

Accounting Choices and Financial Position in Brazilian Carbon Credit Markets

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Abstract

In Brazil, two systems carbon credits coexist: the voluntary market for carbon credits in general, and the regulated market specifically for the fuel sector. This article aims to investigate the absence of accounting standards in voluntary and regulated carbon credit markets in Brazil, and its consequences on the reported financial position according to the economic interests of the agents involved in the markets. A positive and qualitative approach was applied to describe and analyze cases of carbon credit accounting practices of purchasing and selling companies. The cases studied recognized carbon credit assets as inventory, as intangible and as financial assets, although the characteristics of carbon credits do not qualify them under the current classifications. The results highlight different economic interests in voluntary and regulated markets that lead to the respective accounting choices linked to them. The research contributes to strengthening the scientific arguments on the accounting of carbon credits.

Keywords: carbon credit, climate change, accounting standards, voluntary market, CBIO

JEL Classification: M41

1. Introduction

The difficulties in regulating and defining accounting standards to quantify, control and disclose carbon emissions by companies have been present since the first discussions about the post-industrial revolution production pattern and its interference in the climate, present at the First World Climate Conference, organized in Geneva (Switzerland) in 1979. As very well established in Martineau and Lafontaine (2020), the systems and standards defined for carbon accounting by companies have transformed greenhouse gas (GHG) emissions into a commodity, and led to the commodification of nature as GHG emissions are transformed into tons of CO₂, to which an exchange value is assigned in carbon market operations.

Amidst this great complexity and distance from the real concern for the preservation of nature as a consequence of the commodification of carbon emissions, the accounting of carbon credits is still surrounded by doubts from scientific, practical, and normative points of view. From a normative standpoint, there is no specific IFRS standard for carbon credits, which requires interpretation to define the appropriate accounting treatment. There is a consensus that carbon credits are assets, whose economic benefits can be achieved by complying with the obligation to reduce GHG emissions, as well as by trading them in the carbon credit market. However, the economic nature of the carbon credit asset is to be at the root of the standardization problem, which requires scientific studies.

Literature has described some of the economic attributes of carbon credits, although not all economic characteristics of a carbon credit are consolidated, with many features in different markets and contracts, which do not contribute to developing a specific accounting standard (Ertimur et al., 2020; Lovell et al., 2010; Warwick & Ng, 2012). Therefore, the accounting classification of these assets is still subject of ongoing debate, and practitioners have adopted different accounting treatments.

The most commonly encountered accounting treatment for carbon credits is in the category of intangible assets, according to International Accounting Standard (IAS) 38, as they have no physical substance, are identifiable, and have non-monetary rights (Black, 2013; Ertimur et al., 2020; Garcia-Torea et al., 2022; Lovell et al., 2010; Warwick & Ng, 2012), although the classification of carbon credits as intangible assets is still controversial. Usually, intangible

assets generate economic benefits through their use, aligned with the definition of future economic benefits flowing from an intangible asset in paragraph IAS 38.17 (IASB, 2014). This is not the case with carbon credits, in most cases. According to a survey by PwC and IETA (2021), companies have destined carbon credits to settle their liabilities.

In addition, carbon credits seem to have characteristics of financial instruments. They are traded in the financial markets, even with low liquidity. However, the classification as financial instruments do not seem appropriate either, as there is no contract that gives rise to a financial liability, or an equity instrument for a counterpart.

This means that carbon credits seem to have their own characteristics in terms of economic benefits, which do not fit perfectly into current classifications, thus demanding discussion on current accounting standards. Moreover, the literature on carbon credit accounting has focused on the European 'cap and trade system', but voluntary markets have increased around the world, and there are few papers on companies' practices and incentives in low-regulation environments (He et al., 2022; Birchall, Murphy & Milne, 2015).

Given different accounting treatments considered for carbon credits, the objective of this paper is to investigate if the lack of accounting standardization leads to different financial position, due to different accounting choices, reported according to the economic interests of agents involved in the markets. This research contributes to the literature shedding light on the difficulties of the lack of carbon credits accounting standards and the divergence of financial results. Furthermore, the study explains the stages of issuing and trading carbon credits in regulated and voluntary markets in Brazil and their main sources of uncertainty for the agents involved, which are decisive for the differences in accounting practices found in companies.

This is an empirical study of the accounting practices of the leading Brazilian companies involved in credit carbon issuance and negotiation, both in the regulated and voluntary markets, that aims to investigate if the lack of accounting standardization for carbon credits in Brazil leads to different accounting choices, and that these choices are intrinsically related to the uncertainties and economic interests of the markets where carbon credits are issued and traded (voluntary and regulated).

The Brazilian territory is relevant for the carbon credit market, as the country has large forests, biomes, and natural resources, and is one of the main destinations for carbon credit projects from all over the world. Projections show that the potential for generating revenue from carbon credits by 2030 for Brazil has risen from US\$100 billion to up to US\$120 billion, and an ability to meet 22.3 to 48.7% of global demand for voluntary market credits, which should reach between 1.5 and 2 gigatons of CO₂eq by the end of the decade (ICC Brasil & WayCarbon, 2022).

Another aspect that makes carbon credit markets in Brazil a relevant research field is the coexistence of two systems of issuing, buying and selling carbon credits: a voluntary market for carbon credits - where carbon credits are issued and traded in the over-the-counter market, mainly abroad-, and a regulated market for the fuel sector, with a specific decarbonization credit instrument (CBIO), traded in the organized over-the-counter market at the Brazilian Stock Exchange (B3), where prices and trading volumes are recorded and can be checked.

The paper content is presented in the following four sections. The second section presents the structure, characteristics and challenges of voluntary and regulated carbon credit markets in Brazil. The third section describes the research methods and information sources, followed by the fourth section, where Brazilian companies' cases regarding carbon credits trading and accounting are analyzed. Finally, the last section concludes the research.

2. Carbon Credit Markets

Carbon credit markets allow companies, organizations and individuals to offset their greenhouse gas (GHG) emissions by purchasing carbon credits generated by emission reduction or carbon offset projects. This section explains the two markets in which carbon credits are traded in Brazil: the voluntary market and the regulated market specifically designed for the fuel sector.

2.1 Voluntary Carbon Credits Market

Norms and operating rules of the voluntary market of carbon credits in Brazil are entirely dictated by the private initiative, in a market structure where few companies control their proposition and certification. The absence of regulation for the market's operation increases problems of information asymmetry, transparency, and uniformity. For Bayon *et al.* (2009), the voluntary market's lack of transparency and price reference is strengthened by the fact that this market is not regulated by a state or federal political body.

Carbon credits are generated from carbon removal projects (such as reforestation projects), emission reduction projects (such as those that switch production processes to cleaner energy or less polluting technologies), or non-emission projects (such as REDD and REDD+ projects (Note 1)).

In general, the stages for issuing carbon credits in the Brazilian voluntary market is shown in Figure 1.

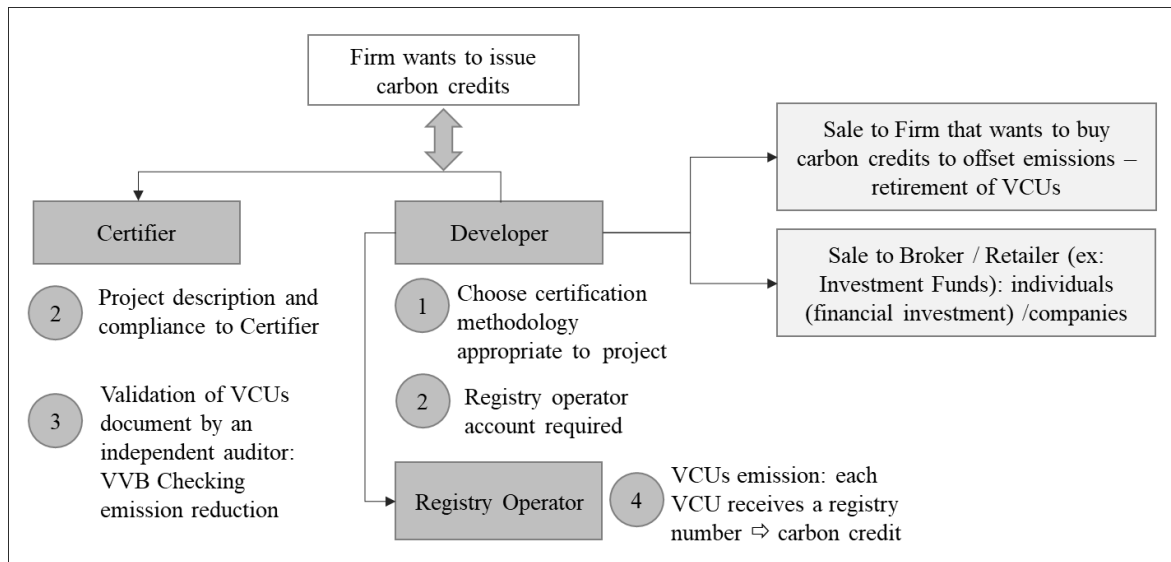


Figure 1. Stages for issuing carbon credits in the voluntary market

Note: VCU is verified carbon units; VVB is Validation / Checking Body

Project proponents, the sellers, are private agents, who prospect areas for their implementation that generate carbon credits, and, at the same time, the proponent defines the certifying company, which is associated with the price of the checking and certification service, but also with the choice of the methodology that will be used for certifying carbon offsets.

Methodology refers to the analytical basis and mathematical models that should be used to quantify the emission reductions achieved by the project (VCS, 2022). Hence, different methodologies for the same type of project can have different results in the amount of reduction and, as a consequence, the amount of credits to be issued. The calculation of offsets for each project is not disclosed to the market, which causes criticisms regarding its validity and effectiveness.

The Brazilian market is quite concentrated regarding the certifying companies, formed by large foreign groups that impose barriers to the entry of new competitors, through international standards (IPs) that are consolidated in the market, through the justification of reducing the insecurity of the credits issued (Simoni, 2009). VERRA's Verified Carbon Standard (VCS) and the WWF's Gold Standard (GS) dominate the Brazilian market; in 2021, the year of largest carbon credit issue in Brazil, 45.2 million carbon credits were issued, of which 97.3% were certified by VCS standard and 0.7% by GS standard (<https://data.ecosystemmarketplace.com/>).

The registry operators act as settlement and custody centers where carbon credits will be deposited. After the effective issuing of the carbon credits, already checked and validated by the certifiers, Verified Carbon Units (VCUs) are registered - it receives a number which enables its traceability and prevents double trading of the same credit - and hereafter the proponent owns carbon credits recorded and ready for trading.

It is important to highlight that the same project generates carbon credits periodically (called harvest), and before each issue a new check of the capture in that period must be done by the certifier. The cost of checking is high, and varies according to the methodology adopted for each type of project. For example, reforestation projects usually issue carbon credits every five years, but electricity projects do it annually, since the cost of checking is lower.

On the buyers' side, the market is extremely diversified. The voluntary participation of companies is explained by the expected social, environmental, and economic benefits, both by the carbon offsetting itself and by the greener image that companies have been pressured to achieve (Oliveira, 2022; Jiang et al., 2021).

The purchase of carbon credits is made through contracts between the proponent (or selling entity) and the buyer (or purchasing entity), which can take place at three different moments: (i) when the project has already been validated, but not implemented; in this case, the buyer funds project development and owns most of the credits after project

maturity ; (ii) when the credit is ready to be verified, but the verification has not yet taken place; in this case, the buyer funds only the final phase of project’s maturation, being entitled to part of the credits issued; and (iii) when the carbon credits have already been validated and are ready to be traded; in this case, the purchase is made directly for the value negotiated between the proponent (seller) and the buyer.

For each stage of project development, there is a level of risk for the buyer. For example, in the stage described in (i), considered the highest risk among all alternatives, the contract with the proponent mitigates risks and guarantees the progress of the project, involving real collaterals and staggered payments.

Carbon credits can be bought for later trading, in order to gain from price differences, or for offsetting, when the credits retirement are registered, that is, credits are permanently withdrawn from circulation, representing the permanent removal of tons of CO₂ from the atmosphere (Bayon et al., 2009).

Green (2021) observes that too little is known about the *ex-post* performance of the projects that generate credits, and that available information indicates that the effect of carbon credits on emissions is limited. Gifford (2020) provides an excellent discussion of the uncertainties on the methodologies and results of reforestation carbon credit projects.

In the voluntary market, there is no information transparency, especially regarding the methodologies, the volume, and price formation for traded carbon credits, thus reducing their liquidity (Vargas, Delazeri & Ferreira, 2022).

2.2 Regulated Decarbonization Credit (CBIOs) Market

RenovaBio (National Policy for Biofuels) is the largest energy matrix decarbonization program in the world, and resulted from a demand from the Brazilian sugarcane sector to have a consistent energy policy for ethanol. The program was formally created by Law 13 576/2017, with the goal of expanding biofuel production in the country, based on the predictability of production and demand and on the environment, economy and social sustainability (UNICA, 2019).

The main instrument of RenovaBio is determining annual national goals of decarbonization for the fuel sector, defined for the period 2019 to 2029 by the National Energy Policy Council (CNPE) Resolution No. 15, of June 24, 2019. The aim was to value the externalities of biofuels compared to fossil fuels. National goals were broken down into compulsory individual annual targets for fuel distributors in the national territory, calculated proportionally to the volume of fossil fuel sales in the previous year, under the terms of ANP Resolution No. 791/2019, of June 12, 2019.

To achieve the decarbonization goal, fuel distributors must buy a specific carbon credit issued by biofuel sellers, named Decarbonization Credits (CBIOs), which are conceptually carbon credits. Each CBIO corresponds to 1 ton of carbon that was no longer emitted into the atmosphere, as a result of the production of biofuel equivalent to its direct substitute in fossil form.

Granjeia, Santos e Lázaro (2022) consolidated the operating stages of the CBIOs market into a flow shown in Figure 2.

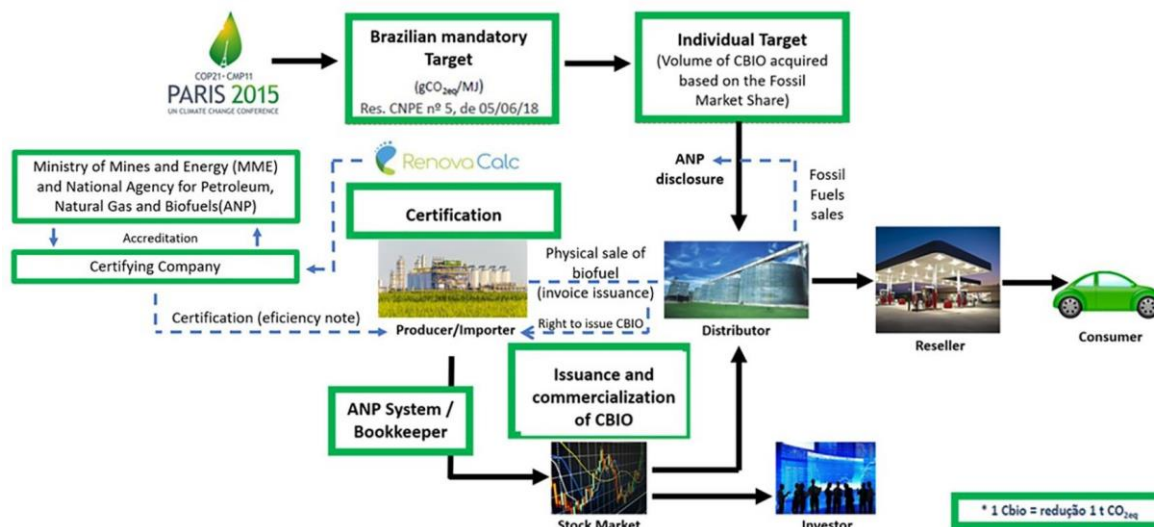


Figure 2. Stages for issuing CBIOs in the regulated market

Source: Granjeia, Santos e Lázaro (2022, p. 4)

The issue of each CBIO depends on the registration of the biofuel volume producer or importer at the Computerized System of the Brazilian National Agency for Petroleum, Natural Gas and Biofuels (ANP), which checks and validates the invoices registered by producers and importers, and calculates the number of CBIOs to issue.

The model for checking the environmental performance of biofuels, called *RenovaCalc*, applies the Life Cycle Assessment (LCA) methodology to quantify the volume of carbon that is no longer emitted, compared to the equivalent fossil fuel. According to Klein et al. (2019), the LCA method will lead companies to identify process bottlenecks and rethink their processes for certification, given that the number of CBIOs generated is associated with the Energy Efficiency Score (EES) of each producer/importer, which should generate research and development efforts, an important indirect effect of *RenovaBio*.

CBIOs are tradable in the over-the-counter market organized by the B3, the Brazilian Stock Exchange. Roitman (2019) argues that, in addition to goals related to each fuel's ability to contribute to GHG emission reductions, trading a CBIO in a regulated market increases the program transparency, which makes it innovative and extremely promising.

Therefore, unlike carbon credit certificates traded in the voluntary market, CBIOs present disclosure of volumes, prices, and trading dates, notwithstanding Hughes et al. (2020) argue that price formation is still unclear for both negotiating parties, leading to uncertainty and little forecast for new investments.

3. Methodology

This research adopted a positive and qualitative approach using documents analysis to describe and analyze cases of accounting practices for carbon credits of buying and selling companies through their specific features in Brazil.

To study the accounting practices of firms participating in the markets, it was conducted a document analysis of the financial reports of a selling entity versus a buying entity, for each of the two markets. The most relevant buyer in each model was chosen, and then chose a seller with potential to make direct transactions with the selected buyer.

To analyze the buyer's standpoint in the voluntary market of carbon credits, a Brazilian company recognized for pioneering sustainability strategies declared its commitment to be carbon neutral since 2007. In contrast, from the seller's perspective, we analyzed a non-profit organization that reports the transaction with the selected buyer in its accounting notes.

In parallel, regarding the buyer's perspective in the CBIOs market, we analyzed the fuel distribution company with the highest individual goal for emission reduction in 2022. In contrast, from the seller's viewpoint, we analyzed the first ethanol producer in Brazil to get certification for issuing and selling decarbonization credits (CBIOs).

The analyzed cases were done by public companies listed for trading on the segment of Brazilian stock exchange known as *Novo Mercado* (New Market), the higher-level corporate governance standards in the Brazilian stock exchange, except the one selling on the voluntary market.

The documents' analysis aimed to identify the criteria for recognition and measurement of assets, liabilities, revenues, or expenses arising from the negotiation of carbon credits. Also, to understand the event systemically, the accounting recognition criteria were related to the stages of the two Brazilian carbon markets. Finally, for discussing the results, the relevant accounting standards were confronted to the accounting treatment observed in the companies.

4. Description and Analysis of the Brazilian Cases

The Securities and Exchange Commission of Brazil has recently recognized the importance of providing uniform accounting treatment for carbon credits, and prepared together with the Brazilian Accounting Pronouncements Committee and the Federal Accounting Council, an accounting guideline based on current IASB documents. The guidance covers operations in both the voluntary and regulated markets, and also addresses the recognition of non-formalized obligations, defined in IAS 37, for offsetting emissions (Draft OCPC10, CPC/CVM/CFC, 2023).

For this research, it is important to analyze the effect on buying and selling organizations of the processes related to carbon credits. After analyzing the working flow of both markets, a simplified process flow was designed (Figure 3), highlighting the steps that could involve variations in assets and liabilities at each end of the process. Third-party organizations involved in the process are essential to increase the reliability of the amounts involved, both financial and carbon equivalent, but accounting in such organizations is not relevant to this discussion.

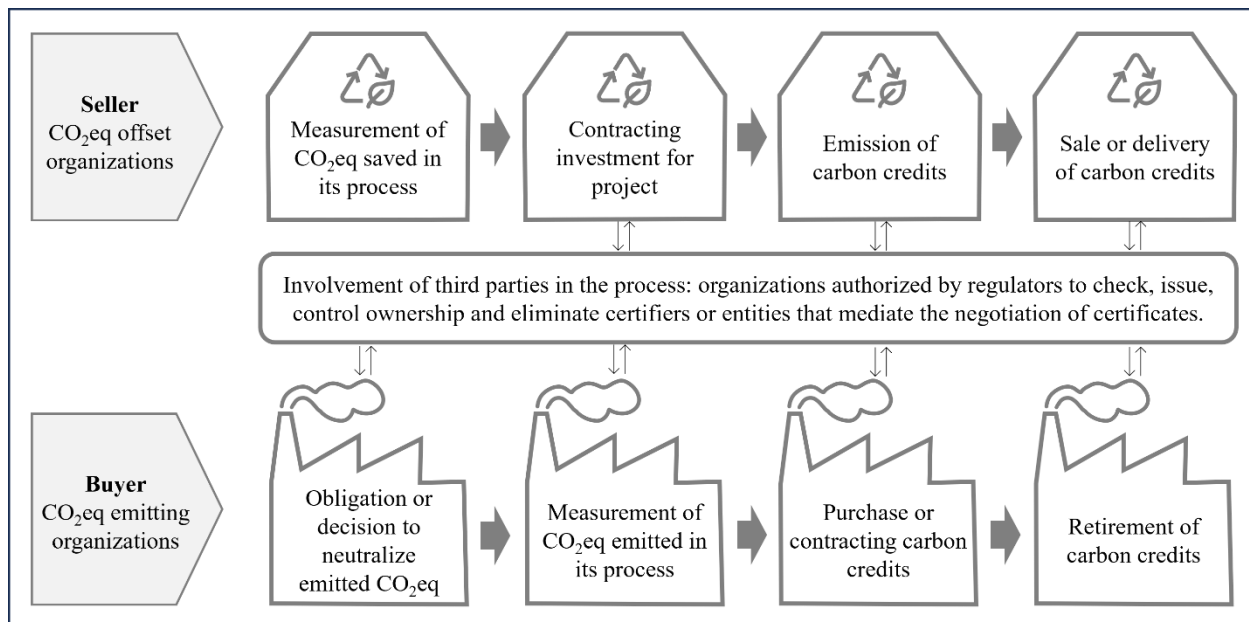


Figure 3. Simplified flow of the stages involving carbon credits for buyers and sellers

4.1 Carbon Credits in Voluntary Market

The lack of accounting regulation for carbon credits assets in the Brazilian voluntary market makes it difficult to standardize accounting practices among companies, harming comparability of results by financial information users. This section presents a description of the carbon credit accounting issued and traded by the sustainability leader company in Brazil that recognized constructive liability as a result of public commitment to becoming a carbon neutral company.

4.1.1 Accounting Treatment at the Buyer: Natura & Co

Natura is a Brazilian industry of cosmetics and personal care products. Nowadays, Natura is one of the leading companies in its sector in Latin America. In 2022, it had a revenue of R\$ 36.3 billion (€6.5 billion) employing around 35 000 employees.

In 2022, 2021 and 2020 financial reports, the note 3.9 addresses specifically the Carbon Neutral Program and its impacts, in which the company reaffirms the commitment publicly assumed as a constructive obligation. The company recognizes a liability presented under the item "other non-current liabilities". The increase in this liability "is estimated through the annual audited inventories of carbon emissions, and valued based on the best estimate of cash disbursement that will be required to settle the current obligation at the reporting date". Thus, the company accounts annually for liability increase and an expense, measured by the expectation of disbursement.

Natura invests in long-term projects with socio-environmental benefits that are linked to the reduction of GHG emissions. Hence, these expenditures generate carbon credits after the completion or maturation of these projects. The company recognizes such disbursements as "other current assets", measured on the initial recognition at their fair value, which is equivalent to the amounts invested in the projects, and later measured "at fair value, based on the estimated average value of the receivable certificates from recent transactions between unrelated parties". That is, the company invests in long maturation projects and recognizes the cash outflow against financial assets, which are revised periodically according to the expectation of certificates resulting from the contracted projects.

When carbon certificates of these projects are effectively transferred to the company and their retirement is registered, the company reduces, proportionally, the recognized liability. Therefore, asset balances are offset against liability balances.

However, it is worth mentioning that assets are based on estimates of certificates of receivables and liabilities are based on estimates of disbursements, thus there can be differences that should be recognized to avoid inconsistent treatment between assets and liabilities. Natura financial reports do not mention this matter. The recognized balances of assets

and liabilities, during 2020-2022, did not exceed 0.04% of total assets, while in the income there was recognition of an expense reversal in 2021 and 2022, in the amounts of 1.3% and 0.6% of absolute value of net income, respectively, and recognition of expenses in 2020 in the amount of 1.5% of net loss.

The most interesting point of reflection, in this case, is the recognition of constructive obligation when there is a public commitment to be a carbon neutral company. For the coherence of this accounting treatment, it is important to observe the points that define liabilities and constructive obligations, especially paragraphs IAS 37.1 and 37.15 to 37.26 (IASB, 2001). The company's accounting treatment is compatible with the Brazilian Draft OCPC10 (CVM/CPC/CFC, 2023) proposal regarding the recognition of liabilities, but the proposal does not clearly address the recognition of assets arising from investment projects like we observed in this case.

Another point of reflection is the business model, i.e., the company's choice to finance projects to generate carbon credits instead of just buying them on the voluntary market. By using this strategy, the company seems to assume the risks and benefits of the project, but it is not clear in the report. This is an important definition, because if Natura does not control risks and benefits of the project, the asset is in fact a supplier advances and not an asset resulting from carbon credits control.

Figure 4 summarizes the accounting treatment observed. The arrows indicate increases and decreases in accounting records evidenced by this buyer entity.

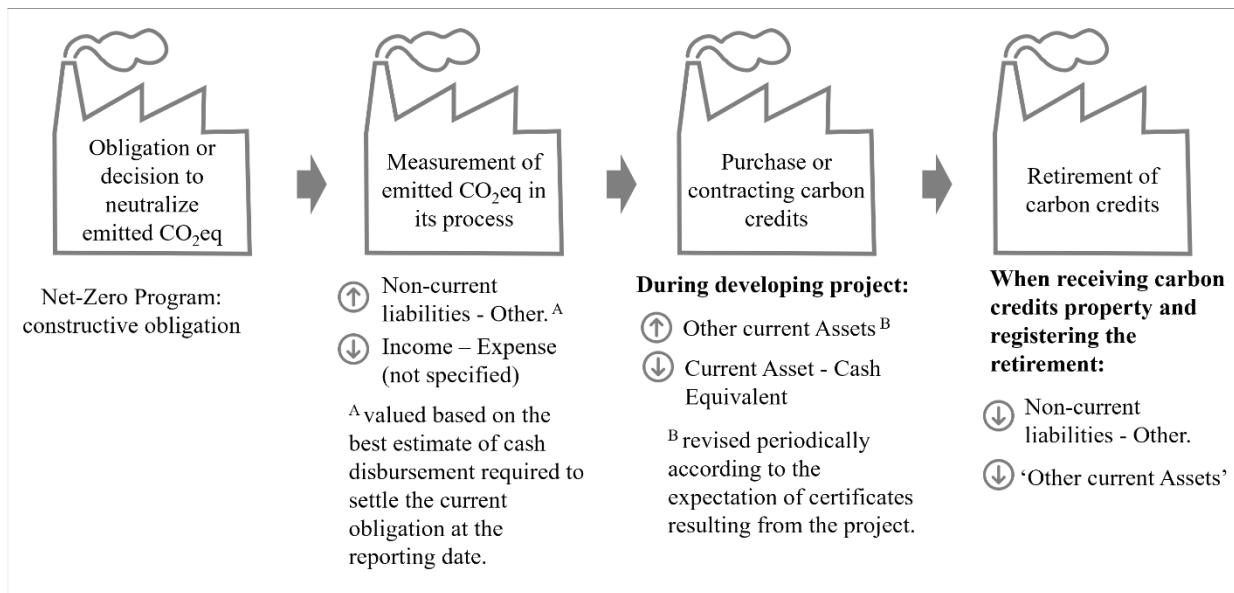


Figure 4. Accounting flow involving carbon credits for the analyzed buyer organization

4.1.2 Accounting Treatment at the Seller: IPE

The Instituto de Pesquisas Ecológicas (IPE) is a non-profit organization created in 1992, whose 2020, 2021 and 2022 financial reports mention Natura in note “Projects to Execute”. IPE’s partnership with Natura occurred according to type (i) contracts, described in section 3.1; that is, when the project has already been validated, but not implemented, and the buyer funds project development, becoming the owner of most of the carbon credits after maturation.

The organization's main activity – carrying out biodiversity conservation projects - is based on establishing an exchange with landowners interested in giving their land for restoration. According to its financial report notes, IPE assumes the restoration of the land, a legal obligation imposed on the landowner, and, in exchange, receives the rights to issue carbon credit certificates, configuring a situation of exchange without a commercial nature. IPE reports describe the exchange transaction but do not evidence any accounting recognition for it, nor any mention of possible related risks.

After defining the exchange and designing restorations projects, the organization seeks to attract investors for funding their execution. Note 3 of 2020, 2021 and 2022 IPE's financial reports show the basis of accounting for projects in stages. In the initial recognition, upon receiving the resources, there is an increase of cash equivalent, as opposed to the

increase of non-current liabilities "Projects to execute". In further periods, by consuming cash equivalent resources for carrying out the project, the liabilities are appropriated to the result as revenue, as the cash is changed into project costs, "simultaneously and by the same value"; thus, without earning profits/surplus. Although apparently investors like Natura have received the certifications' ownership in return for project financing in 2020, IPE report does not evidence any accounting recognition of issuing carbon credit, nor mention of transferring emission rights to investors. Figure 5 summarizes the accounting treatment observed arising from Natura investment.

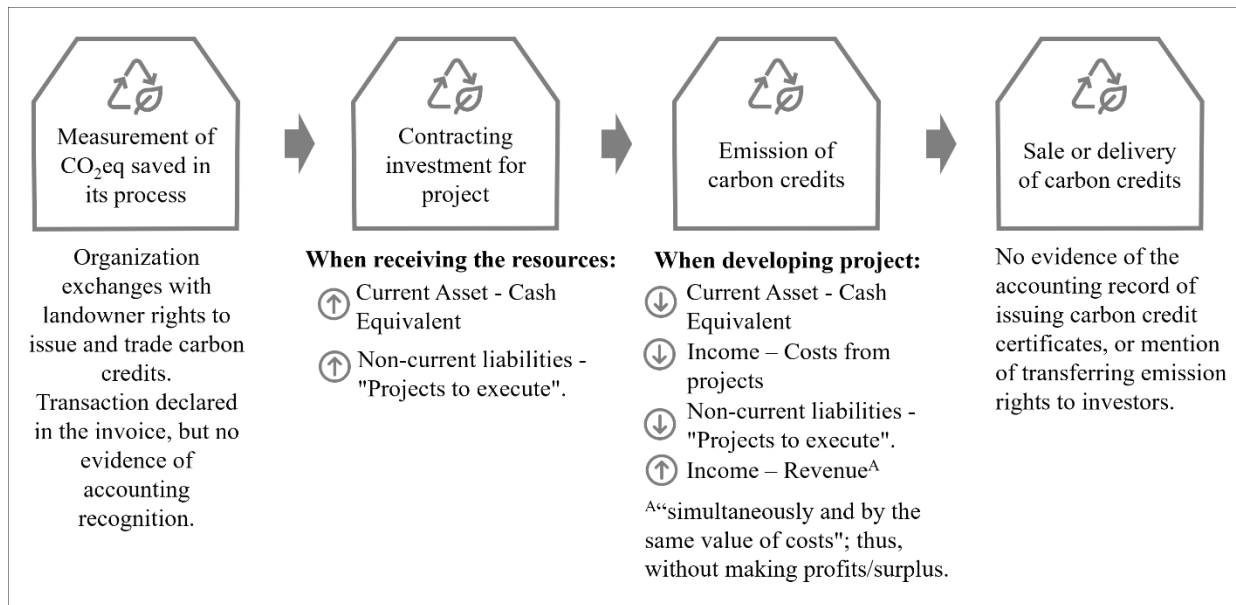


Figure 5. Accounting flow involving carbon credits for the analyzed selling organization

But 2021 and 2022 IPE's financial reports presented two business models with different accounting treatments: the one presented in the previous report, which was applied in Natura partnership, and a new partnership involving a for-profit company called Biofíca, which has recognized experience as a developer and broker in the voluntary carbon credit market. According to note 7 of 2021 IPE's financial report, in the new business model, IPE and Biofíca act together as proponents of the same project for reduction of GHG emissions, aiming to generate carbon credits and sell them to several buyers after being certified and registered, according to type (iii) contracts described in section 3.1., when the carbon credits negotiation occurs directly in the voluntary market, between the proponent (seller) and the buyer. However, as in other projects, IPE gets paid for carrying out the project, and delivers the carbon credits as they mature.

The difference in accounting treatment for the partnership with Biofíca was the recognition, in addition, of an intangible asset against another non-current liability, under the item "advance from customers", and, note 7 explains that both will remain with the same balance of initial recognition, until 2027, when there will be the first checking and issuing of certificates that will be ceded to the company Biofíca. Hence, the text indicates that there will be no amortization of the intangible asset over its execution. Indeed, the 2022 financial report did not present intangible amortization and recognized an increase in intangible from the Biofíca contract instead.

Finally, the information on the accounting treatment of carbon credits of Biofíca was analyzed. Since individual financial reports were not available, we used the consolidated financial report of its investor. In the 2021 e 2022 financial report, the company reported in note that "other receivable accounts" stated in Balance Sheet arise from the expenditures related to the acquisition of carbon credits for trading. The asset is measured at acquisition by cost value and later by the lowest value between the net realizable value and the value registered. In case of loss recognition, the counterpart is recorded in the result. The balance recognized in "other receivables" represents less than 2% of the consolidated total asset.

Regarding compliance with the Brazilian Draft OCPC10 (CVM/CPC/CFC,2023), the guidance does not address the phase of carbon credit generation, as already mentioned. Neither does it deal with negotiations between intermediaries before the existence of the certified carbon credit.

This case provided two interesting reflections on business models involving carbon credits in the Brazilian voluntary market. The first is the difficulty of applying current standards to the different business models built in this market, especially when there is a change in the control of risks and benefits of the carbon credit asset. The second is the classification of the project as an intangible without amortization. Considering IAS 38, an intangible asset without amortization does not have a defined useful life or is a project under development, however, the entity presents a table with the expected useful life of the project.

Looking at IAS 38, it seems appropriate to classify carbon credit projects during the maturation process (after the third and before the fourth stage defined in Figure 1) as internally generated intangible assets under development, since the complex validation system (stages 1 to 3) appears to meet the requirements of paragraph IAS 38.57 (IASB, 2014).

The relation Natura-IPE-Biofíca present a situation similar to projects developed under the premises of the Clean Development Mechanism, suggested in the Kyoto Protocol, which provided for mutual aid between developed and developing countries; the latter are remunerated by the former for creating and implementing conditions that reduce GHG emissions, therefore, for developed countries it implies obtaining carbon credits through investments in third party projects.

4.2 Decarbonization Credits: The Regulated Market for Brazilian Biofuels

In spite of being regulated by ANP, there is no mention about how organizations should recognize and measure their assets and liabilities arising from the public policy for offsetting emissions. With the analysis of three accounting years in operation, this section describes the accounting practices of a CBIO buyer and a CBIO seller.

4.2.1 Accounting Treatment of CBIOs at the Buyer: Vibra

Vibra is the leading fuel distributor in the country, employs about 3 300 people, and made R\$ 181 billion (€32.3 billion) in 2022. Decarbonization credits began to appear in the company's financial reports in 2020, with the effective implementation of the RenovaBio program. The provisions are recognized monthly in current liabilities against "Other income (expenses), net", and measured by estimate "considering the costs of the amounts already bought and the average market value traded on the last day of the month for the remaining quantities". In the accounting basis note, the company includes the Provision for Decarbonization credits among the estimates with a high level of judgment or complexity.

When acquiring CBIOs, the company recognizes intangible assets, with an indefinite useful life and measured by historical cost. The retirement of CBios is recognized as write-offs, against provisions, since it settles the obligation imposed by RenovaBio. Figure 6 summarizes the accounting treatment observed.

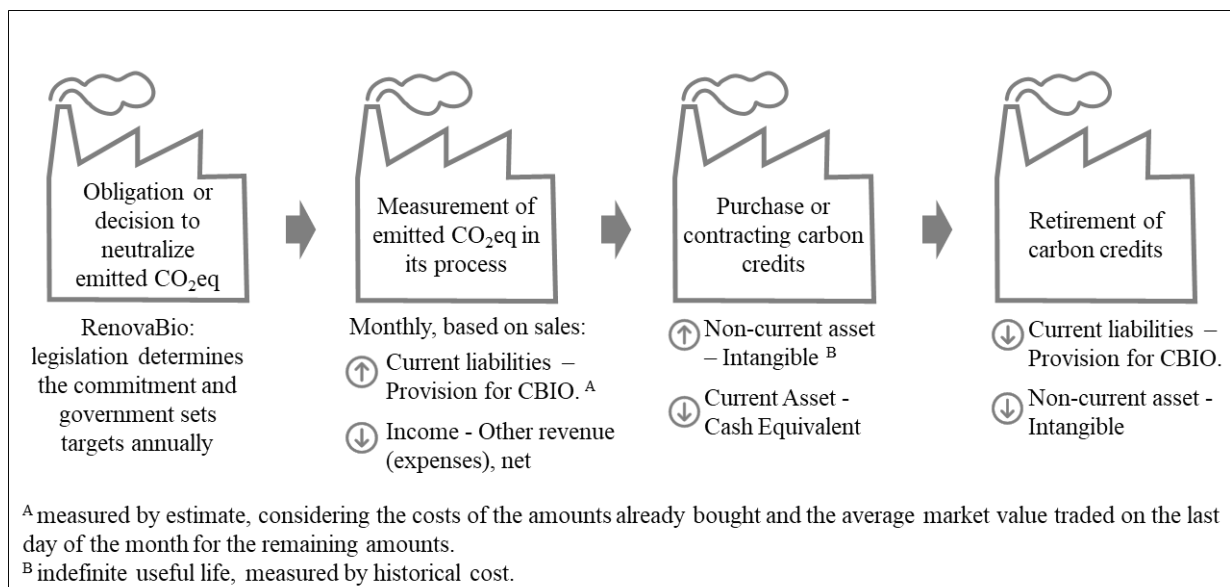


Figure 6. Accounting flow involving CBIOs for the analyzed buying organization

In 2020 and 2021, the acquired amount of CBIOs was exactly equal to the amount retired, that is, the company bought the exact amount it was obligated to. In 2022, the company purchased a volume much higher than the volume written off due to retirement. The expenditure was about 0.2% of the company's net revenue in 2021 and 0.5% in 2022.

Vibra's accounting practice contains some divergences compared to the Draft OCPC10 proposal (CVM/CPC/CFC, 2023). Two of these are worth mentioning. The main divergence is the fact that the proposal recommends that acquired CBIOs should be recorded as inventories - in compliance with IAS 38.3(a) - but the company recognizes them as intangible assets with an indefinite useful life. Another divergence occurs in the result: The proposal recommends that the counterpart of provisions recognized in proportion to sales of fossil fuels should be recorded as part of the cost of goods sold in the result, but the company records it as other expenses, after gross income, thus reducing the comparability between companies in the sector.

4.2.2 Accounting Treatment of CBIOs at the Seller: S ão Martinho

Usina S ão Martinho (S ão Martinho Mill) has been producing ethanol for over 100 years and it is often listed among the five largest sugarcane mills in Brazil. With four production units and 350 000 hectares of agricultural area, it employs 12.5 thousand people and processes around 20 million tons of sugarcane annually. It was the first ethanol producer to achieve certification for selling CBIOs.

The first accounting of CBIOs appeared in the 2021 financial report. At the end of the fiscal year, in March 2021, CBIOs appeared as part of the inventory, with an amount of R\$ 8.25 billion (€1.6 million) and the following explanation: "On March 31, 2021, there were 408 599 CBIOs booked and registered at fair value". There was no detailed explanation regarding the accounting treatment as a whole.

In March 2022, company reported revenue as other products, €6.9 million, and the amounts of R\$ 16.6 (€3.2) million (2022) and R\$ 8.26 (€1.6) million (2021) are shown in the note of Inventories as: "On March 31, 2022, there were 249 thousand CBIOs booked and recorded at net receivable value (409 thousand CBIOs on March 31, 2021)". Hence, there was a change in measurement criteria, but no justification, adjustment, or restatement of the previous balance was disclosed, perhaps due to immateriality. We consulted the 2022 intermediary reports for understanding. The change in measurement criteria occurred as of the second quarter of 2022, but there is no further detailing in the document.

In March 2023, measurement criteria remained the same, net receivable value. Company reported a major revenue from CBIOs, R\$80.2 (€14.3) million, and a lower amount of CBIOs in Inventories, R\$ 4.2 (€0.7) million.

Therefore, S ão Martinho recognizes the certificates issued but not yet sold as inventories measured at net receivable value. The counterpart of this recognition is not disclosed. At the time of sale, inventories are written off, probably matching the same counterpart registered before. Also, the company recognizes 'Other sales revenue' with the counterpart in cash equivalent. Figure 7 summarizes the accounting treatment observed.

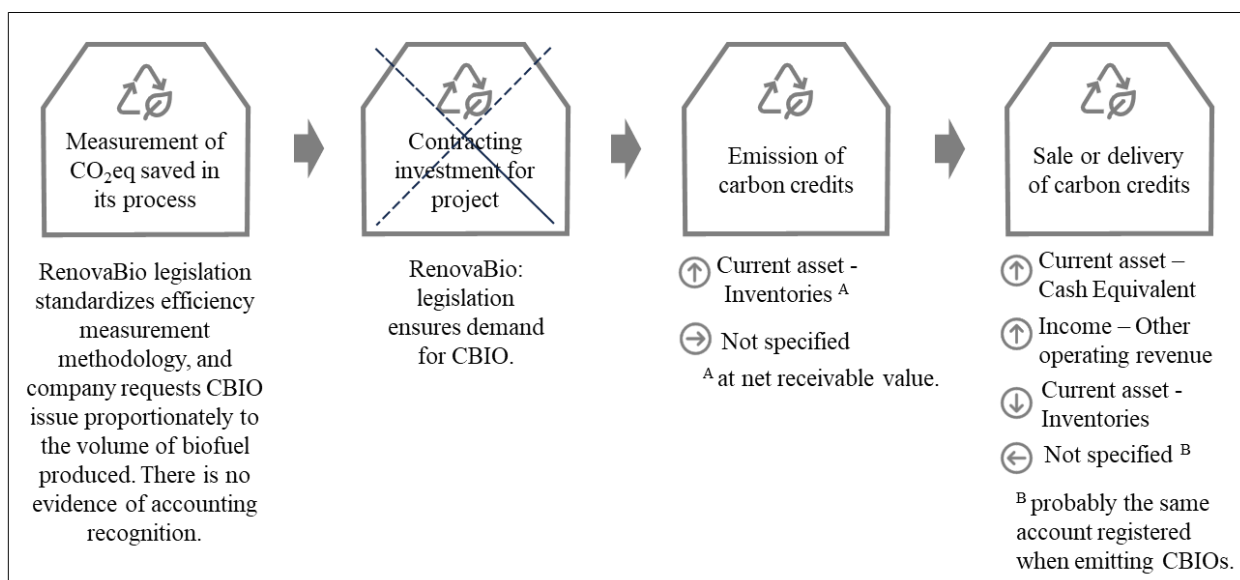


Figure 7. Accounting flow involving CBIOs for the analyzed selling organization

There was nothing related to CBIOs evidenced in the note of expenses by nature nor in the cash flow statement. In addition, there were no details on the transaction costs for achieving the certification. This recognition procedure as inventories coincides with that determined by the American agency for regulating the energy sector, however, it differs in terms of measurement, which is at cost, as commented by Lovell et al (2010) and IAS 38 when there is intention to sell.

The company's accounting treatment is convergent with the Brazilian Draft OCPC10 proposal (CVM/CPC/CFC, 2023), when observing the measurement criteria and the recognition of the asset as inventory. However, the impact on the result is different. The proposal's orientation is to recognize a government subsidy revenue in the income statement and not an operating revenue, as the company did.

5. Conclusion

Aligned with the discussions in literature (Black, 2013; Ertimur et al., 2020; Garcia-Torea et al., 2022; Lovell et al., 2010; Warwick & Ng, 2012), cases studied recognized carbon credits assets as inventory (seller in regulated market), as intangible (buyer in regulated market and seller in voluntary market) and as financial assets (buyer in voluntary market). But carbon credits seem to have their own characteristics, which do not fit into current classifications.

The internal generation of carbon credits in its production process, and further sale to customers of its main products, resembles an inventory, since they are held for sale in the ordinary course of business, according to paragraph IAS 2.6. However, it does not look like goods purchased and held for resale, as provided by in paragraph IAS 2.8.

Carbon credit is similar to an intangible, but as defined in paragraph IAS 38.17. Although any economic resource can be used to settle an obligation (Conceptual Framework 4.16), the settlement of a liability is not the economic benefit expected for intangibles. Then, the carbon credit asset does not seem like an intangible asset when retired, liquidating a constructive obligation because typically an intangible asset generates benefits from its use.

Both the seller and the buyer in the voluntary market register advance accounts (liability and asset, respectively), but did not recognize a carbon credit asset, therefore it is not possible to identify the risk of carbon credit in their financial report, since cash disbursement is evident and carbon credit still depends on maturation process. When an advance is disclosed, risks of loss seem to be held by the supplier, however it is not clear if buyer or seller controls risks and benefits from carbon credit.

Moreover, it seems to be appropriate to classify carbon credit projects during the maturation process as internally generated intangible assets under development, since it is not yet capable of operating in the manner intended by management and the complex validation system to obtain carbon credit appears to meet the requirements of paragraph IAS 38.57.

In addition to the recognition of assets, the analysis of financial statements showed the recognition of expenses and liabilities associated with carbon emissions in buyer cases. In voluntary market, liability arises from a constructive obligation and in regulated market arises from a legal obligation. Both formed liability by the accrual basis: one uses periodically carbon emission inventories to measure neutralization obligations and the other uses the goal imposed by Brazilian government proportionally to the invoices issued.

The financial position proved to be susceptible to choices in recognizing assets and liabilities, but also to the methodology for inventorying emissions, to the strategy for offsetting emissions, to criteria for measuring liabilities and even to the moment to state the public commitment.

From a conceptual point of view, it is possible to see two groups of economic interests related to the disclosure of carbon credits. In the case of the voluntary market, there is an interest in disclosing liabilities and investments in carbon credits, to show investors that the speech on reducing greenhouse gasses is for real, and is in fact producing economic effects. Therefore, the display of assets and liabilities, even if they are relatively small in relation to total assets, is considered relevant.

However, the accounting practices observed in these voluntary market participants indicate that preparers had to find a reference in the existing standard in order to represent more faithfully the nature of assets and liabilities, but the lack of uniformity in accounting practices seems to show that it is difficult for preparers to find an accounting treatment that does not produce misleading information. There doesn't seem to be a bias in the agents' interest in recognition and measurement practices, as these look prudent.

In the case of the regulated market, specifically for fuels, the information on the recognition of the asset by a government grant and the result obtained from the generation of carbon credits are relevant, due to the materiality of their amounts for those selling the credit, but without the same interest in disclosing their benefits for the environment.

Similarly, the buyer's accounting practice does not show economic interest from an environmental point of view, but only complying with a formal obligation. Recognizing credits for the seller could be more prudent by postponing the result to the moment of sale, but perhaps the information would be less relevant.

Carbon credit maturation process depends on decisions made by the company, but mainly depends on environmental conditions. When carbon credit asset is ready for use, there are only two possible destinations: sale and writing-off of the carbon credit liability. This means that an accounting standard should cover these origins for asset recognition, since the future economic benefits can be the same: trading or retiring the carbon credits.

Therefore, there are some suggestions for forming accounting standards for carbon credits and future research, which can reduce uncertainties regarding financial information and contribute to the development of markets. First, for an active voluntary market and reliable prices, a future accounting standard could set the measurement of assets and liabilities at fair value or cost, but the carbon credits under development with advance payments to suppliers should be measured at cost.

In the regulated market, measurement at fair value is reliable. A future standard should set principles for recognizing assets and liabilities when (or as) a company achieves control over the carbon credits, and the possibility of measuring them at fair value or at cost, depending on how it expects to obtain its economic benefits, either through credit sale or retirement, and the availability of reliable information on credit prices.

Second, information on assets and liabilities is provided by voluntary market participants under economic interests that appear to be different from the interests of regulated market participants. Therefore, research on accounting information should consider different interests.

Finally, as there is still no regulation of the information to be produced, accounting choices appear to leave room for earnings management, but prudent choices for recognition and measurement are observed in the voluntary market. Other cases, in other economic environments and through different methods of scientific investigation, could contribute to improving accounting standards on carbon credits.

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Authors' contributions

Mrs. Segatelli was responsible for surveying the cases with Natura CO. Prof. Ribeiro contributed mainly to the literature review, with relevant contributions in the Final Considerations, in addition to reviewing the paper as a whole. Prof. Nakao contributed to the Introduction and Final Considerations, in addition to relevant suggestions in the final review of the paper. Prof. Cicogna contributed to the description of carbon markets in Brazil, in addition to definitions in the transaction structures, literature review and final considerations. Prof. Fregonesi was mainly responsible for the description and accounting formalization of carbon credit trading operations, in addition to the general review of the paper.

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Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Obtained.

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Note

Note 1. REDD type projects aim to prevent deforestation, and REDD+ projects seek to prevent deforestation and also include activities of forest management or reforestation.