CRITERION AFRICA PARTNERS

Gatsby Africa

# Lessons from 30 years of African commercial forestry investments and implications for the future

Prepared by

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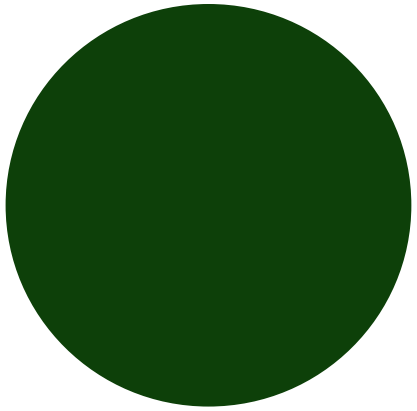
# Contents



# I. Executive Summary (1/3)

The coming decades are predicted to bring significant demographic, environmental and economic changes to the African continent. By 2050, it is projected that there will be 2 billion people living in Africa, half of whom will be found in the continent's rapidly growing cities. As populations grow, demand for wood, housing, food, energy, and jobs will grow with them, increasing pressure on existing natural resources, economies, and infrastructure. **Sustainable planted forests could play a critical role in meeting these demands, driving Africa's economic development while simultaneously making a significant contribution to mitigating climate change.**

Increases in regional and global demand present an opportunity to expand Sub-Saharan Africa's sustainable planted forests. Globally, demand for wood is projected to rise by 36% by 2050. Meeting this demand will require an additional 33 million hectares of sustainable planted forests. While Sub-Saharan Africa is predicted to produce a surplus of wood, production is currently unable to reach higher value markets.

There is an opportunity for Sub-Saharan Africa to meet these demands by industrialising its processing capacity, accessing more diversified and secure markets, increasing investment returns, and attracting new sources of capital as a result. The potential impacts of this are widespread, enabling sustainable planted forests to play a crucial role in decarbonising its downstream industries such as the regions rapidly growing construction sector, a sector which globally accounts for 39% of emissions, while providing alternative sustainable sources of wood supply to high employment sectors such as furniture and joinery.

Expansion of sustainable planted forests could also help meet Sub-Saharan Africa's growing demand for fuelwood and charcoal, while also reducing pressure on natural forests. Demand reached 652 million $m^3$ in 2020, a total exceeding North America's industrial roundwood consumption, while emissions from charcoal alone produced an estimated 370 million $tCO_2e$, equivalent to more than a third of Sub-Saharan Africa's (excluding South Africa's) emissions in 2022. Coupled with more efficient charcoal production technologies, planted forests present an opportunity to reduce emissions, while limiting deforestation.

Over the last 30 years significant investments have been made in developing new sustainable planted forests to try and realise the sector's potential. However, so far, commercial investments have largely underperformed, resulting in a significant loss of investor capital. In this study, Gatsby Africa and Criterion Africa Partners investigate the drivers of underperformance. Focusing on both industrial scale and smallholder forestry, we draw out key lessons and their implications for the next generation of investors, development actors and governments.

**Key findings**

**Early investments in Sub-Saharan Africa focused on developing industrial-scale planted forests, with limited investment in industrial assets.** The 1970s saw donor organisations make initial investments into industrial-scale planted forests, followed by commercial investors in the 1990s and 2000s. Since 1990, $1.4 billion has been invested to establish 190,000 hectares across 7 countries, amounting to an estimated average cost of $6,437/hectare, ranging from $9,615 to $2,667 across projects. Despite these efforts, the sector remains nascent, and the value chain remains undeveloped.

Comparing Sub-Saharan Africa to the more advanced sectors of South Africa and Asia shows the importance of industrial development and market access. In Asia, DFIs and commercial investors have directed investment toward industrial processing and value addition, in turn creating market signals stimulating smallholder investment in planting and roundwood production. Growth in smallholder forestry in Asia was also underpinned by the structure of the Asian economy, in particular its large consumer base and a presence of merchants and traders historically involved in international trade and markets.

In Sub-Saharan Africa, only 11% of capital deployed has focused on downstream processing opportunities, leaving routes to market underdeveloped, and confining producers to lower-value markets.

# I. Executive Summary (2/3)

**Industrial scale greenfield investments in Sub-Saharan Africa have not met upfront expectations,** and the sector as a whole continues to struggle with structural issues. However, data analysis and key informant interviews also uncovered a range of recurring challenges faced by investors:

1. Inexperienced project sponsors and management teams
2. Technical challenges with the development of forestry assets
3. Limited development of viable routes to market and industrial processing assets
4. Enabling environment challenges, from export restrictions to issues with licence to operate
5. Misaligned capital structure and investor expectations
6. High cost of capital combined with currency depreciation

**Smallholder production in Sub-Saharan Africa has potential but remains largely disconnected from industrial value chains.** Like industrial scale sustainable planted forests, smallholders have also faced market access challenges, confined to low quality, low-value markets, often working with informal offtakers, or planting trees for subsistence uses. However, several countries have successfully linked smallholders to industrial operations through out-grower arrangements, both supplementing industrial plantations and unlocking access to higher value markets. Although more complex, if smallholders can be linked to industrial markets, they may offer a more cost-effective supply base.

To successfully navigate the complexity of smallholder production, four factors need to be in place: clear ownership, technical knowledge, clear access to markets, and an enabling regulatory environment. In Sub-Saharan Africa, clear access to conducive markets is the critical constraint.

**Opportunities for action**

**To unlock the next phase of growth, industrial processing and secure regional and international offtake markets will be critical.** The last 30 years of commercial forestry investment in Sub-Saharan forestry has been challenging. But while there have been losses, some firms are on a path to profitability. New funds are being established by DFI's, and a range of financial and blue-chip companies are increasingly seeking carbon-based investments in the region.

Looking at the past 30 years, our research demonstrates that for these to succeed, there needs to be a focus on industrial processing with clear offtake markets secured, deepening access to higher value international markets using ESG compliance as a differentiator, and unlocking demand for high quality timber products in place of imports and non-timber substitutes. It is our view that commercial investors should prioritise brownfield opportunities to catalyse such industrialisation.

**Industrial scale forestry and processing**

For greenfield investors, research highlighted several high-impact areas:

- **Recruiting experienced operators** can ensure effective decision making and execution at all stages of investment
- **Recognising significant patient and concessional finance** will play a crucial role in achieve realistic returns
- **Implementing effective community engagement** will play a crucial role securing social licence to operate
- **Considering the opportunities for smallholders** to play a meaningful role in the value chain could give investors an opportunity to potentially reduce costs and further support their social licence to operate

# I. Executive Summary (3/3)

**Smallholder production**

To support smallholder expansion, research suggested a focus on the following areas:

- **Accessing diversified whole tree markets** will play a crucial role in the development of smallholder production systems. Building on this, processing and product options should be selected considering the needs of smallholders. For example, veneer producers can offer an offtake for short rotation production, while woodchip and sustainable charcoal offer potential value addition for a larger proportion of the tree. These markets can support smallholders by providing increased flexibility in rotation period and silviculture, allowing farmers to decide when to monetise their trees.
- **Developing new service delivery models,** although still underdeveloped within the sector, have the potential to further enable smallholder investments, from extension to offtake aggregation.

**Carbon revenues can increase the competitiveness of forestry investments**

And finally, to realise the potential presented by carbon finance, our research suggested a focus on the following:

- **Supporting access to carbon finance** has the potential to subsidise an estimated 20% or more of greenfield establishment costs and could fund the majority of smallholder establishment costs, creating an opportunity to improve the investment case of both.
- **Developing new carbon methodologies** could play a crucial role in unlocking downstream market opportunities. If carbon credits can be generated from increased use of timber in green buildings it can bolster price competitiveness relative to traditional materials (e.g., cement, steel); for example, integrating timber into a Kenyan mid-rise building could offer upwards of 40% lower embodied emissions relative to traditional construction methods. Carbon finance could also play an important role in making sustainable charcoal production economically viable.
- **Developing a suitable carbon regulatory environment** will be required for such carbon finance opportunities to be realised, enabling project developers to realise appropriate value for the projects, recognising carbon finance in the forestry context is more of a subsidy rather than a financial windfall.

# II. Introduction

# Historical and prospective insights into the transformation of the commercial forestry sector in Africa

**Criterion Africa Partners ("CAP")** is an independently owned private equity firm investing across the forestry value chain in Sub-Saharan Africa since 2010. The firm advises two funds with assets of US$275 million from institutional investors including prominent European Developmental Finance Institutions and Multilateral Development Banks. The CAP team has been involved in Sub-Saharan Africa's forestry sector since 2010 and has invested in a portfolio of approximately 200,000 ha of plantation and related conservation lands, 550,000 ha of tropical forest concessions and several downstream industrial assets.

**Gatsby Africa** is a private foundation focused on transforming sectors with real opportunity for widespread impact. They focus on high potential and labour-intensive sectors, providing targeted assistance and helping to drive rapid growth that is competitive, inclusive, and resilient. Gatsby Africa considers the Commercial Forestry sector in East Africa to have enormous potential for growth and value addition. Gatsby Africa employs a systems approach to industry development. Areas of intervention include: working with industry in pre-competitive areas of research and development; providing innovation financing to entrepreneurs in the sector; unlocking public-private partnership opportunities and necessary structural reforms in the sector.

Recognising their complementary specialisms in commercial forestry development in Sub-Saharan Africa as well as their shared objectives for this research, CAP and Gatsby Africa have collaborated on this paper.

***Objectives for this paper:***

The study aims to derive a key set of lessons from commercial forestry investments in Africa over the last 30 years, and to provide for sector transformation through recommendations for future investments, as well as high-level industrial policy.

The objective is to show how DFI and non-DFI backed investments can catalyse broader sector transformation, and to address the main challenges that have been faced in the African commercial forestry sector over the last 30 years. These insights are both historical and prospective. They examine a) how a range of investments have played out (including public-backed, private-backed, and new era DFI investments) and b) how to provide pioneering investment going forward, scaling up smallholder forestry activity and creating routes to high value markets.

We believe this study will be a valuable resource for showing investors what good forestry investments may look like, and for guiding donors, development partners, and governments toward appropriate focuses likely to help transform Sub-Saharan Africa's commercial forestry sectors (excluding South Africa).

# The three main components of the methodology were: reviewing CAP data and existing papers, and conducting interviews

## 1 Reviewing proprietary data from CAP

- The datasets leverage CAP's history in the forestry investment sector since 2010.
- CAP has aggregated data from its own market research and from its portfolio on past investments between 1993 and 2022.
- The data includes investment amounts, investor base, level of industrialisation, financials, species mix, growth rates and age class profile, capital structure and indicative carbon stock analysis of individual projects.
- CAP's data includes the relevant investments made from its own funds including Global Woods (Uganda), KVTC (Tanzania) and SFI / Form Ghana (Ghana).
- In addition to reviewing the data, the CAP team have been interviewed on past investments and on key lessons learnt.
- CAP has also shared their presentation on past investments, the role of carbon finance and market related data on the global and African forestry sector.
- CAP has also supported financial modeling to understand the carbon impact of past projects and precedent valuations in the sector.

## 2 Desktop review of existing papers

- Desktop review of existing literature on forestry projects in Africa (parastatal and privately owned) and carbon projects
- The following key public research materials have been reviewed in relation to lessons learnt from the history of commercial forestry:
  i. FAO papers including the state of the World's Forest 2020-2022;
  ii. Lessons learnt on sustainable forest management (Chamshama and Nwonwu, 2004);
  iii. Financing of sustainable forest management in Africa (P. Gondo, 2010);
  iv. Towards large-scale commercial investment in Africa forestry by WWF and AfDB (2019)
  v. World Bank's report on forestry sector in Mozambique (2019);
  vi. Assessing the investment climate in the planted forest in Mozambique (Stellenbosch University, 2005).
- In relation to carbon finance, public documents from Verra (carbon standard in the voluntary carbon market) have also been reviewed.

## 3 Interviews with various stakeholders

- The following key stakeholders have been interviewed to understand key challenges and lessons learnt from the history of commercial forestry projects:
  - *Sponsors:* Key sponsors of some of the projects who understand how projects were conceived, and their initial financing and challenges.
  - *Management:* Current and past CEOs of forestry companies who have also provided outlook on market and the role of carbon finance.
  - *DFIs:* A number of DFIs who are active investors in the sector including current and past investment professionals.
  - *Non-DFI investors*: Non-DFI Investors including individuals, family offices and impact investors provided a large portion of financing during the historical period (1993-2022).
- Output from the interviews has been aggregated to understand key lessons learnt and to devise an investor framework.

# The smallholder forestry diagnosis and analysis involved a similar methodology, but more qualitative data was available

## 1 Review proprietary data from CAP and Gatsby

- CAP shared proprietary resources on current visions for smallholder plantation development in Africa and a model for strengthening Africa's wood supply via the integration of SME suppliers.
- Gatsby shared proprietary reports on a Gatsby-funded tree growers' associations initiative, the organization's assessment of feasible wood processing investment facilitation mechanisms in Africa, and other documents of relevance within the Gatsby Forestry portfolio.
- Data from Gatsby also included carbon models and analyses.
- In addition to reviewing the data, the Gatsby team have been interviewed on their vision for commercial forestry sector transformation in EA including smallholder opportunities in Africa, investments to date, and key lessons learnt.

## 2 Desktop review of existing papers

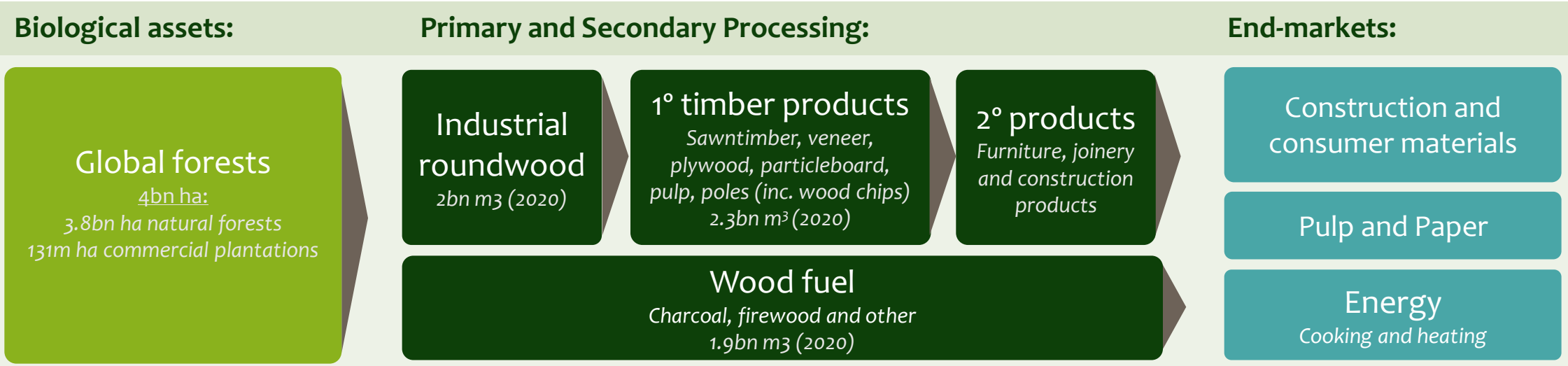
- Desktop review existing literature on smallholder forestry projects in Africa (research papers, articles and case studies on existing projects in Africa and Asia).
- The following key publications have been reviewed in relation to lessons learnt for smallholder forestry:
  i. FAO papers including the state of the World's Forest 2020-2022
  ii. CAP and Indufor paper on Allocating Capital for Maximum Impact in Africa's Plantation Forestry Sector (2017)
  iii. Byron's four keys to Smallholder Forestry (2001)
  iv. Midgley et al., papers on smallholder forestry (2017, 2018, and 2022)
- As well as the above listed documents, we also reviewed case studies from specific projects across Africa and Asia. These studies are used to draw out information, qualitative and quantitative, to make comparisons between the two regions, identify key differences and expected challenges to achieving smallholder forestry in Africa, when compared to Asia.

## 3 Interviews with various stakeholders

- The following key stakeholders have been interviewed to understand key challenges and lessons learnt with respect to smallholder forestry:
  - *Leading development consultants/service providers:* Pioneers of smallholder plantation development research and technical assistance in Africa and Asia to understand learnings on constraints, incentives (including different models of SME producer engagement) and success factors. These interviews were used to demonstrate findings within specific contexts – showing comparisons between African and Asian smallholder plantation development.
  - *Inclusive forestry businesses:* Key sponsors of some of the projects to understand project conception, initial financing (including funding mechanism and key actors), theories and visions for smallholder plantation development in Africa, and reflections from progress to date, especially regarding challenges faced.
- Output from the interviews has been aggregated to summarise smallholder forestry models being adopted, different archetypes of these models, and key lessons learnt.

# III. Context and overall framing

# Commercial forestry has an important role to play in meeting climate change targets, whilst generating jobs and providing other social and economic benefits




**Job creation:**

| Nursery and forest operators, managers and administrators | *Harvesting and transport operators, fuelwood traders* | *Processing plant production and maintenance* | *Transport operators, traders and distributors* |
|---|---|---|---|

## Extended Climate Change Mitigation Impact

(forests sequester $CO^2$ + forest products store $CO^2$ )

- Trees and forests are a major means for combating climate change. Despite a continued reduction in area, forests absorbed more carbon than they emitted in 2011-2020 due to reforestation, improved forest management and other factors.
- Forests produce more than 5,000 types of wood-based products and generate an annual gross value add of just over $600 billion, about 1% of global GDP.

- Forests also contribute to direct and indirect job creation through the establishment and maintenance of forestry assets and provide other economic benefits.
  - Over 1.6 billion people's livelihoods depend on forests for timber, food, fuel, jobs and shelter.
  - Value-addition opportunities created to produce higher value products that can drive economic benefits for local consumption (import substitution) and exports.

Source: Adapted from BII.co.uk by Wellspring

# Three interrelated pathways give commercial forestry high emission mitigation potential when compared with alternatives

- Between 2010-2019, Agriculture, Forestry and Other Land Use (AFOLU), along with food processing, account for an estimated **12-21%** of total anthropogenic greenhouse gases (GHG) emitted globally. However, this is more than counterbalanced by managed and natural terrestrial ecosystems which had the opposite effect, absorbing around **one third** of anthropogenic $CO^2$ emissions.
- According to the FAO (2022) there are three interrelated pathways involving forests and trees that position them uniquely to support economic development and environmental recovery. Simply put, the FAO found that forests likely hold the highest emission mitigation potential compared with other land mitigation options:

1

**Reducing deforestation reducing deforestation/ degradation** through creating increased supply of wood and reducing pressure on natural forests. This could avoid the emission of 3.6 +/- 2 gigatons of carbon dioxide equivalent ($GttCO^2e$ ) per year between 2020 and 2050, including 14% of global mitigation needed to achieve 1.5/ 2°C targets set by the IPCC, while safeguarding more than half the world's land-based biodiversity.

2

**Restoring degraded lands** through sustainable productive forests, afforestation and reforestation (of plantations and natural forests) and smallholder forestry systems, including agroforestry. This could cost-effectively take 0.9-1.5 GtCO2e per year out of the atmosphere between 2020 and 2050. 1.5 billion ha of degraded land would benefit from restoration, and increasing tree cover into agroforestry systems could boost agricultural productivity on another 1 billion ha.

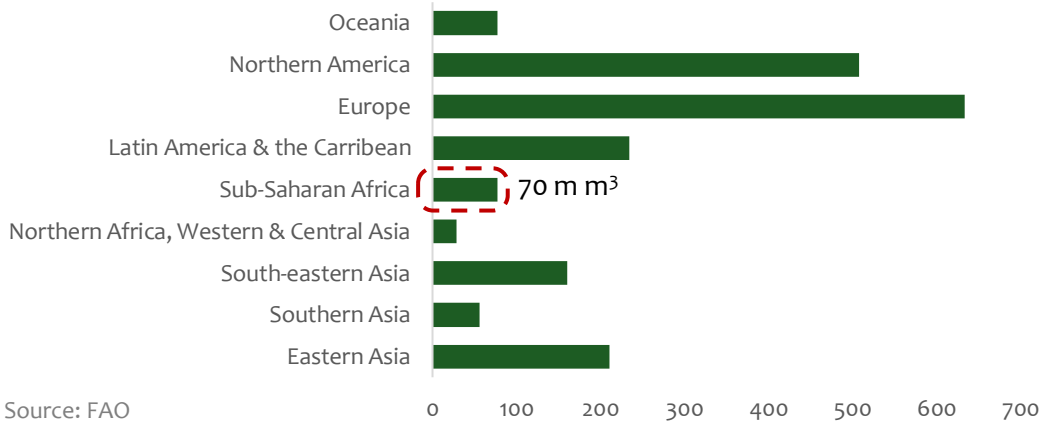
3

**Sustainably using forests and building green value chains** would help to meet future demand for materials, where timber construction materials (e.g. cross-laminated timber, with captured $CO^2$ storage) could be substituted for non-renewable, traditional building materials such as steel and concrete. Retrofitting and decarbonising buildings could see a significant savings of $2tCO^2e$ per $m^3$ as the construction sector contributes ~39% of all global emissions.

- Additional **emission reduction and carbon removal approaches** provided by forests include **i) moving away from inefficient and polluting fuelwood usage, such as charcoal;** wood-based transmission poles also offer a sustainable alternative to concrete and steel poles and support electrification in rural areas, thereby mitigating charcoal use, and **ii) biomass carbon removal and storage (including biochar).**
- The following enabling factors would contribute to positive outcomes from these solutions:
  - FSC certification ensures adherence to strict environmental, social, and economic standards.
  - The global carbon credit market is valued at $2bn with 280m carbon credits issued in 2022. It is anticipated to grow 5x to $10bn by 2030 as companies (e.g. blue-chip multinationals) see carbon mitigation and adaptation as a non-discretionary spend included in their climate strategy.
  - SME producers and local communities are crucial for scaling up production in line with the three pathways, and the carbon and impact case are strengthened through inclusion of smallholder and outgrower schemes (with potential revenue share from carbon credits).

# Sub-Saharan Africa remains a small player in global roundwood production, which is dominated by Europe, North America, and Asia (SSA produces 3% while Europe and North America produce 60% of 2.3 billion m³)

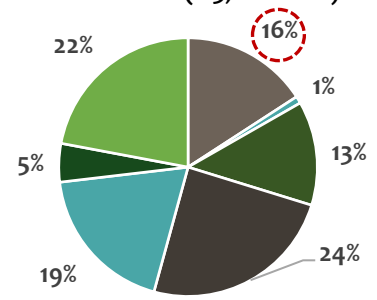
## Production of roundwood in 2020 by region (m m³)



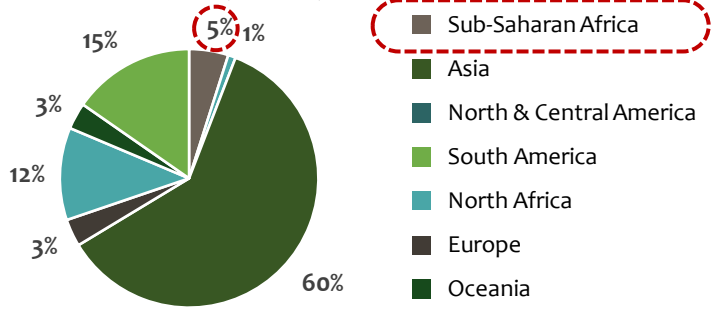

Source: FAO

## Regional breakdown of natural forests and planted forests (FAO 2020)

**Natural Forests (c.3,800m ha):**



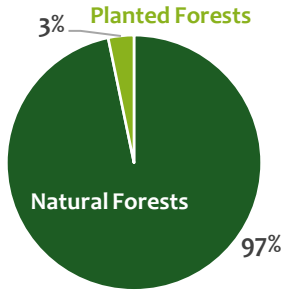

**Plantation Forests (131m ha):**



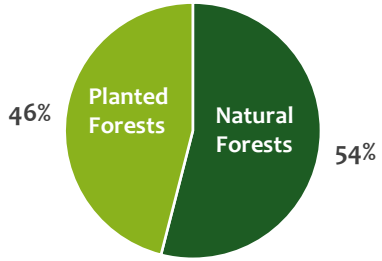

Source: FAO

## Global forestry snapshot and source of industrial roundwood (FAO 2020)

**Global Forests: c.4,000m ha:**




**Source of Industrial Roundwood:**
*FY2020 production of 2bn m³*




Source: FAO

- Global production of industrial roundwood in 2020 was 2 billion m³ with key producing areas being Europe and Northern America (60% of production).
  - 46% was sourced from plantation forests (3% of overall forest area)
- Global plantation forestry productivity is low due to poor productivity levels in Asia (accounts for 60% of plantation forests).
- In Sub-Saharan Africa, plantation forests make up only 5% of the global 131m ha, however natural tree cover in Africa is a much higher 16% of the total global natural forests, more than Asia (13%).

# While consumption of industrial wood products has been highest in East Asia, Sub-Saharan Africa leads the demand for fuelwood which results in significant deforestation and landscape conversion

**Regional consumption of wood products in 2020**

| Region | 2020 (%) – 2.3bn RWE* $m^3$ | RWE* millions $m^3$ |
|---|---|---|
| North America | 23% | 529 |
| Europe | 24% | 552 |
| **Eastern Asia** | **35%** | **805** |
| Southern Asia | 3% | 69 |
| South-Eastern Asia | 4% | 92 |
| Northern Africa, Western and Central Asia | 5% | 115 |
| **Sub-Saharan Africa** | **1%** | **23** |
| Latin America and Caribbean | 4% | 92 |
| Oceania | 1% | 23 |

Source: FAO Global forest sector outlook by 2050 (published in 2022); 'RWE' is Round Wood Equivalent

- The main consumption regions in 2020 of **round-wood equivalent (RWE)** have been Eastern Asia (e.g. China), Europe and Northern America which account for 82% of global consumption. Sub-Saharan African only accounts for 1% of global consumption.

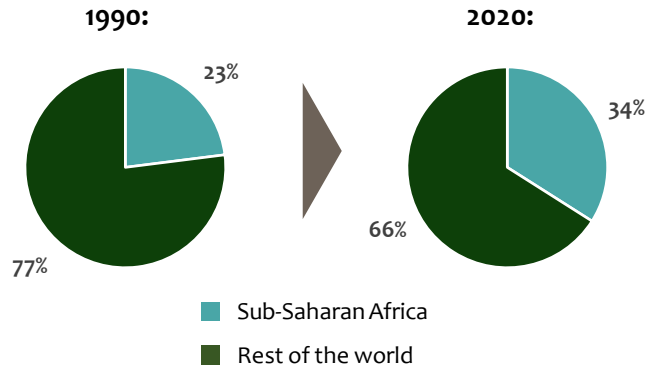
**Regional consumption of wood fuel by region in 1990 and 2020 (millions $m^3$)**

| Region | 2020 | Growth ('90 – '20) | CAGR ('90 – '20) |
|---|---|---|---|
| Eastern Asia | 171 | (42.0)% | (1.8)% |
| Southern Asia | 377 | 8.6% | 0.3% |
| South-Eastern Asia | 142 | (41.5)% | (1.8)% |
| Northern Africa, Western and Central Asia | 76 | 84.0% | 2.1% |
| **Sub-Saharan Africa** | **652** | **58.1%** | **1.5%** |
| Latin America and Caribbean | 229 | 13.5% | 0.4% |
| Europe | 170 | 8.4% | 0.3% |
| Northern America | 101 | (17.9)% | (0.7)% |
| Oceania | 10 | 6.4% | 0.2% |
| **Total** | **1,928** | **5%** | **0.2%** |

Source: FAO

- Based on FAO data, global consumption of **fuelwood** has increased by 100m $m^3$ between 1990 and 2020. This growth has been driven by the usage of wood fuel as a primary source of energy for cooking and heating in Africa and Southern Asia.
- Some regions have experienced decline in fuel wood consumption (e.g. China and Southeastern Asia) due to growth in alternative energy sources and urbanisation.

**Sub-Saharan Africa's share of wood fuel consumption (1990 vs. 2020)**

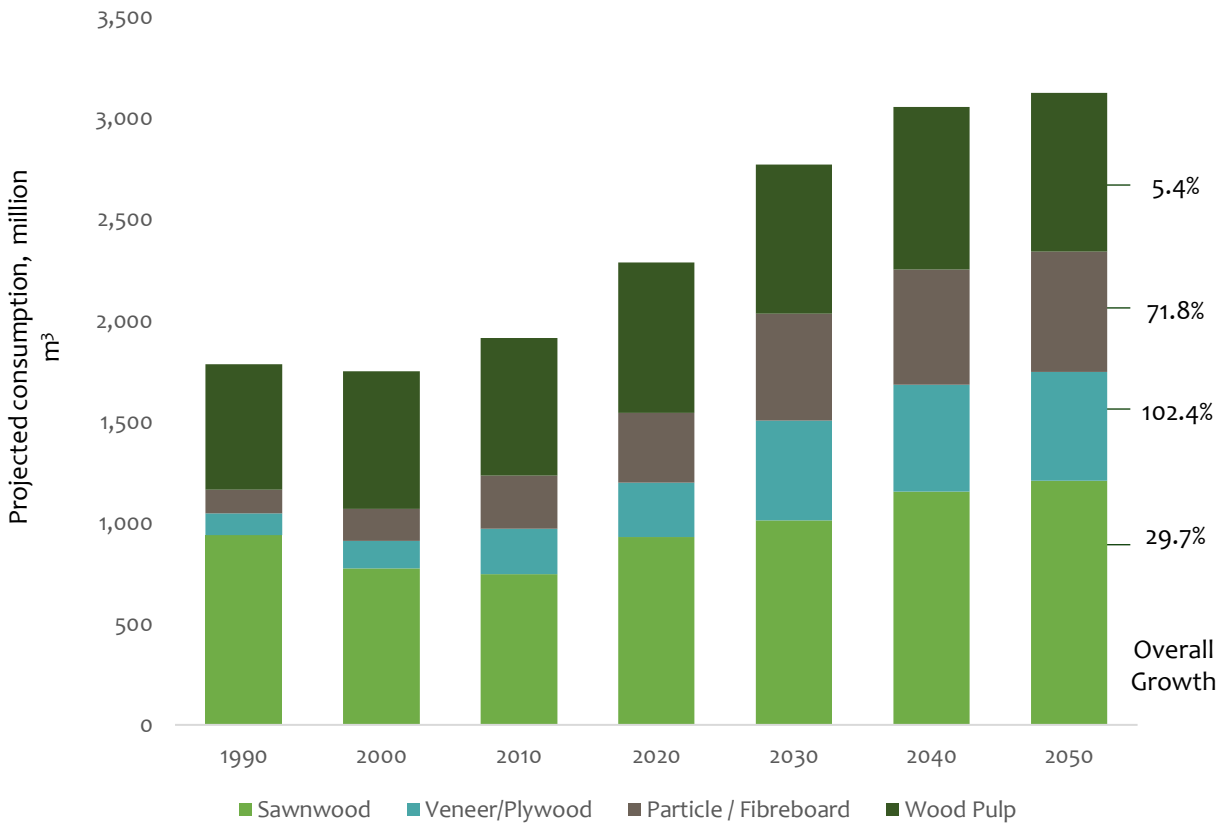



Source: FAO

- In 2020, around **2.3bn people depended on wood fuel** (e.g. charcoal) as their key source of energy for cooking and heating.
- The key long-term drivers of fuel wood consumption:
  i. long-term consumption trends of charcoal in Sub-Saharan Africa and Southern Asia
  ii. the usage of green fuelwood or biomass to generate renewable energy (e.g. wood chips)
- Fuel wood consumption in Africa is linked to significant deforestation and conversion of woodlands to agriculture.

# Global consumption levels of industrial roundwood is projected to grow around 36% by 2050. Furthermore, SSA fuelwood consumption is expected to grow 20-40%

**Global projected consumption of RWE wood products (2020—2050)**



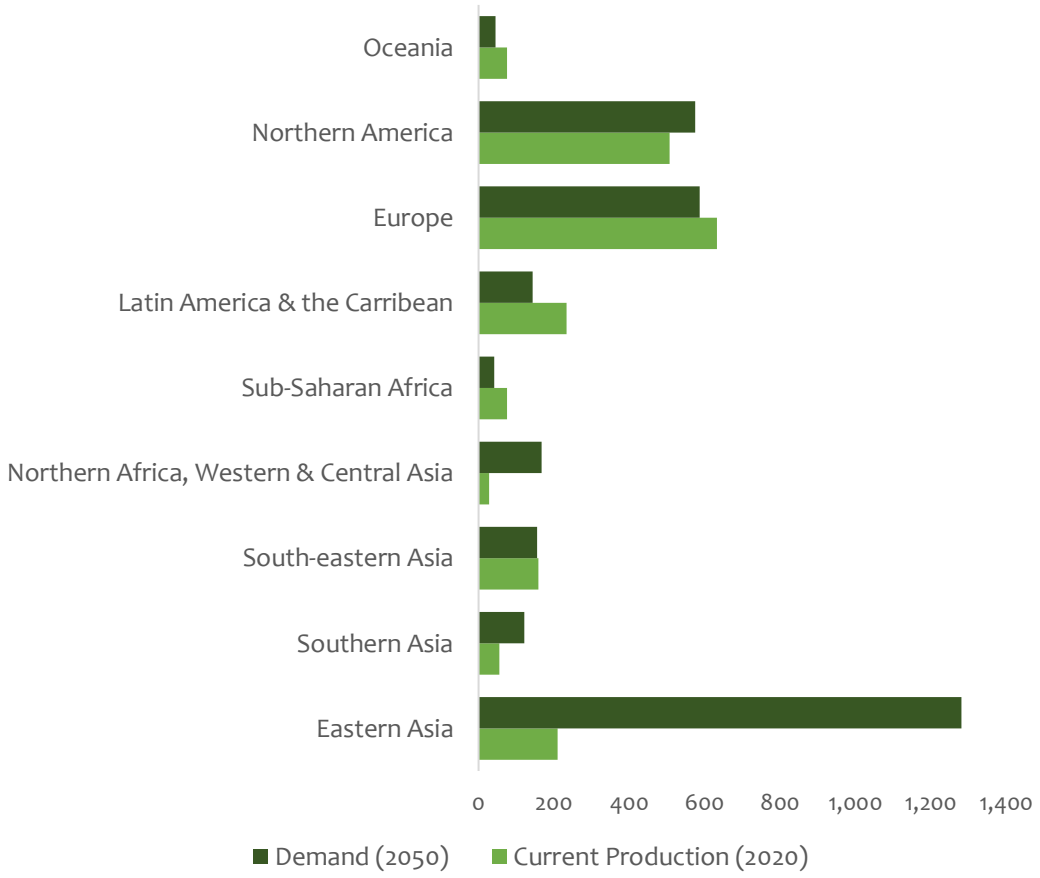

Source: FAO

- According to FAO, global consumption of **industrial RWE** may increase at a CAGR of 1.0% or overall growth of 36.6%, driven by demand for wood-based panels such as veneer, plywood, and particle / fibreboard in the construction sector and consumer products.
  - This growth would be in-line with a historical CAGR of 0.8% (1990-2020).
- The projections for 2020-2050 highlight a **positive demand for sawnwood**, which is largely used to create standard boards for the construction sector. A desire to find substitutions for sawnwood has also driven the growth in wood-based panels (e.g. veneer/plywood).
- Wood consumption in Sub-Saharan Africa is forecasted to grow at a CAGR of 1.1%: from 31m $m^3$ in 2020 to 43m $m^3$ in 2050 driven by demand for veneer and particle / fibreboard.
- Based on FAO, scenarios for global **fuelwood** consumption in 2050 may be between 2.3bn and 2.7bn $m^3$ from 1.9bn in 2020. In Sub-Saharan Africa, this could range from 631m in 2020 to 921m $m^3$ by 2050. This implies an annual CAGR of 0.6-1.1%, or 20 – 40% overall growth between 2020 to 2050: higher than the historical CAGR of 0.2% or 5% overall between 1990-2020.

**The key drivers of fuelwood consumption trends** will be government energy and environmental policies, access to electrification in rural areas, urbanisation trends, and an expansion of agriculture land that will limit the ongoing availability of fuelwood.

# Global production levels of industrial roundwood must increase by 55% to meet demand in 2050, and will require an additional 33m hectares of plantations, based on FAO projections

**Projected demand in 2050 vs. production in 2020 by region (roundwood m m³ )**




Source: FAO

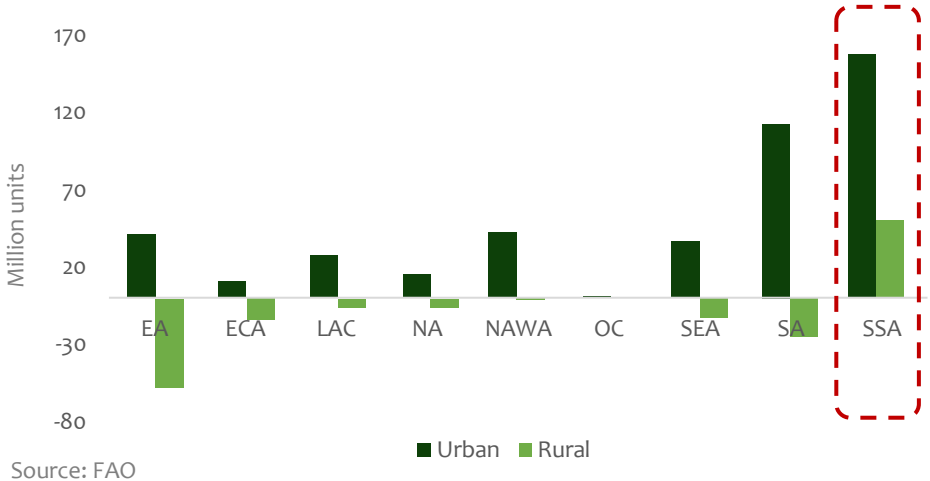
- Going forward, FAO forecasts that by 2050 **Asian countries will account for 50% of overall wood consumption** as driven by: increases in GDP per capita, consumer urbanisation trends, and the growth in construction.
- FAO forecasts that the share in industrial wood-based consumption will remain the same for Sub-Saharan Africa at 1% of global consumption from 2020 to 2050.
- **SSA is forecasted to be in surplus in 2050 based on the current production of industrial roundwood (77m m³) vs the projected demand in 2050 (43m m³).**
- In order to meet the projected demand for 3.1 billion m³ of industrial wood product in 2050, production would need to increase by 55% or 1.1 billion m³.

**FAO and others estimate that 33m ha of highly productive and commercial plantations would need to be established to meet future demand. Sub-Saharan Africa has high potential to meet this shortfall through new plantations (e.g. on degraded land, on smallholder plots, and / or by expanding large-scale plantations). The conditions as of 2023 were:**

- Natural forests are already at capacity, and the risk of deforestation (for charcoal, agriculture, and other land uses) as well as potential restrictive policies in Europe may lead to a further decrease of natural forests as a source of industrial roundwood.
- There is potential for some demand to be met by wood residues and waste products, and by improving productivity of existing forestry projects.

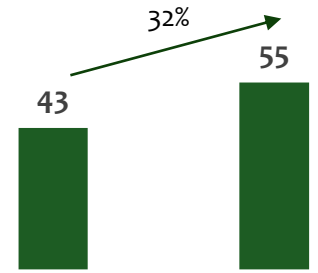
# Increased innovations in building with sustainable timber will meet global urban housing needs, increase industrial wood consumption in Sub-Saharan Africa, and generate positive environmental impacts

## Sub-Saharan Africa may require 160m of urban units by 2050 to meet the deficit




Source: FAO

## Scenario: Wood consumption in Sub-Saharan Africa may increase by 32% on an annual basis in a scenario where 20% of housing needs are met using mass timber in 2050




**Consumption of sawnwood, veneer, and plywood (RWE million m³) in 2050**

Based on FAO inputs, assuming a 20% share of new urban housing in 2050 in Sub-Saharan Africa is built using mass timber and implied raw material components (veneer, plywood and sawn timber).

Source: FAO

## Key Takeaways

- One of the key drivers of growth in wood consumption in China is that 40% of primary wood product consumption (excluding pulp) is used in the construction sector.
  - Since 2015, the Chinese government has been promoting timber as a viable alternative to conventional steel and concrete in high-rise buildings.
- The construction benefits of mass timber include its light-weight nature (improving ease of logistics and transportation costs), strong structure, fire resistance and energy efficiency.
- FAO forecasts that there will be a demand of 460m units between 2020 and 2050 (of which Sub-Saharan Africa will account for 35%) as driven by the urbanization of 800m people into cities by 2050.
- In contrast to China, the usage of mass timber in Sub-Saharan Africa is not related to a reliance on concrete and steel raw materials. Wood consumption in Sub-Saharan Africa is typically only used for roof trusses and / or ancillary construction materials.
  - Mass timber is a new technology but there a few projects in the region have already used the product (in South Africa and Tanzania).
- The key challenges of adopting mass timber in Sub-Saharan Africa are: the lack of industrialisation (associated with an availability of raw materials and finished components); the lack of market awareness; the lack of building standards and regulations; the limited execution capabilities and expertise of construction and real estate developers.

**If 20% of Sub-Saharan Africa's annual housing needs in 2050 have been replaced by mass timber, industrial round wood consumption needs will have increased by 32% annually.**

- Assuming 2t CO2 carbon savings per m3 of mass timber, (Verkerk et al.) the potential carbon savings could be c.100m CO2t annually by substituting 20% of housing needs to mass timber vs. concrete and steel.

# On two conditions, forestry could be the highest land-based mitigation solution by 2050: if unsustainable charcoal and biomass is halted and if demand for sustainable timber increases significantly

Commercial forestry has a role to play across pathways 2 and 3. Sustainable biomass / charcoal has the most significant potential for halting deforestation / degradation. To have a chance of meeting climate targets at 1.5 / 2 degrees set by the IPCC, future demand for sustainable timber must increase significantly. The underlying activities and outcomes required to achieve the 3 impact objectives are illustrated below:

| | 1 | 2 | 3 |
|---|---|---|---|
| **Impact** | **Halting deforestation and maintaining forests** could prevent the emission of 3.6 +/- 2 gigatons of carbon dioxide equivalent (GttCO²e ) per year between 2020 and 2050. This includes 14% of global mitigation needed to achieve 1.5 / 2°C targets set by the IPCC, while safeguarding more than half the world's land-based biodiversity. | **Restoring degraded lands and expanding agroforestry** through afforestation and reforestation (of plantations and natural forests) could cost-effectively take 0.9-1.5 GtCO2e per year out of the atmosphere between 2020 and 2050. | **Sustainably using forests and building green value chains** would help to meet future demand for materials. Retrofitting and decarbonising buildings could see a significant savings of 2tCO²e per m³ since the construction sector contributes ~39% of all global emissions. |
| **Outcomes** | Increased sustainable biomass/ charcoal activities | Increased tree cover in 1 billion ha of agricultural land to boost agricultural activity.<br>Restoration of 1.5 billion ha of degraded land. | Timber construction materials substituted for non-renewable, traditional building materials; wooden utility poles instead of concrete. |
| **Activities** | Substitute unsustainable charcoal causing deforestation for sustainable biomass / charcoal | Expansion of large-scale industrial plantations (on degraded land, brownfield or greenfield plantations) and smallholder plantations. Total required by 2050 is around 33m ha. Can increase growth of indigenous timber share. | |
| | Utilisation of carbon credit incentives for greenfield commercial forestry activities during the first rotation to improve the risk / return profile. For example, greenfield projects could generate a total carbon sequestration of c.17m t / CO2 and cover c.20% of investment cost to date (see section VI). | | |

# The evolution of the commercial forestry sector followed separate development pathways in East and Southeast Asia, South Africa and Sub-Saharan Africa*

## East and Southeast Asia

**Commercial forestry in East and Southeast Asia was driven by colonial industry in the 1900s.** SME tree growing has surpassed industrial plantations. This is due to changes in policy and a pull in market demand bolstered by a large consumer base.

**Types of investor:**

- Colonial governments were the first investors in forestry in East Asia, providing financial and technological support to plantations.
- Since then, most investments are privately funded, small to large scale commercial projects. However, some well-known development-finance backed investments exist (e.g. Sida, Bai Bang).

**Industrial plantations:**

- Industrial plantations began in the early 1900s 'capitalist' era, when tropical tree-crop commodities like tea, rubber, and oil palm were being grown for export.
- Colonial governments enabled the growth of plantations in Colonised East Asia by distorting policies in an attempt to facilitate access to cheap labour and land.

**Smallholder plantations:**

- In the mid-to-late 20th century, national policies, economic structures, and land ownership shifted in favour of smallholder plantations, which surpassed industrial plantations in the production of perennial crops.

## South Africa

**South Africa's industrial journey started in the 1800s.** Development of the sector was driven by the establishment of forest reserves to counter the depletion of natural forests. Today, smallholder forestry is working sustainably and at scale.

**Types of investors:**

- Private sector investments have largely driven the success of plantation forestry and downstream processing in South Africa (supported by the emergence of the domestic pulp and paper industry).
- Government policies have been implemented to facilitate investments (particularly foreign) in the South African forestry sector.

**Industrial plantations:**

- The emergence of the pulp and paper industry was a key driving force for the sector led by Sappi (1936) and Mondi (1967), both of which are global players today.
- Post WW2, neighbouring Eswatini experienced large-scale development of 150,000 ha of commercial forestry. CDC (now British International Investment) established 70,000 ha of softwood plantations and a pulp mill in 1961 – with linkages to South African markets and companies.
- Key factors that have led to the growth of the sector have been an availability of skilled management and investments in infrastructure, logistics (road and rail), and ports to enable exports at scale. According to FAO (2020), South Africa has 3.1m ha of planted forest, of which 40% is plantations.

**Smallholder plantations:**

- South Africa's commercial forestry sector currently covers 1.2m ha of plantations operated by corporates, commercial farmers, and small-scale growers.

## Sub-Saharan Africa*

**Commercial forestry in Sub-Saharan Africa* has been donor driven and started in the 1970s.** A challenging operating environment, limited infrastructure and logistics have limited large-scale commercial forestry. Smallholder plantations are more nascent.

**Types of investors:**

- To-date c.$1.4bn has been invested to develop 190,000 ha of forestry assets.
- Multilateral and Bilateral funding: World Bank and other multilateral institutions and governments (e.g. EU and Japan) have financed large-scale parastatal government projects in Africa*. Between 1980 and 1990, the World Bank invested $300m in developing 185,000 ha of forestry projects (see timeline on next slide for geographical locations). World Bank shifted its policy in 1991 from funding forestry projects to funding conservation.
- DFI Funding: CDC Group played a key role in establishing large-scale greenfield forestry projects in Sub-Saharan Africa*, investing in and operating 132,000 ha of forestry assets in Eswatini, Tanzania and South Sudan through country offices.
- Across the board, projects have been sponsored by a diverse range of stakeholders (individuals, family offices, strategic players, and financial investors). E.g. some large tropical forestry projects led by private players exist in Gabon and Republic of Congo.

**Industrial plantations:**

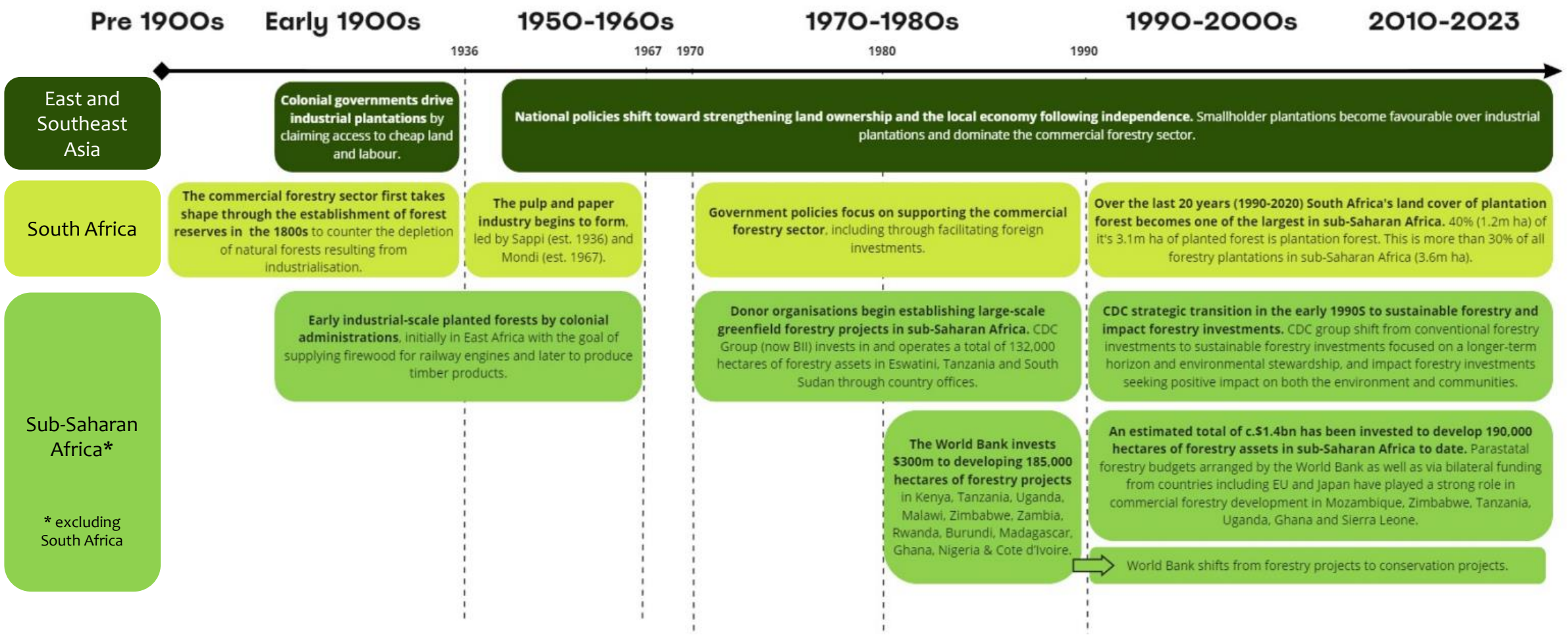
- A challenging political, land, and community operating environment has limited large-scale commercial forestry developments in Sub-Saharan Africa*. This has been augmented by limited infrastructure and logistical routes to market.
- CDC invested in and operated two flagship projects in Tanzania: (i) KVTC was established in 1992, with 28,000 ha, of which only 8,000 of teak were ever planted; (ii) Tanwat was established in 1950s, an integrated wattle extract export project with 18,000 ha of forestry assets.

**Smallholder plantations:**

- Smallholder plantations are more nascent but are beginning to take off in Sub-Saharan Africa*. Opportunities have been identified to boost the wood industry for local construction, potentially also tapping into a share of carbon credit revenue. Tanzania = 412,000 ha small and medium woodlots (71% of total area planted (580,360 ha)). Uganda = 100,000 ha smallholder forestry, ~45,000 SPGS growers and some vertically integrated SME producers (NFA, 2019), Ethiopia = 639,400 ha total smallholder plantations forest.

** excluding South Africa*

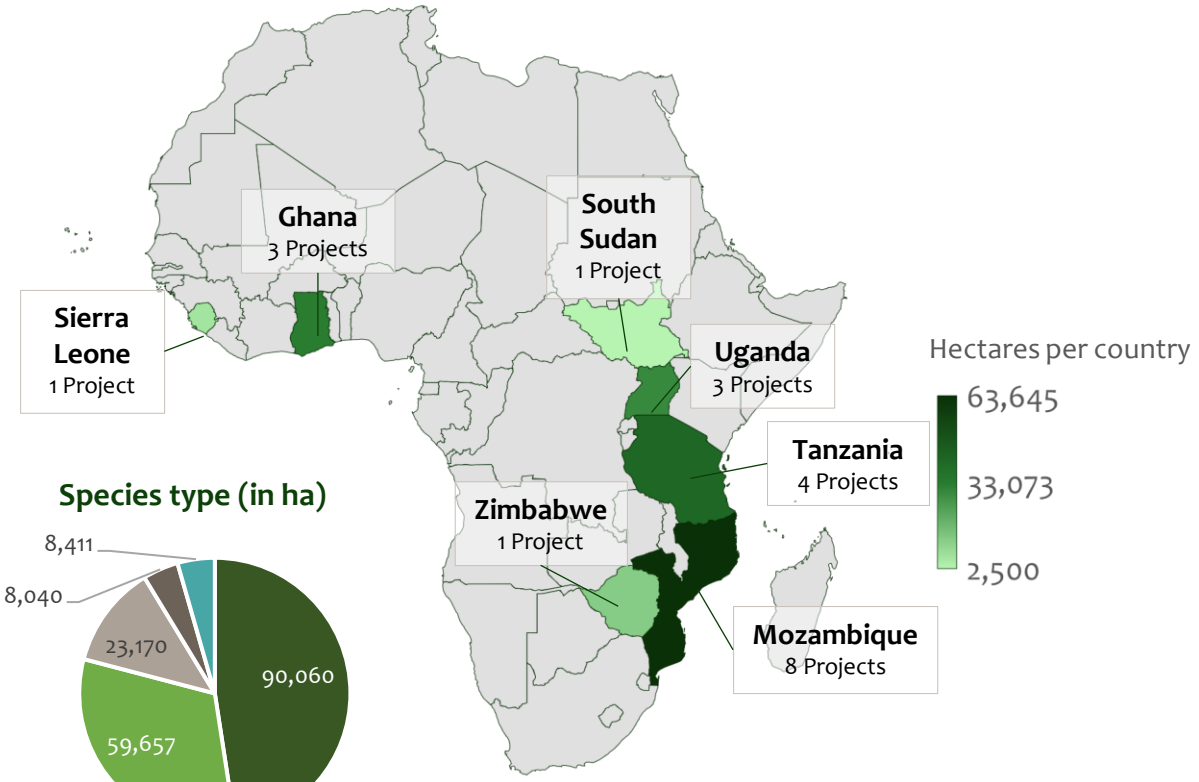
# Timeline of commercial forestry across East and Southeast Asia, South Africa, and Sub-Saharan Africa showing how the sector did not develop uniformly across these regions



# In Sub-Saharan Africa (excluding South Africa) the private sector has established 190,000 hectares of forestry projects concentrated in just 7 countries

## Footprint of projects in Sub-Saharan Africa by country, region and species

### Overall hectares developed for that country and projects across Africa




### Species type (in ha)




Source: CAP and Wellspring analysis



## Landscape overview

- The private sector has developed **21 greenfield projects to establish 190,000 ha** that have been largely initiated between 2002 and 2009.
- The 190,000 ha planted area excludes land concessions / leases that would be significantly larger than the land developed for forestry assets. The 190k ha also includes only the established hectares of sustainable planted forests and excludes conservation areas, which can be up to ~50% of the total forest estate.
- Our scope for commercial forestry excludes projects in South Africa, parastatal plantations, tropical forestry that is based on government concessions, REDD+ projects and smallholder projects.
- There has **been lack of large-scale project development outside the 7 countries highlighted**, most likely as a result of political risks, limited land acquisition and concession opportunities, and limited routes to market and infrastructure.
- **Mozambique** accounts for the largest concentration of project development in Sub-Saharan Africa with 9 projects covering 64,000 ha (34% of the total plantation area in Sub-Saharan Africa).
- Multiple projects in the country have been abandoned (largely by blue-chip multinationals) or merged with other companies.
- The projects have targeted a **wide spectrum of markets** including sawn timber, utility poles, plywood, biofuel, pulp, teak and wood chips for export.
- 50% of the plantations were planted with **eucalyptus** varieties that would have a shorter rotation cycle (12 years) than other species. Pine accounts for c.30% of acreage (20 years rotation cycle) focused on lumber markets.
  - 12% of the plantation areas developed are focused on teak (e.g. Ghana, Tanzania, and South Sudan) that is mainly export oriented.
- **Out of 21 projects developed, there are now 15 forestry companies that are operational and would be considered as brownfield companies.**

# Differences in forestry development across areas of Africa and Asia demonstrate the lessons learned in smallholder forestry, as shown by Byron's four keys

Byron's "door of many locks" is used to describe the preconditions which are independently necessary for successful smallholder plantings, but only if all conditions are met. According to the metaphor, all four keys are necessary to open the door. **Section V on smallholder forestry**, will examine the difference in SA, SSA and East and Southeast Asia's smallholder forestry development pathways using this simple analytical framework outlined below:

*Byron's keys*

| | | |
|---|---|---|
| **Ownership**  | ***There is clear and unequivocal ownership of the land and trees*** | • For long-term care / maintenance, land must not be disputed even if ownership of tree and land is separated.<br>• Clear ownership is a legal requirement for most international trade in wood flows (for FSC/PEFC certification).<br>• Local community acceptance is important for sustainable forestry; local stakeholder relations must be strengthened by ensuring local communities benefit from the presence of plantations. |
| **Know-how**  | ***A robust technical package of practices which help minimise risks*** | • Access to quality inputs like site-specific genetic stock and technical silvicultural knowledge through good extension services will minimise risks in propagation to ensure sustainable production over many rotations.<br>• Smallholder perceptions of economic value of tree planting are important to understand, especially the perceived and real risks associated with smallholder ability to protect the crop over a long period of time, e.g., from fire risk (not worthwhile planting). The 'discount rate' applied by smallholders to assess the viability of planting is calculated based on both the length of rotation and the scale of the risk. |
| **Market**  | ***The certainty of attractive and reliable market(s)*** | • There must be diversified local and export markets for the 'full tree' and all its forest products.<br>• Combined value from sale of the trees must be attractive relative to other land use options, bearing in mind a mosaic of land uses is important for generating returns since tree farming alone attracts low returns due to long rotations and margins in forestry. |
| **Regulation**  | ***Sympathetic legal and regulatory frameworks and environments*** | • Transaction costs need to be low and incentivising, e.g. for licenses, fees for land and plantation, vehicle registration, operation of haulage businesses, production of certificates of origin, border crossing fees, fertiliser importation fees.<br>• Policies, rules and regulations need to focus on plantation forestry rather than natural forests; to be clear, non-contradictory, up-to-date, and consistently applied; and to foster a mutually beneficial engagement between SME producers and commercial wood supply. Market enablers are also required (i.e. standards for quality, as well as weight and measurement) and need to be enforced. |

Source: Byron *et al* (2001), Keys to smallholder forestry. Forests, Trees, and Livelihoods. 11: 279-294. Midgley papers on smallholder forestry (2017, 2018, and 2022)

# Lessons learned in African forestry: with definite conclusions to be drawn from industrial plantations, and hypotheses to be tested by impact investors in smallholder forestry

## Industrial plantations

For **industrial plantations,** we apply a rigorous quantitative and qualitative analysis of 30 years of CAP data. Based on our interpretation, we draw conclusions and articulate the strategic implications for impact investors and the development community in the future.

- The proprietary CAP data includes investment amounts, investor base, level of industrialisation, financials, species mix, growth rates and age class profile, capital structure, and indicative carbon stock analysis of individual projects.
- Our findings are supplemented by a desktop review of existing papers and by stakeholder interviews with sponsors, management, DFIs, and non-DFI investors.

## Smallholder forestry and the role of carbon finance

For **smallholder forestry and the role of carbon finance,** we apply a more qualitative analytical approach as available data has been more anecdotal to-date. We conduct a desk-top review and analyse proprietary data from Gatsby, CAP, and others. We conclude by putting forward hypotheses to be tested by impact investors and the development community.

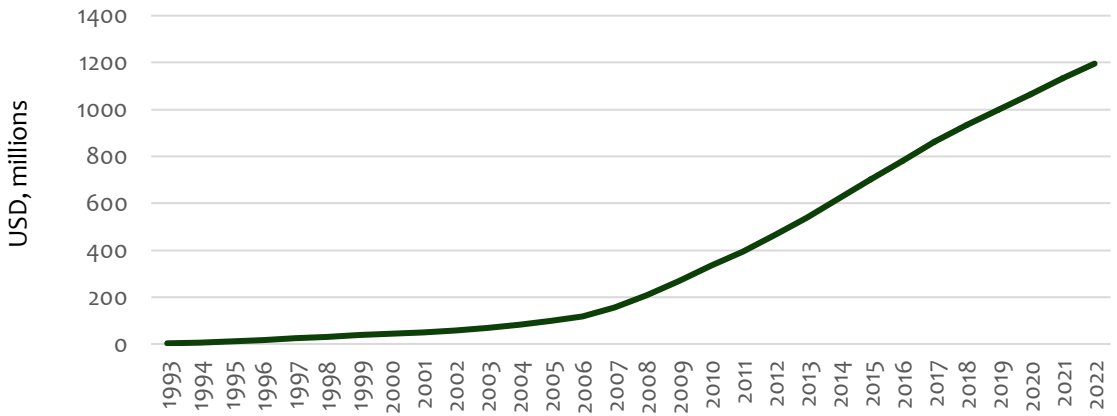
- Our findings are supplemented by interviews with key stakeholders such as leading development consultants, service providers, and inclusive forestry businesses.

From here onwards, the focus lies on Sub-Saharan Africa, not including South Africa.

# IV. Lessons learned from industrial plantations over the past 30 years in Sub-Saharan Africa

# $1.4bn has been spent on developing greenfield commercial forestry projects covering 190,000 hectares with majority of funding centered in Eastern Africa

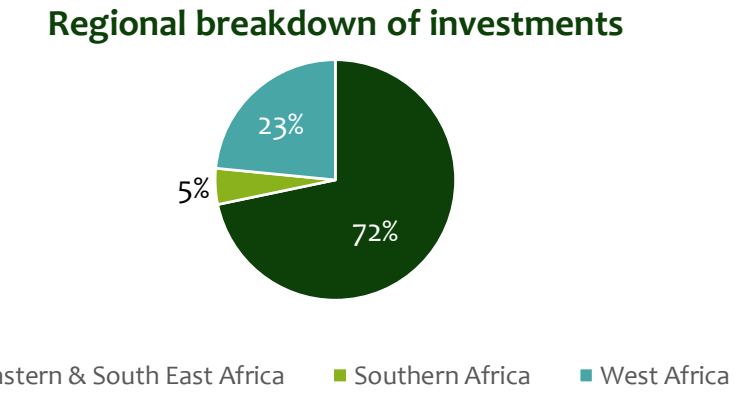
**Cumulative funding of greenfield projects between 1993 to 2022**




Source: CAP and Wellspring analysis

- CAP's proprietary data shows that c.$1.4bn has been invested in 190,000 ha of forestry projects in Sub-Saharan Africa (excluding South Africa, parastatal projects, tropical forestry and smallholder projects).
  - There has been significant capital deployment from 2007 onwards (80% of the c.1.4bn has been deployed after 2007).
- The cumulative funding analysis covers projects in Mozambique, Tanzania, Uganda, Zimbabwe, Ghana, Sierra Leone, and South Sudan.
  - Projects with investments prior to 1993 have been excluded (e.g. investments by CDC in Tanwat in Tanzania from 1950s).
- Average cost of development across the region is c.$7,000 per ha. This amount covers investments in forestry assets, management costs and other fees, working capital, and processing facilities.

**More than 70% of funding has focused on East and Southeast Africa**

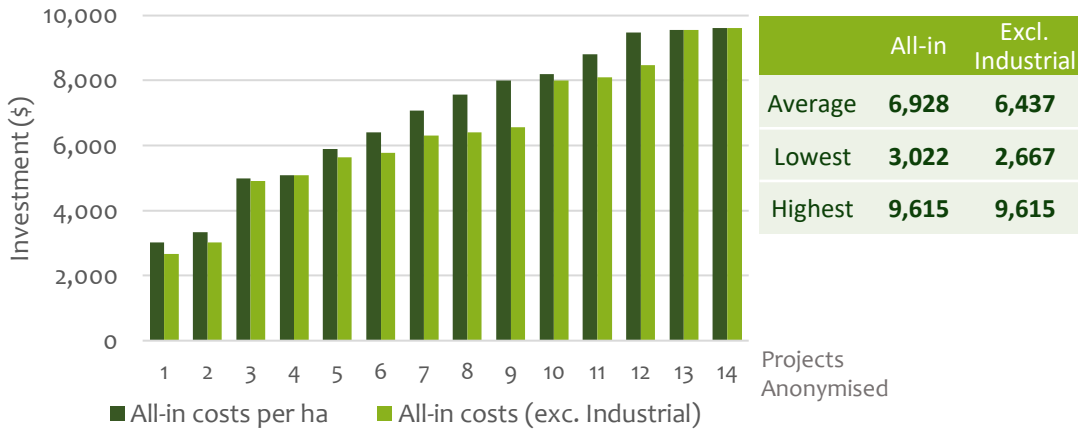



Source: CAP and Wellspring analysis

- More than 70% of funding has been concentrated in developing greenfield projects in Mozambique, Tanzania, and Uganda across 12 companies.
  - There are 2 companies that have built some regional presence in Tanzania, Uganda and Mozambique.
- Only 23% of the funding has focused on development in West Africa.
  - This statistic is set in the context that West and Central Africa account for 50% of natural forest depletion (50m ha) between 1990-2020.
  - More than $300m has been invested in 3 companies in Ghana and Sierra Leone to develop 40,000 ha of commercial forestry assets (including costs related to processing, management, etc.).

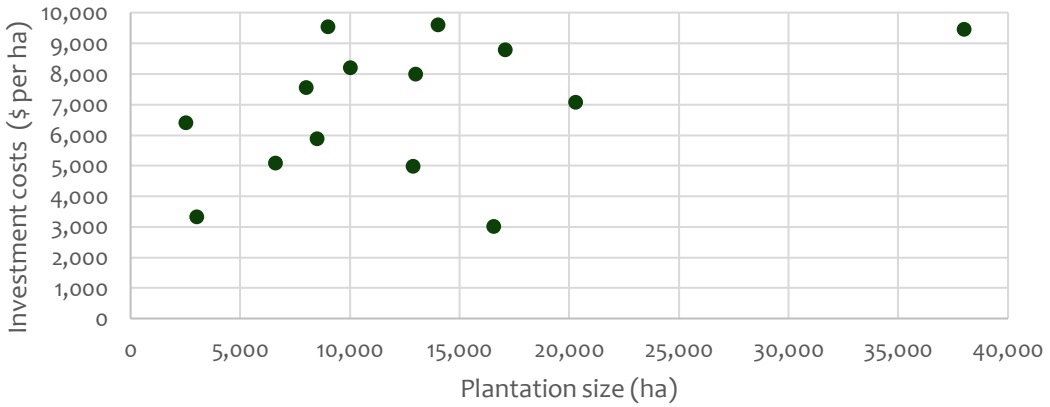
# There is a large variation in investment costs per hectare, with differences typically driven by project specific factors and limited benefits to scale demonstrated

## Investment costs profile of greenfield projects on per ha basis




| | All-in | Excl. Industrial |
|---|---|---|
| Average | 6,928 | 6,437 |
| Lowest | 3,022 | 2,667 |
| Highest | 9,615 | 9,615 |

## Investment costs per ha benchmarked with plantation size




Source for both charts: CAP and Wellspring analysis

## Key Considerations

- Greenfield development costs include investments in forestry assets, processing facilities, fixed overheads (e.g. management costs), working capital, and transaction fees and expenses.
- Analysis highlights a large variation in development costs driven by project specific considerations including: country dynamics, end-markets, species and rotation, requirements for developing infrastructure and processing, variations in whether land was acquired or leased, overhead costs, and time taken in developing assets (including delays due to raising capital).
- **The average all-in cash cost per ha of 15 greenfield projects is $7,000 per ha up to 2022. Stripping out investments in industrial capex for processing, the average cost is $6,500 per ha for forestry assets and other costs (e.g., management / fixed overheads)**
  - Only 11% of the investment costs have been focused on industrial processing (as described in more detail in the markets section of the paper).
  - The lowest all-in cost is $3,000 per ha whilst the highest investment cost is c.$10,000 per ha up to the end of 2022.
  - Engagement with stakeholders highlighted that management costs (underpinned by expats), governance and E&S management has made a meaningful contribution to the overall cost base.
- The cumulative investment costs will continue to increase over the next 5 years as the majority of projects are immature and so not yet achieving steady-state sales.
  - Most projects have recently invested or have active plans to be vertically integrated in order to develop routes to market and to monetise forestry asset wood flows.
- Analysis highlights that there is a limited correlation between all-in cash costs per ha and size of the plantation.

# On a per hectare basis, greenfield forestry requires up-front capital expenditure while harvest income is inevitably generated much later

| Illustrative 1 ha forestry plantation of eucalyptus 12-year rotation in East Africa for diverse end-markets ($US) assuming optimal implementation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Plantation costs and income ($US)** | **Yr 1** | **Yr 2** | **Yr 3** | **Yr 4** | **Yr 5** | **Yr 6** | **Yr 7** | **Yr 8** | **Yr 9** | **Yr 10** | **Yr 11** | **Yr 12** |
| Establishment costs | (890) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Maintenance costs | (93) | (93) | (73) | (73) | (73) | (73) | (73) | (73) | (73) | (73) | (73) | (63) |
| Fixed overheads | (85) | (85) | (85) | (85) | (85) | (85) | (85) | (85) | (85) | (85) | (85) | (85) |
| **Cumulative plantation costs** | **(1,068)** | **(1,245)** | **(1,403)** | **(1,560)** | **(1,718)** | **(1,875)** | **(2,033)** | **(2,190)** | **(2,348)** | **(2,505)** | **(2,663)** | **(2,810)** |
| Gross harvest revenues | - | - | - | - | - | - | - | - | - | - | - | **15,600** |
| Harvest costs | - | - | - | - | - | - | - | - | - | - | - | (2,160) |
| Transportation costs to market | - | - | - | - | - | - | - | - | - | - | - | (5,760) |
| **Net harvest revenues** | - | - | - | - | - | - | - | - | - | - | - | **7,680** |
| **Net investment income per ha** | - | - | - | - | - | - | - | - | - | - | - | **4,870** |

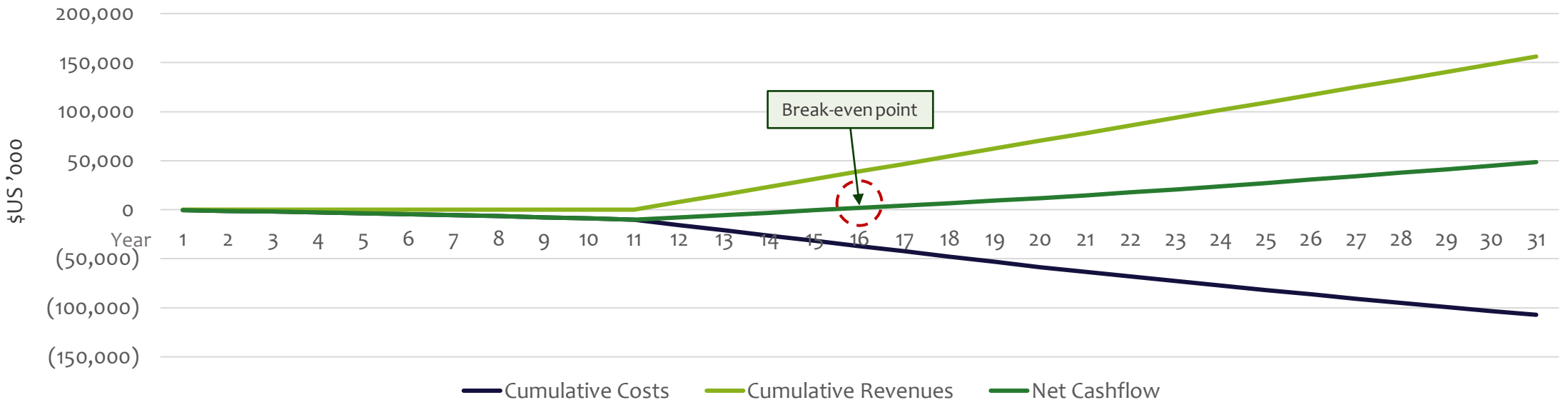
Assumptions: Assumes 1 ha land leased. Base MAI (m3/ha/year) of 20 and average stumpage per m3 of $65 based on utility poles, veneer poles, lumber and industrial round wood. Assumes no thinning revenues

- The above example is based on an illustrative project assuming correct implementation and no project development issues as experienced by past greenfield projects.
- The asset profile for greenfield projects is underpinned by large up-front costs to establish the plantation and ongoing maintenance costs up to harvest.
  - Based on the above illustration, all-in costs are c.$2800 per ha before harvest income at the end of the rotation at year 12.
  - Maintenance costs such as tending and pruning are important to ensure quality of the forestry asset for target end-markets.
- Eucalyptus harvest rotations are typically 6 to 13 years for poles / pulp and 15 to 22 years for sawlogs. For pine and teak, typical rotations are 20-22 years.
  - There is potential for early revenues from thinning for pulp and pole end-markets (particularly for eucalyptus species).
- A key significant up-front cost item can be infrastructure establishment, such as roads and land purchase costs if not leased.
- Harvest and transportation / logistics costs can be significant, comprising of more than 70% of total costs (>50% underpinned by transportation costs).

# Assuming a 10,000 hectare hypothetical plantation model , a greenfield project will reach cashflow break-even after 16 years, with full revenue realised after 30 years

**Illustrative 10,000 ha greenfield plantation that assumes 500 ha planted each year until 20 years based on 1 eucalyptus 12 year rotation cycle**

**Cumulative plantation costs, revenues and net cash flow from year 1 to year 31**




Assumptions: Assumes 1 ha land leased. Base MAI (m3/ha/year) of 20 and average stumpage per m3 of $65 based on utility poles, veneer poles, lumber and industrial round wood. Assumes no thinning revenues

- With a 10,000 ha greenfield plantation, the up-front capital intensity increases substantially as new plantings are established every year until fully planted.
  - A key consideration is the number of ha that can be planted on an annual basis with constraints around infrastructure and team capacity.
- As a result, the overall net cash flow profile of a greenfield project is delayed substantially. As the above graph shows, the project reaches cash-flow breakeven at year 16.
- Full revenues of a 10,000 ha plantation are realised after 30 years, as the final annual planting of 500 ha is in year 20.

**A typical large-scale greenfield project requires significant up-front investment to cover establishment, maintenance, and fixed overhead costs. It then demands a long-term investment horizon to realise revenues and reach cash flow break-even.**

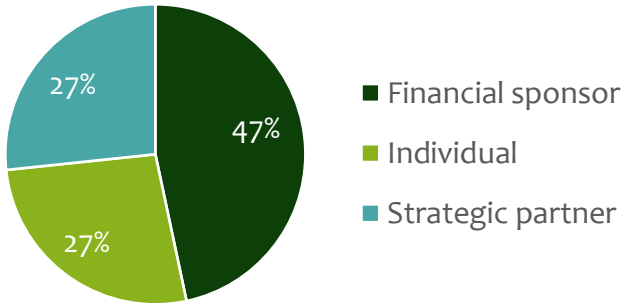
# The below framework has been developed to understand key challenges impacting the development of greenfield projects in Sub-Saharan Africa

| Key Elements | Summary of key findings |
|---|---|
| **1. Sponsors and management** | • The majority of the 15 greenfield projects in Sub-Saharan Africa (excluding South Africa) have been led by promoters that have had a limited track record and limited experience in developing forestry projects in the region. There has been a limited involvement of strategic forestry operators in the region. This factor has been a key driver of the various challenges faced by projects as described below. |
| **2. Development and management of forestry assets** | • Greenfield projects have faced challenges early on while developing assets such as silviculture issues and species selection, and by developing biological assets too quickly. This has resulted in quality and yield issues that have impacted projected woodflows and the monetisation of forestry assets. These factors were further impacted by unavailability of capital to maintain forestry assets. External factors such as challenges to the development of infrastructure and the non-availability of skilled labour in rural areas has led to delays and impacted the cost base. |
| **3. Routes to market and Industrialisation** | • There has been limited development of viable routes to market by greenfield projects. There were limited plans to develop market for wood flows in initial business plans. Only 11% of the c.$1.4bn of capital in the sector has been utilised toward developing industrial assets to facilitate the production of timber products. Looking ahead, industrialisation will be a key theme for existing brownfield forestry projects as they reach material woodflows. A key issue these projects face is competition with informal market participants who do not require high ESG standards or have a high fixed overhead structure. A key theme is developing viable export routes to Europe, US, Middle East and Asia as well as achieving diversification. |
| **4. Enabling environment** | • Greenfield projects have faced a number of challenges related to government regulation and unfriendly business policies, including land acquisition processes and unexpected export bans that have impacted financial performance for projects which depend on exports to the region or outside of Africa. Acquisition of land in rural areas with high population density has resulted in inherent community issues. |
| **5. Investor profiles, the role of DFIs and financial performance** | • 60% of the $1.4bn capital deployed in 15 greenfield projects has been sourced from commercial and non-DFI investors such as private equity funds, timber asset management companies, family offices, and individuals. Over the last 10 years, capital from non-DFI investors has declined materially and DFIs have increased their share substantially. Going forward, the sector anticipates DFIs being a key source of financing and a new source of capital, developing from carbon focused investors as a product of increased appetites for carbon offset projects.<br>• A key finding is that many projects did not have a fully funded business plan and faced multiple attempts to raise capital with investors. This led to misalignment on valuation and issuance of debt in projects that did not have established cashflows. A majority of the projects are considered immature and have yet to get to a steady-state revenue profile or enable target investor returns |
| **6. Valuation considerations & return expectations** | • In terms of valuations, there is a large variation on entry price on a per ha basis in Sub-Saharan Africa (excluding South Africa). Investors have paid a significant premium to invest in immature projects vs. mature projects in South Africa driven by bullish forecasts that did not materialize<br>• A key challenge to valuation of early-stage forestry projects is that material cash flows are typically back-ended due to the nature of forestry assets. These cash flows are discounted at high discount rates due to country risks. In addition, USD based investors face significant currency depreciation risks (e.g. a 10% annual currency depreciation rate of key currencies over the last 10 years) that can impact returns. |

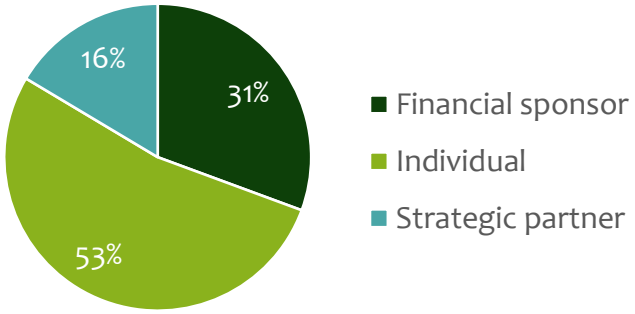
# Greenfield projects in Sub-Saharan Africa have seen a limited involvement of operators with significant sector experience which had impacted their initial development

## Breakdown of greenfield projects and investments by sponsor profile

### Projects




### Investments




Source: CAP and Wellspring analysis

## Key Considerations

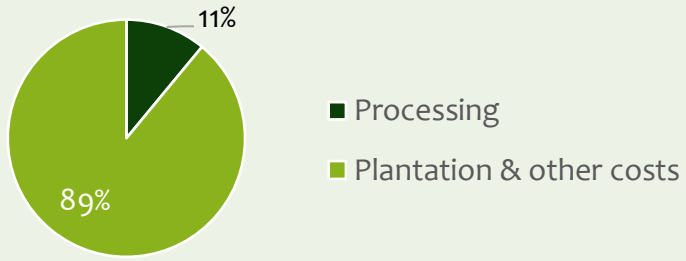
- 15 greenfield projects (excluding 4 abandoned projects) have been profiled according to sponsor type, as per the definition outlined below:
  - *Financial sponsor:* Include high net worth ("HNW") groups / individuals (e.g. family offices), impact investors, and DFIs who have provided capital for development.
  - *Individual(s)*: Include individual(s) who have led capital raising from other private shareholders, DFIs, impact investors, and HNW individuals. Individuals come from a variety of backgrounds and generally have limited sector and / or forestry project development experience.
  - *Strategic operator*: Regional operators, blue-chip players, or local companies with significant forestry experience and prior track record.
- **More than 70% of the projects (driving 80% of the capital invested ~$1.1bn) have been led by promoters who are individuals and / or financial sponsors with limited forestry and project development experience.**
  - Companies have largely relied on building expat management teams e.g. from South Africa, Zimbabwe, and South America. This has resulted in increases to fixed overhead costs and a high staff turnover (as described below) and impacted the overall project cost of development.
- **South Africa offers a key source of blue-chip players with sector experience but there has been limited appetite to develop projects in Sub-Saharan Africa.**
  - Two South African blue-chip players have initiated projects in Mozambique but pulled out due to changes in strategy, infrastructure and logistics, and land issues.
  - Mozambique has been a key focus for multiple players due to its proximity to South Africa and its ability to leverage existing management and infrastructure.
- **Discussions with stakeholders highlight a scarcity of quality management and know-how in the region**. Interviews also emphasised the difficulty in retaining management in rural areas due to the operating environment and, in some cases, health and safety risks (e.g. some projects in Mozambique).
- Analysis also highlights that there have been limited projects that (i) are led by black African promoters and (ii) mobilise capital from local stakeholders and investors (e.g. pension funds).
  - Furthermore, engagement with stakeholders highlighted some potentially discriminatory views on local capacity while others pointed to commercial evidence which is contrary to this.

# Greenfield projects have faced several issues such as limited infrastructure, project delays, silviculture challenges, and non-availability of skilled workers in rural areas

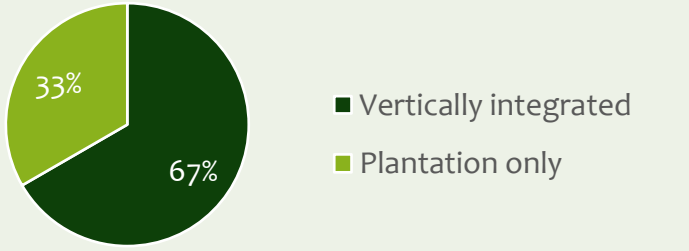
| Overview of challenges | Key Considerations |
|---|---|
| **Limited infrastructure in rural areas and subsequent need to develop all key supporting assets from scratch.** | • A key challenge across the board has been limited infrastructure in rural areas.<br>• Projects have had to build roads, power, energy infrastructure, and other necessities (e.g. providing water access, building workers housing) resulting in an increase in up-front and maintenance costs.<br>  o Execution of infrastructure development has also taken time (with delays) due to the need to obtain equipment, parts, and services in rural areas. This has resulted in a carryover of high overheads.<br>• During rainy seasons, plantation management has been impacted due to poor roads.<br>• Furthermore, some projects have had challenges in terms of location and distance to markets. |
| **Challenges in reaching desired yield and quality** | • Due to nascency of commercial forestry in the region, there was a lack of information on site and species suitability, and a lack of access to quality planting materials and seed production.<br>• Projects had to establish trials, nurseries and import planting materials from other countries.<br>• Some projects faced issues in obtaining desired yields due to wrong planting material and issues with pest management.<br>• Some projects scaled up too quickly to establish plantations in context of limited trials. The attempt to deploy investment capital to cover high fixed overhead costs ultimately exacerbated mistakes. One reason for this was promoters being keen to develop plantations quickly to develop net asset value for valuation purposes. |
| **Silviculture management of forestry plantations impacted by lack of steady flow capital** | • Linked to the above and to the non-availability of skilled labour in rural areas, inadequate silviculture management has been a recurring issue in several projects in relation to maintaining forestry assets.<br>• Projects have experienced a “stop and go” approach whereby there has been insufficient capital and resources to maintain plantations over time (e.g. tending and pruning) after initial plantings.<br>  o This has further impacted wood flows and delayed plans for industrialisation, due to the unavailability of raw materials to underpin scale for processing. |
| **Scarcity of skilled management in rural areas across the value-chain** | • A key challenge for sponsors has been recruiting skilled labor in rural areas due to a scarcity of experienced professionals across forestry, processing, and Environmental & Social<br>• Due to a scarcity of experienced management, forestry companies are recruiting from their competitors resulting in retention issues and increased fixed overhead costs. |

# During early phases of development, most projects did not focus sufficiently on developing viable routes to market or on investment plans for industrialisation

**Investments in processing vs. plantation and other costs (1993-2022)**




**Companies have had to vertically integrate to establish routes to market**




**There is an increasing trend of companies seeking export opportunities**


## Considerations

- Only 11% of the total c.$1.4bn (c.$150m) was invested in downstream processing between 1993-2022. Going forward, there will be a significant shift towards investments in industrialisation supported by DFIs.
- Some projects had insufficient plans at inception on developing viable routes to market, including the requirement to invest in downstream processing.
  - Some projects expected that a plantation at scale could catalyse downstream processing through other operators.
- Some projects experienced logistical issues in building viable routes to market (e.g. for exports) in terms of costs and the viability of ports.
- Due to lack of sufficient wood processing, projects had to vertically integrate into processing as they gained sufficient volumes of wood flows.
  - Almost 70% of the greenfield projects have vertically integrated into primary and / or secondary processing over time.
  - A few exceptions include projects focused on teak and roundwood exports that do not require material processing investments.
- Due to nascency of end-markets, some companies have had to diversify into multiple sectors whilst executing industrialisation plans to monetise wood flows. Some companies have established diversified local end-markets including standing sales, pine, and eucalyptus sawn timber, transmission poles, plywood and secondary processed products (e.g. pallets).
  - Conversely, there were projects that had minimal diversification plans and were impacted when plans for long-term wood flow off-take did not materialise (e.g. for biomass fuel).
- Excluding projects that are focused on teak and roundwood, companies are now increasingly diversifying into exports focused on plywood and veneer.
  - This highlights that projects could be cost-competitive globally.
  - Exports can also help mitigate local currency risks through USD sales.

Source: CAP and Wellspring analysis

# Engagement with stakeholders highlights the challenges of competing with local and informal market players due to higher overhead structure and E&S obligations

**Example of key factors impacting competition with local players**

| Factors | Informal / local market player | Project set up by international consortium (inc. DFI financing) |
|---|---|---|
| **Source of wood** | • Able to source competitively from SME producers and smaller plantations.<br>• Local players may also source illegally from parastatal plantations or natural forests. | • Sources are from projects' own industrial plantation that has significant amounts of capital deployed to establish and maintain forestry assets (including initial silviculture and yield issues) |
| **FSC certification requirements** | • None as local markets do not require FSC certified wood. | • Yes, due to DFI financing and strategy focused on mitigating E&S risks. |
| **Logistics and Harvesting** | • Have their own logistics and harvesting capabilities or third-party reliance.<br>• No E&S requirements and costs. | • Projects has its own own harvesting capabilities and logistics (or relies on third-party).<br>• Significant E&S requirements and costs. |
| **Management structure and costs** | • Local management teams with reduced overhead structure. | • Expat management teams with investment in housing and social infrastructure. |
| **E&S requirements** | • None. | • Significant E&S requirements due to DFI financing.<br>• Investments in E&S staff and E&S management systems. |
| **Governance** | • None. | • Significant governance and reporting requirements. |
| **Taxes** | • Due to informal nature of market, some informal players may minimise tax. | • Follows local and international tax regulations. |
| **Local end-markets** | • Local market for some products such as sawn timber is informal and nascent<br>• Usually, local markets are cost sensitive and have limited appetite / understanding of quality parameters and standards. | • Competes in the same market for sawn timber, transmission poles, and other secondary products. Experiences margin and cost pressure due to competition from informal and smaller players due to difference cost structure. |

**Key takeaways**

- Based on several conversations, a key challenge of forestry operators is competition with **informal markets**. There are around four key profiles of informal, small, and medium market participants that are distinct from the forestry players who have set-up greenfield projects (with international financing):
  - Sourcing capabilities: (i) Source wood legally from SME producers and parastatal plantations; (ii) Source wood illegally (directly or via intermediary) from natural forests, private or government owned plantations.
  - Target end-markets: (i) Export industrial roundwood (e.g., to Asia); (ii) Process raw materials through their own processing facility to manufacture timber products for local and export markets.
- As the table on the left shows, **large forestry operators who have received international and DFI financing may not be able to compete** due to higher cost of raw materials (from their own plantations), high fixed overhead costs driven by expat management teams, and E&S requirements (FSC certification, governance, reporting and additional FTEs to mitigate E&S risks).
- Furthermore, the target local end-markets are nascent, cost conscious, may not appreciate quality of wood and have limited E&S requirements (e.g. FSC certification).
- **Business integrity risks** are also an issue. Forestry operators who have DFI financing have zero tolerance to corruption whereas informal players may not require to adhere to these standards.

# Challenges faced by forestry projects including accessing land for development from the government, export ban issues, and business integrity risks

**Countries have issued export bans in the past and new carbon regulation**

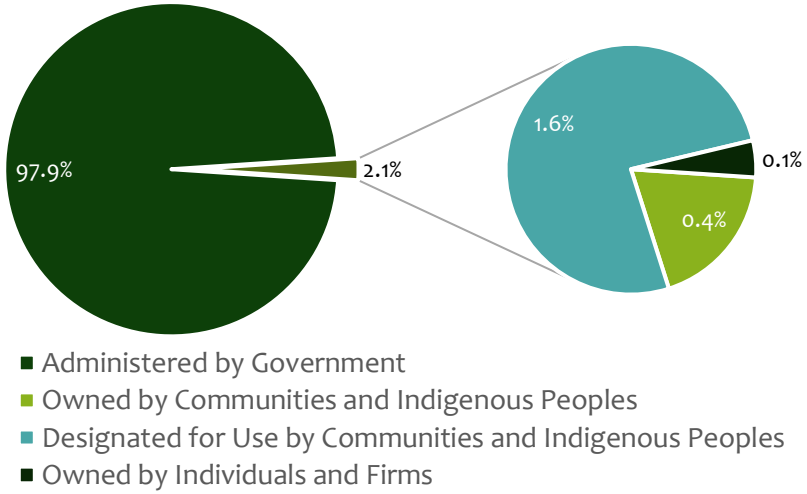
| Country | Date of ban | Considerations |
|---|---|---|
| Uganda – export ban | Jun 2023 | The government recently banned exports of timber as part of an overall strategy to mitigate timber harvesting from forests. The President ordered the cancellation of all licenses and permits issued to individuals and companies for harvesting from forests. |
| Tanzania – export ban | Nov 2021 | The government banned export of a range of forestry products to increase investment and value-addition in the country for local consumption. This was followed by the lifting of a ban temporarily allowing exports of some containers. |
| Mozambique – export ban | Jun 2017 | The government banned the export of whole logs outright from 2017 (regardless of species) in the effort of encouraging local processing. |
| Sierra Leone | Jan 2008 | The government banned the export of all timber products by Chinese and other foreign companies. |
| Tanzania – carbon tax | Oct 2022 | The government announced its carbon trading regulation for new and existing projects requiring companies to pay 1% of expected carbon credit revenues up-front (even on a retrospective basis). |
| Zimbabwe – carbon tax | May 2023 | The government announced its carbon regulation limiting foreign investors to 30% of income. |

**Considerations**

- Forestry companies developing greenfield projects have faced several challenges pertaining to the local environment. One of the key challenges has been **securing land access.**
  - In Mozambique, companies have faced complex and time-consuming negotiations in the process of obtaining land access (called DUATs). Furthermore, due to the complex communal land structures, companies have encountered community issues when concessions have been granted.
- A recurring challenge for companies are **unforeseen government regulations** that impact revenues. Several governments have issued export bans that have impacted export-oriented companies.
  - Recently, some governments (e.g. Tanzania and Zimbabwe) have introduced new carbon tax regulations that will have a material impact on carbon revenues of forestry companies.
- Numerous companies rely on end-markets that depend on government-based contracts (e.g. transmission poles). Companies have faced **business integrity risks** and been impacted by changes in ministries and new budgets, resulting in unreliable revenue flows.
  - Furthermore, having parastatal companies as customers has posed cash flow risks due to the long lead times for payments.
  - In one example, a long-term government contract for biomass was the main commercial driver of a project attempting to develop plantation assets. The project faced issues due to business integrity risks and the government pulling out from the transaction.

# Projects have faced endemic social problems around land tenure and access in relation to developing plantations, triggering E&S and reputational challenges

## Overview of land ownership in Sub-Saharan Africa




Source: Lessons about land tenure, forest governance and REDD+ (USAID Report)

## Mozambique example: land concession granted vs. area planted

| | Mozambique forestry concessions / DUATs |
|---|---|
| Number of DUATs / land concession granted to firms | 13* greenfield project developments |
| Overall DUAT area (ha) | 750,000 ha |
| Area planted (ha) | More than 70,000 ha |
| **% of area planted in concession** | **10%** |

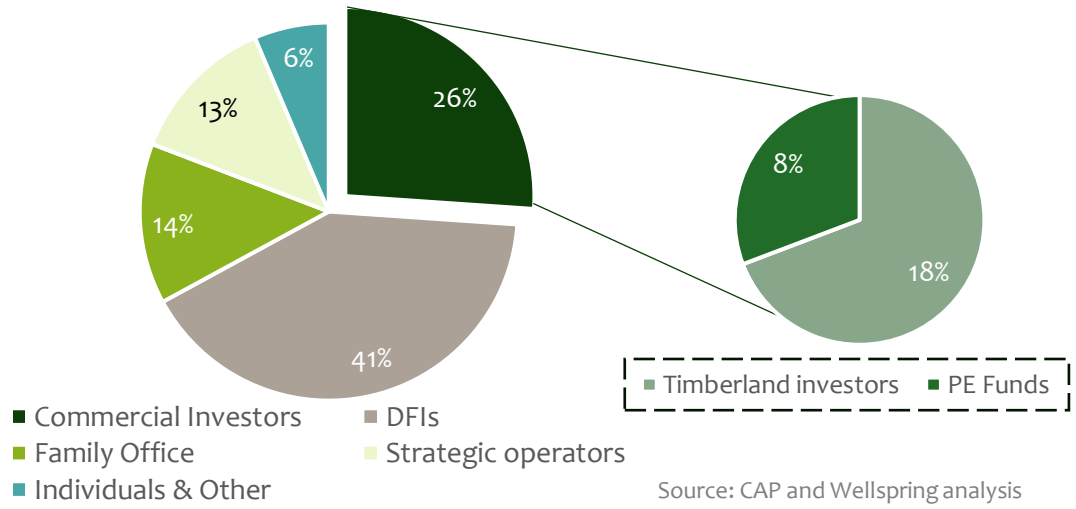
*Includes projects abandoned and those merged with other companies
Source: Assessing the investment climate in the planted forestry sector in Mozambique

## Considerations

- The majority of land in Sub-Saharan Africa is owned and administered by governments with **community arrangements with local villages and districts**.
  - Over 90% of the rural population in the region accesses land through these arrangements. These arrangements can also be complicated by a lack of land registration / titles.
- The rural population in Sub-Saharan Africa consists largely of **small-scale farmers** (more than 60% of the population in the region) who utilise land for subsistence agriculture (food and cash crops).
- Greenfield projects have acquired land access for forestry developments through long-term concessions from the government, who have declared that **land is under-utilised and / or degraded.**
  - The concessions or lease areas granted are usually significant in terms of scale vs. area planted, as demonstrated in Mozambique.
- There has been **inherent conflict** between projects and local communities during the land tenure process as some rural population depend on the land and / or existing forestry assets for their livelihoods .
  - These conflicts have continued, with forestry companies facing land encroachment, illegal logging, and deliberate forest fires.
  - A number of NGOs have been obliged to raise land tenure concerns (including through the media). These have in turn presented reputational issues for investors, particularly DFIs.
- Some projects have faced conflict issues with **local biodiversity** (e.g. wildlife populations). Pressure from NGOs has led to sponsors abandoning their projects due to reputational risks and operating environment.
- **On the back of DFI investments, projects are addressing E&S issues via several routes: through an implementation of E&S systems for community engagement, risk management FSC certification, benchmarking against IFC Performance Standards, community projects, outgrower schemes, and establishing workers' rights.**

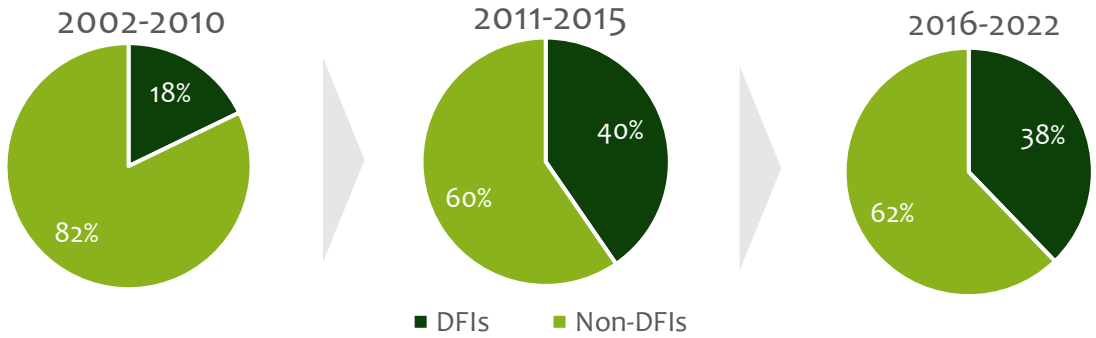
# History of capital for greenfield projects shows non-DFI investors have dominated but DFIs have increased their share from 20% to 40% over the last 10 years

## Breakdown of funding source by investor type (1993 – 2022)




Source: CAP and Wellspring analysis

## DFIs have increased their share of capital deployment over the last 10 years




Source: CAP and Wellspring analysis

## Considerations

- 60% of the capital has been provided by non-DFI investors including commercial funds, family office, HNWs, and individuals.
- Over the last 10 years, DFIs have increased their deployment rate.
- Analysis of data shows a shift in investor base over the last 20 years:
  - *Early-stage capital*: The initial capital into the projects was largely dominated by HNWs, individuals, and family offices seeking commercially oriented returns.
  - *Early 200s-2010*: Additional capital was dominated by commercial investors including global timberland investors (70% of overall commercial investment capital ~$360m) and PE funds. Some DFI capital was injected into the sector.
  - Capital from timberland investors has been concentrated in three projects in East Africa.
  - *2011-current*: Over the last 8 years, there has been a shift towards DFIs increasing their capital share from 20% during 2002-2010 to 40% over the last 10 years or so.
    - There has been limited investment from global timberland investors and PE funds highlighting a change in strategy and / or risk appetite.
- There has been minimal capital investment in greenfield projects from strategic operators with prior forestry experience.
  - Only 13% of the capital has been invested by strategic players.
  - A key strategic project has been Portucel in Mozambique which was led by The Navigator Company, a global pulp and paper company.

# DFIs will play an important role in prospective capital deployment, and emerging carbon investors are focusing on forestry as part of a nature-based strategy

## A number of DFIs have recently developed new initiatives to deploy capital at significant scale in the forestry sector in Sub-Saharan Africa

- In October 2022, New Forests alongside BII, Norfund, and Finnfund announced $200m investment in a dedicated African fund: the African Forestry Impact Platform ("AFIP"). The platform will continue to raise capital from investors with the aim of raising $500m in the next few years.
- Concurrently, the platform announced its first acquisition, Green Resources, East Africa's largest integrated forestry and processing company that has 38,000 ha under management in Tanzania, Uganda and Mozambique.

- In November 2022, FMO announced its commitment to build a forestry portfolio of up to EUR1bn by 2030 across Africa, Asia, and Latin America. A forestry portfolio will be a core part of FMO's strategy to support climate action and biodiversity.
- FMO has also partnered with the UK Government in 2021 to launch GBP 150m Mobilisation Finance for Forests programme ("MFF"), with the aim of mobilising private sector finance and facilitating blended finance solutions.

## Carbon focused players are gaining interest in forestry projects in Africa for carbon sequestration (excluding REDD+ projects)

### Blue-chip MNCs

- Blue-chip MNCs have embarked on global initiatives with a focus on nature-based solutions, involving forestry projects to plant new trees.
- In June 2022, TotalEnergies acquired 49% stakes from CAP in Compagnie des Bois du Gabon, 600,000 ha of tropical FSC certified forestry plantation in Gabon, as part of its net zero strategy.
- AstraZeneca has an AZ Forest global initiative to plant 200m trees. It has projects in Ghana and Rwanda through local partners.

### Carbon investors

- There are a number of carbon-focused investors with strategies focused on developing forestry projects, either to monetise carbon offsets in the voluntary market and / or in partnership with blue-chip MNCs, Governments, and other stakeholders.
- In April 2023, Apple announced that it will invest up to $200m in Climate Asset Management, a JV of HSBC and Pollination to invest in natural capital and nature-based carbon solutions globally. In Africa, the fund will deliver carbon credits from financing nature-based solutions including forestry.

# Most greenfield projects have been funded through a misaligned capital structure and investor base, resulting in a lack of steady capital flows in crucial early stages

| $360m has been invested in 14 greenfield projects as debt / debt-like | | |
|---|---|---|
| **Capital Structure In** | **$m** | **% total** |
| Equity | c.$1,000m | 75% |
| Debt* | $360m | 26% |
| **Total Funding** | **$1,360m** | **100%** |

| Examples: Capital structure and no. of investors of 3 of the largest projects | | | |
|---|---|---|---|
| | **Project A** | **Project B** | **Project C** |
| Debt as % of capitalisation | 54% | 70% | 20% |
| No of investor / groups | 10+ | 10+ | 12+ |
| **$250m debt invested as part of $650m overall funding (40% debt)** | | | |

| Forestry projects are largely immature with limited cash flow generation | |
|---|---|
| **Financial performance** | **$m** |
| Revenues | $90m |
| EBITDA | c.$4m |
| Total funding | $1,360m |

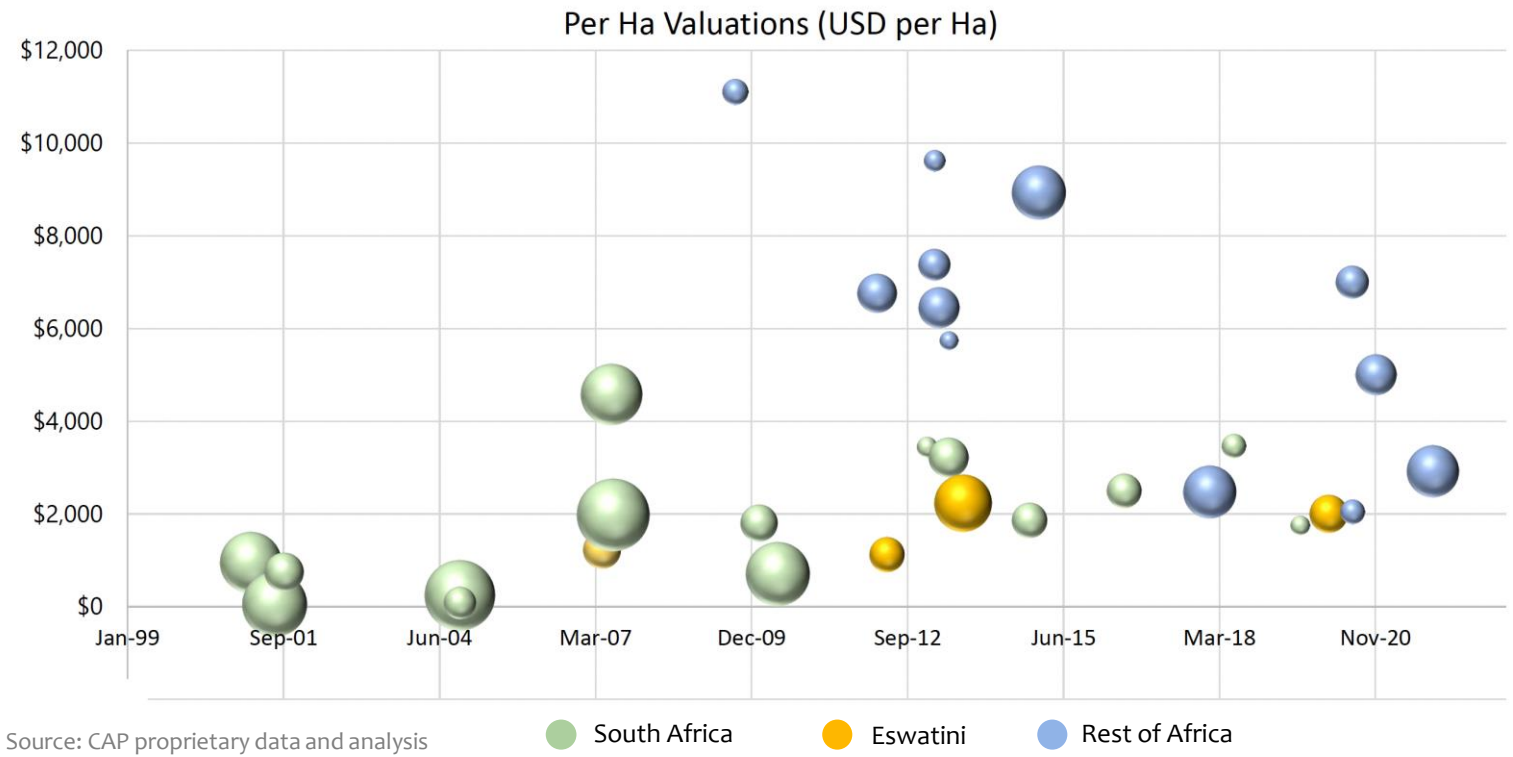
Note: Based on CAP proprietary datasets and Wellspring analysis based on 14 companies
* Includes debt-like instruments such as preference shares that sit senior to common equity

## Considerations

- Some sponsors of greenfield projects have financed through a phased approach that required multiple capital raising rounds over time.
  - Capital was raised to expand and maintain forestry assets, invest in downstream activities and / or cover funding shortfalls.
  - There was lack of large balance sheet investors in early stages, who could commit capital on an ongoing basis up to financial break-even. This resulted in the investor base broadening across the capital structure.
  - New funding rounds resulted in delays in project execution, maintenance of existing forestry assets, and a carryover of high overhead costs due to long lead times on raising capital and aligning on terms / valuation.
    - Delays in capital being deployed to maintain forestry assets resulted in additional capital needs for rehabilitation.
- Majority of the c.$1.4bn capital invested in greenfield forestry projects has been equity. This was driven by financial investors, HNWs, and individuals.
- $360m (or 26% of overall funding) has been invested into 14 greenfield projects as debt or debt-like instruments predominantly driven by DFIs.
- Based on interviews and analysis, the key drivers of debt vs. equity issuance are:
  i. Misalignment on the equity valuation of the project
  ii. De-risking the investment through cash flow repayments
  iii. Enabling an exit through defined maturity period
- As a result of project execution issues coupled with lack of steady capital flows, numerous projects have not been able to generate sufficient cashflows to service debt and provide target equity returns
  - This has led to a number of projects being restructured with debt being converted into equity diluting initial investors.
- Majority of the large-scale forestry projects are still immature, yet to generate steady-state cashflows and would be considered as brownfield projects.
  - These projects will continue to require substantial capital going forward as they transition to mature companies and reach their EBITDA targets.

# Forestry companies in Sub-Saharan Africa have seen large variations in valuation with investors generally paying a premium for immature projects vs. steady state assets

**Precedent transaction comparables in Sub-Saharan Africa (including South Africa) on per ha basis (US$)**




Source: CAP proprietary data and analysis

**Valuation methodology**

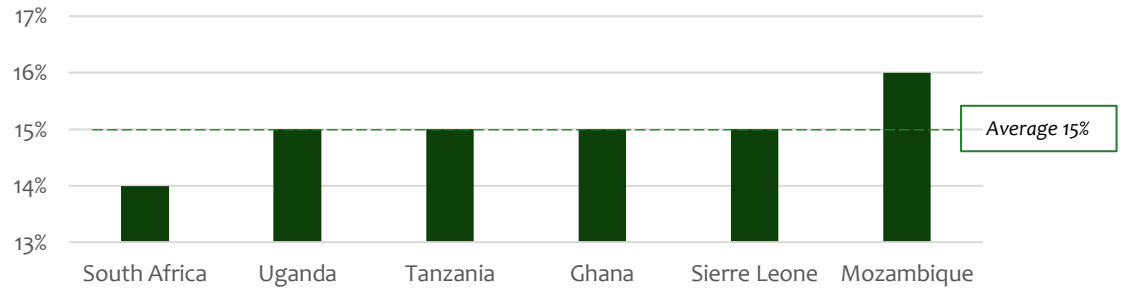
**Valuation methodology – considerations:**

- Outside of South Africa, a majority of forestry projects are immature and yet to reach steady-state in terms of positive cash flows and revenue profile.
- As a result, a key appropriate valuation approach has been discounted cash flow ("DCF") based on: plantation wood flows, harvesting and rotational profile and costs, the sale and cost price of wood, and products and fixed overheads across the divisions (both forestry and processing).
- In countries with a mature asset base such as South Africa, earlier transaction comparables have played a role in valuation methodology. Consideration has taken place on a like-for-like basis because forestry companies have distinct profiles.

- The majority of recorded forestry transactions in Sub-Saharan Africa have been in South Africa and Eswatini. There have been limited transactions in the rest of Africa due to the limited number of forestry companies and low of number of transactions that have occurred.
  - Valuation in Sub-Saharan Africa (excluding South Africa and Eswatini) was driven by negotiations between existing investors.
  - New and external investors joining projects typically invested in debt or debt-like instruments due to a misalignment on valuation.
- The analysis above highlights that investors have generally paid a premium for deals in the rest of Africa vs. deals in South Africa and Eswatini due to companies being immature and yet to generate cash flows and stable revenue profiles.

# Investment expectations of returns in the forestry sector in Africa will be impacted by currency depreciation risks and high DCF discount rates applied to distant cash flows

## The average DCF discount rate of key countries is 15% (real basis)




Source: CAP estimates and analysis of annual reports of forestry projects in Africa

## USD investor returns will be impacted by currency depreciation over time

| Key Currencies | Currency depreciation rate % vs. USD (2013 – 2023 annualised) |
|---|---|
| Ghanaian Cedi | 19% |
| Sierra Leonean Leone | 17% |
| Mozambican Metical | 8% |
| South African Rand | 6% |
| Tanzanian Shilling | 4% |
| Uganda Shilling | 4% |
| **Average** | **10%** |

Source: Google FX rates history

## Key Considerations

- Material cash flows of greenfield and immature companies are typically realised after more than 15-20 years+. These figures are driven by the harvest rotation times of pine (20 years), eucalyptus (12 years), and teak (20 years).
- Due to the lack of transaction comparables outside of South Africa, a DCF methodology that relies on forecasted cash flows over the long-term (e.g. more than 20-30+ years) is generally utilised to determine valuations.
- Given the country risks in Africa, DCF discount rates are high (averaging 15% discount based on real terms) resulting in high compounding discount rates applied to distant cash flows impacting the net present value.
- Excluding teak, a majority of forestry projects generate local sales as a result of the focus on local / regional markets. This results in potential currency depreciation risks for investors who are USD focused.
  - Average annual currency depreciation of 6 countries of forestry projects (excluding Zimbabwe) has been 10% over the last 10 years.
  - West Africa (Ghana and Sierra Leone) has suffered the highest depreciation compared to East and Southern Africa.
  - In order to mitigate currency risks, companies are increasingly focused on exports to generate USD sales for diversification.
- As the majority of the projects outside of South Africa are immature and yet to generate material cash flows, investor returns are yet to be realised. Furthermore, given the long-term and illiquid nature of assets, there has been a dearth of realised exits in the sector.

# Prospective recommendations to forestry investors reflects evidence which supports backing experienced operators and building a diversified revenue base (1/2)

**Backing a credible sponsor and management team with a track record of developing forestry assets in Africa**

- A key lesson learnt from the analysis is to ensure that there is a credible and incentivised team and sponsor, with a prior track record of success in developing and managing forestry assets in Africa. This would help mitigate risks and help ensure due diligence has been executed for potential projects.

**Consider brownfield projects and industrialisation opportunities associated with existing projects in the region before greenfield opportunities**

- Analysis highlights that a majority of existing forestry projects in Africa (exc. SA) are immature and will continue to require significant capital to achieve steady-state revenues, including investment in industrialisation opportunities. A key theme emerging is the need to for full integration across the value-chain to ensure routes to market, given the limited third-party processing in the region. Choosing to invest in an existing project has a number of positive advantages including: (i) an existing management team that has already learnt industry lessons; (ii) existing governance and ESG systems that can be leveraged to mitigate ESG risks; (iii) leveraging existing forestry asset for wood flows and expansion to new greenfield projects.

**Building a diversified revenue base underpinned by multiple products (including by-products) and greater export opportunities to generate USD revenues and mitigate local competition**

- Projects with a diversified revenue base (that includes multiple products e.g, sawn timber, poles, plywood; and secondary products, e.g. crates) in multiple countries can mitigate market risks. An emerging theme is that some forestry companies are seeking to develop export channels to USA, Europe, and Asia. These markets often pay a premium for quality FSC-certified wood products which enables forestry companies to mitigate competition from informal players with lower fixed costs and ESG standards.
- Projects can also maximise the value of under-utilised biomass for power generation (e.g. CHP) and produce ancillary products such as biochar (linked to carbon), charcoal, and pellets.

# Prospective recommendations to forestry investors should reflect evidence which supports backing experienced operators and building a diversified revenue base (2/2)

**Developing a viable community engagement and investment strategy to support a social license to operate in rural areas of Sub-Saharan Africa**

- A majority of companies in the region have faced endemic social issues that have led to high reputational risks for operators and investors. A strong community engagement and investment plan, focusing on community projects, can be crucial to secure investment in a forestry project. This can cover typical CSR based projects but also smallholder outgrower schemes, agroforestry, and agriculture projects which promote job creation and enhance livelihoods. Management incentives can enhance social and environmental outcomes by the Board and / or by investors. Concessional and grant capital can play a role in providing capital for high impact community and environmental projects alongside commercial capital. We will explore the importance of this in section V.
- Potential small-holder and outgrower models (with silviculture management and routes to market) could provide a sustainable and impactful route towards growing biological assets

**Investing in forestry requires a patient capital approach and realistic expectations on returns due to currency risks and the long-term nature of forestry asset profile**

- Due to the long-term nature of a forestry asset, greenfield or immature projects require a long-term investment horizon such as a fixed-life investment fund able to convert to a permanent capital vehicle or evergreen fund at the outset (e.g. AFIP vehicle). A long-term investment vehicle can also provide flexibility on achieving exits.
- Once assets reach a steady-state cash flow profile, a cash yield could be attractive for investors seeking steady-state returns and / or diversification to real assets.
- Based on the analysis, expected returns are driven by entry valuation and performance of the investment in a context of systematic and idiosyncratic risks – including currency movements compounded by high discount rates which are applied to long-term cash flows. As a result, a realistic expectation is required as to a plausible rate of return.

**Incorporating carbon offset revenues (subject to carbon methodology) can improve the risk / return profile of a greenfield forestry project that has a strong additionality case**

- Historically, carbon credit opportunities were not the first priority of investors and sponsors for greenfield projects in Africa. As analysis later shows, carbon offset revenues can make a material impact in improving returns and providing capital in the early years of developing biological assets. Subject to carbon methodology (e.g. additionality), forestry projects can leverage carbon finance (linked to a new era of carbon investors) to develop projects which reflect the growing demand for carbon removal credits in voluntary markets.

# V. Lessons learned from smallholder forestry in Sub-Saharan Africa and Asia

# The term 'smallholder' is highly context-specific and can mean different things to people in different cultural and land-use situations.

Broadly, we look at four typologies for this analysis, using the collective term **'smallholder forestry'** for the industry and **'SME producers'** for the actors referred to.

| Typologies | Description |
|---|---|
| 1 Natural forests and large private plantations are out | • Does not include natural forests or blocks larger than 1,000 ha with single ownership. |
| 2 Exotic and indigenous tree species | • For example pine, eucalyptus, teak, acacia, and other important timber species which are used in commercial wood industries in Africa. |
| 3 Range of production systems | • These may be grown in a range of production systems including:<br>o agroforestry systems – intercrops, line plantings, small block plantings;<br>o around field or property boundaries, roadsides and rivers (although harvesting is constrained adjacent rivers);<br>o in small blocks (e.g., 0.1-5 ha);<br>o in medium blocks (e.g., 5-200 ha);<br>o in large blocks (e.g., 200-1,000 ha). |
| 4 Common and collective criteria for defining 'outgrowers' and 'smallholders' | • Tree ownership is clear, although there may be some questions over the ownership of the land, since land and tree ownership can be separated;<br>• Trees have been planted with the knowledge that they will be harvested – there is a clear and unambiguous, commercial imperative. |

# Smallholder forestry is nascent in Africa whereas, by contrast, the regional wood base in East and Southeast Asia is supplied primarily by SME producers

## Key projects in Sub-Saharan Africa anonymised by archetype

| Country | Archetypes* | # SME producer | Area planted |
|---|---|---|---|
| **Uganda** | Hub-and-spoke formal | 2,256 | 6,500 ha |
| | Processor Light and Farmer Co/Owned Processing | 21 | 4,707 ha |
| | Processor Light and Trader Plus | TBC | 45,000 ha |
| | Other SME producers | TBC | 100,000 ha |
| **Tanzania** | Processor Light and Trader Plus | 9,000 | 12,500 ha |
| | Other SME producers | TBC | 399,500 ha |
| | Hub-and-spoke informal | TBC | 15,500 ha |
| **Kenya** | SME producer forestry model | 30,000 | 10,000 ha |
| **Sierra Leone** | Community land-lease | 130 | 9,200 ha |
| **South Africa** | SME producers | 20,000 | 42,000 ha |
| | Hub-and-spoke formal | 1,800** | 301,200 ha |
| **Ethiopia** | SME producer outgrower schemes | TBC*** | 639,400 ha |

Note on data: number and ha of SME producers is based on estimates from companies or latest available reports and presented anonymously.

* Archetypes are used to show the typologies of projects which are explained on side 47.

** This figure is a combination of small, medium, and large owners. NCT is a fully vertically integrated co-op model with wood chip processing and exports.

*** National four-year "green legacy" initiative (GLI) mobilising 25 million Ethiopians since 2019.

## Key projects in East and Southeast Asia

**Plantation Timber Products (PTP):** 200m trees planted by an estimated 360,000 SME producers. Leading producer of high-end wood panel and laminate flooring in China. The company received DFI funding from IFC as well as private capital from individual investors.

**Vietnam:** supplies more than 50% of the Asia-Pacific hardwood woodchip market (Margules Groome, 2022) and approximately 12% of the total world export volume (GTA data, 2022). In 2020, Viet Nam's export earnings on wood products were USD 12.4 bn.

**Vietnam:** 1.9m ha plantation forest are managed by more than 1 million SME producers. Wood is sold into a reliable local market which feeds the country's wood industry.

**India:** 6.4m ha Eucalypt trees have been planted by millions of SME producers. Wood is sold as wood fuel, pole, sawn timber, and as raw material for the pulp industry.

**Lao PDR:** 25,000 ha of smallholder plantations supply large commercial players. Government supported initiatives facilitate these agreements between large players and SME producers.

**Sri Lanka:** SME producers are estimated to provide over 40% of the country's sawlog supply, 26% of the biofuel production, and a significant proportion of the country's poles.

**Thailand:** A total of 1.55 million ha of plantation forest is controlled and managed by the private sector but dominated by SME producers. Demand for eucalypt wood remains strong and the region's eucalypt resource is expanding. There is minimal government involvement.

# South Africa is the only location in Sub-Saharan Africa where smallholder forestry is working sustainably and at scale because of necessary end-markets, economies of scale, and infrastructure

**South Africa**

- Successful smallholder forestry programs like NCT and TWK in South Africa benefit from the reliable global woodchip market and Mondi and Sappi a reliable pulp and paper market.
- NCT, Sappi, and Mondi have extensive outgrower schemes that have been established historically, and NCT offers a good example of a vertically integrated employee-owned outgrower model for export. These companies provided SME producers with a market for the whole tree with a little space for trader offtake, and then took advantage of global market forces.
- The necessary end-markets, economies of sale, and infrastructure in South Africa highlight the importance of these factors for sustainable smallholder forestry development elsewhere.

**Application of Byron's four keys to South Africa as a country**

**Ownership**

●●●

Smallholder remains the owner of the tree, and traditional authorities endorse land use. There is also strong community acceptance.

**Know-how**

●●●

Efficient deployment of extension systems to extensive outgrower networks through group schemes and employee-owned cooperatives.

**Market**

●●●

Orchestrated offtake for commodity players (woodchips and pulp / paper). Offtake with first right of refusal for mature tree, and pricing is clear and attractive.

**Regulation**

●●●

Mature and incentivising regulatory frameworks with clear quality / grading standards in place.

# In the rest of Sub-Saharan Africa, smallholder forestry initiatives have not achieved significant scale and are vulnerable due to limited market offtake at viable price points

**Sub-Saharan Africa**

- To our knowledge, smallholder forestry in Sub-Saharan Africa has not been working sustainably as there are limited examples of smallholders replanting trees in follow-on rotations. Most of the projects outside of South Africa are NGO / donor or DFI funded, or are linked to greenfield projects as part of a wider CSR effort.
- We know that in East Africa, large international and smaller informal processors are buying some of the producers' trees. Formal and FSC-certified operators in Sub-Saharan Africa currently prefer to buy only higher-quality trees for utility poles (often only 5% of a smallholder crop) and / or sawn timber, with remaining produce often sold into informal markets at lower prices.
- Overview of selected countries in East Africa:
  - **Kenya** – there have been smaller bursts of activity which were not sustained. For example, there was activity driven by the pole market and a temporary shift toward private forestry woodflow in response to a government forest logging ban. Another firm has received significant investment to date for an ambitious outgrower and processor model with the intention of becoming commercially sustainable. However, the model of retaining ownership of trees planted on smallholder land has been controversial, and overall has not demonstrated a pathway to commercial viability.
  - **Uganda** – forestry has been enabled by policy and by tree growing subsidies and TA. However, this long rotation SPGS forestry model is now vulnerable to collapse due to limited market offtake at viable price points.
  - **Tanzania** - forestry in the Southern Highlands has started to flourish, providing learnings based on a mix of donor-funded projects, smallholder activities linked to commercial greenfield projects, and some commercial funding from private individuals' SME woodlots (i.e. through the Finnish-funded Participatory Plantation Forestry Programme).

**Application of Byron's four keys at Sub-Saharan Africa region**

**Ownership**

Lack of secure land tenure/ property rights is often complicated, based on a mixture of partnerships with community land-owners through land-lease or outgrower programmes.

**Know-how**

Optimal site-specific genetics / species are still being tested. These include pine vs. Eucalyptus, short vs. long rotation. Generally high-cost extension models and high input costs are challenging.

**Market**

Disjointed markets are at times distant from producers. There has been a lack of orchestrated offtake for smallholders with the result that most smallholder crop ends up being sold to informal markets.

**Regulation**

Periodic log export bans, prohibitive carbon tax regulations, and standards for quality / grading are not in place across several countries.

# In contrast with Sub-Saharan Africa, smallholder forestry in East and Southeast Asia has been market-led and is bolstered by a large consumer base

**East and Southeast Asia**

- Growth in smallholder forestry in Asia was underpinned by the structure of the Asian economy, in particular its large consumer base and a presence of merchants and traders historically involved in international trade and markets. Forestry smallholders in Asia took up small-scale processing and engaged with existing SME producers nearby. In this way, they supplement imported inputs and bolstered factory capacity.
- Additionally, forestry smallholders in Asia experienced a better enabling environment. This including policy, governance, and institutional frameworks which supported an industry and market-led primary production system. The sanctity of contracts and systems that had worked reasonably well in other agricultural sectors (such as fisheries) was adopted and inspired trust in the forestry value chain.
- Momentum was gained as market actors diversified in primary and secondary processing. This momentum extended to retail in some cases (e.g. furniture and flooring) supporting spin-off industrial kilns / charcoal processors for waste. Market demand for the whole plot / tree was secured through the creation of multiple processing industries and multiple product lines.

***An illustrative case study on why Asian smallholder forestry has been successful:***

PTP merged with Asia Dekor, a Chinese furniture company, to create a vertically integrated company. The company sold medium and high-density fibreboards and other wood products to the Chinese market. They were able to source woodchip from global market to meet supply volumes initially. Later SME farmers were incentivised to grow and supply eucalyptus domestically. Wood was processed and sold by PTP directly to the consumer in their own branded outlet stores. They offered MDF and value-added products such as doors and floorboards at competitive prices and at a higher quality than the wider market. Reliable offtake demand to 360k SME producers and strong downstream distribution (now more than 1,200 stores) created the conditions necessary to buy the whole tree at a competitive price from SME producer suppliers.

**Application of Byron's four keys at East and Southeast Asia region**

**Ownership**

●●●

Land ownership strengthened post-independence and often large areas of land allocated by state to communities for out-grower initiatives.

**Know-how**

●●●

Flexible contracts to meet SME producer needs: from inputs, to silvicultural assistance, to loans etc.. Depth of knowledge on short-rotation species.

**Market**

●●●

Diversified and reliable processing industries for the whole plot / tree, supported by localised offtakers / traders with fair pricing.

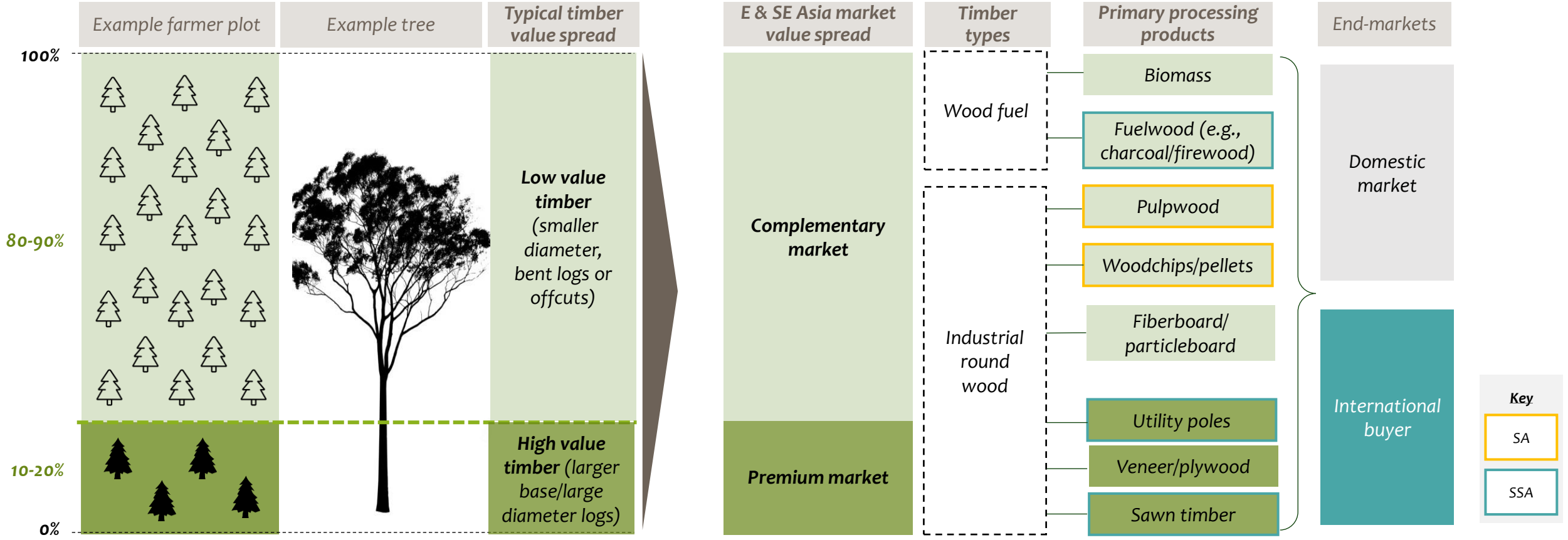
**Regulation**

●●●

Vietnam leading the way in reducing transaction costs, other countries catching up and shifting away from 'illegal logging' regulations.

# SME producers in East Asia are supported to sell the whole plantation and tree at an aggregate price that makes best use of the land, and creates incentives to replant

- Market dynamism and a strong market 'pull' incentivises SME producers in **East and Southeast Asia.** This is the result of sufficient primary processor market diversification and a large consumer base.
- In South Africa, long-standing extensive outgrower schemes are well structured by large companies. Companies offer transparent payment and direct access to international woodchip and pulp and paper markets.
- However, across Sub-Saharan Africa, markets are thin and disjointed. To date, a lack of orchestrated offtake has resulted in SME producers selling a small portion of their trees for poles and / or sawn timber, and the remainder being sold at low value to informal markets. The early harvest of long-rotation species and / or the poor support of silviculture practices has led to historically poor-quality produce and has further decreased market value.



# Eight archetypes for smallholder forestry show variations of supply mix, business model, SME producer relationship, and land and tree ownership

| *Archetype* | Supply mix | Business model | SME producer relationship with company | Land Ownership | Tree Ownership |
|---|---|---|---|---|---|
| 1 **Community land-lease*** | Commercial operator growing the forests | Processor and management company | Formal land lessor | 100% community land | Commercial grower/ processor |
| 2 **Outgrower centric** | 100% SME production | Processor and services company | Formal outgrower | SME producer | SME producer /or commercial grower/ processor |
| 3 **Hub-and-spoke Formal** | Nucleus commercial plantation + SME production supplement | Processor, plantation management + services and aggregation company | Formal outgrower | Commercial grower/ processor and SME producer** | Commercial grower/ processor and SME producer** |
| 4 **Hub-and-spoke Informal** | Nucleus commercial plantation + SME production supplement | Processor, plantation management + aggregation company | Informal supplier | Commercial grower/ processor and SME producer** | Commercial grower/ processor and SME producer** |
| 5 **Processor Light** | 100% SME production or mixed | Processor company (compliant or informal) | Formal/ Informal supplier | SME producer | SME producer |
| 6 **Trader Plus** | 100% SME production or mixed | Trader, harvesting and haulage service company | Formal/ Informal supplier | SME producer | SME producer |
| 7 **Farmer-owned woodlots** | 100% SME production | Farmer owned inputs and outputs and freedom to sell | None | SME producer | SME producer |
| 8 **Farmer co/owned processing** | 100% SME production | SME producers and micro-processors selling sawn timber and young poles via road-side markets OR farmer / co-op co-owned / JV partnership into a processing facility | Supplier and co-owner/JV partner | SME producer | SME producer |

**Legend:** Mixed supply 100% SME producer supply

** Community land-lease model is not a smallholder forestry model per se, rather a more inclusive land arrangement involving benefit sharing.
**Ownership of land and trees is by both actors of their own land and trees, it is not co-owned.

# The community land-lease archetype in West Africa demonstrates the potential to be inclusive and profitable for smallholder landowners and for companies

***Company A:***
***Community land-lease archetype***
***Sierra Leone***

The model works well for the company and the community of landowners because roles, responsibilities and incentives are clear.

## *Overview*

Context: Company cannot access commercial land and therefore requires partnerships/ leasing arrangements with communities.

Model: Company leases land from 130 landowners and manages all aspects of production: thinning, pruning, and harvesting to reduce risk of volume output and quality variation (in species, age, size, uniformity).

Commercial incentive for SME producer: Being paid land-lease fees and / or profit share on outputs, and a bonus for preventing fire risks, illegal logging, and encroachment.

Commercial incentive for company: Capacity utilisation of processing assets to generate a positive return. It is less costly to produce same stock on community-owned land than to acquire land in this geography.

*Application of Byron's keys to the model*

**Ownership**

Land leased from SME producer land-owners with agreement on land not being used for crops, i.e. use specific fields / sloped land for trees. Company owns tree assets and has high control over supply; also manages own harvest and haulage. Company has trusted relationship with community which increases convenience, reliability, responsiveness.

**Know-how**

Focus on clonal varietals that are agro-climatically suitable and globally demanded and competitive. Key KPI is getting cost per cubic metre down (e.g., by decreasing weeding and thinning costs). Company has always been focussed on the market, and profit-driven through incremental growth ("plant what they can manage"). Company has staff who are competent operators in forestry, community engagement, and marketing.

**Market**

Local market is a nascent industry with few competitors for smaller diameter wood, e.g. their small plymill is vertically integrated into a German retailer. For export market, FSC certification has been obtained as part of strategy to access high value export markets.

**Regulation**

Neutral / no major impediments to doing business.

# In the informal hub-and-spoke archetype in East Africa, social co-benefits are attractive while profitability remains nascent

***Company B:***
***Hub-and-spoke formal archetype***
***Uganda***

Although only contributing 5% to supply mix, the model works well for company and SME producers. Both also benefit from carbon revenues (40/60).

## *Overview*

Context: Company reaching capacity in its plantations close to communities and faces risk of new entrants (smaller processors, non-compliant with regulations).

Model: Company provides 2,256 producers with seedlings and services for free to reduce quality and side-selling risk. Community agreement for managing risks of fire, illegal logging, encroachment.

Commercial incentive for SME producer: Company is closest big off-taker and shares 60% carbon revenues. However, producer faces options from smaller new entrants and may transact with either if timing and price is right. Community receive bonuses if fire risk metrics upheld.

Commercial incentive for company: Although not yet profitable, SME producers provide 'fibre security' to processor. Producers offset costs through carbon revenues (40% share) and manage fire risks. This community agreement approach creates 50% saving on forestry risk-management costs compared to alternatives approaches.

*Application of Byron's keys to the model*

**Ownership**

SME producers plant trees, in addition to food crops and other woody crops (e.g. avocado, citrus). Land size is crucial and planting trees is only advisable if there is additional, allocatable land. There is an increasingly strong informal cultural linkage to SME producers: 6500 ha is mapped, 18 carbon cooperatives are to receive 60% of carbon revenues (40% to company for management of the scheme).

**Know-how**

Company provides inputs for free to encourage culture of tree growing and incentives to protect from fire. Intention is to save company money vs. alternative approaches. Management team had hard learnings about low community engagement and initially poor quality of trees. Learnt also that longer rotation pine trees are less profitable / attractive for farmers and more risky for company vs. short rotation eucalyptus. Even if the farmer cuts pine trees 2 years too early (due to need for funds / middlemen) then 80% of tree value is lost and becomes either scrap wood or product for sawmill.

**Market**

Nascent industry where only 60% of the tree is used by local processors.

**Regulation**

Unpredictable and uncertain environment e.g. export bans on timber products, local standards on quality to be finalised.

# SME producers may provide a cost-effective solution to developing forestry projects, with factors such as land valuation and labour contribution to be taken into account

| Illustrative smallholder cash plantation costs for a 1 ha 12-year eucalyptus rotation in Tanzania (excluding valuation of land and labour contribution) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Indicative Smallholder Costs ($US)** | **Yr 1** | **Yr 2** | **Yr 3** | **Yr 4** | **Yr 5** | **Yr 6** | **Yr 7** | **Yr 8** | **Yr 9** | **Yr 10** | **Yr 11** | **Yr 12** |
| Site Preparation and Seedlings | 250 | - | - | - | - | - | - | - | - | - | - | - |
| Maintenance / Weed Control | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| *FSC Certification and Carbon Costs | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| **Annual Cash Costs** | **310** | **60** | **60** | **60** | **60** | **60** | **60** | **60** | **60** | **60** | **60** | **60** |
| **Cumulative Cash Costs** | **310** | **370** | **430** | **490** | **550** | **610** | **670** | **730** | **790** | **850** | **910** | **970** |

Source: CAP analysis of SME production costs in Southern Highlands in Tanzania. *Assumes SME producer participates in FSC andcarbon programme – see smallholder carbon anlalysis.

- The above scenario assumes an SME producer has access to land and labour in Tanzania, and that producers implement a 1 ha 12-year eucalyptus rotation for multiple end-markets (sawn timber, utility poles, and veneer). The farmer is part of FSC and carbon accounting group scheme as part of an overall smallholder co-operative.
- Based on an illustrative analysis, smallholder forestry may be cost competitive. Key considerations focus on understanding: (i) incorporating valuation of land as an opportunity cost of growing forestry vs. other products (e.g. annual crops or tree crops); (ii) valuation of labour of SME producer for implementation and maintenance until harvest; (iii) harvest and logistics costs that can be material in rural areas.
  - The scenario above shows cumulative cash costs of $1,000 up to harvest in year 12 (excluding land, time, and harvest and logistics costs).
- If in-kind contribution of time and land are incorporated into the overall costs to illustrate a potential investment structure to fund smallholder forestry, the all-in costs are $2,700 per ha. These include (i) c.$1,000 cash costs as per above to fund up to harvest; (ii) $1,000 per ha valuation of land (indicative cost from Southern Highlands and Tanzania); (iii) $700 valuation of in-kind labour costs from an SME producer (based on proxy costs from a commercial plantation example).
  - **Assuming an equity investment structure based on profit sharing whereby an investor funds cumulative cash costs of $1,000 and a SME producer provides their in-kind contribution of land and labour (c.$1,700), the implied profit share would be c.60% for SME producers and c.40% for investors for income generated.**
  - **Other potential costs that need to be factored in are harvest and logistics (can be netted from revenues) and the costs of training for silviculture management.**
  - **Debt-like structures can also be considered in order to fund the cumulative cash costs for investors developing smallholder forestry projects.**
- Key considerations for funding smallholder forestry projects would be (i) routes to market; (ii) side-selling risks; (iii) potential silviculture issues.
- For smallholder forestry, a shorter rotation such as eucalyptus (12 years) vs. pine (20 years) may be appropriate in terms of reducing the overall cost burden until harvest. Earlier harvest income and improving returns are subject to access to market, pricing and supply / demand factors.
  - If there is a large market for wood chips and MDF in Sub-Saharan Africa, a shorter rotation of eucalyptus for 7 years may enhance returns for farmers.

# Summary and strategic implications of this paper for smallholder forestry

- **Smallholder wood supply is critical and increasing:** In short, if forestry is to satisfy future wood demand and contribute substantially toward climate mitigation targets, the contributions of SME tree-farmers toward commercial wood supplies are increasingly critical. The expansion of forestry using conventional plantation models is challenged across Sub-Saharan Africa where land tenure, access, and ownership are ambiguous, and conventional commercial plantations will be unable to meet demands for plantation-grown industrial wood.
- **There are inclusive shared value opportunities for smallholders and industry:** Smallholder forestry has the potential to create shared value for communities through partnering with the commercial forestry sector. It can be highly impactful in forging positive community relationships, maintaining low operational costs for tree production, and creating additional sources of income for SME producers or landowners.

- **However, commercial viability for smallholders and larger companies is not yet conclusive:** In Sub-Saharan Africa, the open questions remain: is it commercially viable for larger companies to source from SME producers? And do the economics make sense for the SME producer to see forestry as a positive economic opportunity vs. alternative land uses?
  - Senior stakeholders from larger commercial off-takers noted that smallholder supply models are not yet profitable for them, due to costs of providing inputs and extension support to SME producers and the risks of SME producers harvesting trees early or side-selling timber to other buyers. However, they also commented on how community-land lease models are working well for company and SME landowners. Furthermore, as we've shown, the potential to correctly implement outgrower models remains, since smallholder forestry may provide a cost-effective solution to developing forestry projects if the balances of risks and incentives can be addressed.
  - For SME producers, a suitably diversified and reliable market for wood remains lacking. As such, it remains in question whether SME farmers can be profitable and incentivised to harvest at full maturity, or to replant over multiple rotations. Grower scale and capacity is small and therefore requires that land is used for tree planting only once the needs of the farmers have been met, and the land has no other value to the community. A mosaic of land uses is important to generate returns; tree farming alone attracts low returns due to long rotations and margins in forestry. Proximity is also important and interrelated with scale. In short, tree-farmers with a few small trees, growing far from the road and far from the market, will receive a lower price per unit than a farmer with large trees, close to the road and close to the processing plant.

# Recommendations for potential further development

***What firm-level initiatives could be pioneered and supported by DFIs and non-DFI investors to increase offtake from SME producers and transform the forestry sector in Sub-Saharan Africa?***

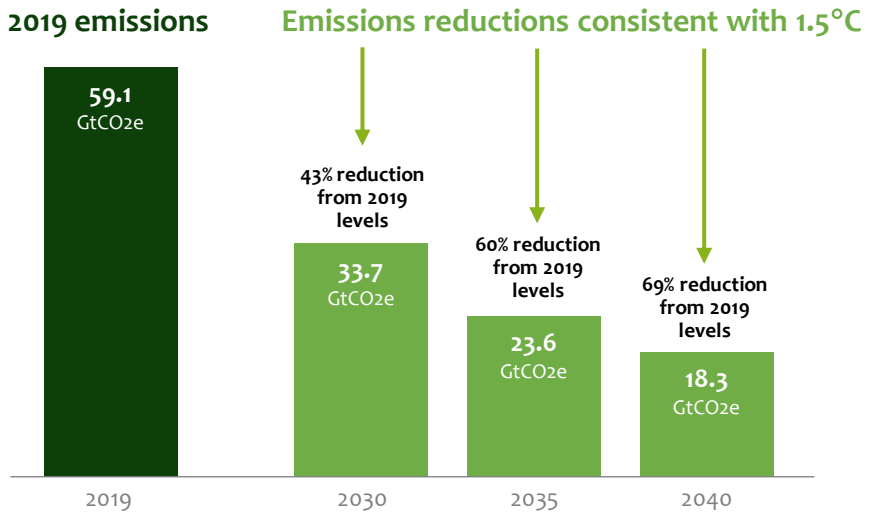
- Countries, industrial clusters and vertically integrated companies would need to build extra capacity to purchase the whole tree and smooth the route-to-market challenges.
- More pragmatic value chains might work within industrial clusters to provide value-addition and offtake for the whole tree.
- For example, short duration models (e.g. 5-year eucalyptus for veneer or woodchip markets), use of spindle-less lathes to create higher value veneer product, and selling of low value offcuts to sustainable charcoal offtakers, have proven more successful for smallholders in other parts of the world.
- A low-cost extension model (low input, less sophisticated) with full offtake by a commercial forestry company.
- ESG compliance and emerging regulations could open up a competitive advantage over informal offtakers in the region (e.g. FSC certified veneer / plywood sold into the EU following new directives on deforestation). However, for smallholders to respond to this, technical innovations in smallholder certification and management will be required, such as CMO's group scheme services.
- Scaling nursery opportunities would channel improved and diverse genetics into the wider system and add resilience (by mitigating pest, disease, and yield risk).

**What is clear is that distinct strategies would be needed for each unique context considering Byron's 4 keys: ownership (and community), market (and logistics), technical know-how, and regulatory environment.**

# VI. The role of carbon finance

# As stated in the IPCC 6th Assessment Report, limiting global warming to 1.5 degrees will require immediate climate mitigation underpinned by carbon removal

## Deep GHG emission reductions are required to limit warming to 1.5 degrees




Note: Analysis of pathways that limit warming to 1.5 degrees C with no or limited overshoot.
Source: IPCC

- IPCC highlights there is more than 50% chance that global temperature will reach or go beyond 1.5 degrees between 2021 and 2040.
- Under a high-emissions pathway scenario, the world may hit the 1.5 degrees threshold between 2018 and 2037.
- An urgent climate mitigation response is required across all sectors to limit global warming to 1.5 degrees, with no or limited overshoot.

## IPCC highlights 10 urgent solutions that are required to limit global warming

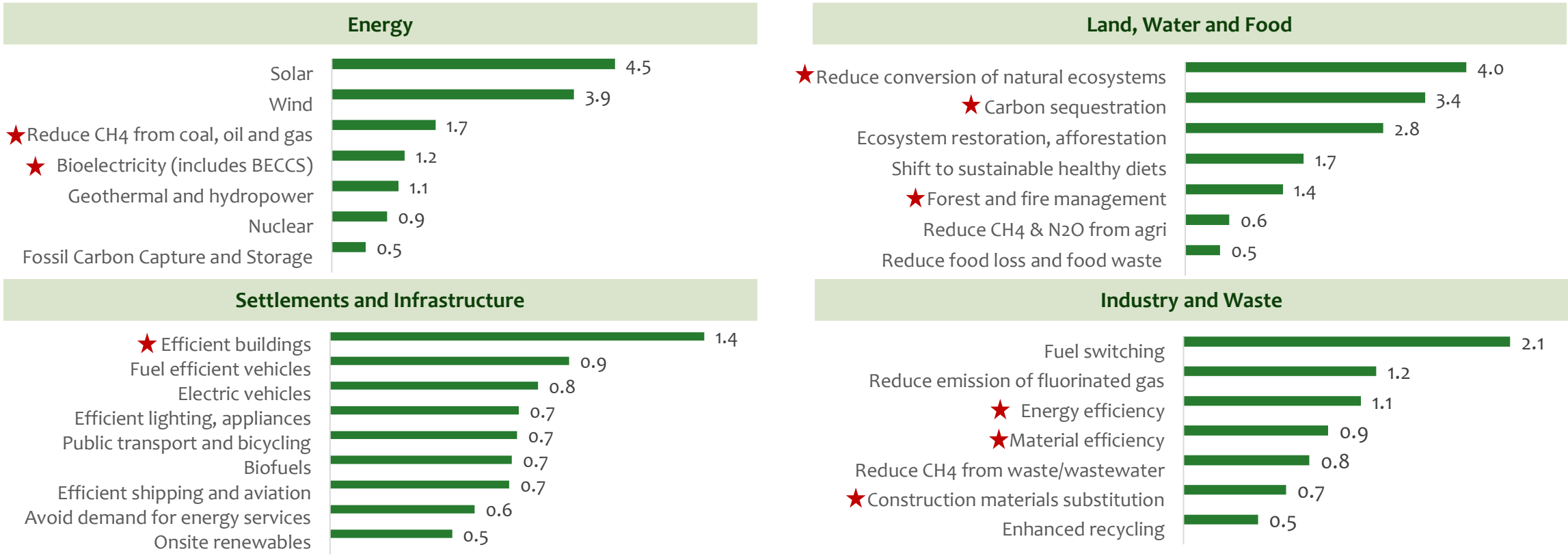

Source: IPCC

WORLD RESOURCES INSTITUTE

- While fossil fuels are the number one source of GHG emissions, systematic transformation is required across all sectors to ensure rapid and deep reductions in limit global warming to 1.5 degrees.
- Halting deforestation and restoring degraded lands and decarbonising buildings are relevant to the forestry sector and Africa.

# With renewable energy, the actions with greatest potential to contribute to climate change are: reducing deforestation, carbon sequestration, and creating efficient buildings

**IPCC Analysis: Potential contribution to net emission reductions (2030) – $GtCO_2$-eq/year across multiple sector activities**




★ Relevant to forestry sector and production of sustainable timber products for construction. Reduction of conversion of natural ecosystems is applicable to mitigating high deforestation rate in Africa (4m ha p.a.)

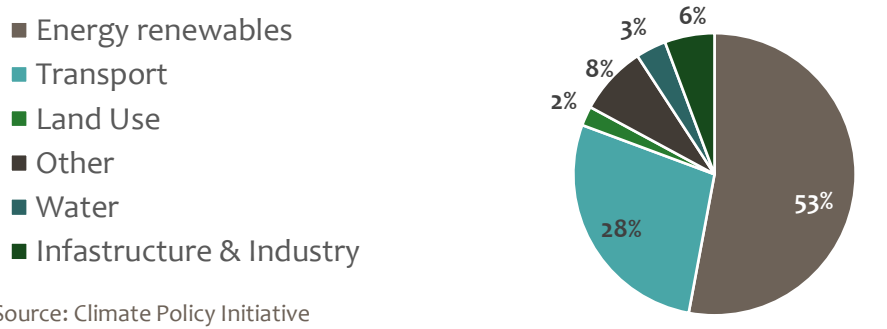
**There is a significant opportunity for the forestry sector to play a role in carbon sequestration, restoring degraded land, and sustainable forestry management as part of nature-based solutions. Timber products can provide a sustainable source for construction materials to build efficient buildings. Underutilised biomass from forestry operations can be used to produce biochar (carbon removal) and steam for sustainable energy production (from CHP).**

# Climate finance inflows to Africa are low compared to other regions: carbon finance can help incentivize projects with high potential to mitigate climate change

**Africa has low climate finance inflows and limited private sector involvement vs. other regions**

| Region | Climate finance inflows ($bn, 2020) | % funding from private sector |
|---|---|---|
| East Asia and Pacific | 292 | 39% |
| Western Europe | 105 | 59% |
| US and Canada | 83 | 95% |
| Latin America and the Caribbean | 35 | 49% |
| Eastern Europe and Central Asia | 33 | 39% |
| South Asia | 30 | 37% |
| **Sub-Saharan Africa** | **19** → **3% of total** | **11%** |
| Middle East and North Africa | 16 | 44% |
| Other Oceania | 9 | 89% |

**Majority of the climate finance is driven by renewables and transportation sectors, highlighting significant gaps in other areas**




Source: Climate Policy Initiative

**Climate finance and carbon finance: key considerations**

- Climate finance is a broad term that refers to local, national, or bilateral financing from public and private sector to implement projects that reduce impact from climate change. A global framework led by UNFCCC defined the role of climate finance in terms of the obligations of developed countries to provide financial assistance to developing countries as per Paris Agreement.
- As IPCC highlights, insufficient financing and a lack of incentives for finance are key barriers to climate action, and the largest climate finance gaps and opportunities are in developing countries.
- In 2020, climate finance flows reached $632bn with majority concentrated in East Asia and Pacific, Western Europe, and North Africa.
  - Africa has one of the lowest climate finance inflows (3% of total) and limited investment from the private sector highlights significant importance of increasing climate inflows to the region.
- A majority of global climate finance capital is geared towards energy renewables and transportation sector. This highlights a financing gap for high contributing areas to reduce emissions such as nature-based solutions and efficient buildings and infrastructure as highlighted by IPCC.
- Carbon finance is a component of climate finance (also under Article 6 of the Paris Agreement) that relates to provision of capital for projects through payments that are linked to the delivery of verified emission reductions.
  - These incentive payments or carbon offset credits can be utilised to fund projects and improve risk / return profile to facilitate investors.
- Carbon credits generated from projects can be traded on voluntary carbon markets underpinned by accreditation verifiers such as Gold Standard and Verra. Carbon credits can be related to removals (e.g. carbon sequestration from greenfield projects or biochar) or avoidance (e.g., REDD+).
- **Carbon finance can play a role in addressing the significant gaps in climate finance inflows in Africa and opportunities in nature-based solutions.**

# Carbon finance can play a significant role in unlocking capital across forestry, and downstream from the use of timber products to accelerate carbon removal goals

**Upstream Activities** → **Downstream Activities (Primary & Secondary Processing & By-products)**

| | Forestry | Primary Processing | Secondary Processing | Processing of by-products using underutilized biomass |
|---|---|---|---|---|
| **Example / Description** | Greenfield forestry project that restores degraded land through afforestation, reforestation or revegetation, with trees harvested for timber products through rotational cycles. | Production of primary timber products including sawn timber, poles, plywood and veneer for construction and real estate sector. Some of these products go towards secondary processing on the right | A) Production of mass timber and engineering products that utilize primary products such as plywood and veneer for construction materials<br><br>B) Other secondary products include doors, windows, other furniture items and industrial products (e.g. crates) | Raw materials that are not used for timber products can be used for a number of alternatives including: (i) steam generation (e.g., CHP); (ii) by products such as pellets, briquettes, charcoal and biochar |
| **Climate impact opportunities** | New plantings result in carbon sequestration. Carbon finance can be used to incentivise new projects due to the risk / return profile of investing in the African sector | Production of sustainable construction materials that can substitute for steel / cement and unsustainable timber. FSC certified products ensure sustainability vs. sourced from natural forests | In-line with primary processing, the usage of FSC certified secondary products ensure mitigation of deforestation and provide a sustainable solution for construction sector | Production and use of sustainable by-products such charcoal and pellets can reduce deforestation. Biochar is an accepted form of carbon removals that also can provide positive impact to the agriculture sector for fertilisers |
| **Carbon methodology status** | In place | Gap for primary products | Mass timber and sustainable building materials: Underdevelopment<br>Gap for other secondary products | Biochar: In place; sustainable charcoal: Underdevelopment |
| **Applicability to IPCC sectors to reduce emissions** | Carbon sequestration and Ecosystem restoration, Afforestation and reforestation | Efficient buildings and construction materials substitution | Efficient buildings and construction materials substitution | Renewable power generation and bioelectricity (including BECCS) |

*ARR: Afforestation, reforestation and revegetation

**The forestry value-chain offers significant opportunity for carbon removals as highlighted by IPCC, including sequestration activities through upstream activities, and biochar production from underutilised biomass and renewable steam production (from CHP) subject to carbon methodology. There are innovation and development opportunities for catalysing carbon finance to incentivise the development of efficient buildings. This depends on the use of timber products e.g. mass timber (currently at a concept stage of development by Verra).**

# Carbon methodology continues to evolve due to greater demands for quality credits while downstream activities provide opportunities for innovation

**Key components of a carbon credit methodology**

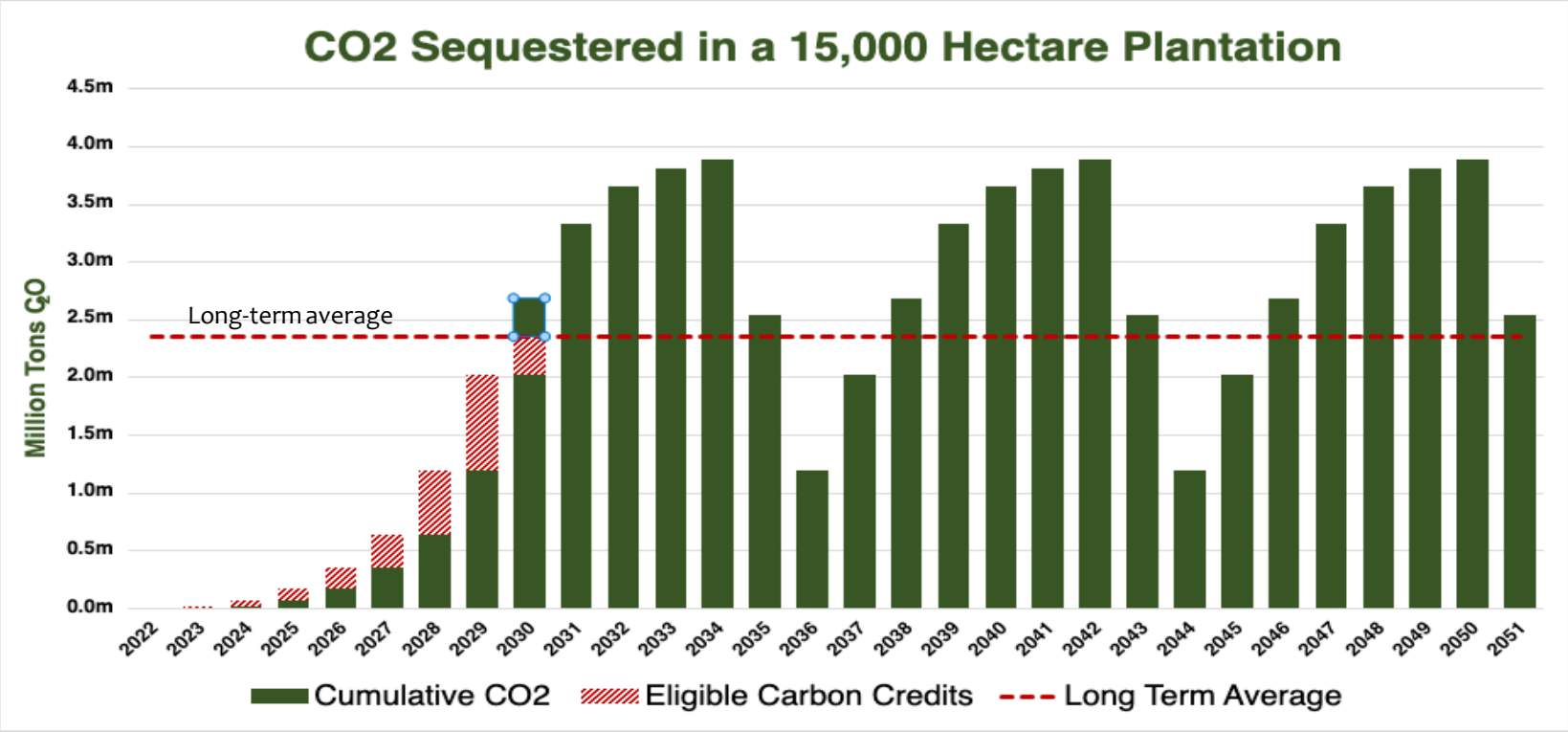
| Factor | Considerations |
|---|---|
| **Additionality** | Projects would not have occurred without carbon credit revenue streams (i.e. the revenue is required to improve the risk / return of the project and ensure the project is executed). |
| **Permanence** | Assurance that the carbon reductions have a permanent benefit and do not get reversed due to natural and human based activities (e.g. pests and diseases, fire implementation issues). Credits are reserved in a "buffer" to account for this risk. |
| **Leakage** | Assurance that the project does not result in carbon emissions outside the project boundary, reducing its overall impact. |
| **Quantification** | Ensuring that the project gets tracked over time to mitigate potential double counting issues. |
| **Baseline** | Assurance that the base line is conservative and adequate to measure carbon reductions. |
| **Carbon sequestration** | Based on above biomass (stems, bark, branches and twigs), below-ground biomass (roots), and soil organic carbon. |

**Potential project types to generate carbon credits and key emerging themes**

- For upstream forestry projects, there are 3 key project types for carbon credits:
  - Plantation ARR: typical sustainable forestry plantation with the purpose of harvesting and rotational cycles for manufacturing timber products. Based on our recent understanding, there are potential changes that may make it challenging for carbon credit generation of non-native and mono-plantations
  - Natural ARR: Afforestation, reforestation, and revegetation of natural forests with no purpose of harvesting the wood.
  - Improved Forestry Management: increasing the rotation age of the plantation and / or conversion of natural forests in order to protect forests.
- For manufacturing activities, there is no carbon methodology developed today that can leverage the positive contribution of sustainable building materials for construction, for the real estate sector and for the manufacturing of by-products such as charcoal, pellets, and briquettes. Charcoal and Mass timber are being developed.
  - A key exception is the production of biochar which is widely accepted as a credible method for carbon removals. However, this segment is in its infancy in Africa and there are a handful of credible projects being developed. This highlights significant scope to increase activities in this segment.
  - Downstream segments could offer greater traceability and permanence of carbon removals, subject to the double-counting issue vs. upstream activities.
- In terms of carbon methodology and markets, key themes are emerging:
  - Shift towards removals: There is a shift towards removal credits (e.g. ARR or biochar) vs. avoidance (e.g. REDD+ or renewable energy production) due to market participants requiring greater additionality and quality.
  - Greater concern on reputational risks due to quality issues on past projects (e.g. REDD+) resulting in the need for higher requirements for credible monitoring, reporting, and verification frameworks.
  - Convergence of the voluntary carbon markets and compliance markets (underpinned by government-related schemes) to enable companies to participate in both incentivising projects and mitigating climate change.

# Greenfield plantations have significant carbon removal capabilities combined with carbon credit generation

**Upstream: Illustrative climate impact and carbon credit generation of a 15,000ha forestry plantation (subject to changes in methodology)**




- A greenfield forestry project can result in significant carbon sequestration activity if implemented correctly, driving positive climate action. Carbon credits can be generated to incentivise and fund the implementation of projects thereby improving the risk / return profile. Carbon credits are generated during the 1st rotation only, providing early cash flows for the project.
- Based on current methodologies, carbon credit issuance is limited to the long-term average during the crediting period (e.g. 30 years) to account for the movement of GHG carbon stock over time due to rotation cycles.
- In the above illustrative example, a 15,000 ha greenfield project will generate 2.4m of verified CO2/t carbon credits, for which at least 20% would likely be withheld in a risk buffer unavailable for monetization. Assuming a carbon credit price of $10/t, the above example generates c.$19m of eligible carbon credit funds that can part-fund project costs and incentivise project development by investors.

Source: CAP analysis. Assumed 15,000ha plantation, project duration of 30 years, species: Eucalyptus, rotation 12 years

# Showing the impact of carbon projects, c.20% or more of the total investment cost of greenfield projects in Sub-Saharan Africa could have been funded using carbon credits

**Illustrative assumptions of $CO_2$ stock at maturity up to 1st rotation of greenfield projects**

| Species | Total Ha | MAI (m3 / ha / year) | Annual $CO_2$/t sequestration rate (m) | Rotation Period (years) | $CO_2$/t stock at maturity (m) |
|---|---|---|---|---|---|
| Eucalyptus | 90,060 | 18 | 1.5 | 12 | 8.9 |
| Pine | 59,657 | 10 | 0.5 | 20 | 5.5 |
| Teak | 23,170 | 7.5 | 0.2 | 20 | 1.6 |
| Other | 16,451 | 10 | 0.2 | 10 | 0.8 |
| **Total** | **c.190,000** | | **2.4m** | | **16.8m** |

**Illustrative carbon revenues and contribution to overall $1.5bn investment costs**

| Carbon Price US$/t$CO_2$ Scenarios | Carbon credits generated based on 16.8m $CO_2$/t (pre-discounting) - $m | % contribution to $1.5bn overall investment costs |
|---|---|---|
| $10 / $CO_2$t | 168 | 12% |
| $15 / $CO_2$t | 252 | 18% |
| $20 / $CO_2$t | 336 | 24% |
| $25 / $CO_2$t | 420 | 30% |
| **Average** | **294** | **21%** |

**Summary of Analysis**

- In order to determine the illustrative impact of carbon credits on the overall investment cost of 15 greenfield projects in Africa ($1.5bn in total), the following steps were taken:
  - On an aggregate basis, overall ha split by eucalyptus, pine, teak and other species were determined across all 15 projects.
  - MAI (yield) and annual sequestration rate for each species was determined assuming optimal implementation of all projects.
  - Based on the rotation period of each species type, the overall quantum of $CO_2$ stock at maturity was determine as a proxy for eligible carbon credits.
  - Based on various carbon pricing scenarios ($10-25/t), carbon credit income was determined and applied to the overall $1.5bn investment cost for c.15 greenfield projects to understand the potential contribution.
- As the indicative analysis on the left shows, carbon credits generated would have made a material contribution (c.20%) to the overall investment cost of projects (c.$1.5bn).
- If future projects in the region are implemented optimally in terms of target investment costs, carbon credits could make a significant impact in contributing to the funding of the project and improving the risk / return profile for investors, incentivising project development and climate action

**Retrospective analysis demonstrates that carbon credits can result in meaningful contributions to the investment cost of a greenfield forestry project. If all past 15 greenfield projects were eligible for carbon credits, 20% of the investment cost could have been funded using carbon credit income alone. This highlights that carbon credits for greenfield projects can play a meaningful role in contributing to project costs and improving the risk / return profile for investors.**

# Carbon finance could play a role in providing funding for smallholder forestry plantations, with potential issues including permanence risk, carbon tax, and funding structure

| Illustrative carbon income for a 1 ha 12-year eucalyptus rotation in Tanzania | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Indicative carbon income ($USD)** | **Yr 1** | **Yr 2** | **Yr 3** | **Yr 4** | **Yr 5** | **Yr 6** | **Yr 7** | **Yr 8** | **Yr 9** | **Yr 10** | **Yr 11** | **Yr 12** |
| Standing volume evolution (m3)* | 18 | 36 | 54 | 72 | 90 | 108 | 126 | 144 | 162 | 180 | 198 | **216** |
| Accumulated $CO_2$ sequestered** | 17 | 33 | 50 | 66 | 83 | 99 | 116 | 132 | 149 | 166 | 182 | **199** |
| Pre-tax carbon credible Income based on carbon price of $USD10/$CO_2$t*** | | | **497** | | | **497** | | | | | | |

* Based on 18 MAI (m3 / ha / year)
** Assumes 0.92 COt2/m3 conversion factor
*** Assumes audit in year 3 and year 6. Carbon income based on average standing volume for the 12 year rotation. Income before discounting and carbon tax

- In the above scenario, carbon credit income is generated in year 3 and year 6 (assumed audit years). It thereby provides early cash flows to fund plantation development costs during the 12-year rotation period. Carbon credit income is based on the average standing volume within the 30 year period.
  - Cash flows from carbon offsets can be realised early within the first rotation, with requirements for further rotations within the 30 year period.
- Carbon finance could provide a role in funding smallholder forestry projects. Potential carbon credit income could fund a substantial cash costs of plantation development. Based on indicative analysis, a 1 ha plantation would generate c.$1,000 of carbon credit revenues before discounting and tax.
  - Material government carbon tax would significantly reduce any income potential that could fund smallholder forestry in Sub-Saharan Africa.
- Carbon methodology (driven by additionality and permanence) are key factors in determining whether a potential smallholder project could be eligible for carbon finance. Such finance could part-fund project development and improve the risk / return profile for SME producers and investors.
  - Permanence would be a key issue in terms of ensuring SME producers re-plant for further rotations within a 30 year crediting period.
- A key consideration will be understanding how an aligned funding structure can be formed with SME producers. This will depend on sharing carbon offset income in relation to third-party investor costs. A clear communications plan for early engagement and a contract with SME producers will need to be developed.

**Indicative analysis demonstrates that carbon offset income could provide a funding solution for plantation development costs for smallholder forestry. However, this is subject to (i) government carbon tax that may materially reduce funding amounts; (ii) carbon methodology in respect to permanence risk (i.e. commitment from SME producers to re-plant on multiple rotations following harvest within a 30-year period).**

# Market adoption of sustainable wood substitutes in downstream industries could deliver compelling climate benefits

**Downstream: Illustrative climate impact of using sustainable building materials (e.g., Mass Timber) vs. traditional building materials of a 6 storey tower in Kenya**

| | Traditional Building made with cement | Hybrid Building with some Mass Timber | Building made with Mass Timber |
|---|---|---|---|
| Description | Building made with cement and stone that is typical in Kenya | Some use of mass timber products (floor and internal partitions) | Complete use of mass timber except core construction and foundation |
| Concrete and stone used (m3) | 1,300 | 800 | 500 |
| Mass timber / wood products used (m3) | 0 | ↓ -30% 400 | ↓ -40% 1,000 |
| Net carbon footprint* | 1,181 tCO2e | **837 tCO2e** | **705 tCO2e** |

Source: East Africa sustainable timber construction supply and demand study by ARUP and Fractal Forest
* Based on full life cycle analysis including product stage to construction and completion, carbon stored in biological materials (relevant for mass timber scenarios) and end of life stage that includes deconstruction / demolition, waste processing and disposal

**Charcoal in Africa**

Charcoal production in Africa is highly inefficient, using about 3X as much wood as is needed to produce each ton of charcoal when compared with modern technologies.

Moreover, carbon emissions from charcoal are estimated to be about 370m t $CO^2$ equivalent: some 7-10X higher than the emissions would have been if a modern retort had been used.

Source: CAP analysis

- As a sustainable construction material, mass timber could be a viable opportunity to decarbonise the construction and real estate sectors to drive climate action.
- The illustrative analysis highlighted above shows that a typical 6-storey tower in Kenya could result in potential carbon savings of up to 40% by switching from traditional building materials (such as concrete and stone) to mass timber products.
  - A key driver of carbon savings is the embedded carbon stored in Mass Timber that offsets against the overall carbon footprint in the product life cycle.
  - Key considerations for the adoption of mass timber includes: (i) limited industrialisation in Africa; (ii) the need for building standards and market awareness; (iii) lack of implementation capacity; (iv) cost is a key factor for adoption. Opportunities for carbon credits may catalyse adoption (a key issue will be double counting vs. upstream activities).
- If sustainable charcoal was produced with more efficient kiln technologies, more than a third of SSA's (excluding SA) 2022 emissions could be reduced*

*Global Carbon Budget (2022), excluding land use change.

# Summary and overall strategic implications for carbon finance (1/2)

- IPCC highlights the need for significant and immediate carbon removals in order to limit global warming within 1.5 degrees. There is already a material chance that this threshold will be breached, based on a modelling of various pathway scenarios if no material action is taken.
- **Africa plays an important role for climate action in terms of the significant deforestation rate (after South America),** the negative impact of weather-related events, and food security issues linked with SME producers.
- **Climate finance inflows to Africa vs. other regions are low and there is limited involvement from the private sector.** Substantial capital is required for climate action across multiple sectors. IPCC analysis highlights the need for climate action across all sectors; outside renewables, nature-based solutions (e.g. carbon sequestration of trees and the minimising of deforestation), efficient buildings, and minimising the use of high carbon embodied construction materials have a significant potential to reduce net emissions.
- **Carbon finance can play a role in incentivising high climate impact projects. Using income from carbon offset revenues contributes to the cost and improves the risk / return profile of investors** (e.g. for greenfield commercial plantations in Africa). The voluntary market is shifting towards carbon removals vs. avoidance credits. This aligns it with the carbon sequestration and storage capabilities of the forestry sector.
  - Indicative analysis highlights that carbon income could have contributed to **c.20% to the investment cost** of past greenfield projects in Africa. This contribution could be materially higher if the key learnings highlighted earlier are implemented to reduce development costs.
  - Carbon revenue has the potential to provide funding for smallholder forestry plantations provided that key issues are addressed: namely, carbon tax, replanting over multiple rotations to reach the 30-year credit period, and structuring carbon revenue share with SME producers.

# Summary and overall strategic implications for carbon finance (2/2)

- **The forestry value-chain across upstream and downstream activities offers significant potential for climate action in Africa.** Carbon finance opportunities are limited to Natural and Plantation ARR (and improved forestry management) from an upstream perspective. They are limited to biochar carbon removals from a downstream perspective. There are limited biochar projects in Africa, highlighting an opportunity to grow the sector.
- **There are a number of opportunities for innovation and in order to leverage the positive climate impact of using sustainable building materials (e.g. Mass Timber) to substitute for cement. This carbon methodology concept is under review by Verra.** Usage of sustainable FSC certified wood products in secondary processing (e.g. furniture) can displace products made from natural forests. Furthermore, there is an innovation opportunity for carbon finance to support sustainable charcoal production. This has the potential to displace charcoal made from natural sources which contribute to deforestation.
- **A key theme emerging in Africa is that governments are implementing policies to regulate carbon projects, including taxing carbon offset income** (e.g. Zimbabwe has announced an income share of 30% and Kenya is considering 45% share). It is important to note that these policies will counteract the opportunity for uses of carbon finance to part-fund project development costs, and to incentivise investors by improving the risk / return profile. **Carbon offset income is not necessary an incremental income, operating more accurately as a financing mechanism.**

Carbon finance can play a meaningful role in catalysing climate action via the forestry sector in Africa. An appropriate carbon regulatory environment is required for the purposes of accreditation, and for governments to facilitate projects and create sufficient investor incentives.



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