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Navigating the rivers of sustainability in the Amazon: the dilemma of accounting for carbon credits

Navegar por los ríos de la sostenibilidad en la Amazonia: el dilema de contabilizar los créditos de carbono

Navegando pelos rios da sustentabilidade na Amazônia: o dilema da contabilização dos créditos de carbono

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Abstract

Purpose: The education case in this paper aims to encourage discussions about accounting for carbon credits by presenting a fictional story about a female accountant who is head of an ecologically sustainable family business called Econorte. Lecturers and students from accounting courses will be able to discuss the bookkeeping issues for sustainable companies that use carbon credits.

Methodology: This educational case uses a mixed methodology, starting with a reflection on the importance of studies on accounting for carbon credits, which include classification, bookkeeping, and explanations/justifications for these records.

Results: The data presented in this educational case serves as a basis to reflect on, classify, record and justify the importance of accounting for carbon credits.

Study Contributions: This paper is an instrument that can be applied to undergraduate business courses, mainly the Accounting Sciences such as Environmental Accounting, Environmental Management, Socio-environmental Responsibility and Sustainable Development.

Keywords: Environmental Accounting; Bookkeeping; Carbon.

Resumen

Objetivo: Este caso didáctico pretende fomentar el debate sobre el tratamiento contable de los créditos de carbono presentando una historia ficticia sobre una contable que dirige una empresa familiar ecológicamente sostenible llamada Econorte. A través del caso didáctico, profesores y alumnos de cursos de contabilidad podrán debatir sobre la contabilización de los créditos de carbono de empresas sostenibles.

Metodología: La metodología de este caso para la enseñanza es mixta, ya que parte de un proceso de reflexividad sobre la importancia de los estudios, desde la contabilización de los créditos de carbono hasta la clasificación, la contabilidad y las explicaciones/justificaciones de dichos registros.

Resultados: A partir de los datos presentados en este caso para la docencia, es posible reflexionar, clasificar, registrar y justificar la importancia de contabilizar los créditos de carbono.

Contribuciones del Estudio: El caso contribuye como un instrumento que puede ser aplicado en las materias de Contabilidad Ambiental, Gestión Ambiental, Responsabilidad Socioambiental y Desarrollo Sostenible en carreras de pregrado en el área empresarial, principalmente en la carrera de Ciencias Contables.

Palabras clave: Contabilidad Ambiental; Teneduría de Libros Contables; Carbón.

Resumo

Objetivo: O presente caso para ensino objetiva fomentar discussões acerca do tratamento contábil para créditos de carbono, com a apresentação de uma história fictícia sobre uma mulher contadora, chefe de uma empresa familiar ecologicamente sustentável chamada Econorte. Por meio do caso para ensino, docentes e discentes de cursos de Ciências Contábeis poderão discutir sobre a escrituração contábil dos créditos de carbono de empresas sustentáveis.

Metodologia: A metodologia deste caso para ensino é mista, pois parte de um processo de reflexividade sobre a importância dos estudos da contabilização dos créditos de carbono até a classificação, escrituração contábil e as explicações/justificativas para tais registros.

Resultados: Com base nos dados apresentados neste caso para ensino é possível refletir, classificar, registrar e justificar a importância da contabilização dos créditos de carbono.

Contribuições do Estudo: O caso contribui como um instrumento que pode ser aplicado nas disciplinas de Contabilidade Ambientes, Gestão Ambiental, Responsabilidade Socioambiental e Desenvolvimento Sustentável em cursos de graduação na área de negócios, principalmente no curso de Ciências Contábeis.

Palavras-chave: Contabilidade Ambiental; Escrituração Contábil; Carbono.

Part I - The Case

1. Introduction

Econorte is a family organization founded and managed by two partners: Fernando Soares and Marcelo Soares. Both have held essential positions in business management for more than 20 years. As brothers, they share not only the responsibility of leading the organization, but also a concern for the environment. They are committed to seeking alternatives to make Econorte an ecologically sustainable company.

In recent years, the company has significantly expanded its activities, resulting in increased profits, costs, and the emergence of new demands in the market. Mary Oliveira, a specialist in environmental management since 2012 with extensive experience in the field, noted that one needs to stay constantly updated in order to find solutions to the challenges that arise on a daily basis.

Mary Oliveira is the head accountant at Econorte, located in the metropolitan region of Belém, in the state of Pará. The company operates in the timber industry and has a variety of customers and suppliers. At present, it employs 150 people who work in different areas, including operational activities such as unfolding, pre-treatment, drying and transportation, and managerial and administrative activities.

As head accountant, Mary is responsible for managing a team of the following five assistant accountants: Maria de Souza, Marcos Santana, Silva Gomes, José Ferreira and Antônio Pereira. The main responsibility of this accounting department is asset control and to monitor the company's economic performance, ensuring the company continues to make a profit.

The timber industry involves several specific controls on production, calculating expenses, and compliance with environmental, social and tax regulations due to the particularities of the sector. These demands often require meetings to be held to discuss and resolve any problems that may arise. On certain occasions, third-party services are consulted (external environmental consultancies and accounting offices) due to a lack of qualified environmental accounting professionals in the state of Pará. Despite the growth in the Amazon region, it is still predominantly made up of Small and Medium-sized commerce and service Companies (SMCs).

Mary Oliveira was recently called to attend a meeting with two Econorte directors, Fernando and Marcelo, who showed her a new scenario she was unaware of: the existence of carbon credit certificates. Marcelo explained that the company was beginning to expand its operations internationally and, as a result, there was a greater demand for the company to be more environmentally aware, in addition to aligning with the Sustainable Development Goals (SDGs) of the 2030 Agenda. He highlighted the need to implement and use this tool through the clean development mechanism, and ascribed head accountant Mary with acquiring and managing the carbon credit certificates. Mary listened attentively and requested some time to further study and understand the entire process; however, she assured the directors that her team would provide the necessary answers.

Mary Oliveira shared this information with the accounting department to discuss the ways this new demand from Econorte could be met. After a number of meetings, they decided the company's accounting systems needed to be improved upon, in addition to training the accounting team and effectively sharing relevant information. However, a few of the aspects remained unclear to her and the entire team, perhaps a reflection of the quality of the information provided by Econorte's accounting team.

2. Challenges of Sustainable Development in the Amazon

The Amazon region has one of the richest and most important biomes in terms of biodiversity in the world, with the largest territorial extension of tropical forests on the planet with approximately 350 million hectares, in addition to 7 million km² and more than 100 billion tons of carbon. However, the incentive for debate in Brazil was late, after the Rio 92 convention,

through discussions on the preservation and development of the Amazon with the disclosure of the risks related to the lack of a sustainable development and maintenance program of the Amazon, a topic of global relevance (Mello, 2015). These risks are the main challenge for sustainable development in the Amazon since this relationship involves private interests and the supply of products to a population (Mello, 2015).

On the other hand, the term sustainable has a number of different meanings depending on the perspectives, understandings, and aspirations of researchers or groups who study and/or work with the issue (Barbosa; Drach & Corbella, 2014; Blewitt, 2008; Yolles & Fink, 2014). Some authors believe that the logic of sustainability is overloaded with potentially conflicting conceptualizations that try to explain the different meanings of sustainability.

These different meanings came about from the amalgamation of intellectual and political currents, such as: i) biology, which defends the correct exploitation of natural resources, and manifests itself in a constant income; ii) ecology, which is linked to the preservation of individual species in ecosystems subject to human intervention; iii) the economy, adhering to economic growth without compromising natural resources; and iv) sociology, which is related to development that preserves society, maintaining social relations (Ciegis et al., 2009; Gatto, 1995; Mebratu, 1998; Paehlke, 2005).

In this sense, the difficulty lies with the natural resources available on Earth, which are finite, whether through the biosphere's ability to absorb pollutants or the supply of natural resources and energy that are clearly limited in space and time (Adams, 2006; Quental et al., 2011). Therefore, the challenge of sustainable development in the Amazon consists mainly of finding a balance between using natural resources without harming the environment. These challenges include thinking about strategies for controlling natural resources and aim toward replenishing, maintaining and monitoring the internal and external impacts of the broad use of the Amazon.

We need to think about effective solutions to solve social, economic and environmental problems, ones that meet the desires and demands of society. These solutions must be aimed at developing the place, especially those that are still in the process of expansion (Canto et al., 2020). Development here is mistakenly linked to actions that benefit the majority of parties directly interested in the development process; however, one of the particularities involves recognizing that there are setbacks in advances and that these must be controlled so that everyone involved can maintain their relations with the environment without harming it.

A practical example of this duality between development and regression is the extraction of wood in the Amazon. Even though this activity generates development, economy, income, quality of life, is a practical utility for consumers and generates benefits for users, doing so without the proper control brings imbalance between those who depend on the environment and the land to live, and indirectly to the ecosystem in general, even harming indigenous peoples. The sense of development in the first situation is that these extractions would be enhanced, streamlined with the help of technology and encouraged by producers and interested parties, as the more wood-derived products on the market, the more advantages between producers and consumers.

However, given this scenario and the adverse and harmful effects associated with this activity, it was important to create regulations, norms/laws, and awareness programs, intensify rigid inspections and improve continuous control processes so that this system remained healthy for everyone involved, including the environment. This resulted in an increase in the price of wood products due to the small quantity available on the market that was in constant demand,

and the regulated "burden" for those who carry out the extraction of natural resources. However, even with the apparent negative effects of controlling these resources (slowing down the development of producers in the area) it is still relevant for the sustainable development of natural resources in the Amazon.

In light of this, there are different measures that can be taken to control, seek sustainable development, and map the damage resulting from human actions on the environment and natural disasters, such as fires. These measures may come from society in general, from social control, and from legitimate participants who define programs and policies aimed at the sustainability of natural resources. It can also come from initiatives put forth by professionals, researchers, and specific regulators in the area who propose legal mechanisms for monitoring and controlling these resources, without harming the environment.

One of the practical results of this control will be discussed in the next section, which looks at how accounting for carbon credits can help control and gauge the effects that economic exploitation of the environment in the Amazon causes on the climate.

3. Carbon Credits to Help Solve Environmental Problems

The environment in the Amazon is being damaged and is losing its ability to remove carbon dioxide (CO_2) from the atmosphere, the predominant gas that contributes to increasing the greenhouse effect and plays a role in slowing down the process of global warming (Pivetta, 2020). Between 2010 and 2017, the Amazon rainforest, the largest tropical forest in the world, emitted (on an annual average) hundreds of millions of additional tons of carbon into the atmosphere compared to what it absorbed and stored in its vegetation and soil (Gatti, Basso, Miller, Gloor, Domingues, Cassol & Neves, 2021).

The balance of carbon dioxide emission and absorption by the Amazon was presented at the American Geophysical Society (AGU) meeting held between December 9th and 13th, 2019. At this meeting it was revealed that, during the period examined, the Amazon region proved to be a stable source of carbon, according to Luciana V. Gatti, chemist and coordinator of the Greenhouse Gas Laboratory (LaGEE) at the National Institute for Space Research (INPE). Gatti is the individual responsible for the atmospheric measurements that support the results of this work, which conclude that, not including data from years marked by major droughts (2010, 2015 and 2016), the ecosystem almost reaches a neutral balance, although carbon emissions still slightly exceed carbon absorption (Gatti et al., 2021).

There are some external, natural/physical factors and internal factors arising from human actions that disrupt this balance. One example is periods of severe drought that reduce the trees' ability to remove carbon dioxide from the atmosphere, as a result, this reduced capacity leads to an increase in carbon dioxide emissions. An example of this is the fires (which can be a result of both external and human actions) that release all the carbon dioxide stored in vegetation into the atmosphere. In addition to this release, natural devastation also consumes carbon absorption units (forests, plants, trees, etc.). Since there is less vegetation, there is less photosynthesis - which reduces the amount of CO_2 in the atmosphere. Under normal conditions, the opposite is true: light and carbon dioxide are converted into energy for plants, and oxygen is then released into the atmosphere.

In addition to the worrying natural factors, there is carbon dioxide released by companies, which is the intended focus of this case study. The environmental problem caused by the excess emission of pollutant gases by companies is one of the most debated topics at

present day. The Kyoto Protocol came about as a result of discussions initiated by the United Nations (UN), a protocol demanding that developed countries reduce part of their Greenhouse Gas (GHG) emissions through anti-pollution measures and/or with the use of emission reduction certifications.

These anti-pollution measures that generate carbon credits operate like certificates. They are proof that a company has reduced its gas emissions. This protocol determined that one ton of carbon dioxide that is not emitted into the atmosphere is equivalent to a carbon credit. These credits are converted into currencies that can be sold to other companies that are unable to reduce their emissions and thus offset them.

Given the relevance of this relationship between carbon and the environment, controlling and monitoring of this balance is clearly important. Scientific data on the amount of carbon emitted by carbon generating units into the atmosphere can identify the urgency and need for specific reforestation or inspection programs in certain areas, identify how society is dealing with natural resources, inform of the progress and evolution of the greenhouse effect and, consequently, global warming. Carbon credit accounting involves recording and monitoring the positive balances from companies reducing their pollutant gases.

4. The Accounting Dilemma with Carbon Credits

The first challenge involves the nature of the object. Its intangible nature initially makes it difficult to individually measure. Another challenge involves the resources available for collection. A study conducted by Pivetta (2020) determined the carbon emission and consumption balance from 513 measurements over an eight-year span: every two weeks a small plane would fly over the four points where air samples were collected. For instance, companies measure this by comparing before and after scenarios for a company's carbon emission reductions.

Yet another challenge involves the accounting legislation or the lack of it. At present day, after having met international accounting standards set by the *International Accounting Standards Board* - IASB (under Law No. 11,638/07 (Brazil, 2007) and Law No. 11,941/09 (Brazil, 2009) in addition to declarations issued by the Accounting Pronouncement Committee - CPC), Brazilian accounting supports research that aims toward reaching an agreement on the accounting approach to carbon credits; however, this conceptual consensus and accounting practices are still nebulous in the literature, even with the rising concerns over protecting the environment and, in particular, the Amazon region.

The fictional story presented in this paper would present some academic challenges in terms of the distance between the object and the practice as this subject is not common among accounting students, especially if they live in large urban centers and are not involved in discussions on deforestation and sustainable development. There is the additional challenge of reaching a consensus on accounting practices and an understanding of their relevance in the curricula for undergraduate accounting courses in Brazil.

Continuing our story from earlier, Mary Oliveira talks to her assistant, Silva Gomes, about the carbon credits market:

- "Silva, carbon credit certificates are important for the environment. I've read that they help countries reduce their emission of gases that are harmful for the ozone layer. This also encourages companies to use this sustainable practice in the market".

- "Mary, I agree that the carbon credits market is an interesting measure for all economic and social agents, but the lack of adequate regulation can affect an organization's accounting department, and this lack of uniformity is reflected in the quality of information generated, in particular comparability and reliable representation. After all, how do we account for carbon credit certificates?"

- "You have a point, Silva. The literature on environmental accounting lists different treatments. There is a doctrinal approach which argues that carbon credit certificates are part of the company's operations as there is an economic benefit from reducing gas emissions, as well as from the assets that play an important role in this process, classified as Fixed Assets".

- "That's right, Mary. However, there is an argument that certificates are not tangible assets and organizations are only using a right connected to their core activity, which led this asset to be classified as an "intangible asset". There are also discussions on whether certificates are financial assets or just a company expense. So the question is how are we going to classify carbon credit certificates in Econorte's financial statements?"

- "I really don't know, Silva... maybe we need to establish some criteria or justify our decision in explanatory notes. One thing I do know is that we have an issue on our hands and we need to resolve it the best way possible so as not to negatively affect our company".

Teachers and students can discuss this conversation and reflect on the best way to record carbon credits in Econorte's financial statements in light of the studies conducted and suggested for reading. They can compare forms and guidelines from accounting records in terms of their importance toward reducing carbon emissions, and also consider the inconsistencies and weaknesses of having no accounting standard for carbon credits in companies.

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Part II – Teaching Notes

5. Pedagogical Procedures and Overall Guidelines

Teaching notes are tools to help the teacher oversee the student's pedagogical training. Here we shall address the paths and objectives of accounting for carbon credits, seeking solutions to and providing suggestions for the dilemma.

5.1 Data Source

The solutions we present are the result of a combination of academic efforts and documentary/bibliographical research. The academic efforts aimed to find the best way to transmit the content, taking into account the limitations and potential of the students in the class. The documentary investigation involved searching for appropriate methods and content, using academic work platforms as well as normative materials and articles that helped to understand the topic. For this research, we consulted sources such as *Web of Science* and *Google Scholar*.

After searching the platforms, we selected the suitable materials for the educational objectives of this teaching case. The experiences of the authors of this article were also used as sources as they have already taught environmental courses and are familiar with the students' realities and the particularities of the Amazon.

5.2 Educational Objectives

The proposal to develop a teaching case on the topic of carbon credits was designed to promote theoretical discussion on environmental issues and help students understand the relevance of the topic within a socio-environmental system. This teaching case also seeks to

encourage and improve students' critical reasoning, decision-making, and problem solving skills. From a teaching perspective, the case develops a sense of collectivity and teamwork among the students by applying new methodologies that facilitate learning and seeking other teaching possibilities.

The notes from this teaching case could serve as inspiration or encouragement to other educational institutions when thinking about how to include it in accounting courses and demonstrate the importance of the issue to citizens and professionals in the area. The deliberations around this issue go beyond the boundaries of the classroom; they can be used as a challenge and place the student in the role of the accounting professional who has to record these facts.

5.3 Applying the Case

The target audience for this teaching case are teachers and students of business courses, for subjects such as Environmental Accounting, Environmental Management, Socio-environmental Responsibility, and Sustainable Development. This kind of discussion can also be held in postgraduate courses since it involves the conceptual, normative and practical processes, which require further discussions.

The case will be applied in the classroom in the following manner: 1), the teacher asks the students to read the materials in advance. Once in the classroom, teachers and students discuss, identify the problem, and identify the gaps which they intend to fill. The teacher then divides the class into groups to discuss and address any questions, arguments or input. This group dynamic is a tool that provides an important experience because “a simulated situation, developed to create experiences for those who learn, serves as a starting point for their own process of investigation and learning” (Kolb, 1984, p.11). Below is a table with a list of activities and suggested duration.

Table 1
Suggested Class Plan

Activity	Suggested Duration
Students read the case prior to class	20-25 minutes
Teacher explains the case	15 minutes
Additional questions and observations	15 minutes
Divide into groups	5 minutes
Group discussions	50-60 minutes
Groups give their answers	25 minutes
Teacher wraps up class	30-45 minutes
Total Estimated Time	160-190 minutes

Source: *research data.*

We suggest a lesson plan consisting of 7 activities, with a total duration of approximately 160 to 190 minutes, from the preliminary reading of the case until the teacher wraps up class. We recommend holding an expository dialogue with the class to exchange knowledge and experiences when giving their answers.

6. Discussion Questions and Answers

a) Amid the growing concern about sustainability and climate change, why is it relevant and essential for professionals like Mary Oliveira to dedicate themselves to studying carbon credit accounting?

Suggested Answer:

Studying carbon credit accounting from a technical perspective is important to understand the context in which it emerged. It is important for several reasons, it shows students how accounting can be useful in environmental contexts and it especially helps them understand how an accounting certificate can affect the pollution *versus* the environment relationship. Another important aspect is that carbon credits can become revenue and help develop strategies and processes to maximize results without compromising the preservation of the environment.

The student training is also an important aspect. By studying and discussing this topic, students exchange views on the intangibles, on negotiations, on strategies, and on technical aspects related to the chart of accounts that increase their academic and personal knowledge.

b) If you were the company accountant and needed to resolve the demand of managers, how would you explain the criteria for adopting carbon credits?

Suggested Answer:

According to the Kyoto protocol (which entered into force in February 2005 and establishes protocols to reduce emissions), clean development projects (involving developed and developing countries) must meet the following requirements in order to have a certificate issued: Voluntary participation approved by the party involved, real and measurable long-term benefits related to climate change mitigation, reduce emissions that would occur had there been no certification.

c) How are carbon credit certificates for reducing gas emissions classified in the company's financial statements? And how are entries made in the chart of accounts?

Suggested Answer:

1) <u>Carbon Credits on Financial Statements</u>:

Uhlmann et al (2011) conducted research on technical statements in accounting. Their conclusion was that Carbon Credit Certificates (CCCs) generated by the company (and which are in accordance with current regulations) are classified as intangible assets, but if a company intends on selling CCCs in the short term, they are classified as financial assets. So, if a company aims to sell carbon credits, they should be recorded in a specific account in current assets as a financial tool available for sale.

2) Carbon Credits in the Chart of Accounts:

Although present day accounting is guided by essence and not form, Ribeiro (2005) highlights the relevance of uniform treatment so that communication fulfills its role of assisting in the decision process and bringing accounting information to the statements without losing its comparable nature.

There are two accounting perspectives involved here; the carbon credit buyer's and the carbon credit seller's. Table 2 below summarizes the available accounting options.

Table 2
Accounting Methods

Event	Accounting Entry	Authors
Purchase for Stock Market	Debit: Temporary Environmental Investments (Carbon Credits) Credit: Availability	Tasso & Nascimento (2005)
Purchase for Future Reserve to Fulfill Quotas	Debit: Permanent Assets (Environmental Investments Carbon Credits) Credit: Availability	Tasso & Nascimento (2005)
Accounting for Receiving Quotas	Debit: Current Assets – Realizable Environmental Rights (Carbon Certificates) Credit: Current Liabilities – Environmental Obligations (Carbon Quotas)	Tasso &Nascimento (2005)
Obtaining the Right to Sell / Purchase Credit	Debit: Current Liabilities – Environmental Obligations (Carbon Quotas) Credit: Current Assets – Realizable Environmental Rights (Carbon Certificates)	Tasso &Nascimento (2005)
Cost Activation	Debit: Product Stock – Wood Planting, Maintenance and Management Costs Debit: Product Stock – Carbon Incremental Management and Certification Costs Credit: Cash	Ferreira, Bufoni, Marques & Muniz (2007)
Issuing Permits	Debit: Product Inventory - Wood Planting, Maintenance and Management Costs Debit: Product Stock – Carbon Incremental Management and Certification Costs Credit: Cash	Ferreira, Bufoni, Marques & Muniz (2007)
Selling Permits	Debit: Cash Credit: Revenue Carbon Credits Debit: Unrealized gains (PL) Credit: Certified Carbon Stock Debit: Cost of Carbon Sold Credit: Certified Carbon Stock Débito: Caixa	Ferreira, Bufoni, Marques & Muniz (2007)

Source: *Adapted from Maciel et al (2009).*

d) As the company's accountant, how would you approach the benefits of adopting carbon credits for employees?

Suggested Answer:

According to the Ministry of Environment's Forest+Carbon report (2020), the voluntary carbon market is an environment for those who want to conserve native vegetation and offset their emissions. In the Amazon, for example, regions with high levels of deforestation will have forest conservation credits generated in order to avoid further deforestation. In the Pantanal, credits will be generated in important ecological corridors. In the Cerrado and Caatinga, credits will be generated by replacing or reducing the use of native firewood as an energy source, which helps maintain important remnant habitats.

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