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"A Future for Ghana's African Rosewood – Potential solutions to ensure the survival of a keystone species"

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Abstract

Protecting forests in order to reduce tropical deforestation is essential to combat climate change and preserve biodiversity. Worldwide, deforestation is the second largest anthropogenic source of carbon dioxide release into the atmosphere, after fossil fuel combustion sources.

The paper highlights that Ghana is currently losing its primary forests at an unsustainable rate and risks losing the African rosewood species forever. Using the Kalakpa Resource Reserve as a case study, it explores the devastating impacts that illegal logging and the resulting degradation has on local communities and wildlife. The paper evaluates the concerning implications for the achievement of SDG 15: Life on Land and, upon examining the supply and demand factors fuelling the trade, explores the potential of frontier technologies, particularly tethered aerostats, and other innovative means to address the challenge across countries. Finally, the authors offer policy recommendations that could improve protective mechanisms. They suggest that government stewardship and local community engagement needs to be urgently strengthened in order to enhance Ghana's potential to restore the African rosewood and halt the loss of its remaining forests.

Keywords: Ghana, African rosewood, Kalakpa Resource Reserve, Conservation

Introduction, scope and main objectives

With current deforestation and degradation patterns, it is estimated that Ghana's forests could completely disappear in 25 years (Acheampong et al. 2019).

The Kalakpa Resource Reserve (KRR) is one of six resource reserves in Ghana and the only one in the Volta region (IUCN/PACO 2010). The KRR was officially established as a resource reserve by the Government of Ghana in 1975 (Forestry Commission and SNV 2007). Despite its protected status the Kalakpa Resource Reserve is threatened by human induced pressures (See Box 1).

Box 1: The Kalakpa Resource Reserve

The Kalakpa Resource Reserve (KRR) is located about 100 km northeast of Ghana's capital, Accra (Ayipey 2016; Owusu et al. 2021). According to Ayipey (2016), the reserve is estimated to cover a land area of 325 km^2. It is composed of dry forest and short grassland savannah in a deciduous forest vegetation zone of Ghana (Afriyie et al. 2021).

There are about 5 species of primates and 200 bird species, which has led the reserve to be declared an important birdlife area (Birdlife International 2021). According to Owusu et al. (2021) human settlement, logging (including the illegal logging of several endangered tropical tree species like African rosewood), charcoal production, use of land for agriculture, grazing and bush fires have been identified as the threats facing the KRR. These issues are leading to the rapid depletion of the reserve's spectacular flora and fauna and, between 1970 and 2000, led to 40 percent of large mammals becoming locally extinct (Forestry Commission and SNV 2007). Compared to two other protected areas in Ghana, the KRR had the lowest rate (46 percent) for management effectives, far below the global average (Afriyie et al. 2021; Owusu et al. 2021).

African rosewood (*Pterocarpus erinaceus)* is primarily found in the savannah zones of Ghana such as the Volta region (Abdul-Rahaman et al. 2016). A key factor in forest degradation in the KRR in the Volta region is illegal logging of the endangered African rosewood species (Afriyie et al. 2021). This is intertwined with the socio-economic challenges faced by communities residing illegally within the resource reserve and persistent poverty in surrounding districts.

Using the KRR as a case study, in this paper we examine the supply and demand factors fuelling the trade in African rosewood, discuss the concerning implications for the achievement of SDG 15: Life on Land and explore potential solutions to ensure the survival of the African rosewood.

Approach

In order to assess the potential solutions to the African rosewood felling in the Kalakpa, the authors undertook a qualitative review of the supply and demand issues fuelling the trade, with a particular focus on the KRR, which provides a case study into the challenges of balancing human impact and biodiversity protection.

Results

Supply-side challenges

Governance issues in general have been recognized by the UN as a major challenge and result from limited "resources and logistics to adequately monitor timber operations and to ensure that timber contractors comply" (FAO 2019). For example, due to a lack of stock mapping, where seed [sapling] trees and other species should be marked and tracked, loggers can harvest all trees in one go – the Forestry Commission could apply low-cost frontier technology to ensure better stock mapping, enforcement and monitoring of logging as well (FAO 2019).

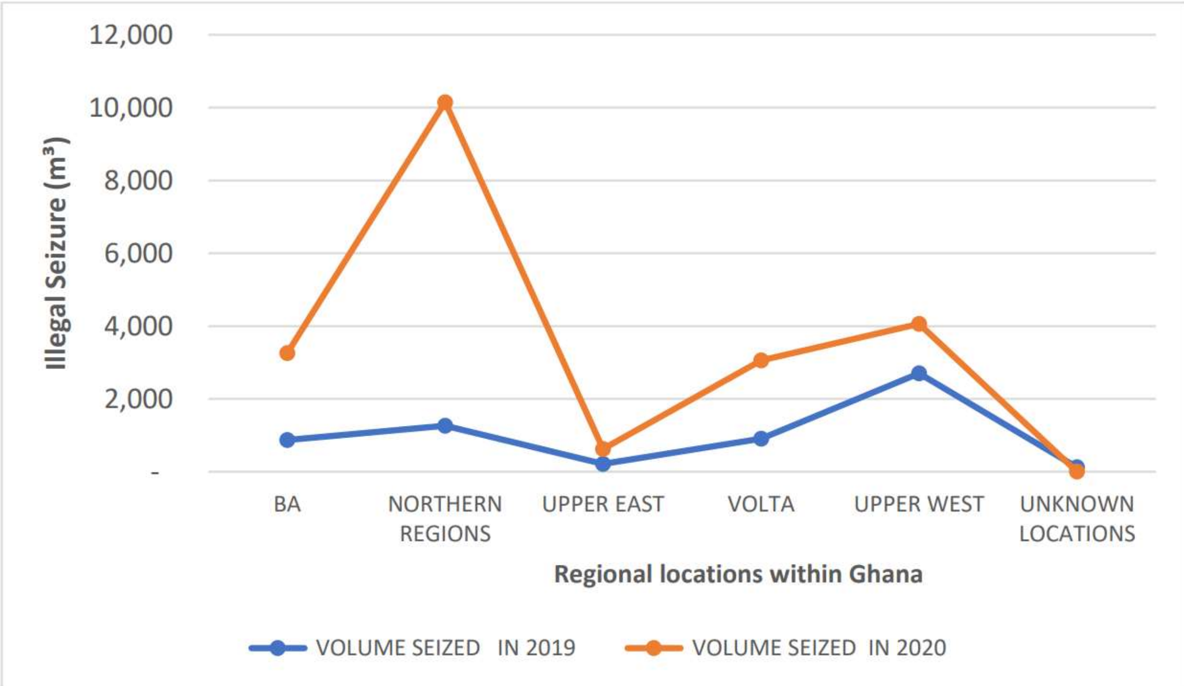
Ineffective bans and corruption have contributed greatly to the illegal logging of the African rosewood. In 2012 Ghana's Forestry Commission initiated a Logging Export Ban on African rosewood (GNA 2019). Despite the ban, logging companies continued to obtain legal documents to export their stock, while in other cases the Forestry Commission fined loggers GH¢10 000 (USD 1 800) per truck (GNA 2019). Given the value of rosewood products on the market, one might consider this fine too weak a disincentive to stop loggers and traders.

Land management systems are complex in Ghana with dual land administration where the majority (about 78 percent) of lands are under the "custodianship of chiefs and traditional leaders" meaning these leaders can also issue contradicting planning and land-use orders (Tasantab 2019). Local leaders need to be engaged, in line with SDG 15 to ensure local decisions and livelihoods are linked to new forest protection measures and illegal logging is not the most lucrative option. African rosewood can take decades to mature – therefore, the country risks losing the African rosewood species and its keystone role in protected areas.

Local community engagement is vital to protect endangered species of flora and fauna as local communities – both those illegally located within the KRR and neighbouring indigenous communities – are engaged in poaching of wildlife and logging of the African rosewood due to limited livelihood options and agricultural expansion (Afriyie et al. 2021; Acheampong et al. 2019). One recent study shows evidence indicating extensive threats to endangered mammals both small and large and an urgent need to strengthen local efforts to manage and preserve the area against poaching (Decher et al. 2021).

Tracking of rosewood has recently been strengthened by the Forestry Commission. According to latest data from the Forestry Commission (September 2021), current African rosewood figures show a 50 percent reduction in both total stem numbers (71 660 961) and stem volume (50 879 282.31 m^3) compared to 2013, but data oversight is limited within resource reserves (Forestry Commission 2021). No tracking system is in place for the KRR currently. At the national level, data also captures seizures of illegally harvested stands, but the true amount of African rosewood destruction remains unknown, especially within protected areas (Figure 1). There are studies such as Adjonou et al. (2021) applying georeferencing to monitor the occurrence of *Pterocarpus erinaceus* across multiple West African countries, (from Senegal to eastern Chad) through field surveys and datasets such as the Global Biodiversity Information Facility website, the African plant species database "RAINBIO" and others (Adjonou et al. 2021). It is hoped that these studies could inform future decisions on the tracking and governance of rosewood in Ghana's protected areas.

Figure 1. Seizures of rosewood in Ghana 2019, 2020.



Source: Forestry Commission 2021

Demand-side challenges: Local level

Local community practices influence the survival of African rosewood and its role in Ghanaian traditional practices. More than 70 percent of homes across Ghana use wood and charcoal for cooking fuel and African rosewood is traditionally the most preferred species (Dumenu and Bandoh 2016). For local communities across Ghana, African rosewood also plays a key role as an important source of livestock fodder for pastoralists and in pharmacopeia, especially rosewood oil (CITES 2016). Therefore, African rosewood is a central part of Ghanaian livelihood, pastoral communities and indigenous medicine, all of which drive local demand (Kosi et al. 2020; Rabiou et al. 2017).

Illegal or informal human settlements have been identified as the cause of extreme pressure and the key threat to the KRR, followed by excessive logging (Afriyie et al. 2021). Within and around the reserve, there are a number of human settlements (see Table 1), with those in the reserve having no access to formal basic services as they are not legally recognized by local or national government (Kalakpa Club Partners Report, 2020; Forestry Commission and SNV, 2007). To reduce the human environmental footprint from within the reserve, the settlements require urgent relocation. Unfortunately, the lack of financial support has hindered government plans to relocate inhabitants

(Owusu et al. 2021). Through multi-stakeholder engagement and civil society, efforts are underway for a new initiative to tackle this key challenge for the KRR.

Table 1. Census data on some observed settlements in and around Kalakpa Resource Reserve

Observed Settlements	Observed Inhabitants
Venakope	48
Sokokope	85
Dzrawode	340
Atixoe	120
Fosime	110
Okai	89
Dorkpor	350
Amatikpoe	160
Agortive	147
Wukpo	110
Awator	87
Agordeke	360
Kpetoe	150

Source: Kalakpa Club Qualitative Interviews with Kalakpa Resource Reserve Rangers, in Kalakpa Club Partners Report, 2020

Poverty rates in the neighbouring districts of the Volta Region are also a major influence on the exploitation of African rosewood in the Reserve. The poverty rate in Adaklu district surrounding the KRR is 89.7 percent, or more than two and half times the Volta regional average (33.8 percent) (Ghana Statistical Service 2015). These levels of poverty have a direct impact on illegal rosewood felling in the reserve especially for charcoal production. There is a need to implement poverty alleviation schemes to reduce the demand for rosewood from illegal chainsaw operations and other locals relying on rosewood for income and charcoal.

Demand-side challenges: International level

International schemes like the EU's Forest Law Enforcement, Governance and Trade (FLEGT) do help prevent the sale of illegally sawn timber to Europe, but political will is needed to coordinate and implement similar schemes for exports to other regions, particularly Asia-Pacific. Demand for and trade in rosewood has exploded in recent decades, multiplying 65 times in value and is now worth $2.2 billion a year (Carrington 2016).

Log export bans in Ghana have not been effectively implemented by authorities due to suspected "grand corruption" schemes, with millions of rosewood logs still exported to the Asia-Pacific region (UNEP-WCMC 2018; Dumenu 2019). In line with SDG 15.5, many countries instituted logging bans on rosewood to protect the species, including Ghana, but enforcement is challenging. According to an assessment by the CITES secretariat, the 2017 exports from West African countries like Ghana, Nigeria and the Gambia represented 85 percent of the global trade in African rosewood, with China as the primary destination market (UNEP 2019).

Log import bans are not in place in primary destination markets, such as China, to prohibit the import of illegal timber or illegal timber products, impeding the "ability of Chinese law enforcement to take action" on suspected illegal timber shipments (UNEP-WCMC 2018). Due to China's size and volume in trade of goods, enforcing inspections for African rosewood at ports of entry in the country would be challenging, especially given the diversity of rosewood across tropical countries and poor tracking of timber products.

Consumer preferences need to be changed to reduce demand through public information campaigns and penalizing consumers directly for rosewood purchases. China has no sanctions or fines on timber export or import (UNEP-WCMC 2018). Rosewood is now the highest valued illegal forest commodity, despite its status as a protected species under CITES, due to rising Chinese demand (UNODC 2016). Rosewood is prized in Chinese furniture-making for its fragrant smell and red colour (Dumenu and Bandoh 2016). In Chinese, "Hongmu" means "red wood" referring to a range of tropical hardwoods used for high-end furniture that can even sell for $1 million USD, but consumer preferences could change with greater campaigns (CITES 2016).

Discussion

Pterocarpus erinaceus is recognized as "a keystone fire-resistant nitrogen-fixing species within fragile semi-arid habitats and an important source of livestock fodder for traditional pastoral communities across its range" (CITES 2015). Protecting the species is essential for the Kalakpa ecosystem. However, to ensure the survival of the endangered species in protected areas, both supply side and demand side approaches are needed.

Two key policy recommendations include:

1) ***Multi-stakeholder engagement*** has been proven to strengthen conservation locally and improve sustainable forest management strategies (Elbakidze et al. 2010; Favretto et al. 2020). See Box 2 for an example of a local organization's work.

Box 2: The Kalakpa Reserve Friends and Activists Club

The Kalakpa Club (Kalakpa Reserve Friends and Activists club) is a small Civil Society Organization that was formed in Ghana in 2018 after a group of conservation enthusiasts started to discuss issues relating to the nature reserve and finding ways in which they could help.

Communities living in and around the Kalakpa Resource Reserve (KRR) are poor and often resort to unsustainable practices to boost their livelihoods. These practices include poaching, charcoal burning and illegal logging, and continue to degrade the reserve. The KRR also suffers significantly from bushfires. These are caused by people setting fire to wild beehives when using traditional methods to harvest honey, by slash-and-burn subsistence farming practices, and hunting parties pursuing bushmeat. There are some operational staff who manage the Kalakpa Reserve, however they are few and largely under-resourced so they struggle to effectively manage the 325 km^2 reserve area.

After the Club understood this situation, it centred most of its activities around developing sustainable alternative livelihoods for local communities. For example, the club started a beekeeping training programme to promote modern beekeeping methods and instituted a coffee training programme to introduce a perennial crop in order to reduce the annual slash and burn practices. The Club has also collaborated closely with forestry staff and the local community to support tree planting around the reserve.

Given that the settlements within the reserve are a key threat to its survival, the Club began a relocation initiative to ensure participatory resettlement of families in the reserve into a "Sustainable Villages" pilot with renewable energy and green homes (Kalakpa Club Partners Report, 2020).

As a key mission, the Kalakpa Club also works on fostering trust between relevant stakeholders. The Club helped bridge the gap between some of the indigenous communities surrounding the reserve and the Forestry commission, ensuring better engagement between all parties. The Kalakpa Club's advocacy work has been fundamental to raising awareness of the issues facing the KRR and highlighting its numerous challenges.

Photographs: The Kalakpa Club with local officials from the Forestry Commission's Game and Wildlife Division engaged in a tree planting exercise for KRR. Courtesy of the Kalakpa Club, 2021.

2) ***Leveraging frontier technology*** is key to enforce rosewood logging bans and yet, to date, none of the current Forestry Commission programmes focus on using frontier technologies to ensure forest monitoring and protection (Forestry Commission 2019).

   In Guyana, for example, scalable solutions have seen great success (Global Sustainable Development Report (GSDR) 2019, p. 102), demonstrating that implementing such technologies for forest governance is possible for developing countries. Aside from the financial and human resources required for this approach, the risks are minimal, but the potential for gains are large (See Box 3).

Box 3: Frontier technologies within the Kalakpa Resource Reserve

Today, big data, drones, blockchain and satellite technologies can be used to protect forest resources (WWF 2019). However, at the local level in the Kalakpa Resource Reserve (KRR), financial and human resource challenges hinder the ability of KRR rangers and reserve managers to leverage emerging technology for monitoring the reserve and enforcing logging bans (Forestry Commission and SNV 2007).

Aerostats with associated monitoring equipment have been proposed as a tool to reduce and monitor illegal activities within the KRR, as they can be placed strategically where suspected illegal logging is going on. The financial constraints faced by the Ghana Forestry Service (Owusu et al. 2001) means that any solution implemented needs to be cost-effective.

The use of tethered aerostat technology would provide cheap and effective monitoring of the KRR from a safe distance, ultimately protecting not only the KRR, but the lives of rangers as well. The use of these small lower cost airships can ensure effective monitoring and data collection for multiple uses, including bush fires and more (Mohan 2012). According to Tenenbaum et al. (2016), aerostats can also act as a visual deterrent. They serve as extra eyes and ears (US Customs and Border Protection 2021) and the use of this technology in the KRR would be cost-effective as it would support the activities of the under-resourced and inadequate number of staff.

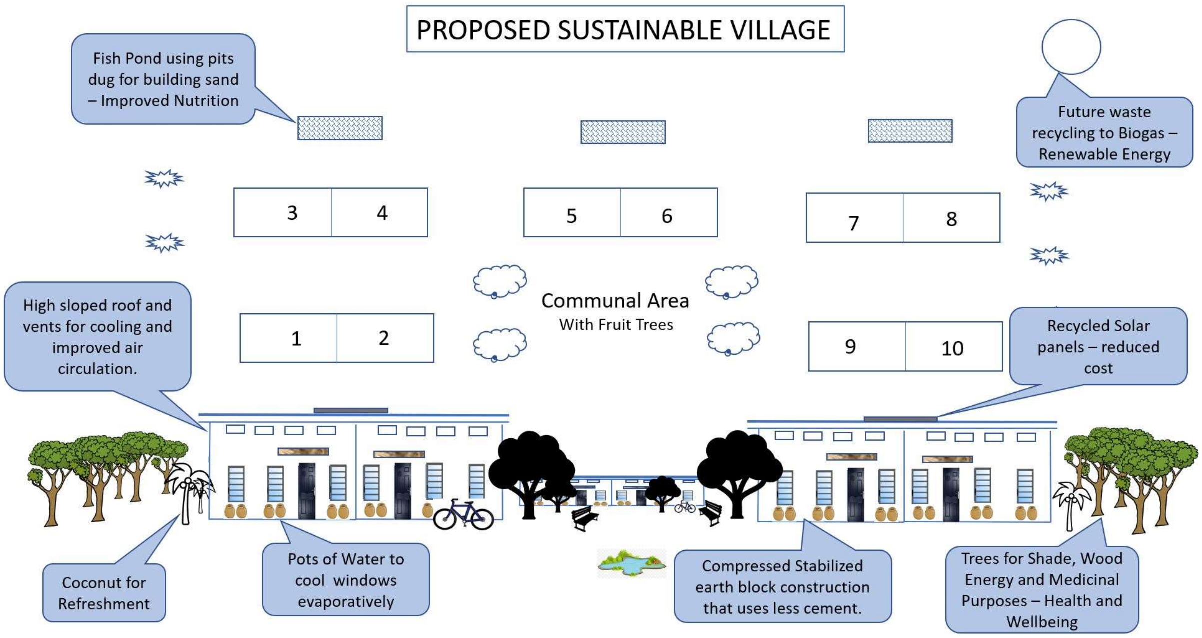
Photograph: A Tactical Aerostat used by the US Border Patrol. Copyright US Customs and Border Protection, 2021.

Recommendations

Effective and transparent public governance and institutions can fight against corruption and ensure greater enforcement of policies for sustainable forest management and restoration of the African rosewood (GSDR 2019). Strengthening public governance is a proven accelerator to achieve the SDGs (OECD 2019). Public governance must tackle institutionalized corruption and regulatory enforcement at local levels as central reasons why developing countries are targets of illegal rosewood logging (EIA 2016; Dumenu and Bandoh 2016). By focusing on public governance, Ghana could realise co-benefits on SDG 16 as well, and key targets on strengthening the rule of law (16.3), eliminating organized crime (16.4) reducing government corruption and bribery (16.5) and increasing government effectiveness and transparency (16.6,16.10) (UN 2019).

Multi-stakeholder engagement can strengthen local conservation efforts, but this requires tackling key conservation challenges like the sustainable relocation of human settlements within protected areas, through a participatory approach. Illegal or informal settlements in the Kalakpa is the key threat to the reserve (Afriyie et al. 2021). The settlements developed in the Reserve's territory before it was officially designated as a protected area, but as these were not legally recognized the government did not ensure their relocation (Ayipey 2016). The households are classified as extreme poor, with no means for relocation, ensuring these communities remain informal and in an intergenerational poverty trap. Through the engagement of multiple stakeholders, the Kalakpa Club began a process of exploring cost-effective and sustainable housing options for the settlers. The club also planned to include the provision of training to enable relocated people means to make a living when resources of the reserve are no longer at their disposal. The entire process was planned to be executed in a highly participatory manner to ensure needs-based design of the new sustainable villages.

Figure 2. Kalakpa Club Resettlement Concept for the Sustainable Village Initiative



Source: Kalakpa Club Partners Report 2020

Local data monitoring is a key solution is to strengthen the Forestry Commission's ability to monitor and enforce logging bans, ensuring improved local data on African rosewood. Ghana's Forestry Commission aims to improve forest governance with European Union's (EU) Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan, including through the implementation of a Wood Tracking System (Forestry Commission 2019). This launched an online Timber Legality Transparency Portal, which seems inactive or with limited tracking data currently. These are positive advances to strengthen sustainable forest management, but they only aim to prevent illegally logged timber from entering the European market. Similar programmes and actions plans do not exist yet with China. The FAO could also incorporate the African rosewood (*Pterocarpus erinaceus*) species in the Forest Resources Assessment to incentivise national monitoring efforts of this endangered species (FAO 2020).

To ensure better enforcement of existing bans and penalties, a policy focus should be on empowering the Forestry Commission to leverage appropriate frontier technologies, such as Tethered Aerostats, for monitoring of protected areas. Such new technologies are emerging, including lower cost options, to improve real-time local monitoring of protected areas. The Forestry Commission could also ensure more remote sensing on species occurrence using baseline data to develop real-time georeferencing and monitoring systems around protected areas such as KRR.

Conclusion

Ghana must strengthen its governance and sustainable forest management practices using local community engagement and frontier technology to ensure the regeneration of African rosewood for the country's forests, wildlife, and communities.

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