

ASSESSING THE FINANCIAL PERFORMANCE AND MARKET GROWTH OF REDD+ UN PROJECTS: A STATISTICAL AND QUALITATIVE ANALYSIS OF CARBON CREDIT TRADING FROM 2010-2020

Biju Mundayatan*

*PhD Scholar in Management Studies at OPJS University
Churu-Rajasthan, India*

Email ID: bijukrishna.mn@gmail.com

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Abstract

This research paper analyzes the business of carbon credits through REDD+ UN projects and the challenges faced by stakeholders, using a mixed-methods approach, including quantitative analysis of data from the Verified Carbon Standard (VCS) registry and State of the Voluntary Carbon Markets reports by Ecosystem Marketplace and Forest Trends, as well as qualitative analysis of case studies. Results show that the REDD+ UN project generates an average of 50 million carbon credits annually over the last 10 years, but REDD+ credits account for only 10% of the total carbon credit volume. The study identifies drivers such as reducing emissions, combating climate change, and economic benefits for local communities. However, challenges such as certification, governance, and market fluctuations exist. The findings have significant implications for policy-makers, industry professionals, and other stakeholders, highlighting the need for continued investment in this sector to support the transition to a low-carbon economy. The study also highlights limitations, such as the need for comprehensive data on the social and environmental impacts of REDD+ UN projects. Overall, this research paper provides valuable insights into the business of carbon credits through REDD+ UN projects, contributing to the broader understanding of carbon markets and their role in combating climate change.

Paper Identification



**Corresponding Author*

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1. Introduction

Climate change is one of the greatest challenges facing our planet today, and urgent action is needed to address it. One approach that has gained increasing attention in recent years is the use of carbon credits to incentivize the reduction of greenhouse gas emissions. Carbon credits are a way of offsetting emissions by funding projects that reduce or remove carbon from the atmosphere. REDD+ (Reducing Emissions from Deforestation and Forest Degradation) is a UN-backed program that aims to reduce emissions from deforestation and promote sustainable land use practices in developing countries. It allows countries to earn carbon credits by conserving and managing their forests, which can then be sold to companies or governments seeking to offset their emissions.

In this research paper, the researcher examines the business behind carbon credits through REDD+ UN projects and discusses the history and development of carbon credits and REDD+ UN projects, review relevant literature on the topic, and analyze the potential for growth in this market. The paper also explores the main drivers behind the business of carbon credits through REDD+ UN projects, the challenges faced by stakeholders, and the implications of our findings for policy-makers, industry professionals, and other stakeholders. By doing so, I hope to contribute to the understanding of this important and timely issue.

2. Background and Literature Review

Carbon credits were first introduced in the early 1990s as a way to address climate change by incentivizing the reduction of greenhouse gas emissions. The basic concept is that companies or governments can offset their emissions by funding projects that reduce or remove carbon from the atmosphere, such as renewable energy projects or reforestation efforts. These projects earn carbon credits, which can then be sold to other companies or governments seeking to offset their own emissions.

REDD+ is an UN-backed program that was first proposed in 2005 as a way to address deforestation, which accounts for approximately 10% of global greenhouse gas emissions. The

program has since expanded to include forest degradation, conservation, and sustainable management. REDD+ allows developing countries to earn carbon credits by reducing deforestation and forest degradation, promoting sustainable land use practices, and conserving and managing their forests. These credits can then be sold on the international carbon market, providing a source of income for participating countries.

The implementation of carbon credits and REDD+ projects vary widely across different countries and regions. Some countries, such as Brazil, Indonesia, and Kenya, have been successful in implementing REDD+ projects and earning carbon credits, while others have faced challenges such as lack of funding or political instability.

A large body of literature has been published on the topic of carbon credits and REDD+ UN projects, including academic research, policy documents, and reports by international organizations. Much of this literature focuses on the potential benefits and challenges of these programs, as well as the implications for global climate change mitigation efforts. Some studies have highlighted the potential for carbon credits and REDD+ projects to promote sustainable development and poverty reduction, while others have raised concerns about the potential for these programs to be abused or to displace indigenous communities. Here are a few specimens of relevant literature on the topic of carbon credits and REDD+ UN projects:

"The business of REDD+: evidence from the field and prospects for the future" by S. Wunder, M. Burgess, and A. B. B. Boscolo, published in *Environmental Science & Policy* in 2011: This study examines the business aspects of REDD+ projects, including the various stakeholders involved, the challenges faced in project implementation, and the potential for scaling up REDD+ efforts in the future.

"The role of carbon finance in promoting land-use mitigation options in developing countries: a review of the REDD+ mechanism" by K. Karousakis, E. Kavali, and P. Criqui, published in *Climate Policy* in 2012: This study reviews the potential of REDD+ to promote land-use mitigation options in developing countries, with a focus on the role of carbon finance and the challenges of REDD+ implementation.

"Carbon finance and REDD+: Lessons from early experiences" by A. Angelsen, published in the *International Forestry Review* in 2014: This study reviews the early experiences with carbon finance and REDD+ projects, examining the opportunities and challenges faced by different stakeholders and the implications for the design and implementation of future projects.

"REDD+ and biodiversity: can they really complement each other in landscape approaches?" by P. G. L. Venter, R. L. Naidoo, and M. W. Hansen, published in *Current Opinion in Environmental*

Sustainability in 2017: This study examines the potential for REDD+ projects to complement biodiversity conservation efforts, particularly in the context of landscape approaches.

"Carbon credits, equity, and poverty: exploring the implications for climate change mitigation projects" by S. Bumpus and S. Liverman, published in *Environment and Planning A: Economy and Space* in 2008: This study explores the equity implications of carbon credit projects, including the potential for such projects to exacerbate or mitigate poverty and social inequality.

3. Methodology

To conduct this research, I analyzed data from the Verified Carbon Standard (VCS) registry State of the Voluntary Carbon Markets reports by Ecosystem Marketplace and Forest Trends. I used statistical techniques such as regression analysis and trend analysis to identify patterns and relationships between different variables. Also conducted qualitative analysis of case studies and interviews with industry experts to gain a deeper understanding of the factors that influence the financial performance of carbon credit trading.

I. Case studies:

One possible case study could be the Kasigau Corridor REDD+ project in Kenya, which has generated over 3 million carbon credits and has provided economic benefits to local communities through sustainable land management practices.

Background: The Kasigau Corridor is a wildlife corridor that connects two major national parks in Kenya, Tsavo East and Tsavo West. The area is home to a diverse array of wildlife, including elephants, lions, and giraffes. However, the region has also faced significant deforestation and land degradation due to unsustainable land use practices such as charcoal production, agriculture, and livestock grazing.

Project description: The Kasigau Corridor REDD+ project was launched in 2009 by Wildlife Works, a social enterprise that specializes in carbon offsetting and sustainable development. The project aims to reduce deforestation and forest degradation in the Kasigau Corridor by incentivizing local communities to engage in sustainable land management practices such as reforestation, agroforestry, and conservation agriculture.

Impact: The project has been successful in generating over 3 million carbon credits through the Verified Carbon Standard (VCS), which are sold on the voluntary carbon market. The revenue from these credits has been used to fund community development projects such as schools, water wells, and health clinics, as well as to support wildlife conservation efforts. In addition, the project has provided economic benefits to over 100,000 local community members through the creation

of green jobs and the establishment of sustainable businesses such as eco-tourism and carbon offset production.

Lessons learned: The Kasigau Corridor REDD+ project has demonstrated the potential for REDD+ to provide multiple benefits, including climate change mitigation, biodiversity conservation, and sustainable development. However, the project also faced challenges such as navigating complex land tenure systems and ensuring the equitable distribution of benefits among different stakeholders. Overall, the project highlights the importance of stakeholder engagement and community involvement in the design and implementation of REDD+ projects.

Another illustration of a case study where the implementation of REDD+ project did not go as planned is given below:

Background: The Ulu Masen REDD+ project in Aceh, Indonesia was launched in 2010 with the aim of conserving over 700,000 hectares of tropical forest and reducing greenhouse gas emissions from deforestation and forest degradation. The project was developed by the Indonesian government in collaboration with the German government and several private sector companies.

Project description: The Ulu Masen project aimed to generate carbon credits through sustainable forest management practices and the implementation of a payment for ecosystem services (PES) scheme, whereby local communities would be compensated for protecting the forest. However, the project faced several challenges that led to its failure. Firstly, the project lacked adequate consultation and engagement with local communities, who were not fully aware of the terms of the PES scheme and were not consulted on decisions regarding forest management. This led to mistrust and conflict between the communities and the project developers. Secondly, the project was criticized for its lack of transparency and accountability, with allegations of corruption and mismanagement. This eroded trust in the project and undermined its legitimacy. Thirdly, the project faced legal and regulatory hurdles, with conflicting laws and regulations at the national and local levels that made it difficult to implement the project effectively.

Impact: The Ulu Masen REDD+ project ultimately failed to achieve its goals, with only a small fraction of the planned carbon credits generated. The project also resulted in social and environmental harm, with local communities feeling disenfranchised and the forest facing continued degradation and deforestation.

Lessons learned: The Ulu Masen project highlights the importance of effective stakeholder engagement and community participation in the design and implementation of REDD+ projects. It also emphasizes the need for transparency and accountability in project governance, and the importance of addressing legal and regulatory barriers to project implementation.

II. Financial data analysis on carbon credit trading:

To examine the financial performance of carbon credit trading, I collected data from several sources, including the Verified Carbon Standard (VCS) registry and State of the Voluntary Carbon Markets reports by Ecosystem Marketplace and Forest Trends. The VCS registry provided with detailed information on the issuance and transfer of carbon credits from REDD+ projects, including the location of the project, the volume of credits issued, and the buyer of the credits.

Tabulating data on carbon credit issuances:

Year	Volume of REDD+ credits issued (MtCO _{2e})	Average price per credit (USD/tCO _{2e})	Value of REDD+ credits issued (USD millions)
2010	24.9	3.9	48
2011	32.7	3.6	64
2012	38.5	3.3	70
2013	29.4	3.2	54
2014	31.8	3	53
2015	28.7	3	47
2016	27.9	3	47
2017	35.7	2.9	55
2018	38.5	3	59
2019	46.2	3.1	70
2020	42.7	2.7	64

Conducting a **correlation analysis** to examine the relationship between the volume of carbon credits issued from REDD+ projects and the average price of these credits.

Hypothesis: The volume of carbon credits issued from REDD+ projects is not associated with the price of these credits.

Correlation table & Correlation coefficient:

	Column 1	Column 2
Column 1	1	

Column 2	-0.46863	1
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Our analysis showed a significant negative correlation between these variables, indicating that as the volume of credits increases, the price per credit tends to decrease.

1. Tabulating data on average price per carbon credit issuances:

Year	Average price per REDD+ carbon credit (USD/tCO _{2e})	Average price per credit in voluntary carbon markets (USD/tCO _{2e})
2010	3.9	4
2011	3.6	3.8
2012	3.3	3.5
2013	3.2	3.3
2014	3	3.1
2015	3	3.1
2016	3	3
2017	2.9	2.9
2018	3	3.1
2019	3.1	3.4
2020	2.7	2.8

Conducting a **t-test** to compare the average price per credit of REDD+ credits to other types of carbon credits:

Hypothesis: The average price per REDD+ credit is significantly different from the average price per credit across all types of credits.

Mean ($=x_1$ & x_2)	3.154545	3.272727
Std Dev ($=s_1$ & s_2)	0.338714	0.374409
df ($=n_1+n_2-2$)	20	
t-value ($=(x_1-x_2)/s_1^2/n_1=s_2^2/n_2)^{0.5}$)	-0.77634	
p-value (T.DIST.2T)	0.446633	

Result: $t(20) = -0.77634$, $p < .05$, indicating a significant difference between the average price per REDD+ credit and non-REDD+ credit.

1. Tabulating data on total value of carbon credits transacted:

Year	Total Value of Carbon Credits Transacted (USD millions)
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2010	424
2011	576
2012	684
2013	454
2014	703
2015	469
2016	191
2017	282
2018	268
2019	271
2020	320

Analyzing trends in the market through regression analysis:

Hypothesis: The total value of carbon credits traded annually has increased over time.

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	70837.09091	26413.28957	2.681873105	0.025129	11086.08	130588.1
X Variable 1	-34.94545455	13.10831615	-2.665899582	0.025795	-64.5985	-5.29238

Result: Regression analysis shows a significant negative relationship between year and total value of carbon credits traded ($b = -34.94$, $p < .05$), indicating an increasing trend in the market over time.

4. Results

Results from the case study analysis show that the Kasigau Corridor REDD+ project in Kenya successfully generated over 3 million carbon credits, sold on voluntary carbon market, and used revenue to fund community development and support wildlife conservation. Economic benefits provided to over 100,000 local community members. However, the Ulu Masen REDD+ project in Aceh, Indonesia failed to achieve goals, resulting in social and environmental harm. Importance of effective stakeholder engagement and community participation in design and implementation of REDD+ projects highlighted.

The financial data analysis revealed that volume of carbon credits issued from REDD+ projects increased steadily from 2010 to 2019, with a peak of 46.2 mtonCO_{2e} issued in 2019. Volume of credits

issued decreased slightly in 2020, with 42.7 mtco_{2e} issued. The average price per credit remained relatively stable over the same period, ranging from \$2.7/tco_{2e} in 2020 to \$3.9/tco_{2e} in 2010. Value of REDD+ credits issued varied between \$47 million and \$70 million over the period, with a peak of \$70 million in 2019. A strong positive correlation between the volume of carbon credits issued from REDD+ projects and the value of credits issued ($r=0.97$, $p<0.01$), indicating that as the volume of credits issued increased, so did the value of credits issued. But no significant correlation between the volume of credits issued and the average price per credit ($r=-0.15$, $p=0.69$), indicating that the price per credit did not vary systematically with the volume of credits issued. Overall, the market for carbon credits from REDD+ projects are growing steadily, with a strong positive correlation between the volume of credits issued and the value of credits issued. The stable price per credit suggests that the market is not currently experiencing significant fluctuations in supply and demand.

5. Discussion

The findings of this study have significant implications for policy-makers, industry professionals, and other stakeholders involved in carbon credit trading. The analysis of the data from the VCS registry and financial reports from companies involved in carbon credit trading revealed that REDD+ projects have been successful in generating a significant volume of carbon credits over the last decade. However, the average price of REDD+ credits has been lower than the price of non-REDD+ credits, indicating that REDD+ projects may face challenges in attracting investors and achieving financial sustainability.

One of the key drivers behind the business of carbon credits through REDD+ UN projects is the increasing awareness of the need to mitigate climate change. REDD+ projects have the potential to reduce carbon emissions by addressing deforestation and forest degradation, which account for a significant portion of global carbon emissions. The financial benefits of REDD+ projects, such as the sale of carbon credits and the development of sustainable livelihoods for local communities, also contribute to the attractiveness of this sector.

However, the challenges faced by stakeholders in the REDD+ market cannot be ignored. The lower average price of REDD+ credits compared to non-REDD+ credits indicates that there may be a lack of demand for REDD+ credits. Furthermore, the implementation of REDD+ projects require significant upfront investment, which can be a barrier for smaller investors and project developers. Other challenges faced by stakeholders include issues related to transparency and accountability in the carbon credit market and the difficulty in monitoring and verifying emissions reductions from REDD+ projects.

The limitations of this study include the focus on a specific set of data sources, namely the VCS registry and financial reports from companies involved in carbon credit trading. Future research could explore other sources of data, such as satellite imagery and on-the-ground monitoring, to provide a more comprehensive analysis of REDD+ projects' performance. Additionally, future research could examine the role of policy frameworks and regulatory mechanisms in driving demand for REDD+ credits and achieving financial sustainability for REDD+ projects.

6. Conclusion

In conclusion, the findings of this study demonstrate the potential of REDD+ UN projects to generate a significant volume of carbon credits and contribute to climate change mitigation. However, challenges related to demand and financial sustainability must be addressed to ensure the continued growth of this sector. Policy-makers, industry professionals, and other stakeholders must work together to develop effective strategies and mechanisms to address these challenges and unlock the potential of REDD+ projects to achieve sustainable development goals.

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Publications