# 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, held at 3.5 million credits five years after operations began (CGA, 2016). An oversupply of carbon credits has caused prices to plummet to as low as US 10 cents per million tons of CO2 equivalent (MtCO2e), down from a peak of $7 MtCO2e in

2013. Projections indicated 270 million unsold credits by 2018. Additionally, investor preference has shifted away from forest-derived credits toward wind-based offsets, with forest credits sales at 11 MtCO2e compared to wind at 12.7 MtCO2e in 2015 (Ecosystem Marketplace, 2016).

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, Zimbabwe holds substantial carbon credit stocks for sale internationally. By 2017, CGA held 7.5 million credits and had sold 2.5 million at low prices. Globally, unsold carbon credits were projected at 270 million. Declining investor interest in forest-based credits versus wind-based ones threatens CGA's viability. 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*

$H_0$: Forest management has no significant impact on carbon trading in Zimbabwe.

$H_1$: 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. The primary beneficiary of the study comprises Carbon Green Africa and the rest of the carbon trading businesses who can gain insights into the impact of

forest management on carbon business trading. The direction of the study helps inform how best CGA can be able to convert the carbon credits it has in stock to financial value to enable the viability of the business while at the same time serving the communities as is intended by the incentives of the green initiatives.

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 carbon trading business. Geographically, it was confined to Binga District in areas

under Chief Siabuwa and Sinamusanga 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 and resources were a challenge as I was under resourced to carry out the research adequately. However, to optimise on the limited finances that were available, the researcher used emails and social media (WhatsApp, Facebook, WeChat, etc.) to send questionnaires.

I was full time employed and hence did not have adequate time to carry out the research. However, to manage this challenge the researcher dedicated 2 hours every day for doing this project to meet the set standards. As the researcher I am also the Chief Executive Officer of CGA and thus some respondents (CGA Staff) may have provided answers they regarded as "smart instead of genuine responses. However, participants were encouraged to fill in questionnaires anonymously and drop them at certain point at our work place without identifying themselves. The researcher 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.