TECHNICAL REPORT

Overview of the International Carbon Market

FUNDO VALE

eco securities

2022
Version: 2

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Produced by:

eco securities

For:

FUNDO VALE

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The definitions presented here were taken from the IPCC's 2018 report, "Global Warming of 1.5°C," the Clean Development Mechanism's glossary of terms and other benchmark publications. The presented terms are aimed at illustrating and guiding key terminology in the field of climate change.

Paris Agreement: The Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC) was adopted in December 2015 in Paris, France, at the 21st session of the Conference of the Parties (COP) to the UNFCCC. The agreement, adopted by 196 parties to the UNFCCC, entered into force on November 4, 2016, and as of May 2018 it had 195 signatories and had been ratified by 177 parties. One of the goals of the Paris Agreement is "Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels," recognizing that this would significantly reduce the risks and impacts of climate change. Additionally, the Agreement aims to strengthen the ability of countries to deal with the impacts of climate change.

Additional/Additionality: The effect of the CDM project activity or CPA to reduce anthropogenic GHG emissions below the level that would have occurred in the absence of the CDM project activity or CPA. This definition is applicable to other carbon standards.

AFOLU: Agriculture, Forestry and Other Land Uses.

Stranded assets: Assets exposed to devaluations or conversion to "liabilities" because of unanticipated changes in their initially expected revenues due to innovations and/or evolutions of the business context, including changes in public regulations at the domestic and international levels.

CAR: Climate Action Reserve.

CCB: Climate, Community and Biodiversity.

CCS: Carbon Capture and Storage.

Baseline scenario: The scenario for the CDM project activity or CPA that reasonably represents the anthropogenic emissions by sources of GHGs that would occur in the absence of the CDM project activity or CPA. This definition is applicable to other carbon standards.

CER: Certified Emissions Reductions.

Co-benefits: The positive effects that a policy or measure aimed at one objective might have on other objectives, thereby increasing the total benefits for society or the environment. Co-benefits are often subject to uncertainty and depend on local circumstances and implementation practices, among other factors. Co-benefits are also referred to as ancillary benefits.

CO2: Carbon dioxide.

Emissions trading: A market-based instrument aiming at meeting a mitigation objective in an efficient way. A cap on GHG emissions is divided into tradeable emission permits that

are allocated by a combination of auctioning and handing out free allowances to entities within the jurisdiction of the trading scheme. Entities need to surrender emission permits equal to the amount of their emissions (e.g., tons of CO2). An entity may sell excess permits to entities that can avoid the same amount of emissions in a cheaper way. Trading schemes may occur at the intra-company, domestic, or international level (e.g., the flexibility mechanisms under the Kyoto Protocol and the EU-ETS) and may apply to carbon dioxide (CO2), other greenhouse gases (GHGs) or other substances.

Conference of the Parties (COP): The supreme body of UN conventions, such as the United Nations Framework Convention on Climate Change (UNFCCC), comprising parties with a right to vote that have ratified or acceded to the convention.

United Nations Framework Convention on Climate Change (UNFCCC): The UNFCCC was adopted in May 1992 and opened for signature at the 1992 Earth Summit in Rio de Janeiro. It entered into force in March 1994 and as of May 2018 it had 197 parties (196 states and the European Union). The Convention's ultimate objective is the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." The provisions of the Convention are pursued and implemented by two treaties: the Kyoto Protocol and the Paris Agreement.

COP26: 26th Conference of the Parties to the UNFCCC.

CORSIA: Carbon Offset and Reduction Scheme for International Aviation.

Component Project Activity (CPA): A single measure, or a set of interrelated measures under a CDM program of activities, to reduce GHG emissions by sources or result in net anthropogenic GHG removals by sinks, applied within a designated area defined in the baseline methodology or methodologies. This definition is applicable to other carbon standards.

CRT: Climate Reserve Tons.

DOE: Designated Operational Entity.

CO2-equivalent emissions (CO2e): The amount of carbon dioxide (CO2) emissions that would cause the same integrated radiative forcing or temperature change, over a given time horizon, as an emitted amount of a greenhouse gas (GHG) or a mixture of GHGs. There are a number of ways to compute such equivalent emissions and choose appropriate time horizons. Most typically, the CO2-equivalent emission is obtained by multiplying the emission of a GHG by its global warming potential (GWP) for a 100-year time horizon. For a mix of GHGs it is obtained by summing the CO2-equivalent emissions of each gas. CO2-equivalent emission is a common scale for comparing emissions of different GHGs but does not imply equivalence of the corresponding climate change responses. There is generally no connection between CO2-equivalent emissions and resulting CO2-equivalent concentrations.

Baseline emissions: The GHG emissions that would occur in the baseline scenario.

Net negative emissions: A situation of net negative emissions is achieved when, as a result of human activities, more greenhouse gases are removed from the atmosphere than are emitted into it. Where multiple greenhouse gases are involved, the quantification of negative emissions depends on the climate metric chosen to compare emissions of different gases (such as global warming potential, global temperature change potential, and others, as well as the chosen time horizon).

Negative emissions: Removal of greenhouse gases (GHGs) from the atmosphere by deliberate human activities, i.e., in addition to the removal that would occur via natural carbon cycle processes.

Net-zero CO2 emissions: Net-zero carbon dioxide (CO2) emissions are achieved when anthropogenic CO2 emissions are balanced globally by anthropogenic CO2 removals over a specified period. Net-zero CO2 emissions are also referred to as carbon neutrality.

ESG: Environment, Social and Governance.

ETS: Emissions Trading System.

Afforestation: Planting of new forests on lands that historically have not contained forests.

Forest Reference Emissions Level (FREL): Forest Reference Emissions Levels are national forest emission reference levels and/or forest reference levels or, as a temporary measure, subnational forest emission reference levels and/or forest reference levels. This is one of the elements to be developed by developing countries that are implementing REDD+ activities (in accordance with paragraph 71 of decision 1/CP.16). This decision recognized the importance of and need for appropriate financial and technological support for the development of such reference levels.

Gold Standard (GS): The Gold Standard Foundation.

Greenhouse gas (GHG): Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of terrestrial radiation emitted by the Earth's surface, the atmosphere itself and clouds. This property causes the greenhouse effect. The main GHGs are CO2, N2O and CH4. In addition, the Kyoto Protocol deals with the GHGs sulfur hexafluoride (SF6), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).

HAMA: High Ambition Markets Accelerator.

ICAO: International Civil Aviation Organization.

Carbon intensity: The amount of emissions of carbon dioxide (CO2) released per unit of another variable such as gross domestic product (GDP), output energy use or transport.

IPCC: Intergovernmental Panel on Climate Change.

ITMOs: Internationally Transferred Mitigation Outcomes.

Least Developed Country (LDC): A country identified by the United Nations as meeting its criteria for LDC status. The criteria relate to low national income, weak human assets, high economic vulnerability and a total population of less than 75 million.

Project boundary: The physical delineation and/or geographical area of the CDM project activity or CPA and the specification of GHGs and sources under the control of the project participants that are significant and reasonably attributable to the CDM project activity or CPA, in accordance with the applied methodologies and, where applicable, the applied standardized baselines.

LoA: Letter of Approval within the scope of a CDM carbon project cycle.

Clean Development Mechanism (CDM): A mechanism defined under Article 12 of the Kyoto Protocol through which investors (governments or companies) from developed countries may finance greenhouse gas (GHG) emission reduction or removal projects in developing countries and receive Certified Emission Reduction Units (CERs) for doing so. CERs can be credited toward the commitments of the respective developed countries. The CDM is intended to facilitate the two objectives of promoting sustainable development in developing countries and of helping industrialized countries to reach their emissions commitments in a cost-effective way.

Mitigation (of climate change): A human intervention to reduce emissions or enhance the sinks of greenhouse gases.

MRV: Monitoring, Reporting and Verification.

Nationally Determined Contribution (NDC): A term used under the United Nations Framework Convention on Climate Change (UNFCCC) whereby a country that has joined the Paris Agreement outlines its plans for reducing its emissions. Some countries' NDCs also address how they will adapt to climate change impacts, and what support they need from, or will provide to, other countries to adopt low-carbon pathways and to build climate resilience. According to Article 4, paragraph 2 of the Paris Agreement, each party shall prepare, communicate and maintain successive NDCs that it intends to achieve.

Nature-Based Solution (NBS): Initiatives to protect, sustainably manage and restore natural and modified ecosystems that address societal challenges effectively and adaptively, while providing human well-being and biodiversity benefits.

Sustainable Development Goals (SDGs): The 17 global goals for development for all countries established by the United Nations through a participatory process and elaborated in the 2030 Agenda for Sustainable Development, including ending poverty and hunger; ensuring health and well-being, education, gender equality, clean water, energy and decent work; building and ensuring resilient and sustainable infrastructure, cities and consumption; reducing inequalities; protecting land and water ecosystems; promoting peace, justice and partnerships; and taking urgent action on climate change.

NGO: Non-governmental organization.

Burden sharing: In the context of mitigation, burden sharing refers to sharing the effort of reducing the sources or enhancing the sinks of greenhouse gases.

Project Design Document (PDD): The document prepared by the project participant of a CDM project activity that sets out in detail, in accordance with the CDM rules and requirements, the CDM project activity that is to be undertaken. A template PDD is publicly available on the UNFCCC website. This definition is appliable to other carbon standards.

Crediting period: The period in which GHG emission reductions or net anthropogenic GHG removals by sinks attributable to a CDM project activity or CPA can result in the issuance of CERs, from that CDM project activity or CPA. The time period that applies to a crediting period for a CDM project activity or CPA, and whether the crediting period is renewable or fixed, is determined in accordance with the CDM rules and requirements. This definition is appliable to other carbon standards.

Program of Activities (PoA): A voluntary coordinated action by a private or public entity that coordinates and implements any policy/measure or stated goal (i.e., incentive schemes and voluntary programs) that leads to GHG emission reductions or net anthropogenic GHG removals by sinks that are additional to any that would occur in the absence of the PoA, via an unlimited number of CPAs. This definition is appliable to other carbon standards.

Oxford Principles: The Oxford Principles for Net Zero Aligned Carbon Offsetting.

Kyoto Protocol: The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) is an international treaty adopted in December 1997 in Kyoto, Japan, at the Third Session of the Conference of the Parties (COP3) to the UNFCCC. It contains legally binding commitments, in addition to those included in the UNFCCC. Countries included in Annex B of the Protocol (mostly OECD countries and countries with economies in transition) agreed to reduce their anthropogenic greenhouse gas (GHG) emissions – carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF6) – by at least 5% below 1990 levels in the first commitment period (2008–2012). The Kyoto Protocol entered into force on February 16, 2005, and as of May 2018, it had 192 parties (191 states and the European Union). A second commitment period was agreed in December 2012 at COP18, known as the Doha Amendment to the Kyoto Protocol, in which a new set of parties committed to reduce GHG emissions by at least 18% below 1990 levels in the period from 2013 to 2020. However, as of May 2018, the Doha Amendment had not received sufficient ratifications to enter into force.

Reducing Emissions from Deforestation and Forest Degradation (REDD+): An effort to create financial value for the carbon stored in forests, offering incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths to sustainable development. It is therefore a mechanism for mitigation that results from avoiding deforestation. REDD+ goes beyond deforestation and forest degradation, and includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks. The concept was first introduced in 2005 at the 11th Session of the Conference of the Parties in Montreal and later given greater recognition at the 13th Session of the COP in 2007 at Bali. It was included in the Bali Action Plan, which called for "policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation

in developing countries (REDD) and the role of conservation, sustainable management of forests and enhancement of forest carbon stock in developing countries." Since then, support for REDD has increased and slowly become a framework for action supported by a number of countries.

Reforestation: Planting of forests on lands that have previously contained forests but that have been converted to some other use. For a discussion of the term forest and related terms such as afforestation, reforestation and deforestation, see the IPCC Special Report on Land Use, Land Use Change and Forestry (IPCC, 2000), information provided by the United Nations Framework Convention on Climate Change (UNFCCC, 2013), and the report on Definitions and Methodological Options for Inventory Emissions from Direct Human-Induced Degradation of Forests and Devegetation of Other Vegetation Types (IPCC, 2003).

Monitoring Report: A report prepared by a project participant that sets out the GHG emission reductions or net anthropogenic GHG removals by sinks of an implemented registered CDM project activity or program of activities for a particular monitoring period. This definition is appliable to other carbon standards.

Greenhouse gas removal: Withdrawal of a GHG and/or a precursor from the atmosphere by a sink.

SBTi: Science-Based Targets Initiative.

SD VISta: Sustainable Development Verified Impact Standard.

Carbon sequestration: The process of storing carbon in a carbon pool/sink.

Sink: A reservoir (natural or human, in soil, ocean and plants) where a greenhouse gas, an aerosol or a precursor of a greenhouse gas is stored. Note that UNFCCC Article 1.8 refers to a sink as any process, activity or mechanism that removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere.

TCFD: Task Force on Climate-Related Financial Disclosures.

TSVCM: Task Force for Scaling Voluntary Carbon Markets.

Land use: Land use refers to the total of arrangements, activities and inputs undertaken in a certain land cover type (a set of human actions). The term land use is also used in the sense of the social and economic purposes for which land is managed (e.g., grazing, timber extraction, conservation and city dwelling). In national greenhouse gas inventories, land use is classified according to the IPCC land use categories of forest land, cropland, grassland, wetland, settlements, and other.

Validation: The process of independent evaluation of a CDM project activity or program of activities by a DOE against the requirements of the CDM rules and requirements, based on the PDD. This definition is appliable to other carbon standards.

VCS: Verified Carbon Standard.

VCU: Verified Carbon Unit.

Verification: Periodic independent evaluation and ex post determination by a DOE of monitored GHG emission reductions that have occurred as a result of the registered CDM project activity or program of activities. This definition is appliable to other carbon standards.

VVB: Validation and Verification Bodies.

01

Introduction

This report was prepared by **ecosecurities** for Fundo Vale with the aim of providing an analysis of carbon markets from an international perspective. The report was developed through research and a review of industry reports and academic literature, ongoing discussions at different policy levels and **ecosecurities**' market experience.

The report was structured to meet Fundo Vale's expectations regarding capacity building and knowledge about different carbon markets. This document should not be interpreted as a technical recommendation of any kind or for any specific case, but as an abstract analysis by **ecosecurities** of the sector as a whole. This report begins with a description of the fundamentals of carbon markets and this is followed in section three by comments on greenhouse gas (GHG) accounting. Carbon standards and the carbon project cycle as a whole are presented in the fourth and fifth sections, respectively. The sixth section presents an overview of credit transfers and the corresponding business cycle. Finally, the seventh section provides a brief analysis of the carbon market.

02

Fundamentals of the Carbon Market

Carbon pricing corresponds to the internalization of the social costs generated by emissions in the private costs of production, through the establishment of a value per ton CO2e emitted (CEBDS, 2021).

Different mechanisms have emerged in the last 20 years with the purpose of setting a carbon price, either through initiatives with a legal approach – such as an emissions trading system (ETS) or carbon taxes – or voluntary initiatives led by the private sector, such as voluntary climate commitments.

Carbon pricing initiatives that rely on market-based instruments are designed to create tradable units that are exchanged and traded between actors in any carbon pricing scheme to achieve their climate goals. As such, carbon markets could be defined as market-based instruments that can be used to lower the total costs of reducing greenhouse gas (GHG) emissions. Each initiative/market has different characteristics, scenarios, application scopes and methodologies for offsetting emissions, depending on its purpose and location. Carbon markets are divided into two major segments: regulated markets and voluntary markets.

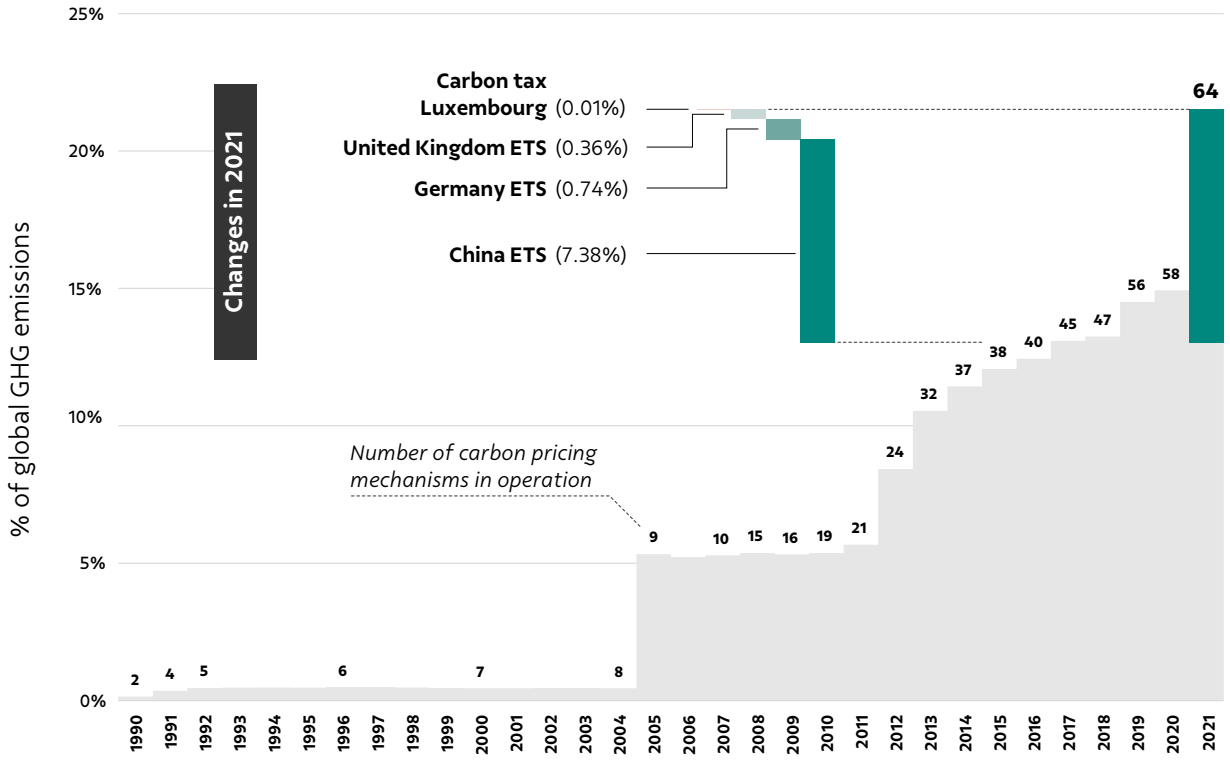
2.1. Regulated Carbon Markets

Regulated markets are controlled by governments to reduce GHG emissions and enable regulated entities to obtain emission allowances or carbon credits in order to meet pre-determined targets. Regulated entities have reporting obligations in accordance with certain standards set by governments. In this case, failure to meet the pre-determined targets gives rise to specific legal penalties, such as fines and restrictions.

Regulated entities mainly acquire carbon credits in order to meet their obligations in the regulated market. As such, these legal requirements are perceived by regulated companies as compliance costs to be minimized as far as possible. This results in carbon credits being perceived as commodities by regulated companies. In other words, as long as the carbon credits meet their legal obligations, no distinctions regarding technology, geography or other characteristics related to the credits are made.

According to the World Bank (2021), there are 64 carbon pricing initiatives in place or planned globally, in 46 different national jurisdictions and another 32 subnational jurisdictions. In 2019, these initiatives generated revenue of US$45 billion. Together, they cover approximately 25% of global GHG emissions (12 GtCO2e). Significant contributions are made by the European Union system and China's national mechanism, which has been in operation since July 2021.

Figure 1. Share of Global Emissions Covered by Carbon Pricing Initiatives (ETS and Carbon Tax)[1]



[1] World Bank, State and Trends of Carbon Pricing 2021

Developers must consider factors such as jurisdiction, sector/GHG scope, pricing and emission allowances, providing for a realistic and coherent commercial strategy for ETS trading.

2.1.1. ETS Allowances vs. Carbon Credits

An ETS is a market-based mechanism that, in most situations, is based on the "cap-and-trade" principle, whereby governments set the maximum amount of emissions in a given region. Based on this maximum amount, emission allowances are distributed to specific economic sectors. Actors in regulated sectors need to use an allowance for each ton of emissions released and they may trade them with other companies.

Government-allocated allowances may be granted free of charge, based on past emissions or performance standards, or auctioned.

The allowances granted are only a fraction of the regulated sector's emissions, so actors are obliged to manage their emissions to meet their obligations in three possible ways: (i) reducing their emissions (e.g., through efficiency improvements); (ii) buying extra allowances from other actors; or (iii) using national or international carbon offset credits from sectors not covered by the ETS or from other countries (if permitted in the ETS in question).[2]

Therefore, while each allowance represents the legal right to emit one ton under the cap-and-trade mechanism, a carbon credit, while also representing one ton of CO2 equivalent emissions, is generated by an emission reduction achieved by a voluntary project, specifically designed for this purpose. That is, while allowances are used to meet legal obligations, carbon credits support emission reductions through national or international projects.

Carbon credits are considered flexible mechanisms, as they offer alternative ways to reduce carbon emissions in different locations and sectors, thus making it easier and cheaper to comply with legal obligations under the cap-and-trade approach.

For each ETS, there are specific regulations applicable to the use of carbon credits. In general, their use is restricted, only allowing domestic projects or imposing a limit on emission offsets. For this reason, carbon credits are normally traded at prices lower than those of allowances.

2.1.2. Carbon Taxes and Offsetting

While carbon taxes and ETSs are built on the same carbon pricing logic, carbon taxes tend to provide more price certainty for market participants and higher levels of simplicity for policymakers when compared to ETSs.

Carbon taxes are imposed by governments on the emissions of certain sectors and activities, varying between different jurisdictions with respect to items such as scope, price and the possibility of offsetting emissions with carbon credits. Accordingly, when provided for in regulations, offsets with carbon credits can minimize the total emissions of an entity, reducing the carbon tax levied on its emissions.

The option of offsetting emissions enhances flexibility by enabling emissions to be managed through effective projects to reduce and offset emissions. Limitations on regulatory offsetting through carbon credits vary by tax jurisdiction. Due to these limitations, credits normally trade at a discounted price in view of their use to meet tax obligations.

[2] Each ETS has its own rules and some of them allow the use of carbon credits from other regions to meet the targets of participating agents.

2.1.3. Carbon Pricing in Brazil

In Brazil, the only regulated market currently in place is the market established by the National Biofuels Policy (RenovaBio). However, the text of Brazil's Nationally Determined Contribution (NDC) leaves open the possibility of using other available market mechanisms, as established in the Paris Agreement, which may be implemented nationally or internationally.

RenovaBio establishes that, once certified, biofuel producers and importers may generate Decarbonization Credits (CBIOs). On the other hand, fuel distributors must demonstrate compliance with mandatory individual targets through the purchase of CBIOs.

CBIOs are a financial asset that is tradeable on the São Paulo Stock Exchange, derived from certification of the biofuel production process, based on the respective efficiency levels achieved in relation to emissions.

The objective of the regulated market established by RenovaBio is to expand the production of biofuels in Brazil, in a way that is predictable, sustainable in environmental, economic and social terms, and compatible with the growth of the fuel market. As this market expands, the idea is for biofuels to make a major contribution to reducing greenhouse gas emissions in the country.

In addition to RenovaBio, two other initiatives are under discussion in Brazil: the Partnership for Market Readiness (PMR) project, which is the main carbon pricing project in the country, coordinated by the Economy Ministry and World Bank; and a bill before Congress aimed at creating the Brazilian Emissions Reduction Market (MBRE), as determined by the National Climate Change Policy.

The PMR is helping Brazil explore options for various types of carbon pricing schemes in order to select suitable instruments for implementation and to build monitoring, reporting and verification (MRV) capacity. The project will produce a white paper setting out policy proposals to inform the decision-making process on the adoption of mitigation instruments as part of the National Climate Change Policy toolkit in the post-2020 period. Three work components have been defined to produce this white paper:

- **Component 1:** Analytical studies aimed at developing alternative design options, covering both carbon taxes and emissions trading;
- **Component 2:** Assessment of the impacts of the policy tools identified in Component 1; and
- **Component 3:** Strategy to strengthen understanding of carbon pricing instruments among stakeholders through engagement, communication and consultation.

The objective of the regulated market established by RenovaBio is to expand the production of biofuels in Brazil, in a way that is predictable, sustainable in environmental, economic and social terms, and compatible with the growth of the fuel market.

The Brazilian Emissions Reduction Market (MBRE) is likely to be implemented, as it is one of the instruments of the National Climate Change Policy. The bill designed to execute it, currently before Congress, would create a National Institute for Climate Data Records (INRDC) and it would require the Economy Ministry to issue regulations for a mandatory national GHG emissions offset program, within five years after the law's publication. The draft bill does not provide any details about how the MBRE will work.

In 2022, the Mining and Energy Ministry began to discuss the creation of a regulated market similar to RenovaBio for the Brazilian electricity sector. A proposal was produced, in line with Law 14,120 of 2021, which requires the creation of mechanisms to assess and value the environmental contributions of renewable energy ventures. To this end, one of the possibilities is to have a regulated carbon market to price and trade these benefits.

The Mining and Energy Ministry foresees that this market may face some obstacles, such as unattractive carbon credit prices, since the energy transition is increasingly less valued in the markets compared to nature-based solutions, and given that Brazil's energy system is already mainly based on renewables.

One way found to address these obstacles would be to differentiate this new regulated carbon market from RenovaBio by **not** limiting it only to the sector itself and instead defining a multi-sector scope for the market. This is because in an intra-sector cap and trade system[3], the green composition of the Brazilian energy system would generate a very large supply of credits and little demand, reducing the price of credits.

In order for the market to be established, the Mining and Energy Ministry has defined certain guidelines that must be complied with and implemented by the end of 2022, since Law 14,120 of 2021 requires compensation arrangements for the sector's environmental benefits to be defined within 12 months.

[3] Agents have a limit (cap) on possible emissions, and if they go beyond this limit, they must compensate for them by buying "permits to pollute," i.e., carbon credits.

2.2. Voluntary Carbon Markets

While demand in regulated markets is created by legal requirements based on a cap-and-trade approach, voluntary carbon markets are driven by often arbitrary promises by private actors to achieve certain climate targets that vary in ambition, sector scope, source of emissions, methodology and standards.

Voluntary commitments are often made as part of initiatives such as the Science-Based Targets Initiative (SBTi), Carbon Disclosure Project (CDP), Task Force on Climate-Related Financial Disclosures (TCFD) and We Mean Business Coalition. These initiatives are not administered by governments and are often run by civil society with the support of institutional and scientific partners, international organizations and other institutions. Although these initiatives have no legal powers, they still shape market behavior due to their broad acceptance and perceived legitimacy.

The actors that drive voluntary markets generally relate to environmental, social and governance (ESG) aspects such as climate leadership, communication with stakeholders and customers, and alignment with United Nations initiatives such as the Sustainable Development Goals and Global Compact.

Carbon credits generated in voluntary markets are considered a communication tool, closely related to concerns about reputational risks that arise from oversight by civil society and other pressure groups. As such, participants in voluntary markets acquire credits and engage in projects with significant co-benefits and with a certain level of sector or geographic connection to commercial activity.

03

Carbon Inventories

The fundamental element, without which carbon pricing would not be possible, concerns the measurement of GHG emissions in the public or private sectors, value chains and mitigation actions. There are standardized rules and guidelines for this type of accounting, which ultimately depend on which actor is measuring its emissions. There are different carbon inventory systems for governments, cities, regions and countries (jurisdiction approach), and also at the level of a company, business unit, factory, office or product life cycle (company-based), or at project level (Projects that generate carbon credits depend on these standards to build methodologies and implement their activities.)

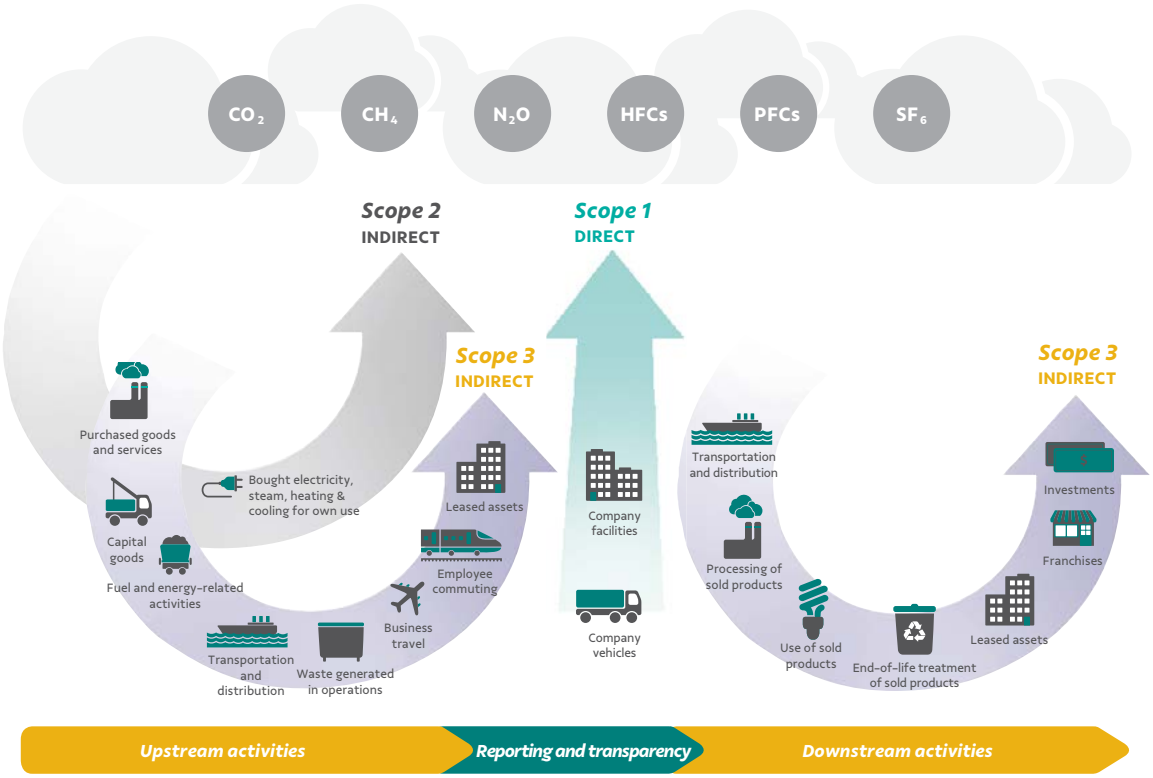
For private sector actors, a carbon inventory is primarily based on the framework developed by the GHG Protocol and refined by the CDP. These accounting standards were initially developed as voluntary initiatives without a government mandate or official support, but they were later used by state institutions to build public policies, thus acquiring a quasi-legal nature. Companies obtain multiple benefits from accounting for their emissions. They include managing GHG risks and identifying reduction opportunities; public reporting and participation in voluntary GHG programs; participation in reporting programs for regulated entities; participation in carbon markets; and recognition for early voluntary actions.

3.1. Scope 1, 2 and 3 Emissions

There are many factors to consider when preparing a carbon inventory, including organizational boundaries, operational boundaries, inventory quality management and reporting aspects. At company level, GHG emissions accounting for carbon markets needs to consider three "scopes" of emissions, categorized in relation to operations and commercial activities:

- **Scope 1: Direct GHG emissions** – Direct GHG emissions occur from sources that are owned or controlled by the company. Examples include combustion emissions from owned or controlled machinery such as boilers, furnaces and vehicles, and emissions from the production of chemicals in own or controlled process equipment;
- **Scope 2: Indirect GHG emissions from electricity** – Scope 2 includes indirect GHG emissions from the generation of electricity that is purchased and consumed by the company. Scope 2 emissions physically occur at the facility where the electricity is generated;
- **Scope 3: Other indirect GHG emissions** – Scope 3 is an optional inventory category that allows all other indirect emissions to be assessed. Scope 3 emissions are a consequence of the company's activities but they are produced by sources not owned or controlled by the company, but in its value chain. Some examples of Scope 3 activities are the extraction and production of purchased materials, the transportation of purchased fuels and the use of products and services that are sold.

Figure 2. Overview of Corporate GHG Inventories (source: GHG Protocol)[4]



[4] GHG Protocol, Corporate Value Chain (Scope 3), Accounting and Reporting Standard (2011)

When relevant to carbon markets, companies may account for and/or set Scope 1, 2 or 3 emission reduction targets, although it should be noted that Scope 3 emissions tend to be the most significant source of emissions for most companies. Private actors often start their climate commitments by covering Scope 1 and Scope 2 emissions and subsequently expand to cover their Scope 3 emissions as well.

3.2. Carbon Inventories and Carbon Credits

One key issue for Fundo Vale concerns interaction between carbon inventory standards and acceptance of the use of carbon credits for reporting purposes. In this regard, it should first be noted that while all major initiatives allow, to varying degrees, the use of carbon credits for reporting purposes, initiatives such as the GHG Protocol, CDP and SBTi have different mandates with different components, thereby leading to different interpretations and guidelines for the use of carbon credits by market agents.

It is worth emphasizing that the GHG Protocol and CDP are reporting/dissemination initiatives, while the SBTi is an organization that advocates voluntary carbon targets in line with the best scientific evidence. As such, differences in their understanding of the use of carbon credits are normal and to be expected.

Carbon markets in general and voluntary initiatives in particular are evolving at a rapid pace to accommodate growing demand and improve governance of the system, given that regular updates and advice on carbon market best practices are needed. An example of this is discussion about adjustments needed to avoid double issuance or double counting. This report will address this issue in the section about the Paris Agreement.

Table 1. Carbon Inventories and Carbon Offsetting

Initiative	General Recommendation
GHG Protocol	The GHG Protocol Corporate Standards establish that carbon credits are accepted as a reporting tool to reduce global emissions by a reporting agent, provided that the Quality Criteria and specific energy-related recommendations applicable to Scope 2 emissions are met.
CDP	CDP's technical note for the 2020 Questionnaire defines that carbon credits are permissible for reporting under the CDP, provided that the formal reporting requirements are met.
SBTi	Based on its "Net-Zero Vision," the SBTi promotes the use of credits only for residual emissions (those emissions that are outside the company's control or are not possible to reduce) or for transitory phases that are not covered by the entity's targets. In addition, there is an understanding that carbon credits should come from carbon removal projects rather than emission reduction projects. The general message is that the use of carbon credits should be restricted to a few specific cases and carbon removal credits should be prioritized. A figure representing the SBTi Net-Zero Vision can be found in Appendix 1 – The SBTi Net-Zero Vision.

04

Carbon Project Cycle

The carbon project cycle is based on the same logic, in accordance with different carbon standards, considering the emphasis and focus of each standard.

This section assesses the basic carbon project cycle using the procedures of the Verified Carbon Standard (VCS) as a starting point, before comparing key project elements with the Clean Development Mechanism (CDM), Gold Standard and Climate Action Reserve (CAR), which are the main carbon markets at this moment.

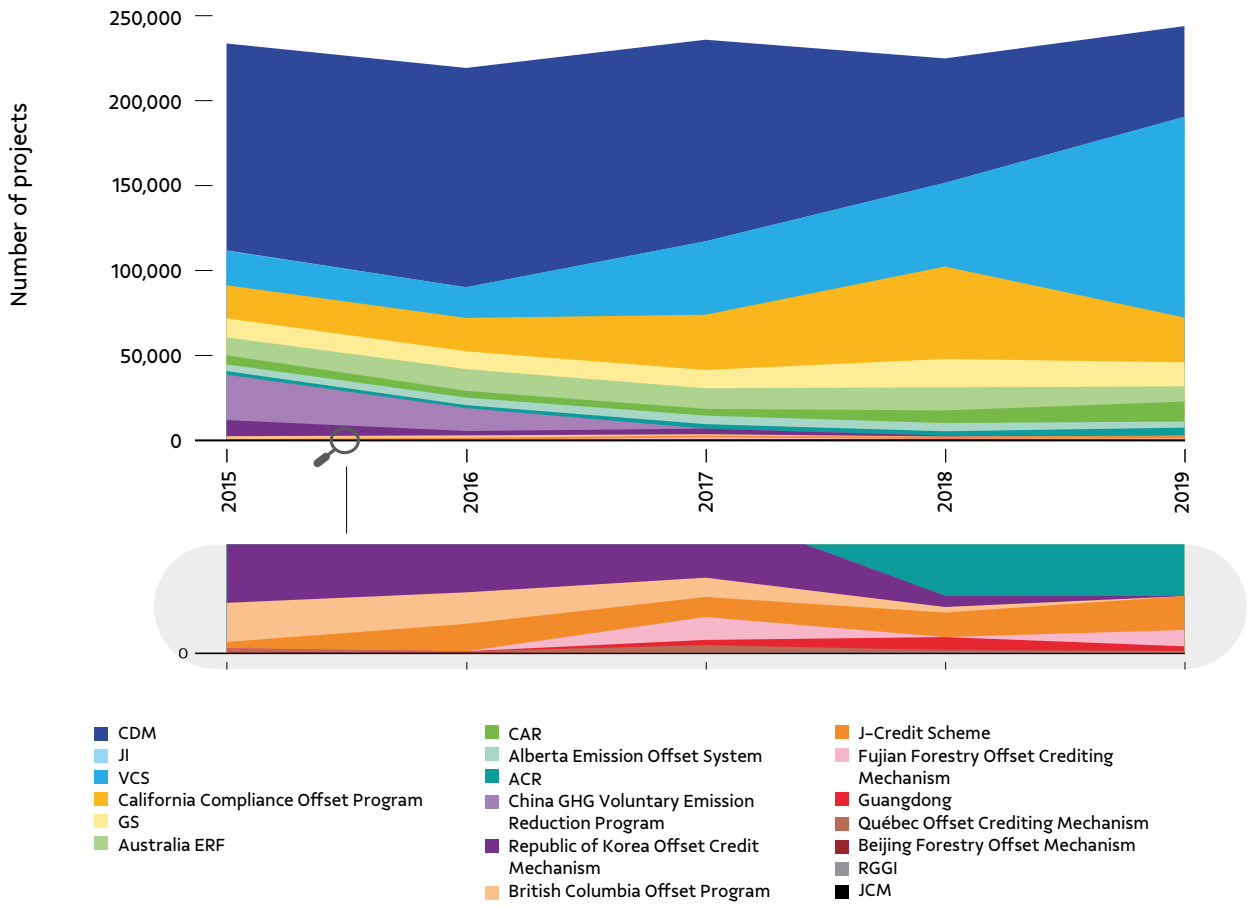
4.1. Carbon Standards[5]

Immediately after the ratification of the Kyoto Protocol, the only certification mechanisms for projects or activities that resulted in the reduction or removal of GHG emissions were the CDM and the Joint Implementation (JI) mechanism, which were aimed at providing flexibility for Annex B countries to achieve the Kyoto Protocol targets. Since then, carbon markets have expanded to incorporate other dynamics and realities of a voluntary nature and other types of specific projects that were not considered under CDM rules.

There is now a growing variety of carbon standards with different scopes, geographies, procedures and accepted technologies. As different regulated carbon markets and the climate change mitigation debate have advanced, more standards have emerged in order to meet the specific needs and requirements of different carbon markets.

The figure below shows the shares of different standards in the carbon market, according to the number of credits issued, encompassing both regulated markets (such as the California Compliance Offset Program, Korean Offset Credit Mechanism, J-Credit Scheme and RGGI) and voluntary schemes (such as the Gold Standard and VCS).

Figure 3. Annual Volume of Emissions by Offset Standard[6]



[5] Carbon Standards or GHG Programs are formal or organized programs, systems or arrangements to recognize activities that lead to GHG emission reductions or removals, and/or the crediting or issuance of instruments that represent or recognize GHG emission reductions or removals.

[6] World Bank, State and Trends of Carbon Pricing 2020.

The applicability of each project to a particular carbon standard will depend on its individual characteristics and specific requirements. One clear example is the Carbon Offset and Reduction Scheme for International Aviation (CORSIA), which despite having authority over the aviation sector, setting GHG emission reduction targets, accepts carbon credits certified by both regulated and voluntary standards. Considering the large number of carbon credits to be acquired by the civil aviation sector within the scope of CORSIA, this initiative works practically as a global market in which carbon credits of different standards can be traded. The fact that CORSIA accepts credits from the GCC has made this new carbon standard attractive to projects that are not accepted in other standards, such as energy and industrial projects. This may be interesting for Vale. A more detailed description of the most relevant carbon standards, selected in accordance with their size in the global market and applicability to Vale and its projects in Brazil, is given below.

4.1.1. Article 6 of the Paris Agreement (formerly CDM)

The CDM was established together with the Kyoto Protocol as a mechanism to provide greater flexibility to "Annex I countries" under Article 12. Currently, the former CDM is still the carbon standard with the most extensive project base and widest range of technologies.

Since the carbon market crisis in 2011, and as new international climate governance schemes (such as the Paris Agreement) have emerged, the CDM has slowly been adapted to incorporate elements that allow it to be used as a voluntary carbon standard. In other words, it authorizes the voluntary retirement of offsets by market agents.

Despite this, the CDM was an instrument whose mandate was based on the Kyoto Protocol and, as such, there was uncertainty about its future, as the Kyoto Protocol's second commitment period ended on December 31, 2020. The CDM operated under provisional arrangements until the decision made at the 26th Conference of the Parties to the UNFCCC, held in Glasgow in November 2021 (COP26). At this event, it was said that the CDM would be transformed into a new mechanism under Article 6.4 of the Paris Agreement.

It is important to highlight that the points defined in Article 6 of the Paris Agreement are guidelines for the implementation of a mechanism for the carbon market and, in any case, the former CDM is the only state-supported carbon standard of international scope.

Therefore, we can summarize the preliminary conclusions that can be drawn from the discussions and decisions at COP26 regarding Article 6 of the Paris Agreement as follows:

4.1.1.1 Article 6.2 – Internationally Transferred Mitigation Outcomes (ITMOs)

- Framework that enables cooperation between countries
- There is no central registry
- Credits with corresponding adjustments pursuant to Article 6.4 are considered ITMOs
- Strict rules to guarantee corresponding adjustments
- Strict ITMO reporting rules

4.1.1.2. Article 6.4 – "Sustainable Development Mechanism" (unofficial name)

- Secretariat
  - Mandate of the CDM Secretariat is implicit throughout the text
  - Mechanism will have a new Executive Board
  - Designated Operational Entities (DOEs) are still active
  - Designated National Authorities (DNA) are yet to be defined
  - New costs
    - 5% Adaptation Fund
    - At least 2% for general mitigation of global emissions
- Methodology / Project Design Document (PDD)
  - Project cycle similar to that of former CDM

- Baseline: same definition criteria
- Standardized baselines: countries may establish them
- Crediting period:
  - General rule: 5 years and maximum of 2 renewals (total 15 years) or 1 time in 10 years
  - Removal projects last 15 years and they may be renewed 2 times at most (total 45 years)

- Letter of Approval (LoA)
  - Letter of Approval from host country:
    - Needs to be linked to Nationally Determined Contribution (NDC)
    - New LoA is needed to renew crediting period
  - • Necessary to include each country's updated NDC
- Registration system
  - Voluntary cancellation, with or without corresponding adjustments
  - Mandatory corresponding adjustments for all transactions that count toward NDCs and other international mitigation objectives (e.g., CORSIA)
  - It appears that participants will be able to register if the host country approves and DNAs request this
- CDM transition rules
  - Request must be made to the Secretariat and host country by December 31, 2023
  - The host country must approve requests by December 31, 2025
  - Corresponding adjustments are demanded
  - The CDM methodology is applicable until the end of the crediting period or until December 31, 2025, whichever comes first
  - Other rules and guidelines are expected from the Supervisory Body (SB) and Conference of the Parties, given that no deadline has been set to restrict excess CDM projects in alignment with the methodology
- Use of Certified Emission Reduction Units (CERs) for Nationally Determined Contributions (NDCs)
  - Project / program of activities must be registered after January 1, 2013
  - CERs must be identified as "pre-2021"
  - Only used for "first NDC"
  - Corresponding adjustments are not necessary
  - Temporary or long-term CERs are not accepted by the CDM
  - Option to loosen the eligibility criteria and accept other CERs
  - More guidelines yet to be determined

CDM and Article 6.4 Mechanism – Comparative Table

	CDM	Art. 6.4
Name of credit	CER	A6.4ER
Host country participation	• Signatory to Kyoto Protocol • Designated National Authority appointed	• Signatory to Paris Agreement • Prepare, communicate and maintain Nationally Determined Contribution (NDC), in line with Article 4 • Designated National Authority appointed for new mechanism • Compatible with NDC
Project cycle and methodology	CDM cycle: (1) Project Design Document (PDD); (2) Validation by Designated Operational Entity (DOE); (3) Approval by Host Country; (4) Registration with UNFCCC; (5) Monitoring Report; (6) Verification of DOE; and (7) UNFCCC Issuance Methodologies: More than 300 small and large-scale methodologies – revised and approved by panel of experts	Project cycle: similar to CDM Methodologies: • Secretariat to review methodologies and tools – panel of experts yet to be determined • Strict guidelines for defining additionality and baselines • Methodological tools consider NDCs
Administrative fees	• Administrative (US$0.20 per tCO2) • Adaptation Fund: 2%	• Administrative [undefined] • Adaptation Fund: 5% • Overall Mitigation in Global Emissions (OMGE): at least 2%
Registration system	• Registration under the UNFCCC is based on projects • System for retiring voluntary credits • Registration of private entities only permitted in National Registration Systems	• Similar to CDM • Emphasis on allowing voluntary retirement (with or without corresponding adjustments) • Language allows registration of public and private entities that are authorized by the UN
Corresponding adjustments	No corresponding adjustments	• Corresponding adjustments are necessary for all transactions that count for (i) NDCs and (ii) "other international mitigation objectives" • Also applicable to administrative fees (Adaptation Fund and OMGE) • The total extent of "Overall Mitigation in Global Emissions (OMGE)" is not clear, nor whether it could encompass voluntary markets
Mandate – CDM	• The CDM must not file new applications for registration, renewal of crediting periods or issuance of emission reduction credits occurring after December 31, 2020 • New requests must be made under the Article 6.4 mechanism of the Paris Agreement	
Transition rules – CDM	• Requests must be made to the Secretariat and host country by December 31, 2023 • The transition must be approved by the host country by December 31, 2025 • Corresponding adjustments are required • The CDM methodology is applicable until the end of the crediting period or until December 31, 2025, whichever comes first • Other rules and guidelines are expected from the Supervisory Body (SB) and Conference of the Parties, given that no deadline has been set to restrict excess CDM projects in alignment with the methodology	
Use of credits for Nationally Determined Contributions (NDCs)	• Project / program of activities registered after January 1, 2013 • CERs must be identified as "pre-2021" • Only used for "first NDC" • Corresponding adjustments are not necessary • Temporary or long-term CERs are not accepted	• Provided that corresponding adjustments are made, A6.4ER may be used for NDC targets

4.1.2. Verified Carbon Standard (VCS)

The VCS establishes a governance system that encompasses the rules of the VCS standard, the VCS registry and other optional certification and labeling schemes, such as Climate, Community and Biodiversity (CCB) certification, to enable validation and verification of carbon projects and programs that can be used in both voluntary and regulated markets. The VCS is supported by Verra, an American NGO that is responsible for the management, supervision and development of the VCS Program.

It is the largest global registry in the voluntary market, accounting for 75% of the capacity of projects implemented in 2019, certifying carbon credits called Verified Carbon Units (VCUs). The main focus of the VCS initiative is REDD+ projects,[7] which are also eligible to receive other quality certifications, such as Climate, Community and Biodiversity (CCB).

The VCS has also been active in aligning its crediting activities with the Paris Agreement and the UN SDGs. In January 2019, Verra launched the Sustainable Development Verified Impact Standard (SD VISta), which is a flexible framework to assess and report on the sustainable development benefits of project activities. Projects can participate simultaneously in the VCS and SD VISta programs. VCS projects will also soon be able to indicate their contributions to sustainable development by filling in a Contribution Report template for the SDGs.

While VCUs is still predominantly used for voluntary offsetting, more than 17 million VCUs from VCS projects have been used to pay Colombia's carbon tax. Other regulated systems, including the South African carbon tax and CORSIA, have also permitted the use of VCUs.

The VCS has established a broad set of rules and requirements that project developers must meet to produce and issue VCUs, focusing on the following principles, which are evaluated on a project-by-project basis:

- **Real** – All GHG emission reductions and removals and the projects or programs that generate them must be proven to have genuinely taken place;
- **Measurable** – All GHG emission reductions and removals must be quantifiable using recognized measurement tools (including adjustments for uncertainty and leakage) against a credible emissions baseline;
- **Permanent** – Where GHG emission reductions or removals are generated by projects or programs that carry a risk of reversibility, adequate safeguards must be in place to ensure that the risk of reversal is minimized and that, should any reversal occur, a mechanism is in place that guarantees the reductions or removals will be replaced or compensated;
- **Additional** – GHG emission reductions and removals must be additional to what would have happened under a business-as-usual scenario if the project had not been carried out;
- **Independently Audited** – All GHG emission reductions and removals must be verified to a reasonable level of assurance by an accredited validation/verification body with the expertise necessary in both the country and sector in which the project is taking place;
- **Unique** – Each VCU must be unique and must only be associated with a single GHG emission reduction or removal activity. There must be no double counting or double claiming of the environmental benefit, in respect of the GHG emission reductions or removals;
- **Transparent** – There must be sufficient and appropriate public disclosure of GHG-related information to allow intended users to make decisions with reasonable confidence;
- **Conservative** – Conservative assumptions, values and procedures must be used to ensure that the GHG emission reductions or removals are not overestimated.

[7] REDD+ projects aim to conserve intact areas of forest in regions that are experiencing deforestation pressure. REDD+ "Avoided Unplanned Deforestation" projects involve illegal deforestation pressure in the area and tend to generate fewer credits than REDD+ "Avoided Planned Deforestation" projects, which are based on the owner's legal permission to deforest that area.

4.1.2.1. The VCS' Sector Scope

All carbon projects must be carried out in line with a methodology approved by Verra, developed under the UNFCCC or Climate Action Reserve (except CAR forest protocols).

There are currently 47 Verra-approved methodologies covering the following sectors: energy, industrial processes, construction, transport, waste, mining, agriculture, forestry, grassland, mangroves and livestock & manure. **Appendix 2** of this report presents all the VCS-approved methodologies categorized by sector scope, as well as all current VCS methodologies under review.

The VCS also allows CDM and CAR methodologies (except forest protocols) for carbon projects intended for registration under the VCS Program. This not only allows greater flexibility for project developers, but also enables the transition from a project registered under one of the aforementioned carbon standards to the VCS Program.

In addition, the VCS Program's restrictions on certain technologies and projects must be observed. These restrictions are presented in **Appendix 5 – VCS Program Restrictions**.

4.1.2.2. Development of VCS Standards

The VCS is currently reviewing its requirements and rules with a view to aligning its standards with the Paris Agreement, in particular to address the need for corresponding adjustments to mitigate dual issuance risks and enhance governance of REDD+ projects.

In 2020, Verra held a public consultation to collect stakeholder impressions and suggestions on how to ensure that the VCS Program can play its role both in emerging regulatory mechanisms (such as CORSIA and Article 6.2 of the Paris Agreement) and in supporting companies in their efforts to achieve ambitious targets, including carbon neutrality, on a purely voluntary basis, thereby ensuring that private funding continues to flow into additional mitigation efforts. One relevant aspect concerns the concept of corresponding adjustments, an accounting approach designed to ensure that emission reductions are counted only once in the context of the Paris Agreement. This approach is considered critical to avoid double counting when units are transferred from one country's accounts to another (or to another regulated market such as CORSIA).

However, there is still no consensus on the need for corresponding adjustments for international voluntary market transactions and for what types of claims. For example, some stakeholders believe that in most cases, corresponding adjustments are necessary to avoid double counting and thus ensure environmental integrity. On the other hand, other stakeholders believe that corresponding adjustments are not appropriate because carbon credits purchased and retired for voluntary corporate targets do not appear in the company's home country inventory, but will, for reporting purposes, in accordance with the terms of the Paris Agreement, be accounted for in the host government's inventory.

In addition, the VCS is updating its forest preservation and restoration programs and standards to strengthen forest conservation and restoration efforts to contribute to global climate goals. Key updates include greater integration of project activities with jurisdictional (i.e., government-led) efforts to strengthen projects (as they are effective in providing services to local communities and addressing local drivers of deforestation and are more likely to attract the private sector) and governments (as they provide a supportive environment, including incentives for forest protection and restoration, and they can draw on capital from buyer/donor countries). The main regulatory changes include the adoption of Forest Reference Emissions Levels (FRELs) published by the UNFCCC for the level of deforestation, the use of an "allocation tool" to define the baseline for projects and more frequent updates and reporting obligations. All these measures will cause a shift from a bottom-up approach to a top-down program orientation.

4.1.3. Gold Standard

The Gold Standard was established by the World Wildlife Fund (WWF) and international NGOs as a crediting mechanism for both voluntary offsetting and additional certification on the social impacts of carbon projects. Compared to other carbon standards, the Gold Standard has a special focus on generating co-benefits such as employment and health improvements for local communities, along with emission reductions from its projects. Such co-benefits are evaluated against metrics and guidelines to measure project impact based on the Sustainable Development Goals.[8]

The Gold Standard is the second largest independent crediting mechanism by crediting project activity and credit volume with a significant portion of its crediting activities from renewable energy and cookstove fuel switch projects.

Like most other voluntary market credits, Gold Standard credits are used predominantly for voluntary offsetting purposes. Some regulated market schemes also accept these credits on their platforms for compliance purposes. An example in Latin America is the regulated market in Colombia, where more than 200,000 Verified Emission Reductions (VERs) from Gold Standard projects implemented in the country have been used for compliance purposes.

4.1.3.1. Gold Standard Policy Development

The Gold Standard is currently undergoing a review of its rules and procedures to align with the Paris Agreement and ensure that its projects and credits remain eligible for as many market opportunities as possible, continue to represent best practices and are protected from reputational risks. Two public consultations have been held to discuss the market's integrity and collect opinions on the issue of double counting and corresponding adjustments in voluntary markets.[9]

The Gold Standard is also revising its guidelines on Monitoring, Reporting and Verification (MRV) for the SDGs through SDG Toll Guidance, an Excel tool that provides a standardized model to clearly and transparently monitor SDG impacts together with carbon reductions/removals.

There are specific subjective restrictions according to the penetration rate of certain technologies, which is generally limited to 5%, and project location, where there is greater resistance to carbon projects outside Least Developed Countries, depending on the sector scope and technology.

The Gold Standard's Sector Scope

Similar to the VCS rules, the Gold Standard also recognizes certain CDM methodologies as applicable for quantifying emission reductions/removals under the Gold Standard rules. However, the methodologies approved by the Gold Standard tend to prioritize areas and types of projects involving: (i) land use, forestry and agriculture; (ii) energy efficiency; (iii) fuel switching; (iv) renewable energy; (v) waste management and disposal; (vi) energy efficiency in maritime transport; and (vii) water benefits. **Appendix 3 – Gold Standard Approved Methodologies** presents an extensive list of methodologies approved by the Gold Standard.

[8] Gold Standard. 2019. Guidance for the Identification of Impacts and Indicators for Activity Level SDG Impact Reporting. Switzerland.

[9] https://www.goldstandard.org/our-work/innovations-consultations/integrity-scale-aligning-gold-standard-projects-paris-agreement

4.1.4. Global Carbon Council (GCC)

The Global Carbon Council (GCC), established by the Gulf Organization for Research and Development, an NGO, is an emerging and still-evolving program that is starting to participate in the voluntary market. It was established in 2016 and only became operational in 2020. Based in Qatar, it is the first and only voluntary carbon offset program in the Middle East and North Africa region and it was developed with the strategic purpose of prioritizing low-carbon development in that region. It is worth mentioning, however, that the program does not exclude projects in other locations, as it has a global scope. In fact, the projects submitted so far are mostly located in India, China and Turkey.

The GCC has some key requirements that set it apart from other mechanisms. Its regulations state that a project's crediting period must be fixed at 10 years, while other programs allow projects to be renewed and last for up to around 20 years. In addition, the program does not allow programmatic registration of projects, a feature present in other mechanisms that facilitates the registration of multiple activities. Finally, for GCC registration, the project starting date cannot be earlier than January 1, 2016.

This date restriction is due not only to the year when the program was launched, but also the need to comply with CORSIA criteria. Indeed, the GCC has a clear concern to facilitate projects' compliance with CORSIA specifications by integrating them with its own requirements.

In addition to carbon credits, the GCC grants additional certifications for Environmental No Net Harm (called "E+"), Social No Net Harm ("S+"), and contributions to UN Sustainable Development Goals ("SDG+"). This includes five levels of certification, depending on how many SDGs a project contributes to.

The GCC, like the CDM, was developed to cover a range of sector activities, including power generation, energy efficiency, industrial gases, waste and effluent management, afforestation and reforestation, and agriculture. Unlike other mechanisms, in the context of its general requirements the GCC has no specific restrictions on technologies or geographic regions. However, the eligibility of each specific project must be evaluated according to the methodology and tools used.

Table 2. Standards and Main Applications

Standard	Description	Applications for Vale
Article 6, Paris Agreement	It will probably follow the general regulations of the former CDM but it is likely to include new requirements related to the scope of SDGs and there will probably be restrictions related to industrial projects, as in the case of other voluntary standards.	Yet to be defined. Probable application to Nature-Based Solution projects or social projects.
VCS	Voluntary standard. Version 4.0 further restricted the types of projects accepted by the standard, regarding proof of alignment with SDGs.	Nature-Based Solution projects. Some selected projects in energy area.
Gold Standard	Voluntary standard. Restricted to projects with proven social and environmental benefits.	All projects with proven social benefits. REDD+ not accepted.
GCC	Voluntary standard launched in 2020. Accepted in CORSIA, ensuring that the credits generated are credible and applicable.	All. Still not very selective.

4.2. Carbon Credit Project Cycle

This section of the report describes and comments on the steps and relevant factors in a carbon credit project cycle based on the VCS Registration and Issuance Process v4.0. However, it should be noted that the carbon project cycle is similar for CDM, VCS, the Gold Standard and CAR. Thus, these comments about VCS can be applied to other standards.

There are no substantial differences between the norms and guidelines, but specific characteristics may require different strategies for developing a carbon project with different standards. Therefore, expert advice is recommended to develop a carbon project on a case-by-case basis in order to mitigate irreversible project risks.

4.2.1. Agents

There is a diverse range of actors involved in the development of a carbon project, from local communities in the project area to international government authorities. Each carbon project and standard has its own characteristics and requirements.

However, in general terms, it is possible to group these agents into six groups, as described below:

- **Project proponent:** The project proponent is the individual or organization that has overall control and responsibility for the project, or an individual or organization that, together with other project proponents, has overall control or responsibility for the project. Such entities must be able to demonstrate legal title or rights in relation to the project and the use of the environmental attributes that derive from it.
- There may be more than one project proponent/participant, but there are systems to control access to credits in each carbon registry to implement different project governance structures that individual parties may agree on.
- **Carbon registry:** The entity that provides the carbon standard and guidelines for the development of a project-level emission reduction and removal certification system with different technologies and scopes. This applies to CDM, Verra, the Gold Standard and CAR. In addition, carbon registry agents tend to operate or have partnerships to operate central electronic registries in which carbon credits are issued, traded and retired by market actors. An example of this is SustainCERT, which operates the Gold Standard central registry. Likewise, Verra operates the VCS central registry.
- **Auditor:** The external entity accredited by each carbon standard to conduct an independent assessment of project documents. Its involvement with the project cycle takes place in two stages: validation of the project design for registration; and in each verification of the monitored project activities for the issuance of carbon credits.

  Depending on the carbon standard, different terminologies apply. In the case of the CDM, the auditors are called Designated Operational Entities (DOEs), while in the VCS and Gold Standard they are called Validation and Verification Bodies (VVBs) and in CAR they are called Verification Bodies.
- **Technical advisor:** Agent responsible for the development of technical documentation for the project and consulting services. Their participation is not required by carbon registries, but highly recommended to optimize the process and mitigate risks.
- **Project stakeholders:** Different project activities have different impacts on the project area and region, affecting a variety of stakeholders, from local communities to government authorities. All carbon registries provide detailed and specific rules to address stakeholders' concerns. Key comments for each stakeholder group are presented below:
  - *Local stakeholders:* All evaluated carbon standards and records have rules that require the project proponent

to consider the concerns of local communities in order to obtain free, prior and informed consent for project activities, i.e., "social license to operate." The level of analysis and engagement with communities varies depending on the carbon standard, but it is a general rule that stakeholder engagement should take place prior to project implementation and, in some cases throughout project implementation.

- It should be noted that the level of interaction with local stakeholders will depend on the project's sector and technology. For example, a REDD+ conservation project developed within an indigenous national reserve will require the project proponent to interact more closely with such communities than a large-scale wind farm project developed in an uninhabited area.
- Furthermore, considering developments in the carbon industry involving carbon projects with strong community elements, local community engagement is an increasingly important component when considering the development of a carbon project. It is critical for project proponents to have direct and streamlined interaction with local communities and project stakeholders, not only to deliver the social benefits of a carbon project, but also to ensure good project governance in order to meet the different requirements of carbon standards.
- *Government authorities*: CDM rules require project proponents to obtain from host country authorities a Letter of Approval (LoA) with government consent for the development of a carbon project. Each host country may specify specific requirements for issuing LoAs, ranging from simple and efficient procedures to lengthy and bureaucratic assessments.

However, it is worth mentioning that the LoA approach was established according to the logic of the Kyoto Protocol, in which non-Annex I countries would have to recognize and approve each specific project. With the end of the Kyoto Protocol and the imminent change of CDM rules to the logic of the Paris Agreement, the weight and purpose of LoAs will also change. While it is not yet clear how this will play out, it is expected that under the Paris Agreement rules, government authorities will tend to increase their scrutiny of LoA issuance with the aim of optimizing international revenue streams from carbon assets in their country and ensure that projects are aligned with the country's National Determined Contribution (NDC). In other words, there will be in-country mechanisms to avoid double counting of the same emission reductions/removals.

In addition, given the growth in governmental initiatives to monetize environmental assets in a region, such as jurisdictional outcome-based payment mechanisms for conservation efforts, it is recommended that assessments confirm that activities and areas do not overlap between government initiatives and a potential carbon project, as this would lead to double counting of climate change mitigation efforts.

4.2.2 Preliminary Assessment

There are certain preliminary steps to be taken by a project proponent to assess the feasibility of the project and ensure compliance with carbon standards. The main such aspects are described below.

I. **Prior carbon consideration:** The basic assumption of a carbon project is that without carbon revenues the project activity would not have taken place. That is, it must be demonstrated that the revenues from carbon credits are additional to the project in order to pass all carbon standards.

   As a result, carbon registries have requirements for project proponents to communicate their intention to develop a carbon project before the start of the project activity or, at the latest, within one year of the project start date. The purpose of this is to demonstrate that

carbon revenues were considered from the beginning of the project. Failure to comply with this requirement may impair the project's ability to be registered and issue carbon credits.

Applicable advance notice rules vary by carbon project technology, sector and carbon registry and they need to be evaluated on a case-by-case basis. However, taking a conservative approach, prior consideration notification should be completed by project proponents as quickly as possible with the aim of mitigating eligibility risks.

II. **Stakeholder consultations:** Meetings with local communities to explain the project, discuss its potential environmental and social impacts, answer questions and address potential conflicts must be held at a certain level prior to project implementation. This does not exclude the potential need for further stakeholder consultation during project development, as may be applicable to specific cases.

III. **Government approval:** Depending on the local regulatory situation, there may be a need to obtain government approval for the development of a carbon project and ensure alignment with the NDC. This aspect needs to be evaluated in light of local regulations and laws.

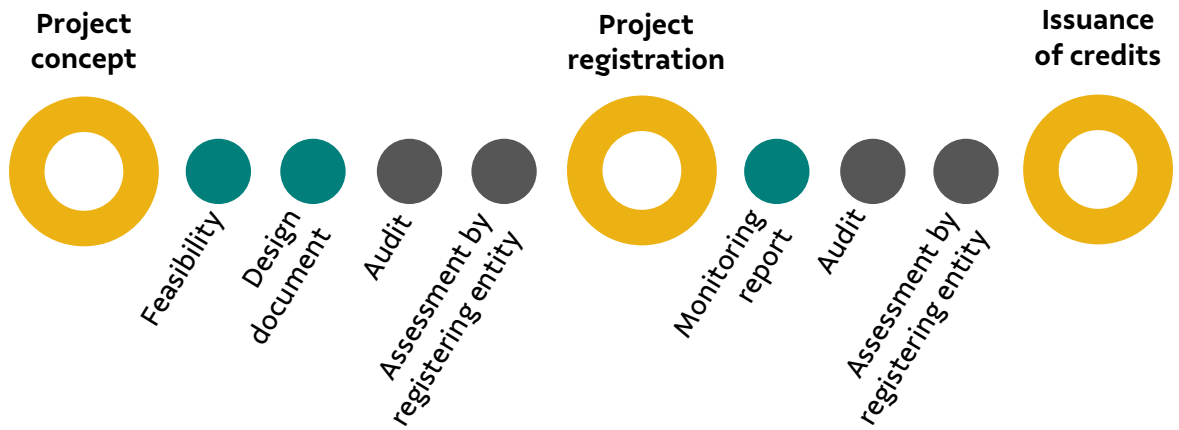
4.2.3. Project Development

According to VCS procedures, carbon project development can be organized into three stages:

1. Development of project documents and external audit procedures;
2. Review of VCS document;
3. Project registration and initial carbon offset issuance.

Each of these stages is represented in the following figure.

Figure 4. Carbon Credit Project Cycle



4.2.3.1. Development of Design Document and External Audit Procedure

In this phase, the project developer must produce the Project Design Document (PDD), containing elements to describe the project, establish the baseline, declare the additionality of the project and prove compliance with all other aspects of the carbon standard's rules. Once this is completed, an external auditor is hired to carry out a validation audit in order to verify the project's compliance with the rules of the carbon standard.

The PDD is the document that sets out the project boundaries, methodological choice, baseline definition, project additionality, legal entitlement to environmental attributes and all other assumptions that guide the development of the carbon project.

The main sections of the PDD are described below.

Baseline: This is the key aspect to be addressed by a carbon project. Every project needs to determine what the emissions would be in its absence. These are called baseline emissions. The number of credits a project receives is then calculated by subtracting the project's emissions from the baseline emissions.

The definition of the baseline will depend on the project's activities and sector, to determine which elements and parameters should be considered for the project. For example, while a forest conservation project will need to consider aspects of deforestation in the area, a renewable energy project will have to take into account the carbon intensity of the grid and its emission factor.

Methodology: This is the technical framework to guide the project's emission reduction/removal assessment. More than one methodology may be applicable to an activity and consideration of the most appropriate methodology must take into account the local context and the project's specific features.

Additionality: As mentioned earlier, additionality is related to evidence of why revenues from carbon credits are essential for project development and it is considered a key element of a carbon project. There are different methods to assess the additionality of a project that can be summarized in three groups, as follows:

- *Investment analysis:* Investment analysis is used to determine that the proposed project activity is not economically or financially attractive or viable without revenue from the sale of carbon credits. This analysis shows that the project's expected financial returns are below a benchmark for what is considered a good investment for this particular type of project. There are specific guidelines to be used in evaluating a project that applies this method.
- *Barrier analysis:* Barrier analysis is used to demonstrate that there are barriers, most often expressed as risks, which prevent the project activity from moving forward, but do not prevent the implementation of alternatives.
- *Common practice analysis:* Common practice analysis is a credibility check to complement the investment or barrier analysis. It is used to demonstrate that the project type is not yet common practice in the relevant sector and region. If similar activities or technologies are already being used, the proposed activity cannot be considered non-additional.

Legal title and rights: It is also necessary to prove that the project proponent has legal title or full legal rights to the environmental attributes of the intended carbon project. This is generally evidenced by demonstrating ownership of the assets that generate the emission reductions/removals.

However, depending on the project activity, the demonstration of legal ownership may be carried out in different ways. For example, a project related to enteric fermentation in cattle could demonstrate legal ownership by proving ownership rights over the herds (which could be done through contractual arrangements).

Furthermore, the demonstration of legal entitlement is related to the environmental attributes of an activity. As such, it is advisable

to incorporate appropriate language into agreements relating to the carbon project activity to demonstrate legal entitlement over the environmental attributes of an activity. One example concerns renewable energy generation, in which contractual arrangements can stipulate specific clauses allocating environmental attributes between the parties.

Finally, there is a growing trend for countries to pass laws that regulate certain environmental attributes. Consequently, a local regulatory assessment is recommended to mitigate risks. One clear example of this situation involves forestry projects. There are certain jurisdictions that establish that environmental attributes must be controlled by the state, while other jurisdictions establish that environmental attributes must belong to landowners.

4.2.3.2. Review of VCS Document

Upon completion of the PDD and external audit procedures to ensure the project's compliance with the VCS standard, the carbon registry performs a secondary project audit/review.

In this stage, both the project proponent and the external auditor may be asked to clarify certain aspects of the PDD and the audit process. Generally, most concerns about a project are addressed in the external audit phase by the auditor, so the VCS review tends not to raise significant issues.

This process stage is applicable to all analyzed carbon standards, with minor differences limited to procedural rules.

4.2.3.3. Project Registration and Initial Issuance of Carbon Credits

After the carbon registry completes the project review process, the project monitoring phase begins, in which carbon credits are issued.

After project registration, the project's activities can be monitored according to the parameters and criteria established in the PDD. The monitoring period is flexible and defined by the project proponent. Thus, a project's activities could be monitored for six months before credits are issued or it could take five years of monitoring before this happens. The reasons for this are related to emission costs, market conditions and the project's carbon reduction/removal generation.

Once the monitoring period is defined, the project proponent develops a monitoring report containing all necessary data to determine the baseline and to measure carbon emission reductions/removals within the project boundaries, and leakage, as applicable. In other words, the monitoring report is based on the premises and methods of the PDD, to determine and quantify the activities that lead to carbon reduction/removal, underpinning the issuance of carbon credits.

The monitoring report is then audited by an external auditor, who will review the documentation and issue a verification report. This report will verify and confirm the monitoring report's alignment with the PDD, the methodology and other applicable requirements.

The verification report is the final document to be prepared before submission to the carbon registry, as described above.

After this stage, the carbon registry performs its own verification of the integrity of the submitted documents and takes the necessary steps for the carbon credits to be issued in the project proponent's carbon registry account. Details about credit trading and retirement are provided below.

05

Carbon Credit Transfer and Trading Cycle

All carbon standards considered in this report have a centralized registration system through which monitored and certified emission reductions/ removals give rise to tradable carbon credits. These centralized registration systems are the platforms on which carbon credits are traded or retired/ cancelled as needed.

5.1. Registration

Each carbon standard has its own central registry where carbon credit units are credited to the project proponent. The project proponent needs to have a registration account on the platform in order to have access to carbon credits and be able to trade/withdraw them.

Verra and the Gold Standard operate the same IT system, so the operational aspects of these two standards are very similar. The central registry is the interface where units are issued and all project documentation is submitted by the project proponent.

The CAR operates a similar IT system, based on the same approach. In other words, access to the registry is necessary for the project proponent to trade, sell and withdraw carbon credits.

The CDM operates a more bureaucratic and less flexible registry. Registration is managed by the UNFCCC Secretariat and most interactions are not automated and require email messages to the Secretariat for issuance, transfer and retirement of carbon credits.

For all registries, the lead project proponent and account holder have the discretion to appoint other parties and agents to have access to the registry's account. This is not mandatory, but it may offer more flexibility in accessing the account.

All records have a public interface where people can access project information.

5.2. Trading and Retirement

Central registries are not markets. They merely act as a central registry for carbon credits.

However, market agents and project proponents have access to central registries and they use these platforms to trade carbon credits. Carbon credits can be traded indefinitely in the registries and they do not expire. Most trading of carbon credits takes place through over-the-counter transactions.

At any time, carbon credits can be retired/cancelled. This happens when an agent uses carbon credits to substantiate its claims for reporting and disclosure purposes (whether in the voluntary or regulated market).

5.3. Commercial Platforms

Given the expansion and proliferation of carbon market initiatives, there are some platforms that intend to act as carbon credit markets, based on different strategies.

These platforms, like CBL Markets, while still in their infancy, may grow in volume and demand, providing a new avenue for project developers to trade their carbon credits.

06

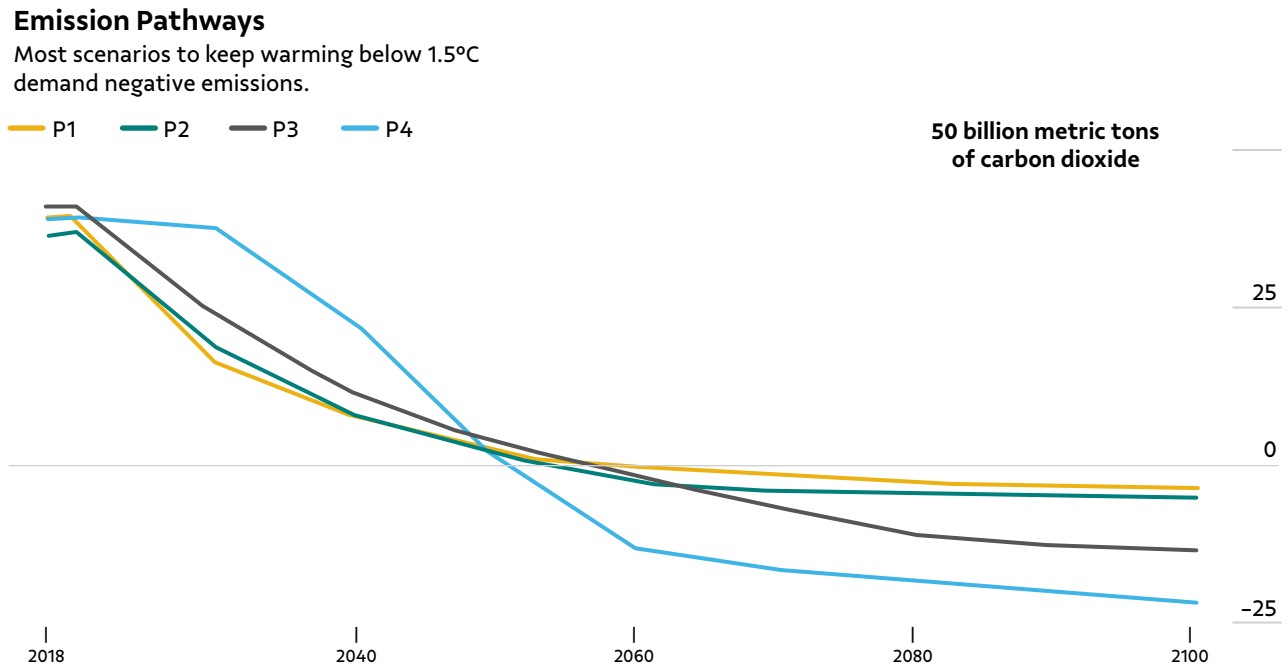
Carbon Market Analysis

This section of the report provides an overview and simplified analysis of regulated and voluntary carbon markets. Carbon markets have developed significantly since the Kyoto Protocol Era. As issues related to climate change become more evident and integrated, commitments are being made not only by state agents, but also voluntarily by private entities.

From a systemic and broad view, market developments can be organized into three phases:

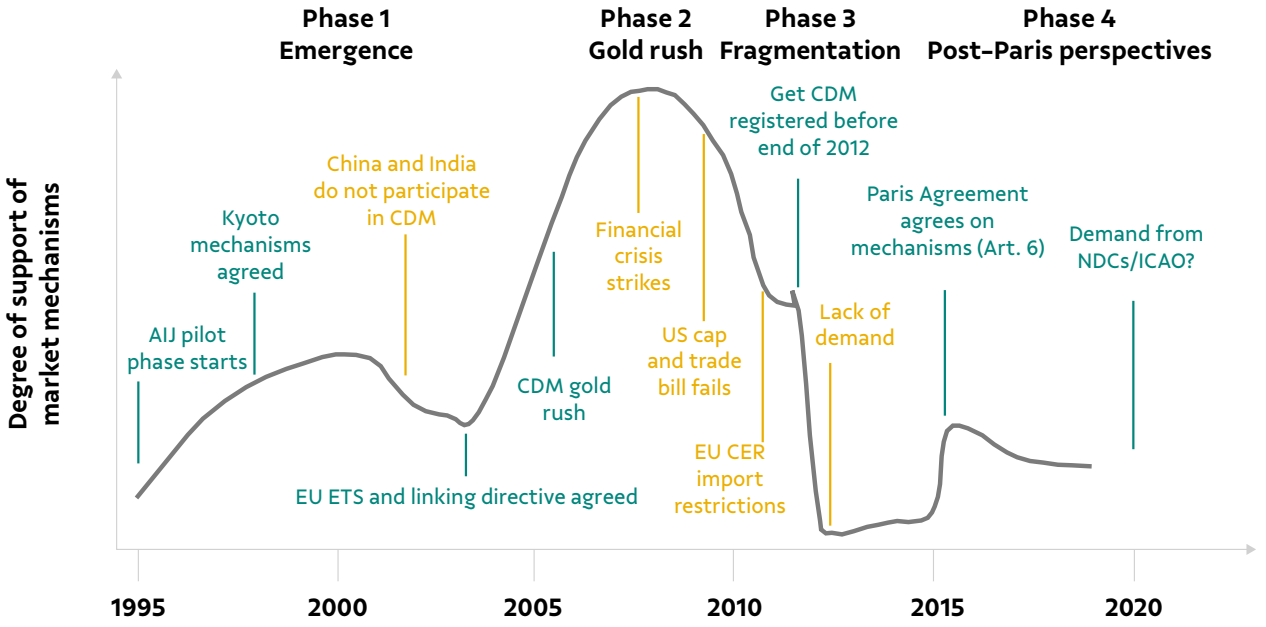
- **Kyoto Era:** Involving top-down regulations and steady improvements in terms of emission reductions, the Kyoto Era focused on energy efficiency, renewable energy, industrial processes, waste and other types of projects. In the Kyoto Era, national compliance schemes such as the European Union's ETS were established.
- **Paris Era:** Based on the commitments and promises made by each country, the Paris Era had bottom-up regulations, supported by a renewed catalytic process and greater ambition on the part of the countries. The Paris Agreement called on the private sector to act and, since its adoption in 2015, many non-state initiatives have been developed, such as the Science-Based Targets Initiative, We Mean Business and RE100.
- **Net Zero Era:** In the wake of the 2018 IPCC report, which established the need to achieve net zero or even negative GHG emissions and based on what was established in the Paris Agreement, voluntary corporate climate action pledges emerged. There has been a growing shift in perception toward carbon credits and their technologies, in which carbon projects with strong community elements and social impacts are of increasing value compared to Kyoto Era carbon projects. There is a growing trend toward carbon removal projects focusing on Nature-Based Solutions and Agriculture, Forestry and Other Land Uses (AFOLU) projects, while certain types of renewable energy projects are being gradually phased out.

Figure 5. IPCC Report (2018) – Pathway to Emission Reductions[10]



[10] Source: Bloomberg Green

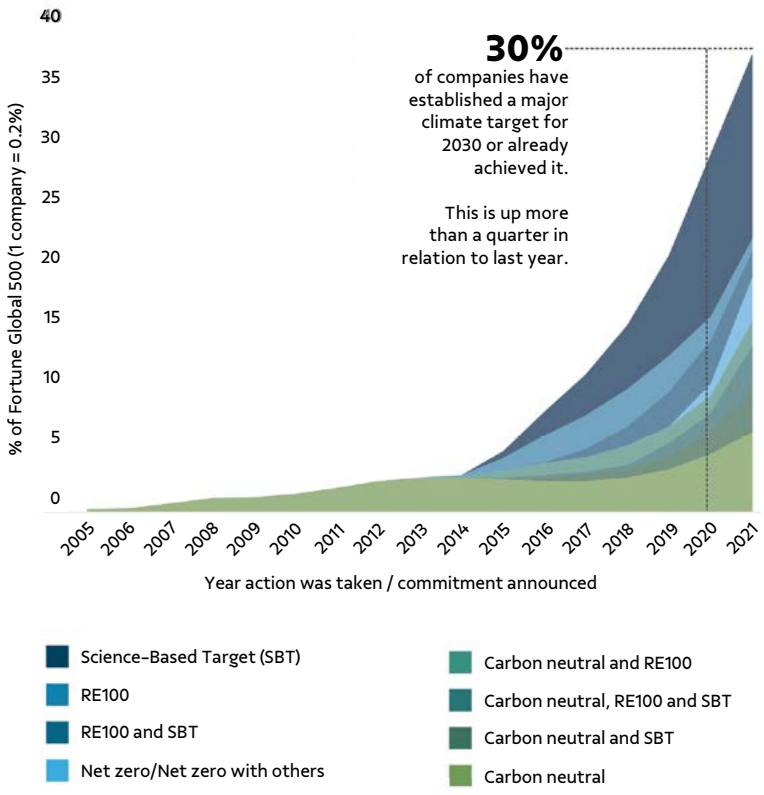
Figure 6. Development and Evolution of International Carbon Market[11]



It is critical to understand that while under regulated regimes carbon credits are seen as a compliance cost, the reality in voluntary markets is that offsets are a communication and engagement tool. This is one of the factors that explain why projects with strong community elements have been favored in the market.

In addition, due to initiatives such as the SBTi, which foster private commitments in line with the Paris Agreement and the latest scientific information, private entities have focused on net-zero promises that provide for some limitation on the use of offsets.

Figure 7. Climate Commitments of Fortune Global 500 Companies[12]

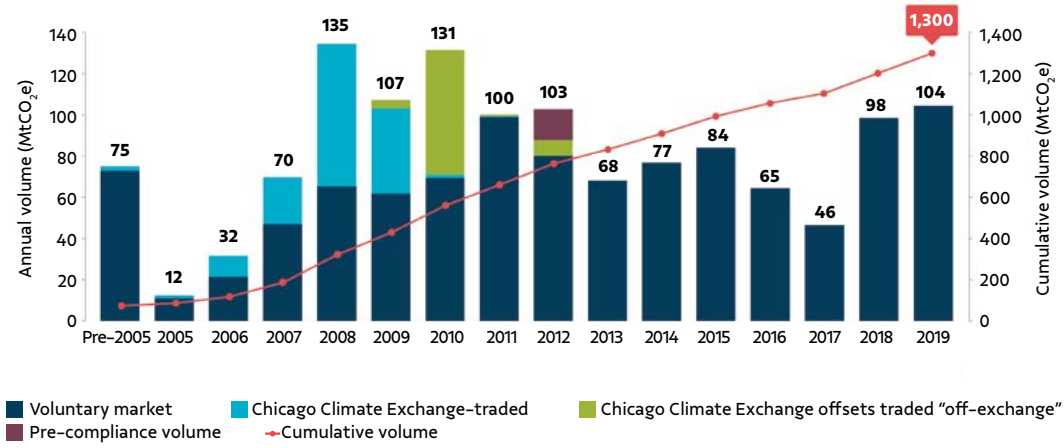


[11] Source: Michelowa, Axel; Shishlov, Igor; Brescia, Dario. Evolution of International Carbon Markets: Lessons for the Paris Agreement. In: WIREs Climate Change, 10, 2019, and 613, DOI: 10.1002/wcc.613

[12] Source: Natural Capital Partners

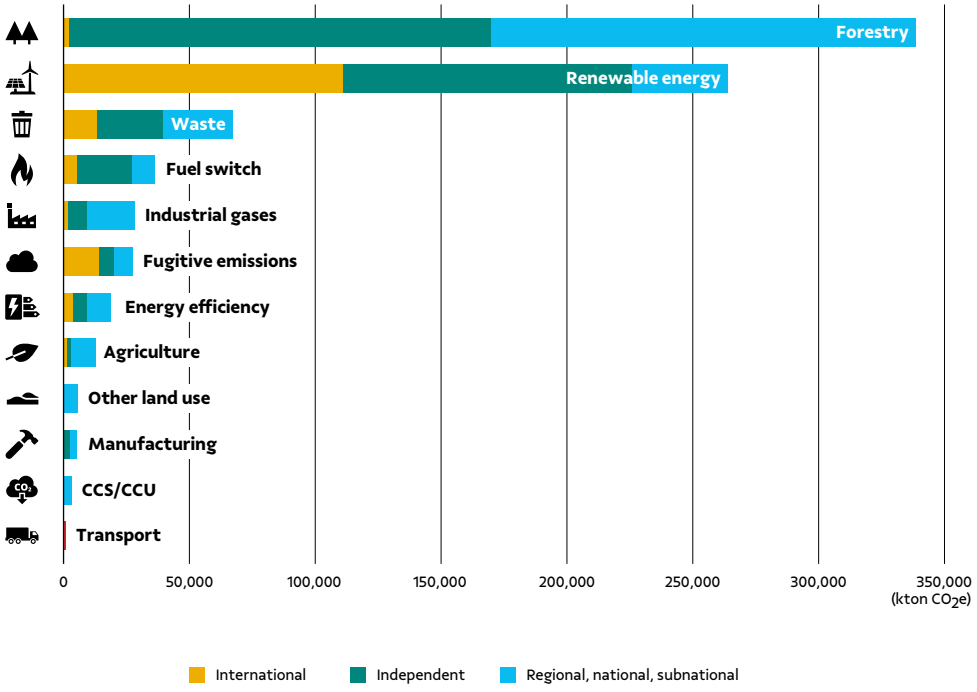
Private commitments are reflected in the growth of the voluntary market since 2017.

Figure 8. Historical Voluntary Offset Transaction Volumes (2019)[13]



It can be seen that Verra forestry projects have dominated the issuance of credits since 2015. The high share of renewable energy credits from international standards belongs to Kyoto Era CDM projects that are still able to issue carbon credits and have generated a surplus in the market with low-priced credits.

Figure 9. Issuance Volumes in kton CO2e by Sector and Type of Mechanism (2015 to 2019)[14]



[13] Source: Ecosystem Marketplace, State of the Voluntary Carbon Markets 2021
[14] Source: World Bank, State and Trends of Carbon Pricing 2020

6.1. Guiding Criteria for Demand in the Voluntary Market

Based on market practice, the decisive criteria determining the profile of demand in the voluntary market can be structured in terms of the elements indicated below (not listed in order of relevance):

- **Carbon standard:** Standards that are well known and widespread in the market have greater market acceptance. Currently, the VCS and Gold Standard are the main internationally accepted standards.

  The CDM was relatively well accepted in the market, but certain actors faced restrictions as the CDM platform operated with a different logic and criteria than other voluntary standards. In addition, there is uncertainty about the future of this mechanism, given the end of its official mandate and the decisions about this issue at COP26, held in November 2021 in Glasgow. After COP26, the process of launching a new mechanism began but there has not yet been any real progress.

  Other carbon standards continue to be developed and implemented, including the Global Carbon Council (GCC), which uses the same methodologies as the CDM and is based in Qatar. This standard was recently accredited by CORSIA. CERCARBONO is also worth mentioning. It was initially designed to serve the Colombian regulated market, but following recent revisions, it is expected that it will change its position and target international voluntary markets. Accordingly, accreditation of this standard by CORSIA was recently requested.

  It is also worth mentioning that the VCS and Gold Standard are reviewing their regulations and codes to incorporate elements aimed at alignment with the Paris Agreement. The details are not yet known, but it is expected that certain carbon credits registered with the VCS and/or Gold Standard require aspects involving corresponding adjustments and prevention of double counting/issuance to be addressed.

- **Project technology:** There is a clear preference for projects involving nature-based solutions (such as forestry, land use and blue carbon projects [15]) and those with strong community engagement and positive social and environmental impacts. These projects have been commercialized more than projects using other technologies.

  However, growth in the voluntary market has led to greater demand for other technologies such as landfill methane capture, small-scale hydroelectric and wind farms connected to the electricity grid. On the other hand, certain other technologies/methodologies are experiencing quite limited demand in the voluntary market. They include large-scale hydroelectric projects, capture of industrial gases (N2O, HFC) and capture of gases associated with oil extraction.

- **Location:** There is no uniform preference regarding project location. Different buyers have different expectations about this factor. However, some buyers have expressed certain restrictions regarding carbon credits originating in specific locations. In general, Brazil is not included on these blacklists. Possible location-related constraints in each standard should be checked when a project is started.

- **Volume:** The volume of demand, although not an exclusionary criterion, influences the final price of carbon credits. Smaller commercialized volumes tend to be priced at a premium.

- **Vintage:** The year when emission reduction/removal took place is also a factor that influences purchase decisions in the voluntary market. The market tends to price newer vintages at higher prices while older vintages tend to have price discounts. It is common practice for voluntary buyers to set a vintage limit for providing credits.

- **Additional certifications:** Certain carbon standards have additional certifications to increase the integrity and quantification

[15] Blue carbon projects are those that conserve, restore or promote the sustainable use of marine and coastal ecosystems.

of positive project impacts. For example, Verra, which administers the Verified Carbon Standard (VCS), also offers Climate, Community and Biodiversity (CCB) certification as a means of ensuring that its projects have a net positive impact in other dimensions, such as community and biodiversity.

It is customary among institutional voluntary buyers to demand that forestry projects registered with the VCS also have CCB certification. Projects that do not have this certification are sold at a discount.

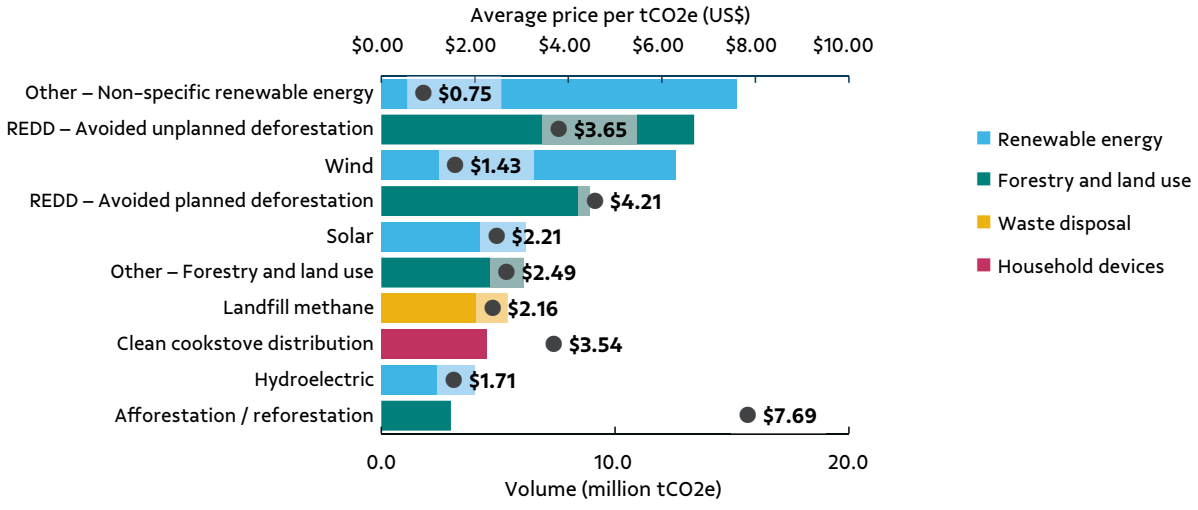
- **UN Sustainable Development Goals:** Since 2015, when the Paris Agreement was reached and the 2030 Agenda for Sustainable Development was launched, carbon projects have also been evaluated based on their potential benefits for sustainable development. Market practice today is to demand that projects have a report quantifying their impacts and relating them to the 17 United Nations Sustainable Development Goals.

Accordingly, the CDM, VCS and Gold Standard have specific SDG reporting forms and standards. This may be mandatory (as in the case of the Gold Standard) or voluntary (in the case of the CDM and VCS).

6.2. Granularity in Carbon Credit Pricing

The figure below shows the 2020 volume and price levels of credits traded on the voluntary market, showing that "Other – Unspecified Renewable Energy" (such as hydroelectric plants), "REDD – Avoiding Unplanned Deforestation" (forest conservation projects) and wind power projects dominate the market. In this regard, it is relevant to note that price levels between such technologies vary significantly. While afforestation and reforestation projects have higher prices, their total volume is lower. On the other hand, large hydroelectric projects have lower prices and significant traded volumes.

Figure 10. Top 10 Project Types by Voluntary Credit Volume (2019)[16]



[16] Source: Ecosystem Marketplace, State of the Voluntary Carbon Markets 2021

Overall, considering the VCS, GS and CAR, forestry and agriculture projects (including REDD+ and forestry) are still the sector with the largest surplus, followed by wind projects and then "waste – energy generation" technologies.

Figure 11. Surplus Credits by Project Type (tCO2e)[17]

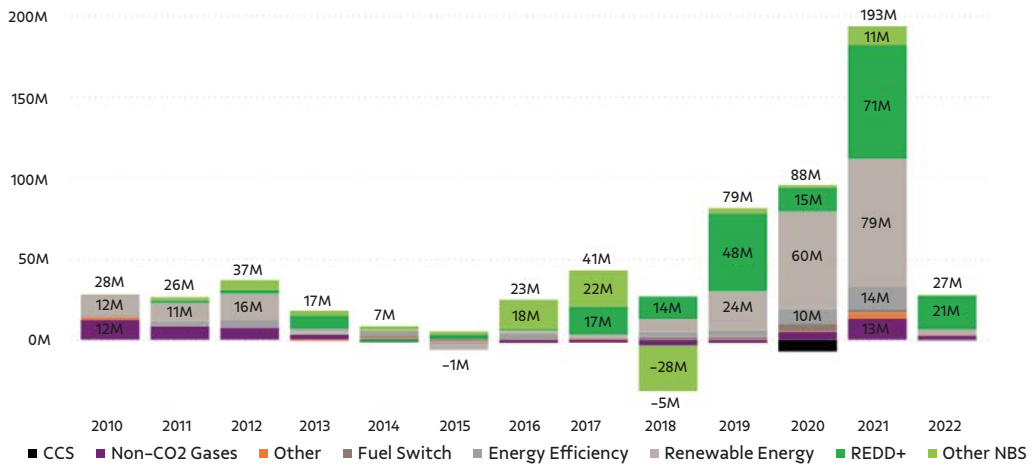
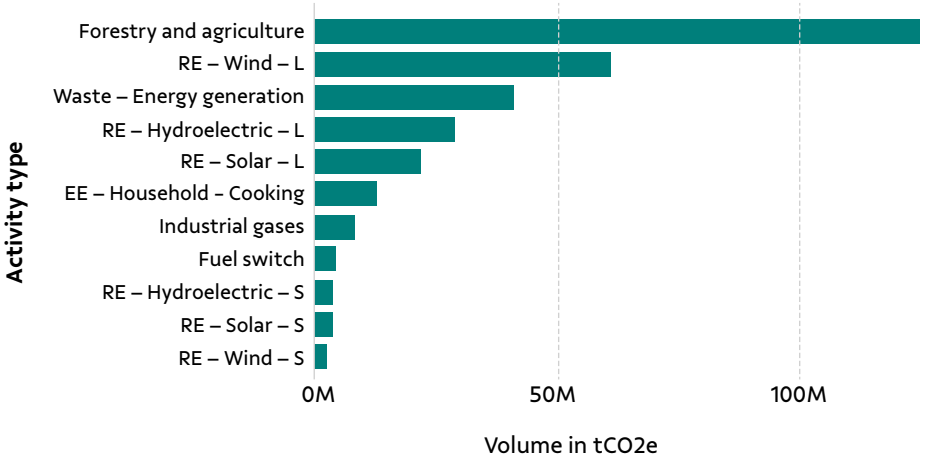


Figure 12. Historical Credit Inventory by Technology in VCS, GS and CAR[18]



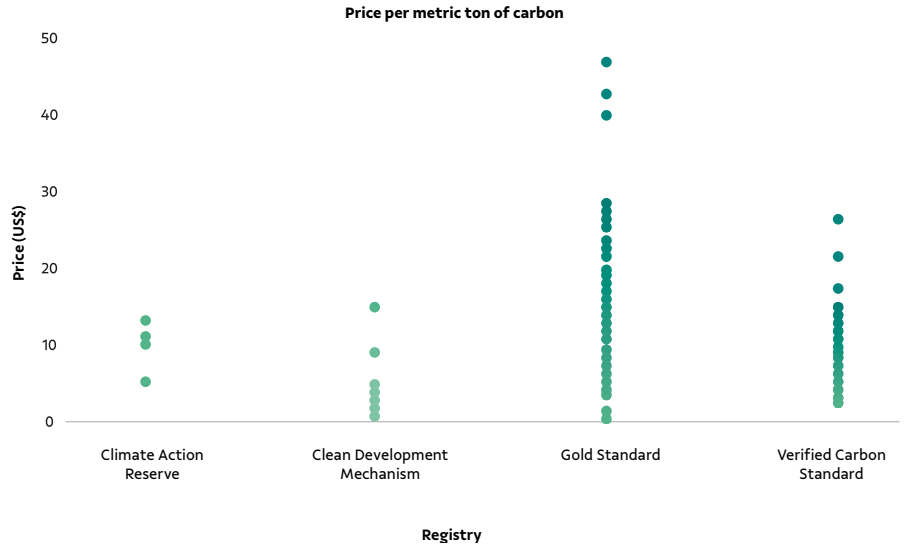
6.3. Price Indicators

Based on what has already been discussed and demonstrated in the context of carbon credit markets by technology and location, it is evident that carbon markets have significant levels of granularity and major differences. This is also reflected in the price paid for a credit. That is, the same technology can have different prices according to location. Likewise, projects in the same location can have different prices according to their technology.

CDM credits tend to be cheaper than Gold Standard or VCS credits. However, even within the Gold Standard, it is observed that credits above US$30 are atypical. The following figure presents the different retail prices found in the main carbon markets.

[17] Source: Trove Research Database
[18] Source: Allied Offsets Database

Figure 13. Retail Carbon Prices Reported by Carbon Standards (2021)[19]



Another angle to assess market conditions concerns credit vintage, that is, the year in which the emissions reduction took place. This is relevant, since market agents tend to prefer to acquire more recent vintages, and this affects the price of older credits.

It can be observed that the market has a considerable surplus of CDM renewable energy projects in Southeast Asia (implying lower prices), there is growing demand for VCS forestry or agricultural projects, and REDD+ credits have lower prices than afforestation and reforestation projects. It is also worth noting that while forestry and renewable energy projects have scale and are capable of issuing significant volumes, other projects with strong community elements (which is the focus of the Gold Standard) have lower carbon potential but higher prices.

In this regard, it is also interesting to note that the appreciation of carbon credits has also created demand for old credits or ones that previously did not arouse the interest of voluntary buyers. These credits, priced below market levels, relate to renewable energy and industrial gas projects that have old vintages. Players are interested in buying these carbon credits basically to create a portfolio of credits, with both high-quality credits and lower-priced credits, so that the average price paid for carbon credits is reduced. For example, a buyer may purchase 100,000 forestry carbon credits for US$5.00 per ton and another 100,000 carbon credits from large-scale hydroelectric plants and old vintages for US$1.50 per ton, bringing the average acquisition price to US$3.25 per ton.

6.4. The Carbon Market and the Mining Sector

The mining sector is related to the carbon market as it is directly responsible for 5% to 7% of global GHG emissions. According to the Second Mining Sector Greenhouse Gas Inventory, produced by the Brazilian Mining Institute (IBRAM), referring to the year 2011 and considering the sector's Scope 1 and Scope 2 emissions in Brazil, mining was responsible for the emission of 11.29 million tCO2e, 96.5% of which was Scope 1.

Despite its seemingly minor share of Brazilian and global emissions, the mining sector will be highly relevant to the transition to low-carbon technology. So-called "clean" technologies, including wind power, batteries and solar energy, use large amounts of minerals such as copper, lithium, cobalt and graphite. According

[19] Source: Allied Offsets Database

to the World Bank,[20] demand for lithium and cobalt is expected to grow by 965% and 585%, respectively, by 2050. This means that the mining sector's production model needs to be increasingly sustainable and rigorous.

In addition to growing quantitative demand, the mining sector will also gradually experience greater demand for high-quality ores of sustainable origin. This is because the main technology companies that buy minerals will start to demand that the ores they need for their products are carbon neutral. Apple is already insisting on carbon-neutral aluminum,[21] which led Alcoa Corporation and Rio Tinto Aluminum to develop a technology that does not emit GHGs in their production processes.

The mining sector, as it is exposed to many different production chains, is directly responsible for and affected by commitments such as that made by Apple, which has pledged to become carbon neutral throughout its chain by 2030.

The sector therefore has two possible paths to comply with this trend: reduction and compensation. The first could be funded by a financing strategy through carbon pricing, while the second depends on the operation of a carbon market, regulated or otherwise.

Reducing emissions in the mining sector, especially in Brazil, which already has very clean power supplies, is a major challenge, requiring the adoption of new technologies and heavy capital investment. One of the ways to finance this transition, therefore, would be the sale of the credits generated by this activity. However, it is important to remember that credits from industrial and energy processes have gone down in price and they may not be sufficient to finance the new production model.

The potential for decarbonization in the mining sector varies according to the production context of the country or ore in question. In 2012, Brazil's Mining and Energy Ministry launched the Low-Carbon Mining Sector Plan, based on the inventory prepared by IBRAM.

This plan lists three main decarbonization areas for the sector: changing energy sources used in processes; increasing the energy efficiency of mining assets by changing equipment or parts; and adopting new technologies in mining, altering mine designs and using more up-to-date equipment.

As for the offsetting of emissions, many large mining companies in Brazil and across the world have announced "net zero" commitments. This invariably requires the support of an auditable offset mechanism, internationally recognized and stable enough to guarantee the longevity of offsets. For this reason, IBRAM, the main representative of the industry in Brazil, advocates the creation of a regulated carbon market in the country under the cap-and-trade model, alongside the adoption of regulatory frameworks that promote the carbon neutral agenda in the sector, through both payments for environmental services and a voluntary carbon market, integrated into the proposed regulated market.

It is therefore clear that the mining sector will have a prominent role in the sustainable technological transition and it will come under increasing pressure to make its operations more sustainable. Regulated or voluntary carbon markets may fund the new activities that will be adopted, but it is important to recognize the difficulty in drastically reducing emissions in the sector. Thus, compensation through purchases of carbon credits will be a short and medium-term strategy to meet exponential demand for "net-zero" solutions and products from purchasing companies and also to meet internal commitments made by companies such as Vale. Therefore, the voluntary carbon market, governed by the international standards described in this report, and currently the only active carbon market in Brazil for this sector, represents the fastest way to start this transition.

[20] Source: https://www.worldbank.org/en/news/infographic/2019/02/26/climate-smart-mining
[21] Source: https://www.apple.com/pt/newsroom/2018/05/apple--paves-the-way-for-breakthrough-carbon-free-aluminum--smelting-method/

07

Final Considerations

In this report, various aspects related to carbon markets have been addressed. Carbon markets have seen a resurgence since the Paris Agreement and there is a constant and evolving trend to accommodate and support compliance and voluntary initiatives aimed at setting targets to achieve the Paris Agreement objectives.

Carbon standards are evolving with the market. As eligibility criteria evolve, there is a transition from large renewable energy projects to nature-based solution projects involving strong community engagement and new technologies. It is expected that revenues from carbon credits will increasingly be directed toward projects on the technological frontier that are in line with the net-zero vision championed by voluntary initiatives, in alignment with the Paris Agreement.

The Paris Agreement itself, after the conclusion of Article 6 discussions, will also shape behavior in carbon markets of a compliance or voluntary nature insofar as it will impose a new reality of "corresponding adjustments." It is not entirely clear how this will affect carbon markets as the rulebook is not yet completed. However, it is noted that the main voluntary carbon standards are already conducting public consultations to align their programs with this new reality.

Likewise, it is also expected that new methodologies for carbon projects will emerge to address new sectors and technologies, such as blue carbon, direct carbon capture and storage techniques, and land use. The overall stock of carbon credits and projects is based on technologies such as grid-connected renewable energy that are not in line with the net-zero and "Paris Era" vision. Thus, strong and growing demand for new carbon project technologies can be expected.

Opportunities in carbon markets are growing along with the work of market agents and compensation strategies, demonstrating the sector's maturity and its important role in supporting society's transition to a low-carbon economy. From the perspective of supply, there are new opportunities emerging through which carbon credits can provide new sources of financing for new projects. Meanwhile, on the demand side, there is increasing pressure and demand for high-quality carbon credits.

Opportunities in carbon markets are growing along with the work of market agents and compensation strategies, demonstrating the sector's maturity and its important role in supporting society's transition to a low-carbon economy.

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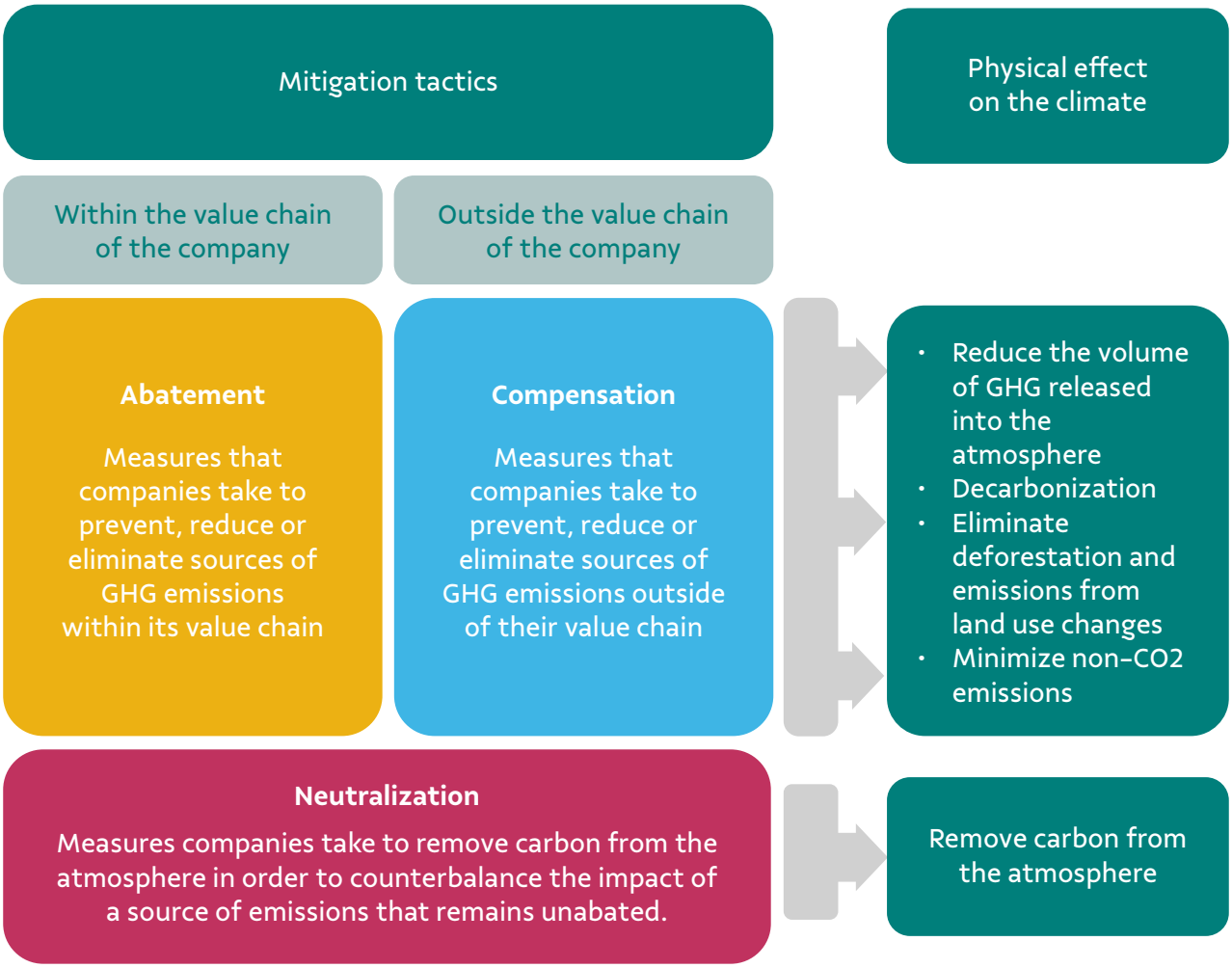
Appendices

APPENDIX 1 – THE SBTI NET-ZERO VISION[22]



[22] Source: Science-Based Targets Initiative

APPENDIX 2 – VERRA METHODOLOGIES

METHODOLOGIES APPROVED BY VERRA AND APPLICABLE SECTOR SCOPE AS OF MARCH 2021	Energy	Industrial Processes	Construction	Transport	Waste	Mining	Agriculture	Forests	Grasslands	Mangroves	Livestock & Manure
VM0001 Infrared Automatic Refrigerant Leak Detection Efficiency Project Methodology, v1.1		■									
VM0002 New Cogeneration Facilities Supplying Less Carbon Intensive Electricity to Grid and/or Hot Water to One or More Grid Customers, v1.0	■	■	■								
VM0003 Methodology for Improved Forest Management through Extension of Rotation Age, v1.2								■			
VM0004 Methodology for Conservation Projects that Avoid Planned Land Use Conversion in Peat Swamp Forests, v1.0								■		■	
VM0005 Methodology for Conversion of Low-productive Forest to High-productive Forest, v1.2								■			
VM0006 Methodology for Carbon Accounting for Mosaic and Landscape-scale REDD Projects, v2.2								■			
VM0007 REDD+ Methodology Framework (REDD-MF), v1.6								■		■	
VM0008 Weatherization of Single Family and Multi-Family Buildings, v1.1	■		■								
VM0009 Methodology for Avoided Ecosystem Conversion, v3.0								■	■		
VM0010 Methodology for Improved Forest Management: Conversion from Logged to Protected Forest, v1.3								■			
VM0011 Methodology for Calculating GHG Benefits from Preventing Planned Degradation, v1.0								■			
VM0012 Improved Forest Management in Temperate and Boreal Forests (LtPF), v1.2								■			
VM0013 Calculating Emission Reductions from Jet Engine Washing, v1.0	■										
VM0014 Interception and Destruction of Fugitive Methane from Coal Bed Methane (CBM) Seeps, v1.0		■									
VM0015 Methodology for Avoided Unplanned Deforestation, v1.1								■			
VM0016 Recovery and Destruction of Ozone-Depleting Substances (ODS) from Products, v1.1		■									

METHODOLOGIES APPROVED BY VERRA AND APPLICABLE SECTOR SCOPE AS OF MARCH 2021	Energy	Industrial Processes	Construction	Transport	Waste	Mining	Agriculture	Forests	Grasslands	Mangroves	Livestock & Manure
VM0017 Adoption of Sustainable Agricultural Land Management, v1.0							■				
VM0018 Energy Efficiency and Solid Waste Diversion Activities within a Sustainable Community, v1.0	■				■						
VM0019 Fuel Switch from Gasoline to Ethanol in Flex-Fuel Vehicle Fleets, v1.0	■			■							
VM0020 Transport Energy Efficiency from Lightweight Pallets, v1.0	■			■							
VM0021 Soil Carbon Quantification Methodology, v1.0							■		■		
VM0022 Quantifying N2O Emissions Reductions in Agricultural Crops through Nitrogen Fertilizer Rate Reduction, v1.1							■				
VM0023 Reduction of GHG Emissions in Propylene Oxide Production, v1.0		■									
VM0024 Methodology for Coastal Wetland Creation, v1.0										■	
VM0025 Campus Clean Energy and Energy Efficiency	■										
VM0026 Methodology for Sustainable Grassland Management (SGM)							■		■		■
VM0027 Methodology for Rewetting Drained Tropical Peatlands, v1.0										■	
VM0028 Methodology for Carpooling				■							
VM0029 Methodology for Avoided Forest Degradation through Fire Management, v1.0								■			
VM0030 Methodology for Pavement Application using Sulphur Substitute, v1.0		■		■							
VM0031 Methodology for Precast Concrete Production using Sulphur Substitute, v1.0		■	■								
VM0032 Methodology for the Adoption of Sustainable Grasslands through Adjustment of Fire and Grazing							■		■		■
VM0033 Methodology for Tidal Wetland and Seagrass Restoration, v1.0										■	
VM0034 British Columbia Forest Carbon Offset Methodology, v1.0								■			
VM0035 Methodology for Improved Forest Management through Reduced Impact Logging v1.0								■			
VM0036 Methodology for Rewetting Drained Temperate Peatlands, v1.0										■	

METHODOLOGIES APPROVED BY VERRA AND APPLICABLE SECTOR SCOPE AS OF MARCH 2021	Energy	Industrial Processes	Construction	Transport	Waste	Mining	Agriculture	Forests	Grasslands	Mangroves	Livestock & Manure
VM0037 Methodology for Implementation of REDD+ Activities in Landscapes Affected by Mosaic Deforestation and Degradation, v1.0								■			
VM0038 Methodology for Electric Vehicle Charging Systems, v1.0	■			■							
VM0039 Methodology for Use of Foam Stabilized Base and Emulsion Asphalt Mixtures in Pavement Application, v1.0			■								
VM0040 Methodology for Greenhouse Gas Capture and Utilization in Plastic Materials, v1.0	■	■									
VM0041 Methodology for the Reduction of Enteric Methane Emissions from Ruminants through the Use of 100% Natural Feed Supplement, v1.0											■
VM0042 Methodology for Improved Agricultural Land Management, v1.0							■				
VM0043 Methodology for CO2 Utilization in Concrete Production		■									
VM0044 Methodology for Biochar Utilization in Soil and Non-Soil Applications, v1.0							■				
VMR0001 Revisions to ACM0008 to Include Pre-drainage of Methane from an Active Open Cast Mine as a Methane Emission Reduction Activity, v1.0						■					
VMR0002 Revisions to ACM0008 to Include Methane Capture and Destruction from Abandoned Coal Mines, v1.0						■					
VMR0003 Revisions to AMS-III.Y to Include Use of Organic Bedding Material, v1.0					■						■
VMR0004 Revisions to AMS-III.BC to Include Mobile Machinery, v1.0	■			■							
VMR0005 Methodology for Installation of Low-Flow Water Devices, v1.0	■										
VMR0006 Methodology for Installation of High Efficiency Firewood Cookstoves	■										

APPENDIX 3 – GOLD STANDARD METHODOLOGIES

Methodologies Approved under the CDM	
UNFCCC CLEAN DEVELOPMENT MECHANISM METHODOLOGY – GOLD STANDARD ELIGIBILITY	This document describes the Impact Quantification Methodology Approval Process under the Gold Standard for the Global Goals (GS4GG).
Agriculture, Forests and Land Use	
Soil Organic Carbon Methodology	
SOIL ORGANIC CARBON FRAMEWORK METHODOLOGY	This methodology presents requirements to quantify changes in greenhouse gas (GHG) emissions and soil organic carbon (SOC) stocks through the adoption of agricultural best practices. Such activities can prevent emissions as well as soil carbon sequestration, both of which result in increased SOC content.
SOC ACTIVITY MODULES APPROVAL PROCEDURE	Provides guidance for the development and approval procedure for Activity Modules under the Soil Organic Carbon (SOC) Framework Methodology.
SOIL ORGANIC CARBON ACTIVITY MODULE: INCREASING SOIL CARBON THROUGH IMPROVED TILLAGE PRACTICES	This Soil Organic Carbon (SOC) Activity Module presents the requirements and guidance for quantifying greenhouse gas (GHG) emissions from agriculture by changing soil tillage practices within agricultural systems. This SOC Activity Module is based on and replaces the Gold Standard Agriculture Methodology for Increasing Soil Carbon Through Improved Tillage Practices V0.9.
Afforestation/Reforestation	
AFFORESTATION/REFORESTATION GHG EMISSIONS REDUCTION & SEQUESTRATION METHODOLOGY	Methodology for projects that seek to quantify the reduction and sequestration of GHG emissions from afforestation/reforestation activities. Used in conjunction with GHG Emissions Reduction & Sequestration Product Requirements projects, carbon credits may be issued.
SUPPORT FOR AFFORESTATION/REFORESTATION GHG EMISSIONS REDUCTION & SEQUESTRATION METHODOLOGY	Includes the set of models needed to help calculate the GHG sequestration of Afforestation/Reforestation projects.
Agriculture	
REQUIREMENTS TO APPLY CDM METHODOLOGY "AMS – III AU" FOR GOLD STANDARD CERTIFICATION	The Gold Standard-approved requirements to apply the CDM AMS-III.AU "Methane emission reduction by adjusted water management practice in rice cultivation" methodology to Gold Standard Certification.
Livestock Farming	
REDUCING METHANE EMISSIONS FROM ENTERIC FERMENTATION IN DAIRY COWS THROUGH APPLICATION OF FEED SUPPLEMENTS	This methodology quantifies the reduction in methane (CH4) emissions from enteric fermentation for dairy cows, as well as the impacts on emissions from manure management. The methodology focuses on the application of dietary supplements to directly inhibit methanogenesis.
GOLD STANDARD AGRICULTURE SMALLHOLDER DAIRY METHODOLOGY	Methodology to quantify GHG Emission Reductions from better management in smallholder dairy production systems. Used in conjunction with GHG Emissions Reduction & Sequestration Product Requirements, carbon credits may be issued.

Water Impacts	
WATER AND EROSION IMPACT ASSESSMENT OF SUSTAINABLE AGRICULTURAL LAND MANAGEMENT PROJECTS	Soil erosion is a major contributor to soil degradation. Agricultural lands with declining soil organic matter face reductions in soil water infiltration capacity, leading to increased surface runoff and increased topsoil erosion. This methodology quantifies the water benefits created by adopting sustainable agricultural land management (SALM) practices that mitigate soil erosion.
Energy Efficiency	
Cookstoves	
GOLD STANDARD TECHNOLOGIES AND PRACTICES TO DISPLACE DECENTRALIZED THERMAL ENERGY CONSUMPTION	Methodology for projects that seek to quantify GHG Emission Reductions from projects that displace decentralized thermal energy technologies. Used in conjunction with GHG Emissions Reduction & Sequestration Product Requirements, carbon credits may be issued.
COOKSTOVE USAGE RATE GUIDELINES	This document sets out requirements and guidelines for conducting usage surveys for improved cookware implementation projects. It is an annex to various methodologies related to sustainable cooking.
THE GOLD STANDARD SIMPLIFIED METHODOLOGY FOR EFFICIENT COOKSTOVES	Methodology to quantify GHG Emission Reductions from microscale stove projects. Used in conjunction with GHG Emissions Reduction & Sequestration Product Requirements, carbon credits may be issued.
PROGRAMME, BASELINE AND MONITORING METHODOLOGY FOR THE INTRODUCTION OF AN ALTERNATIVE IGNITION TECHNIQUE AS MEASURE TO IMPROVE THE ENERGY EFFICIENCY OF DOMESTIC COAL FIRES	Methodology to quantify GHG Emission Reductions from microscale stove projects. Used in conjunction with GHG Emissions Reduction & Sequestration Product Requirements, carbon credits may be issued.
THERMAL ENERGY FROM PLANT OIL FOR THE USER OF COOKING STOVES	Methodology for projects that seek to quantify GHG Emission Reductions from the replacement of fossil fuel stoves with vegetable oil stoves. Used in conjunction with GHG Emissions Reduction & Sequestration Product Requirements, carbon credits may be issued.
METHODOLOGY TO ESTIMATE AND VERIFY ADALYS FROM CLEANER HOUSEHOLD AIR	Methodology to estimate and verify "Averted Mortality and Disability Adjusted Life Years" (ADALYs), based on projects to make domestic air cleaner.
SUPPORT DOCUMENTS AND TOOL FOR METHODOLOGY TO ESTIMATE AND VERIFY ADALYS FROM CLEANER HOUSEHOLD AIR	This technical reference manual is intended to assist project developers and practitioners in applying the Gold Standard Methodology for Estimating and Verifying Cleaner Home Air ADALYs. While specific requirements and guidelines are set forth in the ADALYs methodology, this document serves as a complementary guide to support the successful implementation of the methodology. The manual also provides information on global and regional organizations and testing centers that have the experience and ability to monitor personal exposure – a mandatory requirement for the ADALYs methodology.
GOLD STANDARD QUANTIFICATION OF CLIMATE RELATED EMISSION REDUCTIONS OF BLACK CARBON AND CO-EMITTED SPECIES DUE TO THE REPLACEMENT OF LESS EFFICIENT COOKSTOVES WITH IMPROVED EFFICIENCY COOKSTOVES	Methodology for projects that seek to quantify Short-Lived Climate Pollutants (SLCPs), such as Black Carbon, from improved kitchen projects.

Households	
INDICATIVE PROGRAM, BASELINE AND MONITORING METHODOLOGY FOR THE LARGE SCALE SUPPLY & DISTRIBUTION OF EFFICIENT LIGHT BULBS, SHOWER HEADS AND OTHER WATER SAVING DEVICES TO HOUSEHOLDS	Methodology for projects that seek to quantify GHG Emissions Reductions from improved home device designs (such as energy efficient light bulbs). Used in conjunction with GHG Emissions Reduction & Sequestration Product Requirements, carbon credits may be issued.
GOLD STANDARD METHODOLOGY FOR THERMAL PERFORMANCE IMPROVEMENTS IN LOW-INCOME DWELLING STRUCTURES	Methodology for projects that seek to quantify GHG Emission Reductions from thermal improvements in buildings. Used in conjunction with GHG Emissions Reduction & Sequestration Product Requirements, carbon credits may be issued.
Fuel Switch	
ECOLOGICALLY SOUND FUEL SWITCH TO BIOMASS WITH REDUCED ENERGY REQUIREMENT	Methodology for projects that seek to quantify GHG Emission Reductions from fuel substitution by biomass. Used in conjunction with GHG Emissions Reduction & Sequestration Product Requirements, carbon credits may be issued.
FUEL SWITCH FROM FOSSIL FUELS TO BIOMASS RESIDUES IN BOILERS FOR HEAT GENERATION	Methodology for projects that seek to quantify GHG Emission Reductions from fuel substitution by biomass residues. Used in conjunction with GHG Emissions Reduction & Sequestration Product Requirements, carbon credits may be issued.
Renewable Energies	
METHODOLOGY FOR BIODIESEL FROM WASTE OIL/ FAT FROM BIOGENIC ORIGIN FOR USE AS FUEL	Methodology for projects that seek to quantify GHG Emission Reductions from the use of biodiesel produced from waste. Used in conjunction with GHG Emissions Reduction & Sequestration Product Requirements, carbon credits may be issued.
SUPPRESSED DEMAND METHODOLOGY MICRO-SCALE ELECTRIFICATION AND ENERGIZATION	Methodology for projects that seek to quantify GHG Emission Reductions from small-scale energy and electrification projects. Used in conjunction with the GHG Emissions Reduction & Sequestration Product Requirements, carbon credits may be issued.
SUPPRESSED DEMAND SMALL-SCALE METHODOLOGY FOR LOW GHG FOOD PRESERVATION	Methodology for projects that seek to quantify the Reduction of GHG Emissions from small-scale food preservation activities. Used in conjunction with GHG Emissions Reduction & Sequestration Product Requirements, carbon credits may be issued.
SUPPRESSED DEMAND SMALL-SCALE METHODOLOGY FOR ENERGY USE FOR THE PROCESSING OF AGRICULTURAL PRODUCTS	Methodology for projects that seek to quantify GHG Emission Reductions from small-scale energy production for agricultural products. Used in conjunction with GHG Emissions Reduction & Sequestration Product Requirements, carbon credits may be issued.
Waste Management and Disposal	
GHG EMISSION REDUCTIONS FROM MANURE MANAGEMENT SYSTEMS AND MUNICIPAL SOLID WASTE	Methodology for projects that seek to quantify GHG Emission Reductions from manure management activities. Used in conjunction with GHG Emissions Reduction & Sequestration Product Requirements, carbon credits may be issued.

Energy Efficiency in Transport	
RETROFIT ENERGY EFFICIENCY MEASURES IN SHIPPING	Methodology to quantify Emission Reductions from energy efficiency measures in shipping. Used in conjunction with GHG Emissions Reduction & Sequestration Product Requirements, carbon credits may be issued.
REDUCING VESSEL EMISSIONS THROUGH THE USE OF ADVANCED HULL COATINGS	Methodology for projects that seek to quantify GHG Emission Reductions from the application of hull coating.
INSTALLATION OF FLOW IMPROVEMENT EQUIPMENT ON SHIPS	Methodology for projects that seek to quantify GHG Emission Reductions from the installation of flow improvement equipment on ships. Used in conjunction with GHG Emissions Reduction & Sequestration Product Requirements, carbon credits may be issued.
Water Benefits	
GOLD STANDARD METHODOLOGY FOR ACCREDITATION OF WATER BENEFIT CERTIFICATES	This methodology quantifies the impact of projects that provide access to clean and safe water, particularly in developing countries that use the Gold Standard Foundation's Water Benefit Standard.
SUSTAINABLE SUGARCANE INITIATIVE METHODOLOGY TO QUANTIFY WATER EFFICIENCY OUTCOMES FROM SEEDLING NURSERIES	This methodology is specific to an adaptation of a particular sugarcane planting method, which is part of a much broader package of practices known as the Sustainable Sugarcane Initiative (SSI).

APPENDIX 4 – Protocols Approved by Climate Action Reserve

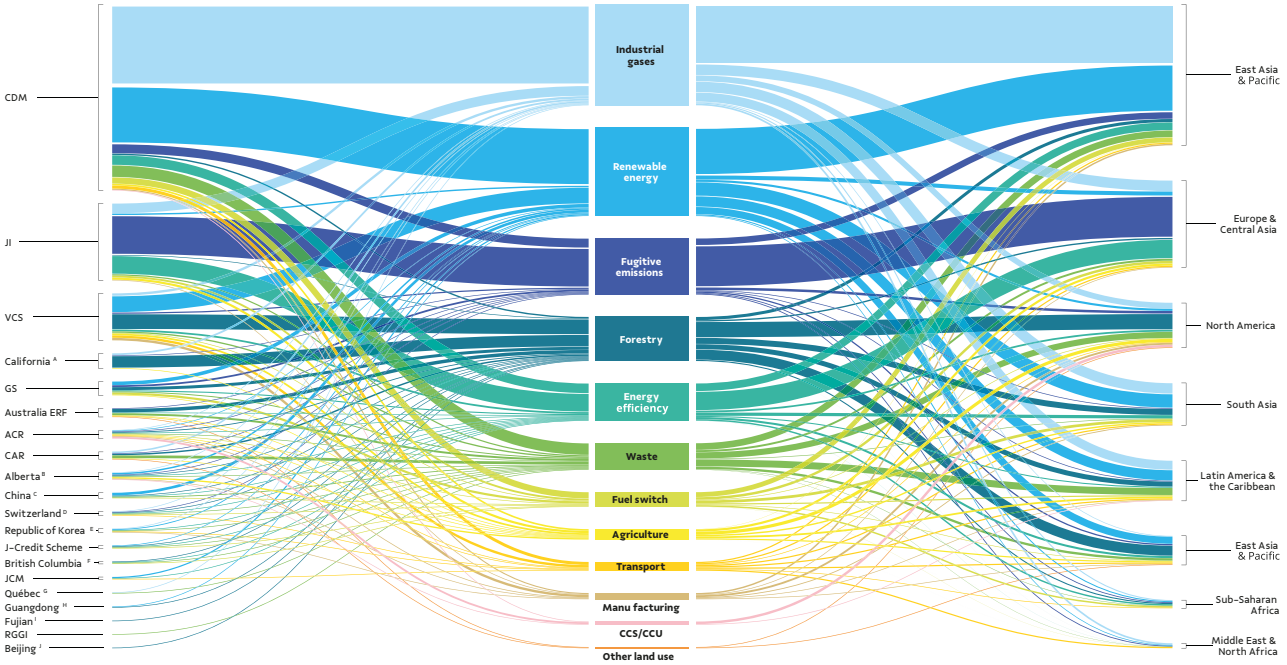
Protocol	Current Version	Date of Publication	Development Status
Adipic Acid Production	1.0	September 30, 2020	Approved
Canada Grassland	1.0	October 16, 2019	Approved
Coal Mine Methane	1.1	October 26, 2012	Approved
Forest	5.0	October 16, 2019	Approved
Grassland	2.1	February 13, 2020	Approved
Mexico Boiler Efficiency	1.0	November 1, 2016	Approved
Mexico Forest	2.0	March 30, 2020	Approved
Mexico Landfill	1.1	September 13, 2011	Approved
Mexico Livestock	2.0	September 29, 2010	Approved
Mexico Ozone Depleting Substances	1.0	April 28, 2015	Kicking off protocol revision on November 19, 2020
Nitric Acid Production	2.2	April 18, 2019	Approved
Nitrogen Management	2.0	October 17, 2018	Approved
Organic Waste Composting	1.1	July 29, 2013	Approved
Organic Waste Digestion	2.1	January 16, 2014	Approved
Ozone Depleting Substances	2.0	June 27, 2012	Approved
Rice Cultivation	1.1	June 3, 2013	Approved
Soil Enrichment	1.0	September 30, 2020	Approved
Urban Forest Management	1.1	April 18, 2019	Approved
Urban Tree Planting	2.0	June 25, 2014	Approved
U.S. Landfill	5.0	April 24, 2019	Approved
U.S. Livestock	4.0	January 23, 2013	Approved

APPENDIX 5 – VCS RESTRICTIONS PROGRAM

VCS Standard v.4 (2019) Program Activities Restrictions

Activity	Non-LDC		LDC	
	Large Scale	Small Scale	Large Scale	Small Scale
Activities that reduce emissions of hydrofluorocarbon-23 (HFC-23)	Excluded	Excluded	Excluded	Excluded
Grid-connected electricity generation through hydroelectric plants/units	Excluded	Excluded	Excluded	
Grid-connected electricity generation through wind, geothermal or solar power plants/units	Excluded	Excluded		
Use of recovered waste heat for, among other things, electricity generation and supply of heat for residential, commercial or industrial use	Excluded	Excluded		
Generation of electricity and/or thermal energy using biomass. This does not include efficiency improvements in thermal appliances (such as cooking stoves).	Excluded	Excluded		
Generation of electricity and/or thermal energy using fossil fuels, including activities that involve switching from a higher carbon fuel to a lower carbon fuel	Excluded	Excluded		
Replacement of electric lighting with more efficient lighting, such as replacing incandescent light bulbs with compact fluorescent or LED lights	Excluded			
Installation and/or replacement of electricity transmission lines and/or energy efficiency transformers	Excluded			

APPENDIX 6 – Flow of Carbon Credit Issuance by Technology, Standard and Location[23]



A California Compliance Offset Program
B Alberta Emission Offset
C China GHG Voluntary Emission Reduction Program
D Switzerland CO_2 Attestations Crediting Mechanism
E Republic of Korea Offset Credit Mechanism
F British Columbia Offset
G Québec Offset Crediting
H Guangdong Pu Hui Offset Crediting Mechanism
I Fujian Forestry Offset Crediting Mechanism
J Beijing Forestry Offset Mechanism

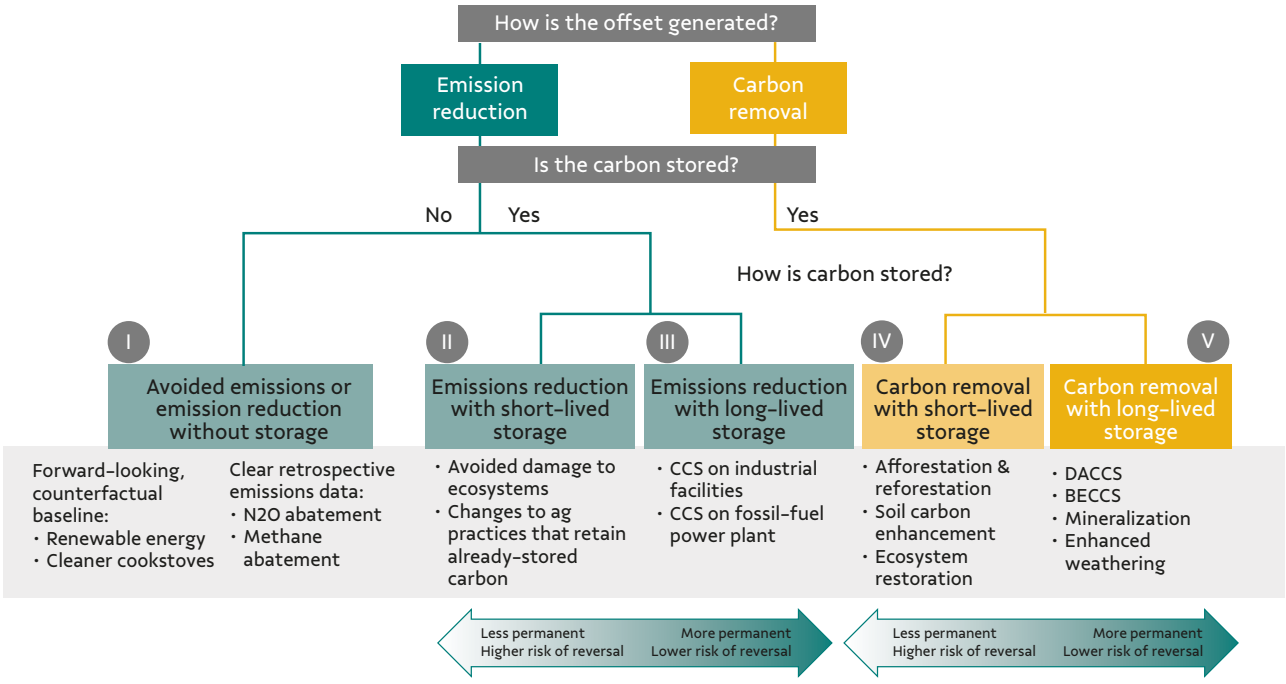
Note: To ensure consistency between the information presented from the different crediting mechanisms, the cut-off date for the data on the crediting mechanisms is December 31, 2019. Only the largest independent carbon crediting mechanisms which issue credits that can be used for compliance obligations have been considered in this report. The authors recognize that numerous other independent crediting mechanisms exist that generate credits sold on the voluntary carbon market. Credits generated under the Saitama crediting mechanism, the Saitama forest absorption certification system, the Switzerland CO2 attestation crediting mechanism and Tokyo offset mechanism are not shown due to data limitations.

[23] Source: World Bank, State and Trends of Carbon Pricing 2020

APPENDIX 7 – Carbon Credit Quality Criteria Matrix[24]

	Quality Objective	Criteria
1	Robust determination of mitigation activity's impact on GHG emissions	a. Additionality
		b. Vulnerability
		c. Robust quantification of emission reductions or removals
2	Avoid double counting of emission reductions or removals	a. Avoid double issuance
		b. Avoid double use
		c. Avoid double counting with international mitigation targets
		d. Avoid double counting with domestic mitigation targets or emission trading systems
3	Address non-permanence	a. Significance of non-permanence risks
		b. Robustness of approaches for addressing non-permanence risks
4	Facilitate transition to net-zero emissions	a. Enhancing the adoption of low, zero or negative emission technologies
		b. Demonstration of host country's commitment to global climate goals
5	Strong institutional arrangements and accreditation program processes	a. Overall program governance
		b. Robust third-party audit
		c. Transparency and stakeholder consultation
6	Improve positive impacts and avoid negative environmental and social impacts	a. Environmental and social impact assessment
		b. Contribution to improving adaptation and resilience
		c. Support for the poorest and most vulnerable people and those affected by climate change

APPENDIX 8 – Oxford Principles Taxonomy and Net-Zero Trajectory[25]



[24] Source: WWF, EDF, Öko-Institut, 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 (2020)
[25] Source: The Oxford Principles for Net Zero Aligned Carbon Offsetting (2020)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