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Voluntary Carbon Credits as a Strategic Approach to Mitigate Climate Change: A Systematic Literature Review

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ABSTRACT

Climate change is recognised as one of the most significant environmental threats facing the world today. Voluntary carbon credits have become a key approach for mitigating climate change by lowering emissions and encouraging sustainable development. However, many voluntary carbon credit projects are of poor quality and do not deliver the claimed emissions reductions. This research aimed to assess the contribution of voluntary carbon credits towards additional greenhouse gas emissions reductions and the overall mitigation of climate change. A systematic literature review was conducted on 40 articles sourced from the Scopus and Clarivate Web of Science databases using the PRISMA protocol. The systematic and bibliometric analyses triangulated both qualitative and quantitative research approaches. The study established market dynamics, funding of VCC projects, and quality of VCC as primary themes related to climate mitigation by VCC. Literature also discusses the quality of VCC, market dynamics, accountability, double counting, additionality, permanence, risks of reversals and leakage, neocolonialism, and justice as key themes that challenge the effectiveness of VCC in mitigating climate change. The study recommends the standardisation and proper regulation of voluntary carbon credit systems to enhance transparency, accountability, and actual reduction of greenhouse gases.

Keywords: Additionality, voluntary carbon standards, greenhouse gas emissions, carbon credits, neo-colonialism.

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INTRODUCTION

Global warming and the corresponding global climate change represent one of the greatest challenges for individuals and policymakers worldwide, with far-reaching consequences for ecosystems, human health and the economy. This challenge resulted from continuous emissions of carbon dioxide, methane, and nitrous oxide, among other gases in the atmosphere, owing to the mass industrialisation in developed and developing economies.[1] The Paris Agreement and the Kyoto Protocol made an urgent call for a reduction in greenhouse gas emissions and a transition to a low-carbon economy to reduce the worst impacts of climate change. However, after decades of ratification of international agreements and implementation of various policies to address climate change, progress remains slow.

The Kyoto Protocol established carbon credits as a key component of the greenhouse gas emission reduction mechanism. Countries with Kyoto commitments were mandated to meet their targets by reducing emissions, removing carbon from the atmosphere or investing in emission reduction projects.

[1] G. Singh, *Understanding Carbon Credits* (Aditya Books Pvt. Ltd., 2009).

Outside the Kyoto-compliant mechanism, voluntary carbon credit offset schemes were developed as a strategy to enhance carbon neutrality for companies which were outside the inclusion criteria of the Kyoto Protocol certifications but were willing to partake in the reduction of greenhouse gas emissions. In recent years, Voluntary Carbon Credits (VCC) have emerged as a strategic approach to mitigate climate change. These credits provide a unified approach for companies, individuals and nations to offset their greenhouse gas emissions.

Nevertheless, after decades of the implementation of VCC and carbon neutrality disclosures by nations and companies, global temperatures continue to increase, and nations continue to experience the aftermath of climate change. There remains no consensus on the role of VCC towards climate mitigation, with some arguing that the credits facilitate greenwashing by creating the illusion of carbon neutrality, whilst providing a survival floor for companies to continue emitting high levels of greenhouse gases. Many VCC projects fail to reduce emissions as claimed, and companies offsetting carbon emissions usually seek to buy at the lowest price, hence compromising the quality of the VCC.[2] This study aims to examine the contribution of voluntary carbon credits toward additional greenhouse gas emissions reduction and the ultimate mitigation of climate change.

This study aims to address the following research questions.

1. How is the impact of VCC on lowering greenhouse gas emissions and preventing climate change perceived in the literature?
2. What are the key factors influencing the effectiveness of VCC in reducing greenhouse gas emissions?
3. Which best practices may be deduced in mitigating climate change through VCC?

METHODOLOGY

A systematic literature review with bibliometric analysis was adopted in this study. Through bibliometric analysis, literature metrics were analysed to assess the influence of VCC on climate change mitigation. The two methods were triangulated to address the research questions of the study through qualitative and quantitative approaches.

Inclusion and Exclusion Criteria

Data were systematically extracted from the Scopus and Web of Science databases; these two databases were selected based on their comprehensive coverage of journals from various disciplines.[3] Years of literature search were informed by major international agreements that facilitated VCC. An advanced search using the search string ("voluntary carbon credits" AND climate AND change* AND (carbon AND credits* OR carbon AND emission AND disc*)) was conducted in February 2025, and a total of 118 articles were obtained. A systematic filtering process involving the merging of the two datasets, sorting of data, removal of duplicates and the reading of abstracts was conducted. Articles that were out of scope and duplicates were removed; only a total of 40 articles qualified for inclusion. Table 1 shows the inclusion and exclusion criteria.

Table 1: Inclusion and exclusion criteria of the systematic review

Eligibility Criteria	Inclusion	Exclusion
Time Frame/ Years	Limit determined major international agreements that facilitated VCC (2016-2024)	2016 and below
Publication language	English	Other
Electronic Databases	Scopus and Clarivate Web of Science	Other Sources/ Inaccessible Studies
Relevance/Setting	Related to VCC	Not related to VCC

[2] Rohini Pande, "Can the Market in Voluntary Carbon Credits Help Reduce Global Emissions in Line with Paris Agreement Targets?," *Science* (American Association for the Advancement of Science, 2024).

[3] Naveen Donthu et al., "How to Conduct a Bibliometric Analysis: An Overview and Guidelines," *Journal of Business Research* 133 (2021): 285–96.

Document Type	Journal articles, conference papers, Books and book chapters	Other
Source type	Open access and green	Other
Publication Status	Published in Journals	Unpublished

Source: Authors' compilation 2025

Only articles written in the English language were considered, and the publication years were determined by major international agreements that facilitated VCC, like the Paris Agreement. Published journal articles, conference papers, books, and book chapters were considered. Figure 1 shows a flowchart of the systematic search of the literature.

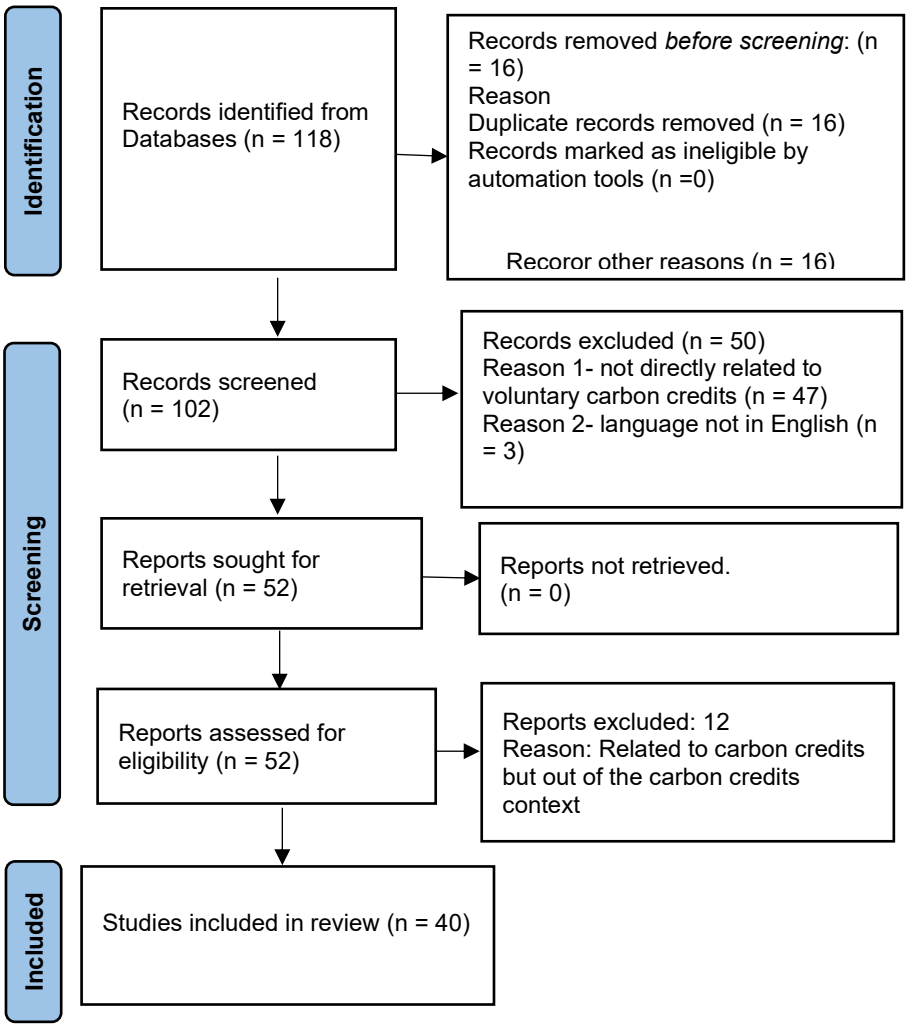

Figure 1: PRISMA flow chart of the literature review process
(Source: Authors compilation 2025)

Data Analysis

Bibliometric analysis was conducted by Vos viewer software and Excel, whilst systematic review was conducted through qualitative thematic analysis. A quantitative analysis of academic literature was conducted based on citation analysis, keyword co-authorship analysis, co-authorship analysis and network visualisations was conducted analysis.[4] Bibliometric analysis is a rigorous method that analyses large datasets. Content and thematic analyses were conducted to determine the major themes related to climate change mitigation by VCC. Inductive coding was utilised, where themes emerged from the data itself.

[4] Donthu et al., "How to Conduct a Bibliometric Analysis: An Overview and Guidelines."

PRESENTATION OF FINDINGS

Bibliometric Descriptive Statistics

This study's review of the literature on voluntary carbon credits as a strategic way to mitigate climate change spans the years 2016–2024 and incorporates information from 36 sources, generating insights from 40 papers. The average citation rate in the current literature is 21.3, which indicates how much each paper adds to the corpus of knowledge. The authors' collaboration was concentrated in the same country, with 146 authors working together and 11 single-authored works. Table 2 lists the papers that were taken into consideration for the systematic literature review, along with their descriptive statistics.

Table 2. Descriptive statistics of the papers

Main information about the data	
Timespan	2016-2024
Sources (Journals)	36
Documents	40
Average citation per document	21.3
Document content	
Author's Keywords	256
Authors	
Authors	146
Authors collaboration	
Single-authored docs	11

Source: Authors' compilation 2025

Contribution according to Country

The United Kingdom, China, the United States of America and the Netherlands emerged as the highest contributors to VCC and climate change mitigation regulation literature. However, there is a poor representation of developing nations in the literature under study, especially from the African context. The low representation of literature in Africa could be due to the high concentration of VCC markets in developed nations outside Africa. Figure 2 shows the country's contribution to VCC and climate change literature.

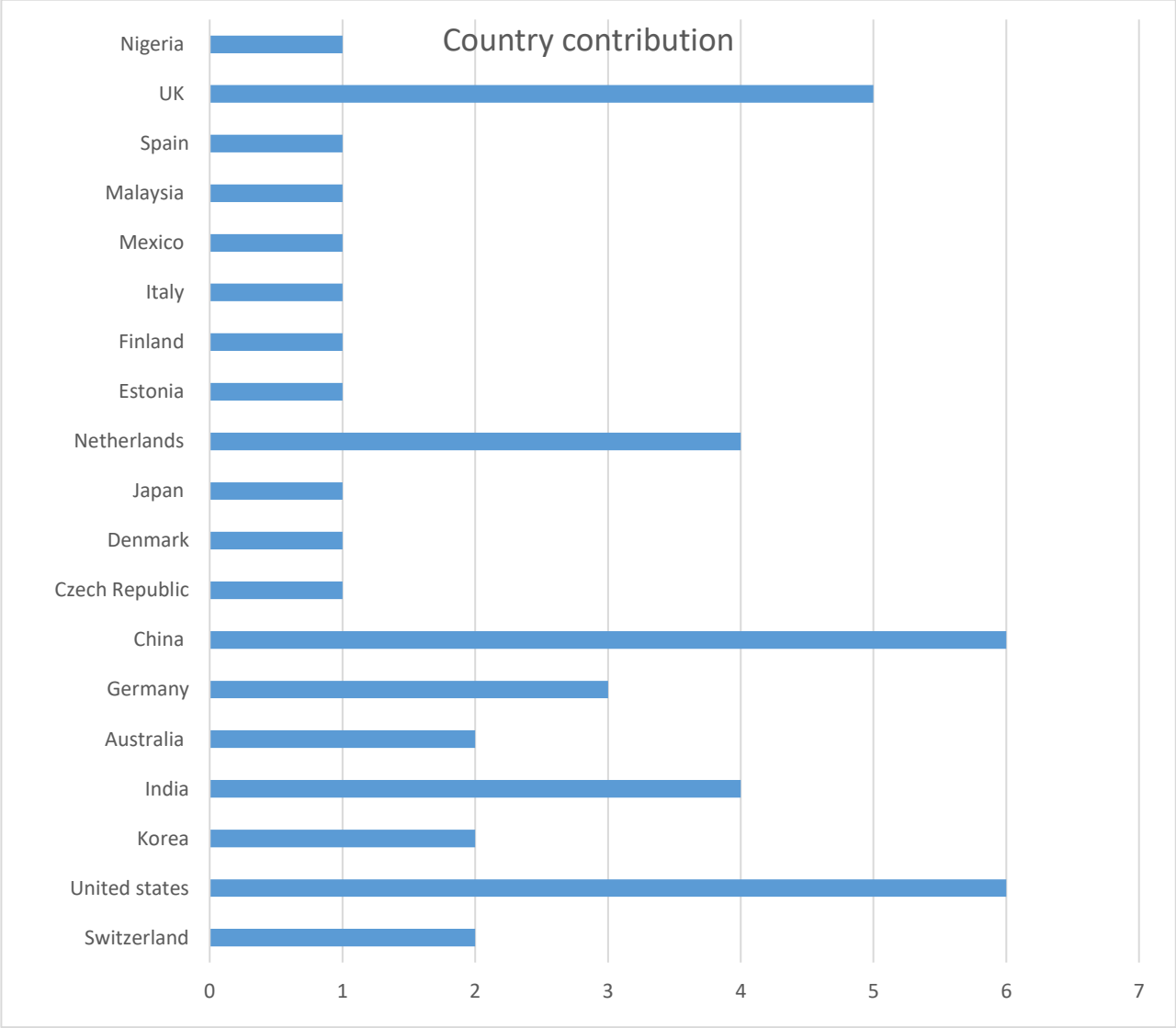

Figure 2. Country contribution (Author's compilation, 2025)

Keyword co-occurrence

A research theme can be identified by the specific associations recognized between its keywords.[5] Hence, a keyword co-occurrence analysis was conducted to determine the main themes and trends in the VCC and climate change literature. Only keywords that occurred at least three (3) times were considered for analysis. A total of thirty-five (55) keywords were mentioned more than three times (Figure 3). Trends in the current VCC and climate change literature show an emphasis on carbon sequestration, the Paris Agreement, climate governance, climate change, emission trading, offsets, biomass, deforestation, renewable energy, carbon neutral and nature-based solutions, as shown in Figure 3. Hence, VCC contributes towards climate change mitigation through financing renewable energy, nature-based solutions, and conservation to facilitate climate governance and emission trading offsets as stipulated in the Paris Agreement.

[5] Francis Kamewor Tetteh, Kwame Owusu Kwateng, and John Mensah, "Green Logistics Practices: A Bibliometric and Systematic Methodological Review and Future Research Opportunities," *Journal of Cleaner Production* 476 (2024): 143735.

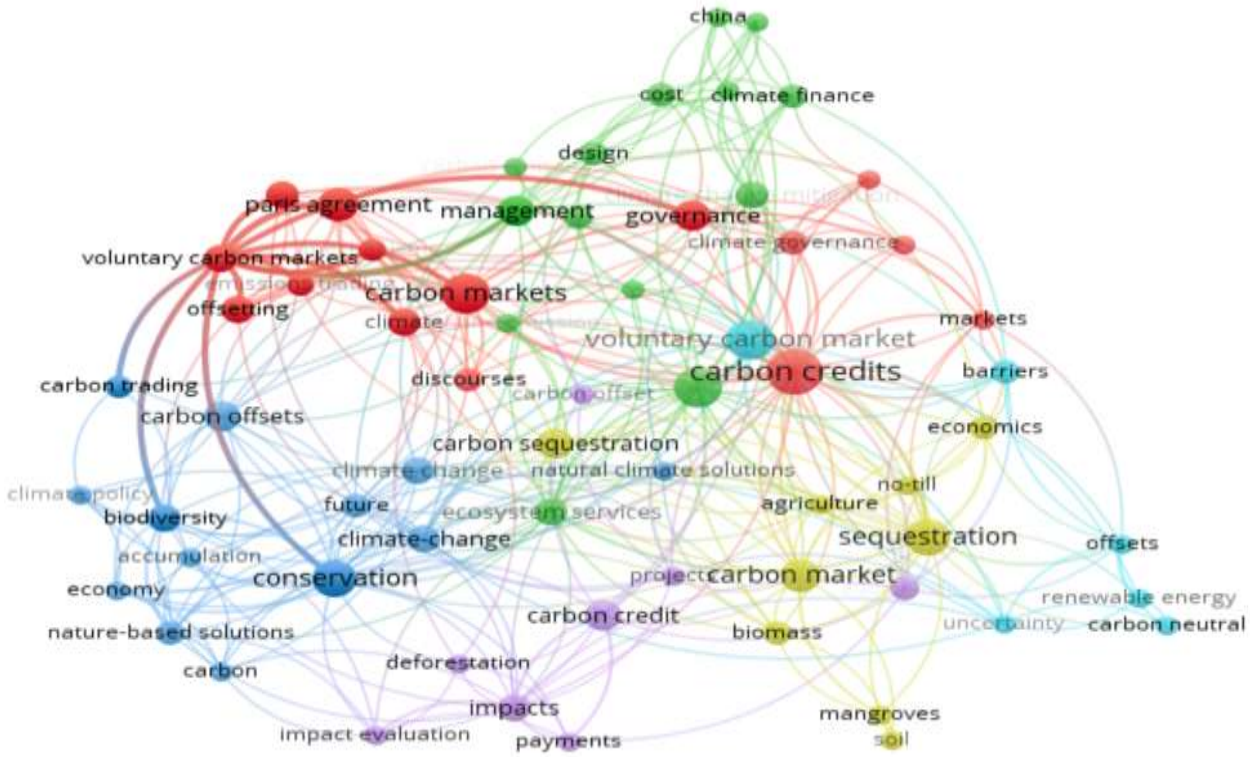

Figure 3. Co-occurrence of keywords (Author's compilation, 2025)

Thematic Analysis

A comprehensive qualitative thematic analysis was conducted to identify and examine the contribution of VCC to climate change mitigation. Themes were assigned to articles after reading the full article. Inductive coding of themes where codes emerged from the data itself was employed. The current literature mainly focuses on market dynamics (n = 11, 28%), funding of VCC projects (n = 10, 25%) and quality of VCC (n = 8, 20%). Environmental governance and reducing greenhouse gas emissions ((n = 5, 13%), additionality, permanence, risk of reversals and leakage (n = 3, 8%), facilitation of the just energy transition in developing countries (n = 2, 5%), neo-colonialism and justice (n = 2, 5%), and accountability and double counting (n = 1, 2.5%), unified approach and global culture of environmentally conscious actions (n = 1, 2.5%) also emerged as major themes towards the contribution of VCC to climate change mitigation. The next section examines the identified themes in detail.

DISCUSSION

VCC as a strategic approach to mitigate climate change.

Theme One: Quality of VCC

Literature concurs that the quality of carbon credits invested determines the effectiveness of VCC in reducing greenhouse gases and ultimately mitigating climate change.[6] Drawing from the Kyoto Protocol and standard best practices, quality carbon credits should be additional, apply robust baselines, apply robust quantification methodologies, apply monitoring and reporting, avoid carbon leakage, avoid double counting and should be permanent. However, due to the uncertainty of carbon quality and the lack of direct benefit to the companies offsetting carbon emissions, companies usually seek to pay or buy at the lowest possible price. Hence, there is a need for a standardised mechanism to price and ensure that funded projects lead to an actual reduction in GHG emissions.

Trencher et al. assessed VCC retired by 20 businesses that oversaw the retiring of the largest volumes on the voluntary carbon market on the three largest registries, namely Gold Standard, Verra's Verified Carbon Standard, and the United Nations Clean Development Mechanism, between January 2020

[6] Pande, "Can the Market in Voluntary Carbon Credits Help Reduce Global Emissions in Line with Paris Agreement Targets?"

and December 2023.[7] According to the study, businesses sourced inexpensive, low-quality offsets with a high chance of failing to produce significant and additional emissions reductions. According to the authors, most offsets do not promote effective climate mitigation since they do not adhere to industry criteria regarding age and country of implementation. The authors pointed out that businesses bought VCC from offsets from renewable energy projects and REDD+ (forest conservation), which tend to overcredit and exaggerate their additionality.

In contrast, Lee et al. regarded forest carbon credits as more beneficial compared to carbon reduction credits, as they provide socio-economic benefits like job creation, poverty alleviation, erosion control, water resource management, and conservation of biodiversity, hence the company's motivation to buy them.[8] However, recent literature provides evidence of exaggerated historical deforestation trends, failures to reduce deforestation to levels claimed by developers, emissions leakage, where deforestation shifts to another area and the use of overaged projects.

Theme Two: Market Dynamics

Market dynamics emerged as a major theme of the role of VCC in climate change mitigation.[9] VCCs are traded over the counter and not through organised exchanges, hence the price of the VCC varies widely depending on the offsetting registry and location.[10] However, variability in prices undermines the effectiveness of the VCC market, as some projects invested in by registries do not result in the additional removal of greenhouse gases. Wongpiyabovorn et al. noted that low demand and illiquidity are inherent in nature-based carbon credits.[11]

To promote efficient absorption and reduction of greenhouse gas emissions, Netter et al. argued for the application of the gold standard in voluntary carbon markets.[12] The gold standard promotes standard pricing models for specific projects, provides transparency and ensures high-quality credits. Furthermore, to increase the fungibility of VCC, Sorensen promoted structured pools for tokenised carbon credits.[13] In the same vein, Christiansen promoted digital VCC monitoring, reporting, and verification to enhance VCC quality.[14] Digitalisation and the adoption of recent technology in trading and monitoring VCC market dynamics have the potential to improve efficiency in the system.

Theme three: Accountability and Double-counting

Pande pointed out the lack of accountability towards projects funded by VCC registries as a major drawback to VCC's contribution to the actual reduction of greenhouse gases.[15] The author argued that since information about the carbon reduction projects is difficult to verify, the true emissions reductions from projects and confirmation that the project was implemented are difficult to account for. This lack of accountability creates opportunities for fraud since registries are not well monitored.[16]

Literature also documents double-counting as a major drawback to the effectiveness of VCC. Offsetting projects are usually funded by VCC registries in developed nations to fund projects in developing nations. However, the country of the registry that funds the project and the country where the

[7] Gregory Trencher et al., "Demand for Low-Quality Offsets by Major Companies Undermines Climate Integrity of the Voluntary Carbon Market," *Nature Communications* 15, no. 1 (2024): 6863.

[8] Dong-Ho Lee, Dong-hwan Kim, and Seong-il Kim, "Characteristics of Forest Carbon Credit Transactions in the Voluntary Carbon Market," *Climate Policy* 18, no. 2 (2018): 235–45.

[9] Ram Ranjan, "Balancing Greenwashing Risks and Forest Carbon Sequestration Benefits: A Simulation Model Linking Formal and Voluntary Carbon Markets," *Forest Policy and Economics* 168 (2024): 103317.

[10] Pande, "Can the Market in Voluntary Carbon Credits Help Reduce Global Emissions in Line with Paris Agreement Targets?"

[11] Oranuch Wongpiyabovorn, Alejandro Plastina, and John M Crespi, "Challenges to Voluntary Ag Carbon Markets," *Applied Economic Perspectives and Policy* 45, no. 2 (2023): 1154–67.

[12] Leonie Netter, Eike Luedeling, and Cory Whitney, "Agroforestry and Reforestation with the Gold Standard-Decision Analysis of a Voluntary Carbon Offset Label," *Mitigation and Adaptation Strategies for Global Change* 27, no. 2 (2022): 17.

[13] Derek Sorensen, "Structured Pools for Tokenized Carbon Credits," in *2023 IEEE International Conference on Blockchain and Cryptocurrency (ICBC)* (IEEE, 2023), 1–6.

[14] Kirstine Lund Christiansen, "Relegitimising the Voluntary Carbon Market: Visions of Digital Monitoring, Reporting and Verification," *Environment and Planning A: Economy and Space* 57, no. 8 (2025): 1190–1205.

[15] Pande, "Can the Market in Voluntary Carbon Credits Help Reduce Global Emissions in Line with Paris Agreement Targets?"

[16] Wongpiyabovorn, Plastina, and Crespi, "Challenges to Voluntary Ag Carbon Markets."

actual project is located can include the project in their national emission commitments, hence, facilitating double accounting and reducing the effectiveness of the VCC in mitigating climate change.[17]

Theme four: Unified approach, global culture of environmentally conscious actions and corporate social responsibility

Mankayarkarasi and Ramalakshmi noted that the VCC system offers a sustainable pathway that promotes a global culture of responsibility for environmentally conscious actions while also taking into consideration economic implications.[18] In contrast to the Kyoto Protocol carbon credits, which only offered offsetting credits to highly emitting institutions, the voluntary carbon markets allow both organisations and individuals to contribute towards carbon neutrality. Hence, providing a unified approach for everyone to contribute towards climate change and developing a culture of environmentally conscious actions. VCC also provides a platform for corporations to demonstrate corporate social responsibility and enhance public relations.[19]

Theme five: Funding for carbon reduction projects

There is consensus in the literature that VCC markets contribute significantly to the financing of greenhouse gas reduction and removal projects. Howie et al. established that the VCC market has the potential to facilitate the establishment of blue carbon ecosystems that include mangrove forests, tidal marshes, and seagrass meadows in offering carbon sequestration capabilities in Australia.[20] Financing of blue carbon wetland restoration sites has a higher potential of reducing greenhouse gases in the atmosphere. Zetterberg et al. further indicated that VCC has the potential to finance the establishment of BioEnergy Carbon Capture and Storage, which is lacking funding in Sweden.[21]

Philanthropic and government funding would not suffice to fund the transition to a carbon-neutral economy. Hence, carbon markets are vital in financing the transition. Sorensen argued that the voluntary carbon market must be accepted as it enables finance for nature projects, which struggle to attract resources.[22] To meet the Paris Agreement targets of holding the global temperature increase below 2 ◦C above the preindustrial levels, every human activity needs to be carbon neutral by 2050.

Theme six: Additionality, permanence, risk of reversals and leakage

Literature documents additionality, permanence, risk of reversals and leakage as major causes of concern for VCC. Carbon credits developers are mandated to ensure that activities or projects supported by carbon finance are additional, which means that the project should lead to greenhouse gas emission reduction or removal, which could not have been achieved in the absence of the voluntary carbon credit activity.[23] Furthermore, invested projects should not increase greenhouse gas emissions or reduce carbon sinks elsewhere. Resultant carbon removals should be permanent to contribute to climate change mitigation.[24] However, Wongpiyabovorn et al. argued that carbon stored in nature is more prone to being released back into the atmosphere due to pests, disease, drought, storms and wildfire.[25] Issues of leakage arise if efforts to sequester carbon in one place led to increased emissions elsewhere. Additionality is not standardised and is sometimes based on subjective judgement. There is also a risk that farmers participating in voluntary carbon programs could discontinue contracted practices.

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[17] Clare Duncan et al., "Potential for Return on Investment in Rehabilitation-Oriented Blue Carbon Projects: Accounting Methodologies and Project Strategies," *Frontiers in Forests and Global Change* 4 (2022): 775341; Pande, "Can the Market in Voluntary Carbon Credits Help Reduce Global Emissions in Line with Paris Agreement Targets?"

[18] Brathikan Vijayamohan Mankayarkarasi and Aparna Ramalakshmi Murugan, "Energy Transition Through Voluntary Carbon Credit System," in *Energy Sustainability*, vol. 87899 (American Society of Mechanical Engineers, 2024), V001T04A006.

[19] Yadav Sapkota and John R White, "Carbon Offset Market Methodologies Applicable for Coastal Wetland Restoration and Conservation in the United States: A Review," *Science of The Total Environment* 701 (2020): 134497.

[20] Alice H Howie et al., "Seas the Opportunity: Multi-Criteria Decision Analysis to Identify and Prioritise Blue Carbon Wetland Restoration Sites," *Frontiers in Environmental Science* 12 (2024): 1431027.

[21] Lars Zetterberg, Filip Johnsson, and Kenneth Möllersten, "Incentivizing BECCS—a Swedish Case Study," *Frontiers in Climate* 3 (2021): 685227.

[22] Sorensen, "Structured Pools for Tokenized Carbon Credits."

[23] M. Dyck, C. Streck, and D. Trouwloon, "The Voluntary Carbon Market Explained (VCM Primer)," *Climate and Land*, 2023.

[24] Anna Laine et al., "Guide to Good Practices for Voluntary Carbon Markets: Supporting Voluntary Mitigation Action with Carbon Credits," 2023.

[25] Wongpiyabovorn, Plastina, and Crespi, "Challenges to Voluntary Ag Carbon Markets."

Theme seven: Neo-colonialism and justice

Literature also documents neocolonialism as a major factor arising from perceptions of justice in nature-based VCC projects. There exists a lack of understanding of forest management within the context of Reducing Emissions from Deforestation and Forest Degradation (REDD+) projects, which generally neglect forest history and forest-reliant communities. Some religious forest practices, which are demarcated as destructive and illegal, are part of cultural practices. Furthermore, some REDD+ projects displace communities and stop them from subsistence farming, which is a vital source of funding for rural economies, hence failing to integrate environmental and adaptation justice concerns with conservation priorities. Literature documents that carbon forestry projects marginalise those communities that live in proximity to and depend on the forest as a key resource. This creates local resentment and resistance.

Despite the rise of nature-based conservation programs, a fierce debate persists concerning justice and the protection of communities' justice, assessed in the context of the beliefs and judgments held by the individuals concerned.[26] Huxham et al. argued that the commodification of nature through carbon credits could be problematic for the inhabitants of the land. [27]Furthermore, the disproportionate allocation of benefits by elites through their social or economic status negatively affects the effective implementation of VCC projects. The rights, values, interests, and knowledge of all individuals involved should be recognised and respected, offering a fair and meaningful role in the planning and implementation of interventions. Literature posits that deforestation accounts for approximately 14% of annual global greenhouse gas emissions, and reducing it is essential to the climate change mitigation strategy.[28]

Theme eight: Facilitate the just energy transition in developing countries.

Developing nations depend on fossil fuels, coal, wood and open fires for energy. Carbon mitigation projects established in developing nations facilitate the implementation of the just energy transition through investing in renewable energy projects and technologies.[29] Karhunmaa argued that VCC funding for emissions reductions created through the uptake of technologies that either increase energy efficiency or use renewable energy at the household level has a positive impact on the livelihoods of households.[30] Such technologies include improved cookstoves, biogas digesters (biodigesters), water filters, solar water heaters, solar cookers, and energy-efficient lights and bulbs. These technologies contribute to the reduction of greenhouse gas emissions in rural areas.

Theme nine: Environmental governance and reducing greenhouse gas emissions.

Smits noted the fragmentation of global governance architectures related to environmental management in Thailand and Vietnam.[31] The authors argued for good coordination between parties within and outside the government and between climate and energy transitions if fragmentation is to be reduced. There is a need for coordination of policies governing the just energy transition, carbon credits and environmental governance, as these policies all contribute towards climate change mitigation. Lee et al. advocated for the adoption of the Verified Carbon Standard, Plan Vivo, Gold Standard, Climate Action Reserve, American Carbon Registry, and ISO 14064 in the development of forest carbon projects for effective governance.[32]

The VCC facilitate carbon reduction and removal initiatives like carbon capture, carbon storage, forest restoration and just energy transition.[33] However, there is no consensus in the literature on the

[26] Mark Huxham et al., "Rawls in the Mangrove: Perceptions of Justice in Nature-based Solutions Projects," *People and Nature* 5, no. 5 (2023): 1497–1511.
[27] Huxham et al., "Rawls in the Mangrove: Perceptions of Justice in Nature-based Solutions Projects."
[28] Margaret McCallister et al., "Forest Protection and Permanence of Reduced Emissions," *Frontiers in Forests and Global Change* 5 (2022): 928518.
[29] Allegra Dawes, *Voluntary Carbon Markets: A Review of Global Initiatives and Evolving Models* (Center for Strategic and International Studies (CSIS), 2023).
[30] Kamilla Karhunmaa, "Opening up Storylines of Co-Benefits in Voluntary Carbon Markets: An Analysis of Household Energy Technology Projects in Developing Countries," *Energy Research & Social Science* 14 (2016): 71–79.
[31] Mattijs Smits, "The New (Fragmented) Geography of Carbon Market Mechanisms: Governance Challenges from Thailand and Vietnam," *Global Environmental Politics* 17, no. 3 (2017): 69–90.
[32] Lee, Kim, and Kim, "Characteristics of Forest Carbon Credit Transactions in the Voluntary Carbon Market."
[33] Sapkota and White, "Carbon Offset Market Methodologies Applicable for Coastal Wetland Restoration and Conservation in the United States: A Review."

effectiveness of VCC in mitigating climate change due to investment in low-quality projects, poor governance, market dynamics and justice concerns. The literature documents the continuous rise of global temperatures regardless of the increase in VCC investments, which calls for more drastic measures to reduce VCC. In Bihar and Punjab States, Cariappa et al. discovered that farmers can cut greenhouse gas emissions by approximately 1.97 tonnes of carbon dioxide per hectare of land by implementing conservation practices like zero/reduced tillage, stopping residue burning, using less nitrogen fertiliser, and reducing irrigations during the wheat production season.[34]

Future developments and trends in the field of study

Literature trends reflect VCC as a unified approach to financing projects that reduce, capture or store greenhouse gases. There is an estimated increase in demand for voluntary carbon credits as more companies seek to offset their carbon emissions and demonstrate corporate social responsibility. Future studies should focus on policies and standards that can be put in place to improve the quality of VCC, improve the trading of VCC and improve technologies that can reduce greenhouse gas emissions at source. The concerns of neocolonialism and justice continue to gain momentum in communities where VCC are established. Digitalisation and tokenisation of VCC through blockchain technologies have the potential to transform the sector. The major voluntary carbon credits markets are concentrated in developed countries; however, the development of such markets in developing countries in Africa can also facilitate African companies to participate in voluntary carbon credits, increasing funding for localised projects in the process.

CONCLUSION

Carbon trading was popularised by the Kyoto Protocol's cap and trade system for carbon; however, only industrialised countries were required to participate. Trading VCC offers a unified approach to achieving carbon neutrality and addressing climate change. In addition to funding carbon reduction projects and ultimately decreasing greenhouse gas emissions, literature also discusses the quality of VCC, market dynamics, accountability, double counting, additionality, permanence, risks of reversals and leakage, neocolonialism, and justice as key themes that challenge the effectiveness of VCC in mitigating climate change. The study advocates for standardisation and proper regulation of VCC systems to enhance transparency, accountability, and actual reduction of greenhouse gases. VCC markets should implement strong governance and oversight mechanisms to prevent greenwashing and preserve the integrity of carbon credits.

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