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Carbon Credits: Effect on the Economy and Environment

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Abstract: This paper encompasses topics, including the implications of global warming, the intricacies of carbon markets, the benefits associated with carbon emissions reduction, and an evaluation of systems like net zero alongside other initiatives designed to normalize the discourse on carbon credits. Furthermore, it revisits and critically assesses previously established protocols and propositions within this sphere. It evaluates the practicality and efficiency of these methods and presents a conclusion. Moreover, the paper establishes connections with campaigns, introducing schemes, models, and mechanisms that have emerged in response to the growing concern over climate change. These integrations are presented as components that contribute to the impact of carbon credits on environmental governance and policy-making. By weaving together these elements, the paper aims to shed light on the role that carbon credits play in maintaining environmental sustainability, and underlining how crucial they are in the future of this field.

Keywords: Carbon Credits, Carbon Trade, Carbon Market, Energy Sources, Carbon Offset, Net Zero

Introduction

Carbon Credit is an incorporated system that is rapidly gaining notice all around the world, helping to achieve the SDG Goals [2], and net zero emissions. Different countries, especially developing countries are starting to understand the potential of carbon credits, its system, and the trade linked around it, along with its benefits in monetizing steps towards a carbon-neutral world. It appears to be fruitful for both business and environmental sections, either mediated through the government or private sector. In this research paper, we learn about the working of this system, discuss its impact, identify its underlying problems and suggest possible improvements.

Carbon credit trading has recently become an important measure against global climate change, providing a commercial solution to reduce global emissions of greenhouses gases (GHGs). The carbon credit market enables companies to trade carbon credits, or "carbon credits" for short, that equal the right to emit a particular volume of carbon dioxide or other GHGs. Carbon credit trading operates by giving an economic value to carbon emissions, thus encouraging companies to reduce carbon emissions. Although carbon credit

markets have been developed and practiced by various countries through participation in documents such as Kyoto and Paris Agreements, there is still a knowledge gap within existing publications concerning their actual impacts on companies, especially Small and Medium Enterprises (SME), and the overall societal context. Most studies that have already covered carbon credit markets have focused simply on large companies and government policies, thus providing a limited understanding of impacts on SME and carbon credit markets through their respective environmental and societal implications. Additionally, there is a lack of coverage of studies that have comprehensively accessed the actual efficiency of carbon credit markets in terms of activating actual reduction of emissions and at the same time promoting economic growth.

The main purpose of this study is to examine the role played by carbon credits in lowering GHG emissions and evaluate the economic and environmental effects arising from carbon credit trade systems. In addition, this paper will endeavor to evaluate how effective these systems are in achieving their respective objectives, specifically in developing nations that still have an evolving market. Through an evaluation of different models in use in the world, such as the Clean Development Mechanism (CDM), this study will make an effort to establish the positives and negatives inherent in such systems. In addition, it will also evaluate how effective offset credits could be in lowering emissions in areas such as the forestry and renewable energy industries, offering an all-round look at the role that the carbon credit market plays in the regulation of global emissions.

Another gap that can be addressed by conducting this research is that there is a lack of emphasis placed on carbon credits as a means for smaller enterprises to reduce carbon emissions. Smaller enterprises simply do not have the capital or the technological know-how to enable them to reduce carbon emissions on their own. Therefore, carbon credits could be a means for smaller enterprises to reduce carbon emissions as a means of helping to reach carbon reduction goals. The hindrances to smaller enterprises' participation in carbon credits are a gap that has not been fully explored by previous researchers; with this paper, it hopes to explore not only innovative means for smaller enterprises to take advantage of carbon credits to reduce carbon emissions, as well as explore innovative means for carbon credits to facilitate economic development for other countries such as Bangladesh, Liberia, and China. The relevance of this study is in its ability to make meaningful additions to the knowledge gained on how carbon credit trade systems could be optimized. The study seeks to gain insights on how these systems could be optimized to enhance their effectiveness. Additionally, the study examines the issue related to the effect of carbon credit trade systems on the environment. This issue is in relation to environmental, social, and governance performance. The study examines the effect on enterprises that are in the emerging economies. Moreover, the study examines how carbon credits could be a means to foster innovation in green technologies. Additionally, the study examines the effect on the ability to trade credits as a means to bring global cooperation in the matter related to the fight against climate change. Additionally, the study examines the flaws in the effectiveness of the current market systems like the Clean Development Mechanisms.

In conclusion, this research endeavor seeks to provide a holistic assessment of the

carbon credits market, highlighting not only economic but also environmental implications, with special attention to the dilemmas and opportunities presented to both large-scale and small-scale businesses. In this regard, by investigating prospects concerning the scale-up of such mechanisms within developing countries, this research endeavor addresses the relevant contemporary discussions concerning ways to utilize carbon credits within the bigger fight against climate change. At the end, this scholarly article endeavors to educate all relevant parties, including governments, business organizations, and environmental groupings, concerning the vital importance of ensuring optimal carbon credit trading mechanisms.

Research Method

Basics and Benefits

Trade of carbon credits is indirectly linked to reducing global panic (Warming). Multiple business opportunities present themselves and the relation with pre-decided emission limits is then highlighted. A need for implementation of different systems is required, to help in reduction of the amount of carbon dioxide in the atmosphere. The 'Kyoto Protocol' is an initiative ratified by multiple countries focusing on the core ideology of carbon credits and its trading system. Carbon Gas - Greenhouse Emissions - Its relation to cutting down emissions to prescribed limits, or applying for carbon credit certificates, or opting to pay the 'carbon tax'. For excess emissions, organizations and others buy carbon credits and sell carbon credits, which is the well-known circulating trade system. It occurs mainly at two exchanges: Chicago Climate Exchange and European Climate Exchange. Aside from being essential and helpful in the two aforementioned sectors, the primary agenda lands on global emissions; which can be controlled through carbon trading. It is a simple but effective practice; as it proves to be an open market that is both convenient and sustainable in the long run. Sustainability in those means, which concern this system and the eventual impact it will have on its surroundings and the people themselves. We can take the system of trading as a circulation, with purchases on one side and sales on the other. Purchases are conducted by companies that have exceeding quotas of gas emissions. Hence, they look to those companies that have spare carbon credits. The term of trading advances with the sales by these companies that withhold spare carbon credits. This cycle is an incentive method of ultimately stopping future harm, put forward against the environment.

Furthermore as a result, the worldwide carbon/greenhouse gas emissions stay within the boundary of permissible levels. Cumulative benefits, both economic and environment wise. Organizations and others can increase their earnings by ways of selling, being highly beneficial. At the end, if we identify its cumulative benefits; we look towards businesses and how they can get its benefit. It's ecologically sustainable, which further boosts its position as a placeholder in the upcoming era. Alongside the minute chances, that anyone will reject this ideology and system - high chances of acceptance of this system. Moreover, carbon credits can also be purchased by the norm, those who are not part of any organization. (Stakeholders, etc.) - A provided effort is aimed for in lowering one's own

carbon footprint- develops a positive outlook on this 'open' system/business. A deeper evaluation of this functionality of carbon credits, is that liquid assets put forward in purchases, are based on funding the ecological projects - working to neutralize these emissions. It also provides a realist-incentivizing thinking, with a fair way of dealing. Positive steps in this system are highly rewarded naturally. While those responsible for pollution are told to pay up. This way of dealing, essentially puts a stop to any curtained thought of harming the environment. Market of carbon credits also has a sound impact on firms. The future will handle the effects of global warming, with consideration to the application of this system.

Resultantly, business opportunities develop and multiple nations come together on trade, and provide benefits to each other, developing a mutualistic relationship and earning recognition amidst the economic and communal circle. - Nations such as India also earn respect, based on the effect they provide to the global carbon credits market. The carbon emission trading system has significantly improved enterprise (ESG) performance. It encourages enterprises to increase their Research and Development investments and enhance internal controls, leading to improved (ESG) performance. The policy has a notably positive impact on low-carbon enterprises, enterprises with high digital transformation levels, and those receiving significant government subsidies. Global Warming and Market-based Mechanisms: Carbon dioxide and other greenhouse gases are the primary causes of global warming. Market-based mechanisms like the Kyoto Protocol and the European Union Emissions Trading Scheme (EU-ETS) have been developed to coordinate resources internationally, aiming to reduce emissions and promote energy-saving policies. Carbon emission trading has resulted in environmental and economic benefits, including technological innovations. It has been linked with improvements in green development efficiency, especially for heavy polluters, and has been effective in reducing greenhouse gas emissions and altering employment patterns. This shift has also positively impacted the financial performance and asset-liability ratios of enterprises. Carbon emission trading policies can even encourage firms to meet their ESG obligations. This involves increasing regulatory pressure from governments and promoting green technology innovation. There is an observed positive spillover effect of customer ESG performance on supplier ESG performance under dual carbon policies.

D.I.D Model

The Difference-in-Difference (D.I.D) model analysis indicates that carbon emission trading policies have a significant impact on enterprise ESG performance. The model's robustness was confirmed through various tests, including parallel trend tests and excluding other policies.

Carbon Offset

Carbon offset credits is a key tool in combating climate change, assigning a monetary value to greenhouse gas emissions. Globally, carbon offset markets reached a value of over 300 billion dollars in 2020, indicating the growing importance of this mechanism in

environmental policy. According to the World Bank, investments in renewable energy projects through carbon offset credits have led to the avoidance of over 1 billion metric tons of CO2 emissions since 2005 . In terms of impact, reforestation projects funded by carbon offset credits have resulted in the restoration of millions of hectares of forests worldwide.[6] For instance, the REDD+ initiative, which aims to reduce emissions from deforestation and forest degradation, has facilitated the protection of vast forested areas, preventing the release of significant amounts of carbon into the atmosphere. Additionally, carbon offset credits have spurred innovation in renewable energy technologies, driving down costs and increasing accessibility. In 2021 alone, investments in solar and wind power projects funded by carbon offset credits accounted for approximately 40 percent of total global renewable energy capacity additions. Moreover, the economic benefits of carbon offset credits extend beyond environmental protection. By promoting the growth of green industries, such as renewable energy production and sustainable forestry, carbon offset markets have generated millions of jobs worldwide. In the European Union, for example, the carbon market is estimated to have created over 2 million jobs in renewable energy and energy efficiency sectors. All in all, it proves to be a developmental idea-based system for multiple other environmentally beneficent thoughts. As referred to, environmental provision, economically fruitful - ideology of trading, development of innovative strategies in the environmental sector. This not only allows for decreasing environmental damage, but also simultaneously allows for industries of countries like the People's Republic of China to continue functioning at optimum levels.

Net Zero System - Decarbonization

Net zero carbon emissions, amidst leaders, investors, customers, and even governments worldwide a pledge is being taken to reduce gas emissions to the lowest of the low, as soon as possible. Greenhouse gasses, especially carbon, are taken to a mainstream level on different agendas, different countries. Net zero system is an example of a system that shows the preceding effect of other ongoing and aforementioned systems. People have started to give attention to this topic, and how they require a balance in these quite possibly harmful gas emissions, as soon as possible, predicted advents go up till 2050. Advents such as decarbonization induces reduction in the overall gas emissions. These advents support the 1.5 Degree Celsius scenario as a benchmark, with reference to the chaos that can destroy ecosystems if left unchecked. 'Left unchecked' meaning the underlying effect of overuse of gas emissions. Now, the question is how can we reduce these GHG (Greenhouse Gas) emissions? Categorization of reduction and probable removal, for reduction we can use solar energy, wind and even hydro energy. - Having clean cookstoves, etc. Now, removal goes on from anywhere of revegetation to Direct Air Capture (requiring significant investment) - for eventual nature-based solutions such as soil carbon capture, and technology-based solutions, including direct air capture (which proves to be helpful in extracting GHG). Removal is essential when we concern ourselves, with the carbon market and its impact. How we can change ourselves, according to this impact. - depending on both the positives and negatives. Carbon Markets have become highly valuable and are

adapted throughout the world, amidst different businesses and companies. - aforementioned data highlights the constructive potential of carbon credits as a whole. The profit, sustainability claims and net zero probables are all future goals and aims. - Net zero scenario can lead the market to eventually overshadow and supersede the oil market- (Figure.1)

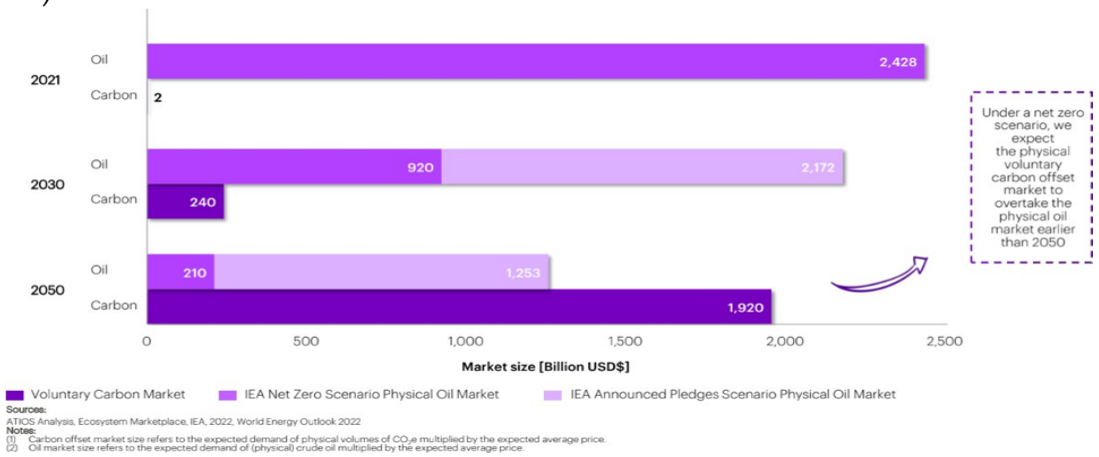

Figure 1. Carbon Market Carbon-Oil

Further Exploration - CDM

It is important to understand the Kyoto Protocol in regards to carbon credits. In response to climate change, it was signed in 1995 and put in effect in 2005. The protocol targeted to reduce carbon emissions by 5 % by 2012, in comparison to 1990 levels. . It acts upon the United Nations Framework Convention on Climate Change by committing 37 developed countries or economies transitioning from fossil fuels to limit and reduce greenhouse gas (GHG) emissions according to their specific goals. The Convention itself only asks for these countries to take measures to reduce GHG emissions and report their progress periodically. This was later replaced by the Paris Agreement, which has the aim to hold the increase of global warming to 2 ℃.

The Kyoto Protocol (Clean Development Mechanism) CDM Market is an ineffective and costly way to offset emissions, The demand for these credits in emission trading systems is likely to be out of phase with the CDM supply. Also, the rate at which CDM credits are being issued today at a time when demand for such offsets from the European ETS is extremely high is only one-twentieth to one-fortieth the rate needed just for the current CDM system to keep pace with the projects it has already registered.

The objective of the UN Framework Convention on Climate Change suggests a focus towards bringing stability towards atmospheric concentrations of greenhouse gases to limit the rate of climate change, while maintaining three aspects: food security, adaptation of ecosystems to climate change and sustainable economic development. The cost control design for the US based offset market is focused on the cap and trade system. The cap refers to the maximum possible emissions set by an organisation for a country or company, which they can not exceed. In this context, trade refers to the market for carbon-offsets as the country/company get paid if they abide by the cap set on them. However, the price depends upon the amount of emissions and the demand and supply for offsets.

The CDM market has shown to grow tremendously. In 2007, the CDM market value came up to 16.8 billion dollars, with 3000 projects either registered or in the process of registration in the project pipeline. Moreover, these 3000 projects would produce 2.2 million CERs (Certified Emissions Reduction) by the end of the Kyoto Protocol's compliance period. However, the CDM market has a few fundamental flaws: Firstly, it is unable to ensure righteous and effective use of credits, keeping the cost of transaction controlled and assuring investor certainty that their funds are used effectively in a verified project. The CDM is also unable to engage developing countries in a way which would effectively reduce emissions. Moreover, credits are granted in unpredictable quantities and after long delays Lastly, the CDM lacks control over drastic price fluctuations in the cap-and-trade markets it serves.

All of these lead to an uncertainty in the CDM market, halting its development and effectiveness.

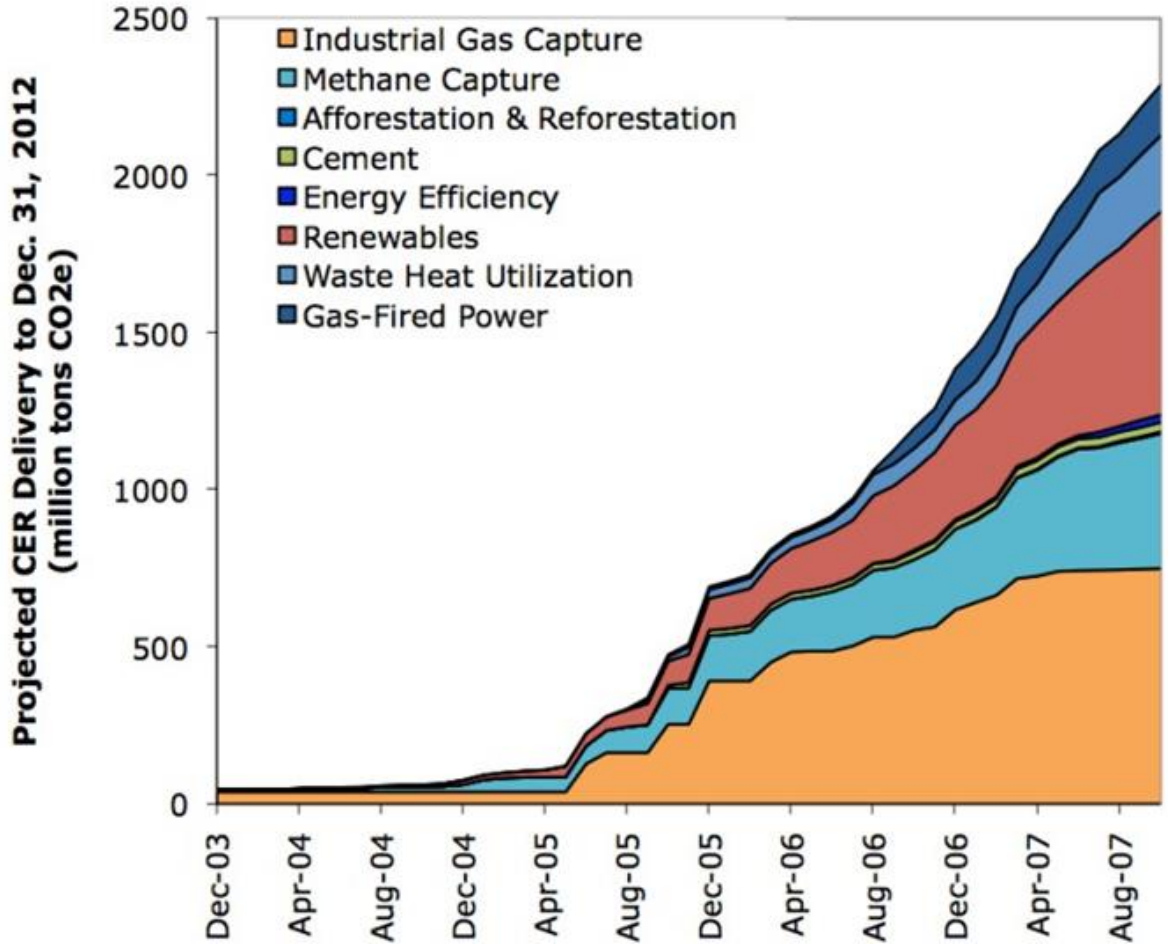

Figure 2. Quantity of CERs in China

Certified Emission Reduction / CER

Shown in figure 2 is the projected amount of CERs (Certified Emission Reduction) delivered towards the end of the Kyoto Protocol agreement period.

Different colors indicate different project types. Ear- lier, industrial gas capture projects, especially HFC-23 capture projects dominated the supply of credits. However, the volume of credits is shifting towards renewable energy projects.

CERs (Certified Emission Reduction) is analogous to a currency, but for the CDM market. They are a method of measuring the impact of a specific project or country in reducing GHG (Greenhouse gas) emissions. One CER is equal to reducing the emission of 1 tonne of carbon. Through CERs, the CDM market is able to identify the effectiveness of a project in cutting down on emissions and carbon credits are distributed accordingly.

The Chinese project pipeline is focused on because it is the most important developing country with a majority of its energy being generated by fossil fuels. This is also because of the fact that the country's economy is growing faster and it has built enough coal power stations to produce 200 Giga Watts of electricity from 2006-2007.[16] In 2008, 80 percent of China's energy was being generated by coal, but now that number has been reduced to 57 percent, due to a shift in energy sources.

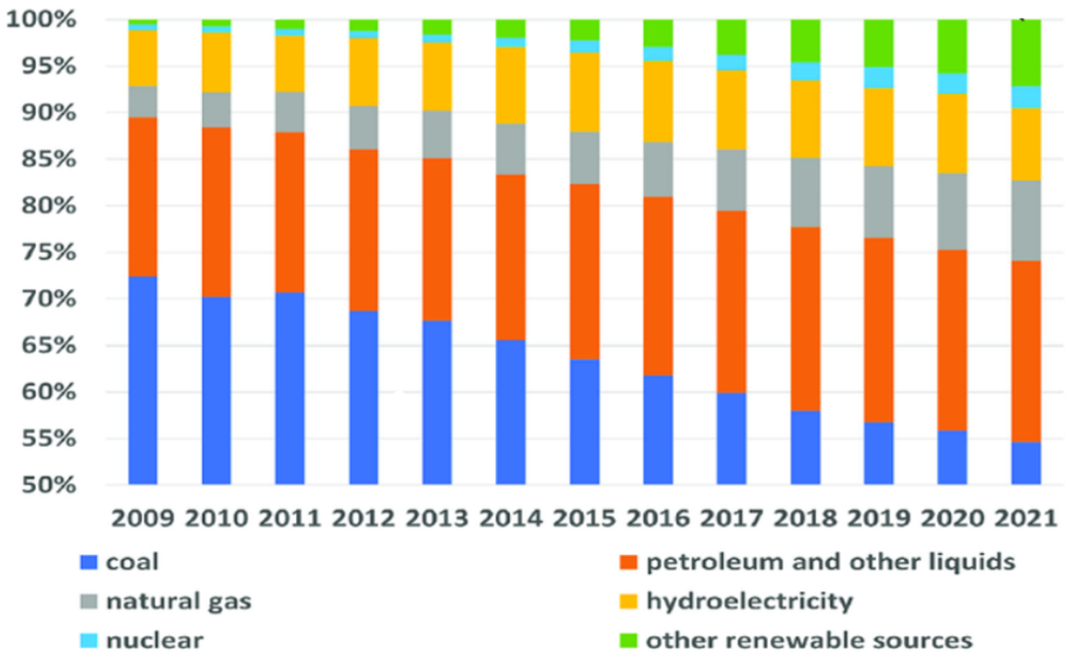

Figure 3. Shift in Energy production in China

This has resulted due to a series of policies by the Chinese government to reduce the country's dependence on coal, to reduce the environmental impacts of electricity generation, and investing in hydro, wind and nuclear power. However, nuclear power is not credited for under the current CDM rules. Carbon offsets and the CDM market have an essential role to play in reducing GHG emissions in China, especially in power generation.

The blue bars show the added capacity of hydro, wind and natural gas production in China, while the red bars show the applications for CDM credits for these projects. This figure proves the driving force for China's energy shift are

carbon credits, strengthening their credibility and effectiveness.

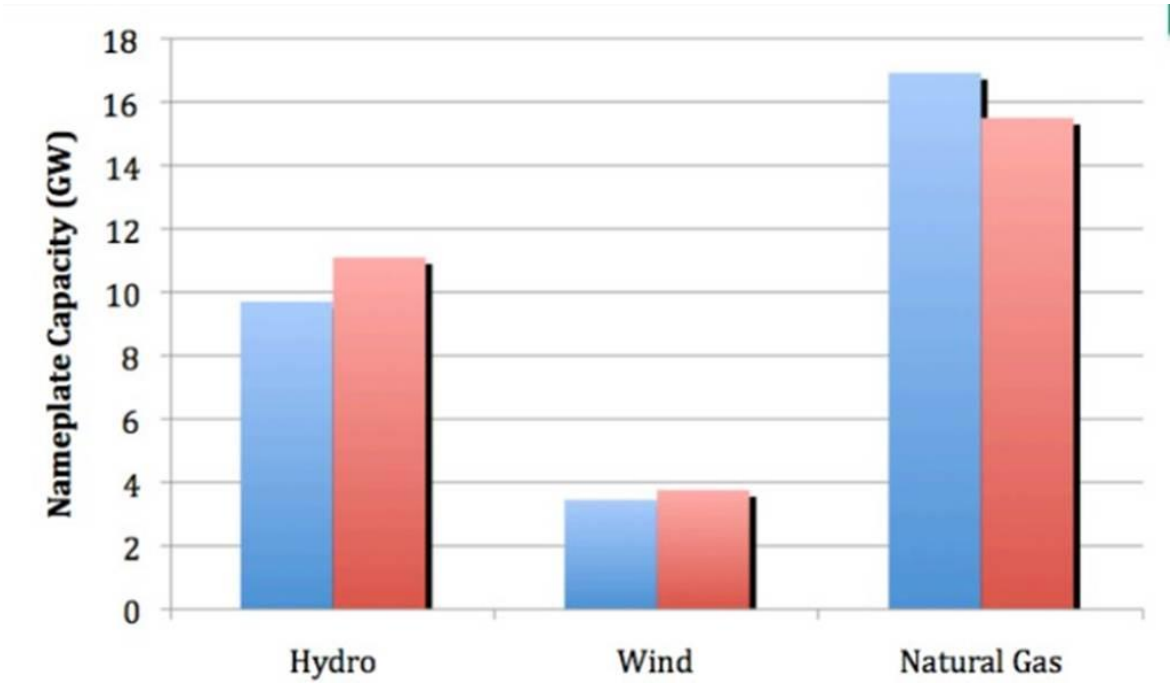

Figure 4. Effects of Carbon Credits on China's energy development

Key Problems of Carbon Offset markets

In order to fix the various problems of carbon offset markets, it is first important to understand those very problems and their effects. A fundamental challenge in any offset market is that the host governments and investors claim that their efforts are additional and were made after the agreement of the provision of offsets. The distributor of the offsets often hire third-party verifiers to check the credibility of their claims. However, these verifiers are paid by the project developers for the verification process, which is why they are obliged to approve the project. This way, offsets are distributed to most of the projects which apply for it, rendering the market ineffective at crediting true efforts and wasting the funds. This problem is made more tedious by the large amounts of projects applying for offsets. Resultantly, the distributor can not spend large amounts of time evaluating the project's eligibility, nor can it verify the actions already being made to reduce emissions of a certain pollutant. The only solution would be to carry out extensive scrutiny, however, that comes with its own additional costs. Most offset projects are pressured by their investors to reduce additional costs and allow for swift approval, resulting in a dilemma for offset markets.

These problems of lack of information regarding the credibility of projects, unreliability of third parties and increased transaction costs seem to have no solutions, in any offset market. However, proposed "programmatic" initiatives are an approach which could change the way offset markets operate and solve most of the glaring problems in offset markets. Rather than granting offsets for a project-

by-project basis, this new approach grants offsets on the basis of policy reforms or for a group of activities in a sector. By utilising this approach, additional costs may be cut down and offsets may be able to be distributed to a larger number of projects, as approval is faster as it is collective instead of individual.

Result and Discussion

Proposed Solutions: Cost Control

Some experts suggest using explicit safety valves instead of offsets, but this is not incentivizing for project owners, as the prices are set too low and their cost-benefit ratio is affected. Offsets can instead be modified with price floors and ceilings (minimum and maximum prices) by controlling the supply of credits according to demand. [19][20]

Engagement with Developing Countries

Developing countries are likely to have the highest GHG emissions as industries set up, making an offset market essential for them. However, the conventional CDM market needs alterations to meet their needs. The CDM market should focus on projects likely to be more effective in reducing harmful emissions. Countries like the U.S. can play a critical role as credit suppliers and project supervisors in these developing regions.

Reducing the Amount of Projects

While involving many projects is important, offset markets are still developing, and focusing on a smaller number of larger projects may be more effective. This would reduce administrative restrictions and ensure actual reductions are credited. Over time, offset markets should gradually accommodate smaller-scale projects as the supply of credits increases.

Climate Funds

Climate funds can be used alongside offset markets to provide credits in one delivery, avoiding market inefficiencies caused by different investors. The Green Climate Fund (GCF) is an example, but broader implementation would improve efficiency. If HFC-23 emission offsets were credited with a climate fund, costs could be reduced, and project owners would have fewer incentives to release more emissions to generate credits.

Other Measures

Money isn't the only problem in engaging developing countries. Broader diplomatic and political reforms are needed to reduce emissions, which would also help calculate offsets. China's energy shift from coal power plants shows how infrastructure changes can provide baselines for emission reduction projects.

System in Underdeveloped, Developing, and Developed Countries Developing Nations – Liberia

Liberia, with a significant portion of its economy based on agriculture and forestry, could use carbon credit trading to promote sustainable development. Liberia’s forests, a

significant carbon sink, can absorb CO2, contributing to global climate change efforts. However, challenges like lack of technical expertise, inadequate infrastructure, and weak regulatory frameworks hinder carbon trading. Key improvements include:

1. Capacity Building: Training stakeholders, including government officials, farmers, and forest communities, on carbon trading would help them understand its benefits.
2. Infrastructure Development: Developing rural infrastructure, transportation, and monitoring systems would facilitate accurate carbon emissions measurement.
3. Regulatory Framework: A robust regulatory framework for carbon trading would ensure fair implementation and accountability.
4. Stakeholder Engagement: Involving local communities in the design of carbon trading schemes would ensure equitable benefits.
5. International Cooperation: Liberia could benefit from partnerships with developed countries and international organizations for technical support and financial assistance.

Efforts like the Karbon-X Project Inc. biochar manufacturing project, in partnership with Revive Terra Corps, are already underway to promote environmental sustainability and economic development in Liberia. The project focuses on carbon offsetting and contributes to local economic growth, providing essential services like healthcare and infrastructure. This demonstrates the potential of carbon credits to help Liberia combat climate change.

Developed Nations – Japan

Japan is highly vulnerable to climate change and has actively used carbon management systems. Japan led efforts to mitigate climate change by implementing carbon credit systems through the Kyoto Protocol in 1997 (UNFCCC, n.d.) and was the first to ratify it in 2002. Japan has since launched initiatives like the Japan Voluntary Emissions Trading Scheme (JVETS) and the Tokyo Metropolitan Government Emissions Trading Scheme (TMG ETS). These efforts have positioned Japan as a key player in global carbon markets.

Japan's financial regulatory framework now recognizes carbon trading as a regulated activity. After registration, financial institutions, including large enterprises and government agencies, can participate in emissions trading activities. As more SMEs in Japan assess their carbon footprint, there is growing demand for financial instruments based on carbon credits, helping companies meet environmental goals while growing sustainably.

Underdeveloped Nations – Bangladesh

Carbon credit trading offers a pivotal opportunity for Bangladesh to address climate change and promote sustainable development. Through the Clean Development Mechanism (CDM), Bangladesh can sell carbon credits generated from renewable energy and waste management projects. However, the forestry sector, which offers significant opportunities for carbon sequestration, remains largely untapped. Expanding into forestry projects could significantly benefit Bangladesh’s economy and environment, while more effective policy and governance are required to support these initiatives.

Strategies for Optimizing Carbon Credit Trading in Bangladesh

1. Enhancing Regulatory Frameworks and Governance: Streamlining CDM project approval processes, especially in the forestry sector, would encourage participation in carbon trading.
2. Leveraging Economic Activities for Environmental Benefit: Policies should harness globalization and foreign direct investment (FDI) for environmental improvement.
3. Promoting Sustainable Industrial Growth: Shifting to cleaner energy sources and technologies would reduce carbon emissions without hindering economic development.
4. Diversifying Carbon Credit Projects: Expanding into underutilized sectors like forestry can enhance the value of carbon credits and attract more investment.
5. International Collaboration and Capacity Building: Strengthening international partnerships would facilitate technology transfer and support successful project implementation.

Effect of Carbon Credits on Variable Enterprises

Carbon emission trading schemes (CETS) are widely embedded in enterprises. They help reduce emissions while promoting economic growth. China's rapid expansion exemplifies how CETS influence enterprise market value (EMV). CETS introduce environmental regulations, which affect enterprise operations by incentivizing them to adhere to carbon emission limits. However, the impact may vary for smaller enterprises compared to larger ones.

Small and Medium Enterprises (SMEs)

SMEs account for 90% of all enterprises globally and 40% of industrial pollution. However, they face unique challenges in implementing carbon reduction measures. Carbon credits offer SMEs an affordable way to offset emissions, improve their brand image, and access financing for sustainable technologies. Yet, challenges like navigating complex carbon credit markets and limited bargaining power remain.

External Barriers to SMEs

SMEs often face external barriers such as a lack of green consumer demand and little supply chain pressure for eco-friendly practices. The CDM market incentivizes GHG reductions, assisting SMEs in overcoming these obstacles.

Internal Barriers to SMEs

Many SMEs are unaware of carbon credits and their environmental benefits. By increasing awareness, SMEs can increase participation in carbon credit schemes.

Opportunities for SMEs

As consumer awareness of environmental impact grows, SMEs can tap into new markets for low-carbon products. Carbon credits drive energy efficiency, reduce energy costs, and boost profit margins.

Large Enterprises

Large enterprises have greater resources and scale to drive carbon innovation. Carbon credits provide a flexible way to meet emissions reduction targets. However, they must carefully select projects to avoid reputational risks. Managing carbon credit portfolios can be complex and time-consuming, requiring additional investments in emission reduction measures.

Spillover Effects of Involving Enterprises

Businesses involved in carbon credit schemes often engage in green management (e.g., shifting energy sources) and green innovation (e.g., developing eco-friendly products), leading to long-term reductions in GHG emissions.

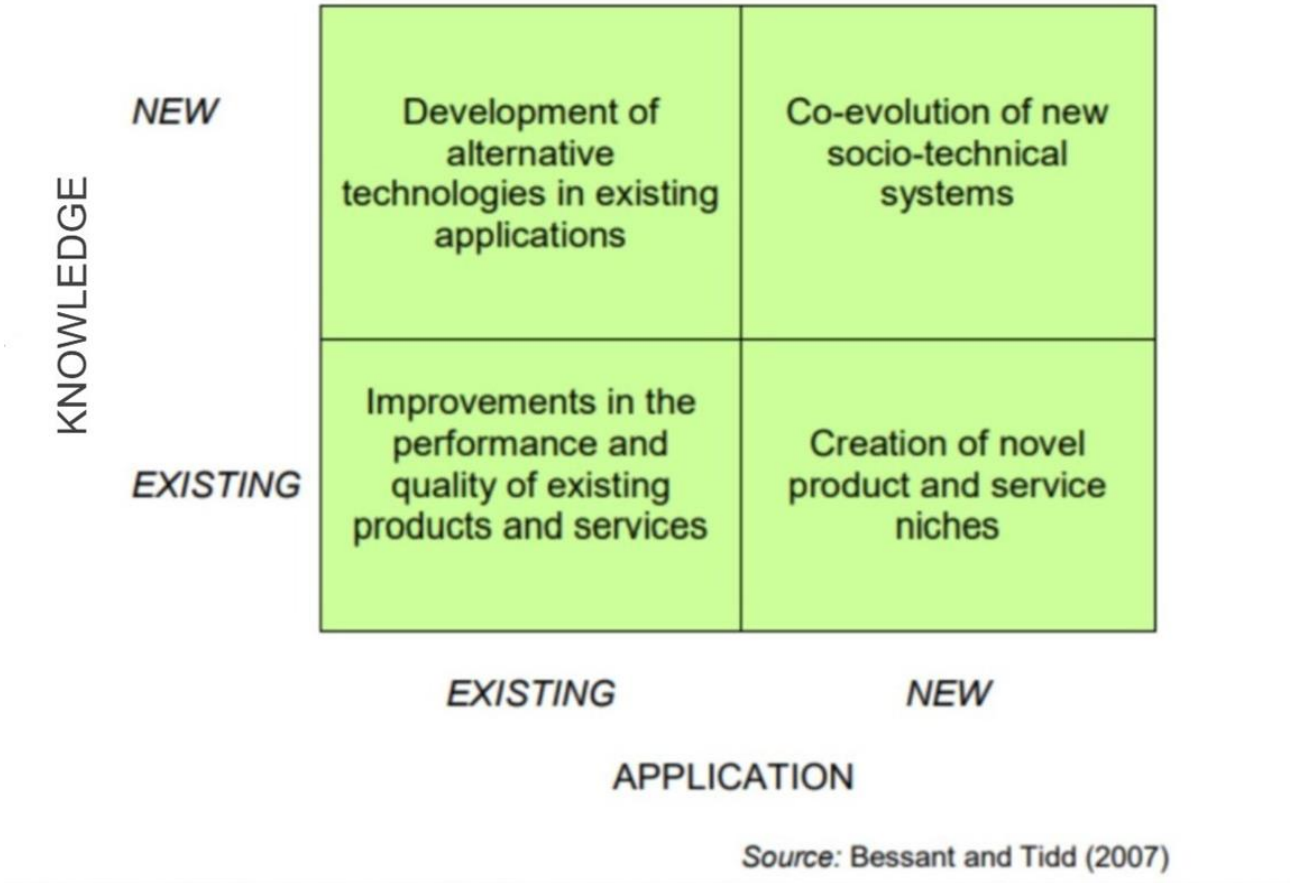

Figure 5. Types of Green Innovation

Economic Stimulus

Beyond their direct impact on individual enterprises, carbon credits can also influence broader economic trends. By creating a market for emissions reductions, carbon credits can stimulate investment in sustainable technologies and practices, leading to economic growth and job creation.

Resultant stimulus can lead to:

- Investment in clean energy: Carbon credits can incentivize investment in renewable energy sources, such as solar and wind power, which can create new industries and jobs.
- Technological innovation: The demand for carbon credits can drive innovation in emissions reduction technologies, leading to the development of new products and services.
- Rural development: Carbon credit projects, such as reforestation or agricultural practices that reduce emissions, can contribute to rural development and poverty alleviation.
- Aside from economic growth, such widespread implementation can increase the competitiveness of other connected industries.
- Enhanced export competitiveness: Countries with robust carbon markets can attract foreign invest- ment and enhance the competitiveness of their export industries.
- Resilience to climate change: By investing in climate mitigation measures, economies can become more resilient to the economic impacts of climate change, such as extreme weather events and supply chain disruptions.

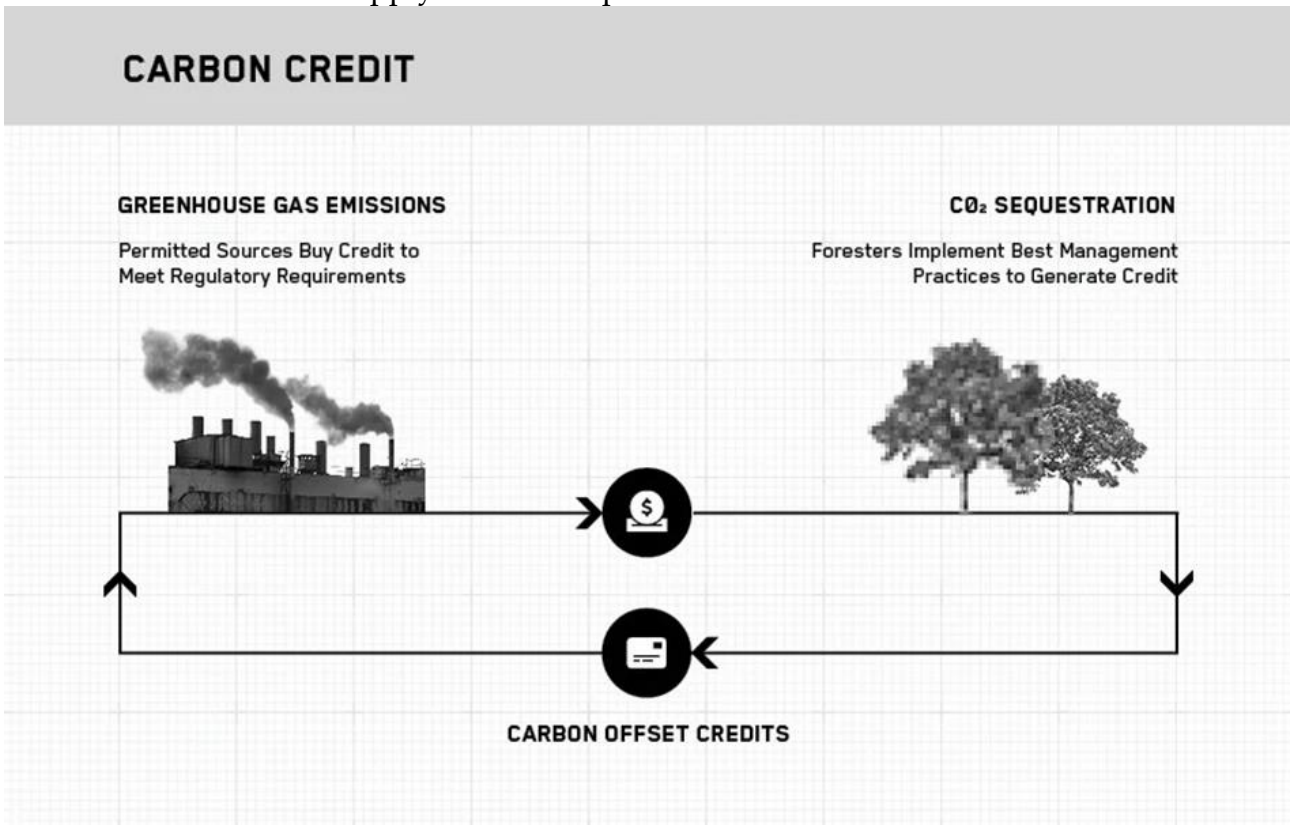

Figure 6. Carbon Credits and Market Chain

Complications

When working with a newer market system, possibilities of different and negative perspectives need to be taken into account. Such as volatility of the market, risks of false claims, and proven ineffectiveness. Carbon credit markets can be subject to price fluctuations, which can create uncertainty for businesses and investors. There is a probable risk of double counting emissions reductions, if the same reductions are claimed in

multiple projects. Eventually, there will be some carbon credit projects may not deliver the intended emission reductions, undermining the credibility of the market.[36], [37], [38], [39]

Insights on Market-based Entrepreneurial Initiatives for Climate Financing

Method

Carbon finance is an innovative method that uses carbon credits through different markets and solves the financial issues related to a sustainable future. It leads to more carbon-constrained projects in various enterprises. This section falls under the global campaign of climate finance, which aims to counter climate change at all costs, by providing funds to the respective counters.

Despite such policies and methods, there can be uncertainties regarding the projects relying on this type of finance. The climatic reality is not actualized in multiple forecasts, resulting in reliance on pure predictions which may prematurely hinder the overall effects of such finance. Leading to the point, that funds supplied should be more flexible depending on the enterprise.

Initiatives

The World Bank was the first organization to establish a specific CER procurement program. We go into more depth about this below since it could teach us valuable lessons about climate funding in the future. In 1999, the World Bank established the "Prototype Carbon Fund" (PCF), which had 180 million US dollars in capital and was backed by 17 businesses and six governments. The PCF set out to create a comprehensive network for global carbon markets since it saw itself as a pioneer in this area. The PCF received 420 project proposals and signed seven CER purchase contracts totaling 7.8 million CERs by October 2003.

In order to meet 50% of its anticipated reduction target under Kyoto, or 67 million CERs, the Netherlands was the first nation to implement a coordinated CER acquisition approach. The Ministry of Housing, Spatial Planning, and the Environment is in charge of overseeing the CERUPT tender program, which was formed in November 2001. The ERUPT tenders for emission credits from JI projects, which were started in 1999, served as a model for this initiative. Maximum CER pricing were outlined and broken down by project type in CERUPT's terms of reference, CER prices varied depending on the scale.

Up to =C5.5/CER would go to non-biomass renewables, =C4.4/CER to biomass and energy efficiency, and =C3.3/CER to all other categories. The magical threshold of 100,000 CERs, from which a purchase contract would be deemed appealing, was also introduced by the CERUPT contract.

In 2002, 36 million CERs were signed with the Andean Development Corporation CAF, two contracts with the World Bank Group, which resulted in the creation of a dedicated carbon fund at the World Bank and the International Finance Corporation, and a ten million CER contract with Rabobank. In March 2003, CERUPT chose 18 projects that were anticipated to produce 16 million CERs, and the World Bank contract was expanded in 2004, by five million CERs.

The World Bank dominated the demand side of the CDM market from 2002 to 2004, by interacting with many countries and their bids dictated the price of CERs; setting an example to be followed.

Conclusion

Future research should explore the scalability of carbon credit systems in developing countries, focusing on overcoming barriers such as technical expertise, regulatory frameworks, and infrastructure. Practical recommendations include enhancing the engagement of SMEs by providing easier access to carbon credit markets and offering financial instruments to help them offset emissions. Additionally, further studies are needed on the effectiveness of price control mechanisms like floors and ceilings in carbon credit markets and their potential to stabilize the system. Exploring alternative funding options, such as climate funds, and assessing their impact on reducing project costs and increasing project engagement in underdeveloped regions would provide valuable insights. Research could also examine the role of carbon credit markets in driving technological innovation, focusing on the development of green technologies and sustainable practices. Lastly, investigating the integration of carbon credits into broader environmental policies, such as the adoption of net zero emissions targets and sustainable development goals, could offer solutions for achieving global climate objectives.

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