Benefiting from Global Carbon Trade

The Case of Green Businesses in Ghana

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Climate *innovation* Center
Ghana

List of Acronyms and Abbreviation

Acronym	Full Meaning
ACMI	African Carbon Market Initiative
AfDB	African Development Bank
CMO	Carbon Market Office
CER	Corporate Environmental Responsibility
CDM	Clean Development Mechanism
CIF	Climate Investment Funds
EU ETS	European Union Emissions Trading System
FIT	Feed-in-tariff
GCR	Ghana Carbon Registry
GHG	Greenhouse Gas
ITMO	Internationally Transferred Mitigation Outcome
IRENA	International Renewable Energy Agency
MOU	Memorandum of Understanding
NDCs	Nationally Determined Contributions
VCM	Voluntary Carbon Market

Table of Contents

01

Introduction

1. Introduction

1.1 Background

Global carbon trade is a market-based strategy to provide incentives for businesses, organisations, and various entities to reduce their impact on climate change. Climate change refers to long-term shifts in temperatures and weather patterns. Human activities have been the main driver of climate change, primarily due to burning fossil fuels like coal, oil, and gas. Burning fossil fuels generates greenhouse gas (GHG) emissions that act like a blanket wrapped around the Earth, trapping the sun's heat, and raising temperatures, leading to global warming effect.

Examples of greenhouse gases implicated in climate change are carbon dioxide and methane. Carbon dioxide is a byproduct of any burning process, while methane is the primary component of natural gas. Methane is released during the production, processing, storage, transmission, and distribution of natural gas. As natural gas is often found with oil, the collection and combustion of oil also contributes to the total methane emissions. Methane may also be generated by anaerobic digestion processes. Other greenhouse gases include nitrous oxide and fluorinated gases. The bulk of global GHG emissions emanates from carbon dioxide (75%) and methane gas (18%), while nitrous oxide and fluorinated gases constitute 4% and 2%, respectively.[1] A common and important feature of the major drivers of climate change is the presence of carbon dioxide (CO_2)in the chemical structure of these gases, hence, the so-called carbon trade.

Essentially, carbon trade is the buying and selling of credits that permit a company or other entity to emit a certain amount of carbon dioxide equivalence (CO_2e) of greenhouse gases. The whole idea is to provide economic incentives to encourage organisations to reduce their environmental footprints. In this market-based system, consumers can choose to pay to compensate for their carbon footprint, while others with low carbon footprint build up carbon asset that could be sold. That is, companies, governments, and other organisations that emit large amounts of greenhouse gases can purchase carbon credits to offset their emissions, thereby reducing their overall carbon footprint and mitigating their contribution to climate change. Carbon trading is adapted from cap and trade. The first significant implementation of carbon trading occurred with the adoption of the Kyoto Protocol in 1997. The Kyoto Protocol established the Clean Development Mechanism (CDM) and Emissions Trading as flexible mechanisms to help countries achieve their emission reduction targets (Böhringer, 2003)[2]. The CDM allows developed countries with emission reduction commitments under the Kyoto Protocol to invest in emission reduction projects in developing countries and receive Certified Emission Reduction (CER) credits in return (Global Carbon Market, 2018)[3]. These credits were used to meet part of the developed countries' emission reduction targets (UNFCCC, 2010)[4]. This mechanism enabled countries that exceeded their targets to purchase allowances from those that met or surpassed their targets. Carbon trading takes two main forms: 'cap and trade' and 'off-setting' (Gilbertson & Reyes, 2009)[5].
The first cap-and-trade system was implemented in the United States as part of the Clean Air Act Amendments in 1990, effectively reducing sulfur dioxide emissions. This success led to the development of carbon trading systems (Gilbertson & Reyes, 2009)[6]. Since the introduction of

[1] IPCC (2022). Climate change 2022: Mitigation of climate change, summary for policy makers. www.ipcc.ch.
[2] Böhringer, C. (2003). The Kyoto Protocol: A review and perspectives. *Oxford Review of Economic Policy*, *19*(3), 451–466. https://doi.org/10.1093/oxrep/19.3.451
[3] Global Carbon Market. (2018). *Global Carbon Market*.
[4] UNFCCC. (2010). The Kyoto Protocol Mechanisms: International Emissions Trading, Clean Development, Mechanism Joint Implementation. *United Nations Framework Convention on Climate Change (UNFCCC)*. https://cdm.unfccc.int/about/cdm_kpm.pdf%0Ahttp://unfccc.int/kyoto_protocol/items/2830.php
[5] Gilbertson, T., & Reyes, O. (2009). *Critical Currents: Carbon Trading - How it works and why it fails*. *7*, 1–104.
[6] Gilbertson, T., & Reyes, O. (2009). *Critical Currents: Carbon Trading - How it works and why it fails*. *7*, 1–104.

carbon trading mechanisms under the Kyoto Protocol, various regional and national carbon markets have been established. For example, the European Union Emissions Trading Scheme (EU ETS) launched in 2005 and became the world's largest carbon market (Carbon Market Watch, 2020)[7]. Other countries, such as China, South Korea, and Canada, have also implemented their carbon trading systems. It's worth noting that the implementation and scope of carbon trading have evolved, with different countries and regions adopting their approaches and mechanisms (UNFCCC, 2010)[8]. The goal remains to encourage emission reductions and facilitate the transition to a low-carbon economy. The outlook is influenced by evolving climate policies and agreements, with the Paris Agreement's provisions on market mechanisms being crucial. Challenges include ensuring market integrity and improving environmental effectiveness (Gilbertson & Reyes, 2009).[9]
Green businesses in Ghana have the potential to play a significant role in this market, as they can reduce their carbon emissions through the implementation of sustainable practices, such as energy efficiency measures, the use of renewable energy sources, and the development of environmentally friendly products and services. By participating in the carbon trade market, green businesses in Ghana cannot only reduce their carbon footprint but also reap the economic benefits of selling carbon credits to organisations and countries that are unable to meet their emissions reduction targets.

Participating in the carbon trade market may require significant investment in technology and infrastructure, as well as access to information and technical expertise. Additionally, the regulatory framework for the carbon trade market can be complex and challenging to navigate, particularly for small and medium-sized businesses. This paper examines the potential benefits and challenges facing green businesses in Ghana as they participate in the global carbon trade market. It analyses government policies and the needed strategies to facilitate the participation of green businesses in the carbon trade market.

1.2 Aim and Objectives

The aim of this study is to examine the potential benefits and challenges facing green businesses in Ghana as they seek to participate in the global carbon trade market and provide strategic measures to promote carbon trading in Ghana.

The specific objectives are to:

- Examine the state of green businesses in Ghana within the frame of green business models
- Clarify the concept of carbon trading
- Analyse the carbon trade market from local, regional, and global perspectives
- Provide policy measures and strategies to promote carbon trade in Ghana.

[7] Carbon Market Watch. (2020). *Carbon Markets 101 - The Ultimate Guide To Market Based Climate Mechanisms*. *July*.
[8] UNFCCC. (2010). The Kyoto Protocol Mechanisms: International Emissions Trading, Clean Development, Mechanism Joint Implementation. *United Nations Framework Convention on Climate Change (UNFCCC)*. https://cdm.unfccc.int/about/cdm_kpm.pdf%0Ahttp://unfccc.int/kyoto_protocol/items/2830.php
[9] Gilbertson, T., & Reyes, O. (2009). *Critical Currents: Carbon Trading - How it works and why it fails*. *7*, 1–104.

1.3 Structure and organisation of the paper

The paper is structured as follows:

- Chapter 2 provides information on the concept of green businesses.
- Chapter 3 summarises the concept of carbon trading as a global framework for reducing greenhouse gas emissions. The different types of carbon market are explained in this chapter.
- Chapter 4 provides an insight into the carbon market from global, regional, and national perspectives.
- Chapter 5 highlights policy and strategic measures needed to facilitate access to the carbon market by local businesses in Ghana.

02

Green Business Paradigm

2. Green Business Paradigm

2.1 Green Business Models

The concept of "green business" has gained traction in recent years due to concerns about climate change and the environmental impact of economic activity. Green Businesses are those that are anchored on green economy principles. UNEP (2011) defines green economy as one that results in"improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities". In its simplest expression, a green economy is low-carbon, resource efficient, and socially inclusive. In a green economy, growth in income and employment are driven by public and private investments that reduce carbon emissions and pollution, enhance energy and resource efficiency, and prevent the loss of biodiversity and ecosystem services. Further, green economy emphasises internalisation of externalities (UNEP, 2011)[10].

Green business models are those that prioritise sustainability, environmental responsibility, and social justice, in addition to generating profits. Green businesses are driven by the recognition that economic growth and environmental stewardship can coexist. By embracing sustainability as a core value, green businesses contribute to a more sustainable and resilient economy while meeting the evolving needs of consumers and society (Khanal, 2018)[11]. They prioritize environmental sustainability, reducing emissions, conserving energy, water, waste, recycling, and adopting renewable energy sources. They also provide sustainable products and services, focusing on renewable energy, eco-friendly materials, and recycling (Bergquist, 2017a)[12].Green businesses also prioritize innovation, developing sustainable technologies, processes, and business models to improve efficiency, reduce waste, and create eco-friendly solutions (Monga, 2018)[13].

Green businesses are critical in implementing sustainable practices and reducing emissions, aligning with the Kyoto Protocol and Paris Agreement goals of reducing greenhouse gas emissions, utilizing renewable energy sources, promoting energy efficiency, implementing waste reduction measures, and providing environmentally friendly products/services (Böhringer, 2003). The Kyoto Protocol and the Paris Agreement provide global frameworks and targets for addressing climate change, while green businesses are critical in implementing sustainable practices and reducing emissions (Erickson & Brase, 2019)[14].

The Paris Agreement promotes market-based mechanisms for climate change mitigation, including carbon trading, through its Article 6 framework (Ludeña et al., 2016)[15]. This framework allows countries to cooperate in implementing their National Development Goals (NDCs) and transfer emission reductions between them, using internationally transferred mitigation outcomes (ITMOs) and cooperative approaches under the Sustainable Development Mechanism (Erickson

[10] UNEP (2011). Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication - A Synthesis for Policy Makers, United Nationns Environment Programme

[11] Khanal, K. (2018). *Green Business: Sustainable and Profitable Product Development*. *May*, 40. https://www.theseus.fi/handle/10024/149675

[12] Bergquist, A.-K. (2017a). Business and Sustainability: New Business History Perspectives. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3055587

[13] Monga, H. (2018). *Green business and its importance for the companies*. *5*(8), 429–440. www.jetir.org

[14] Erickson, L. E., & Brase, G. (2019). Paris Agreement on Climate Change. *Reducing Greenhouse Gas Emissions and Improving Air Quality*, 11–22. https://doi.org/10.1201/9781351116589-2

[15] Ludeña, C., de Miguel, C., & Schuschny, A. (2016). Climate change and Carbon markets: Implications for developing countries. *CEPAL Review*, *2015*(116), 61–84. https://doi.org/10.18356/68536e46-en

& Brase, 2019)[16]. The specific rules and guidelines for carbon trading and market-based mechanisms under the Paris Agreement's Article 6 are still being developed through negotiations among countries (Ghana's framework, 2022)[17].

Unlike the Kyoto Protocol, which established top-down legally binding emissions reduction targets for developed nations, the Paris Agreement requires all countries to reduce greenhouse gas emissions. Green businesses can play a crucial role in reducing greenhouse gas emissions and mitigating the effects of climate change (Global Carbon Market, 2018).[18] Corporate responses to the Kyoto Protocol have included reducing emissions, investing in renewable energy, and participating in carbon markets. In conclusion, the Kyoto Protocol and the Paris Agreement have set the stage for global cooperation to address climate change, and green businesses play an important role in reducing greenhouse gas emissions and mitigating the effects of climate change (Global Carbon Market, 2018).[19] These business models can be applied to any industry, from energy production to food service to fashion. The main principles of green business models include reducing waste, minimizing environmental impact, promoting renewable energy sources, and using sustainable materials.There are several types of green business models. One is the circular economy model which is based on the take-make-use-reuse-remake-recycle model in contrast to the linear model of take-make-use-dispose-pollute model (Sitra, 2022)[20]. The circular economy gives us the tools to tackle climate change and biodiversity loss together, while addressing important social needs (Sitra, 2022)[21]. By adopting the principles of the circular economy, businesses can reduce their carbon footprint, minimize waste, and create a more sustainable future (Smith-Gillespie, 2020).[22] The circular economy aims to keep products and materials in use for as long as possible by promoting sharing, leasing, reusing, repairing, refurbishing, and recycling existing materials and products (Jain, 2022).[23] Another model is the sharing economy model, the sharing economy model aims to create a more sustainable and equitable economy by promoting the efficient use of resources, reducing waste, and increasing access to goods and services (Puschmann & Alt, 2016).[24] The central idea of the sharing economy is the optimization of underused assets, such as physical assets like cars, apartments, individual devices by pooling or sharing them through digital platforms (Dahm, 2022).[25] A third is the regenerative economy model, which focuses on restoring ecosystems and using natural resources in a sustainable way (Jain, 2022).[26] The regenerative economy model focuses on creating a sustainable and thriving economy by shifting away from extractive practices, making positive contributions to nature and society, and recognizing the value of the earth's resources. It

[16] Erickson, L. E., & Brase, G. (2019). Paris Agreement on Climate Change. *Reducing Greenhouse Gas Emissions and Improving Air Quality*, 11–22. https://doi.org/10.1201/9781351116589-2

[17] Ghana's framework. (2022). *Ghana's framework on international carbon markets and non-market approaches;Article 6.2 cooperative approach in Ghana*. www.cmo.epa.gov.gh

[18] Global Carbon Market. (2018). *Global Carbon Market*.

[19] Global Carbon Market. (2018). *Global Carbon Market*.

[20] Sitra. (2022). *Sustainable growth with circular economy business models - Sitra*. https://www.sitra.fi/en/publications/sustainable-growth-with-circular-economy-business-models/

[21] Sitra. (2022). *Sustainable growth with circular economy business models - Sitra*. https://www.sitra.fi/en/publications/sustainable-growth-with-circular-economy-business-models/

[22] Smith-Gillespie, A. (2020). *Economy Business Model*. *730378*, 23.

[23] Jain, Y. (2022). *Regenerative Economies : January 2021*, 0–11. https://doi.org/10.1007/978-3-319-69625-6

[24] Puschmann, T., & Alt, R. (2016). *Sharing Economy Drivers and Potentials*. *58*(January), 93–99.

[25] Dahm, D. (2022). Regenerative economy. *The Impossibilities of the Circular Economy*, 233–244. https://doi.org/10.4324/9781003244196-25

[26] Jain, Y. (2022). *Regenerative Economies : January 2021*, 0–11. https://doi.org/10.1007/978-3-319-69625-6

emphasizes balance, restoration, and a place-based approach to economic systems (Čekanavičius et al., 2014).[27]

Green business models have several potential benefits, including environmental, social, and economic advantages. From an environmental perspective, green business models can reduce pollution, conserve natural resources, and help mitigate climate change. From a social perspective, these models can promote social justice by providing fair wages and working conditions and supporting local communities. From an economic perspective, green business models can create jobs, increase efficiency, and reduce costs in the long run.

Green businesses may however face several challenges. One is the perception that green products and services are more expensive than traditional ones, which can make them less attractive to consumers (Bergquist, 2017b).[28] Another challenge is the lack of government regulations and incentives to support green business models. There may also be a lack of understanding and awareness of the importance of sustainability among the public, which can hinder the growth of green business models (Resource Efficiency & Circular Economy Project, 2019).[29]

A review by Simone (2022) outlined some green business strategies which include: [30]

1. Use of renewable energy in production and processing (e.g., Hydro, and solar power). These sources of energy do not emit greenhouse gases.
2. Environmentally friendly products (e.g., energy-efficient products) that do not require harmful chemicals and materials, are not single-use, sourced locally, and are designed such that they are easily repairable.
3. Recycling and reduction of waste generated and products after its first use.
4. Sustainable packaging by reusing materials, using recyclable materials and biodegradable materials.
5. Composting of organic waste to reduce landfill mass.
6. Ethically sourcing products in ways that respect human and employee rights and are environmentally protective.
7. Sustainable supply chain – a practice that tries to reduce products' and services' overall environmental effect from conception to consumption. It entails determining, evaluating, and minimising the environmental impact of every area of a company, from raw materials utilised in manufacturing to distribution channels and disposal strategies.
8. Corporate Environmental Responsibility (CER) – an eco-friendly business strategy that aids organisations in reducing their environmental effect. Businesses may lessen their negative effects on the environment through recycling, cutting back on waste, and

[27] Čekanavičius, L., Bazytė, R., & Dičmonaitė, A. (2014). Green Business: Challenges and Practices. *Ekonomika*, *93*(1), 74–88. https://doi.org/10.15388/ekon.2014.0.3021

[28] Bergquist, A.-K. (2017b). Business and Sustainability: New Business History Perspectives. *SSRN Electronic Journal*, *October*. https://doi.org/10.2139/ssrn.3055587

[29] Resource Efficiency & Circular Economy Project. (2019). Business Models for the Circular Economy;Opportunities and Challenges from a Policy Perspective. *Business Models for the Circular Economy*. https://doi.org/10.1787/g2g9dd62-en

[30] Simone, N. R. (2022). Sustainable Business Practices (Definition and Examples). Sustainability success. Retrieved from: https://sustainability-success.com/sustainable-business-practices/

reducing pollution. Also, they could collaborate with suppliers to lessen their environmental impact.

9. Sustainability reporting – companies can inform stakeholders of their environmental performance through sustainability reporting. In the end, they achieve the goal of environmental sustainability, while maximising profit through competitive advantages. Others include corporate social responsibility and taking care of employees as well as workspace, which helps protect and sustain the productivity of the businesses.

SMEs may face peculiar challenges when it comes to adopting green business models. One challenge is access to financing, as many traditional lenders may not be familiar with green business models or may not consider them as profitable. Another challenge is a lack of awareness and education about green business practices. SMEs may not have the resources or knowledge to implement sustainable practices, which can hinder their growth and competitiveness.

2.2 Current State of Green Businesses in Ghana

The green business sector in Ghana is still in its infancy, but it is rapidly growing. Ghana has made progress in promoting green business practices, focusing on renewable energy such as hydropower, solar power, and wind energy (Amegbe et al., 2017).[31] Green building practices and sustainable materials are gaining attention (Yudelson, 2020).[32] Efforts are being made in waste management, including recycling, waste treatment, and composting. Sustainable agriculture practices like organic farming and water conservation are being adopted (Adinyra & Gligui, 2012).[33] Environmental regulations are in place, and green entrepreneurship is growing, with startups emerging in renewable energy, waste management, eco-tourism, sustainable fashion, and organic agriculture (Adinyra & Gligui, 2012).[34] However, there are challenges such as low consumer awareness, weak institutions, inadequate funding, and insufficient long-term policies for transitioning to a green economy (Ali et al., 2021).[35] The Green Business Road Map for Ghana aims to promote sustainable development, incorporating environmental, social, and economic considerations into policy-making. It focuses on sustainable land use, renewable energy, green financing, and job creation (Quintás et al., 2018).[36] Despite challenges, the green business has a promising future in Ghana with government support, rising consumer demand, and the potential

[31] Amegbe, H., Owino, J. O., & Nuwasiima, A. (2017). Green Marketing Orientation (GMO) and Performance of SMEs in Ghana. *Journal of Marketing Development and Competitiveness*, *11*(1), 99–109.

[32] Yudelson, J. (2020). Today's Green Building Market. *Marketing Green Building Services*, 56–81. https://doi.org/10.4324/9780080942315-9

[33] Adinyra, N., & Gligui, E. (2012). Green Marketing Potential as Assessed from Consumer ' s Purchasing Behaviors : *Masters Thesis in Business Administration Submitted to Blekinge Institute of Technology, Sweden*, *7*(2), 47–60.

[34] Adinyra, N., & Gligui, E. (2012). Green Marketing Potential as Assessed from Consumer ' s Purchasing Behaviors : *Masters Thesis in Business Administration Submitted to Blekinge Institute of Technology, Sweden*, *7*(2), 47–60.

[35] Ali, E. B., Anufriev, V. P., & Amfo, B. (2021). Green economy implementation in Ghana as a road map for a sustainable development drive: A review. *Scientific African*, *12*, e00756. https://doi.org/10.1016/j.sciaf.2021.e00756

[36] Quintás, M. A., Martínez-Senra, A. I., & Sartal, A. (2018). The role of SMEs' green business models in the transition to a low-carbon economy: Differences in their design and degree of adoption stemming from business size. *Sustainability (Switzerland)*, *10*(6). https://doi.org/10.3390/su10062109

for new technologies and innovations to drive sustainable development and environmental protection (Ali et al., 2021).[37]

According to the Ghana Investment Promotion Centre, the country has attracted several green businesses in the areas of renewable energy, waste management, and sustainable agriculture. These businesses are investing in Ghana due to its abundant natural resources, supportive government policies, and a growing market for eco-friendly products and services.[38] One area where Ghana has made significant progress in green businesses is in the renewable energy sector. The country has a vast potential for renewable energy generation, and there has been a surge of interest in the sector in recent years. Ghana is one of the few countries in Africa to have implemented a feed-in-tariff (FIT) policy, which has incentivized investment in renewable energy. According to the International Renewable Energy Agency (IRENA), Ghana has 2.9 GW of renewable energy potential, of which only 12% have been developed. The government aims to increase this by 10% by 2030.[39]

Another area where green businesses are thriving in Ghana is in the waste management sector. Waste management is a significant challenge in the country, with many cities and towns struggling to dispose of waste properly. Several green business initiatives supported by the Ghana Climate Innovation Centre (GCIC) are providing innovative waste management solutions. One example is Nelplast Ghana Limited that produces eco-bricks from plastic wastes.[40] Another example is Trashy Bags, which produces bags and other products from recycled plastic waste.[41]

Finally, Ghana's agroforestry sector is also seeing the growth of green businesses. Sustainable agriculture is becoming increasingly important as the country looks to improve food security while protecting its natural resources. Several businesses in Ghana are using sustainable agriculture practices to produce organic foods, reduce pesticide and fertilizer use, and conserve soil and water resources. As the country continues to prioritise sustainable development, it is expected that more green businesses may emerge in this sector in the coming years.

[37] Ali, E. B., Anufriev, V. P., & Amfo, B. (2021). Green economy implementation in Ghana as a road map for a sustainable development drive: A review. *Scientific African*, *12*, e00756. https://doi.org/10.1016/j.sciaf.2021.e00756

[38] Ghana Investment Promotion Centre (2021). Green Investment Opportunities in Ghana. Retrieved from https://www.gipcghana.com/en/investment-opportunities/green-investment-opportunities.html

[39] International Renewable Energy Agency (IRENA) (2021). Renewable Energy Statistics 2021. Retrieved from https://www.irena.org/publications/2021/Mar/Renewable-energy-statistics-2021

[40] https://seed.uno/enterprise-profiles/nelplast-eco-ghana-limited

[41] Trashy Bags (2021). About Us. Retrieved from https://www.trashybags.org/about-us/

03

Concept of Carbon Trading

3. Concept of Carbon Trading

Carbon trading is a market-based approach to mitigating climate change that allows entities to buy and sell carbon credits, representing the right to emit a certain amount of carbon dioxide or other greenhouse gases. Carbon trading began in the early 1990s with the establishment of the first market-based mechanism called the "Emissions Trading Scheme" as part of the United Nations Framework Convention on Climate Change (UNFCCC). The concept of carbon trading emerged to address the issue of greenhouse gas emissions and global climate change through market-based approaches (Carbon Market Watch, 2020).[42] Carbon trading is a mechanism that allows countries that have achieved emission reductions below their targets to sell their surplus allowances to countries that may have difficulty meeting their targets (UNFCCC, 2010).[43] This system provides an economic incentive for emission reductions and promotes cost-effective approaches to achieve overall emission reduction goals. There are two forms of Carbon trading - 'cap and trade' and 'off setting'. Under the scheme 'cap and trade', governments or intergovernmental bodies like the European Commission hand out 'carbon permits' to industries to control their pollution rates (Gilbertson & Reyes, 2009).[44] Carbon trading proposals, also known as market-based mechanisms, provide companies with greater flexibility in addressing emissions problems but do not reduce emissions. Offsetting is the second type of carbon trading. Instead of reducing emissions at the source, companies, and occasionally international financial institutions, governments, and individuals, fund 'emissions-saving projects' outside their capped area (Gilbertson & Reyes, 2009).[45]

The Paris Agreement is indirectly linked to carbon trading through its provisions that encourage market-based approaches to climate change mitigation. The Paris Agreement, adopted in 2015, requires all countries to set emissions-reduction pledges, with the goals of preventing the global average temperature from rising 2°C above preindustrial levels and pursuing efforts to keep it below 1.5°C (UNFCCC, 2010).[46]

The origins of carbon trading can be traced back to the Kyoto Protocol of 1997, which established a global framework for reducing greenhouse gas emissions. The protocol included a mechanism called the Clean Development Mechanism (CDM), which allowed developed countries to offset their emissions by investing in emission reduction projects in developing countries.[47] This mechanism was later expanded to include other types of carbon trading, such as voluntary carbon markets and regional emissions trading schemes.

Carbon trading has been lauded as a cost-effective way to reduce emissions by providing incentives for companies to invest in cleaner technologies and practices. In a study by Rose and

[42] Carbon Market Watch. (2020). *Carbon Markets 101 - The Ultimate Guide To Market Based Climate Mechanisms*. *July*.

[43] UNFCCC. (2010). The Kyoto Protocol Mechanisms: International Emissions Trading, Clean Development, Mechanism Joint Implementation. *United Nations Framework Convention on Climate Change (UNFCCC)*. https://cdm.unfccc.int/about/cdm_kpm.pdf%0Ahttp://unfccc.int/kyoto_protocol/items/2830.php

[44] Gilbertson, T., & Reyes, O. (2009). *Critical Currents: Carbon Trading - How it works and why it fails*. *7*, 1–104.

[45] Gilbertson, T., & Reyes, O. (2009). *Critical Currents: Carbon Trading - How it works and why it fails*. *7*, 1–104.

[46] UNFCCC. (2010). The Kyoto Protocol Mechanisms: International Emissions Trading, Clean Development, Mechanism Joint Implementation. *United Nations Framework Convention on Climate Change (UNFCCC)*. https://cdm.unfccc.int/about/cdm_kpm.pdf%0Ahttp://unfccc.int/kyoto_protocol/items/2830.php

[47] https://cdm.unfccc.int/about/index.html

Stevens (2019)[48], the authors found that carbon pricing policies, including carbon trading, were effective in reducing emissions while minimising costs to consumers and businesses. The study also found that carbon trading was more effective than carbon tax in reducing emissions, as it provided a clear incentive for companies to reduce their emissions below their allotted cap.

However, carbon trading has also been criticised for its potential to create perverse incentives, where companies may invest in low-cost emission reduction projects in developing countries rather than invest in their own emissions reductions. In addition, carbon trading may not be effective in addressing the root causes of climate change, such as the overconsumption of fossil fuels.[49] Despite these criticisms, carbon trading remains a popular policy tool for reducing emissions. In fact, the European Union Emissions Trading System (EU ETS), the world's largest carbon market, has seen significant emissions reductions since its implementation in 2005.[50] Other countries, such as China, South Korea, and Canada, have also implemented carbon trading schemes in recent years. The carbon market may be distinguished into compliance and voluntary markets.

3.1 Compliance Carbon Market

The compliance carbon market is also known as Emission Trading Systems (ETS). It is a regulatory system that allows organisations to meet their carbon reduction targets by purchasing carbon credits. Companies that are unable to meet their reduction target can purchase carbon credits from other companies that have exceeded their target. The market, thus, creates a financial incentive for companies to reduce their emissions by allowing them to sell any emissions reduction beyond their compliance obligations to other entities that may have a greater emissions reduction requirement. These credits represent one metric ton of carbon dioxide equivalent (CO2e) that has been reduced or removed from the atmosphere.

The compliance carbon market operates on a cap-and-trade system, in which the government sets a cap on the total emissions allowed within a given sector or country. Companies that exceed their emissions cap are required to purchase credits to offset their excess emissions.

The compliance carbon market has several key components, including the following:

1. Carbon credits: Carbon credits are tradable permits that represent the right to emit one metric ton of CO2e. Carbon credits can be generated through a variety of mechanisms, including carbon offset projects and emission reduction projects.
2. Verification: Carbon credits must be verified by a third-party auditor to ensure that they represent legitimate emission reductions or removals.
3. Trading platform: Carbon credits are bought and sold on a trading platform, such as the European Union Emissions Trading System (EU ETS) or the California Cap-and-Trade Program.
4. Compliance entity: Compliance entities are companies that are required to meet emissions reduction targets. Compliance entities can purchase carbon credits to offset their excess emissions.

[48] Rose, A., & Stevens, L. (2019). An overview of carbon pricing: Theory, practice, and future directions. Renewable and Sustainable Energy Reviews, 105, 82-101. https://doi.org/10.1016/j.rser.2019.01.015
[49] Baranzini, A., Carattini, S., & Lalive, R. (2018). Is carbon pricing enough to mitigate climate change? Lessons from public opinion. Ecological Economics, 146, 740-750. https://doi.org/10.1016/j.ecolecon.2017.11.005
[50] European Union Emissions Trading System. https://ec.europa.eu/clima/policies/ets_en

Some of the challenges that the compliance carbon market face include the following:

1. Overallocation: In some cases, governments have allocated too many emissions allowances, which has led to a surplus of carbon credits and a decrease in carbon prices.[51]
2. Challenges of global coordination: The compliance carbon market operates on a country-by-country basis and require a global coordination, otherwise there may be a potential for carbon leakage.[52]

Despite the challenges facing the compliance carbon market, there are several potential opportunities for growth:

1. Expansion of coverage: The compliance carbon market could be expanded to cover additional sectors and countries, which could increase demand for carbon credits and improve carbon prices.
2. Carbon border adjustments: The implementation of carbon border adjustments could level the playing field for companies that are subject to carbon pricing and those that are not.
3. Innovation: Continued innovation in carbon reduction technologies could lead to new opportunities for generating carbon credits and reducing emissions.

3.2 Voluntary Carbon Market

The voluntary carbon market (VCM) is a mechanism for individuals, organisations, and companies to reduce their carbon footprint and contribute to mitigating climate change. This market is complementary to the compliance carbon market, which is mandatory for certain entities under regulatory requirements.

The concept of the VCM emerged in the late 1990s when several companies and organisations began to purchase carbon credits voluntarily to offset their carbon footprint. The voluntary market is smaller than the compliance market, but it is growing rapidly as more companies and individuals become aware of their carbon footprint and seek to offset it. The voluntary market has grown significantly over the past two decades, with the number of voluntary transactions increasing from just a few hundred in the early 2000s to over 100 million in 2019. The value of the voluntary carbon market (VCM) has reportedly quadrupled since 2020, reaching almost US$ 2 billion in 2021.[53]

This significant growth in VCM transactions in recent years is driven by several factors such as the increasing awareness of climate change, the growth of sustainable investment, and the adoption of carbon neutrality targets by companies and governments.

The VCM has several unique characteristics that distinguish it from other markets. One of these characteristics is its voluntary nature, which means that participation is not mandatory, and buyers purchase carbon credits voluntarily to demonstrate their commitment to reducing their carbon footprint. Another characteristic is the absence of a regulatory framework, which allows for

[51] European Environment Agency (EEA) (2019). Trends and projections in Europe 2019: Tracking progress towards Europe's climate and energy targets. EEA Repot No 15/2019 (ISSN 1977-8449) Publications Office of the European Union. https://www.eea.europa.eu/publications/trends-and-projections-in-europe-1

[52] European Commission (2018). A Clean Planet for all: A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy. Publications Office of the European Union. https://climatecooperation.cn/climate/a-clean-planet-for-all-a-european-long-term-strategic-vision-for-a-prosperous-modern-competitive-and-climate-neutral-economy/

[53] https://climatetrade.com/voluntary-carbon-market-value-tops-us2b/

flexibility in the types of projects that can generate carbon credits. The VCM also allows for the transfer of carbon credits across international borders, which creates opportunities for projects in developing countries to access funding from developed countries.

In recent years, the VCM has experienced several significant developments. One trend is the increasing interest from large corporations in purchasing carbon credits to achieve their sustainability goals. For example, Microsoft has committed to becoming carbon negative by 2030, and part of this commitment involves the purchase of carbon credits from VCM projects.[54] Another trend is the emergence of new certification schemes, such as the Gold Standard for the Global Goals, which aims to provide a more robust and transparent standard for VCM projects.[55]

[54] Microsoft. (2021). Carbon Negative. https://www.microsoft.com/en-us/carbon-negative
[55] Gold Standard. (2021). Our Standards. https://www.goldstandard.org/our-standards

04

Carbon Trade Market:

Global, Regional and National Perspectives

4. Carbon Trade Market: Global, Regional and National Perspectives

4.1 Global Carbon Market

The National Carbon Market Framework aims to reduce greenhouse gas emissions through carbon pricing. It provides guidelines for establishing and operating carbon markets, either compliance or voluntary (Gilbertson & Reyes, 2009).[56] Key recommendations include a clear legal framework, ambitious emissions reduction targets, a robust carbon pricing mechanism, transparency, accountability, stakeholder engagement, and carbon offset projects (Carbon Market Watch, 2020).[57] The framework incentivizes emissions reductions and engages stakeholders in transitioning to a low-carbon economy (Dellink et al., 2014).[58] However, challenges include insufficient governance, limited transparency, narrow scope, lack of standardization, difficulty measuring emissions reductions in sectors like agriculture and forestry, and market volatility (Fan & Todorova, 2017).[59] Addressing these challenges is crucial for the effectiveness of carbon markets in achieving emissions reductions and addressing climate change (Ackerman, 2008).[60]

The carbon market, globally, seeks to mitigate climate change by enabling countries, businesses, and individuals to buy and sell emissions credits. As explained in the previous chapters, the idea behind the carbon market is to create a market-driven mechanism to reduce carbon emissions, which are a leading contributor to climate change. The global carbon market has the potential to mitigate climate change by creating a financial incentive for companies to reduce their carbon footprint. The market has grown rapidly in recent years, with the total value of the global carbon market estimated to be US$851 billion in 2021 up from $40 billion in 2005.[61]

The effectiveness of the carbon trade market in reducing greenhouse gas emissions has been a subject of debate. Critics argue that carbon credits can be bought at relatively low prices, allowing companies to continue emitting greenhouse gases while offsetting their emissions through the purchase of credits. Moreover, some carbon reduction projects may not be as effective as claimed, leading to a phenomenon known as "carbon leakage."

Despite these concerns, proponents of the carbon trade argue that it is an effective way to incentivise emissions reduction and promote clean energy development. They also argue that the trade can help channel funds to developing countries for carbon reduction projects, which can have significant social and environmental benefits. Additionally, carbon trade can create economic opportunities for companies that specialise in emissions reduction projects and renewable energy.

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[56] Gilbertson, T., & Reyes, O. (2009). *Critical Currents: Carbon Trading - How it works and why it fails*. *7*, 1–104.

[57] Carbon Market Watch. (2020). *Carbon Markets 101 - The Ultimate Guide To Market Based Climate Mechanisms*. *July*.

[58] Dellink, R. B., Jamet, S., Chateau, J., & Duval, R. (2014). Towards global carbon pricing: Direct and indirect linking of carbon markets. *OECD Journal: Economic Studies*, *2013*(1), 209–234. https://doi.org/10.1787/eco_studies-2013-5k421kk9j3vb

[59] Fan, J. H., & Todorova, N. (2017). Dynamics of China's carbon prices in the pilot trading phase. *Applied Energy*, *208*(August), 1452–1467. https://doi.org/10.1016/j.apenergy.2017.09.007

[60] Ackerman, F. (2008). Carbon Markets and Beyond: The Limited Role of Prices and Taxes in Climate and Developmet Policy. *G-24 Discussion Paper Series*, *53*(53), 24.

[61] https://www.reuters.com/business/energy/global-carbon-markets-value-surged-record-851-bln-last-year-refinitiv-2022-01-31/

4.2 African Carbon Market Initiative

Carbon trading in African countries has been a topic of concern and discussion. The carbon market in Africa has been analyzed from a corruption and governance perspective, with a focus on transparency and accountability (Newell et al., 2012).[62] Many African countries have limited opportunities to reduce carbon emissions compared to countries like China and India (Yi et al., 2020)[63], and carbon sequestration from avoided deforestation and agriculture has been excluded from carbon trading mechanisms (Chen & Lin, 2021).[64] Sub-Saharan Africa has a low share of registered Clean Development Mechanism (CDM) projects, despite having significant potential for mitigation through agriculture and forestry (Henderson, 2022).[65] The participation of Sub-Saharan Africa in global carbon markets is constrained, and there is a need for appropriate climate-change policies to unlock the potential for pro-poor mitigation investment in the region (Chen & Lin, 2021).[66] Despite the challenges militating against the development of carbon trading in Africa, it has persisted over time (*African Green Business Market Assessment Ghana Country Study*, 2010).[67]

The Africa Carbon Markets Initiative (ACMI) was launched in 2019 by the African Development Bank (AfDB) and the Climate Investment Funds (CIF). The initiative seeks to support African countries in their efforts to mitigate climate change by promoting sustainable development through the creation of a carbon market. The ACMI seeks to build on the successes of the Clean Development Mechanism (CDM), a market-based mechanism that allows developed countries to offset their emissions by investing in clean energy projects in developing countries. The CDM has been successful in reducing greenhouse gas emissions and promoting sustainable development in several developing countries.

The Initiative as a policy instrument was launched in Africa with a leading goal of producing 300 million carbon credits annually, unlock $6 billion in revenue, and create 30 million jobs by 2030 (PAGE, 2015).[68] The initiative aims to promote carbon markets as a means of unlocking financing opportunities to meet the climate needs of Africa while fostering sustainable livelihoods for communities (Erickson & Brase, 2019).[69] ACMI's ambition is to expand African voluntary carbon markets to unlock billions for the climate finance needs of African economies while expanding energy access, creating jobs, protecting biodiversity, and driving climate action (ACMI, 2022).[70] The initiative seeks to encourage conversation, coordination, and action towards the development

[62] Newell, R. G., Pizer, W. A., & Raimi, D. (2012). *Carbon Markets : Past ,. December*.
[63] Yi, L., Bai, N., Yang, L., Li, Z., & Wang, F. (2020). Evaluation on the effectiveness of China's pilot carbon market policy. *Journal of Cleaner Production*, *246*. https://doi.org/10.1016/j.jclepro.2019.119039
[64] Chen, X., & Lin, B. (2021). Towards carbon neutrality by implementing carbon emissions trading scheme: Policy evaluation in China. *Energy Policy*, *157*(August), 112510. https://doi.org/10.1016/j.enpol.2021.112510
[65] Henderson, J. (2022). A Review of Global Carbon Markets. *Oxford Energy Forum*, *1*(132), 10–17. https://www.oxfordenergy.org/publications/new-oxford-energy-forum-the-evolution-of-carbon-markets-and-their-role-in-climate-mitigation-and-sustainable-development-issue-132/
[66] Chen, X., & Lin, B. (2021). Towards carbon neutrality by implementing carbon emissions trading scheme: Policy evaluation in China. *Energy Policy*, *157*(August), 112510. https://doi.org/10.1016/j.enpol.2021.112510
[67] *African Green Business Market Assessment Ghana Country Study*. (2010). *April*.
[68] PAGE Ghana. (2019). *PAGE Ghana : Sustainability Plan 2018-2019 (DRAFT) Table of Contents*. *2019*(August).
[69] Erickson, L. E., & Brase, G. (2019). Paris Agreement on Climate Change. *Reducing Greenhouse Gas Emissions and Improving Air Quality*, 11–22. https://doi.org/10.1201/9781351116589-2
[70] ACMI. (2022). *Africa Carbon Markets Initiative: Roadmap Report*. 64. https://www.seforall.org/system/files/2022-11/ACMI_Roadmap_Report_Nov_16.pdf

of African carbon markets (Bergquist, 2017a).[71] The ACMI is led by a thirteen-member steering committee of African leaders, CEOs, and carbon credit experts (Constantiou et al., 2017).[72] To achieve this, the ACMI has identified 13 action programs to support the growth of voluntary carbon markets (VCMs) on the continent (Oberthür & Groen, 2018).[73] The ACMI is also working with major carbon credit buyers and financiers, such as Exchange Trading Group, Nando's, and Standard Chartered, to set up an advance market commitment for hundreds of millions of dollars for high-integrity African carbon credits (Department of Nuclear Energy, 2017).[74] This initiative is aimed at addressing the challenges of poor governance, lack of transparency, limited scope, lack of standardization, challenges in measuring emissions reductions, and market volatility that have hindered the effectiveness of carbon markets in Africa (Chen & Lin, 2021).[75] The ACMI aims to bring transparency to carbon markets and promote sustainable land use practices, contributing to Africa's efforts to combat climate change and achieve its carbon reduction targets (Ghana's framework, 2022).[76]

Africa accounts for only 2% of trading on the global carbon markets valued at over $2 billion (Henderson, 2022).[77] Of all the carbon credits that were issued between 2016 and 2021, only 11% came from African countries[2]. However, the global demand for carbon credits is poised to grow by a factor of 15 and could reach $50 billion by 2030 (Climate Champions, n.d.).[78] The initiative seeks to promote carbon markets as a means of unlocking financing opportunities to meet the climate needs of Africa while fostering sustainable livelihoods for communities (Erickson & Brase, 2019).[79] The World Bank Group supports several projects in Africa that lower greenhouse gas emissions and earn carbon credits, including vehicle scrapping and recycling projects in Egypt, assisted natural regeneration projects in Ethiopia, and compact fluorescent lightbulb distribution projects in Rwanda (Global Carbon Market, 2018).[80]

The Africa Carbon Markets Initiative (ACMI) offers several benefits for small and medium-sized enterprises (SMEs): access to financing, improved brand image, job creation, technical assistance, increased market access, and support for sustainable land use practices (Sitra,

[71] Bergquist, A.-K. (2017a). Business and Sustainability: New Business History Perspectives. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3055587

[72] Constantiou, I., Marton, A., & Tuunainen, V. K. (2017). Four models of sharing economy platforms. *MIS Quarterly Executive*, *16*(4), 236–251.

[73] Oberthür, S., & Groen, L. (2018). Explaining goal achievement in international negotiations: the EU and the Paris Agreement on climate change. *Journal of European Public Policy*, *25*(5), 708–727. https://doi.org/10.1080/13501763.2017.1291708

[74] Department of Nuclear Energy. (2017). *Nuclear Power and Market Mechanisms under the Paris Agreement*. https://www.iaea.org/sites/default/files/np-market-mechanisms-under-paris-agreement.pdf

[75] Chen, X., & Lin, B. (2021). Towards carbon neutrality by implementing carbon emissions trading scheme: Policy evaluation in China. *Energy Policy*, *157*(August), 112510. https://doi.org/10.1016/j.enpol.2021.112510

[76] Ghana's framework. (2022). *Ghana's framework on international carbon markets and non-market approaches;Article 6.2 cooperative approach in Ghana*. www.cmo.epa.gov.gh

[77] Henderson, J. (2022). A Review of Global Carbon Markets. *Oxford Energy Forum*, *1*(132), 10–17. https://www.oxfordenergy.org/publications/new-oxford-energy-forum-the-evolution-of-carbon-markets-and-their-role-in-climate-mitigation-and-sustainable-development-issue-132/

[78] Climate Champions. (n.d.). *Africa Carbon Markets Initiative*. https://climatechampions.unfccc.int/africa-carbon-markets-initiative-announces-13-action-programs/

[79] Erickson, L. E., & Brase, G. (2019). Paris Agreement on Climate Change. *Reducing Greenhouse Gas Emissions and Improving Air Quality*, 11–22. https://doi.org/10.1201/9781351116589-2

[80] Global Carbon Market. (2018). *Global Carbon Market*.

2022).[81] By participating in carbon markets, SMEs can generate new revenue, create jobs, and demonstrate their commitment to sustainability and emissions reductions. The ACMI aims to create 30 million jobs by 2030, supporting local economies and SMEs (Newell et al., 2012).[82] Technical assistance and support are also available to SMEs, ensuring they can participate in carbon markets and develop emissions reduction projects. Additionally, the ACMI promotes sustainable land use practices, improving soil quality, biodiversity, and agriculture (Qiongyu Li, 2018).[83] Overall, SMEs can benefit from the ACMI by accessing financing, improving brand image, creating jobs, technical assistance, increasing market access, and supporting sustainable land use practices (Rosen, 2015).[84]

However, there are challenges to implementing carbon markets in Africa, including insufficient governance, lack of transparency, limited scope, lack of standardization, challenges in measuring emissions reductions, and market volatility (Gilbertson & Reyes, 2009).[85] Market fragmentation creates complexities in trading and verifying carbon credits, especially for small and medium-sized enterprises. The market's complexity involves various stakeholders, financial instruments, and trading platforms, making it difficult for market participants to navigate. The demand for carbon credits varies, but the availability of buyers and investors is limited (Henderson, 2022).[86]

The African Carbon Market Initiative (ACMI) is a project aimed at reducing greenhouse gas emissions in Africa by promoting carbon trading, carbon pricing, and other market-based mechanisms. The initiative aims to create a platform for African countries to participate in the global carbon market while promoting sustainable development and poverty reduction.

In terms of the volume of trade, the ACMI is a relatively new initiative, and it may take some time before significant volumes of trade are recorded. However, the AfDB has committed to mobilising $25 billion in climate finance for African countries by 2025, which will include support for the development of carbon markets.[87] Several African countries have already taken advantage of the ACMI to develop their carbon markets and access climate finance. These include Morocco, Kenya, Rwanda, Côte d'Ivoire, Ghana, and South Africa, among others. It is important to note that the development of carbon markets in Africa is still in its early stages, and there is a need for further capacity building and technical assistance to support the growth of these markets. However, the ACMI is expected to play a significant role in promoting the development of carbon markets and the transition to low-carbon and climate-resilient development pathways in Africa.

[81] Sitra. (2022). *Sustainable growth with circular economy business models - Sitra*. https://www.sitra.fi/en/publications/sustainable-growth-with-circular-economy-business-models/

[82] Newell, R. G., Pizer, W. A., & Raimi, D. (2012). *Carbon Markets : Past ,. December*.

[83] Qiongyu Li. (2018). Authors : Ac ce d M us pt. *2D Materials*, 0–23. https://iopscience.iop.org/article/10.1088/2053-1583/abe778

[84] Rosen, A. M. (2015). The wrong solution at the right time: The failure of the kyoto protocol on climate change. *Politics and Policy*, *43*(1), 30–58. https://doi.org/10.1111/polp.12105

[85] Gilbertson, T., & Reyes, O. (2009). *Critical Currents: Carbon Trading - How it works and why it fails*. *7*, 1–104.

[86] Henderson, J. (2022). A Review of Global Carbon Markets. *Oxford Energy Forum*, *1*(132), 10–17. https://www.oxfordenergy.org/publications/new-oxford-energy-forum-the-evolution-of-carbon-markets-and-their-role-in-climate-mitigation-and-sustainable-development-issue-132/

[87] https://www.afdb.org/en/cop27/focus-africa/african-development-banks-climate-change-commitment

4.3 Current State of Ghana's Carbon Market

In 2020, the Ghanaian government signed a memorandum of understanding (MOU) with the European Union (EU) to develop a domestic carbon market as part of efforts to mitigate greenhouse gas emissions and promote sustainable development. The MOU provided a framework for collaboration between the two parties to develop a market-based mechanism that would enable Ghana to access climate finance through carbon credits generated from emission reduction projects. The MOU also aimed to support the implementation of Ghana's Nationally Determined Contributions (NDCs) under the Paris Agreement. It is estimated that an investment of US$ 9.3 to US$ 15.5 billion is required to implement 47 NDCs that have been determined for Ghana for the period 2020 – 2030[88].

Ghana outlined its strategy for participating in the cooperative approach in its 2021 updated NDC to the UNFCCC. The cooperative approach refers to Article 6, paragraph 2 of the Paris Agreement, which encourages countries to work together to reduce greenhouse gas emissions (Padín-Dujon, 2023).[89] Ghana's strategy includes making approximately 24 million tonnes of emission reductions under Article 6.2 cooperative approaches available for transactions (Ghana's framework, 2022).[90] The goal of this strategy is to participate in the Paris Agreement's carbon market and non-market approaches (Partnerships for Forests, 2020).[91] Ghana has developed a national operational framework for participating in the Paris Agreement's carbon market and non-market approaches to complement other domestic and international climate finance resource mobilization efforts (Padín-Dujon, 2023).[92] Ghana is a non-Annex I country under the Kyoto Protocol, which means that it is not legally bound to reduce its greenhouse gas emissions. However, Ghana has voluntarily committed to reducing its emissions by 20% by 2020, and by 50% by 2030 (GhREDD+, n.d.).[93] Ghana has participated in two types of carbon markets under the Kyoto Protocol: Joint Implementation (JI) and Clean Development Mechanism (CDM). In addition to the Kyoto Protocol, Ghana is also participating in the REDD+ framework, which is a global effort to reduce emissions from deforestation and forest degradation (National green Jobs Strategy, 2015).[94] Ghana has formulated a REDD+ strategy that incorporates the utilization of carbon markets to finance forest conservation and sustainable forest management (Partnerships for Forests, 2020).[95]

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[88] EPA and MESTI (2021). Updated Nationally Determined Contribution under the Paris Agreement (2020 - 2030).

[89] Padín-Dujon, A. (2023). *Article 6.2 carbon markets in Ghana: a bright future for a shadowy business*. https://blogs.lse.ac.uk/internationaldevelopment/2023/05/30/article-6-2-carbon-markets-in-ghana-a-bright-future-for-a-shadowy-business/

[90] Ghana's framework. (2022). *Ghana's framework on international carbon markets and non-market approaches;Article 6.2 cooperative approach in Ghana*. www.cmo.epa.gov.gh

[91] Partnerships for Forests. (2020). *UNLOCKING CARBON FINANCE IN GHANA Lessons learned from incubating a regenerative cocoa business model to help secure conditions precedent under the Emission Reductions Payment Agreement (ERPA)*.

[92] Padín-Dujon, A. (2023). *Article 6.2 carbon markets in Ghana: a bright future for a shadowy business*. https://blogs.lse.ac.uk/internationaldevelopment/2023/05/30/article-6-2-carbon-markets-in-ghana-a-bright-future-for-a-shadowy-business/

[93] GhREDD+. (n.d.). *Ghana Cocoa Forest REDD+ Programme (GCFRP)*. https://reddsis.fcghana.org/projects.php?id=4

[94] National green Jobs Strategy. (2015). *MINISTRY OF EMPLOYMENT AND LABOUR RELATIONS NATIONAL*. *1*, 1–14.

[95] Partnerships for Forests. (2020). *UNLOCKING CARBON FINANCE IN GHANA Lessons learned from incubating a regenerative cocoa business model to help secure conditions precedent under the Emission Reductions Payment Agreement (ERPA)*.

The carbon market in Ghana is still in its early stages of development, but it has the potential to play a significant role in helping the country to achieve its climate goals (Newell et al., 2012).[96] However, Ghana faces some challenges in developing its carbon market, including a lack of transparency and accountability, high transaction costs, and a weak legal framework. Despite these challenges, Ghana is committed to developing its carbon market(Ghana's framework, 2022).[97] The government believes that the carbon market can be a valuable tool for reducing emissions and promoting sustainable development (Partnerships for Forests, 2020).[98]

Article 6.2 of the Paris Agreement establishes a framework that facilitates international collaboration on carbon markets (Ghana's framework, 2022).[99]. Ghana is poised to reap benefits from this framework, given its significant potential for carbon offset projects, particularly in the energy and agriculture sectors (Padín-Dujon, 2023)[100]To that end, the United Nations Development Programme has initiated a retraining program aimed at rice farmers in Ghana, to impart agricultural techniques that reduce the industry's carbon footprint and mitigate the release of methane (Padín-Dujon, 2023)[101]This project, which covers nearly 80% of Ghana's rice production, is expected to yield savings of over 1 million tonnes of "carbon dioxide equivalent" by 2030 (Ghana's framework, 2022).[102] Further, the Cocoa Forest REDD+ Program implemented sustainable practices aimed at reducing emissions by 2.5 million tonnes of carbon dioxide equivalent by 2030 from Cocoa farming in the country (UNFCCC, 2010).[103] In addition, the REDD Carbon Project contributed to forest conservation, carbon stock enhancement, and sustainable land use practices since 2010, and has successfully reduced emissions by an estimated 1.5 million tonnes of carbon dioxide (Ludeña et al., 2016).[104] Ghana also received $4.8 million in payments from the World Bank's Forest Carbon Partnership Facility (FCPF) for its achievements in reducing emissions from deforestation and forest degradation (GhREDD+, n.d.).[105]

The carbon market under the Kyoto Protocol and GhREDD+ has significantly reduced carbon emissions resulting from cocoa farming and deforestation in Ghana's forest mosaic landscape

[96] Newell, R. G., Pizer, W. A., & Raimi, D. (2012). *Carbon Markets : Past ,. December*.
[97] Ghana's framework. (2022). *Ghana's framework on international carbon markets and non-market approaches;Article 6.2 cooperative approach in Ghana*. www.cmo.epa.gov.gh
[98] Partnerships for Forests. (2020). *UNLOCKING CARBON FINANCE IN GHANA Lessons learned from incubating a regenerative cocoa business model to help secure conditions precedent under the Emission Reductions Payment Agreement (ERPA)*.
[99] Ghana's framework. (2022). *Ghana's framework on international carbon markets and non-market approaches;Article 6.2 cooperative approach in Ghana*. www.cmo.epa.gov.gh
[100] Padín-Dujon, A. (2023). *Article 6.2 carbon markets in Ghana: a bright future for a shadowy business*. https://blogs.lse.ac.uk/internationaldevelopment/2023/05/30/article-6-2-carbon-markets-in-ghana-a-bright-future-for-a-shadowy-business/
[101] Padín-Dujon, A. (2023). *Article 6.2 carbon markets in Ghana: a bright future for a shadowy business*. https://blogs.lse.ac.uk/internationaldevelopment/2023/05/30/article-6-2-carbon-markets-in-ghana-a-bright-future-for-a-shadowy-business/
[102] Ghana's framework. (2022). *Ghana's framework on international carbon markets and non-market approaches;Article 6.2 cooperative approach in Ghana*. www.cmo.epa.gov.gh
[103] UNFCCC. (2010). The Kyoto Protocol Mechanisms: International Emissions Trading, Clean Development, Mechanism Joint Implementation. *United Nations Framework Convention on Climate Change (UNFCCC)*. https://cdm.unfccc.int/about/cdm_kpm.pdf%0Ahttp://unfccc.int/kyoto_protocol/items/2830.php
[104] Ludeña, C., de Miguel, C., & Schuschny, A. (2016). Climate change and Carbon markets: Implications for developing countries. *CEPAL Review*, *2015*(116), 61–84. https://doi.org/10.18356/68536e46-en
[105] GhREDD+. (n.d.). *Ghana Cocoa Forest REDD+ Programme (GCFRP)*. https://reddsis.fcghana.org/projects.php?id=4

(GhREDD+, n.d.)[106]. These programmes also promoted climate-smart cocoa production practices, such as agroforestry and sustainable land use practices, increasing cocoa yields (Lamptey, n.d.).[107] The programmes further promoted reforestation and forest conservation efforts, enhancing carbon stocks and reducing deforestation while promoting Biodiversity conservation and improving soil quality (Xu, 2021).[108] Several livelihoods were also improved through increased cocoa yields and sustainable land use practices (PAGE), 2015).[109] The program has received international recognition for its success in reducing carbon emissions and promoting sustainable land use practices (Smith-Gillespie, 2020).[110]

Implementing carbon market strategies in Ghana was faced with several challenges. These challenges include:The lack of a clear land and tree tenure system about ownership and management of trees posed difficulties in implementing the program effectively (PAGE Ghana, 2019). [111]

The absence of a standardized methodology for measuring and verifying emissions reductions made it more challenging to implement the program, particularly the REDD+ methodology (PAGE Ghana, 2019).[112] Inadequate investment in Cocoa Carbon, a mechanism to incentivize sustainable cocoa production and reduce emissions, further deepened the challenges to the program's success (Partnerships for Forests, 2020).[113] The program aimed to address deforestation pressures resulting from cocoa farming. However, the expansion of cocoa farming and associated deforestation posed ongoing challenges to achieving the program's objectives. Building the capacity of local communities, cocoa farmers, and stakeholders to understand and participate in the program was a challenge (*African Green Business Market Assessment Ghana Country Study*, 2010).[114] Funding and resources were inadequate for the successful implementation of the programs. Despite these challenges, the Ghana Cocoa Forest REDD+ Program has made progress in reducing emissions and promoting sustainable land use practices. Efforts are ongoing to address these challenges and improve the effectiveness of the program in achieving its goals (PAGE Ghana, 2019).[115]

The carbon market in Ghana involved several sectors, including cocoa farming, forest conservation, wildfire management, freight rail transport, electric vehicles, energy efficiency, forest plantation, Agriculture, Forestry, and Other Land Use (AFOLU) sectors, industrial

[106] GhREDD+. (n.d.). *Ghana Cocoa Forest REDD+ Programme (GCFRP)*. https://reddsis.fcghana.org/projects.php?id=4

[107] Lamptey, D. A. (n.d.). *Ghana ' s experience with the development of its carbon markets policy framework State of domestic MRV - GCARP*.

[108] Xu, W. (2021). The Impact and Influencing Path of the Pilot Carbon Emission Trading market——Evidence From China. *Frontiers in Environmental Science*, *9*(December), 1–11. https://doi.org/10.3389/fenvs.2021.787655

[109] (PAGE), P. for A. on G. E. (2015). *Ghana : Green Industry*

[110] Smith-Gillespie, A. (2020). *Economy Business Model*. *730378*, 23.

[111] PAGE Ghana. (2019). *PAGE Ghana : Sustainability Plan 2018-2019 (DRAFT) Table of Contents*. *2019*(August).

[112] PAGE Ghana. (2019). *PAGE Ghana : Sustainability Plan 2018-2019 (DRAFT) Table of Contents*. *2019*(August).

[113] Partnerships for Forests. (2020). *UNLOCKING CARBON FINANCE IN GHANA Lessons learned from incubating a regenerative cocoa business model to help secure conditions precedent under the Emission Reductions Payment Agreement (ERPA)*.

[114] *African Green Business Market Assessment Ghana Country Study*. (2010). *April*.

[115] PAGE Ghana. (2019). *PAGE Ghana : Sustainability Plan 2018-2019 (DRAFT) Table of Contents*. *2019*(August).

processes sectors, and waste management (Bryan et al., 2010).[116] However, these sectors have the potential to reduce carbon emissions and promote sustainable land use practices, contributing to Ghana's efforts to combat climate change and achieve its carbon reduction targets (Ludeña et al., 2016). [117]

Studies have pointed out that Small and medium enterprises (SMEs) have opportunities to participate in the carbon market (Hu et al., 2014)[118] and they have shown varying levels of engagement in carbon management. While some SMEs in Derbyshire, UK, have taken steps to reduce their carbon impact, most do not monitor or set targets for managing carbon usage (Conway, 2015).[119] Chinese SMEs, in particular, have the necessity and possibility to implement low-carbon strategies (Geissdoerfer et al., 2020).[120] However, the voluntary carbon market (VCM) has been identified as a potential resource for promoting sustainable development and innovation in SMEs (Global Carbon Market, 2018).[121] Customer participation can serve as a viable way to promote green product innovation in SMEs. The VCM has supported small businesses with unique business models in Africa, helped large businesses achieve corporate social responsibility goals in the United States, and promoted conservation and increased the value of ecosystem services in Peru (ACMI, 2022).[122] Therefore, while SMEs may face barriers to engagement in carbon management, the voluntary carbon market offers opportunities for growth and innovation in sustainable development (BMW Foundation RESPOND et al., 2022).[123] Additionally, supply chain partnerships can help SMEs improve their resource productivity and contribute to carbon management in the supply chain. SMEs can participate in the low-carbon economy by implementing low-carbon strategies, which can improve their capacity for survival and development (O'Neill & Gibbs, 2016).[124]

Barriers to SMEs' participation in the carbon market include a lack of access to information, training, and confusion over the delivery of the scheme (Quintás et al., 2018).[125] Additionally, SMEs face legal and institutional barriers, such as government intervention in business activities,

[116] Bryan, E., Akpalu, W., Yesuf, M., & Ringler, C. (2010). Global carbon markets: Opportunities for sub-Saharan Africa in agriculture and forestry. *Climate and Development*, *2*(4), 309–331. https://doi.org/10.3763/cdev.2010.0057

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taxes, and unclear regulations (Palao & Pardo, 2018).[126] The lack of skilled scientists in China is also a significant barrier for SMEs in the new energy vehicle (NEV) market (Pulver et al., 2010).[127] Furthermore, market frictions and barriers, including information, capacity, and financial constraints, as well as uncompetitive market structures, hinder SMEs' investments in efficiency and low-carbon technologies (Qiongyu Li, 2018).[128] The Clean Development Mechanism (CDM) participation by sugar mills in Brazil reveals that access to trusted sources of information and market drivers, such as revenue and reputation concerns, influence SMEs' engagement in carbon abatement (O'Keeffe et al., 2016).[129] Identifies key types of trade barriers for SMEs - Explores government policies to reduce trade barriers (Fliess & Busquets, 2006).[130]In line with this, Ghana's framework on international carbon markets and non-market approaches was developed in December 2022 as a policy document for engaging in the carbon market in Ghana[131]. The document provides guidelines for operationalising the carbon market in Ghana and the administrative arrangements for its implementation. Ghana Carbon Market Office (CMO) at the Environmental Protection Agency is the secretariat established to provide administrative and technical services to the public and support the implementation of Ghana's international carbon market and non-market approaches framework.

One of the key activities that has been undertaken by this Office is the establishment of the Ghana Carbon Registry (GCR) to serve as a database for collecting and tracking transactions from mitigation activities at sector, city, and corporate levels. This is an online database designed for receiving, processing, recording, and storing data on mitigation projects, the issuance, holding, transfer, acquisition, cancellation, and retirement of emission reduction credits. This GCR ensures that the carbon market functions effectively and efficiently by providing accurate and transparent data or information to market participants and the public. Additionally, the GCR publishes publicly accessible information to increase public confidence in the emissions reduction agenda.

Ghana has made huge progress in international carbon trading market. Key successes include the following:

- First-ever voluntary cooperation with Switzerland under Article 6.2 of the Paris Agreement Internationally Transferred Mitigation Outcome (ITMO). Under this arrangement, Ghana would receive Switzerland's payment for the ITMOs, which would enable Ghana to transition thousands of rice farmers, jointly covering 80% of its rice production, to climate-smart rice production, reducing methane emissions and increasing farmer income and resilience.[132]

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- Completion of negotiations with the Swedish[133] and Singapore[134] Governments on the Implementation Agreement on Carbon Credits Cooperation, a framework agreement to enable the bilateral transfer of carbon credits.

The country is expected to leverage on these international experiences on carbon credit cooperation to fully develop the carbon financing sector in Ghana.

[133] https://cmo.epa.gov.gh/index.php/ghana-sweden-cooperative-approach-under-article-6-2-of-the-paris-agreement/
[134] https://www.mse.gov.sg/resource-room/category/2022-11-15-media-release-singapore-and-ghana-implementation-agreement-article-6

05

Policy and Strategic Measures needed to Facilitate Carbon Market Access

5. Policy measures and strategies to promote carbon trading

Promoting carbon trading in Ghana would require a combination of policy measures and strategies that incentivise participation and create a supportive environment. The following policy and strategic measures are proposed to enhance growth and participation in the carbon market in Ghana:

(i) **Awareness and capacity building**: Although Ghana has started operating a Carbon Market Office (CMO) to trade in the multibillion-dollar business in the climate change space, most local businesses and institutions, especially small and medium enterprises (SMEs) have not availed themselves to these emerging opportunities because they might either be unaware or do not have the capacity to access these opportunities. It is therefore important to conduct outreach programmes, workshops, and training sessions to raise awareness about carbon trading and its benefits to local businesses and institutions. It is critical to provide resources and support to enhance their understanding of carbon markets, emission reduction strategies, and trading mechanisms.

(ii) **Regulatory framework**: The National Carbon Market Framework provides the fundamental regulatory framework for carbon trading in Ghana. Further important bilateral agreements with other countries, as well as with the private sector have been established/initiated for carbon trading. Despite the broad regulatory framework, it might be necessary to establish sector-specific guidelines that support carbon trading and clarifies the procedures as it pertains to specific sectors for small and medium businesses. These sector-specific guidelines and procedures should define the eligibility criteria, monitoring requirements, and reporting standards for carbon emissions. It should also outline the penalties for non-compliance and provide incentives for participation.

(iii) **Access to finance**: It is important to facilitate access to finance for local businesses to invest in emission reduction projects and technologies. This could be through the establishment of dedicated funding schemes, grants, and low-interest loans that prioritize sustainable projects. This support will enable small businesses to implement measures that reduce their carbon footprint and participate in carbon trading.

(iv) **Technical assistance and partnerships**: Local businesses, especially the SMEs, would need technical assistance and guidance to develop emission reduction projects and to monitor their carbon emissions. This could be achieved by fostering partnerships between small businesses, carbon market intermediaries, and sustainability consultants.

(v) **Carbon market platforms**: User-friendly and accessible carbon market platforms that allow businesses to register, track, and trade their carbon credits is essential for smooth operationalisation of the carbon market, and such online platform has already been created by the Carbon Market Office. It is important to ensure that the platform continues to be more flexible, provides transparent information on market prices, facilitates matchmaking between buyers and sellers, and simplifies the transaction process.

(vi) **Recognition and certification**: It would be necessary to reinforce the system that recognises and certifies emission reduction efforts by SMEs. Accreditation and certification enhances the credibility of carbon credits generated by businesses, making them more attractive to buyers in the market.

(vii) **Information sharing and collaboration**: Within the carbon trading space, it is essential to foster knowledge sharing and collaboration among businesses engaged in carbon trading. Hence,

there is a need to facilitate the formation of industry networks, forums, and communities where businesses can share best practices, challenges and opportunities related to carbon trading.

(viii) **Incentives and rewards**: An offer of financial incentives, tax breaks, or other rewards to businesses that actively participate in carbon trading could help offset the initial costs associated with emissions reduction measures and encourage wider adoption.

Lastly, it is crucial to ensure that the implementation of the policy measures and strategies summarized here are aligned with Ghana's national climate change goals and are regularly evaluated and adjusted to promote effective carbon trading among local businesses.

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