Chapter 4

Analyzing the Contribution of Cameroon's Council Forests to Climate Change Mitigation and Socioeconomic Development

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Additional information is available at the end of the chapter

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Abstract

Council forests were officially enacted in Cameroon in 1994 as part of the forestry law reform. The law provided rural councils with the legal right to create their own forests estate within the Permanent Forest Estate (PFE) of the State, following the preparation of a management plan approved by the forest administration. In this chapter, we analyze the socioeconomic and climate change mitigation potentials of these forests and propose possible options for improving their socioeconomic importance as well as their ability to mitigate climate change. Results indicate that Cameroon's council forests provide socioeconomic opportunities to communities in which they are located including employment and revenue from the sale of timber and nontimber forest products emanating from these forests. Additionally, given their diversity in terms of the various forest types (e.g., humid dense evergreen forests, humid dense semideciduous forests, and gallery forests), these forests have enormous carbon stocks which can provide huge opportunities for international climate initiatives such as the REDD+ mechanism to be initiated within them as a potential for mitigating global climate change. The chapter identifies and discusses possible options for improving the socioeconomic and climate change mitigation potential of these forests. Progress on the options the chapter opines, will help in improving the contributions of these forests to socioeconomic development and climate change mitigation.

Keywords: council forests, forestry law reform, socio-economic importance, climate change mitigation potentials, options and scenarios

1. Introduction

Cameroon's Technical Centre for Communal Forestry (CTFC, 2010) defines a council forest as a forest that constitutes part of Cameroon's permanent forest, which is governed by an agreement between the municipality and the Ministry of Forests and Fauna (MINFOF). Cheteu [1] notes that Cameroon's council forests are usually endowed with a management plan executed by the council or municipality under the supervision of MINFOF.

The rate of deforestation in Cameroon forests including council forest remains one of the highest in the Congo Basin. According to the Food and Agricultural Organization (FAO), between 2000 and 2010, the annual rate of deforestation of Cameroon's tropical rainforest of the Congo Basin was approximately 1.04%. Furthermore, it is reported that about 75% of the forest in Cameroon (including council forest) has been degraded as a result of forest exploitation. As a result, development and conservation experts as well as indigenous rights advocates have embraced the management of council forest to address deforestation and forest degradation as well as improve the livelihoods of communities that depend on these forests. Management of these forests allows local populations to benefit from forests and its resources, as opposed to outside entrepreneurs or economic and political elites. By acquiring rights over natural resources, and related increase in organizational strength, the residents of the municipality as well as the local population can also improve participation in democratic processes. Communal control over these forests therefore decreases the opportunities of nonlocals to engage in destructive forest use, resulting in a positive conservation impact [2]. For instance, within the Guinean forest block, Liberia's council forests are significant for their rich biodiversity as they contain approximately 225 timber species, 2900 flowering plant species, 140 mammal species, 600 bird species, 75 reptile and amphibian species, and over 1000 species of insect [3]. While in Guatemala, the highland council forest landscapes are strategically important because of their location in the higher watershed areas that contribute to the maintenance of water sources; an aspect that is acquiring greater interest and relevance in light of declining water supplies in the area [4].

A majority of studies carried out to date on council forests in Cameroon have sought to describe the state of these forests and the participation of forest-dependent communities in their management [5–9]. At the same time, however, fundamental questions, such as: what are the opportunities associated with council forests in Cameroon especially in terms of their potentials for climate change mitigation and socioeconomic development of rural communities; what threats to these forests faced, and what are the possible options or scenarios that could be used to promote their sustainability, have been seriously overlooked. The purpose of this chapter, therefore, is to examine this much-neglected area of the debate using findings obtained from field work in Cameroon and a comprehensive review of relevant literature. Hopefully, policy makers at the national and subnational level in Cameroon will be able to incorporate the findings of this investigation into their strategic plans designed to advance sustainable management of these forests.

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2. Historical evolution of council forests in Cameroon

Following independence in 1960 from France and 1961 from Britain, in order to protect and manage Cameroon's natural resources, a series of laws and decrees were enacted. Prominent among them were the 11th July 1968 Law which brought the notion of forest conservation and its resources, Order No. 73118 of 22nd May 1973 creating protected areas and recognizing the use rights of the local population, and Law No. 83/13 of 27th November 1983 fixing the forest, fauna, and fishery system. These regulations instituted a policy which insisted on the necessity of using forest resources in a rational manner, with the aim of maximizing productivity so as to offer the necessary revenue needed to perpetuate the wellbeing of the local population [10].

While all these regulations brought hope to nationals, they were not sufficient to guarantee the populations' participation in the management of forest resources; especially the conservation of the existing forests. The wind of sustainable development dictated by the international community around the 1990s doubled the determination of the Cameroonian government to effectively fight against poverty while maintaining its forest resources, led to the creation of the Ministry of Environment and Forestry (MINEF) in 1992.

In 1994, a new forestry law was voted by the national assembly promulgated by the President of the Republic of Cameroon. Central to this law, was the sustainable management of forest resources with a strong implication of the local population. The latter, which constituted one of the most important innovations of this law, was marked by the creation and regulation of decentralized forest management models including *inter alia* council forests [5].

With the adoption of the decentralization laws of 2004 and the ongoing process to strengthen the role of the council in the development of their area and the management of natural resources, the option of council forest continuously evolved while attracting more attention from the councils [8]. Since 2004, council forest landscapes in Cameroon have increased rapidly from 13 council forests in 2004 (collectively covering 325,500 ha); 18 council forests in 2006 (collectively covering 413,622 ha); 31 council forests in 2009 (collectively covering 734,751 ha); to a total of 34 areas designated as council forests (collectively covering 827,285 ha) as of June 2011.

Cameroon's council forests provide environmental services such as raw materials (mostly timber) that provide significant revenue for economic development in Cameroon. Additionally, this forest is rich in nontimber forest products (NTFPs) that are harvested by forest-dependent communities for commercialization and for subsistence purposes. It is also important to note that Cameroon's council forest also contains an enormous amount of carbon. The ecosystem of these forests can also provide other fundamental environmental services including watershed management, soil quality improvement, biofuels from forest residues, and biodiversity.

The establishment of council forest has also altered the land use changes in the regions where they have been set up as many municipalities have contracted their forest to large-scale logging companies for forest exploitations. These companies are engaged in large scale and intensive logging operations and can devastate a council forest in a little time interval.

3. Methods

3.1. Carbon stocks assessment

We conducted field work to estimate carbon stocks within 10 council forests in Cameroon. The decision to choose these case study council forests was borne out of the consideration that they were the only council forests that were operational in the country and/or had a management plan. Above ground carbon in these forests was estimated as follows.

3.1.1. Sampling

In each forest, a rectangular sample plot was selected randomly in the forest zone where there was no human activity (area of the forest were there was no degradation). The area of the main rectangular plot was $20 \times 100 = 2000$ m^2. Within this main rectangular plot, the diameter of trees (DBH) greater than 30 cm were measured and recorded. Additionally, within this main plot, trees with DBH between 5 and 30 cm were also measured and recorded. Understory (like epiphytes, ferns, and herbs) and litter with a DBH of less than 5 cm were also harvested within the main plot and were weight to determine their fresh weight. Next, they were dried at 65°C in order to determine their dry weight.

3.1.2. Biomass and carbon stock calculations

Aboveground biomass (AGB) was estimated for each council forest using the allometric equation developed by Chave et al. [11] for moist tropical forest:

$$AGB = \rho \times \exp[-1.499 + 2.148 \ln 2.148 \ln(\mathrm{DBH}) + 0.207 \ln \ln(\mathrm{DBH})^2 - 0.0281 \ln \ln(\mathrm{DBH})^3],$$

where ρ is wood specific density, DBH (cm) is the diameter at breast height, and AGB (kg) is dry mass. The estimation of the aboveground C stock was based on the assumption that all the AGB biomass pools contain 47.5% of C [12, 13]. The total C stored in each council forest was calculated using the C stock per unit area and the total area of the council forest.

3.2. Structured interviews

Structured interviews were held with officials of the ten council forest to determine (i) the socioeconomic potentials of these forests particularly in terms of their contribution to employment at the local level and income generated from these forests through the sale of timber and nontimber forest products (NTFPs), and (ii) the threats, difficulties or constraints that these forests are currently facing particularly in terms of bush fire, illegal logging, illegal hunting, management conflicts, nonrespect of contracts by loggers, high costs of exploitation, abusive exploitation of nontimber forest products, and absence of public participation in forest management decision-making process.

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4. Results

For illustrative purposes, results of this study are presented in five sections including: (1) provision of income to the municipality and local communities; (2) provision of employment opportunities; (3) valorization of forest resources; (4) provision of environmental services; and (5) threats faced by council forests

4.1. Provision of income to the municipality and local communities

Like other forests domain in Cameroon, council forests provide raw materials (mostly timber) that generate substantial income for economic development of the municipality in which they are located (**Figure 1**). Additionally, they are rich in nontimber forest products (NTFPs) which could be harvested by the municipality and other local communities for commercialization and subsistence purposes. For example, in a personal communication with an official of the Dimako council forest, it was reported that in June 2012, 2,484,000 FCFA[1] was obtained from the sale of Djansang (*Ricinodendron heudelotti*) emanating from this forest.

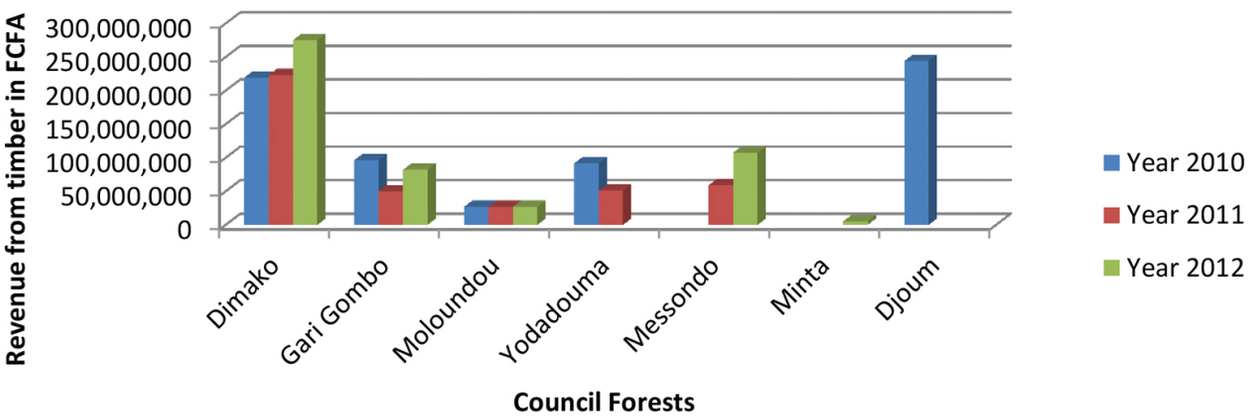

Figure 1. Revenue (in FCFA) generated from timber emanating from the case study council forests.

4.2. Provision of employment opportunities

Council forests provide local employment opportunities. As Cuny [9] notes, about 85% of council forests employees are local indigenes. The contribution of the case study council forests to local employment and in terms of average monthly income is depicted in **Figures 2** and **3**, respectively. Apart from the Dimako council forest where almost all the logging operations are carried out by people directly employed by the council, most of the other councils have contracted their forest to large-scale logging companies for the purpose of timber extraction.

[1] 2,484,000 FCFA is almost equal to 5000 USD.

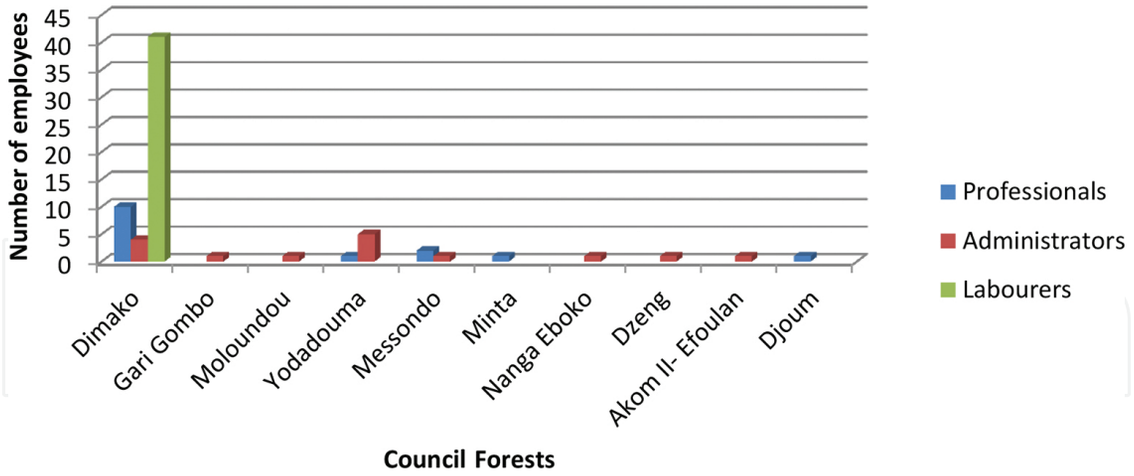

Figure 2. Number of people working with the case study council forests.

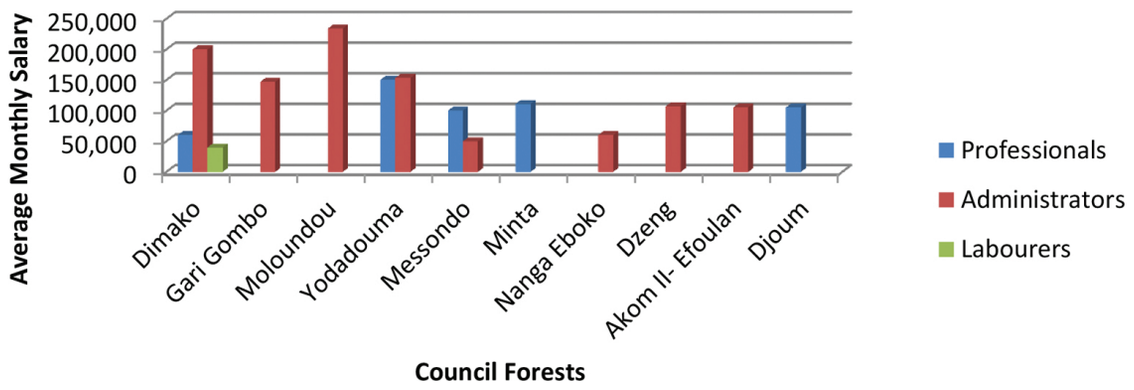

Figure 3. Average monthly wages for people working with the case study council forests.

4.3. Valorization of forest resources

According to the forestry and decentralization laws of Cameroon, council forestry is an opportunity for the valorization of forest resources emanating from council forests. The sustainability of valued-added wood products has been well documented. For instance, as Kozak [14] puts it:

"Catalyzing the value-added wood products sector has been embraced by most stake-holders – government, industry, organized labor, communities, Aboriginal peoples, environmental groups – as a sensible and rational vehicle to transform the forest sector…. Deriving more value and creating more jobs per volume of wood cut is seen as a conservation-based strategy for attaining the tenuous balance between economic well-being, environmental sustainability, and community health and vitality."

Market opportunities for value-added wood products currently exist both within Cameroon and all over the world [15]. Indeed, in the United States alone, higher value wood products represent a US$200 billion market [14]. Apart from value-added wood products, valorization

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of NTFPs from council forests in Cameroon can provide a great opportunity for improving the livelihoods and income of forest dependent communities as well as municipalities were the forest is located. As Tieguhong et al. [16] explain, valorization of nontimber forest products (NTFPs) in African communities can increase the revenue of these communities, thus contributing to poverty alleviation.

4.4. Provision of environmental services

Given the diversity of Cameroon's forest in terms of the various forest types (e.g., humid dense evergreen forests, humid dense semideciduous forests, and gallery forests), these landscapes have enormous carbon stocks. This can provide huge opportunities for international climate initiatives such as the REDD+ mechanism to be initiated in these forests as a potential for mitigating global climate change. In this study, carbon stocks within the case study council forests were evaluated (see **Figure 4**). **Figure 4** shows the carbon contained in the biomass within each forest. Most of the carbon is concentrated in the tree biomass, followed by dead trees. The carbon content of other features (litter, understorey, and palm trees) was very negligible and could not be seen in **Figure 4**.

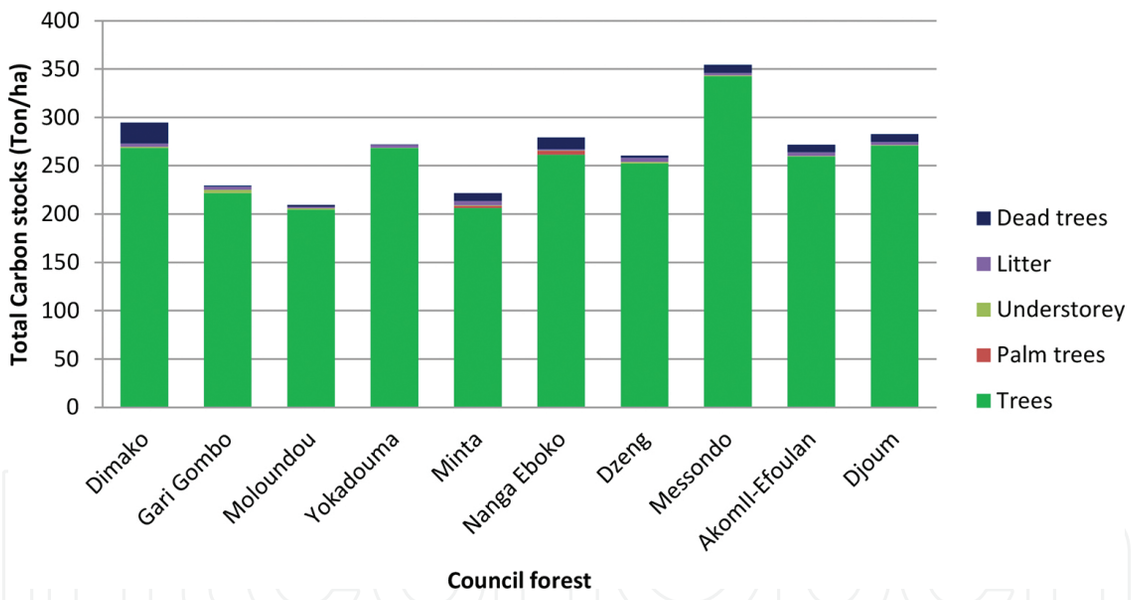

Figure 4. Total carbon stocks within the case study council forests.

4.5. Threats to Cameroon's council forests

4.5.1. Illegal logging

According to Cuny [9], illegal logging is a common practice within some council forests in Cameroon. In a visit to one of the council forest in Cameroon, Om Bilong et al. [17] noted a prominent case of illegal logging practices. In a series of personal interviews with some council officials, it was revealed that actors involved in this illicit practice include "unidentified persons

coming from other communities with local residents as accomplice and as a result of poor forest monitoring from forest guards." The issue of poor forest monitoring as one of main factors unpinning illegal logging in Cameroon is supported in the prevailing literature [15, 18, 19]. Others have identified poor forest governance from the relevant ministries as the root cause for this illegality [15, 20, 21]. Indeed, as Cerutti et al. [21] report, each year, Cameroon's State officials may be collecting an estimated sum of 6 million Euros in the form of informal payments or bribes from illegal chainsaw loggers operating in the country.

4.5.2. Potential source of conflict

The council forest of Efoulan for example is linked to that of AKOM II; this can be a potential source of conflict between the two municipalities in future if practices put in place to promote the sustainable management of these forests are not clearly established in terms of objectives and targets.

4.5.3. High cost involved

The financial expenditures involved in establishing a council forest is usually high; about 50 million FCFC without including the fees for gazettement, exploitation, monitoring, and revision of the management plan [9]. These difficult and almost unrealistic financial requirements involved in the process of setting up a council forest have left local authorities at the mercy of private donors thereby relinquishing their autonomy in decision making (every donor has its own requirements which sometime run contrary to the objectives of the local council).

4.5.4. Illegal hunting

One major threat to council forest in Cameroon is illegal hunting. According to Lindsey et al. [22], illegal hunting is the hunting of protected species, without licenses/permits, in areas where it is prohibited, or using prohibited methods. During personal interviews with council forest officials, it was reported that actors involved in this practice include local indigenes and individuals from Central Africa Republic. They noted that they indulge in this illegal exercise for commercialization and subsistence purposes. Some major drivers of illegal hunting include increase demand of bush meat in both rural and urban areas, absence of other alternative livelihoods, and inadequate enforcement of regulations [22].

5. Discussion

The previous section has provided the socioeconomic opportunities offered by council forests in Cameroon, their climate change mitigation potentials, as well as salient threats faced by these forests. Possible options for addressing these threats and improving their climate change mitigation potentials and socioeconomic importance are highlighted and discussed in the information that follows.

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5.1. Reduced impact logging

Reduced impact logging is one option that could be used to improve carbon stocks in the case study council forests. The term Reduced impact logging and its acronym RIL were first used in 1993. Traditionally, it often describes a set of forest management techniques that reduce logging impacts and improve productivity. Putz et al. [23] define it as "intensive planned and carefully controlled timber harvesting conducted by trained workers in ways that minimize the deleterious impacts of logging." Over the past two decades, sets of timber harvesting guidelines designed to mitigate the deleterious environmental impacts of tree feeling, yarding, and hauling have been known as RIL techniques. Although RIL techniques have been described as covering a variety of practices with no standard definition, De Blas and Manuel [24] define RIL techniques as: the delimitation of protected forest areas within concessions; the determination and use of minimum tree diameter at breast height; the development of a management plan and a logging inventory; minimizing the width and density of logging road networks; planning of logging roads; setting a maximum ceiling on the number of trees felled by hectare; use of directional felling; optimizing timber transport road networks; and planning of timber yards.

Despite its variability in countries, most RIL guidelines are also components of most forest management plans, often starting with recommendations related to designation of forest management units and progresses rapidly through issues related to assignment of annual coupes (i.e., cutting areas), before considering in more detail issues related to road and log landing planning, layout, and construction [23]. In Cameroon like the entire Congo basin area, RIL techniques are included into forestry laws especially those associated with mandatory management plans; i.e., preharvest planning of logging roads, determining diameter at breast height, or timber yards planning [24]. Although improved forest management (RIL inclusive) was not included in the Kyoto Protocol as an option for carbon sequestration, ample evidence is already available that selective logging using RIL techniques increases forest retention of carbon relative to conventionally logging [23]. **Figure 5** shows the total amount of carbon in the case study council forest as well as the amount of carbon obtained from conventional logging compared with RIL. It is glaring that relative to conventional logging, carbon stock in these forests increases when RIL is practiced. The calculations were done following the work done by Durrieu de Madron et al. [25] on the estimation of the impact of various type of forest exploitation on C stock in Central Africa. According this work, the extraction one cubic meter of timber per hectare would lead to the loss of 0.73 t of carbon. In conventional logging operations, if 20 m^3 of timber is exploited per hectare, a total carbon stock of 20 × 0.73 t of carbon are loss per logged hectare, plus C loss due to logging skid tracks (7% of the productive area × 0.00195 kg C/m^2) and roads (1% of the productive area × 0.028 kg C/m^2). Thus, for instance, an exploitation of 180,000 ha of forest under conventional logging would then lead to the loss of 20 × 0.73 × 180,000 t C + 245,800 t C (from skid tracks) + 504,000 t C (from roads). That makes a total of about 3,378,000 t C. The application of RIL would preserve about 517,700 t C from this loss. These figures were therefore used to estimate the impact of RIL and conventional logging on carbon stocks in each council forest.

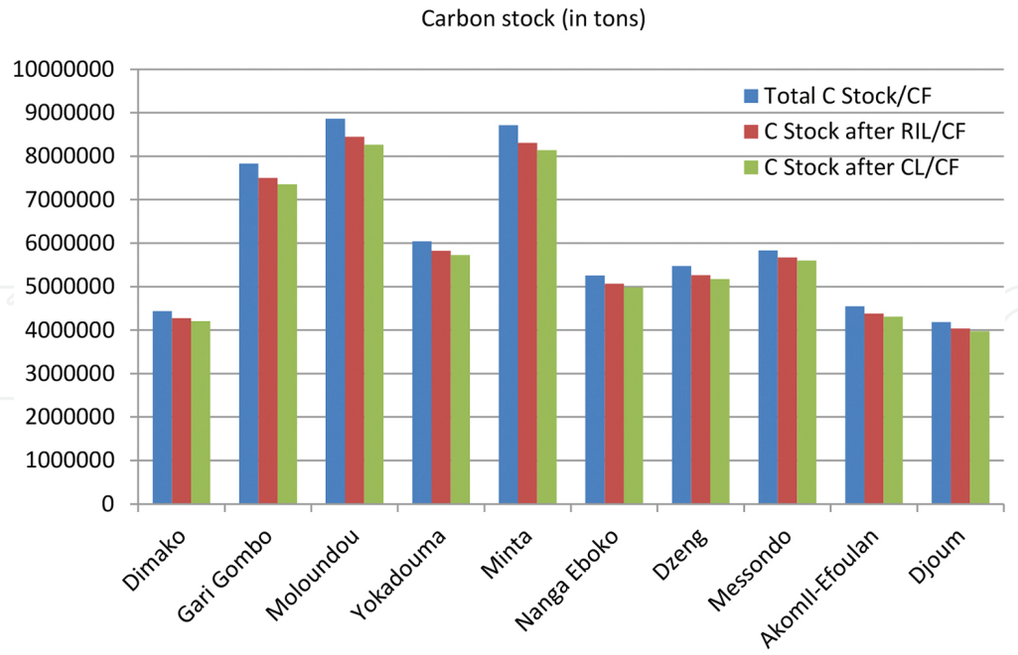

Figure 5. Total carbon stock and carbon stock in the case study council forests after RIL and conventional logging.

5.2. Reforestation

Reforestation constitutes another possible approach that could be employed to improve carbon stocks within Cameroon's council forests. Under the definitions of the Marrakesh Accords, reforestation refers to the direct human-induced conversion of nonforested land to forested land through planting, seeding, and/or the human-induced promotion of natural seed sources, on land that was forested but that has been converted to nonforested land [26]. Simply put, reforestation is planting trees or other activities geared towards the expansion of forest cover in general, though with particular reference to natural forest succession [27], or areas cleared of forests through timber harvesting and/or natural disaster.

Climate change mitigation through carbon sequestration is usually the primary benefit of reforestation as efforts to increase terrestrial carbon sequestration are based on the premise that reforestation adds to the planet's net carbon storage and helps moderate global warming by slowing the growth of carbon emissions in the atmosphere. However, there are many other ecological benefits of reforestation outside of carbon sequestration. Reforestation of degraded lands provides restoration of forest ecosystem goods and services (especially forest-based carbon), biodiversity conservation, improved air and water quality as well as improved soil fertility, structure and sustainability [27], and habitats for wildlife.

5.3. Promotion of good governance in order to combat illegal logging

Accountability, transparency, and jail terms for defaulters should be more aggressively promoted and applied around managing forest resources and ensuring that the proceeds derived from these economic activities are used to enhance the overall objectives of both the

council forest and surrounding communities. The jailing of the former major of the council of Yokadouma for embezzlement of proceeds from the Yokadouma council forest provides a step in the right direction.

5.4. Improve capacity and data

In order to promote effective and efficient monitoring, there is a need to improve capacity and data. One immediate option of doing this is to create strategic partnerships with international organizations like the Food and Agricultural Organization (FAO) that is currently implementing a regional project on REDD+ MRV in the country. The project envisages training with inputs from the Brazilian Institute for Space Science (INPE) and also negotiates remote sensing data from them that might be helpful. However, moving toward community managed MRV approaches may be more useful as this has been demonstrated to be potentially more effective and efficient elsewhere in Asia [28].

5.5. Promote easy access to credit schemes

The inability of council forest operators to cope with the exorbitant cost associated with their establishment and management results partly from their inability to secure financial support and credit schemes from most financial institutions. The government has done minimal efforts to lobby on their behalf, which is fundamental to improving their ability to procure this support. Thus, it is recommended here that cash flow to councils be improved with an important starting point being a fundamental change in the lending schemes of most financial institutions especially those operating in the country.

5.6. Develop alternative livelihood projects and enforcement of wildlife laws.

This chapter presses the need for alternative livelihood projects like bee keeping and the cultivation of snails to be promoted in forest-dependent communities that live around council forest landscapes in Cameroon as a strategy of reducing illegal hunting. As Lindsey et al. [22] explain, for illicit hunter to be curbed, livelihood interventions that generate alternative protein supply must be combined with proper enforcement of the relevant legal regulatory framework that prevails in that jurisdiction.

6. Conclusions

This chapter attempts to analyze council forest landscapes in Cameroon in terms of their socioeconomic and climate change mitigation potentials. The chapter posits that while there are some strengths and opportunities associated with these landscapes, they are fraught with glaring weaknesses as well as threats which could undermine importance services that they provide. Thus, it is argued that promoting good governance in order to combat illegal logging, improving capacity and data, facilitating easy access to credit schemes, developing alternative livelihood projects, RIL, reforestation, and proper enforcement of wildlife laws are keys to

advancing the sustainable management of these landscapes. Advances on these main recommendations will help in improving the contributions of council forest landscapes to desired sustainable development pathways. Finally, lessons learned from this study could be replicated to other countries in West Africa (like Liberia) where the Guinean forest block are significant for their rich biodiversity.

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