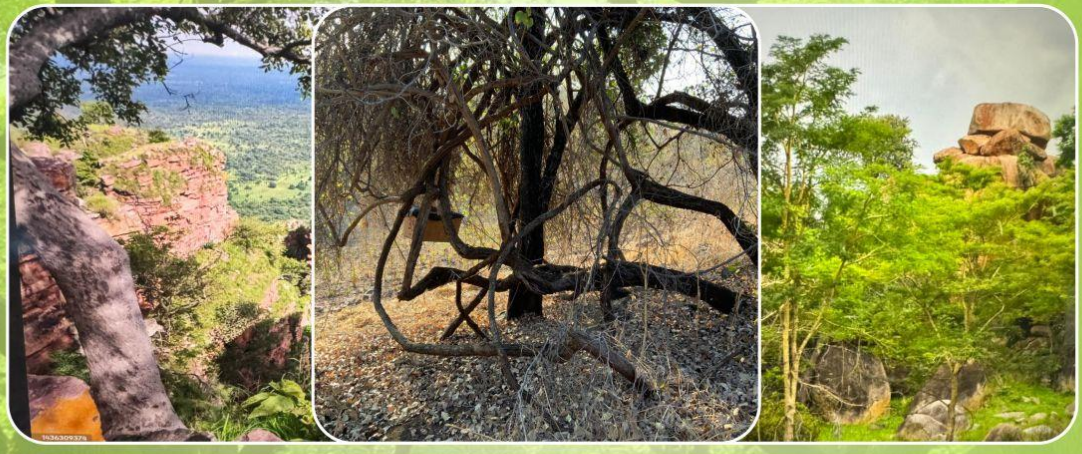
Forest Management and the Carbon Trading Business in Zimbabwe



Charles Ndondo

Forest Management and the Carbon Trading Business in Zimbabwe

Charles Ndondo

Dedication

To my beloved wife Esteli, son Tinashe R. Ndondo and daughter Valerie K.N. Ndondo

Acknowledgements

I hereby express my profound and sincere gratitude to the Midlands State University, Faculty of Commerce, Department of Business Management, together with the Department's staff, whose invaluable support has underpinned the entirety of this academic journey. The academic environment provided was not only intellectually stimulating but also personally enriching.

Special recognition is reserved for Dr D. Ndlovu and Professor I. Chirisa whose expert academic guidance, critical insights, and unwavering mentorship has resulted in the production of this book.

Furthermore, I extend heartfelt appreciation to my beloved wife, son, daughter, nephew and business partner whose steadfast financial and moral support constituted a pillar of strength during the most demanding moments of authoring this document.

Finally, and above all, I ascribe all honour and glory to the Almighty God, whose grace and mercy have sustained and guided me through to the successful culmination of this project.

Book Synopsis

This book critically examined the intricate relationship between forest management and the carbon trading business in Zimbabwe, focusing on how sustainable forestry practices influence the viability and scalability of carbon markets within the national context. By the time of undertaking this research, Zimbabwe had only one known company to be trading carbon credits through a forestry management project named the Kariba REDD+ project. The project started in 2011 and spans across four districts namely Mbire, Nyaminyami, Hurungwe and Binga thus stretching over an area of 750,000 hectors and impacting over 2,000 rural households. To adequately address the subject of this book from the Zimbabwean context, the research had to focus on the sole Kariba REDD+ project in Zimbabwe and make comparisons with projects elsewhere outside Zimbabwe. Carbon Green Africa (Pvt) Ltd is the project developer and a Zimbabwean company created to set up, and enable verification and validation of REDD+ projects so as to generate Carbon Credits for purposes of offsetting carbon footprints thereby mitigation climate change.

Rooted in an empirical framework that utilised a mixed methods approach, the research drew insights from a number of respondents comprising the project developer employees, community members from Binga and Hurungwe districts and Ministry of Environment, Climate and Wildlife (MECW) officials. The selection of participants was random, enhancing the objectivity and representativeness of the findings. The central argument advanced through this study is that sustainable forest management constitutes the linchpin of Zimbabwe's carbon trading business, yet its potential is severely constrained by legislative gaps, weak institutional support, and a lack of enforced corporate accountability. The study revealed that in Africa, and Zimbabwe in particular, carbon trading initiatives are largely forest-based, relying on vast tracts of woodland to generate carbon credits. However, this dependency is undermined by fragmented or poorly

executed forest governance structures. The absence of a coherent, enforceable framework for forest management presents significant obstacles to the sustainability of carbon projects.

A striking revelation from the findings was the lack of any existing legislation mandating local firms to purchase carbon credits. This regulatory vacuum has contributed to a carbon trading sector that is underdeveloped and heavily reliant on international buyers and voluntary participation. Such an arrangement fails to cultivate a domestic market robust enough to support long-term environmental and economic objectives. The absence of compulsion allows local corporations to circumvent climate responsibility, thereby weakening the incentives necessary to drive systemic participation and investment in carbon offsetting. Furthermore, the study uncovered broad community support for the expansion of CGA's carbon trading project. This enthusiasm stems from a recognition of the tangible socio-economic benefits such initiatives provide, especially within rural communities where livelihoods remain vulnerable and opportunities limited. The willingness of local populations to support project expansion signifies a critical but underutilised constituency in national climate strategies. It is also critical to mention that Carbon Green Africa made further expansion by starting yet another REDD project with the Zimbabwe National Parks Authority, a project called the Chirisa REDD+ project which was started in 2021. Nonetheless, without a deliberate policy framework that protects and integrates community interests, such goodwill risks being tokenistic and short-lived.

From these findings, it was concluded that forest management must be understood not merely as an environmental necessity, but as a strategic economic instrument, central to the effective implementation of carbon trading in Zimbabwe. The study's recommendations call for a recalibration of national priorities through the establishment of robust, enforceable legal mechanisms that will embed carbon trading into national development plans. There is also a pressing need for extensive

stakeholder education to foster greater awareness of the socio-economic benefits associated with carbon trading. Furthermore, the introduction of mandatory compliance measures for local companies is essential to transition carbon trading from a donor-supported endeavour to a fully institutionalised economic sector. In sum, the research underscores the latent potential of forest-based carbon trading in Zimbabwe, while critically exposing the structural and regulatory deficiencies that impede its growth. A strategic policy overhaul, rooted in legal reform, institutional commitment, and community engagement, is imperative if Zimbabwe is to harness forest management as a catalyst for both climate resilience and economic development.

Table of Contents

Chapter 1: Assessing the Impact of Forest Management on Carbon Trading Business: A Prologue and Overview

The integration of forest management into carbon trading frameworks has emerged as a foundational element of contemporary climate mitigation architecture, yet its implementation reveals enduring tensions between ecological integrity, economic rationality, and institutional coherence. Forests-particularly those with high biomass density and intact ecological functions-are natural carbon sinks, capable of absorbing significant volumes of atmospheric CO_2 and storing it in biomass and soil (Ameray *et al.*, 2021). However, while their biophysical potential is uncontested, the translation of this potential into credible carbon credits within both compliance and voluntary markets is mediated by the rigour and credibility of forest management regimes. As carbon markets grow, particularly under the Paris Agreement's Article 6 mechanisms, the imperative to ensure permanence, additionality, and verifiability has placed forest governance at the centre of carbon finance debates (Wang *et al.*, 2025).

Recent developments in forest carbon modelling expose longstanding deficiencies in current market structures. Fuller *et al.* (2025) argue that the disciplinary separation of ecological and economic models has led to mispriced carbon credits and misaligned incentives for forest stewards. Their convergence framework, which seeks to integrate feedback loops between forest health, carbon flux, and market behaviour, is promising yet presupposes institutional capacity and data infrastructure that many forest-rich but resource-poor countries lack. Similarly, while Woodall *et al.* (2025) highlight the need for investments in regeneration and lateral flux modelling to support decision-making, the question of who bears these costs remains unresolved.

The concept of climate-smart forestry (CSF), proposed by Xie *et al.* (2025), represents a paradigmatic shift by aligning sustainable forestry

with digital innovations in carbon monitoring. Through tools such as remote sensing, AI, and GIS-integrated accounting, CSF aims to ensure the traceability and transparency of carbon credits. Yet, such high-integrity systems remain largely aspirational in the Global South, where institutional fragmentation and technical capacity gaps hinder consistent implementation. Zimbabwe's own initiatives in this regard remain uneven, with pilot projects struggling to overcome infrastructural and regulatory limitations (UNDP, 2022). It is critical to note that the Kariba REDD+ project had to engage external expertise such as South Pole Carbon to meet the international requirements necessary for implementation of such projects.

Critically, the absence of tight forest management often undermines both ecological performance and market legitimacy. Poorly managed forests-susceptible to degradation, illegal logging, and wildfires—reduce carbon stock permanence and complicate verification. Ameray *et al.* (2021) provide compelling evidence that harvest intensity and species selection dramatically affect soil carbon retention and long-term sequestration. While tropical forests offer high sequestration potential, they are especially vulnerable to conversion pressures. Conversely, temperate and boreal forests, under sound management, provide more stable carbon stocks (Zhang *et al.*, 2022). These variabilities underscore the need for context-specific forest governance strategies, rather than one-size-fits-all models.

The monetisation of forest carbon has created new revenue opportunities through REDD+ and other mechanisms, yet it also presents profound ethical and institutional dilemmas. Kurth *et al.* (2025) note that high-integrity forest credits can command 2–3× higher prices, incentivising investment in improved forest governance. However, commodifying ecosystem services without adequate safeguards risks reproducing extractive dynamics under the guise of sustainability. Ecosystem Marketplace (2025) and the Integrity Council for the Voluntary Carbon Market (2024) have attempted to standardise

methodologies and leakage controls, but practical enforcement remains limited, particularly at subnational levels. In Zimbabwe, despite the establishment of a regulatory framework through Statutory Instrument 48 of 2025 (Veritas, 2025), land tenure ambiguity and weak institutional coordination continue to erode projects integrity (Chimwamurombe, 2023).

Socio-legal critiques increasingly highlight the need to reframe carbon not as a commodified unit but as a relational asset embedded in governance and rights regimes. Cubas-Baez *et al.* (2025) argue that failure to recognise Indigenous Peoples and Local Communities (IPLCs) as legitimate carbon rights holders threatens both market legitimacy and long-term project success. Indeed, the growing literature now points to the necessity of rights-based valuation frameworks and legally enforceable benefit-sharing mechanisms. Without these, carbon markets risk becoming instruments of dispossession rather than empowerment.

Forest management also determines the operational viability of measurement, reporting, and verification (MRV) systems. Technical tools, such as forest inventories, satellite monitoring, and flux towers are only effective when embedded within institutional architectures that ensure data quality and accountability. Makela *et al.* (2023) and Wieckowski *et al.* (2024) highlight that while such systems are well established in temperate regions, their application in sub-Saharan Africa is limited by cost and technical capacity. In Zimbabwe, the Forestry Commission has piloted remote sensing in Nyanga District, but high-resolution data and skilled personnel remain in short supply (UNDP, 2022).

Financial tools are equally constrained. Though models such as COMET-Farm and the Forest Carbon Calculator have enabled more accurate project-level cost-benefit analysis (FMO & Mobilising Finance for Forests, 2024), their use in Zimbabwe has been restricted by baseline data inconsistency and limited stakeholder capacity. Blockchain-based

registries, like those piloted in Kenya, have demonstrated efficiency gains, yet Zimbabwe's digital infrastructure and regulatory readiness remain insufficient to support such innovation at scale (Petraschuk, 2023).

The effectiveness of MRV and valuation systems is also shaped by socio-political variables, notably land tenure and stakeholder participation. Evans and Guariguata (2008) and Poudel *et al.* (2021) show that participatory monitoring can improve data accuracy and community buy-in. Zimbabwe's CAMPFIRE model demonstrates potential for decentralised forest governance, but it has not been fully integrated into carbon measurement protocols (CAMPFIRE Association, 2025). Tenure ambiguity, particularly in customary land areas, complicates carbon rights attribution and verification (UNDP, 2022). By contrast, Ghana's REDD+ readiness process introduced tenure reforms that facilitated local engagement and improved enrolment in carbon schemes (Agyei, 2012).

Globally, adaptive governance models-especially those that combine jurisdictional approaches with participatory mechanisms are out-performing project-based interventions. Sanders-DeMott *et al.* (2025) reveal that subnational jurisdictions leveraging REDD+ schemes report higher fiscal returns and governance indicators. However, this assumes state capacity and political stability-conditions not guaranteed in all contexts. The Surui Project in Brazil, once a paragon of community-led carbon stewardship, collapsed under the pressure of illegal mining and inadequate state protection (Zwick, 2019). This illustrates that permanence is not merely biophysical but politically contingent.

Forest management is neither a neutral ecological variable nor a technical input into carbon markets. It is a structuring condition-one that shapes credit generation, valuation, verification, and distribution. Its influence is mediated by a matrix of ecological, financial, institutional, and socio-political factors. The Zimbabwean experience underscores that

the success of carbon trading initiatives hinges less on their technical design than on their institutional embeddedness and social legitimacy. As such, any analytical framework seeking to evaluate the role of forest management must go beyond the technocratic and embrace a systems-oriented, politically informed, and justice-sensitive perspective. These dimensions and tools form a complex ecosystem of measurement practices whose effectiveness depends on their ability to support credible carbon accounting, facilitate market integration, and uphold verification standards. In high-capacity settings such as Finland and California, tools are deployed synergistically to enhance transparency, scalability, and investor trust (Hyvönen, Laine, & Pellinen, 2024). In Zimbabwe, where technical capacity and institutional coherence are limited, a strategic blend of low-cost inventory methods, satellite monitoring, participatory frameworks, and emerging digital platforms offers a viable pathway for credible impact measurement (Global Climate Action Partnership, 2015). Ultimately, tool selection must reflect not only methodological rigor but also ecological relevance, financial feasibility, institutional readiness, and socio-political legitimacy. A context-sensitive, multidimensional approach is essential to ensuring that forest management interventions translate into verifiable, marketable, and equitable carbon outcomes (UNDP, 2022).

The findings presented in the chapter underscore the centrality of forest management in shaping the credibility, functionality, and developmental legitimacy of carbon trading systems. Forest ecosystems, long recognised for their biophysical capacity to sequester atmospheric carbon, are increasingly positioned as strategic assets within global climate finance. Yet their effectiveness as carbon sinks is not intrinsic, it is contingent upon the quality, intentionality, and governance of management regimes. Evidence from silvicultural studies and modelling simulations demonstrates that interventions such as controlled harvesting, afforestation, and disturbance mitigation significantly enhance long-term carbon retention, particularly in regions vulnerable to climate-induced stressors. These insights affirm the imperative for

tighter forest governance, not only to stabilise ecological outcomes but to safeguard the integrity of forest-based carbon credits.

As carbon markets evolve under both compliance and voluntary frameworks, the commodification of emission reductions introduces a complex interplay between ecological science, financial valuation, and institutional design. The foundational principles of additionality, permanence, and leakage prevention demand more than technical verification; they require interdisciplinary expertise and governance structures capable of ensuring transparency, stakeholder engagement, and rights recognition. The chapter's findings suggest that the credibility of carbon markets is increasingly shaped by socio-political variables, especially in contexts marked by contested land tenure and uneven community participation. The shift toward rights-based valuation frameworks that acknowledge the stewardship roles of Indigenous Peoples and Local Communities, signals a critical epistemic transition in carbon finance. Carbon is no longer merely a tradable unit, it is a relational asset embedded in legal, ecological, and governance systems.

Empirical cases from Brazil, Zimbabwe, and the United States illustrate that forest management induces differentiated impacts across ecological, financial, institutional, and developmental domains. In Brazil, the suspension of the Surui Forest Carbon Project following extractive incursions highlights the fragility of permanence when forest territories lack protective sovereignty. Zimbabwe's regulatory reforms, including the establishment of a centralised carbon authority, reflect efforts to standardise governance and attract investment. Yet persistent fragmentation in land tenure and the absence of enforceable benefit-sharing mechanisms continue to undermine project legitimacy and market scalability. These outcomes suggest that technical compliance alone is insufficient; market success is contingent on governance coherence, institutional capacity, and stakeholder legitimacy.

The chapter also brings to the fore the fact that the tools used to measure forest management's impact on carbon trading are not neutral, they are embedded in institutional contexts and shaped by socio-political dynamics. Ecological tools such as forest inventory protocols, remote sensing technologies, and flux measurement systems offer precision in quantifying carbon stocks and fluxes. However, their effectiveness depends on access to high-resolution data, technical capacity, and integration with participatory frameworks. Financial instruments, including blockchain registries and profitability models, enhance transparency and investor confidence but require regulatory support and robust baseline calibration. Institutional mechanisms such as MRV systems and third-party verification agencies are essential for methodological standardisation, yet their functionality is often constrained by fragmented mandates and limited inter-agency coordination. Socio-political tools, particularly those that promote community-led monitoring and tenure reform, emerge as critical enablers of legitimacy, equity, and long-term project viability.

Cumulatively, the chapter advances a multidimensional framework for understanding how forest management influences carbon trading. It integrates ecological science, financial modelling, institutional analysis, and governance theory to interrogate the structural contingencies that shape market performance. The Zimbabwean experience, when situated within global trajectories, reveals that carbon market outcomes are not determined by ecological metrics alone but by the interplay of policy design, institutional readiness, and stakeholder inclusion. Forest management, in this context, is not a technical input; it is a governance mechanism that determines the architecture, credibility, and developmental potential of carbon finance systems.

The chapter reveals that the viability of carbon trading as a climate finance mechanism is inseparable from the quality, coherence, and legitimacy of forest management systems. The following lessons distil the chapter's multidimensional findings into strategic insights for

scholars, policymakers, and practitioners operating at the intersection of forest governance and carbon market development.

Carbon credits derived from forest projects are only as credible as the management regimes that underpin them. Silvicultural practices, disturbance mitigation, and afforestation directly influence permanence and additionality—core principles of carbon trading. Weak or fragmented forest governance leads to ecological volatility and market devaluation. Therefore, forest management must be treated not as a background variable but as a primary determinant of credit legitimacy. The business of carbon trading cannot rely solely on technical verification or market modelling. It requires robust governance frameworks that ensure transparency, enforce rights, and facilitate equitable benefit-sharing. Zimbabwe's experience shows that without institutional coherence and stakeholder legitimacy; even technically sound projects face reputational risks and suppressed valuations. Governance architecture is as critical as ecological performance.

Tools used to assess forest carbon, ranging from inventory protocols and remote sensing to blockchain registries and MRV systems must be deployed in ways that reflect local capacity, tenure realities, and institutional readiness. High-capacity settings like Finland and California demonstrate the value of synergistic tool integration. In contrast, Zimbabwe's fragmented MRV landscape and limited access to high-resolution data highlight the need for context-sensitive, low-cost, and participatory measurement strategies. Carbon trading systems that fail to recognise the rights of Indigenous Peoples and Local Communities risk undermining both ethical accountability and market stability. Rights-based valuation frameworks grounded in tenure clarity, legal enforceability, and participatory safeguards are essential for building investor trust and ensuring long-term project viability. Carbon must be treated as a relational asset, not merely a tradable commodity.

The monetisation of forest carbon through REDD+ and voluntary markets offers fiscal opportunities for governments and communities. However, these opportunities are contingent on credit quality, verification integrity, and institutional capacity. Jurisdictional approaches, as seen in Ghana and subnational REDD+ models, outperform fragmented project-level interventions. Zimbabwe's potential to leverage carbon finance for public revenue depends on its ability to institutionalise high-integrity forest governance.

Carbon trading projects do not inherently deliver socio-economic benefits. Without enforceable benefit-sharing agreements, participatory structures, and grievance mechanisms, projects risk elite capture and community distrust. Ghana's Cocoa Forest REDD+ Programme demonstrates that integrating carbon finance with agricultural productivity and gender equity can reinforce market stability. Developmental outcomes must be embedded in project design, not assumed as by-products. Across all dimensions, ecological, financial, institutional, and socio-political, forest management emerges as a strategic lever that shapes the architecture and outcomes of carbon trading systems. It determines credit quality, investor confidence, and developmental legitimacy. For carbon markets to scale equitably and credibly, forest governance must be intentional, inclusive, and structurally embedded in climate finance policy.

The chapter has critically examined the interdependence between forest management systems and the operational dynamics of carbon trading, with a particular emphasis on Zimbabwe's evolving climate governance landscape. Drawing from global and regional case studies, the analysis revealed that forest management is not merely a technical backdrop to carbon finance, it is a strategic determinant of credit integrity, market legitimacy, and developmental outcomes. The chapter began by situating forest-based carbon trading within the broader climate finance architecture, highlighting the principles of additionality, permanence, and leakage as foundational to credit valuation. It then interrogated the

institutional and ecological conditions under which forest carbon projects are designed, verified, and monetised, emphasising the role of governance coherence, tenure clarity, and participatory safeguards. Through comparative analysis, the chapter demonstrated that high-integrity forest management characterised by robust MRV systems, inclusive governance, and rights-based valuation enhances investor confidence and ensures long-term project viability. Conversely, fragmented institutions, weak enforcement, and exclusionary practices undermine both ecological outcomes and market performance.

Zimbabwe's case illustrated both the promise and the pitfalls of forest-based carbon trading. While the country possesses significant forest carbon potential, its realization depends on institutional reform, capacity building, and the integration of community rights into project design. Lessons from Ghana's jurisdictional REDD+ model and California's compliance market underscore the need for strategic alignment between forest governance and carbon market architecture. Ultimately, the chapter argued that forest management must be structurally embedded in carbon trading systems, not as a peripheral concern but as a central pillar of climate finance. Only through intentional, inclusive, and transparent forest governance can carbon markets deliver credible climate mitigation and equitable development.

Chapter 2: Dynamics, Trends and Context of Carbon Trading: Stakeholders and the Markets: Asia, Latin America and Africa

Carbon trading is a market-based mechanism aimed at reducing greenhouse gas emissions by putting a price on them through instruments like cap-and-trade systems and carbon taxes (Kukah *et al*., 2025). It works by allocating emission allowances efficiently, letting entities reduce emissions or buy credits from others, promoting cost-effective reduction strategies (Stavins, 2022). Evidence shows emissions trading systems (ETS) have cut CO_2 emissions by up to 18.1% in some areas, encouraging renewable energy use (Bai & Ru, 2022). The European Union Emissions Trading System (EU ETS) is the most developed carbon market, with other regions such as North America and Australia adopting different models based on their political and regulatory contexts (Dabhi, 2019). These systems influence domestic climate policies and serve as examples for newer markets (Stavins, 2022; Dabhi, 2019).

Emerging markets in Asia, Latin America, and Africa are highlighted for their ecological vulnerability and development needs, facing challenges like weak institutions and regulatory fragmentation but also opportunities in nature-based solutions (Kukah et al., 2025; Kumar & Singh, 2025). Asia's markets, notably China's national ETS and South Korea's KETS, mix state innovation and cooperation, while Latin America focuses on forest offsets and REDD+ programs (Marcato, 2023). Africa is still developing infrastructure but shows potential through voluntary markets and community-led forest projects (Okeke *et al*., 2024). In Zimbabwe a typical example is the Kariba REDD+ project having started in 2011.

Carbon trading mechanisms encompass legal, institutional, and economic tools that enable trading of GHG emission allowances or

credits, aiming to internalize emissions costs through market incentives (Sun, 2024; Kumar & Singh, 2025). Their development is shaped by global climate governance and national policies, especially in Asia, Latin America, and Africa (UNCTAD, 2024). The Kyoto Protocol introduced three key market mechanisms: Clean Development Mechanism (CDM), Joint Implementation (JI), and International Emissions Trading (IET) (UNFCCC, n.d.). CDM allowed developed countries to invest in projects in developing countries to earn emission reductions, JI enabled project trading among developed countries, and IET allowed exchange of emission units among Annex I countries (Sahu, 2024). CDM projects expanded in Latin America and Asia, especially in renewables, forestry, and waste management (Pacagnella Jr *et al*., 2025). The Paris Agreement introduced Article 6, with cooperative approaches like Article 6.2 for transferring mitigation outcomes aligned with NDCs and Article 6.4 establishing a Sustainable Development Mechanism (SDM) for better transparency and ambition, which is crucial for emerging economies (Hoffmann *et al*., 2025; Diagne, 2023).

Compliance markets such as the EU ETS, China's ETS, and Korea's ETS operate under legal caps with strict monitoring and verification (MRV) (Zhang *et al*., 2024). Entities receive emission allowances and can trade surplus or buy more to meet targets. Voluntary carbon markets (VCMs) allow non-state actors to buy verified emission reduction credits from projects like REDD+, afforestation or renewable energy, governed by standards like Verra, Gold Standard, and ART-TREES, but concerns over additionality and permanence persist (Wetterberg *et al*., 2024; UNCTAD, 2024).

Credit credibility depends on methodological rigor, including baseline setting, additionality, leakage, and permanence (Barata, 2016). Verra's VM0015 for Improved Forest Management is widely used but criticized for leakage and permanence risks (NCX, 2021). Gold Standard emphasises community benefits and sustainable development alignment, while ART-TREES focuses on jurisdictional REDD+

accounting. These methodologies affect credit quality, trust, and prices (Hyolmo, 2025). Registries are key for tracking credit issuance, ownership, retirement, and transfer, with platforms like Markit, APX, and UNFCCC Article 6 registry advancing transparency and interoperability (Michaelowa *et al.,* 2023). In Africa, Regional Collaboration Centres (RCCs) in Kampala and Lomé support registry readiness with technical aid and capacity building (UNFCCC, 2022). However, gaps remain in digital infrastructure, MRV, and coordination, limiting integration with global markets.

Beyond infrastructure, the strategic linking of carbon markets across jurisdictions offers significant potential to enhance liquidity, reduce abatement costs, and harmonise price signals. Market linkages—such as the integration of the EU ETS with the Swiss ETS—require alignment of MRV protocols, legal frameworks, and governance structures (Wang, 2020). In Latin America, hybrid systems in Chile and Colombia combine carbon taxes with offset mechanisms, allowing regulated entities to use high-integrity credits for partial compliance (UNCTAD, 2024). Emerging interest in transcontinental linkages, such as between African nature-based credits and Asian corporate offset demand, may reshape regional market dynamics and financing flows.

In parallel, sectoral mechanisms are gaining traction under Article 6.4, with methodologies under development for high-emitting sectors such as cement, transport, and agriculture (Michaelowa *et al.,* 2023). Nature-based solutions (NBS), particularly forest-based credits including REDD+, IFM, and afforestation, continue to dominate voluntary markets. While these approaches offer substantial mitigation potential, they are subject to scrutiny regarding verification protocols, permanence risks, and equitable benefit-sharing (Pietracci *et al*., 2023). In the Zimbabwean context, opportunities exist to scale IFM and agroforestry credits under high-integrity standards, supported by regional initiatives such as the African Carbon Market Initiative.

As carbon markets mature, they are increasingly integrated into mainstream financial systems through instruments such as futures, options, and structured products. Exchanges like ICE and CME offer carbon futures, enabling hedging and speculative trading (Serafini & Bormetti, 2024). While financialisation may enhance liquidity and price discovery, it also introduces risks related to market manipulation, volatility, and potential disconnects from underlying environmental outcomes (Sun, 2024). Effective regulatory oversight and transparency are therefore essential to ensure that financial instruments reinforce, rather than undermine, climate objectives.

Equity considerations remain central to the legitimacy and effectiveness of carbon trading mechanisms, particularly in least developed countries. Community-based projects often face barriers including lack of upfront finance, limited technical support, and restricted access to verification infrastructure (Quak, 2025). Proposals for results-based finance, sovereign credit guarantees, and carbon trust funds aim to democratize access and ensure equitable benefit-sharing. The African Carbon Market Initiative exemplifies efforts to promote inclusive participation by supporting project developers, enhancing credit quality, and facilitating market entry (World Bank, 2025).

Despite their transformative potential, carbon trading mechanisms continue to face persistent challenges. Price volatility, regulatory fragmentation, and limited MRV infrastructure constrain market participation and credibility. The proliferation of low-quality credits and green-washing in voluntary markets further undermines trust. Addressing these challenges requires coordinated international governance, robust methodological standards, and inclusive stakeholder engagement—particularly in regions with emerging market structures and high mitigation potential (UNCTAD, 2024). Carbon trading systems are shaped by a constellation of actors whose interests, capacities, and institutional leverage vary across regions. We analyse the roles and incentives of key stakeholders such as governments, private sector

entities, civil society organisations, Indigenous communities, and international institutions while mapping their engagement across major carbon market platforms in Asia, Latin America, and Africa**.**

Governments serve as foundational actors in carbon trading systems, functioning as regulators, facilitators, and at times market architects across compliance and voluntary frameworks (World Bank, 2023). In Asia, China's Ministry of Ecology and Environment oversees the national Emissions Trading Scheme (ETS) that covers over 2,000 entities and is designed to align industrial decarbonization with national climate targets (ICAP, 2022). The Chinese government's centralised control reflects a strategic interest in integrating carbon pricing with broader energy and economic reforms (Zhang, 2022). In Latin America, governments such as Brazil's have adopted hybrid approaches, combining REDD+ mechanisms with emerging domestic carbon pricing instruments (ICC Brasil & Way Carbon, 2023). Brazil's Ministry of Environment plays a dual role, regulating forest-based offset projects while facilitating stakeholder engagement in voluntary markets (Vargas *et al.,* 2021). In Africa, governmental involvement is largely shaped by donor partnerships and international frameworks, with countries like Ghana and Rwanda participating in Article 6 pilot programmes and regional carbon finance initiatives (UNDP, 2024). Zimbabwe has crafted SI48/2025 which tries to align with Article 6 and is working on the Climate Change bill. However, institutional fragmentation and limited technical capacity continue to constrain regulatory effectiveness in many African jurisdictions.

Private sector entities are instrumental in scaling carbon markets, acting as credit generators, buyers, and financial intermediaries (EEP Africa & Open Capital, 2023). In Asia, corporations such as PetroChina have embedded carbon trading into their ESG strategies, aligning emissions reduction with investor expectations and national policy mandates (PetroChina, 2022). Alibaba Group has adopted a digital-first carbon neutrality roadmap, leveraging Scope 3+ accounting and platform-wide

emissions tracking to influence voluntary market dynamics (Alibaba Group, 2021).

In Latin America, project developers like Biofílica and South Pole facilitate forest-based offset generation, managing verification, certification, and credit issuance under REDD+ and nature-based solutions (South Pole, 2023). These actors play a critical role in maintaining market integrity and investor confidence, particularly in voluntary markets where third-party validation is essential. Financial institutions also shape market liquidity through carbon funds and green bonds, with frameworks such as the Partnership for Carbon Accounting Financials (PCAF) guiding emissions disclosure and portfolio alignment (PCAF, 2024). Despite these contributions, concerns persist regarding offset quality and corporate greenwashing. Recent evaluations indicate that a significant proportion of rainforest offsets lack verifiable climate benefits, raising questions about the credibility of private sector climate claims (Carbon Market Watch, 2023).

Civil society organisations and Indigenous communities occupy critical yet often marginalized roles in carbon trading systems, particularly in forest-based offset projects (Durmaz& Schroeder, 2025). Their involvement spans project implementation, monitoring, advocacy, and resistance, especially where land tenure and benefit-sharing mechanisms are contested. In Latin America, Indigenous federations in Ecuador and Brazil have challenged REDD+ initiatives that exclude traditional governance structures and fail to deliver promised co-benefits (Reed, 2011).

In Africa, community-based organisations in Kenya, Ghana, and Zimbabwe engage in afforestation and reforestation projects, often supported by international NGOs and bilateral donors (Gondo, 2012). However, limited legal recognition, technical capacity, and access to market information continue to undermine their agency and participation (Tanveer *et al.*, 2024). Civil society actors also serve as

watchdogs, scrutinizing offset quality, corporate claims, and regulatory loopholes. Their advocacy has prompted reforms in certification standards and increased transparency, though enforcement remains uneven (Carbon Market Watch, 2023). The inclusion of civil society and Indigenous communities is not merely normative but essential for ensuring the legitimacy, sustainability, and justice of carbon trading systems. In Zimbabwe, Carbon Green Africa (Pvt) Ltd has partnered with the rural local authorities (RDCs) and communities in setting up the Kariba REDD+ project which stared way back in 2011. In 2021 another project called Chirisa REDD+ was initiated with a government parastatal, the Zimbabwe National Parks and Wildlife Authority (ZimParks). The two projects are from a Private Investor funding thereby enhancing Private-Public-Community Partnerships.

International organisations function as norm-setters, financiers, and technical advisors within carbon trading systems, shaping both compliance and voluntary market architectures across regions (IOSCO, 2023). Institutions such as the United Nations Framework Convention on Climate Change (UNFCCC), the World Bank, and the Green Climate Fund (GCF) influence project design, monitoring, reporting, and verification (MRV) standards, and financial flows through mechanisms like REDD+, Article 6, and results-based payments (Christen *et al*., 2023).

Their strategic interests include promoting global mitigation, enhancing transparency, and fostering South–South cooperation. For example, the World Bank's Carbon Pricing Dashboard and Partnership for Market Implementation (PMI) provide technical support and capacity-building for emerging markets, including those in Africa and Latin America (World Bank, 2023). These initiatives aim to harmonise carbon pricing instruments and facilitate cross-border credit transfers. However, critiques persist regarding top-down governance and donor conditionalities. In several African and Latin American contexts, international institutions have been accused of imposing rigid frameworks that inadequately reflect local socio-political realities and

ecological priorities (Gadde, 2022). Moreover, the dominance of Northern actors in global carbon governance raises concerns about equity, representation, and the distribution of climate finance (Pettinotti *et al*., 2022). Despite these tensions, international organisations remain indispensable to the scaling and standardisation of carbon markets, particularly in regions where domestic institutional capacity is limited. Their continued relevance depends on their ability to adapt frameworks to local contexts, support inclusive governance, and ensure environmental integrity.

Carbon trading platforms vary significantly across regions, reflecting differences in institutional design, stakeholder capacity, and political economy (Kreibich & Obergassel, 2022). In Asia, China's national Emissions Trading Scheme (ETS) has rapidly scaled to become the largest carbon market globally, covering over 4 billion tonnes of CO_2 annually and integrating digital MRV systems to enhance transparency and compliance (Ewing, 2024). The platform is state-dominated, with limited civil society participation, though corporate actors are increasingly involved in offset procurement and emissions reporting (Zhang, 2022).

In Latin America, carbon trading is primarily facilitated through voluntary platforms and REDD+ mechanisms, with Brazil, Colombia, and Peru leading in forest-based credit issuance (Tomaselli, 2022). The Brazilian Carbon Market, while still under development, is expected to integrate both compliance and voluntary elements, with stakeholder consultations emphasising Indigenous inclusion and biodiversity safeguards (Vargas *et al.,* 2021). However, fragmented governance and inconsistent verification standards remain challenges to market credibility and investor confidence (Wills, 2025).

Africa's engagement with carbon trading platforms is emergent and largely donor-driven, with countries such as Ghana, Rwanda, and Kenya participating in Article 6 pilot programmes and voluntary offset schemes

(UNDP, 2024). The African Carbon Markets Initiative (ACMI), launched in 2022, aims to mobilize up to $6 billion in carbon finance by 2030, emphasising capacity building, MRV harmonisation, and equitable benefit-sharing (ACMI, 2023). Despite these ambitions, institutional capacity constraints and limited private sector involvement continue to hinder market scalability.

Comparatively, platforms such as the EU ETS and California Cap-and-Trade exhibit high regulatory maturity, robust MRV systems, and active private sector engagement, though they remain largely inaccessible to Global South actors (Zetterberg, 2012). These disparities emphasise the need for interoperable frameworks and inclusive governance models that reflect regional priorities and stakeholder diversity (World Bank, 2023). Ultimately, the effectiveness and legitimacy of carbon trading platforms depend on their ability to balance environmental integrity, economic efficiency, and social equity across diverse geopolitical contexts.

Carbon trading systems in Europe, North America, and Australia are among the most institutionally mature and technically refined globally, having evolved through decades of experimentation and reform (Wettestad & Gulbrandsen, 2017). In Europe, the European Union Emissions Trading System (EU ETS), operational since 2005, remains the largest and most comprehensive cap-and-trade program, covering over 11,000 installations across energy, industry, and aviation sectors (ICAP, 2022). The system has undergone successive reforms, including the Market Stability Reserve (MSR) and the transition from free allocation to auctioning that have enhanced price stability and environmental integrity (Perino *et al.,* 2022). Moreover, the EU ETS is expanding to include maritime transport and a separate ETS for buildings and road transport by 2027, reflecting its evolving sectoral breadth (European Commission, 2023).

In North America, carbon trading is primarily driven by subnational initiatives, notably the California Cap-and-Trade Program and the Regional Greenhouse Gas Initiative (RGGI) (CCES,2022). California's system, linked with Québec under the Western Climate Initiative, incorporates stringent compliance obligations, quarterly auctions, and offset protocols that include forestry and methane capture (Kotzampasakis & Woerdman, 2020). RGGI, covering eleven northeastern U.S. states, channels auction revenues into renewable energy and energy efficiency programmes, demonstrating how decentralised governance can yield robust climate outcomes (OceanBlocks, 2025).

Australia's carbon market has undergone significant restructuring since the repeal of its initial carbon pricing mechanism in 2014 (OGorman & Jotzo, 2014). The reformed Safeguard Mechanism, alongside the Australian Carbon Credit Units (ACCUs) framework, now facilitates emissions reductions through both compliance and voluntary pathways (Carbon Market Institute, 2024). The market emphasises nature-based solutions, Indigenous participation, and biodiversity co-benefits, with credits issued under methodologies approved by the Clean Energy Regulator (Rusell-Smith *et al.*, 2024).

Pricing trends vary across these jurisdictions. EU ETS prices have exceeded €90 per tonne of CO_2 in recent years, driven by tighter caps and speculative trading. California's prices range between $30 and $35 per tonne, supported by price containment mechanisms and allowance banking (Statistica, 2025). In Australia, ACCU prices have shown volatility, influenced by supply constraints, policy uncertainty, and evolving integrity standards (Carbon Market Institute, 2024). Verification and monitoring systems in these regions are among the most robust globally. The EU ETS mandates third-party verification, registry transparency, and digital MRV integration (European Commission, 2023). California's Air Resources Board enforces rigorous reporting protocols, while Australia's Clean Energy Regulator oversees

credit issuance and project audits under the Emissions Reduction Fund (Carbon Market Institute, 2024).

Despite their maturity, these systems face persistent challenges. The EU ETS grapples with carbon leakage risks and the political complexities of linking with external markets post-Brexit (Zetterberg, 2012). North American systems contend with offset credibility concerns and political fragmentation, particularly in the absence of federal coordination (Kotzampasakis & Woerdman, 2020). Australia's market struggles with liquidity constraints, offset integrity, and the need for greater Indigenous inclusion in project governance (Carbon Market Institute, 2024). Comparatively, these platforms remain largely inaccessible to Global South actors due to legal asymmetries, financial barriers, and infrastructural limitations. This exclusion underscores the need for interoperable frameworks and inclusive governance models that reflect regional priorities and stakeholder diversity (OceanBlocks, 2025).

The architecture of carbon trading in Asia is marked by a heterogeneous mix of compliance-based emissions trading schemes (ETSs) and voluntary carbon markets, reflecting divergent policy priorities, institutional capacities, and stages of market maturity across the region (Gupta *et al.,* 2024). While China and South Korea have operational national ETSs with legally binding caps and robust monitoring, reporting, and verification (MRV) systems, countries such as India, Indonesia, and Vietnam are in transitional phases, piloting frameworks or expanding voluntary mechanisms (MacDonald & Parry, 2024).

China's national ETS, launched in 2021, currently covers over 2,000 entities in the power sector, representing approximately 4 billion tonnes of CO_2 annually, making it the largest carbon market by volume globally (Gupta *et al.,* 2024). However, its effectiveness is constrained by limited price signals, free allocation of allowances, and data transparency challenges that have prompted calls for reform in auctioning mechanisms and sectoral expansion (Asia Society Policy Institute, 2025).

In contrast, South Korea's K-ETS, operational since 2015, has progressively expanded its coverage to include 70% of national emissions, integrating auctioning and benchmarking methodologies that align more closely with EU ETS standards (Asia Society Policy Institute, 2022). Korea's ETS design is underpinned by a robust legal framework and phased implementation strategy, with dynamic cap-setting and sectoral differentiation that have contributed to improved liquidity and price stability (Asia Society Policy Institute, 2022).

India's carbon pricing trajectory has evolved from the Perform, Achieve, Trade (PAT) scheme toward a formalized carbon market framework, with the Bureau of Energy Efficiency and Ministry of Power initiating consultations for a national ETS in 2023 (Asia Society Policy Institute, 2025). Indonesia, meanwhile, launched IDXCarbon in 2023 to facilitate the trading of Sertifikat Pengurangan Emisi Gas Rumah Kaca (SPE-GRK), signalling a shift toward regulated credit markets with Article 6 alignment (Carbon Market Institute, 2024).

Voluntary markets remain dominant in Southeast Asia, where smallholder agriculture and forestry-based offsets, particularly REDD+ and rice carbon farming are gaining traction under jurisdictional and landscape-level approaches (ASEAN Climate Resilience Network, 2023). The implementation of Article 6 of the Paris Agreement has further legitimized REDD+ activities under both cooperative approaches (Article 6.2) and centralised mechanisms (Article 6.4), provided they meet host country approval and MRV standards (Streck, 2021). However, scalability and methodological approval remain challenges, particularly for nature-based solutions that lack legacy CDM methodologies (Streck, 2021).

Despite the proliferation of carbon pricing instruments, price levels across Asian ETSs remain below the USD 50–100/tCO_2e benchmark recommended by the High-Level Commission on Carbon Prices to meet Paris Agreement goals, with China's ETS averaging below USD

10/tCO_2e in 2023 (World Bank, n.d). This price disparity underscores the need for enhanced market design, regional linkages, and institutional capacity-building to ensure environmental integrity and economic efficiency (Gupta *et al*., 2024).

The evolution of carbon trading in Latin America reflects a complex interplay between voluntary market leadership, emerging compliance instruments, and region-specific policy experimentation (Sullivan et al., 2021). While the region lacks a unified carbon pricing framework, several countries have initiated domestic instruments that align with broader climate mitigation goals under the Paris Agreement (UNFCCC, 2024).

Mexico's pilot emissions trading system (ETS), launched in 2020, represents the most advanced compliance mechanism in the region, designed to cap emissions from large industrial sectors and gradually transition into a mandatory phase (Sullivan *et al*., 2021). Colombia, by contrast, has adopted a hybrid approach, integrating a carbon tax with offset mechanisms that allow regulated entities to purchase credits from verified mitigation projects (UNFCCC, 2024). Voluntary carbon markets dominate the regional landscape, particularly in Brazil, Peru, and Chile, where nature-based solutions such as REDD+ and afforestation projects have attracted significant international investment (Bataille *et al*., 2020). These markets are often driven by corporate net-zero commitments and facilitated by third-party certification standards, such as Verra and Gold Standard that ensure environmental integrity and market credibility (Oliveira, Gurgel & Tonry, 2019).

Despite the proliferation of voluntary initiatives, Latin America faces persistent challenges in scaling compliance markets, including institutional fragmentation, limited technical capacity, and uneven regulatory maturity across jurisdictions (Sullivan *et al*., 2021). The lack of harmonised carbon pricing instruments impedes regional integration and complicates cross-border credit trading, although recent dialogues

under the REDiCAP initiative suggest growing interest in coordinated policy frameworks (UNFCCC, 2024).

Opportunities for regional carbon market development are substantial, particularly given Latin America's comparative advantage in land-based mitigation potential and renewable energy deployment (Bataille *et al.*, 2020). Countries such as Brazil and Mexico are well-positioned to serve as carbon credit exporters, leveraging their biodiversity and energy transitions to supply high-quality offsets to global buyers (Oliveira, Gurgel & Tonry, 2019).Moreover, the prospect of a linked regional ETS has gained traction among policymakers and scholars, with modelling studies indicating that such integration could reduce abatement costs, enhance market liquidity, and facilitate revenue recycling for low-carbon development (Oliveira, Gurgel & Tonry, 2019). However, successful implementation would require robust governance structures, transparent MRV systems, and alignment with national development priorities (UNFCCC, 2024).

In sum, Latin America's carbon trading landscape is characterized by dynamic experimentation, voluntary market leadership, and emerging compliance instruments, all unfolding within a broader context of climate ambition and economic diversification (Sullivan *et al.*, 2021; Bataille *et al.*, 2020). The region's trajectory will depend on its ability to harmonise policy instruments, attract sustainable finance, and institutionalise carbon pricing within long-term climate strategies.

Carbon trading in Africa is evolving within a complex landscape shaped by voluntary market dominance, emerging regulatory frameworks, and structural constraints that reflect the continent's developmental and ecological realities. The market is largely driven by voluntary mechanisms, where corporations and international actors engage in offsetting emissions through afforestation, renewable energy, and REDD+ initiatives, often motivated by sustainability branding and climate finance imperatives (Cheffo, 2019). Although the Clean

Development Mechanism (CDM) under the Kyoto Protocol provided early entry points, Africa's participation remained marginal due to high transaction costs and limited institutional capacity (Zhakata, 2024). The introduction of Article 6 of the Paris Agreement has renewed interest in compliance markets, offering pathways for bilateral trading and international crediting, contingent on robust monitoring and verification systems (Queku & Seidu, 2025).

Recent developments such as the Africa Carbon Markets Initiative (ACMI) reflect a strategic shift toward scaling carbon markets with integrity and equity. ACMI's roadmap envisions retiring 300 million credits annually by 2030 and unlocking up to USD 120 billion by 2050, involving over 400 stakeholders across ministries, financial institutions, and civil society (ACMI, 2024; AUDA-NEPAD, 2024). However, governance challenges persist, including risks of double counting, unverifiable offsets, and limited community inclusion that threaten market credibility and long-term sustainability (Agora Global, 2025). The tension between financial mobilization and genuine emission reduction remains unresolved, as some projects prioritise revenue generation over climate integrity (Cheffo, 2019).

Africa's carbon trading context is further shaped by its low per capita emissions ranging between 2.7 and 3.9 tonnes CO_2e, contrasted with its high sequestration potential through forests and land use (Cheffo, 2019). This paradox positions the continent as a net carbon sink, yet its participation in global markets remains constrained by technical limitations and regulatory gaps (Zhakata, 2024). Socio-economic integration is essential, as carbon markets must deliver co-benefits such as income stability, infrastructure development, and climate resilience, particularly for marginalized communities (Agora Global, 2025). Transparent benefit-sharing models and inclusive governance are critical to avoid exacerbating land tenure inequalities and social exclusion (Mwenya, 2012). Ultimately, aligning carbon trading with poverty alleviation and inclusive growth requires tailored regulatory

frameworks, capacity building, and outcome-based finance to support Africa's low-carbon transition (GIZ, 2024; Queku & Seidu, 2025).

Carbon trading systems across Asia, Latin America, and Africa reveal a complex interplay of institutional maturity, stakeholder engagement, and ecological potential. While each region demonstrates unique strengths, persistent barriers continue to constrain market scalability, equity, and environmental integrity.

Asia's carbon markets, particularly China and South Korea, exhibit advanced compliance frameworks with legally binding caps and robust MRV systems (Gupta *et al.,* 2024; Asia Society Policy Institute, 2022). Yet, China's ETS suffers from weak price signals averaging below USD 10/tCO_2e and free allocation practices that undermine efficiency. Southeast Asian nations rely heavily on voluntary markets, where REDD+ and rice carbon farming are gaining traction, but scalability is hindered by methodological gaps and limited regional integration (ASEAN Climate Resilience Network, 2023; Streck, 2021). Promoters such as Korea's benchmarking methodologies and Indonesia's IDXCarbon platform signal growing institutional commitment and digital innovation.

Latin America leads in voluntary market participation, leveraging forest-based offsets and REDD+ initiatives, particularly in Brazil, Peru, and Chile (Bataille *et al.,* 2020; Oliveira *et al.,* 2019). Compliance mechanisms are emerging, with Mexico's pilot ETS and Colombia's hybrid tax-offset model offering innovative pathways (Sullivan *et al.,* 2021). However, fragmented governance, offset credibility concerns, and lack of harmonised pricing instruments impede regional integration. Promoters include the region's biodiversity assets, hybrid policy experimentation, and regional dialogues such as REDiCAP that aim to coordinate carbon pricing frameworks and facilitate cross-border credit trading (UNFCCC, 2024).

Africa's carbon trading landscape is nascent but rapidly evolving, driven by voluntary markets and initiatives like the Africa Carbon Markets Initiative (ACMI) that aims to retire 300 million credits annually by 2030 (ACMI, 2024; AUDA-NEPAD, 2024). Despite its high sequestration potential and low per capita emissions, Africa faces significant barriers: limited MRV infrastructure, unverifiable offsets, donor-driven governance, and exclusion of Indigenous communities (Cheffo, 2019; Zhakata, 2024). Promoters include Article 6 pilot programmes, regional capacity-building efforts, and the strategic roadmap of ACMI that seeks to democratize access and enhance credit quality.

Comparatively, Europe's EU ETS remains the benchmark for regulatory maturity, price stability, and sectoral breadth, with reforms such as auctioning and the Market Stability Reserve enhancing integrity (Perino *et al.,* 2022; European Commission, 2023). North America's subnational systems, California's Cap-and-Trade and RGGI, demonstrate decentralised innovation and revenue recycling (Kotzampasakis & Woerdman, 2020). Australia's restructured market emphasises nature-based solutions and Indigenous inclusion, though liquidity and offset integrity remain concerns (Carbon Market Institute, 2024). These systems offer templates for MRV rigor and financial integration, yet remain largely inaccessible to Global South actors due to legal asymmetries and infrastructural limitations (OceanBlocks, 2025).

The comparative findings underscore that market maturity does not guarantee equity or environmental integrity. Asia and Latin America show greater institutional sophistication than Africa, yet all three regions face challenges in stakeholder inclusion, offset credibility, and benefit-sharing. Governmental actors in Asia and Latin America actively shape market architecture, whereas African governments often rely on international partnerships. Private sector engagement is robust in Asia and Latin America but limited in Africa. Civil society and Indigenous communities remain under represented across all regions, despite their critical role in forest-based offsets and project legitimacy.

Methodological integrity and transparent registries are foundational to market credibility. Asia's digital MRV systems and Latin America's third-party certifications contrast with Africa's fragmented verification infrastructure, highlighting the need for capacity-building and registry interoperability. Carbon prices in Asia and Latin America remain below global benchmarks, limiting abatement incentives. Financial instruments such as futures and green bonds are emerging but risk disconnecting climate outcomes from speculative trading. Africa's market remains largely unfinancialised, presenting both a challenge and an opportunity for inclusive design.

Global frameworks such as Article 6 must be locally adapted to avoid top-down imposition and ensure environmental justice. Interoperable governance models and inclusive stakeholder engagement are essential to bridge the gap between Global North regulatory depth and Global South ecological potential. It is clear that:

- Effective carbon trading requires robust legal frameworks, MRV systems, and stakeholder coordination. Africa's scalability depends on sustained investment in institutional infrastructure.
- Latin America and Africa must address offset quality, permanence, and additionality to maintain market credibility and attract sustainable finance.
- Indigenous and civil society inclusion is essential for equitable benefit-sharing and long-term project viability.
- Asia and Latin America's fragmented markets would benefit from regional ETS integration, harmonised standards, and cooperative pricing instruments.
- Article 6 and international standards must reflect local socio-political realities to avoid top-down imposition and ensure environmental justice.

The chapter examined the dynamics, mechanisms, and stakeholder configurations shaping carbon trading systems across Asia, Latin America, and Africa, with comparative reference to Europe, North

America, and Australia. It highlighted how carbon markets function as key instruments in climate governance, enabling emissions reduction through both compliance and voluntary frameworks. Asia's carbon markets, led by China and South Korea, demonstrate institutional maturity and digital MRV integration, but face challenges in price signalling, regional coordination, and methodological scalability. Latin America leads in voluntary market participation, particularly through REDD+ and nature-based solutions, yet struggles with fragmented governance and offset credibility. Africa's carbon trading landscape is emergent, marked by high sequestration potential and strategic initiatives like ACMI, but constrained by limited infrastructure, donor-driven governance, and in some instances, exclusion of Indigenous actors. However, the Kariba REDD and Chirisa REDD Projects all of Zimbabwe had prior informed consent of the local communities and there are clear guidelines on revenue share structure meaning the indigenous actors are involved. Similarly the Zambia's Bio Carbon Partners project has a clear revenue share structure with local communities. This is what has led to the projects to run beyond five years from projects start due to their strong community involvement. Stakeholder analysis revealed that governments and private sector entities in Asia and Latin America actively shape market architecture, while African governments rely more on international partnerships. To a larger extent, civil society and Indigenous communities remain under represented across all regions, despite their central role in forest-based offsets and project legitimacy. Comparative insights from mature systems in Europe, North America, and Australia underscore the importance of robust MRV systems, financial integration, and regulatory depth. However, these platforms remain largely inaccessible to Global South actors due to legal and infrastructural asymmetries. The chapter concludes that effective carbon trading requires not only technical and financial infrastructure, but also inclusive governance, regional coordination, and adaptive policy frameworks. These elements are essential for transforming carbon markets into equitable and impactful climate solutions.

Chapter 3: Forest Management and Carbon Trading as Siamese Twins

Through the chapter, I seek to analyse the complex relationship between forest management and carbon trading, focusing on how these two interrelated sectors interact, often with conflicting interests. Forest management aims at the sustainable exploitation and replenishment of forests by regulating the extraction and use of forest raw materials such as timber. Conversely, carbon trading businesses depend on forest resources for their existence. Given this dynamic, this study evaluates the impact of forest management on the carbon trading business, with particular attention to Carbon Green Africa in Zimbabwe. The chapter presents the background of the study, the problem statement, research objectives, questions, and hypotheses. Additionally, it addresses the study's justification, limitations, delimitations, preliminary literature review, and methodology.

Carbon is fundamental to life, providing food, fibre, and energy, while contributing to greenhouse gases such as carbon dioxide and methane that regulate Earth's temperature by trapping heat in the atmosphere. The world's oceans and forests regulate greenhouse gases by absorbing carbon dioxide, storing it in live biomass and organic matter, whereas disturbed forests release this stored carbon back into the atmosphere (Bosworth, Birdsey, Joyce and Millar, 2008).

The atmospheric carbon concentration has fluctuated significantly over geological time. Ice core samples reveal that current carbon dioxide levels are higher than any time in the past 400,000 years (Bosworth *et al*., 2008). Presently, fossil fuel combustion is the major carbon source. In the 1990s, fossil fuel emissions were about 6.3 billion tons annually, with land use conversion adding approximately 2.2 billion tons per year (Caney and Hepburn, 2011). These emissions were partially offset by oceanic absorption of 2.4 billion tons and an "unidentified sink," likely

terrestrial uptake in temperate and boreal forests of the Northern Hemisphere, absorbing about 2.9 billion tons per year. This resulted in a net greenhouse gas increase of 3.2 billion tons annually in the 1990s (Walsh, 2013). Adaptive management represents only a fraction of forest managers' responses to climate change. Between the mid-1990s and mid-2000s, US forests sequestered approximately 200 million tons of carbon per year, offsetting about 10% of carbon dioxide emissions from fossil fuel use (Walsh, 2013). Historically, forests were net carbon sources; around a century ago, US forests emitted up to 750 million tons per year due to agricultural clearing, heavy logging, and losses from fire and pests (Bottazzi *et al*., 2014).

The shift from carbon source to sink resulted from forest regrowth, land use changes from cropland back to forest, and effective pest and fire control. Forest managers can enhance this trend by reviewing current practices, identifying those that increase carbon sequestration, and incorporating these insights into future land management decisions (Caney and Hepburn, 2011; Sato *et al*., 2015).

A forest's carbon is stored mainly in three pools: live biomass, woody debris, and soil organic matter, each affected by disturbances differently and over varying timescales. Forests managed for natural processes see carbon balance driven primarily by soil productivity and natural disturbance regimes. In intensively managed plantations, factors such as site preparation, planting-stock selection, thinning, and rotation length dominate carbon dynamics (Walsh, 2013). The interval between disturbances is a key driver of carbon storage: longer intervals and less severe disturbances promote greater carbon retention (Bottazzi *et al*., 2014).

With mounting evidence of climate change, carbon emission trading schemes (ETS) have been recognised as critical mitigation tools (Zhang, Liu and Su, 2017). Rigorous analysis of ETS design is essential to optimize their effectiveness and derive lessons from pilot programs

(Sato *et al*., 2015). Voluntary carbon trading remains the primary means to reward forestry-related carbon sequestration, with carbon credits sold to partners seeking to offset their emissions (Vacchiano, Berretti, Romano and Motta, 2018). Carbon stored in most forests increases with time since the last disturbance, although some pools like downed woody debris may temporarily decline after timber harvest. Sequestration patterns depend on climate, species, age, site productivity, disturbance type, and other factors. Carbon trading programs set a cap on CO2 emissions for specific sources, progressively lowering this cap over time (Chang, 2014). Caps may apply broadly across the economy or target high-emission sectors. Emission allowances, usually representing one ton of CO2, are allocated via auction, free distribution, or both. Programs may also cover other greenhouse gases under a "CO2 plus" model, measuring allowances in carbon dioxide equivalent (CO2e) units (Plumer, 2013; Chang, 2014).

Regulators retain some allowances to stabilise prices and support new entrants. To incentivise forest management, companies have introduced carbon trading businesses. Entities demonstrating superior forest management that maintains carbon stocks earn carbon credits, which can be sold globally. This approach has spurred interest in Zimbabwe, where Carbon Green Africa (CGA) operates a carbon trading business. Zimbabwe's forest management involves government and private sector efforts. CGA facilitates carbon credit generation through REDD+ projects, excelling in forest conservation under Verified Carbon Standard (VCS) and Community, Climate and Biodiversity Standard (CCBS) frameworks.

Since its inception, CGA's project has successfully reduced deforestation, preserving thousands of hectares of forest. Nonetheless, concerns exist regarding CGA's unsold credit stock still held by VERA. Also an oversupply of carbon credits has caused prices to plummet to as low as US 10 cents per ton of CO2 equivalent (MtCO2e), down from a peak of

$7 MtCO2e around 2013. Forests and their ecosystems are among nature's most abundant and versatile resources (Nunoo, 2008). Despite this, Zimbabwe experiences significant forest loss, approximately 330 hectares annually, as reported by the Forestry Commission. While deforestation poses risks, CGA holds substantial carbon credit stocks for sale internationally. Prolonged unsold credits or low prices may discourage community engagement in forest conservation. Against this backdrop, the impact of forest management on carbon trading demands thorough examination. The study explores the linkage between forest management and the success of carbon trading enterprises in Zimbabwe. The aim is to dissect the principles of both areas and seek effective harmonization, while influencing legislation to ensure sustainable forest protection and management.

The following were the objectives of the study:

1) To determine the impact of forest management on the carbon trading business in Zimbabwe;
2) To ascertain the impact of the current legislation on local companies in Zimbabwe;
3) To ascertain the relationship between global carbon prices and carbon trading volumes;
4) To suggest a framework to guide carbon trading for sustainable forest management in Zimbabwe.

The study sought to answer the following questions:

5) What is the impact of forest management on the carbon trading business in Zimbabwe?
6) How does the current legislation affect local companies in Zimbabwe?
7) What is the relationship between global carbon prices and carbon trading volumes in Zimbabwe?
8) What framework can be used to guide carbon trading for sustainable forest management in Zimbabwe?

The following are the hypotheses of the study.

Hypothesis One

H0: Forest management has no significant impact on carbon trading in Zimbabwe.

H1: Forest management has a significant impact on the carbon trading volumes in Zimbabwe.

Hypothesis Two

H_0: Current legislation has no significant impact on the compulsion of local companies to buy carbon credits.

H_1: Current legislation has a significant impact on the compulsion to buy carbon credits by local companies in Zimbabwe.

Hypothesis Three

H_0: There is no relationship between global carbon prices and carbon trading volumes in Zimbabwe.

H_1: There is a significant relationship between global carbon prices and carbon trading volumes in Zimbabwe.

The study is significant to; forest management agencies, carbon trading businesses, government, scholars and other researchers who can gain insights into the impact of forest management on carbon business trading. Forest management agencies can have an informed position against which they can lobby government to enact laws that favour forest management and green initiatives. In addition, they can enforce policies with the full knowledge of the impact of their actions to the carbon trading business. Given the new information obtained through research, government would be able to enact robust legislation which benefit carbon trading businesses, the forest management agencies and ultimately benefit communities. For scholars and researchers, the study serves as a theoretical framework for future studies. There is a knowledge gap regarding the impact of forest management on carbon trading in Zimbabwe. This research has attempted to cover that gap and

provide researchers and the academia the necessary knowledge base. Lastly, the study is important in that it helps elevate the status of the carbon trading business in Zimbabwe and forest management. It helps communities, government, corporates and other stakeholders appreciate that carbon trading is not a theoretical model but a business which can sustain livelihoods in addition to preserving the future heritage of the country's citizens and other habitants.

The scope of the study covered environmental management with special focus on carbon trading only. The study sort to extract information that shades light on the impact of forest management on the carbon trading business. The study made use of Carbon Green Africa for carbon trading data since it is the only company in Zimbabwe running a REDD+ carbon trading business. Geographically, it was confined to Binga District and Hurungwe District only to gather information from communities with the aim to give a fair representation of the carbon trading business in Zimbabwe. At a government level, the study engaged the Department of Climate Change under the Ministry of Environment, Water and Climate.

Various limitations were encountered in the study. For example, some respondents did not fully cooperate in providing the much-needed information. However, the researcher insisted that the questionnaires were only for academic purposes and confidentiality was to be maintained. Finances, time and resources were a challenge to cover the whole project area. As such the study concentrated on two districts which is 50% of the four districts hence the study area would give a fair representation of the research. To optimise on the limited finances and time that was available, besides personal interviews, the researcher also used emails and social media (WhatsApp, Facebook, WeChat, etc.) to send questionnaires. Participants were encouraged to fill in questionnaires anonymously and drop them at certain points without identifying themselves. The research assumed that the participants selected for the study were willing and provided correct and reliable information. The study assumed that the current forest management

practises in Zimbabwe need enhancement and that they can contribute to the trading of carbon credits. It also assumed that the sample size used in the study was truly representative of the research population.

Definition of Key Terms

The following are the key terms used in the study:

Biodiversity – a contraction of the term 'biological diversity' and refers to the variety of life on earth. It encompasses a wide variety of ecosystems and living organisms, including plants, animals, their genetic constituencies and their genes.
Climate Change – anthropogenic ally induced long-term changes (often decades) in the world's climate likely to impact upon the world's ecosystems and human welfare.
Ecosystem – a complex of living communities of organisms.
Environmental Conservation – the wise use of and management of natural resources for their intrinsic value and for the benefit of human society.
Environmental Protection – prevention of harm to the environment through tangible intervention and active management. The term is often used interchangeably with preservation.
Preservation - in contrast to conservation, it refers to the protection of nature from human use to prevent environmental harm.

The chapter has presented the introductory aspects of the study. The background, statement of the problem, purpose, objectives, research questions, significance, delimitations and limitations of the study were discussed in the chapter. In the next chapter, the literature related to the study is reviewed.

Chapter 4: Critical Review of Related Literature

Through the chapter, I seek to examine the existing literature on carbon trading and forest management, focusing on their conceptual frameworks and the challenges faced within the carbon trading business. The chapter presents a review of key theories and models underpinning both carbon trading and forest management. It further investigates the obstacles encountered in the operation of carbon trading enterprises. Additionally, the chapter highlights perspectives from various scholars on achieving sustainability in carbon trading and forest management.

The carbon trade originated with the 1997 Kyoto Protocol. It was meant and to reduce overall carbon dioxide emissions to 5% below 1990 levels between 2008 and 2012. The Brundtland Report of 1987 triggered carbon trading. The report posited "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change (UNFCCC). It was adopted in Kyoto, Japan, on 11 December 1997. It came into force in 2005. It commits State Parties to reduce greenhouse gases emissions, based on the premise that:

(a) Global warming exists and
(b) Man-made CO2 emissions have caused it.

Currently there are 192 parties belonging to the protocol, responsible for about 60% of GHG emissions. The objectives behind the concept of carbon trading were:

- The reduction of carbon emissions.
- A better environmental situation and to mitigate global warming.
- Provide a financial incentive for companies to pollute less.
- Promotion of sustainable production processes and also sustainable lifestyles across the Globe.

Carbon trading, sometimes called "emissions trading", is a market-based tool to limit the release of greenhouse gases (GHG) in the atmosphere which are believed to be the significant driver of observed climate change (Chemuliti, 2012; Martinello, 2015).

Carbon markets are markets in which buyers and sellers trade in 'carbon offsets' or 'carbon credits'. A "carbon credit" is a unit of carbon emissions reduced at source (for example, by reducing consumption of fossil fuels) or a unit of carbon dioxide that have been absorbed by forests from the atmosphere (Chemuliti, 2012). There are two types of carbon markets, namely, (i) regulatory compliance market and (ii) voluntary markets. The regulated market is used by companies and governments that by law have to account for their GHG emissions. It is regulated by mandatory national, regional or international carbon reduction regimes. Voluntary markets represent voluntary attempts by individuals and organisations to reduce their carbon emissions (Bayon *et al.*, 2007: Fairhead *et al.*, 2012).

A carbon market is initially established by setting a cap on allowable greenhouse gas emissions, with that cap declining as the years go on to gradually meet greenhouse gas emissions reduction goals. The government creates emissions allowances (also called emissions credits), measured in units of greenhouse gases per year, and issues enough of these credits to add up to the cap on allowable emissions (Büscher, 2013). Carbon markets operate under the assumption that by gradually limiting the amount of emissions credits available, the market can lower greenhouse gas emissions overall. Covered entities (for example, power plants, companies, or other polluting entities, depending on the specific market and its confines) can buy and sell emissions credits as necessary, creating a financial incentive for them to pollute less and a financial burden for them if they pollute more. Some carbon markets can also function as revenue generators for the governments that run them from the buying and selling of emissions credits. This revenue can be invested

in projects that support climate change adaptation and mitigation (Sheats, 2017).

Carbon Emission Trading Schemes (ETS) aim at realizing emission reduction targets proposed in the 1997 Kyoto Protocol (Huber, 2013). ETS were also proposed to counter climate issues raised during the 2015 Paris Climate Summit and 2016 Marrakech Climate Summit. Countries or enterprises use ETS as a platform to sell redundant allowances or buy deficient ones to fulfil their carbon reduction duty. According to the polluter-pays principle, under an ETS, emitters must incur external costs that negatively affect others (Diaz, Hamilton and Johnson, 2011). Numerous countries and regions have employed ETS to mitigate climate change, including the European Union (European Union Emission Trading Scheme [EU ETS]), the United States (Regional Greenhouse Gas Initiative [RGGI]), China, Korea, and Japan. A complete ETS comprises mechanisms such as cap determination and market trading. However, owing to the lack of experience and macro-economic environment changes, the carbon market faced low carbon prices, allowance oversupply, and low marketization (Newell, Pizer and Raimi, 2013).

In cap-and-trade schemes such as KP or CCA, pre-compliance carbon "credits" can be generated from activities that reduce CO2 emission or enhance carbon sequestration. Credits for reduced emissions or enhanced sequestration can be sold to partners wishing to offset their own emissions and to avoid topping the mandatory emission caps (Low and Lin 2015; Hamrick and Goldstein, 2016). One offset credit corresponds to an emission reduction of 1 Mg of CO2 equivalent (Ximenes *et al.,* 2012).

On top or in the absence of binding government agreements ("compliance markets"), individual entities can commit to generate additional voluntary credits and sell them on a free ("over the counter")

or regulated market, e.g., the InterContinental Exchange. Such voluntary market of carbon credits has grown to a cumulated volume of 990 Tg CO2e in emission reductions, worth US$ 4.6 billion as of 2015 (Hamrick and Goldstein 2016).

Three types of forestry activities may generate carbon credits: (a) afforestation on non-forested lands or reforestation, where carbon is sequestered and offsets are generated through the creation or reestablishment of forest land use; (b) avoiding emissions from deforestation and degradation, i.e., retaining forest as forest; and (c) improved forest management (IFM), i.e., forest management that increases the carbon stocked in the forest (by better logging practices, longer rotation, or other means) and/or in wood products (by producing more durable assortments), relative to business as usual (Alberdi *et al.*, 2016).

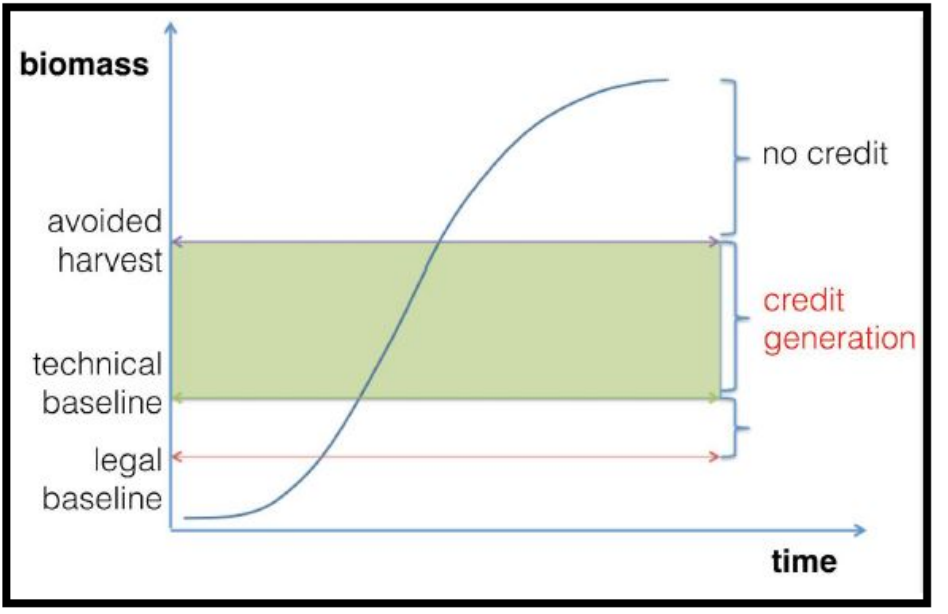


Figure 2.1 The generation of carbon credits (Alberdi *et al.,* 2016).

IFM credits are the most promising for the regional forestry sector, because they can provide income to public and private forest owners, and increase the economic interest in carrying out sustainable forest management activities (Sartor, Palliere and Lecourt, 2014; Low and Lin, 2015).

Carbon offsets provide the basis for two of the Kyoto Protocol's primary mechanisms for reducing GHG emissions in the context of an international environmental agreement.

(Jonsson, Mbongo and Felton, 2012). Under Joint Implementation (JI), industrialised nations can purchase carbon credits (effectively offsets) from emission-reducing projects located in other industrialised. nations or nations with transition economies (Conte and Kotchen, 2010). Under the Clean Development Mechanism (CDM), industrialised countries can purchase offsets in (Jonsson, Mbongo and Felton, 2012) much the same way, though CDM credits are acquired through the finance of projects in developing nations. (Fairhead, Leach and Scoones, 2012).

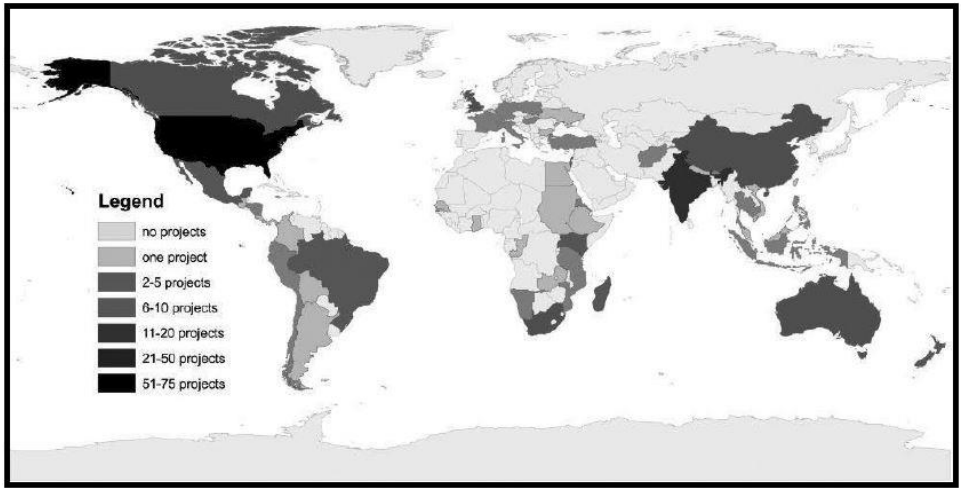


***Figure* 2.2** Global distribution of carbon trading projects (Schroeder and McDermott, 2014).

Offsets are based on the idea that agents need not reduce their own emissions to reduce the amount of GHGs in the atmosphere; instead, they can pay someone else to reduce emissions and achieve the same effect on atmospheric concentrations (Conte and Kotchen, 2010). Agents prefer offsets, of course, if the payment required is less than their own abatement costs. Though often controversial for reasons that have been discussed below, offsets work in principle because GHGs are uniformly mixed pollutants in the global atmosphere, and the location of emissions (or reductions) has no effect on the impact of climate change (Bondevik, 2013).

Only the net effect on overall GHG emissions is what matters. Typically, offsets arise through investments in renewable energy, energy efficiency, reforestation, or other projects that reduce emissions or sequester GHGs. Though usually referred to as "carbon offsets", many projects focus on other GHGs, such as projects based on biomass and industrial methane capture, and emission reductions are measured in carbon dioxide equivalent units (CO2e) (Conte and Kotchen, 2010; Bondevik, 2013; Dibley and Wilder, 2016). Questions about offsets are also playing a pivotal role in determining the future of emission regulation in the United States. Recent drafts of such legislation, for example, allow businesses to offset up to 30% or 63% of their emissions (Jonsson *et al.*, 2012).

Many ostensibly transformative solutions to climate change and environmental degradation are associated with strategies that simultaneously involve privatisation and the direct or indirect valuation of natural capital and the characteristics and functions of ecological systems. Fundamentally this is meant to bring the natural environment into line with the logic of the global economic system (Huff and Tonui, 2017). These concepts and mechanisms are based in the paradigm of market environmentalism, a mode of resource regulation that promises

market-based solutions for addressing both economic and environmental problems (Huff and Tonui, 2017).

In this framing, without private property rights and monetary valuation, resource users have neither the incentive nor the value information available to appropriately weigh the trade-offs of resource use (Blasch and Farsi, 2012: Parenteau and Cao, 2016). This makes natural resources and ecosystems vulnerable to pollution and degradation through over-exploitation. Coupled governance and market failures are thus conceptualised as the primary cause of environmental problems, and corrective market techniques and governance transformations, brought about through new transformative multi-stakeholder alliances, as their potential solution (Death 2014; Koch, 2014; Lyons, Westoby and Nel, 2017).

Chang (2015) evaluates different types of carbon emissions reduction policy and concludes that a cap-and-trade mechanism can decrease CO2 emissions more effectively and at a lower compliance cost than a carbon tax or setting industry standards. A carbon tax imposes a fixed price on carbon emissions for certain sources that allows companies to project the marginal cost of compliance and eliminates fears of carbon price volatility. While a carbon tax provides more certainty for compliance costs, the policy's environmental goals can be easily compromised compared to that of cap-and-trade policy. The actual quantity of emissions reduced by a tax is unknown until the tax has been implemented for some time (Chang, 2015; Fairhead *et al.,* 2012; Martinello, 2015).

Literature has also emerged outlining local level impacts of the expanding carbon economy, including injustice related to land tenure and access rights, and local natural resource rights, with indigenous and local communities especially impacted (Lyons and Westoby 2014; Mbatu

2016; Okereke and Dooley 2010; Schroeder and McDermott 2014; Suisseya and Caplow 2013). Literature also identifies the erosion of biodiversity, the militarization of conservation and associated violence by the state (Benjaminsen and Bryceson 2012; Bottazzi *et al.,* 2013; Büscher 2013; Cavanagh *et al.,* 2015; Fairhead *et al.,* 2012; German *et al.,* 2014; Martinello 2015; White *et al.,* 2012).

The design of climate-change policy involves underappreciated ethical dimensions. Greenhouse gas emissions might be reduced by several main approaches, each of which raise different considerations of ethics and justice (Caney and Hepburn, 2011). For instance, governments might provide information about the science and economics of climate change, price greenhouse gas emissions through a 'carbon tax', subsidise clean technology, establish a 'cap-and-trade scheme' in which a limit is placed on total emissions which declines over time and/or implement 'command-and-control' regulation requiring firms and individuals to take certain action, such as using specific cleaner technologies (Okereke and Dooley, 2010).

These approaches have various levels of effectiveness (that is, of successfully reducing emissions) and of efficiency (in terms of reducing emissions at least cost). They also have distributional implications (in that there can inevitably be losers and winners). Implementing climate-change policies is also likely to, and indeed need to, change relationships with the natural environment (Caney and Hepburn, 2011). Only activities that count towards emissions target under the Kyoto Protocol can be used to offset emissions of a business with a liability under the Clean Energy Act 2011 (Ximenes *et al.,* 2012).

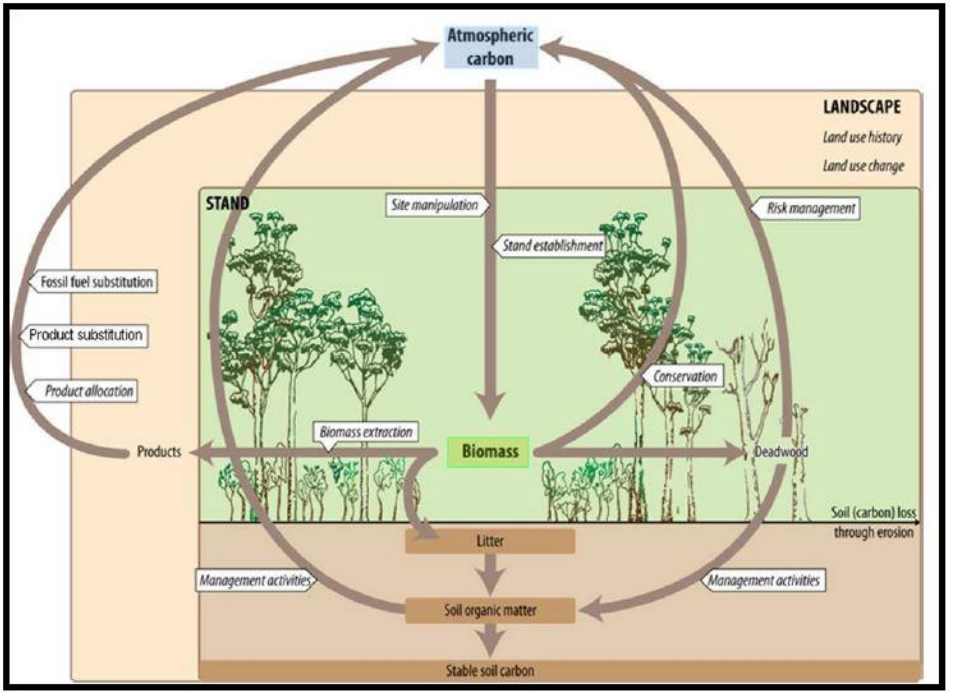


Figure 2.3 The production and use of carbon in the ecosystem (Ximenes *et al.* (2012).

Zhang, Liu and Su (2017) compared the mechanisms of ETS in the European Union with those in China and indicated similarities in cap determination, the coverage and calculation method of allowance allocation, trading participants and allowance category, offset credit, and MRV. On the other hand, the allocation method and supervision of allowance allocation, allowance formats and trading methods, market risk management, market linkage mechanism, and legislation security evidently appeared to vary (Zhang, Liu and Su, 2017). However, the results were unable to identify which ETS is absolutely good or bad due to the political, economic, and institutional contexts and the varying developmental phases (Zhang, Liu and Su, 2017; Ximenes *et al.*, 2012).

Too little attention is given to the multiple functions that are potentially or effectively fulfilled by community-based resource systems, and to

how local institutions regulate trade-offs between the related outcomes (Cavanagh, Vedeld and Traedal, 2015). Carbon sequestration projects that focus on forested areas often overlook local stakeholders' interactions with adjacent pastoral and agricultural areas. In classical REDD+ policy assessments, opportunity cost baselines are defined based on annual returns per hectare derived from regional or national secondary data that are then compared to carbon market offset prices (Bottazzi *et al*., 2016; Cavanagh *et al*., 2015). There is very little empirical knowledge about how local stakeholders actually depend on forests and agriculture for their livelihood and how this translates to reliable carbon emission estimates.

Indigenous peoples in Africa are disproportionately impacted by climate change due to their vulnerability that stems from their total dependence on the environments in which they live. Indigenous people are among "the first to face the direct consequences of but the least able to respond to climate change." Numerous writers have highlighted the potential negative impacts of carbon credit schemes on indigenous peoples' rights to their lands and resources (Lyons and Westoby, 2014; German, Mandondo, Paumgarten and Mwitwa, 2014). These negative impacts are the consequence of designing climate change policy responses without incorporating a human rights dimension (Olson, Mahdi, Al-Kaisi and Lowery, 2013).

However in a positive move and contrast to the above, the Kariba REDD+ project started way back in 2011 and this project had Prior Informed Consent of the local leadership and communities in which the project is being run. Most REDD+ projects do not run beyond five years from inception due to lack of buy-in by the respective communities. The Kariba REDD+ project is now running over 14 years which is a clear indication that the local communities are in synch with the project. The project has a clear revenue share distribution among all the involved stakeholders.

The other prominent approach is payments for ecosystem services (PES) that are payments to communities, individuals, or governments for safeguarding and maintaining ecosystem services like clean water (Sena, 2015). They are considered beneficial for the involved partners (Tacconi *et al.*, 2009) but unlikely to replace other conservation instruments (Olson *et al.*, 2013). They must be carefully designed to avoid focusing excessively on one resource (e.g. water) or reproducing and even strengthening power asymmetries and social inequalities (Hufty and Haakenstad, 2011; Büscher, 2013).This can only be avoided through community direct involvement for they can address their specific needs in the best manner that fits their circumstances. The Kariba REDD+ projects allows communities to determine for themselves which climate mitigation interventions to be implemented.

Despite the theoretical potential for carbon markets to work, carbon markets worldwide and in the U.S. have largely failed to reduce greenhouse gas emissions and, in some cases, have also failed to bring in revenue, among other problems. Governments determine how many emissions credits are made available in a carbon market, and setting this number is critical. If there are too many emissions credits available, covered entities have less incentive to reduce emissions because the credits are so easy to attain. Alternatively, if there are too few emissions credits available, covered entities are forced to adapt their operations and technologies to less emissions which can be expensive and can sharply increase prices for consumers.

The price of emissions credits follows the principle of supply and demand: the more credits, the lower the price; the fewer credits, the higher the price. Most governments have erred on the side of having too many credits available on the market to effectively reduce emissions, and they have often given these credits to polluters for free. In Europe's case, prices dropped as low as .1 euros per ton in 2007, rose for several years, and then dropped back down to under four euros per ton in both

2013 and 2016. Such low prices render a carbon market essentially useless at incentivising emissions reductions (White *et al.,* 2012).

Problems can also arise during the process of distributing emissions credits at the outset of the market. Some markets have used auctions, where covered entities purchase their initial share of credits. On-going auctions allow for covered entities to buy and sell additional credits. However, in most cases, the carbon market's governing body has determined a fair share of credits for each entity and given some at no cost at all. This method of distribution removes the incentive to reduce emissions since the credits to pollute are free (McAfee, 2012).

Vacchiano *et al.* (2018) illustrate the steps taken to design guidelines for the generation of voluntary carbon credits by improved forest management in Piemonte, Italy. They show how to compute the baseline and the additionality of credit-generating forest management activities, and how to reconcile the generation of forest carbon credits with law requirements, technical limitations, and the provision of other ecosystem services Vacchiano *et al.,* 2018). Their model resulted in an avoided harvest of 39,362 m3 for a net total of 64,014 MgCO2e after subtracting harvest emissions, or 38 Mg ha-1 throughout the permanence period of 20 years and they suggest that these steps can be replicated in other mountain regions where there is interest in promoting this ecosystem service as an alternative or an addition to production-oriented forest management (Vacchiano *et al.,* 2018).

Literature points to the failing of carbon markets, including REDD and REDD-type projects in particular, and highlighting the urgent need to address the social (and ecological) justice gaps in global carbon market and forest governance. Watson, Mourato and Milner-Gulland (2013) focused on emission reductions from forest conservation (REDD) in the Bale Mountains, Ethiopia and suggested that the environmental integrity of a mechanism rewarding Reduced Emissions from Deforestation and Degradation (REDD) depends on appropriate accounting for emission

reductions. Their study used primary data estimate area-weighted mean forest carbon stock of 195 tC/ha ± 81, and biome-averaged data reported by the Intergovernmental Panel on Climate Change underestimate forest carbon stock in the Bale Mountains by as much as 63% in moist forest and 58% in dry forest (Watson *et al.,* 2013).

Largely stemming from a lack of forest data in developing countries, emission reductions accounting contains substantial uncertainty as a result of forest carbon stock estimates, where the application of biome-averaged data over large forest areas is commonplace (Watson *et al.,* 2013). Watson *et al.* (2013) argue that a Reduced Emissions from Deforestation and Degradation (REDD) mechanism can help address market failure by financially rewarding greenhouse gas (GHG) emission reductions from conservation, sustainable management, and forest enhancement activities. Watson *et al.* (2013) suggest that by using REDD, potential revenues over the 20-year project ranged between US$9 million and US$185 million and make the conclusion that strong financial incentives exist to improve forest carbon stock estimates in tropical forests, and the environmental integrity of REDD projects.

Ximenes *et al.* (2012) argue that current policy prescriptions support conversion of production forests to conservation forests, provide disincentives for use of native forest residues for energy and discourage the establishment of production focused plantations. Action to reduce logging in forests, with the objective of increased carbon storage, could have perverse global GHG outcomes (Ximenes *et al.,* 2012). Converting multiple use production forests to conservation forests will reduce access to wood and may lead to increased harvesting in other countries where forests are not managed sustainably, with resultant deforestation or forest degradation in those countries. Harvesting of these forests can lead to significant GHG emissions, an example of 'leakage' (Huber, 2013).

Several funding models have been proposed (Karsenty, 2008), including a specialised public fund (Brazil's proposal in 2006, also discussed by the Stern Review) (Benjaminsen and Bryceson, 2012) and a private, carbon market-based approach (ICF International, 2009; Loisel, 2008). A third option is to include both public and private funds in a hybrid or "basket" approach (Mbatu, 2016). Other concerns have involved prospects for long-term funding, phases of implementation, distribution and safeguards, and sensibility to carbon market variations (Brown *et al.*, 2009; Minang and Murphy, 2010). Under the current negotiations, it appears that the framework would use a hybrid approach, with capacity-building funds available for start-up and financial links with the carbon market for scale-up (Sheats, 2017).

Governance must include the design of the mechanism at all levels, norms-setting procedures, related legal and informal institutional arrangements, and interactions between involved state and non-state actors. Additionally, governance encompasses horizontal (within a given level of government) and vertical (across levels of government) links with other issue areas (e.g. biodiversity, finance, trade, etc.), existing policies and institutions at the international, national, or local levels (Forsyth, 2009; Minang and Murphy, 2010; Suiseeya and Caplow, 2013). In general, governance of forests is notoriously bad (Benjaminsen and Bryceson, 2012). During the last 10 years, efforts to slow deforestation rates globally have had little success (Pfaff *et al.*, 2004). Estimates contend that deforestation rates will continue in all geographic areas (Bryceson, 2012).

Manley and Maclaren (2012) carried out research to evaluate the potential impact of the Emissions Trading System (ETS) on forest management decisions. This included an evaluation on whether to erect new forests, the choice of species and forest rotation period. Their findings were that carbon trading has the potential to improve forest profitability and influence the choice of silviculture. In addition, the results showed that forest rotation length increases with expected carbon

price. However, they noted that there is substantial risk arising from carbon prices. Consequently, they recommended strategies that hedge against carbon price risk at both the stand level and the forest estate level. At the stand level, the strategy is to grow a valuable crop and trade only a portion of units received whereas at the forest level the strategy is to manage forest structure through age-class composition and mix.

Robinson *et al.* (2007) researched on the environmental effects of increased atmospheric carbon dioxide. The authors reviewed research literature pertaining to the environmental consequences of increased levels of carbon dioxide in the atmosphere. The research sought to establish whether the production of greenhouses gases, chiefly, carbon dioxide, would result in "human-induced global warming," which would then cause severe increases in temperatures coupled with disastrous consequences. Their findings were that the concentration of carbon dioxide in the atmosphere has escalated over the past century, rising to a current level of 4 gigatons per annum. They also noted that the aggregate of human industrial carbon dioxide production emanating from the use of coal, oil, gas and cement manufacturing was about 8 gigatons per year. It was also noted that humans exhaled 0.6 gigatons annually which had been sequestered by plants from atmospheric carbon dioxide. They concluded that there was no experimental data to support the hypothesis that increases in atmospheric carbon dioxide could be expected to cause unfavourable global temperatures.

Porter and Brown (2009) embarked on a study to assess the impact of carbon emissions on economic growth; referred to as the economic environment. They noted that emissions from fossil fuels do have a negative substantial impact on economic growth. In their assessment, they concluded that the unfavourable impact is as a result of low productivity of land and labour caused by a rise in carbon emissions. They recommended that there was need for carbon emissions to be

reduced. On a different study, Leo (2011) sought to assess the impact of carbon emissions on economic growth. His findings were that there was a positive relationship between carbon emissions and growth. He avers that the positive relationship is because carbon emissions are a product of industrial activities that increase and enhance growth. He recommended that countries should increase industrial activities to enhance growth but noted that the by-product was carbon emissions. To reduce the emissions, he said there was need to come up with mitigating measures.

Thomas (2013) embarked on research to establish whether carbon offsets work. In the study he explores the role of forest management in greenhouse gas mitigation. His findings included the following:

- Managing forests in a sustainable manner can provide greater greenhouse gas mitigation benefits than unmanaged forests. In the process, a multiplicity of environmental and social benefits accrues.
- Energy from fossil fuels releases carbon that has resided in the earth for millions of years while energy from forests results in no net release of carbon as long as forest inventories are stable and increasing.
- The use of wood products instead of steel, plastic, aluminium and concrete as sources of energy reduces net emissions. This is when compared to fossil fuels which release new atmospheric carbon.

He concluded that forest management is paramount in carbon emissions reduction and that there was need to manage forests vigorously in addition to avoiding the use of fossil fuels as they release net carbon which would have been trapped for millions of years.

Woodcock *et al.* (2009) sought to assess the public health benefits of strategies to reduce greenhouse gas emissions focusing on urban land

transport. The settings used were London, UK and Delhi, India. In both cases, the researchers noted that reduction in carbon emissions through an increase in active travel and less use of motor vehicles had greater health benefits per million population than from the use of lower-emission motor vehicles. It was concluded that climate change mitigation in transport would benefit public health substantially. They recommended that policies should discourage travel in private motor vehicles to ensure health benefits accrue to the public.

From the studies presented in the preceding paragraphs, it is apparent that forest management should be encouraged to reduce carbon emissions. Management of forests should include forest structure and age-class composition. To reduce volatility in the price, there is need for trading only a portion of units received, otherwise trading units not received at the stand could drive down prices and cause volatility.

The chapter has reviewed literature related to the study. It presented various concepts and theories on carbon trading and forest management. It highlighted that there are basically two carbon trading markets which are regulatory and voluntary. It also highlighted three types of forest management strategies which are (1) afforestation/ reforestation, (2) avoiding deforestation and degradation and (3) improved forest management. Under the Kyoto protocol the aim was such that industrialised nations can contribute towards offsetting their carbon footprints through purchase of these credits from countries that manage the forests. From a global perspective it made sense that industrialised nations do not have time to manage forests but concentrate on industrial production which causes pollution. On the other hand, some nations do not have the capacity for industrialisation hence should concentrate on forest management. As such the industrialised nations should compensate by paying those nations or companies managing the forests and the cycle is complete. In the next chapter, the research methodology is presented and discussed.

Chapter 5: Research Methodology

The study sought to interrogate the impact of forest management on carbon trading business in Zimbabwe. The chapter, therefore, presents the tenets of research methodology applied in the research process to achieve the objectives of the study. The methodological aspects covered include the research philosophy, approach, the research design, the target population, sampling methods, methods of data collection and analysis and the ethical considerations of the study.

A research philosophy is a worldview underlying the theories and methodology of a particular scientific subject (Wood, 1997). The major research paradigms that dominate literature are the positivism paradigm and the phenomenology paradigm. In the study, the researcher used pragmatism that is a mixture of positivism and interpretivism. This was a more relevant research paradigm to use as it combined the strengths of one research paradigm to compliment the weaknesses of the other, as explained by Saunders *et al. (*2009). This mixed methods approach was applied because it placed the research problem as central and applied different approaches to understanding the research problem. It recognised that every method has its limitations and different approaches can be complimentary. This mixed methods design was fixed as suggested by Creswell and Clark (2011: 54) since it "is predetermined and planned at the start of the research process, and the procedures are implemented as planned." Kato (2002) suggests that this is a more persuasive way of social science. The roots of mixed methods are typically traced to the multi-trait, multi-method approach of Campbell and Fiske (Mood *et al.,* 1994), although it is considered a relatively new methodology whose key philosophical and methodological foundations and practice standards have evolved since the early 1990s (Tashakkori, 2009).

Johnson and Turner (2003) have argued that the fundamental principle of mixed methods research is that multiple kinds of data should be

collected with different strategies and methods in ways that reflect complementary strengths and non-overlapping weaknesses, allowing a mixed methods study to provide insights not possible when only qualitative or quantitative data are collected. Put in another way, mixed methods research allows for the "opportunity to compensate for inherent method weaknesses, capitalize on inherent method strengths, and offset inevitable method biases" (Creswell, 2007). Mixing the research designs was beneficial as it allowed for "triangulation, complementarity, development, initiation, and expansion" as stated by Creswell and Clark (2011: 61). Therefore, making use of both philosophies enriched the understanding of the phenomena and the findings of the study.

Kumar (1999) defines a research design as a framework which can be used to guide, collect and analyse research data. In particular, the research design of the study followed the research onion process that is presented in Figure 3.1, as described by (Saunders *et. al.* 2009).

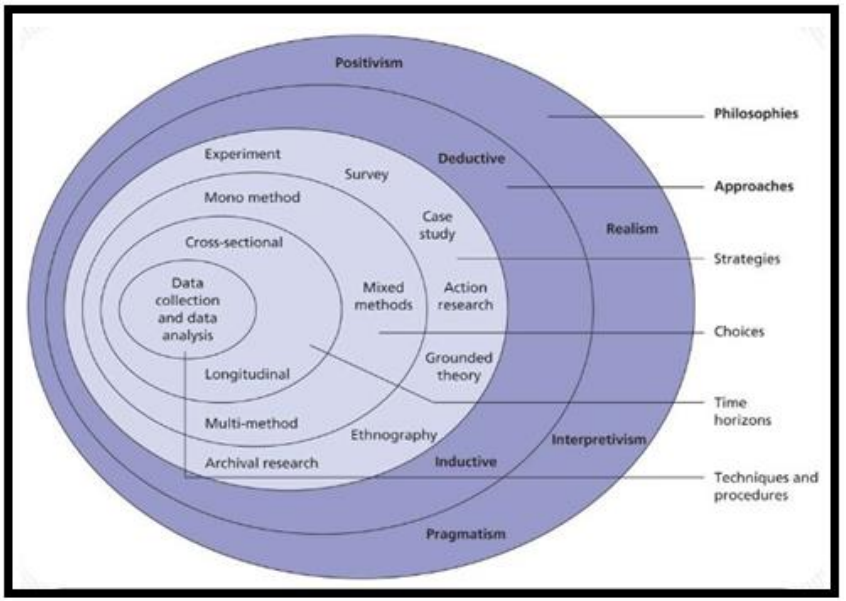


Figure 5.1 The Onion of Research (Saunders *et al.,* 2009)

There are six major designs which are used in scientific research. These include the explanatory sequential, the convergent parallel, the exploratory sequential, embedded research, the transformative and the multiphase designs. In the study, the researcher made use of the convergent parallel design owing to the fact that the study was a mixed methods and this design was more suited as a triangulation design as stated by Cresswell and Plano Clark (2011). This design allowed the researcher to obtain similar yet complimentary data. This enhanced data validation and corroboration as Cresswell and Plano Clark (2011) state. The design was selected since the researcher had limited time to carry out the data collection and also he had appreciable understandings of both qualitative and quantitative research methods. In using the convergent parallel design, the researcher followed the steps suggested by Cresswell and Plano Clark (2011), namely designing both quantitative and qualitative strands, analysed both strand types, merged the two data sets and then interpreted the merged results.

There are two basic approaches in sciences deductive and inductive. In the study, induction was favoured as it was more suited to studies where there was little or scanty empirical data, as suggested by Saunders *et al. (*2015). It was favoured as it was more suited to the testing of theories. The approach allowed the researcher to make use of scientific theories and to explain the causal relationship between the research variables whilst maintaining an understanding of the contexts in which the phenomena occur in the real world and to allow flexibility to changes which could have occurred in the research context as the study progressed. Saunders *et al*. (2015, p.145) argue that inductive research "starts by collecting data to explore a phenomenon" and that it generates or build a theory. In the perspective of Denscombe (2010, p.273), inductive research "tends to work from the particular to the general and the analysis attempts to arrive at more abstract and generalised statements about the topic." Inductive research is aimed at building a theory and "is particularly concerned with the context in which such events were taking place" (Saunders *et al*., 2011, p. 119). As

the aim of the study was to come up with conclusions and generalisations, the inductive approach was more relevant and hence adopted.

According to Welman *et al.* (2011) a population is a group of entities with a common set of characteristics. The target population refers to the specified elements or entities that hold the data required to address and/or investigate the stipulated research issue (Malhotra, 2010). For the study, the target population comprised of the staff and management from Carbon Green Africa and councilors and community members from the Binga and Hurungwe Districts. It also targeted officials from the Climate Change Department under the Ministry of Environment, Water and Climate. The target population was defined based on the following characteristics;

- Geographical spread and project location;
- Existing data on forest management initiatives in the area;
- Being management and staff of a carbon trading business;
- The knowledge base of the respondents;
- Being Government Ministry that regulates Climate Change mitigation;
- Known participants in the market of carbon credits, market makers and market takers.

There are two main methods in which to conduct a study sample, namely probability and non-probability sampling (Berndt and Petzer 2011). In probability sampling, every member or element in the population has a known, non-zero probability of being included in the study sample (Zikmund and Babin, 2013). Systematic sampling that is a form of probability sampling, was used for the descriptive survey. Contrastingly, non-probability sampling exudes arbitrary and subjective traits, as a researcher's selection of participants is based on personal judgment alone.

For that reason, the selected sample cannot be regarded with absolute certainty as a representation of the entire population (Feinberg *et al*., 2013). Purposive sampling that is a form of non-probability sampling method, was used for in-depth interviews. On this method, the researcher selects units purposively. The advantage was that those selected had a direct reference to the research questions and you don't waste time interviewing irrelevant people (Bryman, 2008).

The target population was split into two groups, that is, staff and key informants. Then, the researcher purposively sampled managers and used convenience to sample staff because the researcher did not have a sampling frame from where people would be picked randomly. Thus, respondents were sampled based on availability.

According to Johnson and Christensen (2012) purposive sampling is a non-probability form of sampling. It is sometimes called judgemental sampling. In purposive sampling, the researcher specifies the characteristics of a population of interest. In the study, the researcher chose CGA Staff, government officials and the community. It has been stated that in this procedure, the sampling units are not chosen in a random manner. They are chosen based on some of their characteristics.

The researcher then located the people with these characteristics. This is most common with Qualitative researchers. Cohen, Manion and Morrison (2007) posit that in this way, the researcher builds up a sample that is satisfactory to his or her explicit needs. This was applicable in the study for the researcher purposively chose managers for they were perceived to be rich with information the study sought to establish.

The selection of institutions for the study was also based upon considerations of feasibility and accessibility. The researcher was informed and convinced by this sampling technique adopted to gather in-depth knowledge on certain issues. It should therefore be noted that

the purposive sampling is based on the assumption that a great deal can be learnt about issues of concern.

A sample size is the number of participants needed within the study to draw conclusive findings using analysis (Berndt and Petzer, 2011). McDaniel and Gates (2010) point out that determining a sample size depends on several factors, including financial (costs), statistical (analysis methods) and managerial issues. Consideration was given to the planned statistical analysis techniques when the researcher was determining the sample size.

Hair *et al. (et al. (*2010) posit that structural equation models that comprise seven or more constructs should have a sample size of between 300 and 500, and, as such, this sample size is considered sufficiently large and adequate. For the quantitative study the research used 78 participants comprising of employees from CGA in Binga and Hurungwe Districts and from the department of Climate Change under the Ministry of Environment, Water and Climate. There were 22 more participants who formed part of the in-depth interviews from key informants which made a total sample size of (100) one hundred participants.

Collection of the necessary primary data for the study, was done using semi-structured questionnaires and interviews. The researcher administered 100 questionnaires to the research participants. Questionnaires were preferred for use in the study owing to their cost effectiveness. They proved advantageous because they provided data which was analysed quantitatively as per the research design of the study. Questionnaires allowed the respondents to respond more objectively as they had the chance to read through the questions before responding to them, thereby reducing bias and errors. However, the use of questionnaires in the study came with its disadvantages, as they failed to probe for further information from the respondents. To make up for this weakness, the researcher included open-ended questions in the

questionnaires and provided preliminary instructions for the participants to first understand the nature of each question before responding to it.

To make up for the weaknesses which came with the use of the questionnaires, such as that it largely obtains quantitative and not qualitative data, the researcher engaged in key informant interviews. Denscombe (2010, p.53) suggests that a key informant interview offers "far greater opportunity to delve into things in more detail and discover things that might not have become apparent through more superficial research." The key informants in the study included 20 participants' from Binga and Hurungwe chiefs, CGA staff and from Government officials who had more detailed information and knowledge. In undertaking them, the researcher made prior appointments with the interviewees before attending the interviews on a later date, within their areas of work.

Key informant interviews were preferred in the study as they allowed the researcher to have a more in-depth understanding of the issues under probe. They also made it more convenient for the respondents, who in this case were organisational managers, who had limited time to fill questionnaires. Key informant interviews were also chosen as they allowed the researcher to obtain more detailed and reliable information from the management who were mostly involved in the key decision-making. Each interview lasted an approximate fifteen (15) minutes. The researcher used audio recording to capture the responses to the interview questions, and as well took down field notes during the discussions for later transcription.

The researcher used structured questionnaires which were hand delivered and an interview guide to gather data. In the study, questionnaires were administered to employees. These are described below.

A questionnaire consists of a set of questions presented to respondents for answers. The respondents read the questions, interpret what is expected and then put the answers themselves (Dawson, 2012). The researcher used a questionnaire which consisted of a series of open ended and closed ended questions with boxes to tick, and open spaces to explain their views. For instance, open questions like: "What do you understand by the term carbon credits?" were asked to give respondents an opportunity to freely express their views.

The use of open-ended questions gave employees an opportunity to answer in their own words without guidelines concerning their perception towards global warming. Closed ended questions gave the respondents the direction for required answers for easy analysis. According to Bell (2015), age is often considered to be sensitive therefore rather than asking respondents to give their exact age, the researcher asked them to tick in boxes to indicate their age category (25 or younger; 25-30; 31-35; 36–40; 41-45 and 45 or older). The questionnaires were distributed to employees of diverse age groups.

In general, the questionnaires gave the respondents' freedom in answering questions as it ensured the anonymity of respondents, hence they felt free to express their opinions and the influence from other respondents was minimal. Questionnaires are the most widely used data collection methods in educational and evaluation research. They help gather information on knowledge, attitudes, opinions, behaviours, facts and other information (Saunders *et al.*, 2009).

A questionnaire is a measuring instrument that asks individuals to answer a set of questions and record their answers usually with closely defined alternatives (Bell, 2015). Questionnaires are commonly used in surveys with descriptive or explanatory purpose to collect information on attitudes and opinions. The questionnaire had several advantages in this particular research. It enabled collection of voluminous data from a wider audience simultaneously albeit at a very low cost.

The researcher used semi-structured interview guide for staff, on questions which were mainly open ended. Open ended questions gave a guide as to what was required. The interviews were conducted after making prior appointments with respondents. Where it was felt that respondents had misinterpreted a question, such question was rephrased so that the correct meaning was conveyed, and the respondent was afforded an opportunity to provide an accurate response. The interviews were useful, as they provided an opportunity for unclear responses to be clarified.

The researcher chose a setting with little distraction to ensure the respondents were comfortable. This was possible because interviewees were at their own places of work. The researcher explained the purpose of the interview by addressing the terms of confidentiality that the responses were going to be used for academic purposes only. The format of the interview and type of interview being conducted and its nature was well explained. The researcher asked for permission to record the interview.

Interviews were effective because the researcher combined what was said verbally with the non-verbal language displayed thus emphasising a said point. This created a healthy platform to get reliable and credible information. Furthermore, the researcher used interviews because they facilitated immediate responses and allowed the researcher to seek clarification instantly and probe further to come up with detailed and valid data. However, they were very time-consuming, that is, setting up, interviewing, transcribing, analysing, giving feedback and reporting. More so, the interviews were costly due to travelling frequently to meet respondents.

A pilot study can be described as a small-scale version or trial run, done in preparation for the major study. A pilot study can be used to improve a project, assess its feasibility, improve its clarity, eradicate problems

and refine methodology (Pilot and Beck, 2010). The pilot study was conducted using 10 respondents.

The main objective was for the researcher to determine the appropriate time on average a respondent would take to complete the questionnaire and to measure the level of reliability of the questionnaire before a full-blown version of the research is rolled out. It is also at this stage that ambiguous questions or unclear questions were identified and appropriate remedial action instituted. Hence, it made the study's instrument valid and reliable. Questionnaires were administered personally and through social media. Follow up reminder telephone calls were made. This was done to ensure that respondents complete and return the completed questionnaires on time. Interviews were conducted on sight.

The foundation of any research is in credibility and that evidence and conclusions can be scrutinised (Dzansi, 2004:187). In addition, Davis (2005:184) elaborates that valid and reliable elements are crucial for credibility. Reliability and validity are the two most important and fundamental features in the evaluation of any measurement instrument or tool for good research (Mohajan, 2017). For the study's results to be meaningful, the process of gathering data were conducted to ensure credibility. Credibility indicates that outcomes of the study were legitimate because of the way the groups were selected and the way the data were recorded and/or analysed.

Validity of the research was examined by three different experiments mainly; construct validity, internal validity and external validity. Validity is the establishment of practical measures and seeking harmony between the theoretical framework and a specific measuring process or mechanism (Dawson, 2009). To ensure research validity, the researcher tried to enhance the external validity of the project through desk top researching using numerous library and Internet based sources of

evidence and different methods of data gathering through literature study together with focus, deep study and investigation.

The researcher used both narrative text method and single isolated statement in the qualitative analysis of the data. Narrative text method was used as an approach for interpreting mainly the data from the interviews while single isolated statement was used to interpret data from the questionnaire.

Frequencies, percentages and mean were used as descriptive statistics for interpretation of data in numerical terms. The data were analysed using SPSS v.20 and Microsoft Excel. This was based on analytical techniques to analyse data quantitatively. For ease of illustration, graphical methods, tables and charts were used to interpret the data collected.

After collecting the obtained data, it is arranged into numerical summaries or into graphs or charts which makes analysis easier and providing answers to the research questions (Ngulube, 2009). The data collected from the questionnaires was coded, captured and analysed using the Statistical Package for Social Scientists (SPSS) version 20 whilst qualitative data gathered through in-depth interviews was subjected to thematic narrative analysis.

Thematic analysis was employed to produce useful information regarding client satisfaction. The researchers build valid argument themes basing on existing literature. For the study, the themes and patterns were identified that were related to the research questions and real-life experiences and inferences were made from the interviews.

The informed consent of the participant was an ethical consideration that was prioritised in the study. The participants in the study were made aware of the objectives of the study and of its processes and of its possible impact on both their social and professional lives. The informed

consent was communicated by writing as a letter attached to the cover of the research questionnaire and verbally at the beginning of each interview.

Anonymity of the participants was upheld as an important ethical principle. The anonymity of the participants was ensured by not writing or keeping their names, identification details, employment information, photographs or any other particulars on the study materials or in computers, recordings or on any other data storage devices. By maintaining the anonymity of the participants, the researcher protected them from any form of victimisation, embarrassment or name-calling that may have possibly resulted from participation in the study. Establishing their anonymity ensured more valid and reliable findings as the participants were able to share their views and opinions without fear or prejudice.

Freedom of participation and withdrawal was also upheld in the study. The participants were not enticed, tricked, forced or coerced to participate in the study by any means whatsoever. Participation in the study was strictly on a voluntary basis although the researcher took time to explain the potential benefits of the study to all stakeholders involved and concerned. Participants were made aware of the option to leave or quit the study during any time in its course and of the absence of any negative repercussions, material or otherwise, of doing so.

The purpose of hypothesis testing was to determine the accuracy of a hypothesis because a sample of data were collected. Two kinds of hypothesis are used in classical tests: the null hypothesis and the alternative hypothesis. The null hypothesis is used for testing. It is a statement that no difference exists between the parameter and the statistic being compared to it. If we reject a null hypothesis, then we are accepting the alternative hypothesis.

Equation (2) presented the regression function with the estimated parameters together with the corresponding standard errors within parentheses to know if the parameter estimate for the slope coefficient was significantly different from zero or not. We start by stating the hypothesis:

$$\boldsymbol{H_o}: \boldsymbol{\alpha_1} = 0$$
$$\boldsymbol{H_1}: \boldsymbol{\alpha_1} \neq 0$$

The estimated parameter is transformed according to the null hypothesis and that transformation was used as a test function. The t-statistic value is computed as follows;

$$T - Statistic = \frac{(\text{Estimated Alpha} - \text{Hypothesized Alpha})}{\text{Standard Error of Alpha}}$$

The 95% Confidence Interval (-1.96:1.96) was measured suitable for the study, thus a 5% significance level was chosen for the statistical tests. This translates to a 5% probability that values outside the interval may be obtained.

If the test value is larger than the critical value in absolute terms, we reject the null hypothesis. Otherwise, we just accept the null hypothesis and argue that it is possible that the population parameter is equal to zero.
Critical value: *tc* = 1.96

For a null hypothesis, a *p-value* which is greater than the significance level shows that the intercept is not statistically significant. On the other hand, a *p-value* which is less than the significance level shows that the average intercept is significantly different from zero.

In the chapter, I have presented and discussed the research methodology of the study. I have discussed the research philosophy, approach, and design. I have also covered the population, sample, sampling methods, data collection techniques, and data analysis approaches. Additionally, I

have addressed the ethical considerations made in the study. The next chapter focuses on the study findings, presenting and discussing them.

Chapter 6: Evidence from the Field

Through the chapter, I seek to present and analyse the data obtained in the study. Chapter three described how I conducted the research, focusing on the research design, participants, research instruments, and data collection and presentation procedures. I present data collected from self-administered questionnaires and interviews, both derived from the research objectives. The data include information obtained from structured questionnaires administered to staff and management, and semi-structured interviews with key informants. The research objectives aimed to determine the impact of forest management on carbon trading, to ascertain the effect of current legislation and the compulsion for local companies in Zimbabwe to buy carbon credits, to investigate the relationship between global carbon prices and carbon trading volumes, and to propose a framework guiding carbon trading for sustainable forest management in Zimbabwe, using Carbon Green Africa as a case study.

I provide a summary of the participants' response rate to indicate the extent of contribution from the selected participants in numerical terms, as shown in Table 6.1. The data represent responses collected from staff and management of Carbon Green Africa, councillors and community members from the Binga and Hurungwe District and also officials from the Climate Change Department under the Ministry of Environment, Water and Climate. The response rate, based on returned questionnaires and actual interviews conducted, is presented in tabular form below.

Table 6.1 Questionnaire response rate (Primary data)

Study unit	Sample	Response	Response rate
CGA staff, Councillors, Community and Ministry officials.	95	79	83.16%

Out of the total sample size of 95 copies of questionnaires distributed, the general response rate was 83.16%. Most of the questionnaires were hand delivered and only 79 were answered and collected. The response rate was favourable and those that could not respond to the questionnaires took time to respond to the stipulated time frame. Generally, the response rate was good enough to render the results of the research as valid and representative though the researcher would have preferred a one hundred percent (100%) response rate.

Table 6.2: Reliability of Questionnaire

Item	Cronbach's Alpha	N of Items
The impact forest management has on the carbon trading volumes in Zimbabwe.	.714	9
The impact of current legislation and the compulsion to buy carbon credits by local companies in Zimbabwe.	.755	11
Overall	.727	20

Table 6.2 is a summary of the findings on how reliable the instrument was. Results indicate that the computed overall reliability of the questionnaire was 0.727, items addressing impact of forest management (0.714) and current legislation (0.755). The Crownbach's Alpha values were good in that the values were bigger than 0.7, the minimum acceptable value.

Table 6.3 Interviews response rate (Primary data)

Study units	Sample	Response	Response rate
Key informants (Chiefs, CGA staff, Ministry officials.)	22	22	100%

The researcher successfully conducted 22 interviews with Key informants and the general response rate was 100%. Therefore, the total number of participants was 101.

For the purposes of analysis, the researcher divided the participants into two subgroups which are general employees and managers for institutions and community elders (Key informants)

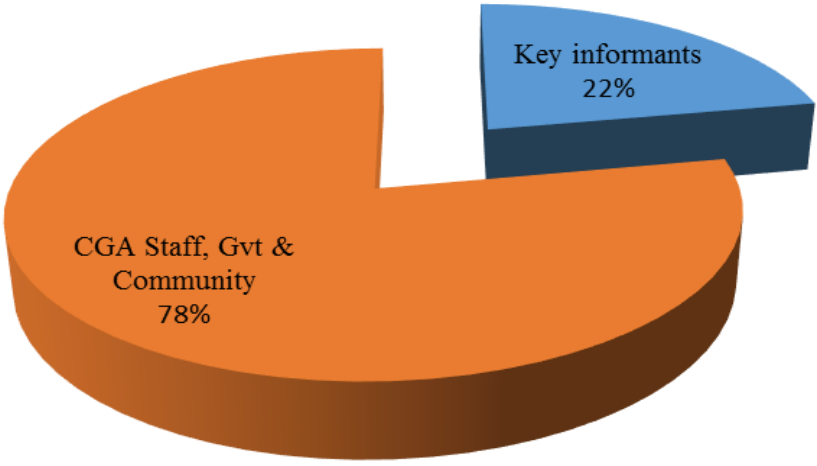


Figure 6.1 Semi-structured questionnaire and interviews response rate

The above descriptive statistics are as illustrated on figure 4.3 above, out of the 100 participants, 78 were proxies for CGA Staff, Government and the community and 22 represented key informants. This gave an average of 78.25% response rate but participation was 78% for CGA Staff, Government and the community and 22% for key informants. The reason being that staff interacts with the government officials and the community quite often.

An assessment of respondent's demographics, especially level of key informants and staff experience was conducted with the aim of providing an understanding of background information about the profiles of the sampled respondents. The study starts by presenting the socio-demographic data obtained from CGA staff, government officials and the community. This was followed by employment experience. The succeeding section shows socio-demographic data:

Table 6.4 Level of management

Designation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Managerial – Lower Level	33	41.8	41.8	41.8
	Non-Managerial	46	58.2	58.2	100.0
	Total	79	100.0	100.0	

Of the 83.16% response rate from the semi-structured questionnaires presented in table 6.7 58.2% represented non-managerial employees and 41.8% represented lower-level managers. This is also shown by a bar chart below which clearly depicts the employees who participated in the completion of the semi-structured questionnaire.

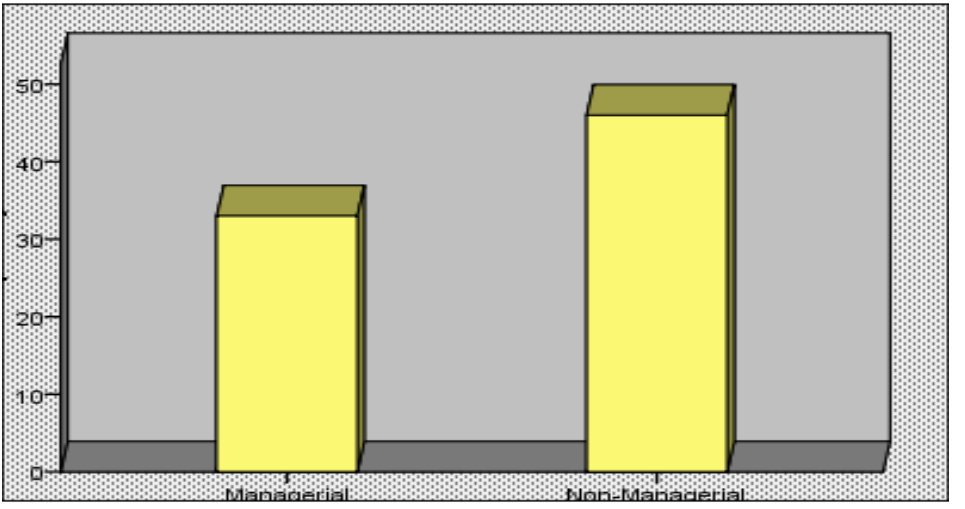


Figure 6.2 Level of management

The demographics of employees' experience were presented using a table and a bar chart showing descriptive statistics of frequency. The study examined employment experience background of the employees from CGA and the Ministry who participated in the study to measure their nature in terms of employment experience to validate the data.

Table 6.5 Employment experience

Employment period

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 5 years	13	16.5	16.5	16.5
	5-10 years	32	40.5	40.5	57.0
	11-15 years	24	30.4	30.4	87.3
	16-20 years	5	6.3	6.3	93.7
	Above 20 years	5	6.3	6.3	100.0
	Total	79	100.0	100.0	

The findings showed that employees of the two main employers (CGA and Government) who participated had two (2) dominated groups. The responses show that 40.5% have been working for CGA and Government for a period ranging from 5 to 10 years followed by those in the range of 11 to 15 years who constituted 30.4%.

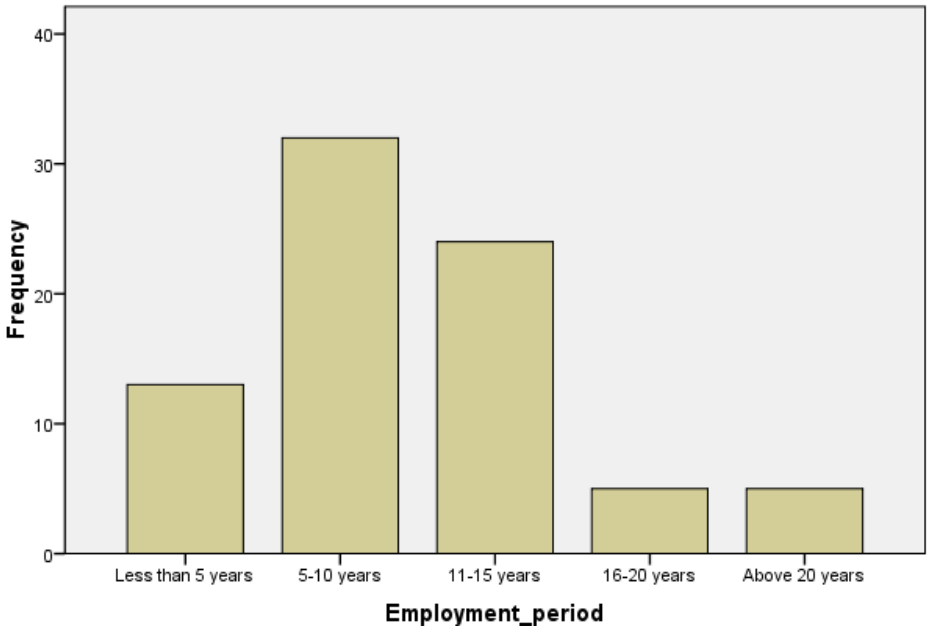


Figure 6.3 Employment experience

The data presented tendencies of normal distribution as shown in Figure 6.3. The data is highly skewed with a skewness of .704 showing that employees are concentrated in the below 15-year period. However, a great number of the employees have remained with CGA and the Government for periods ranging from 5 to 10 years showing high levels of experience.

We present findings of the study particularly, regarding the impact forest management has on carbon trading volumes in Zimbabwe, impact of current legislation and the compulsion to buy carbon credits by local companies in Zimbabwe, relationship between global carbon prices and carbon trading volumes and last but not least, a framework to guide carbon trading for sustainable forest management in Zimbabwe.

The participants were asked on the impact of forest management on carbon trading volumes in Zimbabwe. The study sub-categorised the main variable into small components (forest management and carbon trading volumes) which all pointed to the first research objective. The results from the research question which sort to assess the impact of forest management on carbon trading volumes in Zimbabwe are presented on the following pie chart.

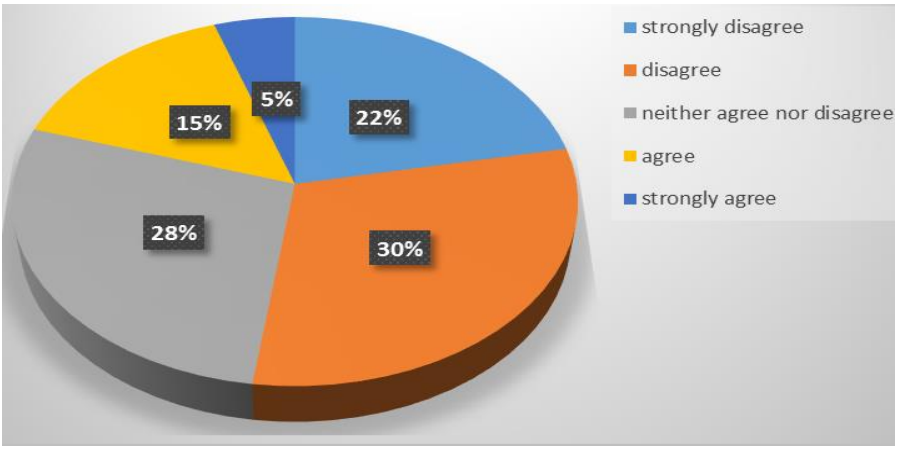


Figure 6.4 Forest management and carbon trading volumes weighted average responses

The general perception of the participants is that forest management has no strong bearing on carbon trading volumes. The above pie chart shows that 30% disagree with all factors which pointed to the impact of forest management to carbon trading volumes. 28% of the responses could neither agree nor disagree to the assertion. Furthermore, 22% of the responses strongly disagreed with the fact that forest management impact carbon trading volumes. Nonetheless, 15% agreed that good forest management practices have an impact on carbon trading volumes. They were supported by 5% of the responses which strongly agreed to the narrative.

Table 6.6 Forest management impact on carbon trading volumes by designation.

Description * Forest management impact on carbon trading volumes Cross tabulation

Count

		Forest management impact on carbon trading volumes					
		strongly disagree	Disagree	neither agree nor disagree	Agree	strongly agree	Total
Description	Key informants	0	8	0	10	15	33
	CGA Staff, Gvt staff and The community	7	15	7	6	11	46
Total		7	23	7	16	26	79

Table 6.6 shows that there is divergent opinion on the participants with 58% of key informants (15 out of 26 participants) and 42% of CGA Staff, government staff and the community (11 out of 26 participants) strongly agree that Forest management has an impact on carbon trading volumes over time. This is supported by 65% (10 out of 16 participants) of key informants and 35% (6 out of 16 participants) of CGA Staff, government staff and the community who agree to the notion.

However, 65.22% (15 out of 23 participants) of CGA Staff, government staff and the community and 34.78% (8 out of 23 participants) of key informants disagree and concur with 30% in the pie chart above who

disagree with all factors which pointed to the impact of forest management to carbon trading volumes saying that there is no significant impact. The diagram below clearly shows the variations.

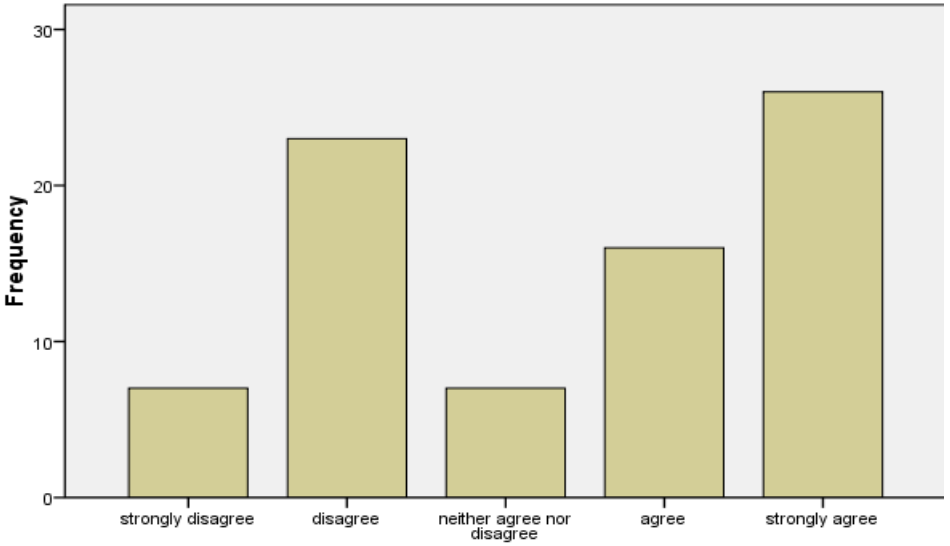


Figure 6.5 Forest management impact on carbon trading volumes by designation.

The divergence of views can best be illustrated by the bar graph above. In depth interviews from all the key informants showed that senior members of institutions and the community strongly agree because they have a direct benefit from carbon trading as a result of good forest management. However, the group that disagreed cited less meaningful benefits derived from carbon trading over time.

The graph below presents the responses on the impact of compulsory buying of carbon credits by local firms as enshrined in the current legislation. This variable assessed the effect of regulatory frameworks on local companies' particularly on compulsory buying of carbon credits.

From the data collected, 21% of the respondents strongly agreed that current legislation impact heavily on local firms compulsory buying of carbon credits. This figure was supported by 24% who responded in favour of the same notion that the current legislation has a bearing on local firms. The researcher observed that from the findings it shows that there was discord among the participants as seen by the support of 23% of the respondents who could neither agree nor disagree. The other 24% disagreed that the current legislation was an impediment to local companies. The data is presented in the following bar graph.

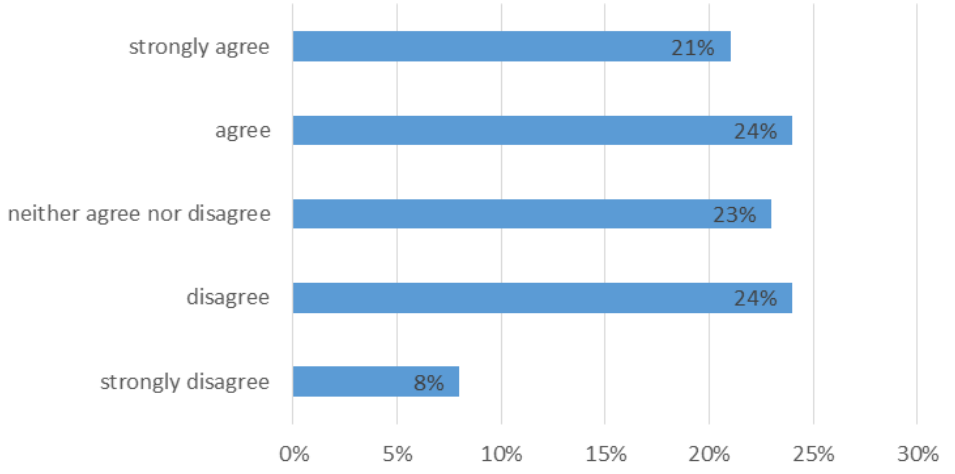


Figure 6.6 Current law structural inefficiencies in relation to carbon trading.

This can point to the fact that participants are confused on why the law is failing the local companies. A further scrutiny had to be done which looked at the structural inefficiencies. The following pie chart presents the data.

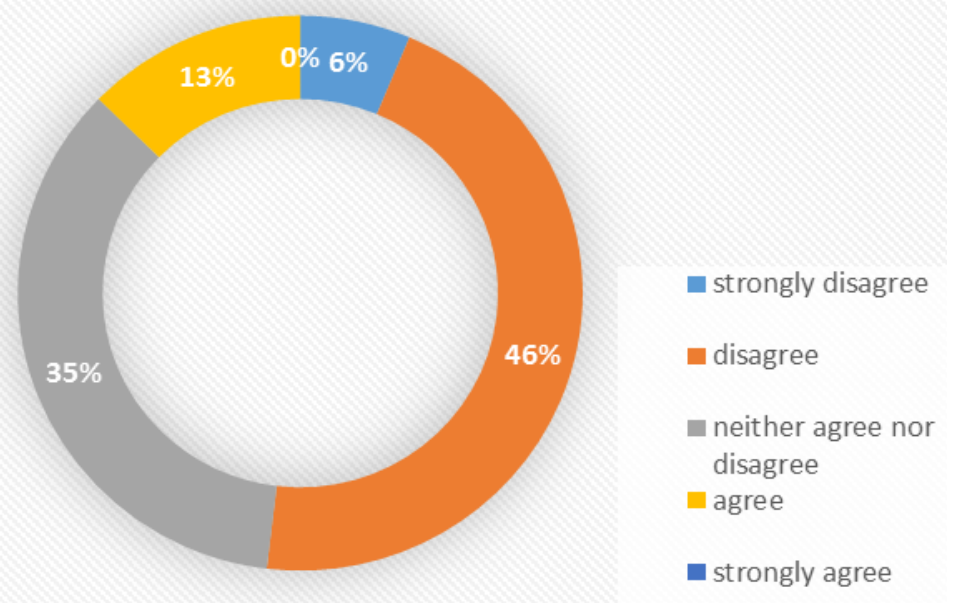


Figure 6.7 Structural inefficiencies in relation to carbon trading

The above pie chart shows that 46% disagreed that structural inefficiencies in relation to carbon trading have been affecting local business save for structural inefficiencies in the application of the current legislation. It was observed that 35% were neutral on the subject; only 13% agreed that structural inefficiencies have been affecting local businesses. Last but not least were the 6% who strongly agreed that structural inefficiencies were an impediment to conducting business.

Administration costs have been cited as the major cause for local companies' distress due to poor global markets prices, as such the study sort to assess the effect of the administration costs. As can be seen on the pie chart below, 47% of the participants disagreed with the opinion that administration costs had decreased over the years. This was supported by 20% of the responses which strongly disagreed as well. Overall, 33% were neutral on the matter.

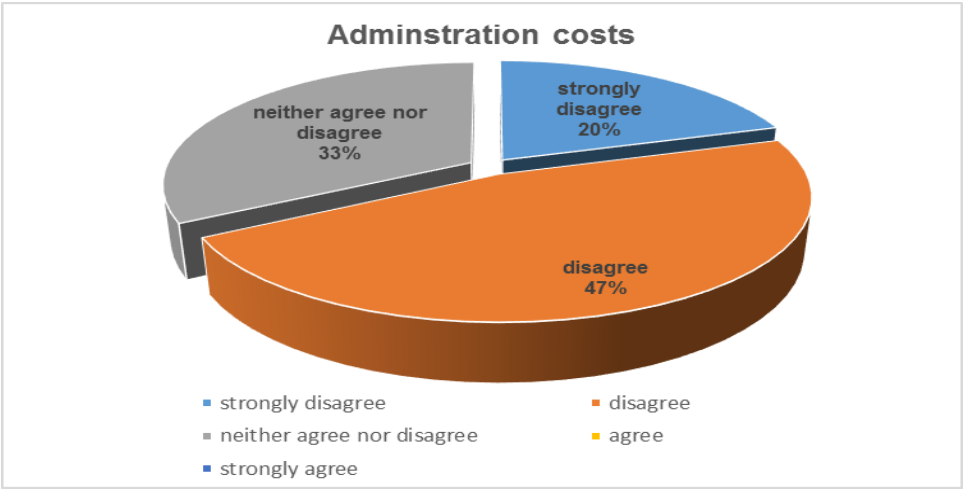


Figure 6.8 Administration costs

The study analysed the link between global carbon prices and carbon trading volumes. The findings found that 33% of the respondents neither agreed nor disagreed that there was a relationship between global carbon prices and carbon trading volumes. However, 25% of the respondents agree and were convinced that global carbon prices had a material impact on carbon trading volumes.

In addition, 19% strongly agree with notion, that investors play a critical role in the sustenance of the carbon credits business. The above arguments are as explained in the following pictorial representation.

Figure 6.8 Link between global carbon prices and carbon trading volumes

Figure 6.9 show the results of the effect of global carbon prices on the trading of carbon credits. Results show that 57% of the participants strongly agree that global carbon prices have a bearing on the trade of carbon credits. This was supported by the 43% responses garnered for the same notion. The following pie chart highlights the above arguments.

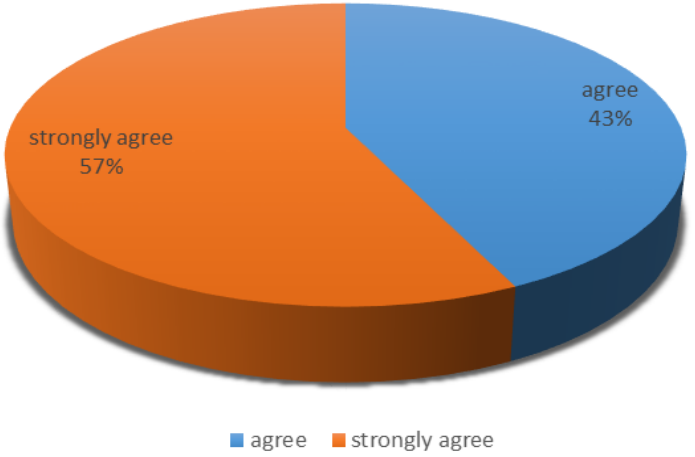


Figure 6.9 Link between global carbon prices and carbon trading volumes

The study sought to establish the relationship between guiding framework for sustainable forest management in relation to trading of carbon credits. The following pictorial representation shows the results of the respondents in the study.

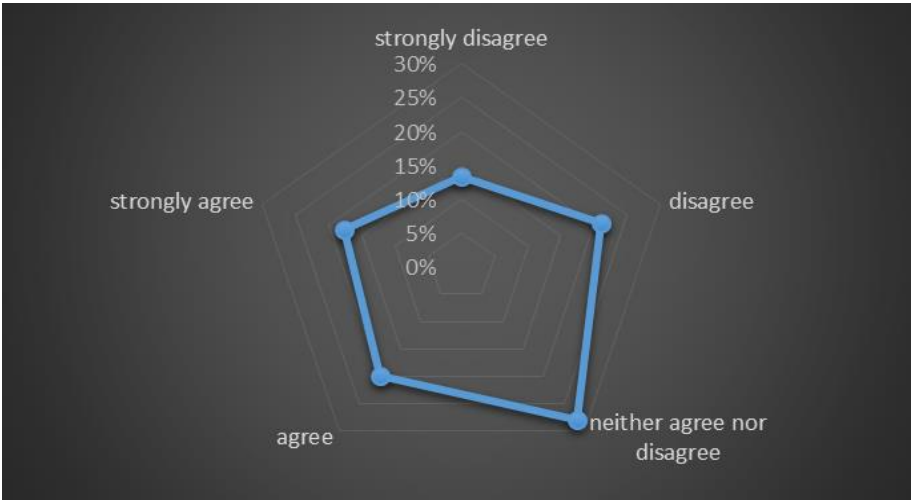


Figure 6.10 Guiding framework for sustainable forest management in relation to trading of carbon credits.

Figure 6.10 show that 28% of the respondents neither agree nor disagree if there is a relationship between guiding frameworks for sustainable forest management in relation to trading of carbon credits. The study reviewed that 17% of the participants disagree with the notion that there is a nexus between guiding frameworks for sustainable forest management and trading of carbon credits. However, 12% agree that indeed there exists a fundamental relationship between the two variables.

Factor analysis was employed to unearth the forest management and carbon trading volumes variables or factors. Before factor analysis was carried out data were tested for sampling adequacy and sphericity using KMO and Bartlett's Test respectively, a condition which had to be satisfied before factor analysis was conducted. The conditions were met, since Kaiser-Meyer-Olkin Measure of Sampling Adequacy was statistically not significant ($p=0.485$) and Bartlett's Test of Sphericity was insignificant ($p=0.000$) at 95% confidence interval ($p<0.05$).

Table 6.7 below illustrated this. Also a correlation matrix was computed to eliminate very highly correlated variables that is $r>0.9$. However, no such relationship existed in this data with regards to a nexus between forest management and carbon trading volumes.

Table 6.7: KMO and Bartlett's Test*a*

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.485
Bartlett's Test of Sphericity	Approx. Chi-Square	759.055
	Df	66
	Sig.	.000

a. Based on correlations

Table 6.8: Total Variance Explained

	Component	Initial Eigenvalues[a]			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
Raw	1	3.409	37.237	37.237	3.409	37.237	37.237	1.709	18.663	18.663
	2	1.661	18.142	55.379	1.661	18.142	55.379	2.845	31.076	49.740
	3	1.424	15.555	70.934	1.424	15.555	70.934	1.254	13.699	63.439
	4	.785	8.577	79.512	.785	8.577	79.512	1.472	16.073	79.512
	5	.571	6.233	85.745						
	6	.492	5.371	91.116						
	7	.308	3.359	94.475						
	8	.196	2.138	96.613						
	9	.131	1.436	98.049						
	10	.108	1.183	99.232						
	11	.052	.569	99.801						
	12	.018	.199	100.000						
Rescaled	1	3.409	37.237	37.237	3.773	31.445	31.445	2.925	24.373	24.373
	2	1.661	18.142	55.379	2.453	20.445	51.890	2.849	23.745	48.119
	3	1.424	15.555	70.934	1.468	12.236	64.125	1.873	15.604	63.723
	4	.785	8.577	79.512	1.173	9.773	73.898	1.221	10.175	73.898
	5	.571	6.233	85.745						
	6	.492	5.371	91.116						
	7	.308	3.359	94.475						
	8	.196	2.138	96.613						
	9	.131	1.436	98.049						
	10	.108	1.183	99.232						
	11	.052	.569	99.801						
	12	.018	.199	100.000						

Extraction Method: *Principal Component Analysis*.

When covariance matrix was analysed, the initial eigenvalues were the same across the raw and rescaled solution.

Table 6.8 indicated the actual factors which were extracted as factors had inhibiting carbon trading. Results reveal that out of the 20 components under investigation only four were extracted as principal determinants in hindering the growth of carbon trading, and the for components accounted for a total variability of 79.5% and 73.90% of all the variables before and after rescaling of all the variables. The components were extracted basing on an Eigen value of 1 and only those factors whose Eigen value was greater than 1 were extracted as they met the cut-off criterion.

Figure 6.11: The Scree-plot below presents also shows graphically the extracted components.

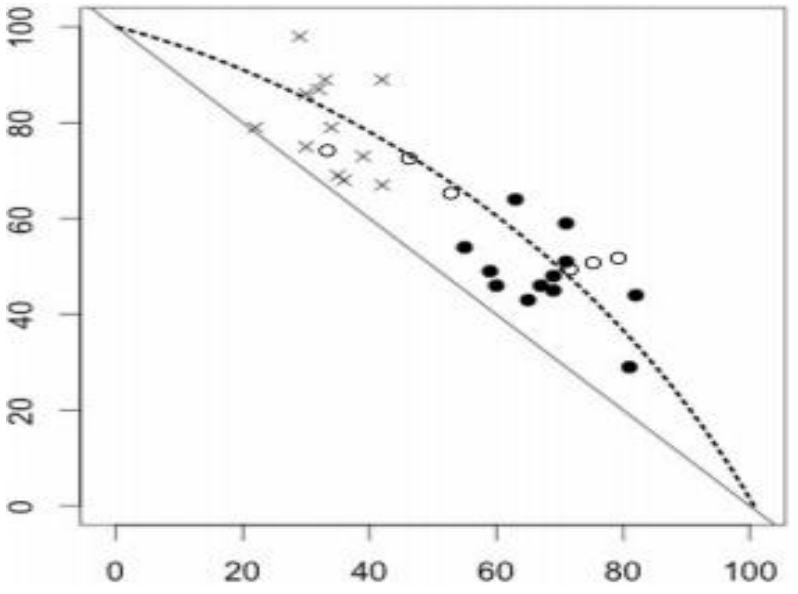


Figure 6.12 Relationship between forest management and carbon trading volumes.

The diagram above shows the Relationship between retained canopy cover proxy for forest management and percent carbon trading volume in 12 plots after simulated harvest. The filled circles represented high intensity on the map, with crosses showing low intensity, the empty circles revealing a validation set; the dashed line is an exponential fit. Last but not least is the solid line which stretched from end to end with a 1-to-1 relationship.

After testing Hypothesis 1, H_1 (alternative hypothesis) was adopted which proposed that forest management has a significant impact on the carbon trading volumes in Zimbabwe. The null hypothesis was adopted which proposed that the current legislation has no significant impact on the compulsion of local companies to buy carbon credits. H_1 (alternative hypothesis) was adopted which proposed that there exists a significant relationship between global carbon prices and carbon trading volumes in Zimbabwe.

The study findings indicate that the general perception is that forest management has a strong bearing on carbon trading volumes. On the other hand, hypothesis test one indicated that that forest management has a significant impact on the carbon trading volumes in Zimbabwe. However, Newell, Pizer and Raimi (2013) found out that forestry used to dominate carbon credits stocks but scientists have discovered wind credits which are cheaper.

Hypothesis two adopted a null hypothesis stating that current legislation has no significant impact on the compulsion of local companies to buy carbon credits. Jonsson *et al.* (2012) supported the study's findings, arguing that recent draft legislation in Austria, for example, allows businesses to offset up to 13% or 23% of their emissions—but not 100%—which leaves room for carbon emissions since the laws are not punitive. Politicians are balancing employment concerns with environmental goals. The findings also showed a significant relationship between global carbon prices and carbon trading

volumes in Zimbabwe. Bottazzi *et al.* (2016) noted that empirical knowledge about how global carbon prices link to trading volumes remains limited.

The hypothesis tests received strong support from questionnaires and in-depth interviews. Participants indicated that current legislation heavily influences local firms' compulsory purchase of carbon credits. Evidence also suggested a nexus between global carbon prices and carbon trading volumes. These findings align with Ximenes *et al.* (2012), who found that current policy encourages converting production forests to conservation forests, while disincentivising the use of native forest residues for energy and discouraging the establishment of production-focused plantations. Additionally, the study's results correspond with Reyes (2011), who argued that international law enforcement in carbon trading remains largely underdeveloped.

The chapter has presented and analysed data on the impact of forest management on the carbon trading business, focusing on Carbon Green Africa in Zimbabwe. The analysis shows that some results agree with empirical and theoretical literature from various schools of thought, while others contradict. The results should not be applied in isolation; rather, recommendations are necessary to reinforce them. The next chapter concludes the study with summaries and recommendations.

Chapter 7: Summary, Conclusions and Recommendations

Utilising the chapter, I seek to synthesise the findings of the study by outlining the key insights, drawing conclusions in relation to the research objectives, and proposing actionable recommendations for the sustainable alignment of forest management and carbon trading in Zimbabwe. This analysis is grounded in empirical evidence and aims to influence governance, conservation practice, and carbon market development for a more equitable and effective climate strategy in the region. The preceding chapter presented, analysed, and interpreted the collected data, bringing the research study to its concluding stage. The chapter consolidates the study's final components—namely, the summary of findings, conclusions, and recommendations. These sections collectively offer clarity on the research problem under investigation, the methodological choices and their limitations, the core findings, and the implications of these findings for the governance of forest management and carbon trading in Zimbabwe. The recommendations offered are directed at key stakeholders, encouraging practical incorporation into national climate action strategies.

The study investigated the nexus between forest management and the operational viability of carbon trading in Zimbabwe, employing both empirical and applied research approaches. With a response rate of 83.16%—well above the acceptable 70% threshold—the study generated a robust data set from structured questionnaires and semi-structured interviews conducted with stakeholders including Carbon Green Africa (CGA) staff, community leaders, and government officials. Findings indicate that forest management significantly influences carbon trading volumes. Participants overwhelmingly linked sustainable forest management practices with the capacity to generate carbon credits, affirming that poor forest governance undermines credit generation and market access. Furthermore, the research revealed that current legislation does not exert any influence on the compulsory purchase of

carbon credits by local firms. There is minimal application of economic governance tools such as carbon taxation, tax exemptions, privatisation incentives, and compliance mandates.

In relation to global carbon prices, the study established that Zimbabwe's carbon market operates almost entirely within voluntary frameworks. Trading volumes remain low, and Zimbabwean carbon credits are only traded internationally, often at undervalued prices. Despite this, evidence from respondents confirmed a relationship between global prices and local carbon trading volumes, suggesting that international pricing directly affects the demand and viability of forest-based credits. The need for a comprehensive national policy framework emerged strongly, one that aligns forest conservation activities with verified carbon standards while addressing social and ecological justice gaps. This should include community incentives, legal clarity, and enforcement mechanisms to facilitate sustained forest conservation.

From these findings, several conclusions were drawn in line with the research objectives. Firstly, forest management directly affects the volume and quality of carbon credits generated. Participants perceived forest-based carbon trading, especially in Africa, as dependent on intact forest ecosystems. Yet, the contribution of forestry to global carbon markets remains marginal due to multiple risks—such as leakage, carbon permanence, and the difficulty of measuring sequestration accurately. These factors, compounded by risks like forest fires and pest outbreaks, continue to deter investor confidence.

Secondly, the study concluded that no binding legislation exists in Zimbabwe to compel local firms to purchase carbon credits. Participants highlighted that companies showed limited interest in voluntary offsetting, largely due to the cost burden and lack of regulatory pressure. As a result, the carbon market remains weakly subscribed, with

communities receiving minimal incentives to engage in forest conservation efforts.

Thirdly, the research confirmed a link between global carbon prices and trading volumes. Most large-scale carbon emitters face limited legal obligations to purchase credits, while voluntary markets—such as those driven by individuals or corporations offsetting travel emissions—remain too small to drive significant trading volumes. Participants called for the introduction of regulated minimum carbon credit prices to stimulate market participation and guarantee returns to local communities. Incentivised pricing structures would, in turn, encourage rural villagers to conserve forests and shift from unsustainable forest management practices.

Insights from interviews reinforced this conclusion, with respondents emphasising that price fluctuations directly affect conservation willingness. Communities expect tangible compensation for forgoing forest-based resource options. Therefore, the study concluded that large emitters must be compelled to purchase carbon credits at levels proportionate to their emissions, ensuring both environmental justice and financial viability for community-based forest management initiatives.

The study concludes that the communities would want the Kariba REDD+ model continued and expanded as a forest management initiative. This is necessitated as the project has a typical bottom up approach and revenue share is made clear and transparent from the onset. The communities can get more farming inputs under the conservation farming programmes, boreholes and more community nutritional gardens. Consequently, more rural energy solutions can be availed for communities to forgo the use of firewood as energy sources. A good source of energy would be the construction of biogas digesters. The participants reviewed that local polluting companies should be

encouraged to offset their carbon emission through buying credits from projects like the Kariba REDD+ project and others with similar setups.

Based on the research findings and conclusions; the study concludes that: there is need to educate stakeholders on the socio-economic benefits of carbon trading. This act as an incentive to communities who look after these forests. It is important for stakeholder education and awareness programmes on the importance and benefits of carbon trading. The study established that forest management in Zimbabwe is done by most companies and other stakeholders even though most of them are not aware of the carbon trading business. There are information gaps as to what carbon trading is and its socio-economic benefits for the concerned stakeholders and local communities, such as the ability to create employment, generate profits and conserve forests. There is need to enhance the teaching of forest management and carbon trading practices at all levels of education both formal and informal.

The study established that most stakeholders are not obliged to buy carbon credits owing to the absence of a legal framework to compel them to do so, even though most of them are polluting and using forests and forestry resources. As a result of the lack of mandatory carbon purchasing laws, Zimbabwe's carbon trading market is mostly voluntary. This has led to the unavailability of a local carbon market which forces current projects like the Kariba REDD+ to solely depend on international markets.

Based on the research findings and conclusions; the study concludes that the government needs to enact laws which are pro-carbon trading. There is a need for the Zimbabwean government to formulate and enforce legal policies which are informed by the principles of carbon offsetting by emitting corporates for sustainable forest management in the country. In particular, the government should make full use of such

strategies as privatizing carbon trading, putting in place carbon taxes and incentives, using other governance mechanisms and natural capital valuation. It is important for the government to put in place a definitive and operational legal framework to guide carbon trading as the study has seen the level of carbon trading in the country to be very low and rather insignificant.

It is suggested that the following principles be included and used in the formulation of the country's legal carbon trading policy:

- True devolution policies will enable and encourage communities to directly benefit from carbon trading activities within their locality.
- Communities to have direct ownership of carbon projects within their localities.
- Reconciling the generation of forest carbon credits with law requirement
- Enable carbon market linkages at both international and local level
- Address social and ecological justice gaps in global carbon market and forest governance
- Use of appropriate accounting methods for emission reductions
- Enable and support conversion of production forests to conservation forests
- Develop a national capacity which can access different carbon financing schemes to implement and support carbon projects in Zimbabwe.
- Institutionalise a forestry management response governance framework at national, provincial, district and ward level.

Future studies must focus on the use of larger sample sizes. The study was limited in terms of time and financial resources which made the researcher resort to using a smaller sample. As such, to enhance the

validity and reliability of the findings, future researchers on the topic are advised to make use of larger sample sizes. Further research can assess the contribution of forest carbon credit projects to addressing the effects of climate change challenges.

Chapter 8: A Postscript: A Review of Article 6 in the Context with Recent Developments in Zimbabwe Surrounding Carbon Trading

Through the chapter, I seek to critically examine Zimbabwe's engagement with Article 6 of the Paris Agreement, assessing whether its carbon trading reforms represent a transformative departure from past governance practices or a continuation of entrenched systems of control and exclusion. This analysis explores the intersection between global climate compliance, national policy recalibration, and local forest governance through the lens of justice, inclusion, and institutional accountability. The question of whether Zimbabwe's engagement with Article 6 of the Paris Agreement signals a meaningful shift or a strategic repackaging of historical governance modalities remains central to ongoing debates in climate policy. Article 6 operationalises international cooperation on climate mitigation by enabling countries to trade internationally transferred mitigation outcomes (ITMOs), with the aim of reducing the cost of meeting Nationally Determined Contributions (NDCs), while fostering sustainable development through finance, technology transfer, and institutional strengthening.

Prior to Article 6 establishment, Zimbabwe has been relying on both local and international funding for most of its climate mitigation strategies. Projects such as the Clean Development Mechanisms (CDM), Green Environment Facility (GEF), and other international development funds have been helping Zimbabwe cope with climate change issues. Most NGOs have also helped a number of mainly rural communities coming up with lively community projects. The private sector has not been left out having been instrumental in coming up with a new form of climate funding thus carbon credits generation. Zimbabwe entered the carbon credit arena in 2011 having established the Kariba REDD+ project

in four districts thus Mbire, Hurungwe, Nyaminyami and Binga. This was the pioneer project in the county to generate revenue from a carbon trading business with other projects such as solar, cookstove, etc following in the later years. This project was established from a purely Private sector Investment funding. The carbon credits have been traded on the Voluntary market.

Zimbabwe does not have any carbon trading project under Government so this means all current carbon trading projects are purely run by the private sector which has immensely covered the gap. Besides other similar entities running carbon projects, the Kariba REDD+ project has seemingly been more visible across the globe. The project covers over 750,000 ha of communal land that it protects in return generating carbon credits revenue for the marginalised communities. The Kariba REDD+ project in particular has been operational through the Government's decentralisation agenda where binding contractual agreements were signed between the private entity and Rural District Councils. The Rural District Councils are a Local Government structure which oversees communal areas management on behalf of communities in the respective jurisdictions. Authenticity and legitimacy of projects such as the Kariba REDD+ project hinges on the binding agreements in place with RDCs which is an arm of the Ministry of Local Government at the higher level. However the directive that all carbon projects should be registered with the MECW is very logical as it is the correct Ministry mandated with carbon accounting for the country.

For Zimbabwe to actively participate on the Article 6 Paris Agreement it need to have bankable projects running carbon credit projects in Zimbabwe to fulfil conditions of mainly Article 6:2 and 6:4. For the Government to start these projects it will take not less than 36 months before carbon credits generation on which Zimbabwe can now actively participate globally under the two sections of Article 6 mentioned above. Article 6 is being managed by the MECW yet the current carbon projects

have binding agreements with Ministry of Local Government though RDCs. To avoid this mismatch, the Government then directed that all Carbon trading projects should now be registered and be recognised by the MECW. The Ministry of Environment now had to come up with a series of ambitious institutional and regulatory reforms. These include the establishment of the Zimbabwe Carbon Registry (ZCR)—the first national registry globally to meet Article 6 compliance standards—the enactment of Statutory Instrument 48 of 2025, and the drafting of the Climate Change Management Bill. The ZCR is underpinned by blockchain architecture designed to automate core processes such as credit issuance, retirement, and corresponding adjustments.

Despite the apparent modernisation, the governance architecture of Zimbabwe's carbon reforms reflects contested power geometries. The design of the ZCR embeds a top-down governance ethos, where central authority over carbon asset ownership and compliance is retained by state institutions and elite intermediaries. This raises concerns about whether the shift to compliance markets constitutes an actual departure from exclusionary governance patterns or simply rearticulates them within new normative frameworks.

Since inception in 2011, the Kariba REDD+ project model was centred on community ownership. The project proposals were discussed first with local leadership and community members first before taken to the RDCs for MOU signatures. There was prior informed consent and full buy-in by the community before any project was undertaken. The project was signed by the RDCs standing on behalf of the communities as mandated by the RDC Act which falls under the Ministry of Local Government. Stock holders to the project have been the RDC, community, project developer and the project Investor. The share of revenue from carbon credit sales was clear from the onset despite the issue of values at which credits were sold for. The project was running under a project design document which enabled climate mitigation and adaption project activities to be implemented from credits revenue. The communities

have to identify which projects they need implemented within their respective wards and claim ownership of such. The project has cut across all SDGs thus ranging from drought mitigation, health, water, education, food, infrastructure etc. Projects are being implemented as per specific ward requirements. The model structure presents a bottom-up approach which brings a sense of inclusivity and total control by the communities who should be beneficiaries of the forests around them. Most carbon projects have failed to run for more than five years. However, the Kariba REDD+ project since 2011 has been running for the past 14 years which is a typical proof that communities are solidly behind the project.

Zimbabwe has joined the global market by participating on the Article 6 of the Paris Agreement which is a milestone achievement by the country. This has culminated in the crafting of the ZCR, ZiCMA, SI48/2025 among other regulations. This brings uniformity to the carbon trading industry in Zimbabwe which is shifting towards the compliance market as opposed to the voluntary market. This has brought both positive and negative results to the whole carbon market.

The study found that Zimbabwe's engagement with Article 6 reflects both opportunity and constraint. Therefore, the chapter interrogated Zimbabwe's carbon trading strategy through the lens of international compliance, market governance, and forest management. On one hand, the reforms create pathways for greater financial mobilisation, legal clarity, and institutional coordination. The question is whether the recent shift to compliance reflects substantive transformation or adaptive continuity. The analysis underscores the need to move beyond symbolic alignment with global frameworks and focus instead on embedding justice, participation, and accountability into carbon governance at all levels. Without a deliberate effort to centre local communities, Article 6 compliance risks becoming another episode in the reconfiguration of natural resource control.

The framing of compliance as innovation obscures the persistence of centralised control and the marginalisation of grassroots stakeholders. While reforms such as Statutory Instrument 48 of 2025 introduce legally binding obligations, the pace and form of implementation suggest a potential alignment with global climate finance narratives rather than a genuine effort to democratise environmental governance. The deployment of digital infrastructure and performative compliance with global norms appears oriented toward securing investment legitimacy and international credibility, rather than fundamentally reconfiguring decision-making power at the local level. This instrumental approach raises important questions about the real beneficiaries of Zimbabwe's carbon trading trajectory. While the reforms invoke the language of sustainable development and community benefit-sharing, the underlying institutional architecture remains tightly controlled, limiting meaningful participation from the communities whose forests generate carbon credits. The commodification of carbon through Article 6 compliance risks reproducing extractive relationships under the guise of environmental reform.

Zimbabwe's recent carbon governance reforms, anchored in the launch of the Zimbabwe Carbon Registry (ZCR), the enactment of Statutory Instrument 48 of 2025, and the drafting of the Climate Change Management Bill are framed as a decisive pivot toward Article 6 of the Paris Agreement. However, a closer interrogation reveals a more complex reality: one in which technical alignment coexists with institutional inertia, and where the language of compliance may mask deeper continuities in centralised governance. Article 6.2 enables countries to engage in cooperative mitigation through the transfer of Internationally Transferred Mitigation Outcomes (ITMOs), offering flexibility in achieving Nationally Determined Contributions (NDCs) (UNFCCC, 2021). Zimbabwe's Statutory Instrument 48 of 2025 operationalizes this mechanism by establishing procedures for ITMO approval, project registration, and corresponding adjustments (Government of Zimbabwe, 2025). The ZCR automates these

adjustments using blockchain, ostensibly enhancing transparency and auditability. Yet, the political economy of ITMO transfers in Zimbabwe reveals strategic adaptation rather than normative compliance. As noted by Omukuti *et al.* (2024), African states often engage with carbon markets through a logic of "regulatory mimicry," adopting international frameworks to attract finance while retaining centralised control. In Zimbabwe, ITMO governance remains opaque, with limited public disclosure of bilateral agreements and no formalized stakeholder consultation process (Zimbabwenow,2024). This suggests a compliance posture driven by transactional incentives rather than participatory transformation.

Article 6.4 establishes a centralised crediting mechanism under UNFCCC oversight, designed to replace the Clean Development Mechanism with stronger safeguards for environmental integrity and sustainable development (Kovacs *et al.,* 2025). Zimbabwe's registry mimics this architecture by embedding benefit-sharing obligations mandating that 20% of carbon revenues support local infrastructure, education, and healthcare (Bulawayo24, 2025). However, the institutional architecture remains vertically integrated, with decision-making authority concentrated in state agencies and technocratic bodies. Tembani *et al.* (2021) demonstrate that Zimbabwe's forest governance is characterized by weak actor networks and low capacity for collective action, conditions that persist despite regulatory reform. As noted by Jinga (2024) and reinforced by recent government interventions (ZBC News, 2025; Herald Online, 2025), Zimbabwe's carbon economy has historically privileged transnational consultants and elite brokers, often sidelining local communities through opaque land tenure systems, limited consultation, and uneven benefit-sharing mechanisms. The replication of this pattern under Article 6.4 raises questions about whether the centralised mechanism is being used to entrench existing hierarchies rather than democratize climate governance.

Article 6.8 promotes non-market approaches such as capacity building, technology transfer, and policy coordination, offering a counterbalance to market-centric climate governance (Global Forest Coalition, 2022). Zimbabwe's Climate Change Management Bill references Article 6.8 but provides no operational roadmap for implementing non-market pathways. The emphasis remains on tradable mitigation outcomes, with limited investment in institutional capacity or community-led adaptation. Zamchiya *et al*. (2021) caution that in contexts of contested land tenure and weak customary rights, market-based reforms may exacerbate exclusion and dispossession. As noted by Durmaz and Schroeder (2025), the global shift toward carbon commodification often sidelines justice-based approaches.

SI 48 of 2025 represents a paradigm shift in Zimbabwe's climate governance. By integrating blockchain technology, enforcing compliance, institutionalising benefit-sharing, and correcting past governance failures, Zimbabwe positions itself as a regional leader in carbon finance. However, the framework's success will depend on its operational fidelity, transparency, and ability to attract credible international partnerships. Zimbabwe's carbon trading reforms anchored in Statutory Instrument 48 of 2025, the launch of the Zimbabwe Carbon Registry (ZCR), and the drafting of the Climate Change Management Bill are often portrayed as a decisive shift toward Article 6 compliance. However, a deeper analysis reveals a hybrid governance model: legal and technical innovation layered atop enduring institutional structures.

The repeal of SI 150 of 2023 and enactment of SI 48 of 2025 marked a legal turning point. The new regulations established the Zimbabwe Carbon Markets Authority (ZiCMA) and the ZCR, both designed to ensure traceability, prevent double counting, and support Article 6 transparency frameworks (Panavanhu, 2025; Muvingi & Mugadza, 2025). The ZCR is blockchain-enabled and now serves as the sole platform for project registration, credit issuance, and retirement (Herald,

2025). ZiCMA's mandate includes licensing auditors, approving mitigation outcomes, and authorizing international transfers. These functions mirror global best practices and reflect Zimbabwe's ambition to become a credible player in the carbon economy (Makombe & Chanza, 2024). Yet, the centralisation of authority within ZiCMA also raises concerns about bureaucratic bottlenecks and limited checks on executive discretion (MCM Legal, 2025).

Despite regulatory upgrades, Zimbabwe's carbon governance remains vertically integrated. ZiCMA operates as the sole liaison with the UNFCCC, and grievance mechanisms, though formally established, lack operational independence (Bulawayo24, 2025; ESG Network Zimbabwe, 2025). The Climate Change Management Bill references Article 6.8 but offers no enforceable pathways for non-market approaches like community-led adaptation. Makombe and Chanza (2024) argue that Zimbabwe's climate diplomacy is often transactional, with weak institutional capacity undermining transformative potential. The replication of centralised control echoes past forest governance models, where elite brokerage marginalized local actors (Mashingaidze *et al.*, 2021).

Zimbabwe's carbon trading reforms reflect technical change layered atop institutional continuity. The transition from voluntary to compliance markets is legally significant, but centralised control, limited stakeholder agency, and transactional diplomacy temper claims of transformation. The result is a hybrid regime which is legally modernized, technologically sophisticated, but structurally conservative. As Makombe and Chanza (2024) and Hoffmann *et al.* (2025) warn, Article 6 may reproduce colonial logics of resource extraction if not accompanied by institutional reform. Zimbabwe has taken a bold step toward compliance, but the true measure of change will lie in its ability to transform governance structures, not just regulatory instruments. Continuity must give way to inclusion, and compliance must evolve into climate justice. It is expected that Zimbabwe's carbon trading regime

mature into a participatory, transparent, and regionally integrated system, one that not only meets Article 6 obligations but also uplifts communities, restores landscapes, and redefines Africa's role in global climate finance.

In Murehwa District, socio-ecological threats such as land fragmentation, invasive species, and unsustainable harvesting have eroded the climate mitigation potential of forests. Mataruse *et al.* (2021) argue that without integrated forest governance, carbon finance will remain vulnerable to ecological shocks and community resistance. The National Forestry Policy (2023) attempts to address these gaps by promoting sustainable forest management and community participation, but implementation remains uneven (Nyagumbo, 2023).

Taking a relook at the Kariba REDD+ project model, the revenue share points to where a greater percentage of the revenue proceeds is accounted for in the respective districts thus the producer community while the project proponent retains 30% only. There is greater control and direct participation by the communities. Similarly, the Eastern Highlands offer a promising model. Grassroots cooperatives like Chitsanza Development Association have begun certifying carbon sequestration and accessing payments, demonstrating that decentralised ownership can enhance both ecological and economic outcomes (Matonho, 2025). These initiatives suggest that community-driven approaches may succeed where top-down frameworks have faltered. If Zimbabwe's carbon trading business is fully regulated, inclusive, and ecologically grounded, the benefits could be transformative. Increased forest cover would enhance climate resilience, verified payments could incentivise sustainable land use, and transparent governance would attract global investment. As Matondi emphasised at the Africa Business Forum, Africa must use its carbon assets responsibly, not merely to

participate in global markets, but to redefine them in ways that prioritize ecological justice and community empowerment (Nyagumbo, 2025).

At a systemic level, Zimbabwe's approach to Article 6 compliance illustrates a broader tension between market efficiency and climate justice. The country has embraced the market-based instruments of Articles 6.2 and 6.4—ITMO trading and project-based mitigation—while neglecting the more justice-oriented Article 6.8, which promotes non-market cooperation, capacity building, and community-led adaptation. This skewed prioritisation reflects a transactional orientation that seeks legitimacy, investment, and diplomatic alignment with global climate norms, while leaving the underlying governance hierarchies intact.

The Climate Change Management Bill, despite its progressive rhetoric, lacks binding clauses on community consultation, benefit distribution, and grievance redress. It codifies compliance without decentralising authority. The continued exclusion of forest-dependent communities from decision-making and revenue flows reflects a policy posture driven by external validation and elite brokerage, rather than internal accountability or ecological justice. Zimbabwe's carbon reforms, therefore, constitute a hybrid model: legally codified, digitally sophisticated, and institutionally centralised. While the reforms offer a promising foundation for integrating climate finance into national development strategies, their transformational potential remains limited by longstanding governance constraints. Centralised control, exclusionary forest policies, weak enforcement, and technocratic bias continue to undercut community empowerment and ecological integrity.

To unlock the full potential of Article 6, Zimbabwe must move beyond compliance for its own sake. A recalibration is required—one that repositions communities as active participants rather than passive

beneficiaries, integrates biodiversity values into carbon methodologies, and embeds enforceable rights into legal instruments. Only through such structural transformation can carbon markets evolve from transactional platforms into engines of inclusive, justice-based climate governance.

References

AB & David Africa. (2025, May 8). Zimbabwe's Carbon Trading (General) Regulations Statutory Instrument 48 of 2025: A new dawn in climate action and market opportunities. https://abdavid.com/zimbabwes-carbon-trading-general-regulations-statutory-instrument-48-of-2025-a-new-dawn-in-climate-action-and-market-opportunities/

Africa Carbon Markets Initiative (ACMI). (2023). Overview and Roadmap to Scaling Voluntary Carbon Markets in Africa. Global Energy Alliance for People and Planet. https://www.pmiclimate.org/sites/default/files/2023-04/Africa%20Carbon%20Markets%20Initiative%20%28ACMI%29%20Overview_Teleola%20Oyegoke_0.pdf

Africa Carbon Markets Initiative (ACMI). (2024). Africa Carbon Markets Initiative: Status and Outlook Report 2024. Africa Carbon Markets Initiative. https://africacarbonmarkets.org/wp-content/uploads/2024/05/ACMI-Status-and-Outlook-Report-2024_vF.pdf

Agora Global. (2025). The Social and Economic Impacts of Carbon Markets. FSD Africa. https://fsdafrica.org/publication/the-social-and-economic-impacts-of-carbon-markets/

Agyei, K. (2012). Ghana's land tenure and benefit sharing approaches and their implications for forest fringe communities under the REDD+ scheme. 35th AFSAAP Annual Conference Proceedings. https://afsaap.org.au/assets/AGYEI.pdf

Alberdi, I. Michalak, R. Fischer, C. Gasparini, P. Brändli, U.B. Tomter, S.M. Kuliesis, A. Snorrason, A. Redmond, J. Hernández, L. Lanz, A. (2016) Towards harmonised assessment of European forest availability for wood supply in Europe. Forest Policy and Economics, 30, 20-29.

Al-Hussein, A. H and Johnson, R. L. (2009). Relationship between corporate governance efficiency and Saudi banks' performance, *The Business Review*, 14.1, 111-17.

Alibaba Group. (2021). Carbon Neutrality Action Report. Hangzhou: Alibaba Sustainability Center. https://sustainability.alibabanews.com/en

Ameray, A., Bergeron, Y., Valeria, O., Girona, M. M., & Cavard, X. (2021) a Review of Silvicultural Practices and Management Strategies Across Boreal, Temperate and Tropical Forest Current Forestry Reports,7, 245–266 https://doi.org/10.1007/s40725-021-00151-w

Arbonics. (2025). European Forest Carbon Credits 2025 Report. Arbonics Knowledge Hub. https://www.arbonics.com/knowledge-hub/european-forest-carbon-credits-2025-report

ASEAN Climate Resilience Network. (2023). Carbon trading and smallholder rice farmers in Southeast Asia: Opportunities and challenges. https://asean-crn.org/wp-content/uploads/2023/08/2023_Carbon-Trading-and-Smallholder-Rice-Farmers-in-Southeast-Asia.pdf

Asia Society Policy Institute. (2022). Korea study tour on ETS design and implementation: Summary report. https://asiasociety.org/sites/default/files/inline-files/ASPI%20Study%20Tour%20on%20ETS%20Design%20and%20Implementation%20-%20summary%20report.pdf

Asia Society Policy Institute. (2025). Developing emissions trading systems in Asia. Asia Society. https://asiasociety.org/policy-institute/ets

AUDA-NEPAD. (2024). Carbon Markets in Africa: A Comprehensive Study. African Union Development Agency. https://amrh.nepad.org/file-download/download/public/148090

Bai, J., & Ru, H. (2022). Carbon emissions trading and environmental protection: International evidence (NBER Working Paper No. 30587). National Bureau of Economic Research. https://www.nber.org/system/files/working_papers/w30587/w30587.pdf

Bakhshi, H**.** (2025, May 21). Blockchain technology and the Zimbabwe Carbon Registry. The Standard. Retrieved from https://www.newsday.co.zw/thestandard/opinion-amp-analysis/article/20004 2243/ zimbabwe-launches-worlds-first-article-6-carbon-registry

Barata, P. M. (2016). Carbon credits and additionality: Past, present, and future (PMR Technical Note No. 13). World Bank Partnership for Market Readiness. https://documents1.worldbank.org/curated/en/407021467995626915/pdf/105804-NWP-PUBLIC-PUB-DATE-5-19-2016-ADD-SERIES.pdf

Bataille, C., Waisman, H., Vogt-Schilb, A., Jaramillo, M., Delgado, R., Arguello, R., et al. (2020). Net-zero deep decarbonization pathways in Latin America: Challenges and opportunities. Inter-American Development Bank. https://publications.iadb.org/ en/net-zero-deep-decarbonization-pathways-latin-america-challenges-and-opportunities

Benjaminsen, T.A. Bryceson, I. (2012) Conservation, green/blue grabbing and accumulation by dispossession in Tanzania. *Journal of Peasant Studies*, 39 (2), 335-355.

Berndt, A and Petzer, D. (2011). *Marketing Research*. South Africa: Heinemann.

Bhebhe, N. (2025, August 14). Rural authorities key in unlocking carbon credit opportunities. Herald Online. https://www.heraldonline.co.zw/rural-authorities-key-in-unlocking-carbon-credit-opportunities/

Blasch, J. Farsi, M. (2012) Retail Demands for Voluntary Carbon Offsets: A Choice Experiment among Swiss Consumers. Institute for Environmental Decision, IED Working Paper 18, Swiss Federal Institute of Technology, Zurich, Switzerland.

Bondevik, S. (2013) Carbon Forestry and Trading: A Case Study of Green Resources in Uganda. Master Thesis, BI Norwegian Business School, Oslo.

Bottazzi, P. Crespo, D. Soria, H. Dao, H. Serrudo, M. Benavides, J.P. Schwarzer, S. Rist, S. (2016) Carbon Sequestration in Community Forests: Trade-offs, Multiple Outcomes and Institutional Diversity in the Bolivian Amazon. Institute of Social Studies, The Hague.

Bryman, A and Bell, E. 2011. *Business Research Methods*. 3rd Ed. New York: Oxford

Bulawayo24. (2025, August 14). *Zimbabwe tightens carbon market regulations*. https://bulawayo24.com/index-id-news-sc-national-byo-256330.html

Büscher, B. (2013). Nature 2.0. *Geoforum,* 44, 1-3.

Bussolo *et al*., 2007. Challenges to MDG achievement in low-income countries: lessons from Ghana and Honduras. The World Bank Development Economics Prospects Group USA Nov. 2007.

CAMPFIRE Association. (2025). The state of community conservation in Zimbabwe: A review of the CAMPFIRE program, 2016–2023. Harare, Zimbabwe. https://campfirezimbabwe.org/wp-content/uploads/state-of-community-conservation-report-2019-2023.pdf

Caney, S. Hepburn, C. (2011) Carbon trading: unethical, unjust and ineffective? Centre for Climate Change Economics and Policy, Working Paper No. 59. Grantham Research Institute on Climate Change and the Environment.

Carbon Market Institute. (2024). Carbon Markets & Australia's Net Zero Challenge. https://carbonmarketinstitute.org/app/uploads/2024/04/2024_CMI-Westpac_Carbon-Market-Report.pdf

Carbon Market Institute. (2024). International carbon market update: State and trends in the Asia Pacific. https://carbonmarketinstitute.org/app/uploads/2024/08/International-market-update_August-24.pdf

Carbon Market Watch. (2023). Combating *Corporate Greenwashing Through Regulation: Policy Implications of the 2023 Corporate Climate Responsibility Monitor*. Brussels: Carbon Market Watch. https://carbonmarketwatch.org/wp-content/uploads/2023/02/CMW_CCRM2023_PolicyRecommendations.pdf

Cavanagh, C. Vedeld, P. Traedal, L. (2015) Securitising REDD+?Problematising the emerging illegal timber trade and forest carbon interface in East Africa, Geoforum 60, 72-82.

Center for Climate and Energy Solutions (CCES). (2022). *California Cap-and-Trade*. https://www.c2es.org/content/california-cap-and-trade/

Chagutah, T. (2023). *Carbon markets in Africa: Opportunities and risks*. African Climate Policy Centre.

Chang, A.H. (2015) The Politics and Future of Carbon Cap-and-Trade: Lessons from the European Union. Claremont-UC Undergraduate Research Conference on the European Union, 7.

Cheffo, A. (2019). Carbon Trading Opportunities and Challenges in Africa. *Journal of African Development,* 9(2), 32–56. http://repository.smuc.edu.et/bitstream/123456789/7582/1/JAD%209%20%282%29%202019-32-56.pdf

Chemuliti, J.K. (2012) An assessment of the feasibility of carbon trading afforestation contracts in trans Mara sub-county, Kenya. Thesis Submitted in Fulfillment of the Requirements for the Degree of Doctor of Philosophy in Agricultural Economics, University of Nairobi.

ChimwaMurombe Legal Practice. (2023, November 20). *Carbon credits in Zimbabwe – An analysis of the regulatory framework*. Mondaq. https://www.mondaq.com/climate-change/1391754/carbon-credits-in-zimbabwe-an-analysis-of-the-regulatory-framework

Chimwamurombe, F. (2023, November 20). *Carbon credits in Zimbabwe: An analysis of the regulatory framework*. Zenas Chambers, ChimwaMurombe Legal Practice. Mondaq. https://www.mondaq.com/climate-change/1391754/carbon-credits-in-zimbabwe-an-analysis-of-the-regulatory-framework

Climate Brief. (2025, May 9). *Zimbabwe launches national carbon registry in carbon market push*. https://climatebrief.co.zw/2025/05/09/zimbabwe-launches-national-carbon-registry-in-carbon-market-push/

Conte, M.N. Kotchen, M.J. (2010) Explaining the price of voluntary carbon offsets. Climate Change Economics, 1 (2), 93–111.

Cubas-Baez, A., Sunderlin, W., Larson, A. M., & Frechette, A. (2025). From promises to practice: Persistent challenges in safeguarding local rights in forest carbon market initiatives. *CABI Reviews, 20*(1), 0025. https://www.cabidigitallibrary.org/doi/pdf/10.1079/cabireviews.2025.0025

Cubas-Baez, A., Sunderlin, W., Larson, A. M., & Frechette, A. (2025). From promises to practice: Persistent challenges in safeguarding local rights in forest carbon market initiatives. *CABI Reviews, 20*(1), 0025. https://doi.org/10.1079/cabireviews.2025.0025

Dabhi, S. (2019). The evolution of carbon markets: Design and diffusion. *Global Environmental Politics*, 19(1), 131–132. https://direct. mit.edu/glep/article/19/1/131/15037/The-Evolution-of-Carbon - Markets-Design-and

Dhanagare, S., & Mason, S. (2025). *Case Study: Family Forest Carbon Program*. Nature-Based Solutions Financing Working Group. Durham, NC: Nicholas Institute for Energy, Environment & Sustainability, Duke University. https://nicholasinstitute .duke.edu/project/green-banks-and-community-lenders-financing -nature-based-solutions

Diagne, E. H. M. (2023, September 1–3). *Carbon markets and Article 6 of the Paris Agreement* [Conference presentation]. Climate Change and Development in Africa (CCDA XI), Safari Park Hotel & Casino, Nairobi, Kenya. United Nations Economic Commission for Africa. https://www.uneca.org/eca-events/sites/default/files/ resources/documents/ACPC/CCDA11/Presentations/ccda_xi_ carbon_markets_and_article_6_of_the_paris_agreement.pdf

Diaz, D. Hamilton, K. Johnson, E. (2011) State of the forest carbon markets 2011: from canopy to currency. Ecosystem Marketplace, Washington, D.C., USA.

Dibley, A. Wilder, A.M. (2016) Forest Carbon Rights: Lessons Learned from Australia and New Zealand. Forest Carbon Rights in Australia and New Zealand, (3).

Durmaz, Z., & Schroeder, H. (2025). Indigenous Contestations of Carbon Markets, Carbon Colonialism, and Power Dynamics in International Climate Negotiations. Climate, 13(8), 158. https://ueaeprints.uea.ac.uk/id/eprint/100090/1/climate-13-00158-v2.pdf

Durmaz, Z., & Schroeder, H. (2025). Indigenous Contestations of Carbon Markets, Carbon Colonialism, and Power Dynamics in International Climate Negotiations. *Climate*, 13(8), Article 158. https://doi.org/10.3390/cli13080158

Ecosystem Marketplace. (2023). *State of the voluntary carbon markets 2023*. Forest Trends. https://www.ecosystemmarketplace.com/publications/state-of-the-voluntary-carbon-market-report-2023/

Ecosystem Marketplace. (2025). 2025 State of the Voluntary Carbon Market (SOVCM): Meeting the Moment—Renewing Trust in Carbon Finance. https://www.ecosystemmarketplace.com/publications/2025-state-of-the-voluntary-carbon-market-sovcm/

EEP Africa & Open Capital. (2023). Carbon Credits Market Access for Smaller-Scale Clean Energy Projects. Helsinki: Nordic Development Fund. https://eepafrica.org/documents/Carbon-Credits-Market-Access-Publication.pdf

ESG Network Zimbabwe. (2025, May 7). New Regulations for Carbon Credit Trading. https://esgnetworkzimbabwe.co.zw/new-regulations-for-carbon-credit-trading/

European Commission. (2023). ETS2: Buildings, road transport and additional sectors. https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/ets2-buildings-road-transport-and-additional-sectors_en

Evans, K., & Guariguata, M. R. (2008). Participatory monitoring in tropical forest management: A review of tools, concepts and lessons learned. Center for International Forestry Research (CIFOR). https://www.cifor-icraf.org/publications/pdf_files/Books/BGuariguata0801.pdf

Ewing, J. (2024). The People's Republic of China's Emissions Trading Scheme: Origins, Characteristics, and Lessons for Greater Asia. Manila: Asian Development Bank. https://www.adb.org/sites/default/files/institutional-document/1007506/apcr2024bp-peoples-republic-china-emissions-trading-scheme.pdf

Fairhead, J. Leach, J. Scoones, I. (2012) Green grabbing: a new appropriation of nature? The Journal of Peasant Studies 39(2), 237-261.

FairPlanet. (2023, June 17). Who will benefit from Zimbabwe's carbon trading regulation? https://www.fairplanet.org/story/who-will-benefit-from-zimbabwes-carbon-trading-regulation/

FMO & Mobilising Finance for Forests. (2024). Carbon modelling tools guide: Estimating carbon in forestry investments. FMO. https://www.fmo.nl/l/en/library/download/urn:uuid:b4d3635b-e99a-44b9-a744-a409bac436af/carbon+modelling+tools+guide+ -+final.pdf

Food and Agriculture Organisation of the United Nations (FAO). (2025). *Carbon rights and the importance of benefit sharing*. UN-REDD Programme. https://www.un-REDD.org/post/carbon-rights-and-importance-benefit-sharing

Forest Solutions Dialogue. (2020). Landscape of carbon markets and nesting of forest carbon projects. Forest Solutions Dialogue. https://forestsolutions.org/wp-content/uploads/2020/11/Land scape -of-markets-and-nesting-FSD-Oct-2020-1.pdf

Fuller, M. R., Ganjam, M., Baker, J. S., & Abt, R. C. (2025). Advancing forest carbon projections requires improved convergence between ecological and economic models. *Carbon Balance and Management, 20*(1), 1–15. https://cbmjournal.biomedcentral.com/articles/10.1186/s13021-024-00290-0

Gadde, H. (2022). National Level Strategies and Policy Frameworks for International Carbon Markets. New Delhi: PMR India. https://www.pmiclimate.org/sites/default/files/downloads/publication/Day%202_Session%203_b_National%20Level%20Strategies%20and%20Policy%20Frameworks%20for%20International%20Carbon%20Markets%20byHarikumar%20Gadde.pdf

German, L. Mandondo, A. Paumgarten, F. Mwitwa, J. (2014) Shifting rights, property and authority in the forest frontier: 'stakes' for local land users and citizens. The Journal of Peasant Studies 41(1): 51-78.

Ghauri, P. N and Grønhaug, K. (2005). Research Methods in Business Studies.3rd ed. London: Prentice Hall

GIZ. (2024). Carbon Finance and Trading in the Power Sector in Sub-Saharan Africa. GET.transform. https://www.get-transform.eu/wp-content/uploads/2024/07/GET.transform_ Carbon-Trading-Power-Sector-SSA_Jul2024.pdfs

Global Climate Action Partnership. (2015). Tools for forest carbon inventory, management, and reporting. https://globalclimateactionpartnership.org/resource/tools-for-forest-carbon-inventory-management-and-reporting/

Global Forest Coalition**.** (2022). Operationalise Article 6.8 for non-market approach to real solutions & real zero. https://globalforestcoalition.org/wp-content/uploads/2022/11 /Briefing-Article-6.pdf

Gogo, J. (2014, June 2). Zimbabwe: REDD credits over supply affects sales. Forest Trends. https://www.forest-trends.org/wp-content/uploads/imported/zimbabwe-REDD-credits-over-supply-affects-sales-pdf.pdf

Gondo, P. C. (2012). A review of forest financing in Africa. Southern Alliance for Indigenous Resources (SAFIRE), Zimbabwe. https://static.un.org/esa/forests/wp-content/uploads/2014/12/Forest_Financing_Africa_Gondo.pdf

Government of Zimbabwe. (2025). Carbon Trading (General) Regulations, 2025: Statutory Instrument 48 of 2025. Veritas Zimbabwe. https://www.veritaszim.net/sites/veritas_d/files/SI%202025-048%20Carbon%20Trading%20%28General%29%20Regulations%2C%202025.pdf

Government of Zimbabwe. (2025a). Statutory Instrument 48 of 2025: Carbon Credit Trading Regulations. Harare: Ministry of Environment, Climate and Wildlife.

Government of Zimbabwe. (2025b). Zimbabwe *Carbon Registry Operational Manual*. Zimbabwe Carbon Markets Authority.

Greenhouse Gas Protocol. (2024). *Market-Based Accounting Approaches Survey: Final Summary Report*. World Resources Institute. https://ghgprotocol.org/blog/now-available-market-based-accounting-approaches-survey-final-summary-report.

GSMA & Office of the Special Climate Envoy of Kenya. (2025, July 25). *Harnessing mobile money and digital solutions for Kenya's carbon markets ecosystem*. https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-for-development/blog/harnessing-mobile-money-and-digital-solutions-for-kenyas-carbon-markets-ecosystem/

Guest, G., Bunce, A and Johnson, L. 2006. How many interviews are enough? An experiment with data saturation and variability. *Field Methods*, 18(1):59-82.

Gupta, S. L. 2011.*Marketing Research*. New Delhi: Excel Books

Gupta, S., Das, S. B., & Gupta, S. (2024). Carbon pricing through emissions trading in Asia and the Pacific: Comparative analysis and way forward. Asian Development Bank. https://www.adb.org/sites/default/files/institutional-document/1007506/apcr2024bp-carbon-pricing-emissions-trading-asia-pacific.pdf

Hair, J.F., Black, W.C., Babin, B.J and Anderson, R.E. 2010. Multivariate data analysis: a global perspective. 7th ed. Upper Saddle River, N.J.: Pearson.

Hamrick, K. Goldstein, A. (2016) Raising ambition: state of the voluntary carbon markets 2016. Ecosystem Marketplace Forest Trends, Washington, DC, USA.

Harrison, S., Mhlanga, L., & Nyikahadzoi, K. (2022). Progressing community-based natural resource governance in Zimbabwe: Lessons from CAMPFIRE. PLAAS Policy Brief. https://www.resourceafrica.net/wp-content/uploads/2022/10/1-Progressing_community_based_natural_reso.pdf

Herald Online. (2025, April 18). Government holds Carbon Markets Indaba for Rural Local Authorities. https://www.heraldonline.co.zw/government-holds-carbon-markets-indaba-for-rural-local-authorities/

Herald Zimbabwe. (2025, August 14a). Rural authorities key in unlocking carbon credit opportunities. https://www.heraldonline.co.zw /rural-authorities-key-in-unlocking-carbon-credit-opportunities/

Herald. (2025, August 14b). Zimbabwe takes decisive step in climate change management. https://www.heraldonline.co.zw/zimbabwe -takes-decisive-step-in-climate-change-management/

Hess, C., & Ostrom, E. (2007). *Understanding knowledge as a commons: From theory to practice*. MIT Press.

Hoffmann, P., Möllersten, K., Sammut, F., Spalding-Fecher, R., & Dufour, M. (2025). Linkages between Article 6 of the Paris Agreement and voluntary carbon markets: Nordic perspectives and points of convergence. Nordic Environment Finance Corporation (NEFCO). https://www.nefco.int/wp-content/uploads/2025/06/linkages-between-article-6-of-the-paris-agreement-and-voluntary-carbon-markets-june-2025.pdf

Hoffmann, P., Spalding-Fecher, R., & Marcias Díaz, P. (2025). Article 6 governance frameworks in action: A collection of case studies from six host countries (Version 1.0). Global Green Growth Institute. https://www.spar6c.org/case-studies/article-6-governance-frame works-action-collection-case-studies-6-host-countries

Huber, B.R. (2013) How Did RGGI Do It? Political Economy and Emissions Auctions. Ecological Law Quarterly, 40, 59–106.

Huff, A. Tonui, C. (2017) Making 'Mangroves Together': Carbon, conservation and co-management in Gazi Bay, Kenya, STEPS Working Paper 95, Brighton: STEPS Centre.

Hufty, M. Haakenstad, A. (2011) Reduced Emissions for Deforestation and Degradation: A Critical Review. Consilience: The Journal of Sustainable Development, 5 (1), 1-24.

Hyolmo, S. L. (2025, February 13). *Forest communities craft recommendations for better ART-TREES carbon market standard*. Mongabay. https://news.mongabay.com/2025/02/forest-co mmunities-craft-recommendations-for-better-art-trees-carbon -market-standard/

Hyvönen, T., Laine, M., & Pellinen, J. (2024). Taking carbon into account in capital budgeting: A field study of municipal energy companies in Finland. *Social and Environmental Accountability Journal, 44*(3), 193–216. https://doi.org/10.1080/0969160X.2024.2337655

ICAP. (2022). China National ETS Factsheet. Berlin: International Carbon Action Partnership. https://icapcarbonaction.com/system/files/ets_pdfs/icap-etsmap-factsheet-55.pdf

ICC Brasil & WayCarbon. (2023). Opportunities for Brazil in Carbon Markets: Report 2023. São Paulo: International Chamber of Commerce Brazil. https://www.iccbrasil.org/wp-content/uploads/2023/12/231201_REPORT_ICCBR_2023_IN.pdf

Integrity Council for the Voluntary Carbon Market. (2024). Integrity Council approves three REDD+ methodologies. https://icvcm.org/integrity-council-approves-three-REDD-methodologies/

International Carbon Action Partnership (ICAP). (2022). EU Emissions Trading System (EU ETS). https://icapcarbonaction.com/en/ets/eu-emissions-trading-system-eu-ets

International Organisation of Securities Commissions (IOSCO). (2023). Compliance Carbon Markets: Final Report. Madrid: IOSCO. https://www.iosco.org/library/pubdocs/pdf/IOSCOPD740.pdf

Jambaya, P. (2023). Zim introduces national carbon credit framework. Zimbabwe Now. https://zimbabwenow.co.zw/articles/4598/zim-introduces-national-carbon-credit-framework

Jinga, T. (2024, July 26). Carbon credits: How they can transform Zim communities. The Zimbabwe Independent. https://www.newsday.co.zw/theindependent/opinion/article/200030097/carbon-credits-how-they-can-transform-zim-communities

Joint Research Centre. (2025). The European Forest carbon sink is declining: Can we reverse the trend? European Commission. https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/european-forest-carbon-sink-declining-can-we-reverse-trend-2025-07-30_en

Jonsson, R. Mbongo, W. Felton, A. (2012). Timber market implications of international efforts to reduce emissions from deforestation in developing countries. A literature review focusing on Europe and other developed regions potentially affected by conservation efforts such as REDD (Reduced Emissions from Deforestation and Forest Degradation). Institutionenförsydsvenskskog-svetenskap, SLU.

Joshi, V. K. (2023). Measuring carbon sequestration: Methods and implications. Doctor Woodland. https://doctorwoodland.com/articles/measuring-carbon-sequestration-methods-implications/

Kleinschmit, D., Wildburger, C., Grima, N., & Fisher, B. (Eds.). (2024). International Forest Governance: A Critical Review of Trends, Drawbacks, and New Approaches. IUFRO World Series Vol. 43. International Union of Forest Research Organisations. https://www.iufro.org/media/fileadmin/publications/world-series/ws43.pdf

Koch, M. (2014). Climate change, carbon trading and societal self-defence. *Real-World Economics Review*, (67), 52-66.

Kotzampasakis, M., & Woerdman, E. (2020). Linking the EU ETS with California's Cap-and-Trade Program: A Law and Economics Assessment. *Central European Review of Economics and Management*, 4(4). https://ojs.wsb.wroclaw.pl/index.php/WSBRJ/article/view/898

Kovács, A., Georges-Picot, B., Rodezno Ayestas, M. J., & Greiner, S. (2025). *The Paris Agreement Crediting Mechanism After COP29: Fundamentals in place, substance in progress*. Climate Focus & Perspectives Climate Research. https://climatefocus.com/wp-content/uploads/2025/05/The-Paris-Agreement-Crediting-Mechanism-After-COP29_FINAL.pdf

Kreibich, N., & Obergassel, W. (2022). *Caught in between: Credibility and feasibility of the voluntary carbon market*. *Climate Policy, 22*(6), 785–800. https://www.tandfonline.com/doi/pdf/10.1080/14693062.2021.1948384

Kukah, A. S. K., Jin, X., Osei-Kyei, R., & Perera, S. (2025). How carbon trading contributes to reduction in emission of greenhouse gases: a narrative literature review. *Journal of Facilities Management*, *23*(3), 463-479. https://www.researchgate.net/profile/Osei-Kyei-Robert/publication/ 380359395_How_carbon_trading_contributes_to_reduction_in_emission_of_greenhouse_gases_a_narrative_literature_review/links/6638413208aa54017ae01145/How-carbon-trading-contributes-to-reduction-in-emission-of-greenhouse-gases-a-narrative-literature-review.pdf

Kumar, K., Singh, R. (2025). From Carbon Trading to Climate Actions: Advancing Carbon Neutrality Through Market Mechanism. In: Singh, R., Crowther, D. (eds) Climate Neutrality and Sustainable Ecosystems. Approaches to Global Sustainability, Markets, and Governance. Springer, Singapore. https://doi.org/10.1007/978-981-96-7181-6_11

Kurth, T., Barnes, W., Murray, L., Coad, L., Wegener, J., Truitt, N., Riley, L., Cadigan, C., & Tran, C. (2025, May 6). How forests can revitalize carbon markets. Boston Consulting Group & American Forest Foundation. https://fedemaderas.org.co/wp-content/uploads/2025/05/how-forests-can-revitalize-carbon-markets.pdf

Lee D R, C B Barrett, P Hazell and D Southgate. (2001). Assessing trade-offs and synergies among agricultural intensification, economic development and environmental goals: Conclusions and implications for policy. In: Tradeoffs or Synergies? *Agricultural*

Leo, K. (2008) The threat of global warming. In O'Riordan, T (ed.) Environmental science for environmental management. England: Longman Group Ltd

Lewis, B. (2013). EU close to meeting 2020 emissions goal already – official data. Reuters.

Low, K.F. Lin, J. (2015) Carbon credits as EU like it: property, immunity, tragiCO2medy? *Journal of Environmental Law*, 27, 377-404.

Lyons, K. Westoby, P. (2014) Carbon colonialism and the new land grab: plantation forestry in Uganda and its livelihood impacts. *Journal of Rural Studies* ,36, 13-21.

Lyons, K. Westoby, P. Nel, A. (2017) Reforming global carbon markets or re-imagining alternative climate solutions and sustainability's analysis of selected NGO strategies in Uganda. *Journal of Political Ecology*, 24, 200-341.

MacDonald, M., & Parry, I. W. H. (2024). Policy options for climate mitigation: Emissions trading schemes in Asia-Pacific (IMF Working Paper No. 2024/155). International Monetary Fund. https://www.imf.org/en/Publications/WP/Issues/2024/07/18/Policy-Options-for-Climate-Mitigation-Emissions-Trading-Schemes-in-Asia-Pacific-552110

Mäkelä, A., Minunno, F., Kujala, H., Kosenius, A.-K., Heikkinen, R. K., Junttila, V., Peltoniemi, M., & Forsius, M. (2023). Effect of forest management choices on carbon sequestration and biodiversity at national scale. *Ambio, 52*(10), 1737–1756. https://doi.org/10.1007/s13280-023-01899-0

Makombe, E. K., & Chanza, N. (2024). The State, Climate Change and Energy Transition in Zimbabwe, 1992–2022. Global Environment, 17(3), 546–578. https://www.liverpooluniversitypress.co.uk/doi/pdf/10.3828/whpge.63837646622504

Malhotra, K.N. 2010. Marketing research: an applied orientation. 6th ed. Upper Saddle River, N.J: Pearson Education.

Manley B, Maclaren P (2012) Potential impact of carbon trading on forest management in New Zealand, Forest Policy and Economics, Volume 24

Manuell, R. (2025, May 5). *Zimbabwe updates carbon trading regulations, introduces new authority and registry*. Carbon Pulse. https://carbon-pulse.com/394085/

Marcato, M. B. (2023). Regional dynamics in global production sharing: Evidence from "Factory South America". *European Journal of Development Research*, 35, 1173–1196. https://link.springer.com/article/10.1057/s41287-022-00572-8

Martinello, G. (2015) Social struggles in Uganda's Acholiland: understanding responses and resistance to Amuru Sugar Works. The Journal of Peasant Studies 42, (3-4), 653-669.

Mashingaidze, N., Chirisa, I., Mutambisi, T., & Matamanda, A. R. (2021). Paradoxes surrounding carbon credits and local area development: The case of Mbire District, Zimbabwe. *Local Environment*, *26*(10), 1175–1185. https://doi.org/10.1080/13549839.2021.1967899

Mataruse, P. T., Nyikahadzoi, K., & Fallot, A. (2021). *Social-ecologically driven threats to the climate mitigation potential of forests: A case of Murehwa District*. https://www.researchgate.net/publication/354209237_Social-ecologically_Driven_Threats_to_the_Climate_Change_Mitigation_Potential_of_Forests_A_Case_of_Murehwa_District

Matonho, T. (2025, May 22). *Forests at crossroads: Zim's REDD+ dilemma and the fight for sustainable livelihoods*. NewsDay Zimbabwe. https://www.newsday.co.zw/opinion-analysis/article/200042114/forests-at-crossroads-zims-REDD-dilemma-and-the-fight-for-sustainable-livelihoods

Mbatu, R. (2016) REDD+ research: reviewing the literature, limitations and ways forward. Forest Policy and Economics 73, 140-152.

McAfee, K. (2012) The Contradictory Logic of Global Ecosystem Services Markets. Development and Change 43 (1), 105–31.

McDaniel, C and Gates, R. 2010b. Marketing research essentials. 7th ed. USA: John Wiley and Sons, Inc.

Mechnig-Giordano, F. (2025, May 21). *Zimbabwe launches world's first Article 6 carbon registry*. The Standard. Retrieved from https://www.newsday.co.zw/thestandard/opinion-amp-analysis/article/200042243/zimbabwe-launches-worlds-first-article-6-carbon-registry

Michaelowa, A., Ahonen, H.-M., Keßler, J., & Singh, A. (2023). *Interlinkages of registries and implications for functions and structures in the context of Article 6*. Perspectives Climate Research gGmbH. https://perspectives.cc/wp-content/uploads/2024/01/Interlinkages-of-registries-and-implications-for-functions-and-structures-in-the-context-of-Article-6.pdf

Michaelowa, A., Singh, A., & Keßler, J. (2023). Advancing the development of Article 6 methodologies: Preventing a stalemate that blocks Article 6.4 implementation. *Carbon Mechanisms Review*, 11(1), 27–37. https://www.zora.uzh.ch/id/eprint/257079/1/CMR_01_2023_bf.pdf

Mujuru, L., Gotora, T., Velthorst, E. J., Nyamangara, J., & Hoosbeek, M. R. (2014). Soil carbon and nitrogen sequestration over an age sequence of *Pinus patula* plantations in Zimbabwean Eastern Highlands. *Forest Ecology and Management, 313*, 254–265. https://oar.icrisat.org/7280/1/FEM_313_254-265_2014.pdf

Muvingi & Mugadza Legal Practitioners. (2025, May 13). *New Regulatory Framework for Carbon Trading in Zimbabwe: An Overview of the Carbon Trading (General) Regulations, Statutory Instrument 48 Of 2025*. https://www.mmmlawfirm.co.zw/new-regulatory-framework-for-carbon-trading-in-zimbabwe-an-overview-of-the-carbon-trading-general-regulations-statutory-instrument-48-of-2025/

Mwenya, M. (2012). *Carbon Trading in Africa*. Academia.edu. https://www.academia.edu/121030337/Carbon_Trading_in_Africa

NCX. (2021). *Methodology for improved forest management through targeted, short-term harvest deferral* (Version 1.0). Verified Carbon Standard Program. https://verra.org/methodologies/methodology-for-improved-forest-management-through-targeted-short-term-harvest-deferral/

Newell, R.G, Pizer, W.A. Raimi, D. (2013) Carbon Markets 15 Years after Kyoto: Lessons Learned, New Challenges. *Journal of Economic Perspectives*, 27, 123–146.

NewsDay Zimbabwe. (2023, November 7). *Carbon credits law in Zimbabwe*.https://www.newsday.co.zw/theindependent/opinion - analysis/article/200019169/carbon-credits-law-in-zimbabwe

Nunoo E K, 2008. EIA Performance Standards and Thresholds for SFM in Ghana. Pages 208 -219 in Standards and Thresholds for Impact Assessments. Schmidt M; J. Glasson, L. Emmelin,H. Helbron (eds) 2008. Springer-Velag, Berlin.

Nyagumbo, D. R. (2023, May 29). *Zimbabwe's Carbon Credit Framework and National Forestry Policy*. My Afrika Magazine. https://myafrikamag.com/zimbabwes-carbon-credit-framework-and-national-forestry-policy/

Nyakudanga, J. (2023, December 15). *Carbon Trading in Zimbabwe*. Zimbabwe Forestry Magazine. https://www.zimbabweforestrymagazine.com/article/carbon-trading-in-zimbabwe/

O'Gorman, M., & Jotzo, F. (2014). *Impact of the carbon price on Australia's electricity demand, supply and emissions* (CCEP Working Paper 1411). Centre for Climate Economics and Policy, Crawford School of Public Policy, Australian National University. https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2014/08/OGorman-and-Jotzo-Impact-of-the-carbon-price-on-Australias-electricity-demand-supply-and-emissions.pdf

OceanBlocks. (2025). *The Global Carbon Market: Current State, Challenges, and Future Outlook*. https://www.oceanblocks.org/the-global-carbon-market-current-state-challenges-and-future-outlook/

Ochieng, R. M., Arts, B., Brockhaus, M., & Visseren-Hamakers, I. J. (2018). Institutionalisation of REDD+ MRV in Indonesia, Peru, and Tanzania: Progress and implications. *Ecology and Society*, 23(2), 8. https://doi.org/10.5751/ES-09967-230208

Okeke, N. I., Bakare, O. A., & Achumie, G. O. (2024). Integrating policy incentives and risk management for effective green finance in emerging markets. *International Journal of Frontiers in Science and Technology Research*, 7(1), 76–88. https://frontiersrj.com/journals/ijfstr/sites/default/files/IJFSTR-2024-0050.pdf

Okereke, C. Dooley, K. (2010) Principles of justice in approaches to avoided deforestation: towards a post-Kyoto climate agreement. Global Environmental Change, 20, 82-95.

Oliveira, T. D., Gurgel, A. C., & Tonry, S. (2019). *The effects of a linked carbon emissions trading scheme for Latin America*. Climate Policy

Olson, K.R. Mahdi, M. Al-Kaisi, R.L. Lowery, B. (2013) Experimental Consideration, Treatments, and Methods in Determining Soil Organic Carbon Sequestration Rates.Soil Science Society of America Journal, 78 (2), 348-60.

Ontl, T. A., Janowiak, M. K., Swanston, C. W., Daley, J., Handler, S., Cornett, M., Hagenbuch, S., Handrick, C., McCarthy, L., & Patch, N. (2019). *Forest management for carbon sequestration and climate adaptation*. Journal of Forestry, 1–16. USDA Climate Hubs. https://www.climatehubs.usda.gov/sites/default/files/Ontl%20et%20al%202019.%20Forest%20management%20for%20carbon%20sequestration%20and%20climate%20adaptation.pdf

Pacagnella Junior, A. C., da Silva, A. L., Marcondes de Moraes, G. H. S., Putti, F. F., & Bortoletto, W. W. (2025). *Clean development mechanisms in Latin America: Efficiency analysis of energy-generating projects*. *Environmental Progress & Sustainable Energy*. https://doi.org/10.1002/ep.70023

Panavanhu, N. (2025, May 29). Understanding Zimbabwe's Carbon Trading Regulations, 2025. MCM Legal. https://mcmlegal.co.zw/articles/understanding-zimbabwes-carbon-trading-general-regulations-2025-legal-perspectives-and-market-implications/

Parenteau, P. Cao, M. (2016) Carbon Trading in China: Progress and Challenges. Environmental Law Institute, Washington, DC.

Partnership for Carbon Accounting Financials (PCAF). (2024). *Financed Emissions 2023*. Amsterdam: PCAF. https://www.carbonaccountingfinancials.com/files/institutions_downloads/1717146817_Financed-emission-2023.pdf

Perino, G., Willner, M., Quemin, S., & Pahle, M. (2022). *The EU ETS Market Stability Reserve: Does it stabilise or destabilise the market?* London School of Economics and Political Science. https://eprints.lse.ac.uk/115742/1/Perino_Willner_Quemin_Pahle_Final_Policy_Brief_final.pdf

Petraschuk, H. (2023). Why are carbon credit registries entering blockchain? *4IRE Labs Insights*. https://4irelabs.com/articles/why-are-carbon-credit-registries-entering-blockchain/

PetroChina Co., Ltd. (2024). *Environmental, Social and Governance (ESG) Report*. Beijing: PetroChina. https://www.petrochina.com.cn/ptr/xhtml/images/ shyhj/2024esgen.pdf

Pietracci, B., Bull, G., Zerriffi, H., & Kerr, S. (2023). Editorial: Forest carbon credits as a nature-based solution to climate change? *Frontiers in Forests and Global Change*. https://www.frontiersin.org/research-topics/29493/forest-carbon-credits-as-a-nature-based-solution-to-climate-change/magazine

Plumer, B. (2013). Europe's cap-and-trade program is in trouble. Can it be fixed? The Washington Post. Policy.Vol.35

Porter, A and Brown, H.J. (. (2009). Energy Consumption, Economic Growth and Prices; A

Positive Eye News. (2025, August 5). Carbon markets come out of the shadows as Zimbabwe pushes ESG reforms. https://positiveeye news.co.zw/2025/08/05/carbon-markets-come-out-of-the-shadows-as-zimbabwe-pushes-esg-reforms-at-leadership-summit/

Poudel, M., Bhandari, S., Dangi, R., & Paudel, S. K. (2021). *Participatory forest monitoring and REDD+ MRV in Nepal* [Conference presentation]. UN-REDD Programme. https://www.un-REDD.org/sites/default/files/2021-10/02_04_03_Mohan%20Poudel_Nepal_Participatory%20MRV.pdf

Price, J., Forstenhäusler, N., Graham, E., Osborn, T. J., & Warren, R. (2024,). *Report on the observed climate, projected climate, and projected biodiversity changes for Chirinda under differing levels of warming*. Wallace Initiative. https://wallaceparcs.uea.ac.uk/Zimbabwe/Chirinda.pdf

Qiao, Y., Liu, J., & Zhang, H. (2024). How does carbon trading impact China's forest carbon sequestration potential and carbon leakage? *Forests, 15*(3), 497. https://doi.org/10.3390/f15030497

Quak, E. (2025). *The social and economic impacts of carbon markets on local communities in low- and middle-income countries: A realist systematic literature review*. FSD Africa & UK Foreign, Commonwealth and Development Office. https://opendocs.ids.ac.uk/articles/report/The_ Social_and_Economic_Impacts_of_Carbon_Markets_on_Local_Communities_in_Low_and_Middle-Income_Countries_A_Realist_Systematic_Literature_Review/29635649

Queku, Y. N., & Seidu, B. A. (2025). *Emission Reduction and Carbon Trading in Africa: Fundamentals, Prospects and Challenges*. In *Sustainable Education and Development – Clean Energy* (pp. 123–140). Springer. https://link.springer.com/chapter/10.1007/978-3-031-65357-5_8

Reassessment using Panel VECM for Developed and Developing Countries, Energy

Rebugio L.L. (2000).Role of Forestry Education in Sustainable Forest Management. Proceedings of the Workshop on Sustainable Forest Management and People to People Exchange Between Asia and Europe, University of Joensuu, Finland, 5-6 July 1999.

Reed, P. (2011). REDD+ and the Indigenous Question: A Case Study from Ecuador. Forests, 2(2), 525–549. https://www.mdpi.com/1999-4907/2/2/525

Reuters. (2023, May 23). Zimbabwe to regulate carbon credit market to curb greenwashing. https://www.reuters.com/world/africa/zimbabwe-regulate-carbon-credit-market-curb-greenwashing-2023-05-23/

Rights and Resources Initiative & McGill University. (2025). *The Carbon Rights of Indigenous Peoples, Afro-descendant Peoples, and Local Communities in Tropical and Subtropical Lands and Forests*. https://rightsandresources.org/publication/2025-carbon-rights-report/

Ritter, T. (2017) Don't Believe the Carbon Market Hype: Why states should not pursue carbon markets and what they can do instead. The Institute for Agriculture and Trade Policy, USA.

Robinson A, Robinson E, Willie, S. (2007). Environmental Effects of Increased Atmospheric Carbon Dioxide. *Journal of American Physicians and Surgeons* 12(3), 14-27.

Russell-Smith, J., Holmes, J., Lewis, B., Brisbin, J., & Sangha, K. K. (2024). *Evolving nature-based solutions for Australia's Indigenous estate in 2024 – opportunities and challenges*. The Rangeland Journal, 46. https://www.publish.csiro.au/RJ/pdf/RJ24019.

Sahu, V. (2024). *Carbon market and trading in Kyoto Protocol*. *International Journal of Creative Research Thoughts*, 12(5), 1–10. https://ijcrt.org/papers/IJCRT2405903.pdf

Sanders-DeMott, R., Jee, Z., & Fallon, K. (2025). *Ground Truth: An Assessment of Forest Carbon Credit Protocols*. Clean Air Task Force. https://www.forestcarbonprotocols.org/wp-content/uploads/2025/ 05/Forest-Carbon-Credit-Protocols-Assessment-Report.pdf

Sartor, O. Palliere, C. Lecourt, S. (2014) Benchmark-based Allocations in EU ETS Phase 3: An Early Assessment. Climate Policy, 14, 507–524.

Sato, M. Laing, T. Cooper, S. Wang, L. (2015) Methods for Evaluating the Performance of Emissions Trading Schemes Discussion paper. Climate Strategies. www.climatestrategies.org.

Schroeder, H. McDermott, C. (2014) Beyond Carbon: enabling justice and equity in REDD+ across levels of governance. Ecology and Society 19 (1), 31.

Sena, K. (2015) Carbon credit schemes and indigenous peoples in Kenya: a commentary. Arizona Journal of International and Comparative Law, 32 (1).

Serafini, S., & Bormetti, G. (2024). *Pricing carbon allowance options on futures: Insights from high-frequency data*. arXiv. https://arxiv .org/pdf/2501.17490

Sheats, N. (2017) Achieving emissions reductions for environmental justice communities through climate change mitigation policy. William and Mary Environmental Law and Policy Review 41 (2), 377-402.

Shiu, E., Hair, J., Bush, R., andOrtinau, D. (. (2009). *Marketing Research* European Edition. McGraw-Hill higher Education, London UK.

Shukla, P. 2010. Status consumption in cross-national context: Socio-psychological, brand and situational antecedents. *International Marketing Review*, 27(1):108-129.

Silver, L., Stevens, R., Wrenn, B and Loudon, D. 2013.The essentials of marketing research. 3rd. USA, NY: Routledge, Taylor and Francis Group.

Slough, T., Kopas, J., & Urpelainen, J. (2021). Satellite-based deforestation alerts with training and incentives for patrolling facilitate community monitoring in the Peruvian Amazon. *Proceedings of the National Academy of Sciences, 118*(29), e2015171118. https://doi.org/10.1073/pnas.2015171118

South African National Accreditation System (SANAS). (2023, August). Improving the quality of certification, measurement, verification and validation of conformity assessment results [Presentation]. Department of Forestry, Fisheries and the Environment. https://www.dffe.gov.za/sites/default/files/docs/improvingthequalityofassessmentresults.pdf

South Pole. (2023). Voluntary Carbon Market Report 2022–2023. Zurich: South Pole Group. https://www.eticanews.it/wp-content/uploads/2023/04/South_Pole___VCM_Report_2022_2023.pdf

Statista. (2023). EU-ETS allowance prices in the European Union 2022–2024. https://www.statista.com/statistics/1322214/carbon-prices-european-union-emission-trading-scheme/

Stavins, R.N. (2022). The relative merits of carbon pricing instruments: Taxes versus trading. *Review of Environmental Economics and Policy*, 16(1), 1–23. https://scholar.harvard.edu/files/stavins/files/relative_merits_final_published_article.pdf

Streck, C. (2021). *What does the Article 6 rulebook mean for REDD+?* Ecosystem Marketplace. https://www.ecosystemmarketplace.com/articles/what-does-the-article-6-rulebook-mean-for-REDD/

Suiseeya, K. Caplow, S. (2013) In pursuit of procedural justice: lessons from an analysis of 56 carbon project designs. Global Environmental Change 23, 968-979.

Sullivan, K., Diemert, A., Cordova, C., Hoekstra, J., Haug, C., La Hoz Theuer, S., Eden, A., De Clara, S., Ortiz Rivera, V., Schroeder, F., & Peon, D. (2021). *Status and trends of compliance and voluntary carbon markets in Latin America*. Inter-American Development Bank, ICAP & IETA. https://icapcarbonaction.com/system/files/document/201025_idb_compliancevoluntary_paper-rz.pdf

Sun, J. B. (2024). *Legal regulations and economic impacts in carbon emission trading systems*. *Open Journal of Social Sciences*, 12(10), 215–226. https://www.scirp.org/pdf/jss20241210_171769232.pdf

Tanveer, U., Ishaq, S., & Hoang, T. G. (2024). Enhancing carbon trading mechanisms through innovative collaboration: Case studies from developing nations. *Journal of Cleaner Production*, *482*, 144122. https://www.sciencedirect.com/science/article/pii/S0959652624035716

TechnoServe. (2022). *Carbon finance for smallholder farmers and agribusinesses: Analytical briefing on agroforestry solutions*. TechnoServe. https://www.technoserve.org/wp-content/uploads/2022/12/Carbon-finance-for-smallholder-farmers-and-agribusinesses.pdf

Tembani, M., Mujuru, L., Mureva, A., Mutete, P., Gotore, T., Muchawona, A., Makumbe, P., & Murepa, R. (2021). Institutional arrangements and collective action: Evidence from forest management in Zimbabwe. *Forests, Trees and Livelihoods*. https://doi.org/10.1080/14728028.2021.1985625

Tembani, M., Mujuru, L., Mureva, A., Mutete, P., Gotore, T., Muchawona, A., Makumbe, P., & Murepa, R. (2021). Institutional arrangements and collective action: Evidence from forest management in Zimbabwe. *Forests, Trees and Livelihoods*, *30*(4), 258–274. https://doi.org/10.1080/14728028.2021.1985625

Thomas, L (2013) Do Carbon Offsets Work? The Role Of Forest Management In Greenhouse Gas Mitigation, United States Department of Agriculture, issue 155

Thompson, J. R., Laflower, D. M., Plisinski, J. S., MacLean, M. G., & Chu, H.-H. (2025). *Forest carbon study: The impact of alternative land-use scenarios on terrestrial carbon storage and sequestration in Massachusetts*. Harvard Forest & University of Massachusetts Amherst. https://harvardforest.fas.harvard.edu/publications/pdfs/EEA_ForestCarbonStudyReport_2025.pdf

Tomaselli, I. (2022, November 9). *Carbon Projects in Latin America: Is Managing Tropical Forests for Timber and Carbon a Fate or a Fake?* Presentation at the ITTO Annual Market Discussion, Yokohama, Japan. International Tropical Timber Organisation. https://www.stcp.com.br/wp-content/uploads/2022/11/IT_ ITTO_Carbon_LATAM_2022.pdf

UNCTAD. (2024). *Carbon markets and sustainable development: Bridging economic, environmental and technological divides*. United Nations Conference on Trade and Development. https://unctad.org/system/files/official-document/ldc2024_ch1_en.pdf

UNDP Zimbabwe. (2024). Climate governance and institutional readiness in Zimbabwe. United Nations Development Programme.

UNDP. (2024). Creating a Government-to-Government Carbon Financing Facility. New York: United Nations Development Programme. https://www.undp.org/sites/g/files/zskgke326/files/2024-03/undp_carbon_finance_full_final.pdf

UNFCCC. (2016). Ghana Cocoa Forest REDD+ Programme Implementation Plan. https://REDD.unfccc.int/media/gcfrp_final_implementation_plan.pdf

UNFCCC. (2021). Guidance on cooperative approaches referred to in Article 6, paragraph 2, of the Paris Agreement. United Nations Framework Convention on Climate Change. https://unfccc.int/documents/310510

UNFCCC. (2022). A guide to UN market-based mechanisms. United Nations Framework Convention on Climate Change. https://unfccc.int/news/a-guide-to-un-market-based-mechanisms

UNFCCC. (2023). Article 6 of the Paris Agreement: Guidance and implementation. United Nations Framework Convention on Climate Change.

UNFCCC. (2024). Regional Dialogues on Carbon Pricing: Latin America Report. https://unfccc.int/sites/default/files/resource/REDiCAP_Latin_America_report_2024.pdf

United Nations Development Programme. (2022). Forest carbon accounting: Overview and principles. UNDP. https://www.undp.org/sites/g/files/zskgke326/files/publications/Forest_Carbon_Accounting_Overview_Principles.pdf

United Nations Development Programme. (2024). Carbon Markets: Advocacy Brief – A Case for Partnerships with UNDP in Africa. UNDP. https://www.undp.org/sites/g/files/zskgke326/ files/2024-06/undp_africa-_carbon_markets_advocacy_brief.pdf

United Nations Framework Convention on Climate Change (UNFCCC). (2025). Article 6 of the Paris Agreement. Retrieved from https://unfccc.int/process-and-meetings/the-paris-agreement/article6

United Nations Framework Convention on Climate Change(UNFCCC). (n.d.). Mechanisms under the Kyoto Protocol. Retrieved August 13, 2025, from https://unfccc.int/process/the-kyoto-protocol/mechanisms

Vacchiano, G. Berretti, R. Romano, R. Motta, R. (2018) Voluntary carbon credits from improved forest management: policy guidelines and case study. iForest, 11, 1-10.

Vargas, D. B., Delazeri, L. M. M., & Ferreira, V. H. P. (2021). *Voluntary Carbon Market in Brazil: In Reality and in Practice*. São Paulo: FGV Agro – Bioeconomy Observatory. HTTPS://EESP.FGV.BR/CENTROS/OBSERVATORIOS/BIOECONOMIA

Veritas. (2025). *Carbon Trading (General) Regulations, 2025 – S.I. 48 of 2025*. https://www.veritaszim.net/sites/veritas_d/files/SI%202025-048%20Carbon%20Trading%20%28General%29%20Regulations%2C%202025.pdf

Walsh, B. (2013). If carbon markets can't work in Europe, can they work anywhere? Time Magazine.

Wang, B., Lin, Y., Liu, P., & Yin, R. (2025). Alternative approaches to forest sector carbon accounting and assessment: A literature review and synthesis. *Forestry: An International Journal of Forest Research*. Advance online publication. https://doi.org/10.1093/forestry/cpaf023

Wang, L. (2020). *Linking carbon pricing jurisdictions* (Doctoral dissertation). University of Edinburgh. https://era.ed.ac.uk/bitstream/handle/1842/37760/Wang2021.pdf?sequence=1

Watson, C. Mourato, S. Milner-Gulland, E.J. (2013) Uncertain emission reductions from forest conservation: REDD in the Bale Mountains, Ethiopia. Ecology and Society, 18 (3), 6.

WCED. (1987). Our common future. Oxford: Oxford University Press. .

Welman, C., Kruger, F and Mitchell, B. 2011.*Research Methodology*. 3rd ed. CapeTown: Oxford University Press. *Intensification, EconomicDevelopment and the Environment*.D R Lee and C B Barrett (eds).Commonwealth Agricultural Bureau International. Wallingford, U.K.

Wetterberg, K., Ellis, J., & Schneider, L. (2024). The interplay between voluntary and compliance carbon markets: Implications for environmental integrity (OECD Environment Working Paper No. 244). Organisation for Economic Co-operation and Development. https://one.oecd.org/document/ENV/WKP%282024%2914/en/pdf

Wettestad, J., & Gulbrandsen, L. H. (Eds.). (2017). *The evolution of carbon markets: Design and diffusion*. Routledge. https://doi.org/10.4324/9781315228266

White, B. BorrasJr, S.M. Hall, R. Scoones, I. Wolford, W. (2012) The new enclosures: critical perspectives on corporate land deals. Journal of Peasant Studies 39(3-4): 619-647.

Wieckowski, A., Vestin, P., Ardö, J., Roupsard, O., Ndiaye, O., Diatta, O., Ba, S., Agbohessou, Y., Fensholt, R., Verbruggen, W., Gebremedhn, H. H., & Tagesson, T. (2024). Eddy covariance measurements reveal a decreased carbon sequestration strength 2010–2022 in an African semiarid savanna. *Global Change Biology, 30*(9), e17509. https://doi.org/10.1111/gcb.17509

Wills, W. (2025) Brazil's roadmap for a high-integrity emissions-trading system: implementation assessment. Climate Transparency. Rio de Janeiro, Centro Brasil no Clima (CBC). https://www.climate-transparency.org/wp-content/uploads/2025/05/ Implementation - Check-Brazil_Carbon_Market_2025.pdf

Woodall, C. W., Munro, H. L., Bullock, B. P., Fox, T. R., Hoover, C. M., Kinane, S. M., Murray, L. T., Atkins, J. W., Prisley, S. P., Shaw, J. D., Smith-Mateja, E., Weiskittel, A. R., Anderegg, W. R. L., Nabuurs, G.-J., Novick, K. A., Poulter, B., Starcevic, A., & Giebink, C. L. (2025). Correction to: Prioritising opportunities to empower forest carbon decisions through strategic investment in forest modeling capacity. *Journal of Forestry, 123*(2), 263–264. https://doi.org/10.1007/s44392-025-00027-y

Woodcock, J. et al. (2009), Public health benefits of strategies to reduce greenhouse-gas emissions: urban land transport, The Lancet volume 374, issue 9705,

World Bank. (2023). State and Trends of Carbon Pricing 2023. Washington, D.C.: World Bank Group. https://documents1.worldbank.org/curated/en/099807306052312253/pdf/IDU0bd431ce208d76047b80a4df01ddfa134063a.

World Bank. (2024). Zimbabwe country climate and development report. https://www.worldbank.org/en/country/zimbabwe/publication/climate-and-development-report-2024

World Bank. (2024, March 4). New reports identify pathways to build a climate-smart economy in Zimbabwe. https://www.worldbank.org/en/news/press-release/2024/03/01/new-reports-identify-pathways-to-build-a-climate-smart-economy-in-afe-zimbabwe

World Bank. (n.d.). Carbon Pricing Dashboard. Retrieved August 14, 2025, from https://carbonpricingdashboard.worldbank.org/

World Bank. (2025). Carbon Crediting: A Results-based Approach to Mobilizing Additional Climate Financing. World Bank. http://hdl.handle.net/10986/43049

Wu, H., & Xu, H. (2023). *A review of sampling and modeling techniques for forest biomass inventory*. *Agricultural & Rural Studies*, 1(1), 0002. https://doi.org/10.59978/ar01010002

Xie, H., Chang, M., Wang, G. G., Tang, Y., & Jin, S. (2025). Integrating climate-smart practices in forestry: Insights from Europe and America. *Frontiers in Plant Science, 16*, Article 1583294. https://doi.org/10.3389/fpls.2025.1583294

Ximenes, F. George, B. Cowie, A. Kelly, G. Williams, J. Levitt, G. Boer, K. (2012) Harvested forests provide the greatest ongoing greenhouse gas benefits. Does current Australian policy support optimal greenhouse gas mitigation outcomes? State of New South Wales through Department of Primary Industries, INT12/33234.

Xu, K., Zou, G., & Hu, H. (2025). Forest carbon sequestration functions and mitigation strategies for global climate change. In G. Shukla (Ed.), *Forest Science – Advances Towards Sustainable Development and Climate Resilience* (pp. 1–25). IntechOpen. https://doi.org/10.5772/intechopen.1009089

Yang, H., Song, M., Son, H., Kim, R., & Choi, E. (2025). Evaluating REDD+ readiness: High-potential countries based on MRV capacity. *Forests, 16*(1), 67. https://doi.org/10.3390/f16010067

Zamchiya, P., Dhliwayo, O., Gwenzi, C., & Madhuku, C. (2021). The 'silent' dispossession of customary land rights holders for urban development in Zimbabwe. Institute for Poverty, Land and Agrarian Studies (PLAAS). https://www.plaas.org.za/wp-content/uploads/2021/06/Blog-Zimbabwe-2021-June-18-Edited-FINAL.pdf

ZBC News. (2025, March 22). Zim carbon registry puts communities at the core of climate action. https://www.zbcnews.co.zw/zim-carbon-registry-puts-communities-at-the-core-of-climate-action/

ZBC News. (2025, May 9). Zimbabwe launches blockchain-based carbon registry. https://www.zbcnews.co.zw/zimbabwe-launches-block chain-based-carbon-registry/

Zenda, C. (2023, June 17). Who will benefit from Zimbabwe's carbon trading regulation? Fair Planet. https://www.fairplanet.org/story/who-will-benefit-from-zimbabwes-carbon-trading-regulation/

Zetterberg, L. (2012). *Linking the Emissions Trading Systems in EU and California*. IVL Swedish Environmental Research Institute. https://www.researchgate.net/profile/Lars-Zetterberg/publication/265579835_Linking_the_Emissions_Trading_Systems_in_EU_and_California/links/54b504910cf26833efd05523/Linking-the-Emissions-Trading-Systems-in-EU-and-California.pdf

Zhakata, W. (2024). *Africa Participation in the Global Carbon Market: History, Challenges and Opportunities*. UN Economic Commission for Africa. https://www.uneca.org/eca-events/sites/default/files/resources/documents/ACPC/ARTICLE6/Presentations/africa_participation_in_the_global_carbon_

Zhang, M. Liu, Y. Su, Y. (2017) Comparison of Carbon Emission Trading Schemes in the European Union and China. Climate, 5 (70).

Zhang, Q., Song, J., & Mayuka, R. N. (2025). Climate change and forestry carbon sink: A literature review and visualization perspective. *Frontiers in Forests and Global Change, 8*, 1487503. https://doi.org/10.3389/ffgc.2025.1487503

Zhang, X., Zhao, Y., Ashton, M. S., & Lee, X. (2012). Measuring carbon in forests. In M. S. Ashton, M. Tyrrell, D. Spalding, & B. Gentry (Eds.), *Managing Forest carbon in a changing climate* (pp. 139–164). Springer. https://doi.org/10.1007/978-94-007-2232-3_7

Zhang, Y., Chen, W., & Chun, W. (2024). *Research status and trend prospects of the carbon cap-and-trade mechanism*. Environment, Development and Sustainability, 27, 5097–5130. https://link.springer.com/article/10.1007/s10668-024-04607-4

Zhang, Y., Fei, X., Liu, F., Chen, J., You, X., Huang, S., Wang, M., & Dong, J. (2022). Advances in forest management research in the context of carbon neutrality: A bibliometric analysis. *Forests, 13*(11), 1810. https://doi.org/10.3390/f13111810

Zhang, Z. (2022). *China's Carbon Market: Development, Evaluation, Coordination of Local and National Carbon Markets and Common Prosperity* (Working Paper No. 030.2022). Fondazione Eni Enrico Mattei (FEEM). https://hdl.handle.net/10419/267495

ZiCMA. (2024). *Zimbabwe Carbon Markets Authority official portal*. https://zicma.org.zw

Zikmund, G.W and Babin, J.B. 2013. Essentials of marketing research. 5th ed. South-Western, Cengage Learning.

Zimbabwenow. (2024, May 6). *Zimbabwe intensifies Article 6 readiness for the carbon market*. https://zimbabwenow.co.zw/articles/10588/zimbabwe-intensifies-article-6-readiness-for-the-carbon-market

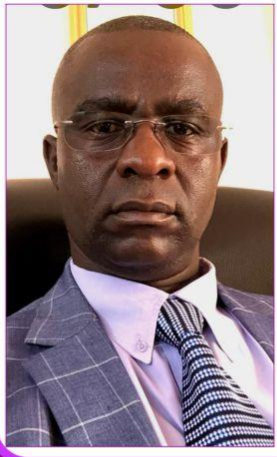
ZimLII. (2025). *Carbon Trading (General) Regulations, 2025*. https://zimlii.org/akn/zw/act/si/2025/48/eng@2025-05-02

Zwick, S. (2019). *The Surui Forest Carbon Project: A Case Study*. Forest Trends. https://www.forest-trends.org/wp-content/uplo4'/ads/2019/03/doc_5751-1.pdf

Synopsis

This book critically examined the intricate relationship between forest management and the carbon trading business in Zimbabwe, focusing on how sustainable forestry practices influence the viability and scalability of carbon markets within the national context. By the time of undertaking this research, Zimbabwe had only one known company to be trading carbon credits through a forestry management project named the Kariba REDD+ project. The project started in 2011 and spans across four districts namely Mbire, Nyaminyami, Hurungwe and Binga thus stretching over an area of 750,000 hectors and impacting over 2,000 rural households. To adequately address the subject of this book from the Zimbabwean context, the research had to focus on the sole Kariba REDD+ project in Zimbabwe and make comparisons with projects elsewhere outside Zimbabwe. Carbon Green Africa (Pvt) Ltd is the project developer and a Zimbabwean company created to set up, and enable verification and validation of REDD+ projects so as to generate Carbon Credits for purposes of offsetting carbon footprints thereby mitigation climate change. Rooted in an empirical framework that utilised a mixed methods approach, the research drew insights from a number of respondents comprising the project developer employees, community members from Binga and Hurungwe districts and Ministry of Environment, Climate and Wildlife (MECW) officials. The selection of participants was random, enhancing the objectivity and representativeness of the findings. The central argument advanced through this study is that sustainable forest management constitutes the linchpin of Zimbabwe's carbon trading business, yet its potential is severely constrained by legislative gaps, weak institutional support, and a lack of enforced corporate accountability.

About the Author



Charles Ndondo is a Zimbabwean entrepreneur with over 30 years of service in both public and private sector business enterprises. His business experience spans across tourism & hospitality industry, freight industry, renewable energy and above all is a strong advocate for Environmental sustainability focusing on climate change mitigation and adaptation strategies. This has led to the establishment of climate resilient projects with the aim of economically empowering some of the most disadvantaged rural communities in Zimbabwe. Charles is a holder of a master's degree in Business Administration and currently studying for a PhD in Business Administration Management. He holds several other qualifications in Environmental & Wildlife Management, Community development, Tourism, Freight Forwarding, law and Corporate Governance.