart 7 below:

Chart 7 - Top project developers[28] and their participation by standard, considering the number of registered projects



Source: Own preparation based on VERRA (2022b); GOLD STANDARD (2022b); UNFCCC (2022a). Extraction in April 2022.

Note: The 10 developer companies with the highest number of registered projects were presented, and other companies with the same number of projects as the 10th, so the graph is not exhaustive.

27. *Matchfunding* is a crowdfunding format where an entity proposes the funding of a given activity in a collaborative way and, for each real contributed by external entities, the entity that proposes the funding makes a proportional contribution, which may be limited to a maximum amount in some cases.

28. Projects registered in the CDM from 2013 onwards, projects registered with the VCS and the Gold Standard were considered, according to the self-statements present in the documents available on the registration platforms. Developers with 4 or more identified projects were indicated, according to the secondary data obtained. This cut was applied to the CDM considering the possibility of project migration or credit to the new mechanism of article 6.4. However, most Brazilian projects registered in the CDM were registered before 2013, and credits from such projects can still be traded on the voluntary market, albeit with an older vintage. Also, it is worth highlighting the flexibility of the voluntary market in relation to projects registered and to be registered, hence the consideration of all projects in the voluntary programs.

It is important to highlight, however, that in some cases it was not possible to identify the project developer, since the data collection was based on the self-statement and identification of the players in the documents published on the VCS, Gold Standard and CDM registration platforms (considering for the CDM, projects registered after 2013).

Implementing Partner

The implementing partner is the one who operates the project activity (or activities) in partnership with the project proponent, jurisdiction, or even the project developer (VERRA, 2022c). In Brazil, the figure of the implementing partner is usually performed by the proponent, project developer or outsourced company specialized in the implementation of the activity. The implementing partner is the one who, in addition to implementing the project, has the ongoing work of operating in loco. Due to its continuous work in the operation of the project, it has a close relationship with the local community.

Technology Suppliers

The technologies implemented by the projects are also key points for their execution and credit generation, and it is the role of **technology suppliers** to provide proponents with adequate resources for their activities. Technologies can be based on reducing emissions or removing greenhouse gases, these which usually do not have financial or regulatory incentives for their implementation and are less carbon intensive, or they can be based on removal through devices that remove the GHG from atmosphere for storage (TSVCM, 2021). Still, technologies can be useful in supporting the monitoring of projects.

DEMAND PLAYERS

Demand players are the credit buyers. The buyer is interested in acquiring credits either for their own benefit (final buyer) or for resale (brokers[29] and traders[30]). Carbon credit projects have a variety of attributes (project type or geographic location, for example) that can directly influence buyer preferences (TSVCM, 2021).

Box 4

Intersection with other players in the purchase and sale of credits rose during the interviews

During the interviews, traders and brokers identified the intersection with project proponents, although not all credit purchases are made directly. Credits already issued are prioritized, although in some cases, advance sales are also executed due to growing market demand. Finally, these players mostly sell credits to legal entities, although some respondents already serve individuals.

On the other hand, some final buyers interviewed mentioned only purchasing the credits directly from the project proponents.

TRANVERSAL PLAYERS

The transversal players are: the registration program (standard), the third-party auditor, local communities and beneficiaries, non-profit organizations, government institutions, political figures, law firms, among other possible players.

Registration program (standard)

By definition, the registration program (standard), also known as standard, is an institution that specializes in standardized approaches to baselines and additionality (VERRA, 2022c). The registration program (standard) works in the definition of criteria, rules and methodologies and has a basis on which there is the possibility of registering projects for the issuance of carbon credits. It is possible to trade reduced or removed tons of GHG without generating a carbon credit with the approval of a registration program (standard), but the reliability of this unit is lower, and its application for emission offsets is limited, as well as its demand. Given its role as an entity that issues credits for projects, this player can also be known as a voluntary market certifier.

Box 5

Most relevant programs and emerging standards identified during interviews

Brazilian projects are usually registered with the VCS (Verified Carbon Standard), CDM and Gold Standard, with emphasis on the acceptance of the VCS by credit buyers. There are also the American Carbon Registry (ACR), Climate Action Reserve (CAR) and ART Trees standards. Other emerging standards were also mentioned: GCC (which is accepting energy projects), Ser Carbono, and Eco Registry, although there are concerns about their acceptance in the market. National Standards, such as Colombian and English, have also been drawing the attention of players in the Brazilian market. it is considered although, as described in the updates under Article 6 of this study, the CDM is understood as a mechanism finalized in December 2020 for implemented and transition projects partial for new projects in the new engine of Article 6.

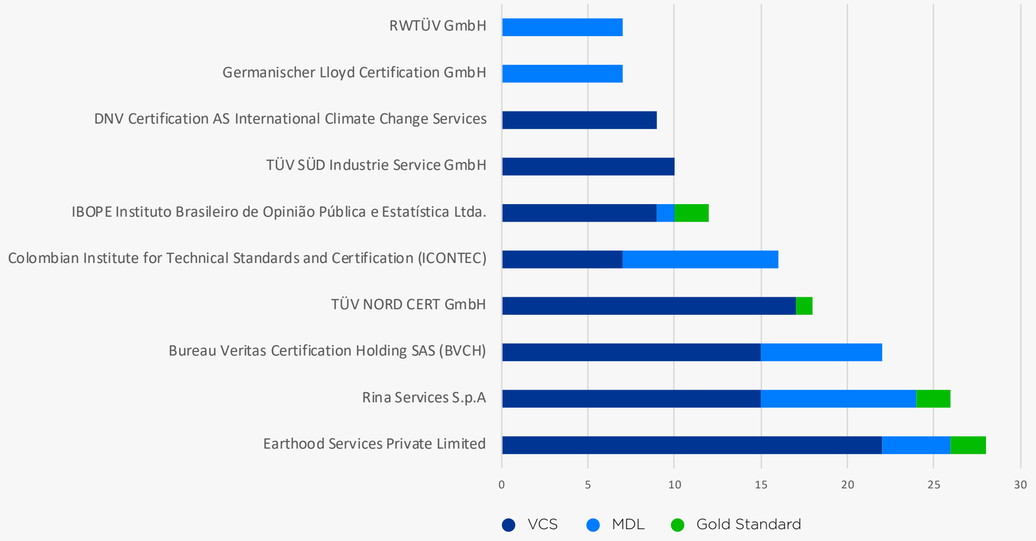
Considering the growth of the topic at the national level, financiers and other players believe that Brazil should have opportunities in the development of a national registration program (standard) that is scientifically based and considers the reality of the country's climate. However, it is important to consider the positioning of any new national standards in relation to the international market, in order to guarantee the confidence and methodological and procedural robustness necessary for market acceptance.

29. *Brokers* are intermediary agents between buyers and sellers, responsible for connecting these players and intermediating actions for the sale of credits, with commissions on sales.
30. *Traders* are agents whose objective is financial remuneration, taking advantage of market variations on credit prices. In the carbon market, this is reflected in the purchase of a credit at a certain price practiced at the time, and resale of the credit after its appreciation in the market, guaranteeing remuneration on the appreciation of the credit between the purchase and sale period.

Third party auditor

The third-party auditor is a company that acts as a validation/verification body for project activities, generating a document that contains a unilateral statement that has verified that the relevant GHG emission reductions or removals are compliant with the applicable registration program rules (standard) or not (VERRA, 2022c). To this end, it audits the documents prepared by the project developer and proponent, aiming at registering, or monitoring the projects with the registration programs. It must be accredited by the registration program (standard) (UNFCCC, 2022e; VERRA, 2022d; GOLD STANDARD, 2022d). Top project auditors can be seen in Chart 8[31].

Chart 8 - Main project auditors and their participation by standard, considering the number of registered projects



Source: Own preparation based on VERRA (2022b); GOLD STANDARD (2022b); UNFCCC (2022a). Extraction in April 2022.
"Note: The 10 auditing companies with the highest number of registered projects were presented, so the graph is not exhaustive.

Note that currently the audits Bureau Veritas Certification Holding SAS, IBOPE, DNV Certification as International Climate Change Cervices, Germanischer Lloyd Certification GmbH and RWTUV GmbH, are no longer accredited to audit projects with the 3 programs. Tüv Sud Industrie Service GmbH is also no longer able to audit VCS projects, but is still accredited to audit Gold Standard projects. Therefore, it is important to consult the list of active auditors by scope with the programs (UNFCCC, 2022e), (VERRA, 2022d), (GOLD STANDARD, 2022d).

As for the Gold Standard, it is important to highlight that the documents identifying the audits were not always available on the registration platform.

Local communities

It is also important to highlight the role of **local communities and beneficiaries**, which are sometimes made up of traditional, indigenous, riverside and quilombola populations. These players are of great importance as they are directly impacted by the projects and have knowledge of the region. They should be consulted during the design of the carbon project, and will benefit from social and local activities implemented by the project.

Other Players

Besides, there are other players in the Brazilian carbon market. Namely: **law firms, non-profit organizations, government institutions, political figures, among other possible players** that work in support of the aforementioned players, whether through the development of educational activities on the carbon market and related topics; through the establishment of regulations for the creation of the Brazilian carbon market; for participation in jurisdictional projects; or even through legal advice for transactions and agreements signed by the ecosystem and interpretation of regulations, respectively.

PLURALITY OF ACTIONS

It is noticed that the plurality of actions has been increasingly common in the voluntary carbon market in Brazil. It is important to highlight that an institution that wants to operate in the carbon market can encompass more than one type of activity. This fluidity of roles was identified during the process of interviews with institutions operating in the market, and most of the institutions consulted identified themselves with more than one type of activity.

For example, a company that buys credits, when faced with a shortage of supply of a certain type of desired credit, also starts to act as a financer and proponent of projects. Another example is a project developer company that also works in implementation. It was identified that the players are identifying gaps they observe in the market as an opportunity to act in a new way in the market.

CONFIGURATION OF THE BRAZILIAN CARBON MARKET ECOSYSTEM

Analyzing the project registration process and the reports of the players interviewed, it was identified that, currently, the Brazilian carbon market ecosystem has the following basic configuration, summarized in the following Figure 3:

31. The survey of registered project auditors was based on the identification of validation reports, audit reports for project registration, and audit verification for monitoring reports, accounting for the audit performance by project. Projects registered in the CDM from 2013 onwards, projects registered with the VCS and the Gold Standard were considered, according to the self-statements present in the documents available on the registration platforms. This cut was applied to the CDM considering the possibility of project migration or credit to the new mechanism of article 6.4. However, most Brazilian projects registered in the CDM were registered before 2013, and credits from such projects can still be traded on the voluntary market, albeit with an older vintage. Also, it is worth highlighting the flexibility of the voluntary market in relation to projects registered and to be registered, hence the consideration of all projects in the voluntary programs.

Figure 3 – Representative Summary of the current Brazilian Voluntary Carbon Market ecosystem

	INITIAL PROCESS				CYCLICAL OPERATION OF THE PROJECT				
PLAYERS | STAGES	**Project Design**	**Project Description Development**	**Validation Audit**	**Project registration application**	**Project implementation and operation**	**Project monitoring**	**Verification audit**	**Credit issuance**	**Final destination of credits**
Project proponent	Performs the project conception	Engages the parties and provides necessary information and evidence to the developer	Supports in the resolution of queries	Requests project registration			Supports in the resolution of queries	Requests registration of documents and issuance of credits	Sell the credits or use them internally
Financier	Provides resources for project development								
Other players	Provides legal and technical support, and discussion groups								
Project developer	Supports project design	Prepares project registration documents and shares with audit	Responds to questions and makes adjustments to project documents	Requests project registration		Collects data from implementer and technology suppliers, prepares documents for monitoring, accounts for reduced emissions, and shares with the audit	Responds to questions and makes adjustments to project documents	Requests registration of documents and issuance of credits	
Activity Implementer		Carries out the planning to implement and monitor the project			Implements, conducts and monitors the project operation				
Local communities and beneficiaries		Voices its opinion about the project design as far as it is impacted			Benefits from the planned social and environmental activities				
Third-party auditors			Audits the documentation and provides an opinion about the project				Audits the documentation and provides an opinion about the project		
Registration Programs (standards)				Processes documentation and grants or denies project registration				Processes documentation and issues credits	
Technology Suppliers					Provides technology to implement and operate the project	Provides technology to project monitoring			
Buyers (final or intermediary)									Purchases or intermediates the credits
STEP RESULT		**Project description document (PD/PDD) and calculation of emission reductions**	**Validation report and opinion**	**Project registration**		**Monitoring report and calculation of emission reductions**	**Verification report and opinion**	**Credit issuance**	**Resources and compensation of emissions**

Source: Own preparation.

The relationship between players for the development of a carbon project and the future issuance of credits to be traded begins with the financing of the activity, which can take place through loans, financing of technologies and activities, advance purchase of credits, participation in projects, and so on. Assured the necessary resources for the development of the project, the proponent will provide the implementation of the activity and the preparation of the documents necessary for the development of the project, counting on the engagement of the local communities and beneficiaries of the project for this process. In this sense, sometimes the same player can present a hybrid performance in the ecosystem, being able to behave as a proponent, implementing partner and developer of the project, or a combination of two of these three roles simultaneously.

The technology provider is also involved at this stage, offering the technology to reduce or remove GHG emissions, or even the technology for project monitoring, such as remote monitoring technologies for avoided deforestation projects.

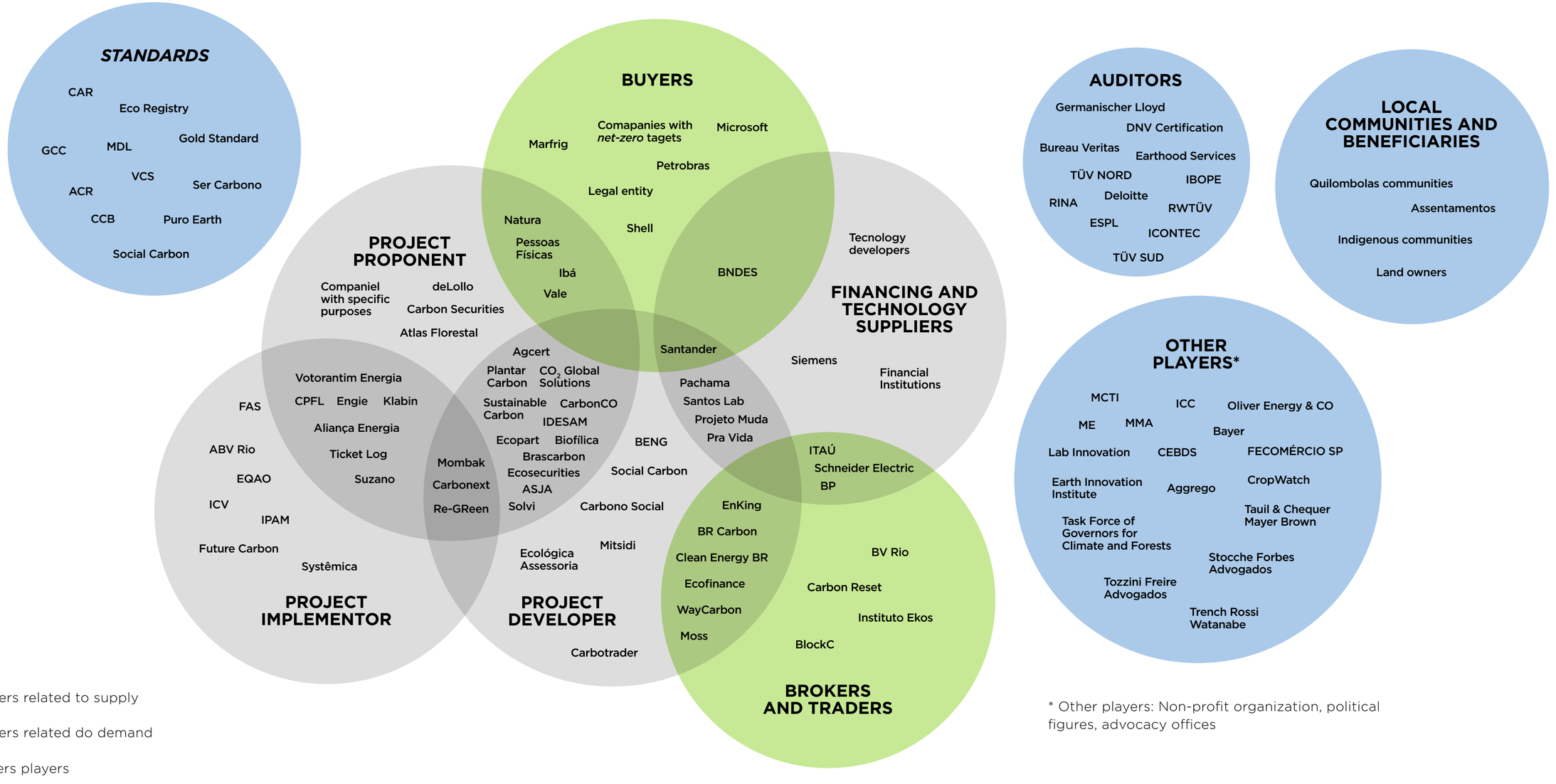
Once the documents necessary for the project's foundation have been developed, the auditor will then be called, to endorse all the information made available in the materials prepared by the project developer. These documents prepared by the developer, together with the auditor's verification, must then be submitted to the registration program (standard) for approval. Only then will the project be able to issue credits. For that, it will be necessary to carry out the monitoring of the activities implemented periodically. Upon confirmation of the emission reductions or removals of greenhouse gases promoted by the project, it will then be possible to issue the corresponding credits for the generated benefit.

The registration program (*standard*) is the player that effectively issues the carbon credit to be automatically allocated to the project proponents, who then passes them on to credit buyers, who can be Brokers, *Traders* or even final buyers.

MAPPING OF PLAYERS IN THE BRAZILIAN CARBON MARKET ECOSYSTEM

Based on primary and secondary data collection, it was possible to draw up a map of players in the current Brazilian carbon market ecosystem, as presented in Figure 4, considering that some of the players are involved in more than one type of activity in this market. It is important to emphasize that this is a non-exhaustive identification of the players, portraying their perceived position at the time of data collection. Players identified in a specific field may, therefore, present other actions not identified at that time.

Figure 4 – Map of players in the Brazilian carbon market. Non-exhaustive figure



* Other players: Non-profit organization, political figures, advocacy offices

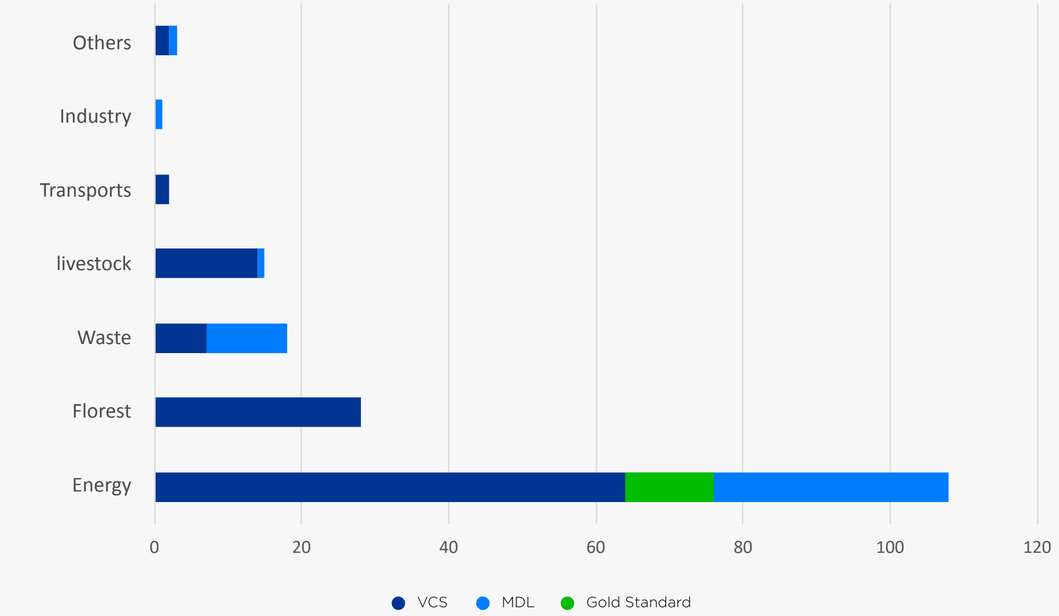
Source: Own preparation.

Note: All the players mentioned in this map are limited to the citations made in the interviews carried out between April and May 2022 and online research or in the survey of the main actors mentioned in the project documents on the VCS, GS and CDM registration platforms (Graphs 6, 7 and 8).

REGISTERED CARBON PROJECTS IN BRAZIL

When reviewing the scopes of projects registered with the VCS, Gold Standard and CDM (for CDM, considering only projects registered after 2013), considering the nature of the activities regarding the methodologies applied by the project, as shown in Chart 9, it was identified the predominance of renewable energy projects (108), followed by forestry projects (28), waste treatment projects (18) and livestock projects (15). It is important to highlight that projects can present activities in more than one scope. In this case, they were accounted for in the "others" classification.

Chart 9 - Number of projects by scope, by standard



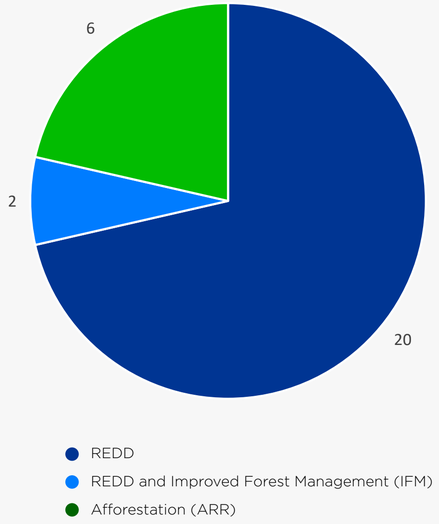
Source: Own preparation based on Verra (2022b); Gold Standard (2022b); UNFCCC (2022a). Extraction in April 2022.

Registered Brazilian forest projects were identified only in the VCS program, given the temporal limitation of CDM project registration, which excluded forestry projects registered in the CDM before 2013. Also, all programs, individually, have by majority registration of renewable energy projects.

Considering forestry projects, note that the vast majority of registered projects are classified as REDD projects, as shown in Chart 10 below.

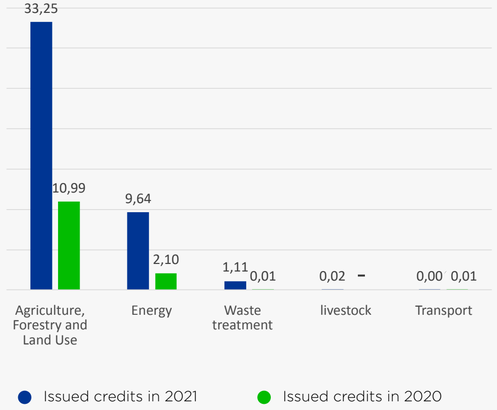
In 2021, projects in Brazil emitted around 45.28 $MtCO_2e$ in carbon credits in the voluntary market, of which 97.2% were registered by Verra[32] (VERRA, 2022ª); (GOLD STANDARD, 2022ª)[33]. This amount was mainly driven by REDD+[34] credits, placing the country in prominence as the country that most emitted carbon credits registered by Verra in the Agriculture, Forestry and Land Use sectors, although this is not the scope of the Brazilian market with the greatest number of registered projects. Projects of this type in Brazil had 33.25 $MtCO_2e$ in credits issued in Brazil, followed by Cambodia (28.6Mt $MtCO_2e$) and Indonesia (21.8 $MtCO_2e$). The amount represents an increase of more than 200% compared to credits of this type issued by projects in the country in 2020, when the country emitted approximately 11 $MtCO_2e$ in forest credits (VERRA, 2022ª). The distribution of these credits by scope for the years 2020 and 2021 can be seen in Chart 11 below.

Chart 10 - Number of projects by type of forestry activity



Souce: Own preparation based on: Verra (2022b); Gold Standard (2022b); UNFCCC (2022a). Extraction in April 2022.

Chart 11 - VCS Standard Credits issued in Brazil in 2020 and 2021, in $MtCO_2e$



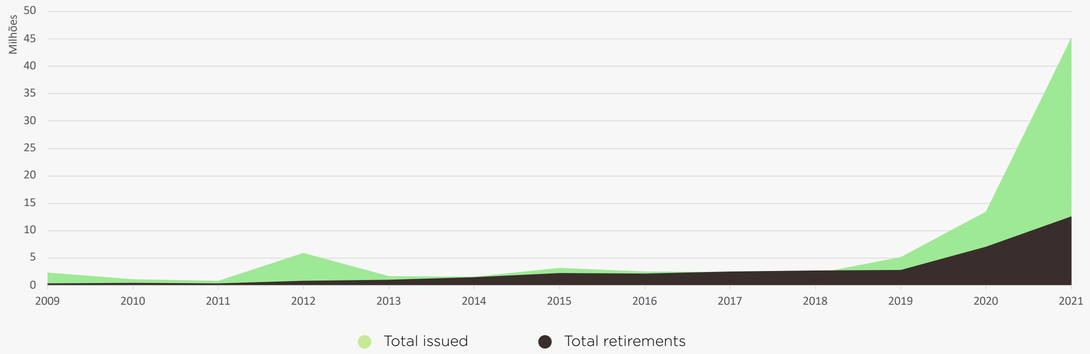
Source: Verra (2022a).

32. Verra develops and manages standards, including the VCS and the CCB
33. There is no record of projects of the ACR and CAR standards in Brazil.
34. REDD+, besides considering the reduction of emissions from deforestation and forest degradation, also considers the conservation and increase of forest carbon stocks and the sustainable management of forests.

Among the Agriculture, Forestry and Land Use credits, the projects with the highest credit issuance are all REDD+ projects, located in the north region of the country, composing 71.4% of the Agriculture, Forestry and Land Use credits issued in Brazil in 2021. Energy credits were generated mainly by the Baesa, Salto Pilão and Foz do Chapecó projects, all hydroelectric generation projects, resulting in 72% of the renewable energy credits issued in the country in the same period.

As shown in Chart 11 below, despite the growth in the amount of credit issuances, retired credits are still smaller than the issuances, in the same trend of the world market. Between 2009 – the first year in which there is a record of carbon credits emitted in Brazil – and 2021, there is a difference of approximately 51 $MtCO_2e$ between total issued and retired credits in the country. However, as mentioned earlier for the world scenario, some other points need to be considered when interpreting this information. There is a mismatch due to market inefficiency, but there is also the issue of delay in the credit issuance processes. Thus, the increase in emissions can aim at the prompt service of the expected future demand. In other cases, buyers may also purchase credits to offset future emissions, and other players may purchase credits without the intention of retirement.

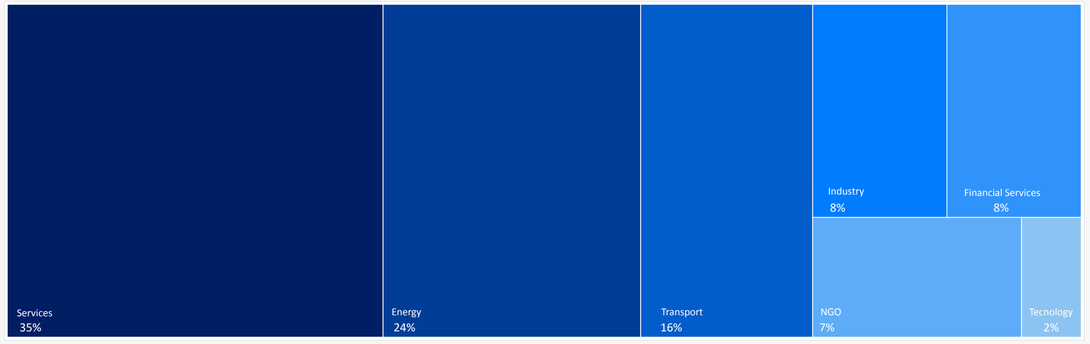
Chart 12 - Issued and Retired Brazilian Project Credits in the Voluntary Market (VCS, GS, CAR, ACR)



Source: Own preparation based on: Verra (2022a); Gold Standard (2022a); American Carbon Registry (2022); Climate Action Reserve (2022).

The demand for credits from Brazilian projects was mainly composed by companies in the service sector, notably companies that work in the area of consulting and environmental services, and companies in the energy sector, especially Oil and Gas companies and energy generation companies, as shown in Chart 13 below.

Chart 13 - VCS Credit Retirements in Brazil by Sector (2021)

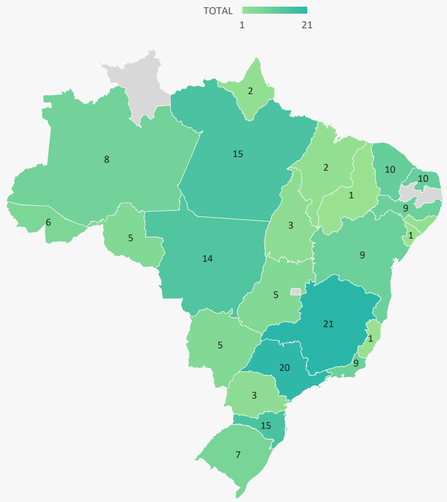


Source: Own preparation based on Verra (2022a); Gold Standard (2022a); American Carbon Registry (2022); Climate Action Reserve (2022).

PROJECT LOCATION

The geographic distribution of Brazilian projects is displayed in Chart 14. Note that grouped projects can present activities in more than one state.

Chart 14 - Number of carbon projects implemented by Brazilian state



Source: Own preparation based on Verra (2022b); Gold Standard (2022b); UNFCCC (2022a). Extraction in April 2022.

It was observed that most of the projects were registered in Minas Gerais (21), followed by São Paulo (20), where renewable energy projects prevail. In turn, forestry projects are predominantly located in the north of the country (21), mainly in the state of Pará, where 9 of the 15 registered projects are forestry, and can also be observed in Bahia, Goiás, Mato Grosso, Mato Grosso do Sul and Rio Grande do Sul.

PRICES APPLIED IN THE CARBON PROJECT CYCLE

The prices applied in the carbon project cycle can differ greatly according to the methodology adopted, the amount of credit generation and other specificities. Table 2 shows the fees charged by the main registration programs.

Table 2 – Fees charged by the most common standards in Brazil

Type of Billing*	Gold Standard Fees	VCS Fees	CCB Fees	MDL Fees
Account opening fee at the Registration	$1,000 per account	$500 per account at Verra	$500 per account at Verra	N/A
Project Registration Fees	Between $2,650 and $12,500	US$0.10/credit/year, limited to US$10,000	US$2,500 per project	Between US$0.10 and US$0.20 /credit/year, capped at US$350.00 for single projects, and between US$10,000 and US$20,000 for clustered projects, with no fee charged for adding instances
Issuance Fees	Between $0.05 and $0.15 per credit for the first year and between $0.02 and $0.30 for subsequent years	Between $0.025 and $0.14 per credit, depending on volume issued	Between $0.005 and $0.05 per credit, depending on the volume issued, limited to a minimum of $5,000	Between US$0.10 and 0.20 per credit, depending on volume
Fee for inclusion of retroactive seal	N/A	$1,500 per inclusion	N/A	N/A
Annual fee of the validation/verification body	N/A	$2,500 per year	N/A	N/A
Validation and Verification of Lands	Between US$1,500 and US$5,000 per project	N/A	N/A	N/A
Additional Review Rounds	$50 per hour	N/A	N/A	N/A

Type of Billing*	Gold Standard Fees	VCS Fees	CCB Fees	MDL Fees
Credit renewal period fee	$0.15 per credit	N/A	N/A	N/A
Accelerated Review Fee	$2,500	N/A	N/A	N/A
Methodology approval process administration fees	Not informed	Between US$1,500 and US$13,000 per project	N/A	N/A
Land Review Fee	$ 500	N/A	N/A	N/A
New Area Certification	$1,500	N/A	N/A	N/A
Gap analysis fee	N/A	Determined case by case	N/A	N/A
Specialist Registration Fee	N/A	$ 375 / project	N/A	N/A

* Billing types may differ between standards. Those classified as “Not informed” refer to charges that are explicit by the certifiers, but the amounts are not public. The cells with “N/A” refer to fees that are not charged by the certifier.

Source: Own preparation based on Gold Standard (2018), Verra (2020), The Climate, Community & Biodiversity Standards (2020), UNFCCC (2021d), UNFCCC (2021e).

These entry values, added to other costs related to the development of the projects, may limit the performance of small proponents, given that the viability of the project depends on the number of credits generated and the access to capital to carry out the required investments to generate and certify the credits. In this sense, the execution of grouped projects is an opportunity to overcome this barrier.

Box 6

Cost of project development and price of credits identified from the interviews and survey carried out

Proponents and developers interviewed said that development costs range from BRL 350,000 to BRL 550,000 per project and monitoring costs around BRL 150,000. These amounts may be higher from the perspective of umbrella projects that include smaller projects or different areas/maps. Through the research carried out, developers report that the amounts vary by scope, type, dimension, standard, inclusion of co-benefits, methodological complexity, and even logistical conditions and availability of information for the project.

Project developers have estimated that the minimum sale price of the credit for forestry projects feasibility is between 10 and 12 dollars[35], but the sale is expected to be as high as 25 dollars. Mentioned factors that change the price: socio-environmental co-benefits, vintage[36], trading volume, technology used in the project, type of credit and whether the credit is tokenized[37]. In turn, older vintage projects can reduce the credit worthiness. Additionally, another issue is the variation of amounts by type of credit. That is, the price of credit has been specific by project, depending on the scope.

Table 3 – Perception of the prices of carbon credits by the supply

	Average price ($)
Forestry projects without CCB[38]	US$10 a US$12
Forestry projects with CCB or co-benefits	US$12 a US$15
Old vintage projects	US$9 a US$10

Source: Own preparation based on data shared in interviews and online surveys.

On the demand side, the estimate mentioned by the respondents of the average price of credits traded in Brazil ranged between $2 and $40. The reason for the wide range between prices is associated with the project type. It is a consensus among respondents that currently NBScredits and with co-benefits or additional seals are the most valued in the market. However, it is worth mentioning that such attributes usually value credit pricing, also influenced by the low supply of this type of credit in the market, a factor that can sometimes limit the purchase of this type of credit.

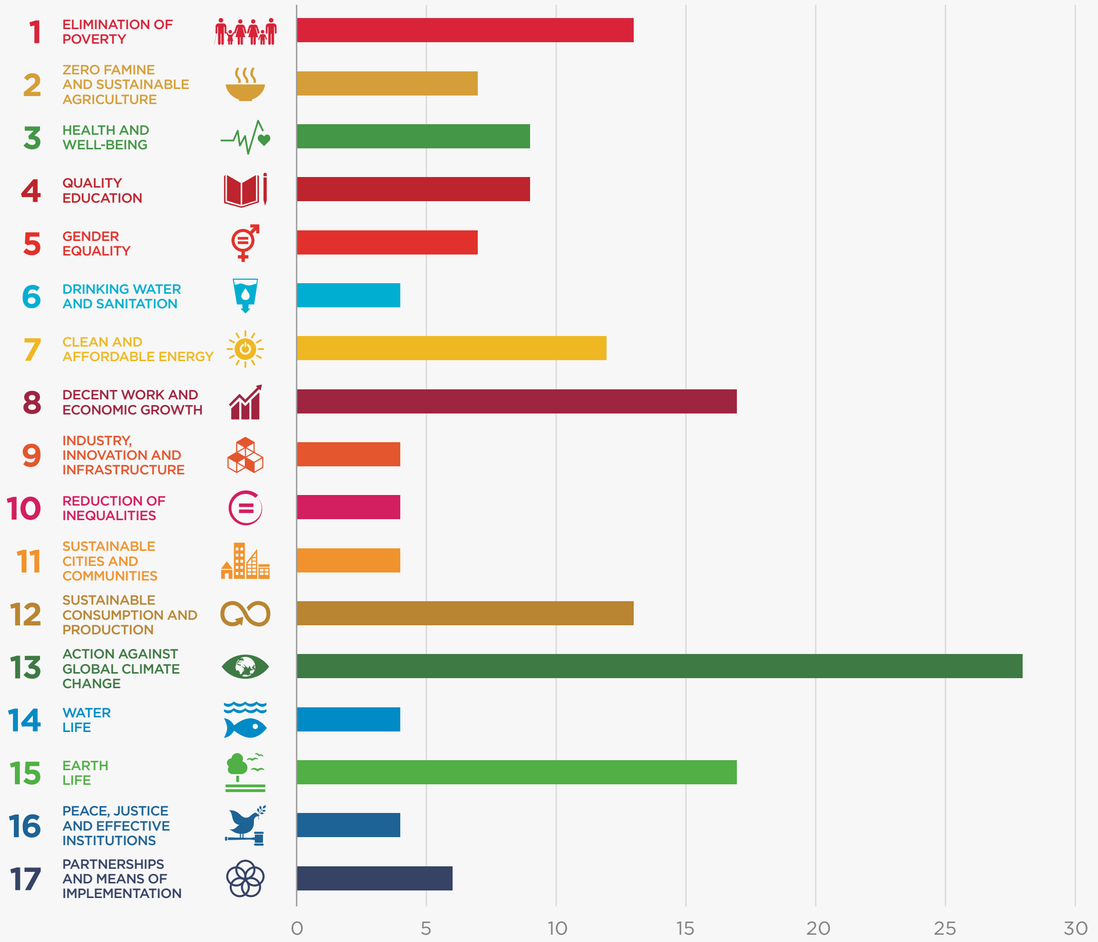
During the interviews, the lack of market transparency in relation to the prices of carbon credits was frequently mentioned, since these are negotiations in the over-the-counter market, which allows bilateral negotiations, without a regulator. Furthermore, considering the different possibilities of credit transaction within and outside the scope of article 6, it is expected that there will be differences between the types of credit in the market, resulting in different pricing. In this sense, it will be important for the buyer to evaluate the best alternative for its needs.

35. In some cases, these estimates may vary, depending on: the geographic limitation of the projects considered; moment of analysis, considering the significant increase in the value of credits after COP26; quality of projects considered by respondents when providing answers during interviews.
36. The vintage is related to the date of operation that led to the generation of the carbon credit and the monitored period that allowed the issuance of the credit, and not to its effective issuance date.
37. The tokenization of an asset means its transformation from a real or financial asset to a digital asset (token), aiming at reducing frauds and greater transparency of transactions through the blockchain.
38. The CCB Program (The Climate, Community & Biodiversity) is a standard developed to identify projects that contribute simultaneously to the three spheres that make up its name. The Seal can be applied to any land management project, requiring registration with the VCS or other similar mechanisms.

CHARACTERISTICS OF CO-BENEFITS AND CORRELATION OF PROJECTS WITH THE SDGS

The programs are increasingly paying special attention to the co-benefits generated by the projects, in line with a market movement in this direction. The Gold Standard, by definition, dictates that projects must identify the SDGs to which they contribute. Recently, the VCS included in its standard the obligation to identify the SDGs to which projects contribute, which will require monitoring of progress made in line with the SDGs at the target level, not yet present in all projects in the Standard. Currently, the registration program (standard) requires proof of direct impact for at least three SDGs, with SDG 13 (Action Against Global Climate Change) being mandatory for all projects (GOLD STANDARD FOR THE GLOBAL GOALS, 2019), (IBGE; SECRETARIA ESPECIAL DE ARTICULAÇÃO SOCIAL, 2022). Based on this information and the extraction of information from the VCS projects that sometimes identify the directly contributed SDGs, a mapping was made for a better understanding of co-benefits and the relationship with the SDGs.

Chart 15 – Number of Brazilian projects that benefit each specific SDG



Source: Own preparation based on Verra (2022b); Gold Standard (2022b); UNFCCC (2022a). Extraction in April 2022.

In this sense, it was evaluated information from 29 projects that directly declared their interface with the SDGs, and as can be seen in Chart 15, the leading SDG is SDG 13 followed by SDGs 8 and 15. With regards to SDG 13, all, except for one project, identified the contribution to it, due to emission reductions,. Contributors to SDG 15 were mostly forestry projects. SDG 1 benefited from 13 projects, 10 of which were VCS forestry projects and 3 were Gold Standard domestic energy efficiency projects.

It is important to note that four projects identified alignment with all the SDGs. Also, 7 additional Brazilian forestry projects approved by the CCB were identified (VERRA, 2022e).

Box 7

Points of impact of the price of credit identified from the interviews

During the interviews, the importance of co-benefits and additional seals for the projects was highlighted. Among the points that value the value of credit, the following were highlighted: credit quality; NBS projects; biodiversity monitoring; social co-benefits; co-benefits to water resources; use of CCB seal and FSC (Forest Stewardship Council)[39] standard; positioning of projects in regions not yet explored geographically; and integration of planted areas with Permanent Preservation Areas (APPs) and Legal Reserves (RLs) in the case of reforestation projects.

Also, note that in the same way that there is a search and prioritization for co-benefits, there may also be a limitation of the purchase of credits by project type - such as hydroelectric plants or sanitary landfills - or even as a result of due diligence analyses specific to the company, in view of the concern with the quality of credits, perceived as growing by the players interviewed.

39. The FSC is a widely recognized green seal for commercial forests and requires that the operation be carried out in an ecologically correct, socially fair and economically viable manner.

TRANSACTION POTENTIAL FOR BRAZILIAN CREDITS

The previous version of this study estimated the **potential for credit supply in the voluntary market** according to Brazil's relative share in the world market, based on assumptions that formed the basis of four different scenarios. First, the global supply ranging between 3,000 and 10,000 $MtCO_2e$ was considered for the year 2030, according to the report by TSVCM (2021). Subsequently, two assumptions were made in relation to the Brazilian market-share within these global offers: I) Brazil's relative share in the voluntary market would remain constant at 3%, which refers to the ratio between the total credits issued by Brazilian projects and credits issued worldwide on the voluntary market in 2019; II) an increase in the Brazilian market-share in the voluntary market to 10% of the credits issued worldwide. Based on these assumptions, the potential for Brazilian supply of carbon credits could vary between 90 MtCO2 and 1,000 MtCO2 in 2030 (ICC; WAYCARBON, 2021)[40].

Table 4 – Credits issued in 2019 and potential emission scenarios (MtCO2) in 2030 in the voluntary market, by sector, in Brazil. Analysis carried out in the study Opportunities for Brazil in Carbon Markets (2021)

Main supplier sectors of carbon credits	Credits issued in Brazil – 2019 ($MtCO_2$)	Global supply scenarios of 10,000(MtCO2) – 2030		Global supply scenarios of 3,000(MtCO2) – 2030	
		3%	10%	3%	10%
Total	**5.16**	**300.00**	**1,000.00**	**90.00**	**300.00**
Energy	1.63	94.80	316.00	28.44	94.80
Forests	3.52	204.75	682.51	61.43	204.75
Others	0.01	0.45	1.50	0.13	0.45

Source: ICC e WayCarbon (2021).

Following the logic adopted in the previous study, whose data are shown in Table 4, the relative share of credits issued in Brazil in 2021 in the voluntary market, it was considered as a base for the offer scenarios. In this year, Brazil issued 45,3MtCO2e in carbon credits, the equivalent to 12% of global emissions– well above the emissions of 2019, when it issued an average of 3% of the world's carbon credits – and above the 10% market-share considered in ICC e WayCarbon (2021). It is possible that this growth in Brazilian market-share in the international voluntary market will continue to be driven mainly by NBS projects, so that, while these low-cost projects are still plentiful, it is possible that the country will have a significant share in this market. As these types of projects become scarce, it is possible that Brazil's participation will be reduced due to the entry of technology-based solutions, where the country does not have a comparative advantage[41].

Based on the same projection of global carbon credit emissions, with Brazil accounting for 12% of the share of the global supply of credits, Brazilian carbon credit emissions under article 6.4 would be between 360 and 1,200 $MtCO_2$ per year in 2030. Note that, despite the time cuts for the transition from CDM credits to the 6.4 mechanism, it is not yet known what types of projects and methodologies can be transferred, as well as how the baseline reviews will take place within these methodologies that may undergo the CDM transition. For this reason, the number of credits estimated for the transition between CDM and 6.4 was not added to the scenarios in order to not inflate the numbers, although there is this potential.

Table 5 – Credits issued in 2021 and potential emission scenarios ($MtCO_2e$) in 2030, by sector, in Brazil

Main credit provider sectors in the world	World Average Prices (2021) *	Credits issued in Brazil in 2021 ($MtCO_2$)	Global supply scenarios of	
			Global of 10,000 ($MtCO_2$) - 2030	Global of 3,000 ($MtCO_2$) - 2030
			12%	12%
Total	**-**	**45.28**	**1200.00**	**360.00**
Forests	$ 5.8	33.25	881.11	264.33
Energy[42]	$ 2.26	10.90	288.95	86.69
Waste Treatment	$ 3.62	1.10	29.14	8.74
Others	-	0.03	0.80	0.24

Source: Own preparation.

40. The values referring to the previous study were updated in this new version due to a methodological improvement and correction of the sector classification.
41. Although there are already initiatives for science-based solutions being developed in Brazil, such as Carbon Capture, Use or Storage (CCUS) projects, the generation of credits by these mechanisms is still uncertain and their use is still much more reduced than nature-based solutions in the country. Also, the reduction of emissions in forestry and agricultural projects are the ones with the lowest reduction costs in Brazil (BRASIL, 2017)
42. The generation of credits in this sector may be affected according to the way in which the registration programs will accept new projects.

Considering the average prices of credits by project types in 2021 of Table 5, according to (Forest Trends' Ecosystem Marketplace, 2022), Brazil could obtain between 1.76 and 5.87 billion dollars per year in 2030. Considering the price of $100 per ton, an amount considered by TSVCM as necessary for a rapid reduction of emissions, the potential could reach up to $120 billion in 2030, against $100 billion estimated in ICC & WayCarbon (2021)[43].

For the voluntary market, it is considered that the non-eligibility of new energy projects since 2020 results in a residual generation potential of already registered projects that can still issue credits of approximately 62 $MtCO_2e$ until 2030[44] and, therefore, the total potential for the offer of credits in the voluntary market is reduced to 973 $MtCO_2e$, in the most optimistic scenario, and 335 $MtCO_2e$, in the pessimistic scenario, considering the same amounts estimated to 6.4 in the other sectors.

On the other hand, it is possible that this portion of energy emissions reduction could be covered by the Articles 6.2 and 6.4 market, since it is possible to include private projects in the packages that will make up the ITMO (ICC; WAYCARBON, 2021). Also, it is worth mentioning the emergence of new registration programs in the market, which can bring changes to the scenario, allowing the registration of renewable energy projects. Finally, it is important to point out that for the mechanism under article 6.2, an even greater supply potential is expected than for 6.4, due to the breadth of initiatives that can compose the results of emission reduction transacted. **Thus, with this credit supply potential, Brazil could supply between 8.4 and 28% of the demand in the Article 6.4 market mechanism, according to Edmonds et al. (2019), who estimates a demand of 4,300 $MtCO_2e$ in this market.**

It is worth mentioning that this last amount, of $100/$tCO_2$, is an expected amount for the emission reductions to happen at an accelerated level, and, therefore, it is not a future price estimate, but the price level considered necessary to limit global warming to 1.5°C (TSVCM, 2021)[45] . There is no way to say that this scenario is likely to happen or that there will be demand for carbon credits in the voluntary market at this price level, but it is important to establish the scenario. For NBS credits, the task force estimates that prices will range between $10-50 in 2030, depending on geographic distribution and project types.

In this emission reduction accelerated scenarios, the demand for credits in the voluntary market would be between 1,500 and 2,00 $MtCO_2e$ (TSVCM, 2021), where Brazil could potentially offer between 22.3 and 48.7% of the credits in the voluntary market.

The TSVCM (2021) report points out Brazil and Indonesia as countries with the greatest potential for generating credits in climate solutions projects, obtaining together a potential of 30% of the credits generated in 2030. Griscom *et al.* (2020) already estimates that, at $ 100/tCO_2, it would be possible for Brazil to mitigate up to around 1,300 $MtCO_2$ per year in climate-based[46] solutions by 2050. The analysis, however, does not consider the portion of this potential that could generate carbon credits. Furthermore, reaching this potential would depend on factors such as the country's governance, use of emission reduction strategies to comply with the NDC and access to the source of financing.

However, the potential for credits from other types of solutions for Brazil is still little explored by the literature, so the analysis of scenarios in Table 2 starts from the premise that new energy, waste treatment and agriculture projects will continue to issue credits and that the growth of these emissions will be the same for all types of projects.

The above analysis refers to the potential for the Brazilian supply of carbon credits. Regarding the **demand for credits generated in Brazil in the voluntary market**, two possible scenarios can be considered: 1) all companies in the manufacturing industry that report their emissions in the Public Emissions Registry, of the Brazilian GHG Protocol Program, assume a net zero target, causing demand for credits to offset residual scope 1 and 2 emissions (ICC; WAYCARBON, 2021); 2) part of the demand from the global voluntary market using the Brazilian market. The first scenario can be considered as a minimum potential, based on the premise that companies have a strong domestic bias[47] and, therefore, prefer the purchase of credits generated in their country of origin. The second scenario considers that not only Brazilian companies, but also foreign companies buy credits in Brazil.

Considering the assumptions of the first scenario, according to ICC e WayCarbon (2021), there was an estimated demand of 26.8 $MtCO_2e$ of credits in the year 2034 – the limit year allowed by the SBTI tool. Already using the emissions data from the Brazilian manufacturing industry in 2020, we have a residual emission of approximately 32.7 $MtCO_2e$ in 2034, according to the tool developed by Carillo Pineda et al. (2020) with the emission reduction paths stipulated by the SBTI for a global warming restriction scenario at 1.5°C, which, following the premise above, would be equivalent to the possible national demand for carbon credits in the voluntary market.

Considering the purchase of Brazilian credits by companies around the world, it is possible to consider two more possible scenarios, based on the estimates made by TSVCM (2021) for the voluntary market, in which the global demand for carbon credits varies between 200 $MtCO_2$ and 1,000 $MtCO_2e$ per year in 2030, and considering the relative share of retired credits from Brazilian projects, 7.9% of world credits in 2021, the demand for Brazilian credits in the voluntary market would be between 15.8 and 79 $MtCO_2$ per year in 2030.

For the global regulated market, Edmonds *et al.* (2019) estimates that a pricing system established to meet the targets set out in countries' NDCs could cover up to 4,300 $MtCO_2e$ per year by 2030. This amount would be equivalent to the demand for credits under Article 6.4 of the Paris Agreement. Based on the same proportion of credits from retired Brazilian projects in the voluntary market, of 7.9%, it is possible to envision a demand of 339.7 $MtCO_2e$ for carbon credits generated in Brazil in 2030.

The difference between the potential supply and the potential demand highlights the need to create a nationally and globally regulated market to give output to the potential of credits to be generated in the country.

Figure 5 presents a summary of transaction potentials for Brazilian credits, updating the numbers presented in the 2021 edition of this report.

43. Regarding the emission potential calculated in the previous year's report, the inclusion in this framework of the waste treatment sector, which presented significant numbers in relation to the other sectors, stands out.
44. For this analysis, active projects with a crediting period until 2030 were considered in the standards of Verra, Gold Standard, American Carbon Registry, Climate Reserve Action and the Clean Development Mechanism.
45. This price can be thought of as the "social cost" of carbon, or the cost threshold below which.
46. Nature Climate Solution (NCS) projects fall within the NBS umbrella but explicitly focus on addressing climate change (WBCSD, 2020).
47. The characteristic that individuals spend most of their income on goods or assets from their country, at the expense of goods or assets from foreign countries (LEWIS, 1999).

Figure 5 - Summary of transaction potentials for the Brazilian credits

BRAZILIAN PARTICIPATION IN THE OFFER OF GLOBAL CREDITS IN THE VOLUNTARY MARKET

3% in 2019

12% of world credits in 2021

Higher shareholding by NBS Projects

360 a 1,200
$MtCO_2e$ / year estimated in 2030

EXPECTED DEMAND FOR BRAZILIAN CREDITS IN THE VOLUNTARY AND REGULATED MARKET (ARTICLE 6 MECHANISMS)

32.7 $MtCO_2e$

National demand in 2034 for abatement of residual emissions within the net zero targets

15.8 a 79 $MtCO_2e$

International demand in 2030 based on estimates made by TSVCM and retired Brazilian credits in 2021

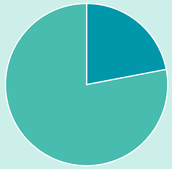
339.7 $MtCO_2e$

International demand for Brazilian credits within the regulated market (art. 6.4) expected for 2030

UP TO US$ 100 BILLIONS* IN 2030

Estimated by ICC and WayCarbon (2021)

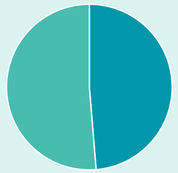
Brazilian supply could cover up to 37.5% of global demand in the voluntary market (in $MtCO_2e$)**



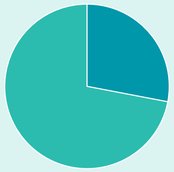
Brazilian supply could cover up to 22% of global demand in Article 6.4 (in $MtCO_2e$)***

UP TO US$ 120 BILLIONS* IN 2030

2022 updates



“Brazilian supply could cover up to 48.7% of global demand in the voluntary market (in $MtCO_2e$)**



Brazilian supply could cover up to 28% of global demand in Article 6.4 (in $MtCO_2e$)***

Source: Own preparation with data from: ICC & WayCarbon (2021), Forest Trends' Ecosystem Marketplace (2022), Carillo Pineda *et al*. (2020), TSVCM (2021), Edmonds *et al*. (2019).

* Optimistic scenario using as a reference price of USD 100 dollars, considered by the Taskforce on Scaling Voluntary Carbon Markets as necessary to reach the Paris Agreement target of limiting global warming to 1.5°C. The average prices of credits by types of projects up to August 2021 in Table 5 are also considered, with the lower limit of the price range.
**Considering the demand for credits in the voluntary market of 2,000 $MtCO_2e$ in 2030 (TSVCM, 2021)
***According to demand of 4,300 $MtCO_2e$ estimated by Edmonds *et al.* (2019) for the Article 6.4 mechanism.

NATIONAL ECOSYSTEM ASSESSMENT

Understanding the players, relationships, types of projects and the hybridity of this market is fundamental to understanding the barriers and working to leverage opportunities, which overlap in different areas. This chapter consolidates the view of the barriers and opportunities of this market from the perspective of its players, identified in this study through interviews, research and literature data.

BARRIERS TO ACTING IN THE CARBON MARKET IN BRAZIL

The barriers faced by players in the carbon market can be market, technical, political, economic or regulatory. This chapter reviews the literature on the barriers to the development of the carbon market, complementing and corroborating the theoretical analysis with the points highlighted during the interviews with market players.

1. MARKET BARRIERS

Market barriers are those inherent to the carbon market, which can hamper the scalability of projects, as well as the supply or demand for credits. Thus, in the analysis of these barriers, endogenous characteristics of the market that hinder its expansion or efficiency were considered.

1.1 PROCESS OF REGISTRATION PROGRAMS

Among the marketing barriers of the voluntary market in a comprehensive way is the long process of project registration, the availability of new methodologies, and the availability of new technologies, which can increase compliance costs and make smaller-scale projects unfeasible.

Additionally, registration programs may have their own characteristics and differ in their methods and tools used to estimate additionality and certify the quality of credits, adding to the complexity of carbon projects (ICC; WAYCARBON, 2021).

1.2 CREDIT QUALITY

The quality of carbon credits plays a key role in promoting climate change mitigation by enabling the creation of value for reduced emissions, encouraging technological advances, and facilitating the achievement of climate goals.

If credits are not generated and used correctly, the carbon markets can increase the cost of achieving these goals. Therefore, ensuring robust implementation is critical for carbon markets to meet their targets (WWF-US; EDF; OEKO-INSTITUT, 2020). If high quality credits are in short supply, confidence in these mitigation solutions may be lost and consequently demand may decrease (ICC; WAYCARBON, 2021).

However, ensuring the quality of these credits is a global challenge that is replicated at the national level. The main quality criteria are:

- Additionality;
- Reliability in calculating reduced or avoided emissions;
- Impact on the community;
- and information about projects and their impacts.

Additionality is a key factor. **The credit must be additional, i.e., it must ensure that the mitigation action would not have taken place without the additional incentive provided by the carbon market, thus establishing the causal link between the mitigation action and the expected outcome** (MICHAELOWA *et al.,* 2019). This assurance is inherently uncertain and often controversial because it requires the determination of unobserved scenarios and is based on assumptions. Coupled with the additionality issue, the difficulty of assessing other parameters involving credit quality complicates investment decisions (CHAGAS *et al*., 2020).

With this in mind, West *et al.* (2020) analyzed the effectiveness of 12 REDD+ projects in Brazil using synthetic controls and found no significant evidence that 8 of these projects actually reduced deforestation. Therefore, the authors question whether the credits generated are effectively linked to additional reductions in deforestation achieved in the Amazon until 2017. According to the authors, projects that established baselines using historical trends overestimated deforestation, unlike projects with counterfactual estimates based on synthetic controls. This study therefore analyzed that this pattern may reflect Brazil's extraordinarily successful efforts after 2004 to control deforestation in the Amazon.

Another question concerns projects in the agriculture and livestock sector, which have raised doubts in interviewed players regarding the need for financial resources from the sale of credits from this type of activity since the practices for the development of carbon projects in this sector can enable productivity gains and ensure financial attractiveness without requiring registration in carbon programs.

It is also necessary to ensure reliable calculations of reduced or avoided emissions, even though the (standard) registration programs provide procedures that require projects to be rigorously verified by the registration scheme and/or by a third party who audits the evidence, ensuring the accuracy of the information provided in the project documentation (ICC; WAYCARBON, 2021).

Consultation with interested parties and identification of direct and indirect impacts is likely to occur in the vicinity of the project and to the affected population. However, some of the biodiversity and social impacts tend to be long-term, so it can be difficult to measure them in the short term. Furthermore, some impacts – especially negative ones – may not be identified prior to project implementation. Thus, **more than seeking to increase the positive impacts of the project, the impact assessment is also important to identify potential negative impacts and risks**, such as elite capture[48] and issues such as the interruption of income from potentially degrading activities that can reduce the quality of life of the local population (CCB, 2022).

It should be noted that one market barrier identified by the players in the demand for carbon credits in Brazil that is associated with poor credit quality is the risk to a company's reputation as a result of purchasing poor quality credits.

1.3 OTHER MARKET BARRIERS

Some structural barriers permeate the economics of climate change in general. According to Stern (2022), it is necessary to recognize that markets have critical important flaws and that governments' ability to correct these flaws is limited. There is also the challenge of incorporating technical and systematic changes into complex systems, considering the impact on distribution over time.

Low market maturity was one of the barriers most frequently cited in the interviews by players from different fields of activity, which increases the potential for other barriers. Furthermore, the current Brazilian market, although voluntary, does not provide mechanisms to protect against price fluctuation, which was also seen as a barrier by the interviewed players. Also contributing to this factor is the lack of a price index to improve price transparency and serve as a reference for these protection mechanisms.

In this sense, Stern (2022) raises some market failures that need to be corrected to achieve better effectiveness of climate change policies that can also be applied to global and national carbon markets:

1.3.1 Information asymmetry and lack of market transparency:

The disparity of access to information on available technologies, actions, and support for climate change mitigation can impact investments in sustainable technologies due to inaccurate risk assessments resulting from a lack of understanding of new technologies. Also noteworthy is the lack of standards that help classify credits, which could help facilitate the pricing of credits and reduce the differences between the prices available in the market. In this sense, the lack of transparency is also a factor pointed out by Chen *et al.* (2021) as one of the main challenges for the carbon market; especially regarding prices charged and market players in general.

Furthermore, as a result of the lack of information, the interviews indicated a low interest of landowners in developing projects, as they were not aware of the benefits that they could bring. This is also related to the low return of the value of the credits to the local population, who would be able to negotiate larger shares if they had better access to the market, especially in NBS projects.

1.3.2 Difficulty estimating the value of co-benefits

Some actions can generate productivity gains, economies of scale, and technological diffusion, which directly impact the number of credits generated. However, it can be difficult to assess positive externalities generated in climate mitigation actions and related social and environmental practices (STERN, 2022). The concern about the low return to the local population, besides being related to the issue of lack of information, evidences the insufficient quantification of the positive impact on the surroundings of the project and on the affected population.

1.3.3 Low maturity of the carbon market

Compared to other consolidated international markets, such as commodities, voluntary carbon markets still have a long way to go in terms of maturity. In an analysis of the maturity of the global voluntary market, TSVCM (TSVCM, 2021) highlights the guarantee of credit quality through the analysis of registration programs and methods that adhere to the relevant scenario as one of the points that best ensures and indicates market maturity. In this sense, given the national context, this point becomes a limiting factor, since the available methods are not suited to the Brazilian reality, a point confirmed several times during the interviews conducted. It should be noted that low market maturity was one of the barriers most frequently cited in the interviews by players from different fields of activity. Other limiting factors for market maturity are the lack of clarity on regulatory issues (for example, the ability to use offsets to contribute to NDCs), the level of maturity of

48. Elite capture refers to the process by which local elites – individuals with superior political status based on economic, educational, ethnic, or other social characteristics – take advantage of their positions to accumulate a disproportionately large share of resources or stream of benefits (PERSHA; ANDERSSON, 2014).

the players, and the lack of transparency and information, especially regarding price, volume, transaction records, buyers and sellers (TSVCM, 2021).

2. TECHNICAL BARRIERS

Technical barriers are related both to the complexity of applying existing methods for credit generation and to the development of technologies and the qualification of professionals involved in the projects, which primarily affects credit supply. Therefore, it can be said that these barriers are inherent to carbon projects and have a strong impact on credit supply.

The technical barriers include the low capacity to manage and use scientific knowledge and to prepare the technical documentation to be used for climate change mitigation. It is therefore necessary to ensure the reach of already established techniques, with the challenge of adapting the technologies to local needs (SMITH *et al.*, 2014).

For land use related activities, the technical challenges related to monitoring, reporting and verification of mitigation actions were identified as a barrier in the interviews. There is also a shortage of people trained to use the technologies required to implement this type of project (SMITH *et al.*, 2014). Respondents also cited the low qualification of the workforce as one of the barriers to market development.

For example, monitoring carbon in forests with high spatial variability in species composition and tree density is a challenge for the implementation of some activities and technologies. For reforestation projects, on the other hand, Nunes *et al.* (2020) indicate that inadequate soil management, as well as a lack of information on the nutritional requirements of native species, are barriers to increasing reforestation rates and preventing degradation in agroforestry systems in Brazil.

On the other hand, it is technically difficult for the agricultural sector to estimate the amount of organic carbon in the soil. In general, this measurement requires a large number of samples taken at different soil depths and at several collection points within the property. Additionally, the methods for assessing soil carbon sequestration cover only a limited number of agricultural practices and there is a lack of knowledge on the extent to which conservation measures can sequester atmospheric carbon at sufficient levels. There is a lack of data on the spatial and temporal patterns of variations in soil organic carbon under different production processes, so obtaining such data can be very costly (EDF; WOODWELL CLIMATE RESEARCH CENTER, 2021).

Corroborating to the technical barriers related to the application and development of methodologies, is the fact that most of the existing methodologies were developed for projects in temperate climates. During the interviews, market players listed among the barriers the incompatibility of current methodologies for generating carbon credits in NBS with the Brazilian reality regarding the climate and types of crops cultivated in the country.

From the perspective of standards, it is hard to speed up processes and meet the growing demand for new project registrations without sacrificing the quality of credits in this process (VERRA, 2022f).

3. POLITICAL BARRIERS

Political barriers relate to international agreements to establish a global market, managerial capacity, and political incentives, as well as the consequences of decisions on a country's credibility.

It also relates to issues regarding the knowledge or confidence of market players in future policies and their potential impacts on market participants. This issue is of paramount importance in shaping expectations: **the more those governments can build predictability about how policies will evolve through learning, the greater the confidence that underpins future investment, innovation, and commitments** (STERN, 2022).

However, governments have limited ability to coordinate and support networks and systems to integrate new technologies. There is a barrier to the credibility of long-term commitments, given that each term can have short time horizons, different or narrower goals, and face major administrative and political constraints. **When thinking about public policy, it is necessary to bring all these considerations together and consider the limitations of policies and how they can be changed or thwarted. It is therefore necessary to think about how to build strong institutions that can survive between different political parties and pressures from established interests** (STERN, 2022).

These aspects of governments can bring about changes in a country's position in global negotiations, directly reflecting on its credibility. The constant change and instability of Brazil's position regarding the carbon market was cited as a barrier by several interviewed players.

Furthermore, it is necessary to consider differences in the maturity of countries and market players when making global agreements, which can lead to two conflicting narratives for conservation initiatives. On the one hand, there is a poorly detailed global aspirational narrative about the goals of forest conservation initiatives and on the other, a local and pragmatic narrative built on contextualized experiences. The global narrative tends to propose "top-down" solutions that may be difficult to implement in local realities, and therefore it is important to recognize that there are different perceptions of projects at different levels – from global to local, where project implementation takes place. This recognition can reduce trade-offs between different goals (SCHWEIZER et al., 2019).

4. ECONOMIC BARRIERS

The economic barriers are those in which the influencing factor is exogenous to the carbon market but may affect the development of the Brazilian market.

4.1 UNCERTAINTY ABOUT DEMAND

As already mentioned, in recent years, several companies, institutions and governments have set net-zero emissions targets. However, these plans are often difficult to compare and definitions of decarbonization plans can be vague. Thus, the use of carbon credits in these strategies is often unclear, as is the incentive a company would have to offset its emissions if regulations were not in place.

Also, **the commitments to carbon neutrality made today are effectively promises to purchase carbon credits at an unspecified price at a later date. However, it is possible that credit prices will increase significantly in the next few years, so that this price increase could make the planned offsets economically unrealistic and lead to non-fulfillment of promises** (REEVES *et al.*, 2022).

Another barrier to demand is the complexity and lack of information about the credits, so it can be difficult for a potential applicant to select high-quality credits at transparent prices, which worsens the buyer's experience (TSVCM, 2021).

Another point highlighted is the inefficiency of the market, characterized by pulverized demand, difficulty in accessing providers, and lack of information, as mentioned above. In this sense, we emphasize the complexity of establishing these connections between providers and applicants.

4.2 GREEN DEAL TRENDS

Despite not being a barrier to the Brazilian carbon market, the global green deals trend may impact Brazil's negotiations in other countries, further isolating the country in international trade, especially due to carbon border adjustments.

Economic policies like the Carbon Board Adjustment Mechanism (CBAM) can encourage the adoption of emission reduction technologies, especially in carbon-intensive sectors affected by the carbon tax. In particular, in sectors such as Cement and Steel, which can adopt other emission reduction measures instead of making use of carbon credits.

However, an unexpected effect of carbon border adjustment mechanisms is the increase in emissions in countries that have lower CO_2 emission intensities in their production, such as Brazil. This can happen because, even when affected by the CBAM, these countries are relatively more efficient in terms of CO_2 generation per product, so that the prices of the products can be proportionately cheaper in relation to the products of countries with higher emissions that will be subject to a stronger taxation. In this case, CBAM would not encourage the reduction of emissions in the most efficient countries in the short term, due to the increase in production for export (DURANT *et al.*, 2021)[49].

4.3 PROJECT FUNDING

The barriers cited by respondents as economic barriers were those associated with project funding. The NBS projects naturally have a long-time horizon. This directly hinders the financial scalability of projects (including jurisdictional projects) and the availability of investment. Carbon projects, especially in the forestry sector, have a long payback period and, as this is a new market, the value generated by the sale of credits from the invested project is unpredictable. Moreover, as the carbon credit is a little-known asset, it is difficult to use it as collateral for project financing.

This barrier is directly related to the low level of standardization of carbon credits and the difficulty in getting access to prices, since in the absence of a price index, it can be difficult for the financial sector to assign a value to carbon credits in both spot and futures markets and to include this variable in investment appraisals [50].

5. REGULATORY BARRIERS

Regulatory barriers refer to internal Brazilian regulations and their applicability. **Although a specific legal framework for developing carbon projects and trading the resulting credits is not strictly necessary, the lack of a legal framework for the domestic carbon market leads to legal uncertainty arising from the very complexity of the issue**. Therefore, the main barrier highlighted by the players interviewed is the lack of a regulated market in Brazil or a certain level of regulation for the regulated market.

As mentioned above, in addition to the decree published by the executive branch on May 19, 2022, there are Bills pending in the National Congress that aim to establish rules for the Brazilian carbon credits market (PL 2,148/2015, in which PL 528/2021 is one of the annexes; PL 412/2022; PL 1684/2022 among others). However, the overlapping of substitute texts and the apparent lack of alignment between the executive and legislative branches create legal uncertainty.

Among the items that should be properly addressed with respect to these regulatory barriers, the following should be mentioned:

i) **The importance of defining the ownership of the credits (owner x developers x applicants);**
ii) **The regulation of the development of carbon credit projects involving protected areas and traditional communities;**
iii) **The repeal of the provision of the Public Forest Management Law (Federal Law No. 11,284/2006) prohibiting the granting of the right to trade credits from avoided carbon emissions in natural forests;**
iv) **The regulation of the coexistence of carbon projects and sustainable forest management projects in public forests, and**
v) **The taxation of transactions involving carbon credits.**

It is understood that items i, ii and iv, which correspond to the monitoring and transparency, can come to be addressed in the registry program scheduled for in SINARE.

49. It is important to note that the study carried out by Durant et al. (2021) states that CBAM has a positive impact on the global reduction of greenhouse gas emissions. However, the effects of the tax vary among the affected countries, penalizing mainly developing countries.
50. The mapping of financial instruments for financing carbon projects was not contemplated in this study, but it highlighted the importance of the topic and its further research in a future study.

The interviewed players also highlighted that the problem of land regulation in the Brazilian reality, with the complexity of the agricultural registry and the difficulties in mapping land, can also be considered a regulatory barrier[51]. Another barrier mentioned by the respondents is the legal and tax complexity, not only regarding the nature of the credits, but also considering the lack of definition of Permanent Preservation and Legal Reserve areas in terms of the possibility or not of registering projects. Uncertainty about land ownership of properties that may receive carbon projects, among other tax and legal issues, is also a vector of legal uncertainty for the full development of the market and was highlighted as a barrier in the interviews.

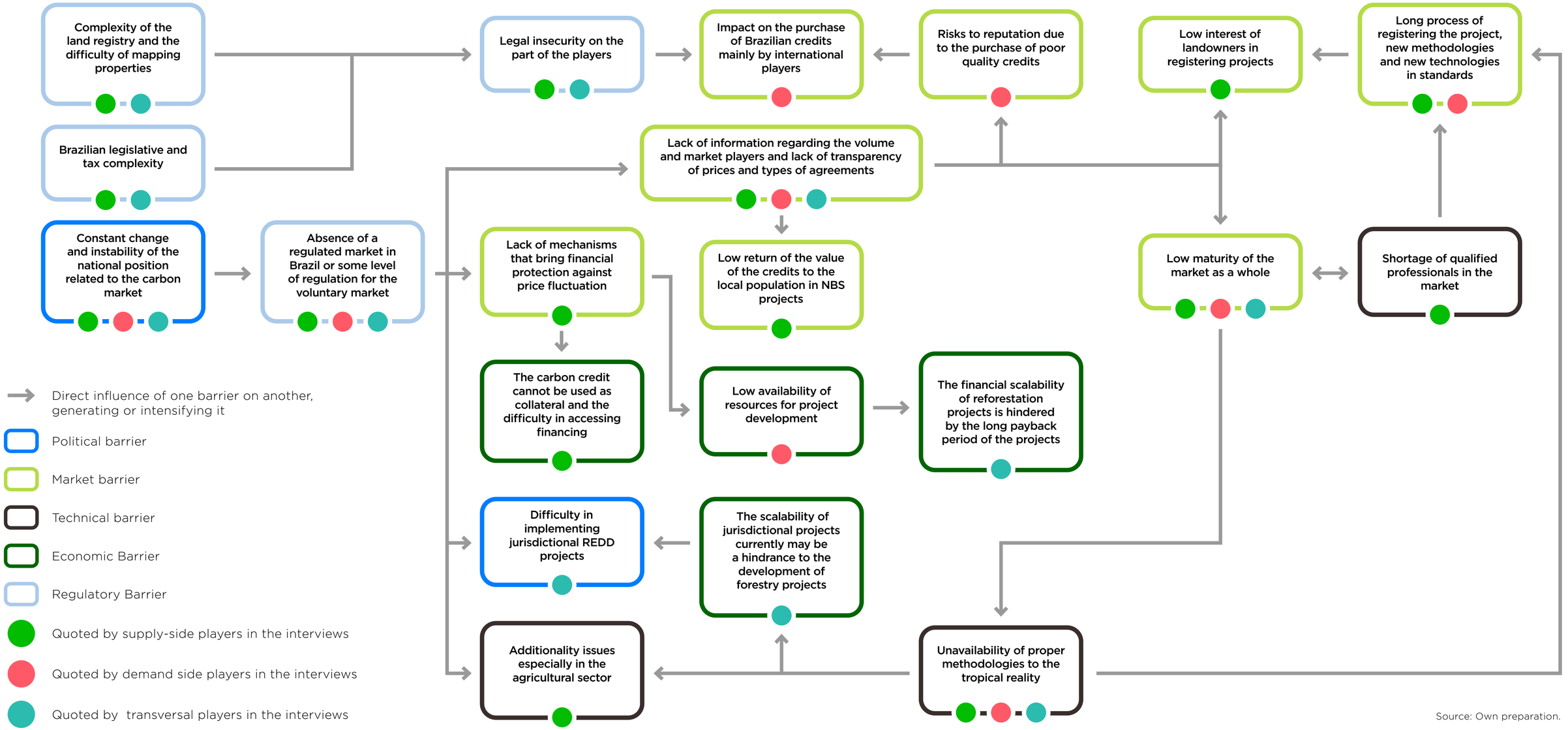
6. BARRIERS ANALYSIS

The barriers to action in carbon markets can interact, given that the functioning of any market depends on several factors at the same time. For example, the lack of a good institutional framework can affect the availability of information, as well as predictability and the formation of expectations. Similarly, the complexity of the projects is a market barrier, but it is also related to the technical barriers to project development.

In the interviews with market players, 22 barriers were cited, of which 8 were considered market barriers, 3 technical barriers, 2 political barriers, 4 economic barriers, and 4 regulatory barriers. From the analysis of these barriers, the connections between them were analyzed, which are illustrated by Figure 6.

51. Besides the advances in environmental regularization and mapping of rural properties with the Rural environmental registry (CAR), some states still face difficulties the analysis and validation of registries. Among the challenges in these phases, it can be highlighted the high volume and the poor quality of the registries as well as the difficulty in communication with the owners and scarcity of cartographic bases and human resource for validation. (Climate Policy Iniciative, 2021).

Figure 6 – Barriers to action in the carbon market and their interconnections



Source: Own preparation.

From this figure it is possible to identify the main barriers that generate others: **the regulatory barriers of the complexity of the agricultural registry, the difficulty in mapping land, and the Brazilian legal and tax complexity. These are historical problems for Brazil, but to achieve the NDC and the maximum potential for action in carbon markets in Brazil, special government attention to these barriers is essential**.

Besides these regulatory barriers, the political barrier of constant change and instability of the national position regarding the carbon market is a clear reason for the lack of carbon market regulation in Brazil. Deviating from the image that has been consolidated in recent years, the Brazilian government recently took a step towards regulated market regulation in Brazil with Decree No. 11,075. After years of instability regarding the climate agenda, the Brazilian government is expected to finally move to overcome this important barrier for various market players.

The absence of a regulated market in Brazil or some level of regulation for the voluntary market was the most frequently cited barrier in the interviews. It has a major impact on several other barriers, highlighting the difficulty of implementing jurisdictional REDD+ projects, which is proving to be highly dependent on a landscape of market regulations. Regulatory actions, therefore, have the power to change the market and work together for different actions in the market. Fueled by this lack of regulation, the market barrier of lack of information and market transparency draws attention, because it reflects key aspects of the market such as its maturity, the quality of the credits generated, the benefits to local populations, and the interest in registering new projects.

Since the guarantee of credit quality through the analysis of registration programs and methods that adhere to the relevant scenario is the prerequisite that most brings maturity to the global market (TSVCM, 2021), the inadequacy of the methods available for implementation in Brazil leads directly to a reduction in the maturity of the national carbon market. Also note that the unavailability of appropriate methods to the tropical reality entails consequences of various kinds: technical (with issues of additionality in the agricultural and livestock sectors), economic (for the scalability of jurisdictional projects), and market-related (congestion and increase in time for analysis of registration programs).

For the country to reach its high potential for credit supply, it is essential that the project methods used to generate these credits are appropriate to the country's reality. It can be said that this barrier is a direct threat to the credit generation potential, especially for NBS.

The interaction between the market barrier of low maturity and the technical barrier of scarcity of qualified professionals in the market, which have some synchronicity, is also highlighted. It can be said that as a market matures, professionals become specialized to meet its demands, but the development of this maturity is hindered by the scarcity of qualified professionals.

OPPORTUNITIES TO OPERATE IN THE CARBON MARKET IN BRAZIL

The previous edition of this study highlighted the potential for the agriculture and livestock, forestry, and energy sectors to operate in the mechanisms of Article 6 and in the voluntary market. This report updates the analysis of the potential sectorial supply of carbon credits for these sectors, considering the content of the carbon markets ecosystem survey and the estimated current potential supply of credits. Table 6 below presents this analysis. .

Table 6 – Updated (non-exhaustive) Potential Sectorial Supply of Carbon Credits

Potential sectorial supply	Article 6.2 Mitigation results (tCO_2e)	Article 6.4 Certified reduction from methods to be defined (tCO_2e)	Voluntary market Certified reductions from registration program methods (tCO_2e)
AGRICULTURE AND LIVESTOCK (Integrated Crop-Livestock-Forestry Systems; Integrated Livestock-Forestry Systems; Biological nitrogen fixation; Recovery of Degraded Pastures; Treatment of Animal Waste).	▲ **Medium Potential** (Justification: Low abatement costs; trend towards government plans and programs that encourage credit generation, such as the ABC+ Plan, but there are technical and methodological barriers that prevent scalability of these projects).	− **Medium Potential** (Justification: Few projects with additionality, but high demand for NBS project credits in developing countries).	− **Medium Potential** (Justification: Preference for NBS credits in developing countries, allied to the low abatement cost, however there are issues methodologies that can make it difficult).
FORESTRY (REDD+, Forest Management; Reforestation and Forest Restoration).	▲ **High Potential** (Justification: Low abatement costs; trend towards government plans and programs that encourage credit generation. E.g.: Floresta +, Floresta + Carbono, National Plan for Payments for Environmental Services).	▲ **High Potential** (Justification: Low abatement costs coupled with high demand for NBS project credits in developing countries)	▲ **High Potential** (Justification: Preference for offsets from NBS in developing countries coupled with low abatement costs).
ENERGY (Hydrokinetic Turbines; Offshore Wind Power Plants; Floating Solar Power Plants; Co-generation; Second Generation Ethanol and Green Hydrogen).	− **Medium Potencial** (Justification: Possibility of incorporating various alternative energy sources).	− **Medium Potencial** (Justification: presence of additionality potential only in technological innovation projects such as the production of green hydrogen).	▼ **Low Potential** (Justification: Exclusion of renewable energy in somecertification standards, however new registration programs are accepting this type of project).
Demand Risk	▼ **Low Risk** Demand depends only on the appetite linked to the buyer country.*	− **Medium Risk** Uncertainty about the types of project accepted; increase in cost due to increasing methodological rigor; possible non-compliance with NDC may trigger reputational loss for the country offering credit in this market.	− **Medium Risk** Demand historically lower than supply; less transparent carbon neutrality commitments of questionable feasibility.

*If, for the operation of the mechanism, a country that has not yet complied with its NDC is allowed to transfer ITMOs, possible non-compliance with the NDC could result in a reputational loss for the transferring country.

Source: Own preparation.

Particularly, the mechanism of Article 6.2 offers greater potential than the mechanism of Article 6.4. After the experiences with the pilot projects of the mechanism of Article 6.2, the Brazilian government has the opportunity to define possible types of projects and partnerships for the transfer of ITMOs, considering that types of generation projects that are easier to implement should not be considered in the operation of the mechanism so as not to hinder the achievement of its NDC. However, it is still unclear how co-benefits will be appraised under the mechanism of Article 6.2, and it is important to pay attention to appropriate financial return of efforts so that funds are channeled through social initiatives and programs to the local communities where projects are implemented.

The waste sector was not highlighted in the previous edition of this study, but according to the credit generation potentials calculated in this report, this sector stood out among the main sectors expected to generate credits by 2030 in Brazil. Therefore, it is believed that there are opportunities to be explored in the development of projects in this sector, considering not only private but also public initiatives for the implementation of projects.

In the interviews that were conducted in preparation for this study, the respondents were asked about the observed opportunities for action on the market. Most respondents highlighted the opportunity for Brazil to consolidate itself as a supplier of credits on a global scale through NBS, whether through Jurisdictional REDD or not, with avoided deforestation and reforestation projects, identified as having a higher valuation per unit of credit generated and traded, focusing on forest restoration activities. In the long term, however, the importance of CCUS and the opportunities associated with the development and trading of this type of activity, still little explored, should be highlighted. There was also mention of the possibility of using NBS monitoring strategies as part of the government's efforts to achieve the goals established by the NDC in a more cost-effective manner.

Other highlighted opportunities place market regulation at the core, with the assumption that there will be an intensification of opportunities for the entire ecosystem, by using the market as a vehicle for investment for the country, being able to leverage the use of less carbon-intensive solutions.

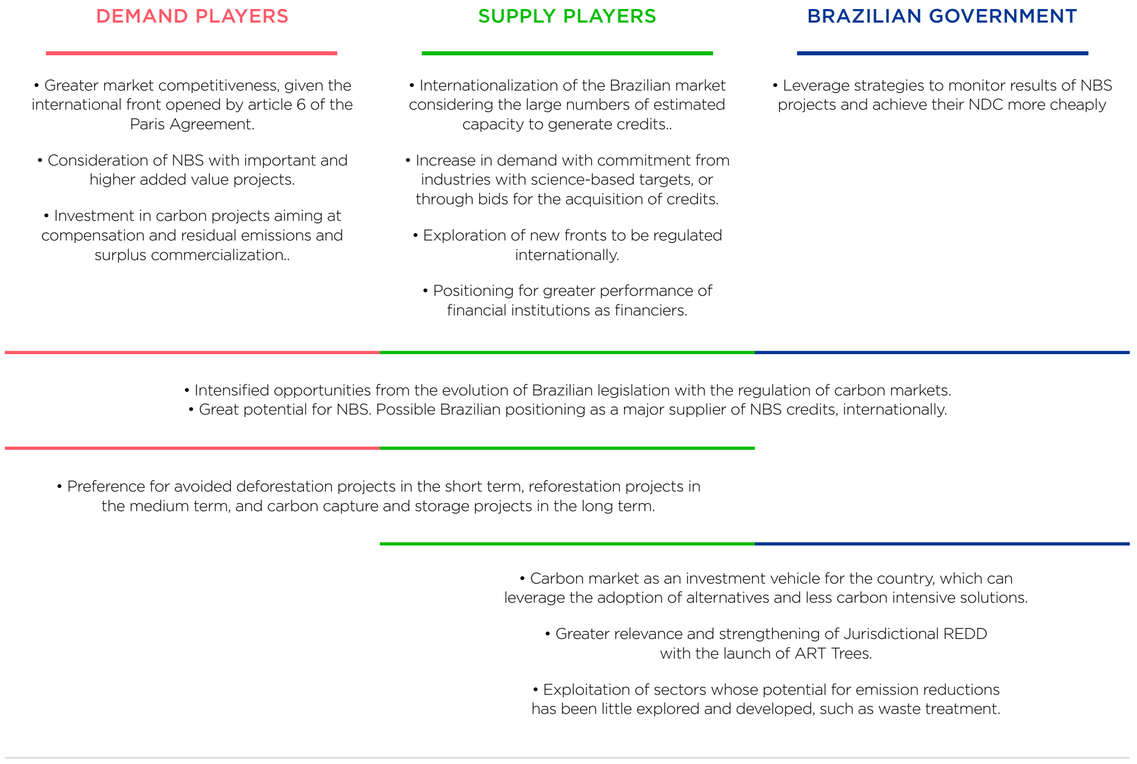
At the international level, respondents mentioned greater competitiveness in the international market with the opening of fronts made possible by Article 6 of the Paris Agreement, once again considering the country as a major supplier of credits and the potential for exploring new sectors to be regulated internationally.

They also talk about the opportunity to explore sectors where the potential for emissions reductions has not yet been tapped and developed, and the increasing demand given corporate emissions reduction commitments, either through science-based targets or through bids to acquire credits.

Finally, it is important to keep in mind the opportunity for the positioning and the greater role of financial institutions as lenders to the projects, or even the opportunity for companies buying credits to invest in projects that can offset their emissions, as well as to generate revenue by trading the credits. Furthermore, it can be observed that financial institutions are increasingly focusing their attention on the carbon market, for example, looking for opportunities to support credit transactions, and aiming to ensure transparency and accessibility of information.

Figure 7 below lists the opportunities mentioned in the interviews and in the form, detailing what type of player will have each opportunity. It should be noted that supply-side players have a larger number of different opportunities.

Figure 7 – Opportunities for demand-side players, supply-side players, and the Brazilian government



Source: Own preparation.

RECOMMENDATIONS AND KEY MESSAGES

Based on the survey of updates in the global market and on an analysis of the Brazilian market, and with the aim of overcoming barriers and unlocking and seizing opportunities, this study presents recommendations that have the potential to overcome barriers, seize opportunities, and boost the domestic market.

FOR THE BRAZILIAN GOVERNMENT

There are several regulatory and policy barriers to action in the Brazilian carbon market that could only be addressed by government measures. Also, there are market and economic barriers that can be directly influenced by government measures. And although the country has great potential to act at the international level, delaying definitions and initiatives in this direction may not only delay the realization of this potential, but also make it unfeasible. Therefore, it is imperative that the Brazilian government take a stand and act urgently according to the following guidelines:

FEDERAL EXECUTIVE BRANCH

1 **It is critical that Brazil, in its regulatory role, supported by ministries and sectors as defined in Decree 11075, develops, and disseminates specific planning to meet its NDC and recent commitments to zero illegal deforestation and methane reduction,** considering the inclusion of project types that are easier to fund in a concrete and robust way, with clearly defined activities and deadlines.

2 **Given the planning for compliance with the NDC, the executive branch, primarily through the Ministry of Economy (ME), the Ministry of the Environment (MMA), and the Ministry of Foreign Affairs (MRE), should determine the strategy for the sale of credits through the mechanisms of Article 6, considering the use of more complex project types in these mechanisms and the country's potential as a major supplier of NBS credits.** It is also necessary to pay attention to the potential that current policies and programs, such as the ABC+ plan, have for Article 6.2 (ITMO), by including within its scope projects of different sizes generating aggregated credit within the same project (e.g. a large group of small entrepreneurs).

3 **It is important that the Inter-ministerial Committee on Climate Change and Green Growth coordinates for the regulated and voluntary carbon markets agenda,** sometimes shared between the Ministry of Economy (ME), the Ministry of Science, Technology and Innovations (MCTIC), and the Ministry of the Environment (MMA). It is important to give the subject the importance it deserves and to better structure the work by announcing the committee meetings in advance, as well as publishing their results by making their agendas and minutes available, thus assuring the Brazilian market of the progress made on this theme.

4 **The Brazilian government, through its ministries, especially the MCTI, and through the state governments, should strongly encourage and support the development of methodologies that take into account the climate reality of the country by providing funding for the development of studies or market training,** aiming to achieve the maximum credit generation potential of the forestry, agriculture and livestock, and energy sectors. It should also take advantage of the potential of sectors with few developed methodologies, thus solving the issue of methodologies that are not appropriate to the national reality and supporting the further development of the maturity of the national market.

5 On the way to achieving the goal of zero deforestation, **it is important for the federal government to provide the state governments with clear definitions on jurisdictional projects and procedures for their implementation through a well-structured and publicly available guide**. Since ART/TREES and JNR do not clearly state how a Jurisdictional REDD project should operate at the state level, it is essential to have definitions on a larger scale. In this sense, it is important that the state governments clearly define their roles and established an MRV system, integrated with or belonging to SINARE, which allows the calculation of the benefits generated and the transaction of the benefits generated by this type of projects..

6 **Regarding the discussions at COP27, the MRE and the MMA should follow the evolution of the mechanisms of Article 6.2 and Article 6.4** and how the transition between the CDM and the mechanism of Article 6.4 will effectively take place, clearly defining the process by which projects can request transfer between mechanisms and whether the MCTI will act as a designated national authority or the responsibility for CDM transition and new projects will shift to another ministry.

FEDERAL LEGISLATIVE BRANCH

1 **Establish a regulated carbon market in Brazil by means of a law. Therefore, it is up to the Brazilian legislative branch, with the support of the executive branch, to move in this direction.** This market should not only demonstrate the government's clear commitment to carbon pricing, but also bring regulatory stability to the country, providing certainty to market players and allowing for higher investments in low-carbon projects and technologies. In addition, this market should serve as a reference for prices and mitigation options to guide the country's participation in international market instruments, both in the Paris Agreement and in potential negotiations for a CBAM. In this sense, the legislative branch should incorporate the positions of the private sector and the studies already developed and available to support of the new delimitations, such as the PMR Brazil project.

2 **Take advantage of the preparation towards a regulated market in Brazil initiated by the Decree to enable several important institutional measures for the good operation of the carbon markets:**

2.1. Although the decree defined the legal nature of the credit, this definition must be included in the Law, since a decree does not have the force of law in Brazil but can only reinforce a statutory provision. It is therefore recommended that this point be addressed when the law on carbon markets is passed. Furthermore, it should be determined what role Financial Institutions will play in this context and who will be entity responsible for regulating carbon credits. For these securities to be traded on the securities exchange, it is necessary to create the trading infrastructure, as well as to book and create identifiers for these securities, and therefore it is necessary to determine which entity will manage the regulated market and address the technical and procedural issues related to the possibility of creating the trading environment[53] (BANCO MUNDIAL, 2020).

2.2. Definitions on the performance of SINARE, considering access and integration with other systems such as SIRENE and data transparency. Furthermore, it is important to ensure the incorporation of an intersectoral architecture that allows monitoring of the mitigation outcomes of all programs and public policies related to the progress of the various sectors towards the targets set by the NDC.

2.3. Considering that SINARE consists of a set of rules containing minimum criteria for monitoring, reporting, and verification of GHG emissions or reductions that are accepted for registration, although the decree provides that the Ministries of the Environment and of Economy are responsible for registration, certification standard, and other aspects, it is of paramount importance that the guidance provided by the Ministries is structured clearly and simply to allow proper tracking of the supported emission reductions and removals, as well as the trading of ITMOS and the corresponding adjustments. It is important for the market to ensure that the procedures to be carried out with SINARE are easily accessible and easy to interpret.

2.4. Bring in the new regulations and sectorial trajectories that need to be established to achieve the NDCs, clear indications about the additionality of projects considering Article 6.4, and the necessary progress in this regard.

3 **It is important to prioritize processes related to land regularization and other regulatory barriers to enable the implementation of projects and to advance the proper implementation of the Forest Code to support the mapping of properties that can potentially host carbon projects.** For example, the land issue of areas for AFOLU projects dictates compliance or non-compliance of a property for the development of carbon projects. And although land regularization in Brazil is a historically sensitive issue, it is important to move forward with the implementation of the Forest Code, simplify and clearly define the approval or denial of CARs (Rural Environmental Registry) status, and ensure that this information is accessible to the market.

4 **Promote the potential for economic development, social equity, and ecological balance that carbon markets offer.** The carbon market model to be defended by the government should include the following goals, among others the protection of biodiversity, fair access to sustainable development and poverty reduction, as well as climate justice, in line with the Paris Agreement and the Climate Convention. It also should:

4.1. Promote the development of less carbon-intensive technologies and the professional development of youth and adults in scientific knowledge in this field.

4.2. Ensure the protection of indigenous peoples, quilombola communities, traditional communities, and primary producers, and ensure that they participate effectively in the elaboration of carbon projects and receive due recognition.

4.3. Ensure that the resources obtained through the revenues from the credits are returned to peoples, communities, and small producers, a point that is sometimes not monitored after the sale of the credits and during the continuation of the projects;

4.4. Provide environmental and Human Rights safeguards that ensure the exclusion of projects that involve: the use of child labor and/or slave labor; loss of biodiversity and/or destruction of ecosystems; unemployment, of indigenous peoples and traditional communities; and social exclusion; increased vulnerability of food production systems; damage or infeasibility of measures to adapt to the effects of climate change; or the pollution of soil and water and the impairment of air quality and other ecosystem services.

52. For the trading of CBios, B3 is the administrative entity responsible for registering the issuance and trading of these credits.

STATE GOVERNMENTS

1 To take advantage of the benefits that can result from jurisdictional programs at the state level, **the state governments should strengthen their technical staff, for example, on the topics of carbon markets**, REDD+, and Jurisdictional REDD+.

FOR THE PRIVATE SECTOR

For the private sector, with the aim of strengthening the national market and supporting its maturation process, this study makes the following recommendations:

1 **Support the simplification of credit transaction processes in the voluntary market and defend the adoption of digital technology for MRV and carbon credit certification processes with voluntary programs.** Efforts should be made in collaboration with public initiatives, financial institutions, and registration programs to develop an environment that centralizes credit transactions such as SINARE, and to promote transparency about such transactions. It is important to ensure that this market includes mechanisms that provide players with financial protection against price volatility. It is worth highlighting the importance of deepening the knowledge on the technologies available for tokenizing credit as well as on the use of blockchain to explore the possibilities of using these resources for the carbon market.

2 **Actively contribute to regular publications prepared by entities experienced in the subject**, to improve market knowledge and ensure the maturation of the Brazilian market

Supply-side players have a critical role in making the country's credit supply potential practical and ensuring the quality of the credits produced. They also have great opportunities as the market grows. Therefore, specific recommendations for these players have been prepared:

1 **Establish partnerships with other market players with the intention of strengthening the market and collaborating to promote market maturation, and emphasize transparency and fair return on investment for the landowner and local communities involved in the project to enable the following**: the financing of carbon projects with long payback periods; and the creation of discussion groups that meet to propose methods that are better adapted to national climate realities, especially in the agricultural and livestock sector, and make their potential more tangible.

2 **Include and increase the visibility of the participation of local, indigenous, and traditional populations directly affected in discussions on the elaboration of projects in the forestry sector,** considering their historical contribution to environmental protection.

3 **Invest in projects that generate co-benefits by creating resources for peoples, communities, and small producers,** and ensuring they have economically viable alternatives to protect the forest and their rich socio-biological diversity (their way of life, culture, and traditional knowledge).

4 **Investments in NBS designed to ensure the greatest possible benefit in terms of sustainability and regeneration, as well as minimizing social and environmental damage, prioritizing projects involving the planting of forests,** due to Brazil's potential in this sense and to the relatively low cost of abatement and considering the potential increase in demand from the commitment of industries to science-based targets and the requirement of such initiatives for carbon capture and removal.

5 **Explore the possibilities of acting under the new international mechanisms, as was the case with the MDL,** an international mechanism in which Brazil's participation was significant.

6 **Ensure that GHG removals and emission reductions are implemented not only in forestry projects, but also in projects of other scopes that have been little explored nationally,** such as projects that apply carbon storage and sequestration technologies to industrial processes and the GCC (Global Carbon Council), a voluntary market mechanism that continues to generate credits through renewable energy-related activities in Brazil.

7 **Support the development of the market through the exchange of knowledge and practices to mature the agenda,** promoting debates, courses, and seminars.

To support the growth of this market and take advantage of the best opportunities to offset emission and to achieve net zero targets, the demand-side players should prioritize the following:

1 **Make commitments consistent with Science-Based Targets and set out concrete strategies** to achieve global warming mitigation goals.

2 **Sign long-term contracts for the purchase of carbon credits** to ensure the feasibility of long-term projects.

3 **Expand market performance by proposing and funding carbon projects,** thus guaranteeing the supply of quality credits for their demand and the eventual return of the excess. Financial institutions, in particular, have the opportunity here to enter partnerships and ensure the sale of credits to companies in their portfolio.

4 **Give preference to projects that provide socio-economic co-benefits and generate income and wealth for peoples, communities, and small producers,** ensuring that they have economically viable alternatives to preserve the forest and its rich socio-biological diversity, and ensure their participation in the elaboration of projects considering their historical contribution to environmental protection.

5 **Expand efforts to reduce and eliminate GHG emissions by investing in technological development and innovation,** using offset mechanisms as transition and elimination tools for neutrality to promote sustainable development.

6 **Establish partnerships that enable new technologies to reduce emissions and remove GHG from the atmosphere** that can be used in the

carbon credit process, thus expanding the country's potential for credit generation.

Since the process of generating carbon credits plays an essential role in the voluntary market, the **registration programs** must follow the Brazilian market development. For this purpose, this study brings the following recommendations:

1 **Registration programs should pay attention to the speed of their processes, from the revision of methodologies to the operation of the registration platform to create market analysis.** In this sense, it is necessary that they structure their technical staffs with a team of professionals trained to understand the different realities between countries, ensuring an understanding of the Brazilian reality, given the number of projects registered and the potential of Brazil to provide AFOLU project credits worldwide. Moreover, it is important to ensure accessibility and proper understanding of the Standard's guidance documents by providing versions in more languages than those already available on the website.

2 **Harmonized reporting with other registration programs is needed to ensure data comparability**. Establishing minimum data and common formatting for data extraction will allow for manipulation of databases and robustness of data available for publications.

3 Considering the Brazilian reality and the current situation related to carbon markets, **the development of methods oriented to the national climate realities and, above all, ensuring compliance with the wide range of possibilities in projects in forestry and agriculture and livestock sectors is proposed.** The development of new methods better adapted to the Brazilian reality will allow the market to mature.

The carbon market is in constant evolution. It is expected that over the next few years, at the international level, the definitions and functioning of the mechanisms of Article 6 will be updated, and at the national level, the voluntary market will grow with the effective creation of a regulated market in Brazil. Therefore, new studies on the carbon markets in Brazil should be carried out year after year to support the development of these markets.

REFERENCES

ADLER, K. COP26: Switzerland touts Article 6-style agreements. In: Clean Energy News. 2021. Available at: https://cleanenergynews.ihsmarkit.com/research-analysis/cop26-switzerland-touts-article-6-agreements.html. Accessed on: 18 mar. 2022.

AMERICAN CARBON REGISTRY. American Carbon Registry. [s. l.], 2022. Available at: https://acr2.apx.com/mymodule/mypage.asp. Accessed on: 11 apr. 2022.

AVIATION BENEFITS BEYOND BORDERS. CORSIA explained. In: 2022. Available at: https://aviationbenefits.org/environmental-efficiency/climate-action/offsetting-emissions-corsia/corsia/corsia-explained/. Accessed on: 23 may. 2022.

BANCO MUNDIAL. Projeto PMR - Brasil: Aspectos Jurídicos de Gases de Efeito Estufa no Brasil. [S. l.: s. n.]

BLACK, R.; CULLEN, K.; FAY, B.; HALE, T.; LANG, J.; MAHMOOD, S.; SMITH, S. M. Taking stock: A global assessment of net zero targets. [s. l.], 2021. Available at: https://eciu.net/analysis/reports/2021/taking-stock-assessment-net-zero-targets. Accessed on: 31 mar. 2022.

BNEF, B. Two Thirds of the World's Heaviest Emitters Have Set a Net-Zero Target. In: BloombergNEF. 24 set. 2021. Available at: https://about.bnef.com/blog/two-thirds-of-the-worlds-heaviest-emitters-have-set-a-net-zero-target/. Accessed on: 29 mar. 2022.

BRASIL. Lei 12.187. Política Nacional sobre Mudança do Clima - PNMC, 2009. Available at: http://www.mct.gov.br/index.php/content/view/315733.html. Accessed on: 19 may. 2014.

BRASIL. Sumário executivo: modelagens setoriais e opções transversais para mitigação de emissões de gases de efeito estufa. p. 78, 2017.

BRASIL. FEDERATIVE REPUBLIC OF BRAZIL - Paris Agreement - NATIONALLY DETERMINED CONTRIBUTION (NDC). [S. l.: s. n.] Available at: https://unfccc.int/sites/default/files/NDC/2022-06/Updated%20-%20First%20NDC%20-%20%20FINAL%20-%20PDF.pdf. Accessed on: 27 jun. 2022a.

BRASIL, D. O. da U. DECRETO No 11.075, DE 19 DE MAIO DE 2022, 2022b. Available at: https://www.in.gov.br/web/dou/-/decreto-n-11.075-de-19-de-maio-de-2022-401425370. Accessed on: 27 may. 2022.

BRASIL, M. do M. A. Brasil e Japão assinam primeiro acordo bilateral para fomento do mercado regulado de carbono entre os dois países. [s. l.], 2022c. Available at: https://www.gov.br/mma/pt-br/noticias/brasil-e-japao-assinam-primeiro-acordo-bilateral-para-fomento-do-mercado-regulado-de-carbono-entre-os-dois-paises. Accessed on: 21 jul. 2022.

CARILLO PINEDA, A.; CHANG, A.; FARIA, P.; SBTI. FUNDAMENTOS PARA ESTABELECER METAS DE ZERO EMISSÕES LÍQUIDAS COM BASE CIENTÍFICA NO SETOR EMPRESARIAL. [S. l.]: CDP, 2020. Available at: https://sciencebasedtargets.org/resources/files/Net-Zero_Full-Paper_Portuguese-from-Portugal.pdf. Accessed on: 7 jul. 2021.

CCB. SBIA Part 1. In: 2022. Available at: https://www.climate-standards.org/ccb-standards/. Accessed on: 2 may. 2022.

CHAGAS, T.; GALT, H.; LEE, D.; NEEFF, T.; STRECK, C. A close look at the quality of REDD+ carbon credits. p. 24, 2020.

CHEN, S.; MARBOUH, D.; MOORE, S.; STERN, K. Voluntary Carbon Offsets: An Empirical Market Study. SSRN Electronic Journal, 2021. Available at: https://doi.org/10.2139/ssrn.3981914. Accessed on: 1 apr. 2022.

CLIMATE ACTION RESERVE. Climate Action Reserve - Climate Action Reserve : Climate Action Reserve. [s. l.], 2022. Available at: https://www.climateactionreserve.org/. Accessed on: 11 apr. 2022.

CLIMATE ACTION TRACKER; CLIMATE ANALYTICS; NEW CLIMATE. Glasgow's 2030 credibility gap: net zero's lip service to climate action. [S. l.: s. n.] Available at: https://climateactiontracker.org/publications/glasgows-2030-credibility-gap-net-zeros-lip-service-to-climate-action/. Accessed on: 29 mar. 2022.

CLIMATE FOCUS. Voluntary Carbon Market Dashboard. [s. l.], 2022. Available at: https://app.powerbi.com/view?r=eyJrIjoiNGI5ZDY1ZWUtZGU0NS00MWRmLWFkNjQtMTUyYTMxMTVjYWQyIiwidCI6IjUzYTRjNzZkLWI2MjUtNGFhNi1hMTAzLWQ0M2MyYzIxYTMxMiIsImMiOjI9&pageName=ReportSection68c2510fa4171bdf82a9. Accessed on: 8 apr. 2022.

CLIMATE POLICY INICIATIVE. Onde Estamos na Implementação do Código Florestal? Radiografia do CAR e do PRA nos Estados Brasileiros – Edição 2021. *[s. l.]*, 2021. Available at: https://www.climatepolicyinitiative.org/publication/where-does-brazil-stand-with-the-implementation-of-the-forest-code-a-snapshot-of-the-car-and--the-pra-in-brazils-states-2021-edition/. Accessed on: 15 ago. 2022.

CVM. DECISÃO DO COLEGIADO DE 10/08/2010. In: 2010. Available at: https://conteudo.cvm.gov.br/decisoes/2010/20100810_R1/20100810_D05.html. Accessed on: 20 jul. 2022.

DEHST, D. E. National Emissions Trading System. p. 2, 2021.

DONOFRIO, S.; MAGUIRE, P.; MYERS, K.; DALEY, C.; LIN, K. Markets in Motion. State of the Voluntary Carbon Markets 2021 - Installment 1. [S. l.: s. n.] Available at: https://app.hubspot.com/documents/3298623/view/251152947?accessId=fd91dd. Accessed on: 6 apr. 2022.

DURANT, I.; CONTRERAS, C.; HAMWEY, R.; GRAHAM, M.; NICITA, A.; PETERS, R.; RAZO, C.; VIVAS, D. A European Union Carbon Border Adjustment Mechanism: Implications for developing countries. [S. l.]: UNCTAD, 2021. Available at: https://unctad.org/system/files/official-document/osginf2021d2_en.pdf. Accessed on: 11 may. 2022.

ECORESPONSE. Conheça três países carbono negativos que nos mostram que as florestas podem salvar o planeta. In: 2022. Available at: https://www.ecoresponse.com.br/blog/noticia-interna/paises-carbono-negativo--florestas-275. Accessed on: 1 apr. 2022.

EDF, E. D. F.; WOODWELL CLIMATE RESEARCH CENTER. Soil carbon credits have potential but need clear standards. [s. l.], 2021. Available at: https://www.edf.org/soilcarbon. Accessed on: 9 may. 2022.

EDMONDS, J.; FORRISTER, D.; LEON, C.; DE CLARA, S.; CLAYTON, M. The Economic Potential of Article 6 of the Paris Agreement and Implementation Challenges. [s. l.], 2019. Available at: https://openknowledge.worldbank.org/handle/10986/33523. Accessed on: 22 jun. 2022.

EPE, E. de P. E. Precificação de óleo combustível marítimo para cabotagem. [s. l.], 2019. Available at: https://www.epe.gov.br/pt/imprensa/noticias/epe-publica-nota-tecnica-precificacao-de-oleo-combustivel-maritimo--para-cabotagem-. Accessed on: 25 may. 2022.

EUROPEAN COMMISSION; UNITED STATES OF AMERICA. Global Methane Pledge. In: 2021. Available at: https://www.ccacoalition.org/en/resources/global-methane-pledge. Accessed on: 29 mar. 2022.

FAMA, E. F. Efficient Capital Markets: A Review of Theory and Empirical Work. The Journal of Finance, v. 25, n. 2, p. 383–417, 1970. Available at: https://doi.org/10.2307/2325486

FEBRABAN. FEBRABAN discute a atuação do setor financeiro na agenda climática no Café com Sustentabilidade. In: 26 out. 2021. Available at: https://febraban.org.br/noticia/3699/pt-br. Accessed on: 4 aug. 2022.

FOREST TRENDS' ECOSYSTEM MARKETPLACE. (2022). The Art of Integrity: State of the Voluntary Carbon Markets 2022 Q3 Insight Briefing. Available at: https://www.ecosystemmarketplace.com/publications/state-of--the-voluntary-carbon-markets-2022/ Accessed on 23 aug. 2022

GFANZ, G. F. A. for N. Z. Glasgow Financial Alliance for Net Zero. In: 2021. Available at: https://www.gfanzero.com/. Accessed on: 29 mar. 2022.

GIC; EBD SINGAPURE; MCKINSEY. Putting carbon markets to work on the path to net zero. In: 2021. Available at: https://www.mckinsey.com/~/media/mckinsey/business%20functions/sustainability/our%20insights/putting%20carbon%20markets%20to%20work%20on%20the%20path%20to%20net%20zero/putting-carbon--markets-to-work-on-the-path-to-net-zero-report.pdf?shouldIndex=false. Accessed on: 8 apr. 2022.

GOLD STANDARD. Post-COP26 – Reflections on Article 6 Outcomes. In: Gold Standard Blog. 2021. Available at: https://www.goldstandard.org/blog-item/post-cop26-%E2%80%93-reflections-article-6-outcomes. Accessed on: 16 mar. 2022.

GOLD STANDARD. The Gold Standard. [s. l.], 2022a. Available at: https://www.goldstandard.org/. Accessed on: 11 apr. 2022.

GOLD STANDARD. Gold Standard Impact Registry. In: 2022b. Available at: https://registry.goldstandard.org/projects?q=&page=1. Accessed on: 11 may. 2022.

GOLD STANDARD. FAQS – Glossary – Site tutorial. In: 2022c. Available at: https://globalgoals.goldstandard.org/faqs-glossary/#glossary. Accessed on: 8 apr. 2022.

GOLD STANDARD. Validation and Verification Bodies. In: 2022d. Available at: https://globalgoals.goldstandard.org/verification-validation-bodies/. Accessed on: 11 may. 2022.

GOLD STANDARD; SWEDISH ENERGY AGENCY. Gold Standard and Swedish Energy Agency partner to ensure integrity in international cooperation under Paris Agreement. [S. l.: s. n.] Available at: https://www.goldstandard.org/sites/default/files/mediarelease_goldstandard_swedishgovt_article6.2.pdf. Accessed on: 18 mar. 2022.

GREENPEACE. Net expectations: assessing the role of carbon dioxide removal in companies' climate plans. [s. l.], 2021. Available at: https://www.greenpeace.org.uk/resources/net-expectations-cdr-briefing/. Accessed on: 11 may. 2022.

GRISCOM, B. W. et al. National mitigation potential from natural climate solutions in the tropics. Philosophical Transactions of the Royal Society B: Biological Sciences, v. 375, n. 1794, p. 20190126, 2020. Available at: https://doi.org/10.1098/rstb.2019.0126

HATHERICK, V. Sweden enlists climate certifier for Article 6. In: Angus Media. 2021. Available at: https://www.argusmedia.com/en/news/2248553-sweden-enlists-climate-certifier-for-article-6. Accessed on: 18 mar. 2022.

HODGSON, C. Surge of investment into carbon credits creates boom time for brokers. Financial Times, [s. l.], 2 maio. 2022 Available at: https://www.ft.com/content/739a5517-4de6-43f7-ae47-1ce8d4774d50. Accessed on: 4 may. 2022.

IBGE, I. B. de G. e E.; SECRETARIA ESPECIAL DE ARTICULAÇÃO SOCIAL. Objetivos de Desenvolvimento Sustentável. In: 2022. Available at: https://odsbrasil.gov.br/. Accessed on: 11 mayo. 2022.

ICAP. China publishes framework for carbon peaking and neutrality, confirming plans to strengthen and expand national ETS. [s. l.], 2021. Available at: https://icapcarbonaction.com/en/news/china-publishes-framework-carbon-peaking-and-neutrality-confirming-plans-strengthen-and-expand. Accessed on: 7 apr. 2022.

ICAP. Emissions Trading Worldwide – International Carbon Action Partnership (ICAP) Status Report 2022. p. 240, 2022 a.

ICAP. Indonesia establishes the legal framework for a domestic emissions trading system. [s. l.], 2022b. Available at: https://icapcarbonaction.com/en/news/indonesia-establishes-legal-framework-domestic-emissions-trading-system. Accessed on: 11 apr. 2022.

ICC; WAYCARBON. Oportunidades para o Brasil em mercados de carbono. [S. l.: s. n.] Available at: https://www.iccbrasil.org/media/uploads/2021/09/27/oportunidades-para-o-brasil-em-mercados-de-carbono_icc-br-e-waycarbon_29_09_2021.pdf. Accessed on: 29 mar. 2022.

ICLEI, G. locais pela S. Fechando o Ciclo de Ambição com a Race to Zero no Brasil: um aquecimento para a COP26. In: 4 ago. 2021. Available at: https://americadosul.iclei.org/fechando-o-ciclo-de-ambicao-com-a-corrida-ao-zero-no-brasil-um-aquecimento-para-a-cop26/. Accessed on: 4 aug. 2022.

IETA. The Economic Potential of Article 6 of the Paris Agreement and Implementation Challenges. [S. l.]: Creative Commons Attribution CC, 2019. Available at: https://www.ieta.org/resources/International_WG/Article6/CLPC_A6%20report_no%20crops.pdf

IETA. COP 26 Summary Report. [S. l.: s. n.] Available at: https://www.ieta.org/resources/Resources/COP/COP26-Summary-Report.pdf. Accessed on: 22 mar. 2022.

IIGCC. About us – IIGCC. In: 2022. Available at: https://www.iigcc.org/about-us/. Accessed on: 11 apr. 2022.

IMO. Brief History of IMO. [s. l.], [s. d.]. Available at: https://www.imo.org/en/About/HistoryOfIMO/Pages/Default.aspx. Accessed on: 25 may. 2022.

IPEA. Legado Do MDL - Impactos e lições aprendidas a partir da implementação do Mecanismo de Desenvolvimento Limpo no Brasil como subsídios para novos mecanismos. [S. l.]: IPEA, 2018. Available at: https://antigo.mctic.gov.br/mctic/export/sites/institucional/ciencia/SEPED/clima/arquivos/livro_legado_do_mdl.pdf. Accessed on: 9 jul. 2021.

JARDINE, C. Swiss article 6 agreements “set poor precedent”. In: Angus Media. 2021. Available at: https://www.argusmedia.com/en/news/2269408-swiss-article-6-agreements-set-poor-precedent. Accessed on: 18 mar. 2022.

KESSLER, J.; ESPELAGE, A.; CHRISTENSEN, J.; MICHAELOWA, A. Ensuring transparency of Article 6 cooperation – designing robust and feasible reporting and review processes and building capacities. [S. l.]: Perspectives Climate Research, 2021. Available at: https://www.perspectives.cc/public/fileadmin/user_upload/Ensuring_transparency_of_Article_6_cooperation_%E2%80%93_designing_robust_and_feasible_reporting_and_review_processes_and_building_capacities.pdf. Accessed on: 23 mar. 2022.

LEGAL RESPONSE INTERNATIONAL. Article 6 carbon markets explainer. [S. l.: s. n.]

LEWIS, K. K. Trying to Explain Home Bias in Equities and Consumption. Journal of Economic Literature, v. 37, n. 2, p. 571–608, 1999. Available at: https://doi.org/10.1257/jel.37.2.571

MACHADO, N. Financiamento climático de países ricos ainda abaixo dos US$ 100 bi. Em: Epbr. 1 ago. 2022. Disponível em: https://epbr.com.br/financiamento-climatico-de-paises-ricos-ainda-abaixo-dos-us-100-bi/

MACQUARIE, R. Searching for trust in the voluntary carbon markets. In: LSE Business Review. 16 fev. 2022. Available at: https://blogs.lse.ac.uk/businessreview/2022/02/16/searching-for-trust-in-the-voluntary-carbon-markets/. Accessed on: 29 mar. 2022.

MASON, J.; SHALAL, A.; RUMNEY, E. South Africa to get $8.5 bln from U.S., EU and UK to speed up shift from coal. In: Reuters. 2021. Available at: https://www.reuters.com/business/environment/us-eu-others-will-invest-speed-safricas-transition-clean-energy-biden-2021-11-02/. Accessed on: 24 mar. 2022.

MCKINSEY. A blueprint for scaling voluntary carbon markets | McKinsey. [s. l.], 2021. Available at: https://www.mckinsey.com/business-functions/sustainability/our-insights/a-blueprint-for-scaling-voluntary-carbon-markets-to-meet-the-climate-challenge. Accessed on: 4 aug. 2022.

MELLO, C. A. B. de. Curso de direito administrativo. 30a ed. [S. l.]: Malheiros Editores LTDA, 2012.

MICHAELOWA, A.; HERMWILLE, L.; OBERGASSEL, W.; BUTZENGEIGER, S. Additionality revisited: guarding the integrity of market mechanisms under the Paris Agreement. Climate Policy, v. 19, n. 10, p. 1211–1224, 2019. Available at: https://doi.org/10.1080/14693062.2019.1628695

MSCI ESG RESEARCH. MSCI Net Zero Tracker. p. 23, 2022.

MSCI, ESG RESEARCH. MSCI Net Zero Tracker. p. 23, 2022.

NUNES, S.; GASTAUER, M.; CAVALCANTE, R. B. L.; RAMOS, S. J.; CALDEIRA, C. F.; SILVA, D.; RODRIGUES, R. R.; SALOMÃO, R.; OLIVEIRA, M.; SOUZA-FILHO, P. W. M.; SIQUEIRA, J. O. Challenges and opportunities for large-scale reforestation in the Eastern Amazon using native species. Forest Ecology and Management, v. 466, p. 118120, 2020. Available at: https://doi.org/10.1016/j.foreco.2020.118120

OPIS. Carbon Market Report | Credit Prices | OPIS. [s. l.], 2022. Available at: https://www.opisnet.com/product/pricing/spot/carbon-market-report/. Accessed on: 6 jul. 2022.

PERSHA, L.; ANDERSSON, K. Elite capture risk and mitigation in decentralized forest governance regimes. Global Environmental Change, v. 24, p. 265–276, 2014. Available at: https://doi.org/10.1016/j.gloenvcha.2013.12.005

PERSSON, S. Bilateral cooperation under the Paris Agreement. In: The Swedish Energy Agency. 2021. Available at: https://www.energimyndigheten.se/en/cooperation/swedens-program-for-international-climate-initiatives/cooperationunder-the-parisagreement/bilateral-cooperation-under-the-paris-agreement/. Accessed on: 18 mar. 2022.

PROLO, C. Créditos de carbono são commodities? | Colunas de Caroline Prolo | Valor Investe. [s. l.], 2022. Available at: https://valorinveste.globo.com/blogs/caroline-prolo/coluna/creditos-de-carbono-sao-commodities.ghtml. Accessed on: 4 aug. 2022.

RAMOS, M. Projeto de Lei PL 528/2021 Apensado ao PL 290/2020, 2021. Available at: https://www.camara.leg.br/propostas-legislativas/2270639. Accessed on: 5 aug. 2022.

REEVES, M.; YOUNG, D.; DHAR, J.; O'DEA, A. The risks and benefits for companies going net zero. [s. l.], 2022. Available at: https://www.weforum.org/agenda/2022/02/net-zero-risks-benefits-climate/. Accessed on: 5 may. 2022.

REPÚBLICA FEDERATIVA DO BRASIL. Nationally Determined Contribution (NDC). [S. l.: s. n.] Available at: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Brazil%20First/Updated%20-%20First%20NDC%20-%20%20FINAL%20-%20PDF.pdf. Accessed on: 8 apr. 2022.

ROMEIRO, V.; GENIN, C.; FELIN, B. Nova NDC do Brasil: entenda por que a meta climática foi considerada pouco ambiciosa. In: WRI Brasil. 2021. Available at: https://wribrasil.org.br/pt/blog/clima/nova-ndc-do-brasil-entenda-por-que-meta-climatica-foi-considerada-pouco-ambiciosa. Accessed on: 6 may. 2022.

SCHWEIZER, D.; VAN KUIJK, M.; MELI, P.; BERNARDINI, L.; GHAZOUL, J. Narratives Across Scales on Barriers and Strategies for Upscaling Forest Restoration: A Brazilian Case Study. Forests, v. 10, n. 7, p. 530, 2019. Available at: https://doi.org/10.3390/f10070530

SCIENCE BASED TARGETS. Status report: business ambition for 1.5°C responding to the climate crisis. [S. l.: s. n.] Available at: https://globalcompact.at/wp-content/uploads/2021/11/status-report-Business-Ambition-for-1-5C-campaign.pdf. Accessed on: 4 aug. 2022.

SEROA DA MOTTA, R. As vantagens competitivas do Brasil nos instrumentos de mercado do Acordo de Paris. [s. l.], 2021. Available at: https://www.climaesociedade.org/post/vantagens-competitivas-brasil-acordo-de-paris. Accessed on: 12 may. 2021.

SMITH, P. et al. Agriculture, Forestry and Other Land Use (AFOLU). In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Agriculture, Forestry and Other Land Use (AFOLU). In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA., 2014. Available at: https://www.ipcc.ch/report/ar5/wg3/agriculture-forestry-and-other-land-use-afolu/. Accessed on: 11 may. 2022.

S&P GLOBAL. Commodities 2022: China's carbon market to expand, build capabilities | S&P Global Commodity Insights. [s. l.], 2022. Available at: https://www.spglobal.com/commodity-insights/en/market-insights/latest-news/energy-transition/010622-commodities-2022-chinas-carbon-market-to-expand-build-capabilities. Accessed on: 29 mar. 2022.

STERN, N. A Time for Action on Climate Change and A Time for Change in Economics. The Economic Journal, p. ueac005, 2022. Available at: https://doi.org/10.1093/ej/ueac005

THE CLIMATE, COMMUNITY &BIODIVERSITY STANDARDS. CCB Program Fee Schedule. Versão 3.4. [S. l.: s. n.] Available at: https://verra.org/wp-content/uploads/2020/04/CCB-Standards-Fee-Schedule-v3.4.pdf. Accessed on: 8 jul. 2020.

THE PACIFIC ALLIANCE. Lessons Learned: The Chile - Canada Experience - The Generation and Transfer of ITMOs, NDC Accounting and Article 6 Mechanisms. [S. l.: s. n.] Available at: https://alianzapacifico.net/wp-content/uploads/2021/09/Lessons-Learned-The-Chile-Canada-Experience-South-South-Exchange-Webinar-Series-Final.pdf. Accessed on: 23 mar. 2022.

TROVE INTELLIGENCE. Carbon Credit Projects & Transactions. In: Trove Intelligence. 2022. Available at: https://trove-intelligence.com/modules/carbon-projects/. Accessed on: 31 mar. 2022.

TSVCM. Scaling Voluntary Carbon Markets: The Final Report | White & Case LLP. [s. l.], 2021. Available at: https://www.whitecase.com/publications/alert/scaling-voluntary-carbon-markets-final-report. Accessed on: 18 apr. 2022.

UK GOVERNMENT. COP26 Presidency Compilation of 2021-2025 Climate Finance Commitments. [S. l.: s. n.] Available at: https://ukcop26.org/wp-content/uploads/2021/11/Table-of-climate-finance-commitments-November-2021.pdf. Accessed on: 24 mar. 2022.

United Nations Climate Change. Bonn Climate Change Conference - June 2022. In: 2022. Available at: https://unfccc.int/SB56#sessions. Accessed on: 11 may. 2022.

United Nations Climate Change; UK GOVERNMENT. Glasgow Leaders' Declaration on Forests and Land Use. In: 2021. Available at: https://ukcop26.org/glasgow-leaders-declaration-on-forests-and-land-use/. Accessed on: 29 mar. 2022.

UNEPFI. Net-zero banking alliance convenes first annual meeting of steering group's principals. In: 2021. Available at: https://www.unepfi.org/news/industries/banking/net-zero-banking-alliance-convenes-first-annual-meeting-of-steering-groups-principals/. Accessed on: 20 jul. 2022.

UNFCCC. COP26 Outcomes: Market mechanisms and non-market approaches (Article 6). In: 2021a. Available at: https://unfccc.int/process-and-meetings/the-paris-agreement/the-glasgow-climate-pact/cop26-outcomes-market-mechanisms-and-non-market-approaches-article-6#eq-1. Accessed on: 17 mar. 2022.

UNFCCC. Guidance on cooperative approaches referred to in Article 6, paragraph 2, of the Paris Agreement - Advance unedited version. [S. l.: s. n.] Available at: https://unfccc.int/sites/default/files/resource/cma3_auv_12a_PA_6.2.pdf. Accessed on: 9 mar. 2022b.

UNFCCC. Rules, modalities and procedures for the mechanism established by Article 6, paragraph 4, of the Paris Agreement - Advance unedited version. [S. l.: s. n.] Available at: https://unfccc.int/sites/default/files/resource/cma3_auv_12b_PA_6.4.pdf. Accessed on: 9 mar. 2022c.

UNFCCC. CDM Project Cycle Procedure for Programmes of activities. Version 3.0. [S. l.: s. n.] Available at: https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20210921110723406/pc_proc02_v03.0.pdf

UNFCCC. CDM Project Cycle Procedure for Project Activities. Version 3.0. [S. l.: s. n.] Available at: https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20210921110741000/pc_proc03_v03.0.pdf. Accessed on: 8 jul. 2022e.

UNFCCC. CDM Projects Research. In: 2022a. Available at: https://cdm.unfccc.int/Projects/projsearch.html. Accessed on: 10 may. 2022.

UNFCCC. Race to zero. In: 2022b. Available at: https://unfccc.int/climate-action/race-to-zero-campaign. Accessed on: 26 may. 2022.

UNFCCC. Guidance on cooperative approaches referred to in Article 6, paragraph 2, of the Paris Agreement and in decision 2/CMA.3. [S. l.: s. n.] Available at: https://unfccc.int/event/sbsta-56#eq-34. Accessed on: 15 jun. 2022c.

UNFCCC. Rules, modalities and procedures for the mechanism established by Article 6, paragraph 4, of the Paris Agreement and referred to in decision 3/CMA.3. [S. l.: s. n.] Available at: https://unfccc.int/event/sbsta-56#eq-34. Accessed on: 15 jun. 2022d.

UNFCCC. CDM List of DOEs. In: 2022e. Available at: https://cdm.unfccc.int/DOE/list/index.html. Accessed on: 11 may. 2022.

UNIVERSITY OF OXFORD. Oxford launches new principles for credible carbon offsetting | University of Oxford. [s. l.], 2021. Available at: https://www.ox.ac.uk/news/2020-09-29-oxford-launches-new-principles-credible-carbon-offsetting. Accessed on: 11 apr. 2022.

UNTERSTEL, N.; MARTINS, N. NDC do Brasil: Avaliação da atualização submetida à UNFCCC em 2022. [S. l.: s. n.] Available at: https://www.politicaporinteiro.org/wp-content/uploads/2022/04/Analise-NDC-2022_V0.pdf. Accessed on: 27 apr. 2022.

VAIDYANATHAN, G. Scientists cheer India's ambitious carbon-zero climate pledge. Scientists cheer India's ambitious carbon-zero climate pledge, Nature, 2021 Available at: https://www.nature.com/articles/d41586-021-03044-x. Accessed on: 6 may. 2022.

VERRA. COP26 Outcomes and Implications. [S. l.: s. n.] Available at: https://verra.org/wp-content/uploads/2021/11/Verra-PPT-COP26-Debrief-22-NOV-2021-final-2.pdf. Accessed on: 24 mar. 2022.

VERRA. Verra Landing page. [s. l.], 2022a. Available at: https://registry.verra.org/. Accessed on: 31 mar. 2022.

VERRA. VERRA Search Page. In: 2022b. Available at: https://registry.verra.org/app/search/VCS/All%20Projects. Accessed on: 8 apr. 2022.

VERRA. Program Definitions. [S. l.: s. n.] Available at: https://verra.org/wp-content/uploads/2022/01/Program-Definitions_v4.1.pdf. Accessed on: 4 apr. 2022c.

VERRA. VCS Validation and Verification. In: 2022d. Available at: https://verra.org/project/vcs-program/validation-verification/. Accessed on: 11 may. 2022.

VERRA. Climate, Community and Biodiversity Standards Search Page. In: 2022e. Available at: https://registry.verra.org/app/search/CCB. Accessed on: 11 may. 2022.

VERRA. Verra - Pardon Our Dust: How Verra Is Meeting the Demands of Tomorrow's Carbon Market. [s. l.], 2022f. Available at: https://verra.org/pardon-our-dust-how-verra-is-meeting-the-demands-of-tomorrows-carbon-market/. Accessed on: 11 may. 2022.

Verra. . [S. l.: s. n.] Available at: https://verra.org/wp-content/uploads/2020/04/Program-Fee-Schedule_v4.1.pdf. Accessed on: 5 may. 2022.

WBCSD. Accelerating business solutions for climate and nature – Report I: Mapping nature-based solutions and natural climate solutions. [s. l.], 2020. Available at: https://www.wbcsd.org/9i37y. Accessed on: 9 may. 2022.

WEST, T. A. P.; BÖRNER, J.; SILLS, E. O.; KONTOLEON, A. Overstated carbon emission reductions from voluntary REDD+ projects in the Brazilian Amazon. Proceedings of the National Academy of Sciences, v. 117, n. 39, p. 24188–24194, 2020. Available at: https://doi.org/10.1073/pnas.2004334117

WORLD BANK. COP26 pledges: Can the private sector come through for climate action in emerging economies?. In: 2021. Available at: https://ieg.worldbankgroup.org/blog/cop26-pledges-can-private-sector-come-through-climate-action-emerging-economies. Accessed on: 22 mar. 2022.

WORLD BANK. Carbon Pricing Dashboard | Up-to-date overview of carbon pricing initiatives. [s. l.], 2022a. Available at: https://carbonpricingdashboard.worldbank.org/map_data. Accessed on: 11 apr. 2022.

WORLD BANK. State and Trends of Carbon Pricing 2022. Washington, DC: World Bank, 2022 b. Serial. Available at: https://doi.org/10.1596/978-1-4648-1895-0. Accessed on: 25 may. 2022.

WRI, W. R. I. From Pledges to Action: What's Next for COP26 Corporate Commitments. In: 2021. Available at: https://www.wri.org/insights/pledges-action-whats-next-cop26-corporate-commitments. Accessed on: 24 mar. 2022.

WWF-US, W. W. F.; EDF, E. D. F.; OEKO-INSTITUT. What Makes a High Quality Carbon Credit. What makes a high-quality carbon credit? Phase 1 of the "Carbon Credit Guidance for Buyers" project: Definition of criteria for assessing the quality of carbon credits, p. 17, 2020.

ZAMAN, P.; QUEK, R. COP 26: Article 6 and its impact on voluntary markets. In: Holman Fenwick Willan. 2021. Available at: https://www.hfw.com/COP-26-Article-6-and-its-impact-on-voluntary-markets. Accessed on: 17 mar. 2022.

ZWICK, S. REDD+ In The Paris Climate Accord: A Summary. In: Ecosystem Marketplace. 2015. Available at: https://www.ecosystemmarketplace.com/articles/redd-in-the-paris-climate-accord-a-summary/. Accessed on: 6 may. 2022.

ANNEXES

ANNEX A

Table A - Differences between the mechanisms established by Articles 6.2 and 6.4 of the Paris Agreement after their Regulation

	Mechanisms	
	ITMO - Internationally Transferred Mitigation Outcomes - ARTICLE 6.2	**Mechanism not yet named - ARTICLE 6.4**
Definition	Trading of mitigation results directly between countries.	Decentralized mechanism for carbon credit transactions.
Quote	Articles 6.2 and 6.3.	Articles 6.4, 6.5 and 6.6.
Participants	Transferring country.	Public or private body in the host country of the project.
	Buyer country.	Buyer country/public or private entity from buyer country.
What is traded	Actual, verified and incremental post-2020 emission reductions and removals, including co-benefits from mitigation actions resulting from adaptation actions and/or economic diversification plans, or the means to achieve them, called ITMOs, measured in tCO2e or non-GHG metrics determined by the participating parties and consistent with the NDC..	Carbon credits from emissions estimated by projects, the base measurement unit is tCO2e – referred to as 6.4ER.
Project development	No project required. However, in the current pilot projects, the buyer country funds projects in the transferring country.	The host country's public or private entity develops the project according to the principles, rules, and methods under the supervision of the Supervisory Body.
Verification and validation of results	The transferring country would be responsible for independently validating the contributions and remuneration against its own parameters that are most appropriate for the country's economic structure and emissions reduction trajectory.	Performed by an accredited independent auditor.
Approval and registration	Approval is not required. Registration will be made between the parties with the Paris Agreement Governing Body according to a guide that is still pending.	The host country approves the project and submits it to the Supervisory Body for registration. This body registers and issues the 6.4ER.
Transaction process	Contract between the Parties, calculated and registered with the Governing Body without the need for its approval, according to a guide that is still pending.	Standardized process that requires approval from both the host country and the Supervisory Body for each activity.
Completion of the transaction	The parties register the transaction and make and notify the appropriate adjustments.	Registration of the 6.4ER issuance and its transactions. The parties make and notify the appropriate adjustments.
Fees	Optional	A 2% fee is applied for overall mitigation in global emissions (OMGE) and 5% is destined for an Adaptation Fund.

Source: Own preparation based on (Legal Response International (2022); UNFCCC (2021b, 2021c).

ANNEX B

Table B - Commitments of countries that are Parties to the Paris Agreement

Germany	Increase climate finance from €4 billion to €6 billion per year by 2025 at the latest.
Australia	Doubling climate finance to A$2 billion in 2021-2025, including A$700 million for the Pacific and continuing to focus on adaptation and resilience.
Belgium	Contribute to multilateral and bilateral climate finance totaling at least €455 million over the period 2021-2024. This means that Belgium's public contribution to international climate finance, which mainly consists of grants, will increase overall.
Canada	Doubling international climate finance to CAD5.3 billion over five years (starting in 2021), including increased support for adaptation and NBS. Canada will also increase its grant offer from 30% to 40%.
European Commission	Increasing spending to support climate action in developing countries within the EU core budget by more than €28 billion as part of the overall contribution of the EU and its Member States and considering the recent announcement by the President of the European Commission, Von der Leyen, of an additional €4 billion for the period 2021-2027. About half of this sum will continue to serve climate adaptation goals.
Denmark	Extend grant-based climate finance to developing countries of more than $500 million per year starting in 2023. And allocate at least 60% of grant-based climate finance to adaptation, with a focus on poor and vulnerable countries.
Spain	Continue expanding its contribution to international climate finance. In this context, Spain will increase its contribution to climate finance by 50% from the already committed €900 million, so that Spain will contribute up to €1. 350 million by 2025.
United States	Further doubling of annual public climate finance for developing countries by 2024 to around $11.4 billion, of which around $3 billion will be to support adaptation measures.
Finland	Support for climate protection measures in developing countries with around €900 million by 2025 with the aim of increasing funds for adaptation.
France	Provide €6 billion annually for climate finance between 2021 and 2025, a third of which for adaptation. France has also announced that 30% of its bilateral climate funding will also benefit biodiversity.
Netherlands	Increase climate finance to €660 million in public climate finance and mobilize €640 million in private climate finance in 2022. The Netherlands has committed to continue allocating at least half of its public funding to climate adaptation.
Ireland	Increase climate finance by 140% from €93 million to at least €225 million per year by 2025.
Italy	Nearly triple its climate finance commitment to $1.4 billion per year by 2025.
Japan	Commit to an additional $10 billion in public and private climate finance, bringing its climate finance commitment to $70 billion from 2021 to 2025. This includes doubling adaptation finance to $14.8 billion.
Monaco	Commit to increasing the budget for international climate finance by €100,000 every two years over the period 2020-2030. This means an increase of €100,000 in 2022 and 2024 and annual climate funding of €1.3 million in 2025, all in the form of grants.
Norway	Doubling annual climate finance for developing countries from NOK 7 billion in 2020 to NOK 14 billion (about $1.7 billion) by 2026 at the latest. This includes public climate finance and mobilized private climate finance.
New Zealand	Increase grant-based climate finance fourfold to NZ$1.3 billion over four years by 2025. At least 50% of the commitment will support Pacific Island countries, and at least 50% of the commitment will target adaptation.
United Kingdom	Double its international climate finance to £11.6 billion by 2025, including a balance between mitigation and adaptation spending, with an additional £1 billion between 2024 and 2025 if the economy grows as forecast, to help developing countries access clean technology and build green infrastructure.
Sweden	Double annual public climate finance for developing countries to SEK 15 billion by 2025. Sweden will continue to allocate around 50% of its bilateral climate finance to adaptation, in line with partner country requests.
Switzerland	Further increase public climate finance from current levels to at least CHF 425 million by 2024. The maintenance of a balance between mitigation and adaptation spending is foreseen in bilateral projects and programs.

UK Government (2021).

ANNEX C

Experts interviewed for this study:

- **Adriano Scarpa** (Ibá)
- **Alex Borges** (Deloitte)
- **Alex Farias** (Eneva)
- **Ana Cristina Moeri** (Instituto Ekos Brasil)
- **Bruno Aranha** (BNDES)
- Carbon Market Overview Work Front of LAB
- **Carlos Aragon** (Governor's Task Force on Climate and Forests)
- **Carmen Moraes** (Eneva)
- **Carolina Fratta** (BP)
- **Caroline Dihl Prolo** (Stocche Forbes Advogados and LAB Lawyers Group - Financial Innovation Lab)
- **Daniel Nepstad** (Earth Innovation Institute
- **Daniele Soares** (Deloitte)
- **David Taff** (Siemens)
- **Denise Hills** (Natura)
- **Denise Maranhão** (Shell)
- **Fábio Nogueira** (Ibá)
- **Fábio Passos** (Bayer)
- **Felipe Bittencourt** (Carbon Reset)
- **Felipe Donatti** (Deloitte)
- **Gabriela Dolenc** (Klabin)
- **Gabriela Sampaio** (FAS)
- **Giovana Figueiredo** (FAS)
- **Guilherme Coraiola** (Klabin)
- **Janaina Dallan** (Carbonext)
- **Julio Cesar Natalense** (Suzano)
- **Keyvan Macedo** (Natura)
- **Lucas Ribeiro** (Eneva)
- **Luis Felipe Adaime** (Moss Earth)
- **Luiz Masagao Ribeiro Filho** (Santander)
- **Luz Abusaid** (BP)
- **Márcia Silva de Jesus** (Ibá)
- **Marco Antônio Fujihara** (Aggrego)
- **Maria Belen Losada** (Itaú BBA)
- **Mariane Barbosa Sa Cesario** (Santander)
- **Monique Gonsalves** (Shell)
- **Nabil Kadri** (BNDES)
- **Patricia Latini** (Schneider Electric Energy & Sustainability Services)
- **Reinaldo Oliari** (Deloitte)
- **Rubens Ferreira** (WayCarbon)
- **Thiago Viana** (Ecosecurities)
- **Viviane Otsubo Kwon** (Santander)
- **Yanna Prade** (Eneva)

A special thanks to everyone who participated in the interviews and contributed to the development of the study.

PREPARED BY:

ICC Brasil | WAY CARBON