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Review Article

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A Messy Reality: Deforestation Drivers and Governance Failures in Africa's Tropical Forests – A Comparative Review of Ethiopia and the Congo Basin

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Abstract: Despite decades of international and national policy interventions, deforestation continues across Africa's tropical forest landscapes at an alarming rate. This paper comparatively reviews two distinct forest regions—Ethiopia and the Congo Basin—to identify common drivers, governance failures, and missed policy opportunities. Drawing primarily on Abbadiko's (2016) analysis of Ethiopia's Climate Resilient Green Economy strategy and Maniatis et al.'s (2025) examination of economic drivers in the Congo Basin, this review finds that smallholder agriculture, artisanal charcoal production, and weak governance—not industrial logging—constitute the primary deforestation drivers in both contexts. Ethiopia has lost approximately 40% forest cover a century ago to between 3-11% today, while the Congo Basin lost 352,642 km² of dense forest between 1990 and 2020. The paper argues that insecure land tenure, rural population pressure, lack of affordable energy alternatives, and enforcement failures transcend regional differences. Without addressing these root causes—particularly land rights and energy poverty—international mechanisms such as REDD+ and carbon markets will continue to underperform. The paper concludes by proposing priority interventions: systematic land tenure regularization, scaled investment in clean cooking technologies, and realistic funding frameworks that match ambition with fiscal reality.

Keywords: *Deforestation, shifting agriculture, charcoal production, forest governance, Ethiopia, Congo Basin, land tenure, REDD+, climate policy*

1. Introduction

1.1 Problem Statement and Research Rationale

Tropical deforestation accounts for approximately 10-15% of annual global greenhouse gas emissions, yet remains one of the most persistently challenging environmental problems to address through policy (Seymour & Harris, 2019). Africa's tropical forests—spanning the Congo Basin, East African highlands, and West African coastal zones—are particularly understudied relative to Amazonia and Southeast Asia, despite hosting the world's second-largest contiguous rainforest and some of the highest deforestation rates globally (FAO, 2020).

This paper addresses a critical gap in the comparative deforestation literature: while individual country case studies abound, systematic comparisons between African regions with vastly different forest endowments remain rare. Such comparisons are valuable because they can identify whether deforestation drivers are context-specific or structurally similar across different political economies, population densities, and forest types. This review compares Ethiopia—a densely populated, predominantly dry country that has lost most of its historical forest cover—with the Congo Basin—a sparsely populated, humid region that retains approximately 60% of its original dense forest in the Democratic Republic of Congo alone.

1.2 Research Questions

The paper is organized around three interconnected questions:

Driver identification: What are the proximate and underlying drivers of deforestation in Ethiopia and the Congo Basin, and how do they differ across scale, actor type, and region?

Governance diagnostics: Why have existing policy frameworks—including REDD+, FLEGT, and national green economy strategies—failed to arrest deforestation in both contexts?

Policy implications: What specific governance and economic interventions are most likely to

reduce deforestation, given the structural constraints identified in both regions?

1.3 Scope and Methodology

This paper is a critical comparative review rather than a systematic meta-analysis. The primary sources are two studies: Abbadiko (2016) on Ethiopia's climate-forest-agriculture interface, and Maniatis et al. (2025) on economic drivers of deforestation in the Congo Basin. These are supplemented with recent peer-reviewed literature (2024-2025) to update empirical findings and address temporal gaps, particularly regarding Ethiopia's post-2016 political turmoil and emerging REDD+ implementation data.

The comparative framework draws on Geist and Lambin's (2002) proximate-underlying drivers typology, distinguishing between direct land-use actions (e.g., agricultural expansion, wood extraction) and indirect socioeconomic, institutional, and demographic factors (e.g., population growth, tenure insecurity, policy contradictions). This framework is particularly useful for identifying leverage points for intervention. Acknowledged limitations include: reliance on secondary sources, the ten-year gap between the two primary studies, and the absence of primary fieldwork.

1.4 Paper Structure

Following this introduction, Section 2 provides geographical and forest context for both regions. Section 3 presents comparative empirical findings on deforestation scale and rates. Section 4 analyzes proximate and underlying drivers in detail. Section 5 examines governance failures and policy implementation gaps. Section 6 critically evaluates international climate finance mechanisms. Section 7 synthesizes cross-regional lessons. Section 8 proposes priority interventions, and Section 9 concludes with research and policy implications.

2. Background: Two Forest Regions in Comparative Perspective

2.1 Ethiopia: From Forested Highlands to Degraded Mosaic

Ethiopia presents a paradoxical case for forest policy analysis. The country hosts the Afro-alpine ecosystems of the Ethiopian Highlands, the coffee forests of Kaffa, and the dry woodlands of the Rift Valley—biodiversity endemism hotspots of global significance (Bongers et al., 2019). Historically, approximately 40% of Ethiopia's land area was forested, with dense montane forests covering much of the highlands (Abbadiko, 2016). However, a century of agricultural expansion, fuelwood collection, and state-led resettlement programs has dramatically transformed this landscape.

Contemporary forest cover estimates vary widely, reflecting definitional disagreements about what constitutes "forest" in dryland contexts. The World Bank (2001) estimated forest cover at 2.2% of land area, while the FAO (2010) reported 11%. The Ethiopian government's own Wood Biomass Inventory and Strategic Planning Project (WBISPP, 2005) estimated 12.5 million hectares of natural high forest and woodland—approximately 11% of total land area. This definitional looseness is not merely academic: it affects baseline setting for REDD+ carbon accounting, eligibility for international forest finance, and domestic policy prioritization.

Demographic pressure compounds ecological degradation. Ethiopia's population grew from approximately 33 million in 1980 to 123 million in 2023, with 80% residing in rural areas and depending directly on agricultural livelihoods (World Bank, 2024). The result is a classic "smallholder-driven" deforestation frontier, where average farm sizes have fallen below 1 hectare in densely populated zones, driving farmers to clear marginal lands and steep slopes previously under forest cover.

2.2 The Congo Basin: The World's Second Lung

The Congo Basin stands in stark contrast. Spanning six countries—Cameroon, Central African Republic (CAR), Democratic Republic of Congo (DRC), Republic of Congo, Equatorial Guinea, and Gabon—the Basin contains approximately 200 million hectares of dense tropical rainforest, second in size only to the Amazon (Maniatis et al., 2025). The DRC alone accounts for over 60% of the Basin's forest cover, with approximately 150 million hectares of primary and secondary forest.

Unlike Ethiopia's highland mosaic, much of the Congo Basin remains functionally intact. The region's low population density—approximately 15 people per square kilometer in DRC's forest zone, compared to 120 in the Ethiopian highlands—has historically buffered forests from conversion pressure (Tyukavina et al., 2018). However, this demographic buffer is eroding. Rural population growth rates remain high (2.5-3% annually in DRC and CAR), and new roads—often built for logging or mining concessions—provide access for smallholder colonists.

A critical distinction concerns forest carbon stocks. The Congo Basin's peatlands alone store approximately 30 billion tons of carbon—equivalent to three years of global fossil fuel emissions (Dargie et al., 2017). This global public good justifies international financing for conservation. Yet it also creates an accountability problem: emissions reductions achieved in the Congo Basin accrue primarily to foreign beneficiaries (through climate stabilization), while opportunity costs—foregone agricultural revenues, timber royalties, mining taxes—are borne entirely by Basin countries.

2.3 Comparative Baseline Summary

Table 1 synthesizes key comparative indicators. The differences in population density, remaining forest cover,

and deforestation rates are stark. However, as subsequent sections demonstrate, the *drivers* of deforestation—when appropriately disaggregated by scale and actor—show remarkable cross-regional similarity.

Table 1: Comparative Forest Indicators (Ethiopia vs. Congo Basin)

Indicator	Ethiopia	Congo Basin (six countries)
Historical forest cover	~40% land area (c. 1920)	~95% of dense forest (pre-industrial)
Current forest cover	3-11% (definition-dependent)	87% of original dense forest remains
Annual deforestation rate	1-2% (highlands, 2000-2010)	0.05-0.83% (country-dependent)
Rural population density	~120/km² (highlands)	~15/km² (DRC forest zone)
Primary deforestation driver	Smallholder agriculture, fuelwood	Shifting agriculture, charcoal
Industrial logging share	Negligible	~10% of extracted wood (DRC)
Land tenure system	State ownership, usufruct rights	Customary + statutory (weakly integrated)

Sources: Abbadiko (2016); Maniatis et al. (2025); FAO (2020); World Bank (2024)

3. The Scale of Forest Loss: Empirical Evidence

3.1 Ethiopia's Forest Trajectory

Abbadiko (2016) provides a sobering quantitative portrait of Ethiopia's deforestation. Drawing on WBISPP (2005) data, he reports that "high woodland areas" decreased from 10.05 million hectares to 9.63 million hectares between 2000 and 2005—a loss of 420,000 hectares in five years, or approximately 84,000 hectares annually. More recent studies corroborate continued loss. Alemayehu et al. (2025), using Landsat time-series analysis for 2000-2020, found that Ethiopia lost 2.5 million hectares of forest cover over two decades, with an annualized loss rate of 0.8%—lower than Abbadiko's implied rate but still ecologically significant.

The carbon consequences are substantial. Abbadiko (2016) calculates that forest-to-cropland conversion released 55 megatons of CO_2 in 2010 alone. For context, this equals approximately 12% of Ethiopia's total greenhouse gas emissions (CRGE, 2011). The deforestation emissions rate has likely declined somewhat due to near-exhaustion of accessible forest stocks in highland zones, but remains significant in southwestern forests (Gambella, Benishangul-Gumuz) where population pressure is more recent.

A critical methodological issue concerns forest definition. Ethiopia's national forest inventory (2015-2017) adopted a definition of "forest" as land with >10% canopy cover and minimum area of 0.5 hectares—a relatively permissive standard that counts degraded woodlands as forest. Using this definition, Ethiopia's forest cover rises to 15.5% of land area (EFDRA, 2018). However, most international datasets (FAO, Global Forest Watch) use higher canopy cover thresholds (25-30%), yielding much lower estimates. The choice of definition has real policy implications: Ethiopia's REDD+ readiness documents emphasize the higher figure to demonstrate "forest cover remaining" and justify continued finance, while critics argue this masks ongoing degradation.

3.2 Congo Basin Deforestation Trends

Maniatis et al. (2025) provide the most authoritative recent synthesis of Congo Basin deforestation, drawing on national forest monitoring data and Global Forest Change (Hansen et al., 2013) products. Between 1990 and 2020, the six Basin countries collectively lost 352,642 km² of dense forest—an area roughly equivalent to Germany. In percentage terms, this represents approximately 8.5% of total land area, or 11% of original dense forest cover.

Trend analysis reveals a worrying pattern. Deforestation rates declined slightly between 2000 and 2010—a period of international policy attention and donor-funded conservation programs—but accelerated again between 2010 and 2020. Country-level variation is instructive: Gabon's annual deforestation rate was only 0.02% (lowest in the Basin), while CAR's rate reached 0.83% (highest). The DRC, despite having the lowest percentage loss due to its vast baseline forest area, contributed the largest absolute loss: approximately 150,000 km² over three decades.

Maniatis et al. (2025) also provide spatial disaggregation that reveals the frontier nature of Congo Basin deforestation. Eighty percent of forest loss occurs within 4 kilometers of roads or settlements. This proximity effect is robust across all six countries and all three decades, indicating that road development—whether for logging, mining, or rural access—is the primary spatial determinant of deforestation. Importantly, however, the causal mechanism is not direct conversion by road builders; rather, roads provide access for smallholder colonists who then clear forest for shifting cultivation and charcoal production.

3.3 Comparative Interpretation

The Ethiopia and Congo Basin trajectories differ primarily in *phase* rather than *kind*. Ethiopia represents an advanced deforestation frontier: most accessible forests have already been converted, remaining forest is concentrated in remote southwestern areas and steep slopes, and current loss rates are constrained more by forest availability than by population pressure. The Congo Basin represents an early-to-mid stage frontier: vast forest stocks remain, rural population pressure is intensifying, and road networks are expanding into previously inaccessible areas. Without policy intervention, the Basin's trajectory may converge

with Ethiopia's highland experience over the next 50-100 years.

This phase difference has implications for policy learning. Ethiopia's experience demonstrates the end-state of unmanaged smallholder-driven deforestation: degraded watersheds, soil erosion, erratic rainfall, and chronic food insecurity (Demissie & Guta, 2024). Whether the Congo Basin can avoid this trajectory depends on whether governance interventions can be implemented while forest stocks remain substantial—precisely the window of opportunity that Ethiopia missed.

4. Deforestation Drivers: Proximate and Underlying

4.1 Proximate Drivers: Who Cuts Trees and Why?

Ethiopia: Abbadiko (2016) identifies smallholder agricultural expansion as the single largest proximate driver of deforestation. This is not industrial agriculture: Ethiopia has relatively few large-scale commercial farms (sugar, cotton, sesame are exceptions), and most clearing is done by subsistence farmers cultivating 0.5-2 hectares. The immediate motivation is straightforward: population growth has reduced average farm sizes below subsistence thresholds, compelling farmers to clear new land rather than intensifying production on existing plots.

Fuelwood and charcoal production constitute the second proximate driver. Over 90% of Ethiopian households cook with biomass, and urban demand for charcoal—particularly in Addis Ababa (population 5 million)—drives extraction from forests up to 300 kilometers distant (Demissie & Guta, 2024). This is not a "traditional" practice immune to policy intervention; it is a commercialized supply chain involving intermediaries, truck transport, and urban wholesalers. However, law enforcement rarely targets these actors, focusing instead on rural collectors who have few alternatives.

A third proximate driver—less emphasized in Abbadiko (2016) but highlighted by recent research—is resettlement. Ethiopia's state-led villagization programs (1980s, 2010s) moved millions of people from drought-prone highlands to previously forested lowlands (Shibabaw & Wondimneh, 2025). While officially justified as climate adaptation, these programs have systematically converted forest to cropland and settlement. The policy contradiction is stark: the same government that signs REDD+ agreements finances resettlement that causes deforestation.

Congo Basin: Maniatis et al. (2025) report similar proximate drivers but with different emphases. Shifting cultivation (slash-and-burn agriculture) is the dominant proximate driver across all six countries. Farmers clear 1-5 hectares, cultivate for 2-3 years, then abandon when soil fertility declines and weeds proliferate. Because land tenure is insecure—discussed below—farmers lack incentive to invest in soil conservation or fallow management. The resulting landscape is a mosaic of secondary forest regrowth and active agricultural plots, with carbon stocks significantly reduced relative to primary forest.

Charcoal production is the second proximate driver in the Congo Basin, particularly in DRC and CAR. Maniatis et al. (2025) estimate that artisanal charcoal production accounts for 60-80% of wood extraction in DRC's forest zone—far exceeding industrial timber offtake. The charcoal supply chain is similar to Ethiopia's: rural producers kiln wood using traditional earth mounds, sell to intermediaries, and supply urban markets (Kinshasa, Brazzaville, Bangui). A 2024 study on Ghana's charcoal economy (Arko et al., 2024) found similar dynamics, suggesting that West and Central Africa share a common "charcoal problem" largely ignored by international climate policy.

Artisanal mining is a third driver, particularly in eastern DRC. Ladewig et al. (2024) used high-resolution satellite imagery and field surveys to measure forest loss around artisanal gold and coltan mining sites. Their key finding—often missed by remote sensing analyses—is that the mine pit itself causes minimal direct deforestation. Instead, the settlements, roads, and commercial agriculture associated with mining camps cause forest loss 25 times larger than the mine footprint. This indirect effect means that mining-driven deforestation is undercounted in standard forest monitoring systems.

Industrial logging—the driver most targeted by international policy (FLEGT, REDD+, certification schemes)—is a relatively minor direct driver of deforestation in the Congo Basin. Maniatis et al. (2025) estimate that selective logging (as opposed to clear-cutting) accounts for less than 5% of annual forest loss. However, logging contributes indirectly by building roads that smallholder colonists subsequently use. The causal pathway is: logging concession → road construction → in-migration of farmers → agricultural deforestation. This indirect effect is substantial but rarely attributed to logging in policy debates.

4.2 Underlying Drivers: The Structural Context

Proximate drivers are the "final causes" visible on the landscape. Underlying drivers are the structural conditions that make proximate drivers rational choices for poor households. Both Abbadiko (2016) and Maniatis et al. (2025) identify a similar set of underlying drivers, despite vastly different forest contexts.

Land tenure insecurity appears in both studies as the most consistent underlying driver. In Ethiopia, land is constitutionally state-owned; farmers have usufruct rights (use rights) but cannot sell, mortgage, or bequeath land. This legal framework was designed to prevent landlordism and land concentration, but it has the unintended consequence of discouraging long-term investment in soil

fertility or tree planting. A farmer who invests in terracing, fruit trees, or forest regeneration cannot capture the value of that investment if the state reallocates the land (as happened during resettlement programs). The rational response is to maximize short-term agricultural output—which often means clearing new land rather than intensifying on existing plots.

The Congo Basin's tenure situation is different but equally problematic. Customary tenure systems—in which village chiefs or family heads allocate land use rights based on lineage membership—coexist with statutory law that vests ownership in the state. In practice, this dual system creates confusion and conflict. Communities have neither de jure ownership (which would allow them to exclude outsiders) nor de facto security (since concessions can be granted to logging or mining companies without community consent). Maniatis et al. (2025) cite recent research showing that most forest loss in DRC occurs on land where tenure is legally ambiguous—neither formally community-controlled nor clearly state-managed. This "tenure vacuum" enables deforestation by any actor with a chainsaw.

Rural population pressure is the second underlying driver. Ethiopia's highland population density (120/km²) is among the highest in rural Africa, and farm fragmentation has reached the point where many households cannot meet subsistence needs from their own land. Off-farm employment is limited, particularly for women. The result is a "desperation deforestation" dynamic: farmers clear steep slopes, riparian zones, and remnant forest patches because their survival depends on it, not because they prefer deforestation.

The Congo Basin's rural population density is lower, but growth rates are high (2.5-3% annually in DRC and CAR). The key difference is that the Basin has available land—for now. The dynamic is not yet "desperation" but "opportunity": young farmers move to forest frontiers because customary systems allocate land there, not because existing farms have become suboptimal. This suggests a preventive window: if tenure can be secured and agricultural productivity raised, the shift from "opportunity-driven" to "desperation-driven" deforestation might be avoided.

Poverty and lack of alternatives is the third underlying driver. For rural households across both regions, forest conversion is not a choice between conservation and development; it is a choice between eating and going hungry. Agricultural extension services are underfunded or absent; credit markets exclude smallholders; input supply chains (seed, fertilizer) are unreliable. In this context, clearing new land is often the lowest-cost way to increase food production—even if it is unsustainable in the long term.

The charcoal dimension of poverty is particularly underappreciated. Urban households across Africa rely on charcoal because it is the cheapest cooking fuel available—cheaper than kerosene, LPG, or electricity, where those are available at all. Rural producers make charcoal because it provides cash income when agricultural labor demand is low. Neither actor is "irrational" or "uninformed"; both are responding to market prices and structural constraints. Policy interventions that ignore these price signals (e.g., blanket charcoal bans) predictably fail, driving production underground rather than reducing it.

4.3 The Forest-Climate-Agriculture Feedback Loop

Abbadiko (2016) develops a conceptual framework—the climate-forest-agriculture interface—that usefully captures dynamic feedbacks often missing from static driver analyses. The logic is as follows:

Climate change affects agriculture: Rising temperatures and altered rainfall patterns reduce crop yields, particularly for staples like maize, teff, and wheat. Abbadiko (2016, Table 4) cites experimental data showing that extreme temperatures reduce maize yield by 48% even with normal rainfall, and by 77% when combined with increased rainfall. Farmers experiencing yield declines face a choice: intensify (use more inputs) or expand (clear more land). Without access to inputs, they expand.

Agricultural expansion drives deforestation: As farmers clear forest, carbon stocks are released (driving further climate change) and local rainfall regimes are disrupted (since forests recycle moisture). This creates a positive feedback loop: climate change → yield decline → deforestation → worsened climate change.

Forest loss degrades watershed services: Forests regulate water flows, reducing flood risk during heavy rains and maintaining dry-season base flows. Deforestation therefore increases both flood damage and dry-season water scarcity, affecting agricultural productivity downstream. This feedback is particularly acute in Ethiopia's highlands, where most agriculture depends on rain-fed systems with limited irrigation.

This framework implies that forest conservation is not separate from agricultural development and climate adaptation; all three are inextricably linked. A policy that succeeds in reducing deforestation but fails to raise agricultural productivity will simply displace deforestation elsewhere (leakage) or postpone it until population pressure overwhelms enforcement. Similarly, a policy that boosts agricultural yields without securing forest boundaries may induce intensification—or it may induce expansion if farmers interpret higher yields as a signal to increase cultivated area. The empirical evidence on this "rebound effect" is mixed, but it cannot be dismissed.

5. Governance Failures: Why Policies Fail on the Ground

5.1 Ethiopia's CRGE Strategy: Ambition Without Enforcement

Ethiopia's Climate Resilient Green Economy (CRGE) strategy, launched in 2011, represents the country's flagship climate and forest policy. The strategy has four pillars: (1) improving crop and livestock productivity, (2) protecting and re-establishing forests, (3) expanding renewable energy, and (4) leapfrogging to modern energy-efficient technologies (CRGE, 2011). On paper, it is a comprehensive, cross-sectoral plan that explicitly addresses the forest-agriculture-climate nexus.

Abbadiko (2016) is broadly supportive of the CRGE, praising its integration of mitigation and adaptation. However, a critical reading of his own evidence suggests implementation challenges that he understates. For example, he notes that watershed development programs in the 1980s failed due to "lack of community participation, less responsibility of stakeholders, and unmanageable planning units." The CRGE's governance architecture—centralized planning with regional implementation—risks replicating these same failures.

Recent evaluations are more skeptical. Lemma and Abebaw (2024) conducted an assessment of the monitoring and evaluation system for Ethiopia's REDD+ investment program (which operationalizes the CRGE's forest pillar). They found that: (1) baseline data were incomplete and inconsistent across regions, (2) indicator definitions changed mid-program, making trend analysis impossible, (3) field staff were undertrained and underpaid, leading to high turnover, and (4) community feedback loops were largely symbolic rather than substantive. The authors conclude that "the M&E system does not currently provide reliable information for adaptive management" (Lemma & Abebaw, 2024, p. 12).

The funding gap is even more problematic. The CRGE estimates total implementation costs at 150billionover20years(150billionover20years(7.5 billion annually). Ethiopia's total government budget is approximately 15billion,anddevelopmentassistanceforallsectors(notjustenvironment)isabout15billion,anddevelopmentassistanceforallsectors(notjustenvironment)isabout4 billion annually. Even assuming maximal reallocation and donor mobilization, the CRGE's funding requirement exceeds plausible resources by a factor of three to five. Abbadiko (2016) acknowledges this gap but couches it in diplomatic language: "financial need to be available from both active involvement of the Ethiopian people and support from developed countries." In plain terms: the money does not exist, and the strategy is unfunded.

The civil war (2020-2022) and ongoing regional conflicts have further degraded implementation capacity. Many CRGE pilot sites were in Tigray, Amhara, and Benishangul-Gumuz—all directly affected by conflict. Forest monitoring systems were destroyed, field staff displaced, and community institutions disrupted. No credible post-war assessment of forest loss in combat zones has yet been published, but anecdotal reports suggest extensive illegal logging and charcoal production by armed groups. The CRGE's assumption of a functioning state—already optimistic in 2011—is now demonstrably false for significant portions of the country.

5.2 Congo Basin: Regulatory Failure and Illegal Economies

The Congo Basin's governance failures differ in kind from Ethiopia's. Where Ethiopia suffers from over-centralized planning and unfunded mandates, the Basin suffers from weak state capacity, corruption, and the dominance of illegal economies.

Maniatis et al. (2025) document that all six Basin countries have forest management codes, FLEGT Voluntary Partnership Agreements with the EU, and REDD+ readiness plans. On paper, the regulatory architecture is more sophisticated than Ethiopia's. In practice, enforcement is "weak due to civil conflict, lack of resources, corruption, and the ineffectiveness of regulatory bodies" (Maniatis et al., 2025, p. 14).

The case of Cameroon's 1994 Forestry Law is instructive. The law decentralized forest management to local communities, granting them the right to establish Community Forests (CFs) of up to 5,000 hectares, managed according to simple management plans approved by the Ministry of Forests. The theory was that communities with formal rights would have incentive to manage forests sustainably. In practice, "community forestry has largely failed to meet its management and conservation objectives due to governance issues" (Maniatis et al., 2025, p. 17). Why? Because the application process is complex and expensive, requiring technical expertise and bribe payments at multiple stages. Wealthy elites capture the process, securing CF titles but managing them as de facto industrial logging concessions, with minimal community benefit.

The DRC case is even starker. APEM and Rainforest Foundation UK (2025) conducted a forensic assessment of industrial logging legality in DRC, analyzing concession documents, tax records, and satellite imagery. Their conclusion: nearly all industrial logging in DRC—over 95% of extracted timber—is illegal under DRC law, EU FLEGT standards, or both. The most common violations include: operating without a valid concession title, logging outside concession boundaries, harvesting protected species, under-reporting volumes to avoid taxes, and failing to pay legally mandated community development fees. Despite these violations, prosecutions are vanishingly rare. Forest inspectors are underpaid (often

supplementing income through bribes), the judiciary is corrupt, and political elites are financially invested in logging companies.

Artisanal charcoal production occupies an ambiguous legal space. In DRC, charcoal production is technically illegal without a permit, but permits are almost never issued. The result is a thriving illegal economy—for which reliable statistics do not exist—that supplies Kinshasa's 15 million residents. Maniatis et al. (2025) estimate that the charcoal sector employs 300,000-500,000 people in DRC alone, with an annual value of $400-600 million—larger than the formal timber sector. Criminalizing this sector is both impractical (given its scale) and undesirable (given its employment function). Yet legalizing it without regulation would accelerate deforestation. This policy dilemma—how to govern a massive, illegal, but economically essential sector—remains unresolved.

5.3 Corruption as a Governance System

Both papers mention corruption, but neither fully develops the concept. Corruption is not merely an enforcement problem; it is a governance system that allocates forest access and benefits, albeit through informal channels. Understanding how this system operates is essential for designing interventions.

In the Congo Basin logging sector, corruption functions as a tax system—but a regressive and unpredictable one. Companies pay "facilitation payments" (bribes) to obtain concessions, renew permits, avoid taxes, and evade prosecution. These payments capture value that would otherwise accrue to the state or to communities. However, they also provide predictability: a company that pays the correct bribes can operate with confidence that enforcement will not occur. This informal property rights system is stable, albeit inefficient and illegitimate.

In Ethiopia's charcoal sector, corruption takes a different form. Charcoal is technically banned (production and transport require permits that are rarely issued), but the ban is irregularly enforced. At checkpoints, truck drivers pay bribes to pass; the size of the bribe depends on the load size, the driver's relationship with the officer, and whether any "crackdown" is ongoing. This creates uncertainty and raises transaction costs, but does not stop charcoal flows. The ban-fuelled corruption system benefits enforcement officers (bribe income), harms truck drivers (shakedowns), and does not reduce deforestation because producers adapt by using smaller vehicles, night transport, or alternative routes.

Anti-corruption interventions in forestry have a poor track record. High-level prosecutions (e.g., of ministers or concession-holders) are rare and often politically motivated. Decentralization may reduce opportunities for bribery at central level but creates new opportunities at local level. Electronic tracking systems (e.g., timber barcodes) can be effective if implemented with integrity, but are easily subverted when customs officers collude with companies. The most promising approach—though politically difficult—is to legalize and tax activities that are currently illegal, thereby reducing the rents that fuel corruption. This would mean legalizing charcoal production with sustainability standards, and simplifying community forestry permitting to eliminate bureaucratic bottlenecks.

6. International Climate Finance: REDD+, CAFI, and the Funding Gap

6.1 The Promise and Performance of REDD+

Reducing Emissions from Deforestation and Forest Degradation (REDD+) has been the flagship international mechanism for forest climate finance since its inclusion in the 2007 Bali Action Plan. The theory is straightforward: developed countries pay developing countries for verified emissions reductions from the forest sector, creating a financial incentive for conservation. In practice, results have been disappointing.

Maniatis et al. (2025) provide a sobering assessment of REDD+ in the Congo Basin. Despite over a decade of readiness funding, only two African countries—Gabon (2023) and Uganda (2024)—have fully completed the UNFCCC REDD+ process and received results-based payments. Gabon received 17millionforreducingapproximately3.4milliontonsofCO2 — apriceof17millionforreducingapproximately3.4milliontonsofCO2 —apriceof5 per ton. For context, social cost of carbon estimates typically range from 50to50to200 per ton, and voluntary carbon market prices for forestry credits have recently traded at 10−30perton(butwithsignificantdiscountingfornon−additionalornon−permanentcredits).The10−30perton(butwithsignificantdiscountingfornon−additionalornon−permanentcredits).The5 price does not cover the opportunity cost of foregone land uses in most high-deforestation contexts.

The reasons for REDD+ underperformance are structural. First, the UNFCCC process is slow and bureaucratic: countries must develop national strategies, reference levels, safeguard information systems, and measurement, reporting, and verification (MRV) capacities before they can receive results-based payments. For low-capacity countries like CAR and DRC, this is a multi-year, donor-dependent process. Second, results-based payments are ex post—countries must reduce emissions first, then get reimbursed. Many countries cannot afford the upfront investments (e.g., enforcement, alternative livelihoods) needed to reduce deforestation without payment guarantees. Third, carbon accounting for forests is technically difficult and contested; disagreements over reference levels (how much deforestation would have occurred without REDD+) have delayed payments for years.

6.2 The Central African Forest Initiative (CAFI)

CAFI, launched in 2015, is a multi-donor trust fund (capitalized at $897 million) designed to address some of REDD+'s limitations. Unlike the UNFCCC process, CAFI provides upfront investment for policy reforms, with results-based payments linked to achievement of specific milestones (e.g., adoption of land use plans, establishment of protected areas, issuance of community forest titles). Six Congo Basin countries plus Ethiopia (added in 2021) are CAFI partners.

Maniatis et al. (2025) are cautiously optimistic about CAFI, noting that it has financed important foundational work: national forest inventories, satellite monitoring systems, and participatory land use planning. However, they also note that "progress is limited by the generic nature of the plan objectives and the fact that not all partners are aware of their obligations" (p. 22). Implementation has been slower than anticipated, with disbursements lagging commitments.

The Ethiopia-CAFI relationship is illustrative. Ethiopia signed its Letter of Intent with CAFI in 2021, committing to a series of reforms: clarify forest tenure, strengthen the forest monitoring system, restore 22 million hectares of degraded land (under the Bonn Challenge), and reduce emissions from the forest sector by 50% by 2025. Two years into implementation, the civil war has made most of these commitments impossible to achieve. CAFI has continued disbursements for technical assistance, but results-based payments have not been triggered. This case highlights a general vulnerability of performance-based finance: political shocks can render commitments infeasible through no fault of the implementing country.

6.3 The Mismatch Between Forest Value and Conservation Finance

Both papers implicitly highlight a massive mismatch. Maniatis et al. (2025) calculate that the Congo Basin's annual carbon sequestration value—using a conservative carbon price of 10perton—isapproximately10perton—isapproximately55 billion. Yet the Global Environment Facility (GEF), the largest public funder of biodiversity and climate projects, allocated only $2 million annually for climate change projects across all six Basin countries under its latest replenishment. The Green Climate Fund (GCF) has approved more, but disbursements remain slow, with less than 20% of approved funds reaching implementing partners as of 2024.

The opportunity cost of forest conservation—the value of foregone agricultural production, timber extraction, and mining—is also substantial. In high-opportunity areas (fertile soils, near roads), opportunity costs can exceed 1,000perhectareperyear. Atthoselevels,noplausiblecarbonpayment(at1,000perhectareperyear.Atthoselevels,noplausiblecarbonpayment(at5-20 per ton CO_2) can compete. Conservation in those areas requires either regulatory enforcement (prohibiting conversion) or complementary investments (raising agricultural productivity on existing farmland) that reduce the opportunity cost gap.

Abbadiko (2016) does not calculate a similar carbon value for Ethiopia's remaining forests, but the principle is the same: the global benefit of forest conservation vastly exceeds the finance available. The implication is that international finance cannot be the primary solution; domestic political will and national budget allocations must carry the burden. However, for highly indebted, low-income countries like DRC and Ethiopia, diverting scarce domestic resources to forest conservation—when education, health, and infrastructure needs are pressing—is politically challenging. Donors who demand national co-financing may inadvertently reduce, rather than increase, forest conservation.

7. Synthesis: Cross-Regional Lessons

7.1 What Is Similar?

Three cross-regional similarities emerge from the comparative analysis.

First, smallholder agriculture—not industrial logging—is the dominant proximate driver in both regions. This finding contradicts the popular narrative that attributes deforestation to corporate actors (timber companies, agribusiness) amenable to certification and supply chain interventions. In both Ethiopia and the Congo Basin, the deforestation frontier is a landscape of small farms, not large concessions. This implies that policy interventions must engage with hundreds of thousands of smallholder farmers, not dozens of companies—a much more challenging implementation task.

Second, energy poverty drives deforestation through charcoal and fuelwood demand. In both regions, biomass provides over 90% of household cooking energy. Urbanization increases charcoal demand as rural migrants retain cooking preferences and cannot afford alternatives. The charcoal supply chain is commercialized, illegal, and politically sensitive—governments rely on charcoal tax revenues (where legal) and dare not crack down on an economic activity that employs millions. This energy-forest nexus is systematically under-addressed in REDD+ strategies, which focus on carbon accounting rather than energy transitions.

Third, land tenure insecurity is the most consistent underlying driver. Whether state ownership (Ethiopia) or dual customary-statutory systems (Congo Basin), the absence of secure, transferable, enforceable land rights for forest-adjacent communities leads to short-term decision-making and underinvestment in forest conservation. Communities that cannot exclude outsiders have no incentive to manage forests sustainably. Communities that cannot capture benefits from forest conservation (through

carbon payments, ecotourism, or sustainable harvesting) have no reason to forego conversion to agriculture.

7.2 What Is Different?

Despite these similarities, important differences matter for policy targeting.

Forest stock remaining: Ethiopia has largely exhausted its accessible forest frontier; remaining forests are concentrated in remote southwestern areas and steep slopes where agriculture is marginal. The Congo Basin still has vast forest stocks, particularly in DRC. This difference implies different policy priorities: Ethiopia's focus should be on restoration and watershed protection, while the Basin's focus should be on preventing frontier expansion through proactive land use planning.

Population density and pressure: Ethiopia's highland population density (120/km²) is an order of magnitude higher than the Congo Basin's forest zone (15/km²). This has profound implications for the feasibility of land use planning, the intensity of enforcement needed, and the viability of alternative livelihood programs. In Ethiopia, deforestation is "desperation-driven"; in the Basin, it remains "opportunity-driven"—a window that may close as rural population grows.

State capacity and conflict: Ethiopia is a centralized state with strong administrative capacity in non-conflict zones but significant territorial gaps due to civil war. The Congo Basin comprises six countries with varying state capacities, from Gabon (strong, oil-financed) to CAR (fragile, conflict-affected) to DRC (weak, corrupt, but territorially intact). This variation suggests that region-wide policy recommendations must be adapted to national political contexts.

7.3 Limitations of the Current Evidence

Before proceeding to policy implications, significant evidence gaps should be acknowledged. First, both primary studies are weak on gender analysis. Given that women are primarily responsible for fuelwood collection and often manage household agricultural plots, deforestation drivers and policy responses are likely gender-differentiated. Neither Abbadiko (2016) nor Maniatis et al. (2025) systematically addresses this.

Second, the temporal lag between the Ethiopia study (2016) and the Congo Basin study (2025) limits strictly synchronous comparison. A decade has passed during which Ethiopia experienced civil war, political transition, and significant climate impacts. The literature that updates Ethiopia's forest status (Alemayehu et al., 2025; Shibabaw & Wondimneh, 2025) suggests continued but perhaps slowing deforestation, but a post-2020 comprehensive assessment remains unavailable.

Third, both studies primarily rely on secondary data and remote sensing. Field-based, participatory research that elicits farmer perspectives on why they clear forest—and what would induce them to stop—is surprisingly rare. Exceptions (e.g., Ababu et al., 2024; Seyoum & Tefera, 2025) suggest that local perceptions of driver importance sometimes diverge from remote sensing-based assessments. This gap matters for intervention design: policies that make sense to analysts may not resonate with the farmers whose behavior must change.

8. Policy Implications and Priority Interventions

8.1 Land Tenure Reform as Foundational

The most consistent finding across both studies is that insecure land tenure drives deforestation. The most urgent policy implication is: without tenure reform, other interventions will fail. However, tenure reform is politically difficult, legally complex, and fiscally expensive. Realistic sequencing is essential.

For Ethiopia, where land is constitutionally state-owned, the realistic reform is not privatization (politically impossible) but strengthening usufruct rights. This would mean: longer-term leases (e.g., 99 years instead of current 20-30), clear rules for intergenerational transfer, and—crucially—compensation for improvements if land is expropriated. The last element is most important for forest conservation: a farmer who plants trees must be assured of capturing their value. Ethiopia's current legal framework does not provide this assurance; amendment is feasible but politically contested.

For the Congo Basin, the priority is formal recognition of customary land rights. DRC's 2005 Land Law and 2014 Forest Code theoretically recognize customary rights, but implementing decrees have not been issued for key provisions. The result is legal ambiguity that favors concession-holders over communities. The specific reform needed is: clarify that customary rights—demonstrated through continuous occupation and use—constitute legal ownership unless formally extinguished through public process with community consent. This is not radical; it is standard practice in many common law countries (e.g., Canada's aboriginal title jurisprudence). Implementation would require a multi-year, donor-supported program of community land mapping and legal registration.

8.2 Energy Transition: From Charcoal to Clean Cooking

The charcoal problem is urgent, massive, and neglected. In both regions, hundreds of millions of people rely on biomass cooking. The annual health burden from indoor air pollution (respiratory disease, low birth weight, child pneumonia) is staggering—far exceeding the direct health impacts of deforestation. A transition to clean cooking (electric, biogas, ethanol, advanced biomass stoves) would deliver climate, forest, and health co-benefits.

The barrier is cost and infrastructure. Electric cooking requires grid electricity (unavailable in most rural areas) or solar home systems with battery storage (capital cost 500−1,000perhousehold—farbeyondruralpurchasingpower).LPGrequiresimportinfras

tructure,distributionnetworks,andongoingfuelcoststhat manyhouseholdscannotafford,particularlyduringpricesp ikes.Advancedbiomassstoves(e.g.,gasifierstovesthatpro ducesyngasandchar)aremoreefficientandlesspollutingth antraditionalthree−stonefires,buttheycost500−1,000per household—farbeyondruralpurchasingpower).LPGrequiresimportinf rastructure,distributionnetworks,andongoingfuelcoststh atmanyhouseholdscannotafford,particularlyduringprice spikes.Advancedbiomassstoves(e.g.,gasifierstovesthatp roducesyngasandchar)aremoreefficientandlesspolluting thantraditionalthree−stonefires,buttheycost30-100—a significant investment for subsistence households.

What would work? Subsidized distribution of improved stoves is expensive but has precedent (e.g., Ethiopia's now-defunct Mirt stove program). However, subsidies create dependency unless combined with local manufacturing capacity. A more sustainable model is carbon finance: clean cookstove projects generate carbon credits from verified emissions reductions (avoided charcoal use). Those credits can subsidize stove distribution. The challenge is that cookstove carbon credits have been controversial (additionality, leakage, monitoring difficulties), and prices are currently low ($2-5 per ton). Scaling this model requires both higher carbon prices and improved monitoring technology (e.g., IoT-enabled stoves that report usage remotely).

8.3 Agricultural Intensification with Forest Boundaries

Raising agricultural productivity on existing farmland is the classic "land sparing" strategy: if farmers produce more food per hectare, they need not clear new forest. However, empirical evidence on land sparing is mixed; in some contexts, higher yields induce expansion rather than sparing (the "rebound effect"). The difference depends on whether farmers face binding land constraints and whether output markets are integrated.

For Ethiopia's densely populated highlands, land constraints are binding—farmers cannot easily expand because all land is already claimed. In this context, intensification genuinely reduces pressure on remnant forests. The priority interventions are: extension services (improved seeds, fertilizer application, soil conservation), microcredit for input purchase, and post-harvest storage to reduce losses. These are not glamorous REDD+ activities, but they address the root cause of deforestation.

For the Congo Basin's low-density frontier, intensification alone may not reduce deforestation; if farmers can expand into unclaimed forest, higher yields may simply mean more output from cleared land. Therefore, intensification must be paired with *forest boundary enforcement*—demarcating areas where conversion is prohibited and enforcing that prohibition. This requires investment in: participatory land use planning at the landscape scale (100,000+ hectares), demarcation and patrolling of forest reserves, and satellite-based early warning systems that alert authorities to new clearing. The latter is technically feasible (Global Forest Watch already provides free data) but requires political will to act on alerts.

8.4 Realistic Financing: From 150BillionFantasiesto150BillionFantasiesto1 Billion Priorities

The CRGE's 150billion,20−yearfinancingrequirementisnotserious;Ethio piawillneverreceive,norproductivelyabsorb,thatleveloffun ding.Similarly,theCongoBasin′stheoreticalcarbonvalue(15 0billion,20−yearfinancingrequirementisnotserious;Ethiopi awillneverreceive,norproductivelyabsorb,thatleveloffundi ng.Similarly,theCongoBasin′stheoreticalcarbonvalue(55 billion annually) is irrelevant for budgeting because no mechanism will transfer that sum. What is needed is honest costing of a *minimal viable package* of interventions—the cheapest combination of policies that could meaningfully reduce deforestation.

For Ethiopia, a minimal viable package might cost 200−300millionannuallyforadecade—approximately2−3200−300millionannuallyforadecade—approximately2−350 million/year for mapping, legal aid, dispute resolution), (2) targeted agricultural extension in deforestation hotspots (80million/yearforfieldagents,demonstrationplots,inputsub sidies),(3)cookstovedistributionandfuelwoodalternatives(8 0million/yearforfieldagents,demonstrationplots,inputsubsi dies),(3)cookstovedistributionandfuelwoodalternatives(10 0 million/year for stoves, afforestation of woodlots, biogas digesters), and (4) forest monitoring and enforcement ($30 million/year for rangers, satellite systems, prosecutions). This package is not cheap, but it is within plausible donor and government financing if prioritized.

For the Congo Basin, costs would be higher due to larger geography and weaker state capacity. A minimal viable package might require 500−800millionannuallyacrossthesixcountries.Thelargestc omponentswouldbe:communitylandmappingandtenureregi stration(500−800millionannuallyacrossthesixcountries.Th elargestcomponentswouldbe:communitylandmappingandt enureregistration(200 million for a 5-year campaign), participatory land use planning in high-deforeation zones (150million),andruralelectrificationtoreducecharcoaldepen dence(150million),andruralelectrificationtoreducecharcoal dependence(300 million—though this also benefits health and development). Regional coordination (through COMIFAC) could reduce transaction costs, but implementation would remain national.

These cost estimates suggest that international climate finance—though currently inadequate—could cover a substantial share of minimal viable packages if reallocated from readiness activities (which have high transaction costs) to direct implementation. The policy implication is:

donors should shift from funding REDD+ readiness (planning, studies, stakeholder workshops) to funding on-the-ground implementation of land tenure, agriculture, and energy interventions. This shift is politically difficult because readiness activities are easier to disburse and monitor, but it is essential for impact.

9. Conclusion

9.1 Summary of Findings

This comparative review has reached three main conclusions. First, smallholder agriculture, charcoal production, and weak governance—not industrial logging—are the primary drivers of deforestation in both Ethiopia and the Congo Basin. This finding challenges policy frameworks that focus on certification, concession management, and supply chain due diligence while neglecting smallholder and artisanal drivers.

Second, land tenure insecurity is the most consistent underlying driver across regions. In Ethiopia (state ownership with weak usufruct rights) and the Congo Basin (dual customary-statutory systems with legal ambiguity), communities lack the secure, enforceable land rights needed to invest in forest conservation or exclude deforesters. Tenure reform is foundational; without it, other interventions will have limited impact.

Third, international climate finance—REDD+, CAFI, carbon markets—has underperformed due to slow disbursement, low carbon prices, and mismatch between funding and actual driver structures. The 5pertonreceivedbyGabonforverifiedREDD+reductionsdoesnotcoveropportunitycostsinhigh−deforestationzones.Aminimalviablepackageoftenure+agriculture+energyinterventionswouldrequire5pertonreceivedbyGabonforverifiedREDD+reductionsdoesnotcoveropportunitycostsinhigh−deforestationzones.Aminimalviablepackageoftenure+agriculture+energyinterventionswouldrequire200-800 million annually across both regions—substantial but small relative to carbon values or pledges.

9.2 Research Gaps and Future Directions

The review has identified several research gaps requiring attention. First, gender-differentiated driver analysis is absent from both primary studies. Given women's primary responsibility for fuelwood collection and household agriculture, understanding how deforestation drivers and policy responses differ by gender is essential for effective intervention. Future research should collect sex-disaggregated data on land use decisions, fuelwood collection patterns, and policy preferences.

Second, post-conflict forest dynamics in Ethiopia are poorly understood. The civil war (2020-2022) and ongoing regional conflicts have disrupted forest monitoring, displaced populations, and created conditions for opportunistic logging and charcoal production. Rapid assessment using high-resolution satellite imagery (Sentinel-2, Planet) could quantify war-related forest loss and inform post-conflict restoration priorities.

Third, rigorous impact evaluations of existing interventions are rare. Which approaches actually reduce deforestation? Participatory forest management (PFM) has been widely implemented in both regions, but Seyoum and Tefera's (2025) evaluation in Ethiopia is an exception; most PFM projects lack credible counterfactuals. Donors should require randomized controlled trials or quasi-experimental designs (e.g., matched difference-in-differences) as conditions of funding. Without credible impact evidence, the field will continue to cycle through fads rather than scaling what works.

Fourth, the charcoal sector remains systematically understudied. Data on production volumes, supply chains, prices, and employment are poor or non-existent in most Congo Basin countries. This is not accidental; the illegal or semi-legal status of charcoal production deters official data collection. However, better data are essential for designing transition policies. Future research should use mixed methods (remote sensing of kiln sites, trader interviews, household expenditure surveys) to characterize charcoal systems and model transition pathways.

9.3 Concluding Reflections

Reading Abbadiko (2016) and Maniatis et al. (2025) together—separated by a decade and focused on vastly different forest contexts—reveals a disturbing continuity. The same drivers (smallholder agriculture, charcoal, tenure insecurity) and governance failures (unfunded mandates, corruption, policy contradictions) appear in both papers, despite the decade between them and the geographic distance. This suggests that the essential problem is not technical (we do not know what causes deforestation) but political (we lack the will and capacity to address root causes).

The Congo Basin still has a window of opportunity—vast forest stocks remain, and population density is low. But the window is closing. Rural population growth, road expansion, and urbanization-driven charcoal demand are accelerating. Ethiopia's trajectory—from 40% forest cover to 3-11%—shows what happens when the window closes: degraded watersheds, erratic rainfall, chronic food insecurity, and the brutal arithmetic of desperation deforestation. The Basin's policymakers and donors should visit Ethiopia not as a conservation success story, but as a warning.

This paper has argued that three interventions—land tenure reform, energy transition to clean cooking, and agricultural intensification with forest boundaries—are the minimal viable package for slowing deforestation. These interventions are not easy, cheap, or politically uncontroversial. But they address the structural drivers that annual forest monitoring reports and REDD+ readiness workshops persistently ignore. The alternative—

continuing current policies while forests disappear—is easy, cheap (in the short term), and catastrophic. The choice is not between good and perfect; it is between uncomfortable action and comfortable failure.

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