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Current overview of carbon credit in sustainable engineering and its contribution to health: Sustainability in focus

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ABSTRACT

This study covers a dynamic essential to environmental confrontations, especially global warming. Therefore, the general objective of this study is to verify the importance of a revolutionary response such as the use of carbon credits, in encouraging the reduction of greenhouse gas emissions and, therefore, promoting sustainable environmental practices. Given the scenario presented in this study, it is understood that environmental impact guidelines have become essential tools in the engineering process to contribute positively to environmental sustainability. In this way, sustainable engineering helps in collective health, reducing harm to health and adding a healthier life to society, promoting contentment. Technological innovations in engineering are fundamental to developing effective sustainable solutions. The development and realization of new technologies are often incentivized through carbon credits, encouraging progress towards more sustainable engineering practices. Carbon credits can also enable companies to adopt more sustainable mechanisms, thus reducing greenhouse gas emissions. These credits provide the market with attributing a monetary value to the reduction of emissions, driving more agile technological wealth.

Keywords: Sustainability, Carbon credit, Public health.

INTRODUCTION

The theme of sustainable engineering represents an innovative and essential response to contemporary environmental challenges, especially in the face of global climate change. This integration of sustainable strategies in engineering contributes to the development of a more resilient and ecologically responsible society, marking a significant change in the way projects are planned and executed (QING et al.). At the heart of this transition are carbon credits, market tools created to encourage the reduction of greenhouse gas emissions and promote sustainable environmental practices. Since their conception in the Kyoto Protocol, carbon credits have evolved, reflecting a growing global awareness of climate change and the urgent need for sustainable solutions (LIU et al., 2015).

Sustainable engineering not only benefits the environment, but also has significant implications for public health. Reducing greenhouse gas emissions is directly related to improving air quality, which, in turn, reduces the incidence of respiratory and cardiovascular diseases (KLUMPP; DOMINGOS; PIGNATA, 2023). Studies indicate that air pollution is responsible for millions of premature deaths each

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year, and sustainability initiatives such as carbon credits can play a crucial role in mitigating these impacts (LANDRIGAN et al., 2018).

In fact, sustainable engineering encompasses a diverse range of disciplines and applications, from construction to energy production, each with specific challenges related to sustainability. This field requires a comprehensive understanding of the environmental, economic and social impacts of engineering activities (MATHEWS, 2008). Furthermore, the incorporation of sustainable engineering practices can lead to healthier urban environments, promoting the well-being of local populations through the creation of green spaces and reduction of noise pollution (KHREIS; MAY; NIEUWENHUIJSEN, 2017).

In the meantime, carbon credits can encourage companies and engineering projects to adopt more sustainable methods, reducing their greenhouse gas emissions. These credits function as a market mechanism that assigns a monetary value to the reduction of emissions, encouraging investments in cleaner and more efficient technologies. They transform carbon reduction into an economically viable and competitive strategy for climate-conscious companies (LIU et al., 2015). Furthermore, reducing carbon emissions is associated with improvements in public health, as it reduces exposure to harmful pollutants and, consequently, reduces health costs related to pollution-associated diseases (NIELSEN et al., 2019).

Given this context, carbon credits emerge as an indispensable tool in sustainable engineering, essential for a more sustainable and balanced future from an environmental and public health point of view. They not only encourage environmental protection, but also promote significant health benefits by reducing the incidence of diseases caused by air pollution and creating healthier urban environments.

OBJETICVE

The objective of this study is to describe in a narrative way the current panorama of carbon credit in sustainable engineering and its contribution to health.

METHODOLOGY

The methodology used in this study was based on a bibliographic review using the Virtual Health Library (VHL) and Web of Science databases. The search strategy applied in the databases included the terms "Sustainability OR Sustainability OR Sustainable AND Engenharia OR Engineering AND Saúde OR Health AND Crédito de Carbono OR Carbon Credit". Data collection took place in April 2024. Original research articles, literature reviews, case studies, conference reports and book chapters that address the current panorama of carbon credit in sustainable engineering and its contribution to the health.

DEVELOPMENT

Government policies and regulations can contribute to shaping the environment in which carbon credits operate, directly influencing the way companies approach sustainability in their engineering projects (XU; SOLANGI; WANG, 2023). Technological innovations in engineering are fundamental to developing effective sustainable solutions. The development and implementation of new technologies are often incentivized through carbon credits, stimulating progress towards more sustainable engineering practices (VENKATARAMA REDDY, 2009). Sustainable engineering is characterized by its interdisciplinary nature, requiring knowledge and collaboration between various areas to develop holistic and effective solutions. This field highlights the importance of integrating diverse perspectives and knowledge to face the complex challenges of sustainability (BAKSHI, 2019).

Education and training in sustainable engineering are essential to prepare the next generation of engineers to face current and future environmental challenges. Universities and educational institutions are increasingly incorporating sustainability into their curricula, reflecting the need for a more comprehensive and sustainability-centered educational approach (BAKSHI, 2019). Furthermore, promoting sustainability practices in urban environments can significantly contribute to public health, creating healthier and safer cities (KHREIS; MAY; NIEUWENHUIJSEN, 2017).

Environmental impact assessments have become fundamental in the engineering process, ensuring that projects not only comply with regulations but also contribute positively to environmental sustainability. These assessments are critical to understanding and minimizing the negative environmental impacts of engineering projects (Lankey & Anastas, 2002). In the energy sector, the challenge is to balance the growing demand for energy with the need to reduce carbon emissions. Carbon credits play a vital role in this transition, encouraging the adoption of renewable energy sources and more efficient practices (PRASAD; VENKATRAMANAN; SINGH, 2021). The future of sustainable engineering and carbon credit markets are deeply intertwined. Collaboration between different sectors, including engineers, policymakers, entrepreneurs and scientists, will be essential to face future challenges and maximize the opportunities emerging in this dynamic field.

In this context, carbon credits emerge as fundamental instruments in sustainable engineering, providing economic incentives for reducing greenhouse gas emissions. These credits allow companies and projects to adopt more sustainable methods, by assigning a monetary value to the reduction of emissions, encouraging investments in cleaner and more efficient technologies (LIU et al., 2015). In addition to their environmental benefits, carbon credits have significant implications for public health, as the reduction of emissions is directly associated with improved air quality, reducing the incidence of respiratory and cardiovascular diseases (KLUMPP; DOMINGOS; PIGNATA, 2023) .

The application of carbon credits covers a wide range of sectors within sustainable engineering. In construction, for example, the use of low-carbon materials and the implementation of ecological construction practices can be encouraged through these credits, resulting in more energy-efficient buildings with a lower environmental impact. Case studies in different countries have demonstrated that incorporating carbon credits into construction projects can lead to substantial savings in CO2 emissions (VENKATARAMA REDDY, 2009).

In the energy sector, carbon credits play a vital role in encouraging the transition to renewable energy sources such as solar, wind and biomass. The adoption of these energy sources is crucial to reducing dependence on fossil fuels and reducing greenhouse gas emissions. Renewable energy projects benefiting from carbon credits have shown a significant reduction in carbon emissions, contributing to the mitigation of climate change and improving public health by reducing air pollution (PRASAD; VENKATRAMANAN; SINGH, 2021).

In addition to traditional sectors, carbon credits also encourage technological innovations in engineering, promoting the development of new sustainable technologies. These incentives have led to significant advances in areas such as energy efficiency, carbon capture and storage technologies, and more sustainable production processes (TITIRICI et al., 2015). Investment in research and development of green technologies is essential to face contemporary environmental challenges and achieve global climate goals.

Sustainable engineering, due to its interdisciplinary nature, requires collaboration between different areas of knowledge to develop holistic and effective solutions. This collaboration is essential to face the complex challenges of sustainability, which include not only reducing carbon emissions, but also promoting balanced economic and social development (BAKSHI, 2019). In this context, government policies play a crucial role in creating a regulatory environment that supports and encourages the use of carbon credits in engineering projects (XU; SOLANGI; WANG, 2023).

The impact of carbon credits goes beyond environmental protection, offering significant economic benefits. They create new markets and employment opportunities, especially in emerging sectors such as renewable energy and sustainable construction. At the same time, they promote social justice by supporting projects that benefit local communities, such as reforestation initiatives and energy efficiency programs in low-income areas (BALETA et al., 2015).

Education and training in sustainable engineering are essential to prepare the next generation of engineers to face environmental challenges. Universities and educational institutions are increasingly incorporating sustainability into their curricula, reflecting the need for a more comprehensive and sustainability-centered educational approach (BAKSHI, 2019). This training is crucial to ensuring future

professionals are equipped with the skills and knowledge necessary to implement sustainable practices in their careers.

FINAL CONSIDERATIONS

Given the scenario presented in this study, it is understood that environmental impact assessments have become indispensable tools in the engineering process, ensuring that projects not only comply with regulations, but also contribute positively to environmental sustainability. These assessments allow for a deeper understanding of the potential impacts of projects and are critical to minimizing negative effects on the environment. The integration of carbon credits into these processes further strengthens the sustainable approach, ensuring that emission reduction targets are achieved in an efficient and responsible manner.

In short, carbon credits play a crucial role in promoting sustainable engineering, not only encouraging the reduction of greenhouse gas emissions, but also providing economic, social and public health benefits. The flexibility and scope of these credits allow a wide range of projects to contribute to global sustainability, making them an indispensable tool in the fight against climate change and building a more sustainable and balanced future.

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