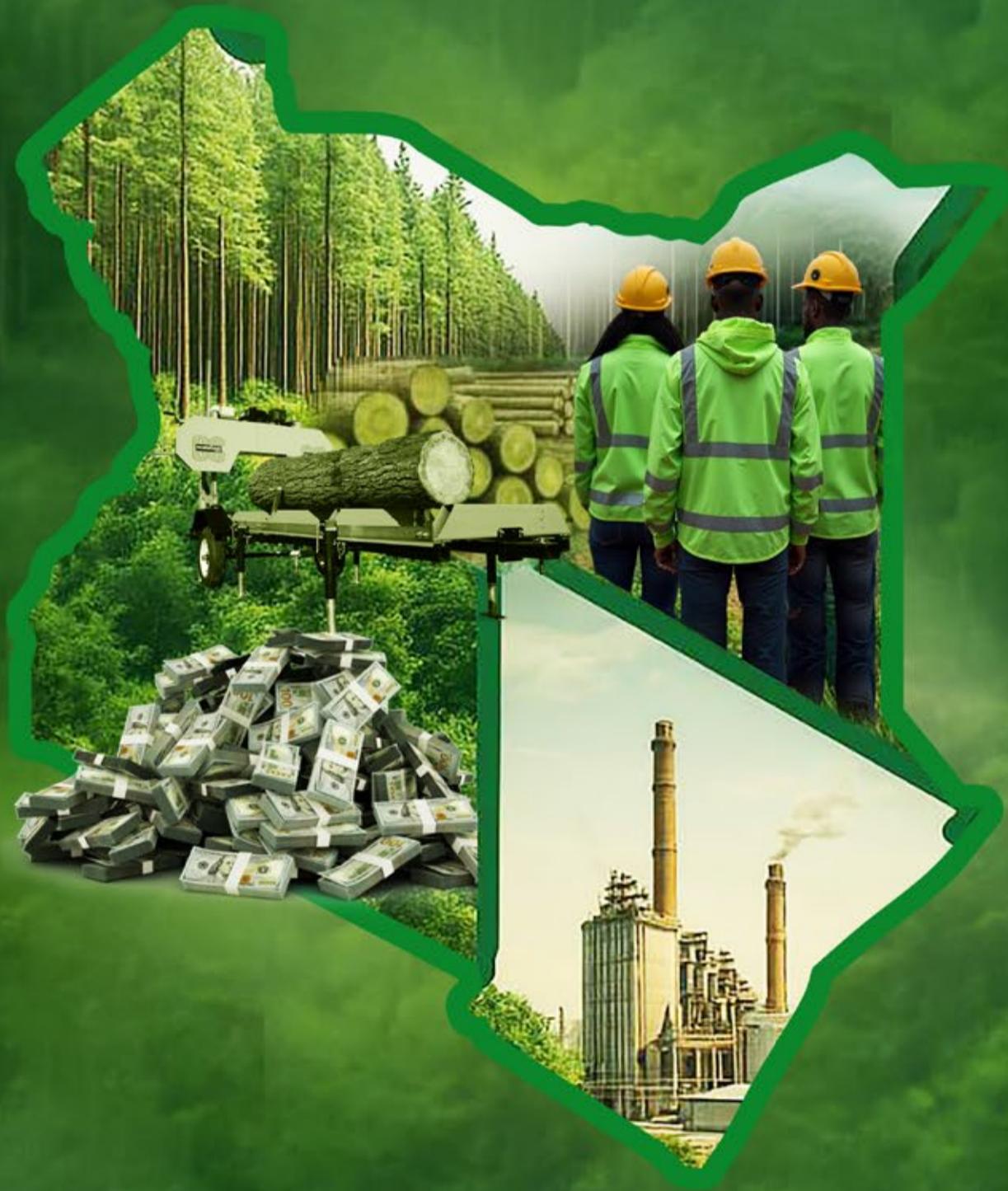




MINISTRY OF  
ENVIROMENT,  
CLIMATE CHANGE,  
& FORESTRY

# KENYA INDUSTRIAL WOOD SECTOR VISION 2050



2025

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# GLOSSARY

TERM	DEFINITION
<b>Commercial forestry</b>	Practice where trees are raised, grown, harvested and processed for products like medicine, gums, resins, fruits, seeds, roundwood, bamboo items, charcoal energy, boards, timber, furniture and constructions
<b>Engineered wood products</b>	Composite materials made primarily from wood, modified through manufacturing processes to optimise strength, appearance, or other characteristics (e.g., use of adhesives in the creation of <b>wood-based panels</b> ).
<b>Farm forestry</b>	Tree growing on smallholder farms, typically in agroforestry systems or as edge planting.
<b>Forest</b>	Government of Kenya defines a forest as an area of land of at least 0.5 hectares with at least 15% canopy cover, with trees of at least 2 metres in height (see <b>tree cover</b> ) (Government of Kenya, 2019).
<b>Forest cover</b>	Total area of land meeting the definition of a <b>forest</b> .
<b>Formal value chains</b>	Value chains with (a) a high degree of business formality, characterised as incorporated, registered business in compliance with national regulations relating to, e.g., payment of taxes and labour standards, and (b) products typically of a higher quality, value, and marketed distance than those in local (typically rural), informal markets (Federation of Kenyan Employers, 2021).
<b>Fuelwood</b>	Any wood used as fuel, including firewood, plus any wood that is further processed into fuel (e.g., charcoal) (FAO, 2020).
<b>Industrial roundwood</b>	Roundwood for onward processing into industrial wood products (total roundwood minus fuelwood).
<b>Industrial wood</b>	Means forest products used to sustain a sawmill, plywood mill, pulp mill or other forest industry related manufacturing facility.
<b>Industrial wood products</b>	Wood products made from industrial roundwood, including <b>sawn timber, transmission poles, wood-based panels,</b>
<b>Mean annual increment (MAI)</b>	A standard measure of commercial forest productivity, defined as growth in marketable volume (in metres cubed) per hectare per year.
<b>Indigenous forest</b>	Any naturally regenerating forest primarily composed of species native to Kenya
<b>Peeler log</b>	A subset of roundwood intended for peeling into sheets to produce <b>wood-based panels</b> .
<b>Plantation</b>	Tree growing in large commercial blocks, either by private operators or government.
<b>Pulp and paper</b>	Paper products (including paper, cardboard, newsprint, packaging, and household sanitary paper, among others) are produced from pulp, a fibrous material made by breaking down trees.
<b>Roundwood</b>	Total wood obtained at harvest suitable for commercial use, excluding bark, branches, leaves, and other non-marketed biomass (e.g., below-ground biomass) (FAO, 2020). Roundwood is divided into (a) <b>fuelwood</b> and (b) <b>industrial roundwood</b> .
<b>Sawlog</b>	A subset of roundwood intended for sawing into <b>sawn timber</b> .
<b>Sawn timber</b>	Wood sawn into planks, typically for use in construction or furniture production.
<b>Silviculture</b>	The science and practice of managing the establishment, growth, composition, health and quality of forests to meet diverse needs and values.
<b>Site-species matching</b>	Selection of appropriate tree species to cultivate in suitable locations (e.g., moisture availability, soil quality, and mean annual temperatures).
<b>Solid wood products</b>	Wood products made from solid wood (treated or otherwise), such as <b>sawn timber</b> or <b>transmission poles</b> .
<b>Transmission poles</b>	Wooden poles used to support overhead power lines.
<b>Tree cover</b>	Total area of land covered with trees.
<b>Wood products</b>	Any product made out of wood, following the definitions in FAO's Yearbook of Forest Products (FAO, 2020).
<b>Wood-based panels</b>	Any panels made primarily from wood, including, among others, plywood, particle board, fibreboard, and hardboard (FAO, 2020).
<b>Woodlot</b>	Tree growing on farms in concentrated plots primarily for commercial purposes.

# FOREWORD



Kenya's forest sector holds immense potential to contribute to the country's socio-economic development and environmental sustainability, in line with Vision 2030 and the Constitution of Kenya. Recognizing the central role forests play in climate resilience, livelihoods, biodiversity conservation, and the green economy, the Government of Kenya has prioritized comprehensive reforms to reposition forestry as a key pillar in national development. These reforms are anchored in the State Department for Forestry Strategic Plan (2023–2027), and the National Forest Policy (2023), which collectively provide a clear framework for sustainable forest development.

Central to these frameworks is the promotion of commercial forestry and the integration of private sector actors as critical partners in forest establishment, management, processing, and trade. The commercial forestry sector, particularly the industrial wood value chain, is increasingly recognized for its ability to generate employment, attract investment, spur rural development, and support Kenya's climate commitments. However, despite growing demand for industrial wood products, local supply remains constrained, resulting in a rising dependence on imports. This paradox persists despite Kenya's significant potential for sustainable domestic production.

To address this gap, and in alignment with the Bottom-up Economic Transformation Agenda (BETA), the Ministry of Environment, Climate Change and Forestry through the State Department for Forestry undertook a comprehensive analysis to define a clear vision for Kenya's industrial wood sector. The analysis applied a robust sector economic model, integrating micro- and macro-level perspectives of growers, processors, and value chain actors, and employed a tailored investment assessment toolkit. The findings are compelling. With the right enabling environment, industrial wood sector contribution to Gross Domestic Product (GDP) could grow from Ksh 5 billion today to Ksh 137 billion by 2050. This growth trajectory could generate 85,000 quality jobs annually (up from the current 15,000), in-

crease household-level participation from 2.7 million to 7.5 million growers, and deliver an estimated Ksh 3.7 billion annually in ecosystem services and climate co-benefits, including carbon credits. Importantly these results will be delivered through private sector investment in improving productivity of plantations and better efficiency in processing. The estimated investments in commercial tree growing and industrial wood processing is Kshs 134 and Kshs 42 billion respectively.

Achieving this vision depends on three transformative drivers: (1) restoration and sustainable management of public plantations through expanded public-private partnerships and innovative forest concession and benefit-sharing models under Kenya Forest Service; (2) deeper integration of smallholder growers into formal markets via structured aggregation and inclusive business models; and (3) development of financing mechanisms and incentives to unlock investments across the wood value chain. Acknowledging that commercial forestry offers great opportunity for small and medium growers including drylands forestry, a grower investment tool has been developed to guide informed and bankable investments by both public and private actors.

This vision offers a roadmap for catalyzing green industrialization, promoting rural livelihoods, and enhancing Kenya's position as a regional leader in sustainable forest-based industries.

I urge all stakeholders to onboard this vision including investments towards digitization of the developed grower investment assessment tool as we all embrace a revitalized commercial forestry sector.

**DR. Deborah Mlongo Barasa**  
**CABINET SECRETARY, MINISTRY OF ENVIRONMENT CLIMATE CHANGE AND FORESTRY**

# PREFACE



Kenya is experiencing unprecedented demand for industrial wood products, a trend that is projected to intensify, with demand expected to quadruple by 2050. The construction sector continues to drive this demand, requiring significant volumes of timber for structural applications such as trusses, concrete formwork, joinery, doors, windows, and flooring. Similarly the demand for wood based furniture is expected to increase driven by urbanization and population demographics. This in turn will create thousands of green jobs for skilled workers across the country in both formal and informal sector.

Benchmarking Kenya against neighbouring countries and other high performers such as Vietnam and South Africa, reveals that the country has a significant opportunity to not only satisfy domestic demand but also become a regional export leader in industrial wood. Realizing this competitiveness requires strengthening production systems and enabling a vibrant forest-based industry, guided by coherent policy and investment frameworks as set out in the National Forest Policy (2023), and the Strategic Plan of the State Department for Forestry (2023–2027). Efforts are at advanced stage to create an enabling environment through supporting legislations such as concessions in public forest, timber grading and valuation, export and import, as well as registration of private forest regulations.

Kenya's public gazetted industrial forests of approximately 152,000 hectares have historically been the backbone of medium-to large-scale industrial wood processing operations. However, these plantations are not operating optimally. In recognition of this, the government targets to partner with private sector actors, to enter into concession agreements of 54, 000 hectares over the next 10 years. This will greatly enhance sustainable forest management and benefits for forest communities. The arrangement will enhance revenues for national and county governments while signaling the opportunity for further investment in processing. The governments acknowledges the investments by private plantations, tree grower association and farm forestry across the country who also contribute to the production of roundwood.

Smallholder farmers are also central to the future of Kenya's wood industry. Many have invested in fast-growing commercial species due to its adaptability and returns. Despite their numerical dominance, smallholders are largely excluded from formal wood markets due to fragmented supply, limited aggregation models, and quality concerns.

To support a thriving industrial wood sector, Kenya must prioritize improvements in productivity of commercial wood growers, including enhanced recovery rates, greater efficiency, value addition, and the institutionalization of timber grading systems for price differentiation and quality assurance. These interventions will increase profitability and competitiveness across the value chain. Kenya's leadership in Forest Climate Leadership Partnership provides further incentives for increasing the production of sustainable timber to be used as an alternative building material in the built environment thereby contributing to reducing Kenya's carbon emissions in construction.

I wish to thank Gatsby Africa, the FCDO through the UKPACT Project (unlocking private investment in commercial forestry to help deliver Kenya's climate strategy) and other partners. Your technical expertise, financial support, and shared vision have made this progress possible. We look forward to continued collaboration in the delivery of the Kenya Industrial Wood Sector Vision 2050.

It is my firm belief that this vision will serve as a practical roadmap for public and private stakeholders seeking to unlock investment potential in Kenya's commercial forestry sector and catalyze sustainable growth in line with the country's green development agenda.

A handwritten signature in black ink, appearing to read 'Gitonga Mugambi'.

**Gitonga Mugambi, CBS**  
**PRINCIPAL SECRETARY, STATE DEPARTMENT FOR FORESTRY**

# EXECUTIVE SUMMARY

The Kenyan industrial wood sector is at a turning point. After years of decline, a range of recent policy commitments have placed the sector at the heart of the country's green economic growth strategy. With the right combination of policies and investment, Kenya could become a regional leader in industrial wood product manufacturing.

This study uses a sector economic model to evaluate both the status quo outlook for the industrial wood sector and the potential impacts of an upgraded sector between 2023 and 2050. Key drivers of success are identified, and associated policy recommendations and investment requirements are set out.

## METHODOLOGY

The study uses a sector economic model based on a combination of micro-level grower and processor business models, which combine into a macro-level aggregation of wood supply across each county in Kenya, compared with demand projects to 2050. A range of socio-economic and environmental impacts are modelled, including wood supply, gross domestic product, job creation, investment generation, tax revenues, tree cover, carbon sequestration, and ecosystem services.

Sector performance is modelled under a range of scenarios relating to grower and processor practices, government policies, and climate change. Sensitivity analysis is used to identify which factors are the key determinants of long-term success in the sector.

## STATUS QUO OUTLOOK

The Kenyan industrial wood sector currently meets less than 10% of the country's industrial wood product demand, largely due to the prolonged logging moratorium in Kenya Forest Service (KFS) plantations, which has disrupted the main historical source of supply. Although smallholder farmers account for two-thirds of the resource base by area, they remain poorly integrated into the value chains.

A continuation of status quo conditions would likely see the total planted area shrink as climate change limits the viable range of growing areas, while the demand of wood products would continue to rapidly outstrip supply. Reliance on imports would continue to grow, placing strain on Kenya's balance of payments, and raising the cost of living for ordinary Kenyans.

## POTENTIAL IMPACTS OF AN UPGRADED SECTOR

An upgraded Kenyan industrial wood sector has the potential to deliver a wide range of socio-economic and environmental impacts. Total planted area has the potential to double, chiefly driven by an expansion in trees on farms. Wood supply could see a more than fivefold increase, as productivity improves across all grower types, KFS supply would be restored, and smallholders increasingly integrated into formal value chains. Forestry revenues would substantially increase as product quality improves and higher value markets could be accessed.

**Scope:** The 'commercial forestry sector' in this study refers to trees grown primarily for the purpose of sale into formal industrial wood product markets, including timber, wood-based panels, transmission poles, and paper products. Growers of all scales are considered, from smallholder farmers to large public and private plantations, as well as downstream wood processing.

**Logging moratorium:** The logging moratorium was lifted by the government through a declaration in July 2023 but was later challenged in court in October 2023 which led to a directive dismissing the lifting.

The courts, however, allowed harvesting of 5,000 hectares of mature and over mature forest plantation trees identified by the Multi-Agency Oversight Team.

The analysis in this study has considered a logging moratorium in place in public plantation forests.

The downstream economic impacts of this development of the resource base would be even greater, with increased value addition in wood processing, construction, and furniture production seeing the sector become one of Kenya's biggest manufacturing industries. Overall, industrial wood sector GDP could rise from Ksh 5 billion today to Ksh 137 billion by 2050.

Table 1: Potential impacts of an upgraded Kenyan industrial wood sector

	Current	Potential
<b>Socio-Economic Impacts</b>		
Gross domestic product (Ksh billion/year)	5	137
Wood supply (million m <sup>3</sup> /year)	1.3	7.1
Jobs (full time equivalents supported)	15,000	85,000
Growers (# households) (million)	2.7	7.5
Tax revenue (Ksh billion/year)	1.4	45.5
<b>Environmental impacts</b>		
Tree cover (million hectares)	0.6	1.2
Carbon sequestration (Mt CO <sub>2</sub> e in planted forests)	45	144
Ecosystem services (Ksh billion/year)	0.7	3.7

In terms of environmental impacts, increase in tree cover and productivity could treble the amount of carbon stored in planted forests, while increased supply of fuelwood from plantations could help relieve pressure on natural forests, sparing some 24,000 hectares per year. High quality eucalyptus furniture has the potential to replace indigenous hardwoods being unsustainably extracted from the Congo Basin, leading to conservation benefits in the wider region. In total, the conservation benefits of a high performing planted industrial wood sector could amount to some Ksh 3.7 billion in ecosystem services provision annually.

To achieve the potential impacts indicated in the table above, the investment needed in commercial tree growing and industrial wood processing is Kshs 134 and Kshs 42 billion respectively between 2024 and 2050. This investment will be driven by the private sector.

## DRIVERS OF CHANGE

Three key drivers of change are identified:

- 1. Upgrading KFS plantations and restoring supply**, creating an anchor for the sector whereby a long-term guarantee of high-quality sustainable roundwood supply serves to boost investor confidence elsewhere in the sector.
- 2. Upgrading and expanding wood processing operations**, fed in part by restored and upgraded supply from KFS, and complemented by the vast supply potential from smallholders, targeting quality premiums high-value markets.
- 3. Integration of smallholders in formal value chains**, drawing on inclusive business models to capitalise on this vast and largely untapped resource base, generating a range of poverty reduction impacts.



## DELIVERING THE VISION

Upgrading KFS plantations and restoring sustainable supply should be the priority for the delivery of the sector vision, establishing an anchor that enables additional investment to be crowded in to the second and third pillars of processing and smallholder integration. Given the high level of investment required to achieve this, a **public-private partnership** such as a **concession model** will help to attract private investment to public forests with arrangements between government, private operators, and local communities—an approach that has been successful in many parts of the world.



# 1. Introduction

Promotion of a thriving industrial wood sector is a key priority of the Kenyan Government (Government of Kenya, 2021b; Kenya Kwanza, 2022)<sup>1</sup>. Increasing the productivity, quality, and extent of sustainably managed commercial forestry and associated wood processing has great potential to generate jobs and investment, boost livelihoods, increase export earnings, and drive fiscal revenue generation, while also strengthening Kenya's climate change adaptation and mitigation efforts, and reducing pressure on the country's remaining natural forests<sup>2</sup>.

While the sector faces numerous challenges, it is well-placed to become a regional leader as a modern, high-tech driver of green economic growth, particularly with respect to wood processing. However, success will require substantial investment to upgrade the sector and set it on a positive trajectory. This study outlines the role of Government policy in unlocking this investment.

## 1.1 STUDY OBJECTIVES

This study uses a sectoral economic model to explore:



The baseline performance of the Kenyan industrial wood sector,



The status quo outlook for the sector to 2050 if current conditions prevail,



The potential economic and environmental impacts of an upgraded sector,



The policies, investments, and other interventions required to deliver this future vision for Kenyan industrial wood sector.

The study is structured as follows. The remainder of the introduction establishes the economic, environmental, and political context of the study. Section 2 sets out the methodology used to model the baseline and potential performance of the sector between now and 2050. Section 3 presents the results of the study, including status quo and potential results, as well as the key drivers of success. Section 4 presents policy recommendations, financing requirements, and a roadmap association with delivering the vision, before conclusions are summarised in Section 5.

<sup>1</sup> 'Commercial forestry' refers here to tree planting primarily for commercial reasons, i.e., the production and sale of industrial wood products and fuelwood. More specifics of the scope of the sector vision are included in Box 1.

<sup>2</sup> The potential for plantation forestry to alleviate pressure on natural forests via a 'plantation conservation benefit' is discussed in (Pirard et al., 2016).

When considering total economic activity related to both planted and natural forests, the overall Kenyan forestry sector has been estimated to account for some 3.6% of national GDP (Government of Kenya, 2018b). However, for the purpose of this study, we focus on an important subsector – commercial tree growing linked to formal<sup>3</sup> wood product value chains, a central component of any successful forestry sector, distinct in its potential to attract investment and contribute to Kenya’s green economic transformation.

Grower types included in the study range from smallholders to large plantations. Smallholder forestry comprises ‘farm forestry’ (primarily boundary planting or agroforestry systems)<sup>4</sup> and small woodlots (dedicated plots of planted trees for commercial purposes). Plantations are either private or KFS managed. The vision covers all major formal wood product value chains, including industrial wood products (sawn timber, wood-based panels, transmission poles, fence posts, and paper products) and fuelwood (charcoal and firewood). Secondary processing of timber and panels is considered in the construction and furniture sectors.

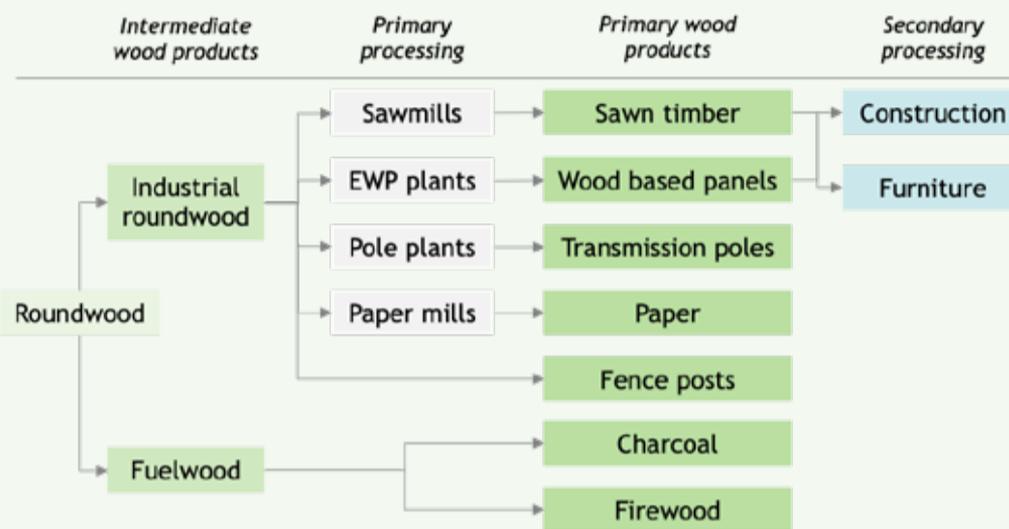


Figure 1: Industrial wood sector value chain

The vision covers the five most prominent commercially planted genus – *Eucalyptus*, *Pinus* (pine), *Cupressus* (cypress), *Grevillea*, and *Melia*. Other indigenous species are not included, due to their slow growth and lack of commercial potential at present. Only the core value chains are modelled (i.e., the trade of wood products from forest to end markets) – while it is recognised that a wide array of supporting functions play important roles in the sector (e.g., nurseries, other input providers, machinery and equipment suppliers, financial services, technical advisory services), detailed economic modelling of these functions was considered out of scope. Their importance is, however, further discussed in Section 4.2. Finally, tree growing for commercial purposes besides wood products (e.g., fruit trees), as well as non-timber forest products, and the vast informal charcoal market, are also considered beyond scope.

While the study primarily focuses on formal planted commercial forestry, the potential impacts on the wider forestry sector are discussed in Section 3.2.3, below.

## 1.2 THE IMPORTANCE OF THE INDUSTRIAL WOOD SECTOR IN KENYA

The Kenyan industrial wood sector is at a crucial turning point. After many years of decline, the Kenyan government has set out a range of commitments to the sector in the coming years (Table 2), and Kenya is well-placed to become a regional leader in commercial forestry as a central pillar of a green economic growth strategy. To move forwards, it is important to understand the complex challenges that have hindered the sector to date, as well as the potential benefits of a thriving industrial wood sector in future.

<sup>3</sup> Formal value chains are those with (a) a high degree of business formality, characterised as incorporated, registered business in compliance with national regulations relating to, e.g., payment of taxes and labour standards, and (b) products typically of a higher quality, value, and marketed distance than those in local (typically rural), informal markets (Federation of Kenyan Employers, 2021). This study focuses on formal value chains for timber, panels, poles, and paper. Informal wood product value chains, such as low-quality timber construction in rural areas, or most of the charcoal market, are not explored in detail.

<sup>4</sup> While farm forestry is predominantly practiced for non-commercial reasons at present (e.g., border trees or fuelwood consumed on-farm), we include this category because of its potential to be integrated into formal wood product value chains in future.

### 1.2.1 HISTORY OF THE SECTOR

Industrial public plantations were established in Kenya in the 1900s with trials of eucalyptus, pine, and cypress established primarily for the provision of industrial wood on a sustainable basis for sawn wood, plywood, firewood, transmission poles and pulp and paper (Kagombe et al., 2020a). Today, the Kenyan industrial wood sector is characterised by a combination of large-scale plantations, predominantly within gazetted public forests operated by Kenya Forest Service (KFS), woodlots on private farms, and 'farm forestry', or small-scale tree planting on farms (Figure 1). While land scarcity and competition for land with other cash crops has precluded the emergence of substantial large private sector growing operations, a handful of private plantations also exist.



Figure 2: Kenya commercial forestry at different scales

Historically, KFS plantations, primarily producing pine and cypress, have been the commercial anchor of the sector, feeding a network of sawmills producing medium- to low-grade timber for the domestic market. However, a logging moratorium has been in place on public plantations for 18 of the last 24 years, a response to challenges of corruption and unsustainable harvesting in government forests (Government of Kenya, 2018b). The moratorium has starved processors of roundwood supply, resulting in an estimated 65% reduction in turnover and retrenchment of 85% of staff (Kagombe et al., 2020b). As of October 2023, plans to lift the moratorium have once again been blocked by the courts. In July 2023, the government announced the lifting of the logging ban – a move that was welcomed by wood value chain actors, but which was challenged in court by the Law Society of Kenya. The court later ruled against the lifting of the logging ban and gave directions on the prerequisite steps before logging can be resumed, including development of regulations and public participation (Agence France Presse, 2023).

These supply constraints have driven wood prices up and led to a widening deficit between demand and supply. Small growers have become the primary suppliers of roundwood, though quality is low, supply is thinly dispersed across wide landscapes, and smallholder preferences for short-rotation, small-diameter trees are unsuitable for most existing sawmilling infrastructure (Langat et al., 2022). This combination of factors has prevented meaningful growth and investment in wood processing and undermined the performance of downstream industries.

### 1.2.2 ENVIRONMENTAL CONTEXT

From an environmental perspective, with a population expected to double by 2050 and an economy heavily reliant on agriculture and nature-based tourism, Kenya is highly vulnerable to climate change (World Bank Group, 2021). Protecting Kenya's forests has a key role to play in both climate mitigation (through carbon sequestration) and adaptation (through water conservation, flood mitigation, and erosion control), as well as in harbouring Kenya's globally important biodiversity.

The country has set an ambitious target of achieving 30% tree cover by 2032 and has committed to significant emissions reductions (Table 2). However, deforestation and forest degradation rates remain high, driven primarily by fuelwood harvesting and conversion of land for agriculture and livestock (Government of Kenya, 2021b). In the wider region (particularly the Congo Basin), unsustainable logging of tropical hardwoods such as mahogany is fuelled by demand for hardwood furniture from Kenya's growing middle classes (Nielson, 2023). Meanwhile, short supply of wood products generally risks downstream industries permanently switching to alternative materials with larger environmental footprints, such as steel, concrete, and plastics.

### 1.2.3 LIMITATIONS OF THE SECTOR

The key factors holding back the performance of the sector to date can be summarised as follows:

- Underinvestment and suboptimal management of the industrial public plantations.
- Logging moratorium in public and community forests leading to substantial supply constraints.
- Limited private investment in the sector, in part due to lack of reliable, high-quality supply from industrial public plantations.
- Lack of development of a wider enabling environment of forestry services (e.g., nurseries, research and development, technical advisory services).
- Limited integration of small growers into formal value chains.

### 1.2.4 POTENTIAL BENEFITS

Industrial wood is one of the few sectors where socio-economic and environmental benefits<sup>5</sup> go hand in hand. Highly productive tree plantations can generate an important supply of wood products for various sectors of the economy, including construction, furniture, and energy markets. A high-quality wood resource base can serve as the foundations for a successful wood manufacturing industry, from artisanal crafts to state-of-the-art mass timber skyscrapers.

For small-scale farmers, tree growing represents a unique livelihood diversification strategy, serving as a long-term investment with potentially transformative payoffs – even from small areas of trees – in contexts where the rural poor otherwise have few savings and investment opportunities. Beyond the commercial benefits to farmers, farm forestry can help to delineate land, prevent erosion, and provide shade for other cash crops in agroforestry production systems.

The industrial wood sector can contribute to environmental goals not only by sequestering carbon in planted trees in support of climate mitigation efforts, but also by alleviating pressure on precious natural forests by replacing unsustainable natural forest extraction with sustainable plantation-based wood products. Deterring deforestation and forest degradation in this way can generate further carbon sequestration benefits, plus a wealth of other ecosystem services provided by natural forests. Finally, promoting the use of wood products in downstream industries such as construction and furniture manufacturing can help to reduce dependence on less environmentally sustainable materials such as steel, concrete, and plastics.

### 1.2.5 ADDRESSING THE RISKS IN THE INDUSTRIAL WOOD SECTOR

While the potential benefits of a high-performing industrial wood sector are substantial, it is important to recognise and manage the potential social and environmental risks in the sector. On the social side, the establishment of large commodity plantations can lead to land rights conflicts, particularly when indigenous peoples and local communities have limited bargaining power and weak property rights (Boone, 2012) there is every reason to believe that in the near future, highly politicized land conflict will continue. This is because land politics in Kenya is a redistributive game that creates winners and losers. Given the intensely redistributive potential of the impending changes in Kenya's land regime—and the implications of the downward shift in the locus of control over land allocation through decentralization of authority to county governments—there is no guarantee that legislators or citizens will be able to agree on concrete laws to realize the constitution's calls for equity and justice in land matters. This article traces the main ways in which state power has been used to distribute and redistribute land (and land rights). On the environmental side, like other monoculture crops, large plantations tend to harbour limited biodiversity, and provide fewer ecosystem services than natural forests (Heilmayr et al., 2020). As such, commercial tree growing that comes at the expense of alternative land covers with higher conservation value (e.g., clearing of natural forest or grasslands) can lead to net negative environmental impacts. Failing to adhere to environmental safeguards in plantation establishment and management can also have detrimental environmental effects, including unsustainable water use and soil degradation. The industrial wood sector also faces risks from pests and disease, particularly given the lack of genetic diversity in the planting stock – a factor which is likely to intensify under climate change (Njuguna et al., 2021).

In recognition of these risks, the present study has been developed under the following principles:

- Inclusive and equitable commercial forestry models should be promoted where possible, with a focus on improved integration of small growers into wood product value chains and increasing tree cover on farms.
- Primarily focusing on upgrading existing plantations can deliver substantial economic benefits without increasing the sector's environmental footprint.
- Commercial forestry at all scales must adhere to relevant social and environmental safeguards.

These assumptions are reflected in the design of the impact model set out below and revisited in the corresponding policy recommendations.

<sup>5</sup> While plantation forestry involves a number of environmental risks (discussed in Section 1.2.5), various benefits have also been documented (Pirard et al., 2016), and are explored in the model below.





### 1.2.6 POLICY CONTEXT

Recognising the opportunity presented by the industrial wood sector, the Government has set ambitious targets across a raft of key policy documents including the Bottom-Up Economic Transformation Agenda, the National Forest Policy 2023, the National Forest Programme (2016–2030) (Government of Kenya, 2016b), the Draft Agroforestry Strategy (2025-2035), the Draft Commercial Forestry Strategy (2025- 2035) and the National REDD+ Strategy (Government of Kenya, 2021b). Table 2 sets out a summary of some of these targets. Together they represent an ambitious plan to substantially increase commercial forest investment and associated manufacturing industries. To support implementation of these the Ministry of Environment, Climate Change and Forestry has established a State Department for Forestry with its own Principal Secretary. Additionally, the Department has introduced a Directorate of Commercial Forestry mandated to, among other roles, promote commercial forestry in the country.

Table 2: A selection of Government policies and targets relating to the industrial wood sector

(a) Tree cover
<ul style="list-style-type: none"> <li>• Work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya; Constitution of Kenya 2010</li> <li>• New target of <b>30% tree cover</b> by 2032 (Government of Kenya, 2022c).</li> <li>• National tree planting campaign aiming to plant <b>15 billion trees</b> by 2032 .</li> <li>• Restoration of <b>5.1 million hectares of land by 2030</b>, including 400,000 hectares of commercial forest, and 1.8 million hectares of trees on farms (commitments to the Bonn Challenge, New York Declaration on Forests, and the African Forest Landscape Restoration Initiative) (Ministry of Environment and Natural Resources, 2016).</li> </ul>
b) Commercial forestry expansion
<ul style="list-style-type: none"> <li>• (Restock and sustainably manage <b>54,000 hectares</b> of public forest plantations, establish <b>3 million hectares</b> of agroforestry and <b>750,000 hectares</b> of private commercial forest plantations (Government of Kenya, 2023)</li> <li>• Establish <b>150,000 hectares</b> of <b>private commercial plantations</b>, <b>350,000 hectares</b> of <b>agroforestry</b>, and restock <b>31,000 hectares</b> of unstocked <b>public plantations</b> under the country's REDD+ Strategy (Government of Kenya, 2021b).</li> <li>• Cultivation of "fast-maturing, high value trees that have multiple commercial uses" identified as a priority means of promoting livelihood diversification for vulnerable communities in the government's Green Economic Strategy (Government of Kenya, 2016a).</li> <li>• Policy Statements from the National Forest Policy, 2023 <ul style="list-style-type: none"> <li>○ "Promote public private partnerships in the management of commercial forests on public and community lands"</li> <li>○ "Create and enabling environment for private sector engagement and investments in tree growing"</li> <li>○ "Sustainably manage public forest plantations to maximize economic, social and ecological benefits"</li> </ul> </li> <li>• Strategic objectives of the Ministry of Environment, Climate Change and Forestry Strategic Plan (2023-2027) (Government of Kenya, 2023) (pp60-61): <ul style="list-style-type: none"> <li>○ "To enhance agroforestry development."</li> <li>○ "To strengthen commercial forestry development."</li> <li>○ "To strengthen wood and non-wood forest product value chains."</li> <li>○ "To enhance enterprise development for agroforestry and commercial forestry."</li> </ul> </li> </ul>
(c) Carbon emissions
<ul style="list-style-type: none"> <li>• As per Kenya's Nationally Determined Contribution (NDC), reduce national emissions by 32% relative to the baseline of 143 MtCO<sub>2e</sub> by 2030 (Government of Kenya, 2020), 53% of which is to be met through increased forestry and agroforestry (Government of Kenya, 2018a).</li> </ul>





# 2. Methodology

The industrial wood sector vision model at the centre of this study is comprised of a micro model, a macro model, and impacts (Figure 3), detailed in turn below. Modelled results were supplemented with additional data based on literature review and expert consultation within the industry. Consultations and validation of the approach and methodology was done with various sector actors prior to publication.

## 2.1 MICRO MODEL

The micro model is based on economic models for growers (farm forestry, woodlots, plantations, and KFS) and processors (sawn timber, plywood<sup>6</sup>, and transmission poles, fencing poles). For each, current and future practices, costs, productivity, and revenues are estimated to understand the inputs and outputs of each unit and their respective commercial viability.

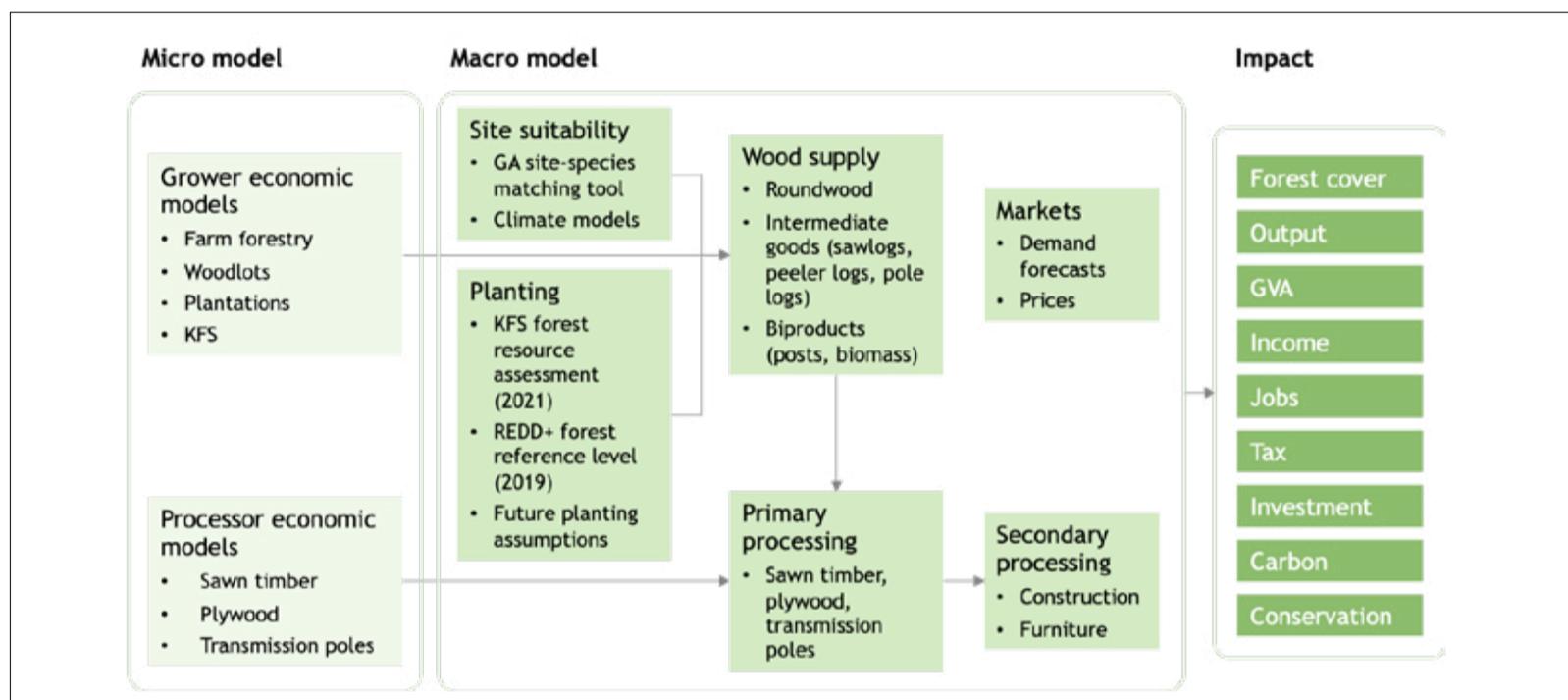


Figure 3: Kenya industrial wood sector model structure

## 2.2 MACRO MODEL

The macro model begins by estimating average **site suitability** (potential productivity – defined as the maximum yield or mean annual increment, (MAI), as determined by agroclimatic conditions) in each county for five genus of interest – *Eucalyptus*, *Grevillea*, *Pinus*, *Cupressus*, and *Melia*<sup>7</sup>, using a site-species matching tool. Future suitability under climate change is estimated using the IP-CC-adopted Representative Concentration Pathway (RCP) scenarios RCP 4.5 (moderate warming) and RCP 8.5 (very high warming) (van Vuuren et al., 2011).

**Current planting** by grower type is based on Kenya’s REDD+ Forest Reference Level, with additional information (e.g. regional distribution, split of natural vs planted forests) drawn from the latest Kenya Forest Service national forest resources assessment, and past data on planting distribution by county and grower type (Government of Kenya, 2019, 2021a; Ministry of Environment, Water, and Natural Resources, 2013).

<sup>6</sup> Plywood is used in the model as a proxy for wood-based panels generally, as it is the most widely produced panel in Kenya currently.

<sup>7</sup> Eucalyptus and grevillea are the dominant genus for farm forestry. KFS plantations have historically been predominantly pine and cypress, with some eucalyptus. Woodlots are mainly eucalyptus, with some pine and cypress. Melia (*Melia volkensii*, or mukau) is a dryland species of growing interest.

**Future planting** is estimated using the following assumptions:



Current and future **roundwood supply** is estimated by genus, county, and grower type as a combination of site suitability (potential MAI), planted area, and grower economics (achieved MAI per grower unit). Roundwood supply is then subdivided into **intermediate wood products** for onward processing (sawlogs, peeler logs, and transmission pole logs) and **biproducts** (posts and biomass)<sup>8</sup>.

To model **primary processing**, sawlog, peeler log, and pole log supply are respectively fed through the sawmill, ply plant, and pole plant processor economic models to compute sawn timber, plywood, and transmission poles supply.

**Secondary processing** is modelled by allocating sawn timber and plywood output to the construction and furniture sectors proportional to their demand, before using economic multipliers from Kenya National Bureau of Statistics (2022) to estimate GVA per unit of wood input in each sector.

Current **imports and exports** are taken from FAO (2020). In future, it is assumed that any excess supply of high value timber or boards beyond domestic demand is exported, while imports will fill any remaining supply deficits.

Current **prices** are taken from GA market data on finished wood products (sawn timber, plywood, transmission poles). Farmgate prices are estimated by subtracting processing and transport<sup>9</sup> costs from the market price to calculate the processor breakeven price and splitting any difference between this and the growing cost between each party<sup>10</sup>. Future prices are estimated by assuming that the average industrial roundwood price in Kenya will converge with the global average (taken from FAO 2020) by 2050. Quality premiums are introduced using the timber grade prices currently offered by Komaza, a Kenyan forestry company (Komaza, 2022).

**Demand** for each wood product is taken from a 2019 market study commissioned by Gatsby Africa.

<sup>8</sup> Current distribution of roundwood into value chains is based on the observed output mix by grower type and genus in Ministry of Environment, Water, and Natural Resources (2013). Future distributions are rebalanced proportional to projected demand.

<sup>9</sup> Assuming a maximum distance from farm to processor of 100 kilometres, and a maximum distance from processor to market of 300 kilometres.

<sup>10</sup> This logic assumes that processors dictate prices based on prevailing market prices for finished goods, while growers are price takers in the market. Any surplus value between the breakeven prices of the processor and grower are split 70:30 (processor:grower), again reflecting the greater influence of the processor. If the processor's breakeven price is less than that of the grower, the losses are distributed by the same logic (i.e., the grower bears more of the losses).

## 2.3 IMPACTS

The modelled micro- and macroeconomic performance of the sector is used to project the following impacts. Where relevant, regional results are summarized at the level of Kenya's six Regional Economic Blocs (REBs)<sup>11</sup>, plus Nairobi.

Table 3: Table showing impacts areas and their description.

Impact Areas	Description
<b>Forest cover</b>	The total area of additional planted forest meeting the Government of Kenya threshold of 15% canopy cover (Government of Kenya, 2019) (i.e., excluding farm forestry, which we assume is a maximum of 10% canopy cover), plus any domestic land sparing effects of fuelwood substitution (see "Conservation", below). Avoided deforestation through land sparing effects outside of Kenya (i.e., tropical hardwood substitution effects in the Congo Basin) are also noted but not counted towards Kenya's targets.
<b>Tree cover</b>	The total area of additional planted trees (since much of the expanded planting on farms is not expected to meet the "forest" definition above but still provides valuable carbon sequestration effects and other ecosystem services).
<b>Output</b>	Total volumes and values of production of each wood product.
<b>GVA</b>	Total gross value addition in each wood product value chain.
<b>Income (profit)</b>	Expected change in income for each grower type (farm forestry, woodlot, plantation, KFS), based on the grower economics in the micro model.
<b>Jobs</b>	Labour associated with tree growing is calculated by converting the total labour days per rotation estimated in the grower economic models to annual full-time equivalents (FTEs). Labour associated with primary and secondary processing is calculated by dividing the modelled labour share of value addition in each sector (wood processing, furniture, construction) by the average salary in each of these sectors (Government of Kenya, 2022b)
<b>Tax</b>	Corporation tax is estimated by applying current rates to the modelled profits of plantations companies and processors. Income tax is estimated by first calculating sector-specific effective tax rates based on average salaries in each sector, before applying these rates to the changes in income calculated above. Value added tax (VAT) is calculated by applying the current rate to modelled value addition
<b>Investment</b>	Required investments in new tree planting are calculated by multiplying the future growing cost per hectare by the total area to be established by each grower. Required investments in upgraded planting are calculated by multiplying the difference between current and future growing costs by the current planted area. Required investments in new and upgraded processing facilities are calculated by applying the same logic to the CAPEX cost of each processing facility.
<b>Carbon</b>	Carbon impacts are calculated as the total of additional carbon sequestered in planted forest (due to a combination of increased area and growth rates) plus avoided emissions from land sparing effects. For planted forests, carbon calculations follow the methodology in VCS (2021). For natural forests, avoided emissions are estimated using an assumption of 140 tCO <sub>2</sub> /ha <sup>12</sup> .
<b>Conservation</b>	<p>Conservation impacts are calculated as a combination of land sparing and associated avoided emissions from (a) tropical hardwood substitution effects and (b) fuelwood substitution effects.</p> <p>Tropical hardwood substitution effects are assumed to be possible in future under the improved processing scenario if the high quality (clear grade) timber price is lower than that of mahogany. If these conditions hold, up to 50% of future modelled tropical hardwood sales are replaced with sawn eucalyptus clears (so long as sufficient eucalyptus clears are produced). The land sparing effect is calculated by dividing the annual reduction in mahogany consumption (m<sup>3</sup>) by the average growth rate of mahogany in natural forests (m<sup>3</sup>/year) (IPCC, 2019).</p> <p>Fuelwood substitution land sparing effects are estimated by dividing the additional future planted forest biomass available for fuelwood<sup>13</sup> (m<sup>3</sup>/year) by the total volume of biomass suitable for fuelwood on the average hectare of natural forest (m<sup>3</sup>/hectare), giving the total hectares of natural forest that would otherwise be required to provide an equivalent volume of fuelwood</p>
<b>Ecosystem services</b>	Natural forests provide a wide range of ecosystem services beyond provisioning of raw materials (wood) and carbon sequestration, including erosion prevention, preservation of soil fertility, food provisioning, oxygen generation, and tourism and cultural services. The ecosystem service values of Kenya's natural forests are estimated using a data from the Ecosystem Services Values Database (Brander et al., 2023) and Langat et al. (2018).

<sup>11</sup> Frontier Counties Development Council (FCDC/"Frontier"), North Rift Economic Bloc (NOREB/"North Rift"), Lake Region Economic Bloc (LREB /"Lake"), Jumuia ya Kaunti za Pwani (JK-P/"Coast"), South Eastern Kenya Economic Bloc (SEKEB/"South East"), and Central Region Economic Bloc (CEREB, "Central").

<sup>12</sup> Average CO<sub>2</sub> stored in natural forests is calculated by applying REDD+ reference level tCO<sub>2</sub>/ha figures by forest type (montane and western rainforest, dryland, coastal & mangrove) and canopy density (dense, moderate, open) (Government of Kenya, 2019) to the latest estimates of Kenya's forest cover in each of those categories (Government of Kenya, 2021a).

<sup>13</sup> Total planted forest biomass available for fuelwood is calculated as (a) the percentage of grower-specific and genus-specific merchantable volume (rotation x MAI) sold or consumed as fuelwood, plus (b) 50% of all non-merchantable volume (i.e., branches, twigs).

## 2.4 SCENARIOS

The future sector is modelled under a range of scenarios set out in Table 3, below.

Table 4: Modelled scenarios

Factor	Current scenario	Future vision
Private grower productivity	Farm forestry: Low Woodlots: Medium-low Plantations: Medium-high Certification: None	Farm forestry: Medium Woodlots: Medium-high Plantations: High Certification: Adopted
Farm forestry market integration	Low (10% of farms selling into formal markets)	Improved (50% of farms selling into formal markets)
Primary processing productivity	Low recovery rates <sup>14</sup> Moderate efficiency <sup>15</sup> Low skill sets No grading of timber Low market differentiation of quality	Improved recovery rates Improved processing efficiency Improved skill sets Grading and valuation
Private planted area	Current planted area by grower type identified as outlined in Section 3.2.1.	Farm forestry: 10% of cropland Woodlots: 20% increase in coverage on cash crop land Plantations: No increase Dryland: 300,000 hectares of melia on smallholder farms <sup>16</sup>
Logging moratorium	Logging ban in place (zero output from KFS plantations)	Logging ban gradually lifted and cleared by 2027
KFS productivity & planted area	Partial stocking of planted area Medium-high productivity	Full stocking of planted areas High productivity
Climate change	RCP 4.5 <sup>17</sup>	

## 2.5 SENSITIVITY ANALYSIS

Sensitivity analysis was conducted by isolating the impact of each of the above scenario settings in turn with respect to overall forestry sector GDP and assigning each factor a corresponding impact weight proportional to its contribution to the overall potential of the sector.

<sup>14</sup> Output volume (e.g., sawn timber) as a percentage of input volume (e.g., sawlogs).

<sup>15</sup> Percentage of time operational (i.e., without unplanned work stoppages).

<sup>16</sup> Equivalent to the current total area of eucalyptus, the most widely cultivated genus.

<sup>17</sup> RCP 4.5 is chosen as it represents an intermediate scenario of global climate change mitigation (with emissions reducing in the second half of the century), whereas RCP 8.5 is considered a worst case/business as usual trajectory. Since RCP 4.5 and RCP 8.5 do not substantially diverge until after mid-century, the choice has limited implications for projected results to 2050.

## 2.6 TIME SCALING

Expected impacts of the various scenarios are scaled over time using the following assumptions:

- Potential lifting of the logging moratorium in full by 2027 (current electoral cycle).
- Potential planting and productivity improvements (all grower types) to be fully rolled out by 2040.
- Corresponding upgrading of the wood processing sector fully rolled out by 2040.
- Wood supply effects lag growing improvements by the average rotation length (12 years).
- Overall effects modelled through to 2050.

The impact weights calculated in the sensitivity analysis are used to determine the relative contributions of different scenario factors to impact indicators over time (e.g., upgrading KFS plantations may have a greater overall impact on GDP than lifting the logging moratorium, but the latter can happen faster).





# 3. Results

The following sections outlined the main results of the study, including a description of the baseline scenario of the sector, a corresponding projection of the status quo to 2050, and a modelled vision of the potential economic and environmental impacts of an upgraded sector over the same time.

### 3.1 STATUS QUO OUTLOOK

#### 3.1.1 DEMAND

##### Industrial wood products

Demand for industrial wood products is an all-time high and is projected to increase almost fourfold by 2050 (Figure 4). Construction represents the bulk of this demand (an estimated 580,000 m<sup>3</sup> in 2022), due to requirements for timber trusses, concrete formwork, and joinery (e.g., doors, windows, floors). While construction is one of Kenya’s fastest growing sectors, construction of new houses has averaged just 50,000 per year, compared to additional demand of 250,000 units per year, reflecting substantial room for further growth (Government of Kenya, 2022b; Kieti et al., 2022). Steel is increasingly being used in construction – in part due to the constrained supply of timber, but demand for timber in construction is nevertheless projected to grow to 1.6 million m<sup>3</sup> by 2050. This is a relatively conservative projection based on current construction approaches – if more advanced timber construction methods are adopted at scale, demand for quality differentiated timber could be many times higher (see Box 6).

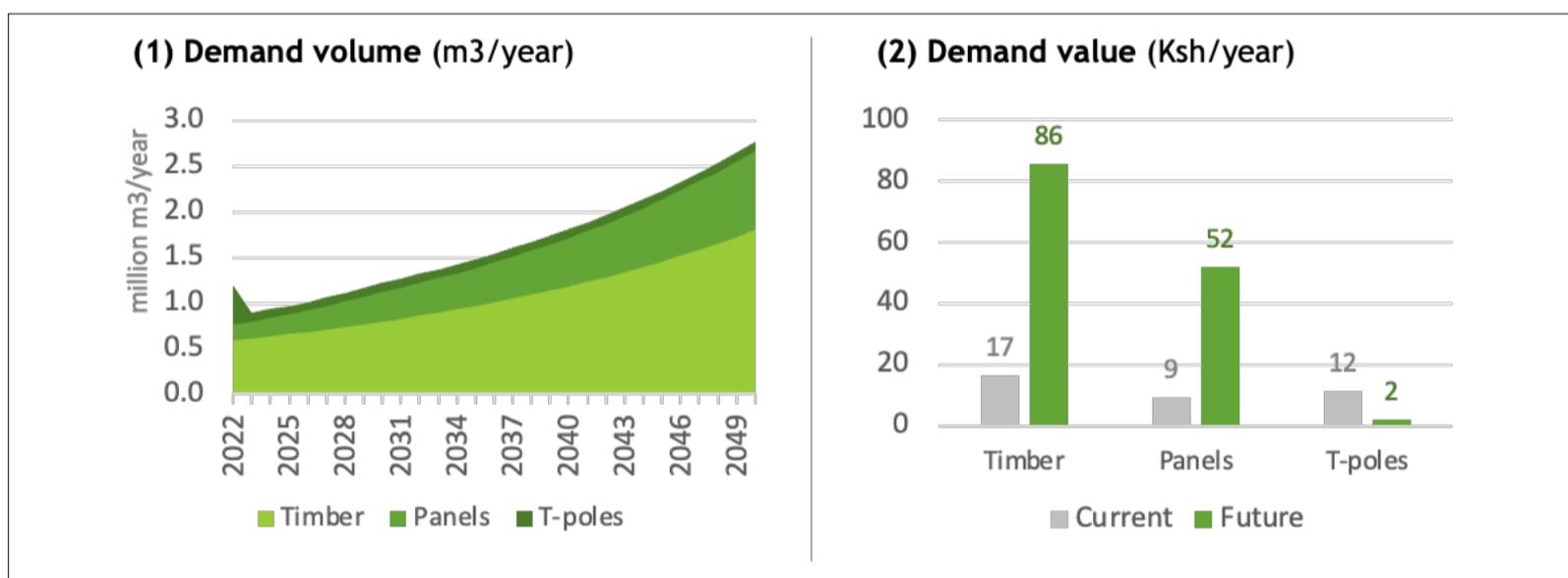


Figure 4: Demand for industrial wood products (2022-50)

Wood furniture demand amounted to 163,000 m<sup>3</sup> in 2022, principally solid wood demand by small-scale firms. The World Bank estimate that the furniture sector produced and sold US\$496 million worth of products in 2013 and is growing at 10% every year (World Bank, 2015). Recognising the increasing competition from imports of finished furniture (which are grew 24% between 2009 and 2013), this analysis assumes growth of slightly over 5% per year. However, adoption of more mass-produced business models, using a mix of engineered board (plywood and MDF) and solid wood, could increase market share for local producers and in turn increase demand beyond what is projected here. Incentives for local production are also increasing following the introduction of 30% import tariffs on furniture in the Finance Bill 2023.

Transmission poles for rural electrification is perhaps the only area where demand is projected to decrease, from an estimated 433,000 m<sup>3</sup> in 2022 to 95,000 m<sup>3</sup> by 2050, as construction of new electrification routes reduces and demand shifts to maintenance of existing routes. Current procurement policy for transmission poles is 50/50 between concrete and wood which is a dramatic shift from 100% wooden transmission poles decades ago.

Finally, the pulp and paper sector – a significant source of demand but with no current domestic supply - is addressed in Box 2.

Kenyan demand for paper products stands at around 300,000 tonnes per year – a level of consumption that relies on over US\$300 million of imports annually (FAO, 2020). Despite 20% of government gazetted plantations being earmarked for pulp production for the paper industry, paper production ceased in Kenya after the closure of Pan Paper, its sole mill, in 2009. The mill has since been reopened as Rai Paper but is not yet operating at capacity<sup>18</sup>.

Typically, the pulp and paper industry requires a large forest resource base in order to achieve the necessary scale economies for commercial viability – for example, Mondi Group, a multinational paper company, manages a quarter of a million hectares of forest in South Africa; almost three times the combined sum of Kenya’s current plantation areas (Mondi Group, 2022). Whether a smaller scale operation can be commercially viable in Kenya, and competitive relative to imports, remains to be seen.

From a sectoral perspective, other uses which drive more downstream manufacturing (e.g. furniture and construction) may offer greater value addition potential to Kenya’s limited resource base.

## Fuelwood

In terms of volume, fuelwood (including charcoal and firewood) represents the largest source of demand, with current demand standing at almost 50 million m<sup>3</sup>/year, and the charcoal market alone being valued at almost Ksh 200 billion (Figure 15). By 2050, combined domestic and industrial fuelwood demand is expected to rise to over 80 million m<sup>3</sup>/year.

Industrial fuelwood feeds boilers for heat intensive industries like tea, textiles, and cement, as well as restaurants and kiosks. Demand has remained strong despite rapid price increases over the last few years, though it is projected to increase more slowly than industrial wood products due to the increased use of more efficient boilers and as alternative energy sources become more available and price competitive.

In terms of domestic consumption, fuelwood remains the primary energy source for most Kenyans, particularly in rural areas. While fuelwood demand growth is expected to slow as urbanisation accelerates and alternative energy sources are increasingly utilised, it will remain by far the largest component of wood demand for the foreseeable future and will continue to place great pressure on Kenya’s remaining natural forests.

To address this, there may be opportunities for an increase sustainable plantation-based fuelwood production, but this would likely require the addition of carbon credits based on more efficient production technologies to make improve the commercially viable of fuelwood production relative to more profitable industrial wood products. However, even if sustainable charcoal production increased from the planted commercial forest resource base, it would likely only fulfil a fraction of current demand. Ultimately, shifts to alternative energy sources (beyond the scope of this study) are required to fully address the charcoal question.

### 3.1.2 SUPPLY

#### Domestic

Despite these increases in demand, a corresponding reaction has not yet materialised on the supply side (Figure 5). Farm forestry accounts for the largest area of planted trees, at over 400,000 hectares<sup>19</sup> - however, most of the wood produced on farms does not enter formal value chains at present, due to the logistical challenges and expense of sourcing timber from a disaggregated supply base, particularly for processors whose business models are predicated on access to reliable supply from public plantations. As such, farm forestry is estimated to contribute only 13% of the sector’s roundwood, despite making up around two-thirds of the resource base by area.

<sup>18</sup> <https://www.businessdailyafrica.com/bd/corporate/industry/webuye-suffers-losses-as-paper-mill-grinds-to-a-halt-1972192#:~:text=Pan%20paper%20closed%20as%20a,Kenya%20Power%20and%20Lighting%20Company>

<sup>19</sup> The current area of farm forestry is estimated using data from Kenya’s REDD+ Forest Reference Level and latest KFS forest resource assessment to estimate the area of planted trees on farms in areas suitable for commercial planting (since farm forestry falls below “forest” definition threshold) (Government of Kenya, 2019, 2021a). First, total tree cover *inside* forests is calculated by multiplying total forest cover (3.5 million hectares) by average canopy cover (54%), giving 1.9 hectares of trees inside of forests. This is then subtracted from total tree cover (7.2 million hectares) to give 5.3 million hectares of trees *outside* of forests. The assumption of 11% planted / 89% natural tree cover from Government of Kenya (2021a) is then applied to total trees outside of forests to give 444,000 hectares of *planted* trees outside of forests. Finally, of these, the total falling in areas suitable for commercial forestry (according to the site-species matching tool) is calculated as 406,000 hectares.

Kenya's public gazetted plantation land covers approximately 137,000 ha and are the largest area of contiguous high-potential commercial growing areas in Kenya (Government of Kenya, 2019). Historically these pine and cypress plantations have provided the overwhelming majority of roundwood for medium to large processing operations (Ministry of Environment, Water, and Natural Resources, 2013). However, only around a half of KFS plantation land is currently stocked, and supply remains frozen under the ongoing logging moratorium (Agence France Presse, 2023; Government of Kenya, 2019).

Given the absence of KFS supply and the lack of farm forestry market integration, the lion's share of Kenya's wood supply is currently sourced from small- to medium-sized woodlots, producing almost 1 million m<sup>3</sup>/year. While these are dedicated plots of commercially grown trees (unlike the farm forestry model), they are still mostly operated by small farmers who are not primarily foresters, and as such forestry practices and productivity remain variable and relatively low quality.

Finally, some 15,000 hectares of large private plantations in Kenya currently supply around 178,000 m<sup>3</sup> of roundwood per year, largely shielded from the impacts of the moratorium by virtue of their vertically integrated growing and processing operations<sup>20</sup>. Both vertically integrated grower-processors and standalone processors sourcing historically from public plantations predominantly produce structural timber, transmission poles, and low-grade plywood.

In sum, total supply from the above sources means that wood product supply currently falls far short of demand (Figure 5). Domestic supply of timber and panels is just 8% of demand, while supply of transmission poles is around 11% of demand.

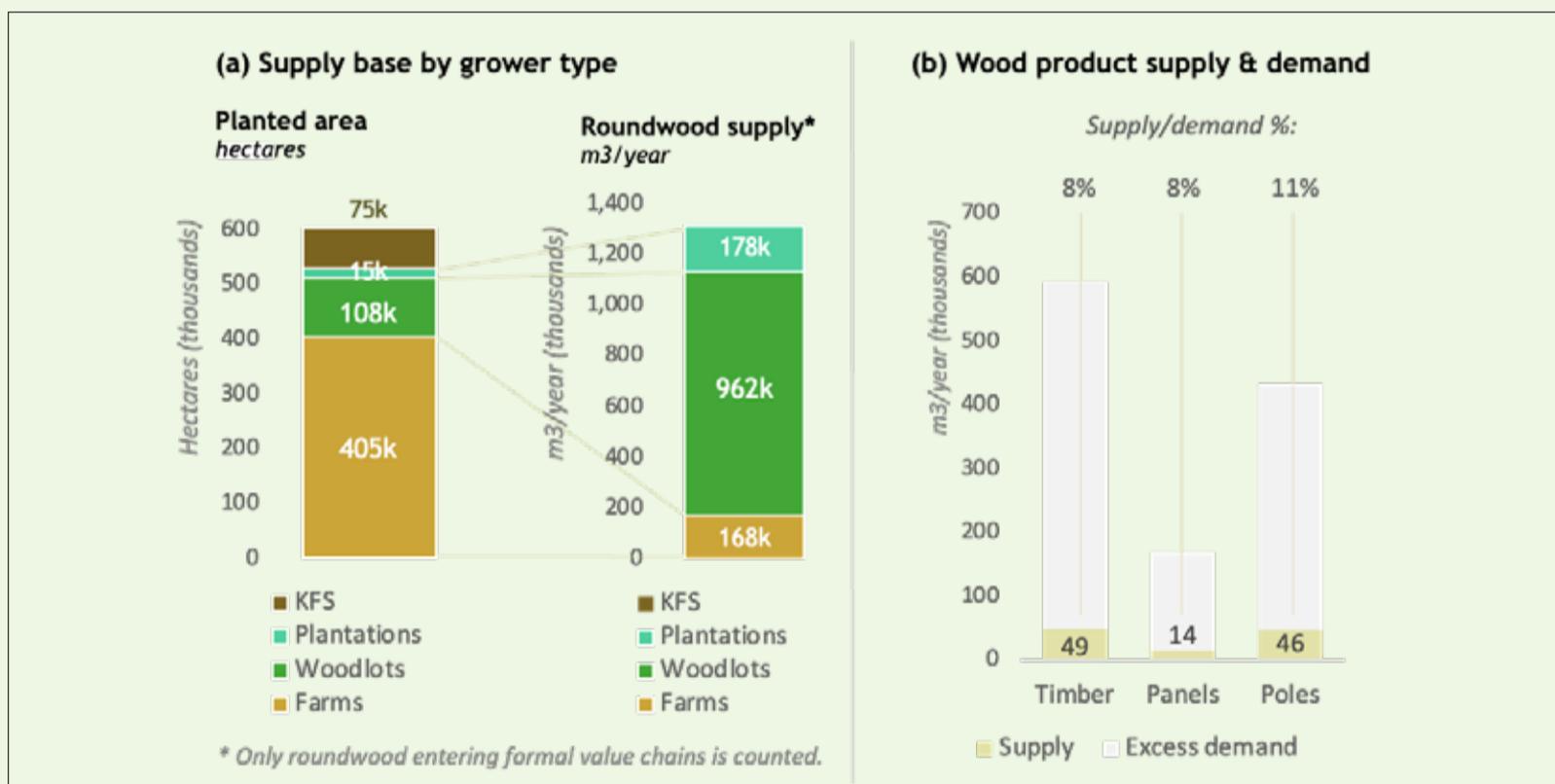


Figure 5: Baseline wood supply

Somewhat distinct from commercial planting in high productivity areas are commercial agroforestry activities in Kenya's arid and semi-arid lands. While much of the most arid areas are not suitable for commercial tree growing, there substantial areas of semi-arid land which could support commercial growing of *Melia volkensii*, an indigenous species with low water requirements and various promising uses. While there has been a lot of interest and research into *Melia* this has yet to translate into commercial production, partly due to i) lack of dissemination of information on how to get a commercial yield, ii) lack of availability of improved seed, and iii) issues around aggregation and commercially orientated support to growers. *Melia* is specifically mentioned in the Bottom-up Economic Transformation Agenda as a tree species ideally suited for drylands and with good returns for growers when sold into the timber value chain.

20 Private plantation area (and species) is taken from the websites of the major known plantation operators (KTDA, Kakuzi, and Better Globe).

Box 3: Productivity challenges

Growers of all scales in Kenya frequently achieve less than half the maximum achievable productivity, with commercial plantations only performing marginally better than smallholders. While KFS productivity has been estimated at around 10m<sup>3</sup>/ha/year on its pine and cypress plantations, potential yields of these genera are thought to be around double this (Government of Kenya, 2013). Profitability of commercial forestry depends on producing quality trees as fast as possible. Productivity and quality start with the decisions growers make. Decisions made around the selection of the right species for the available sites, the use of improved germplasm, the quality of seedlings, the silvicultural practices employed and harvesting practices will all have a huge impact on the volume, quality and value of the output. Poor choices will lead to low survival, slow growth, low quality timber, disease, and lack of uniformity across the planted area. Beyond establishment, high productivity requires ongoing site management, including a combination of weeding, pruning, thinning, and fire management, all tailored to the specific site, species, and target markets.

Delivering these productivity improvements – from smallholder farm forestry to large-scale KFS plantations – will require a combination of (a) commercial incentives to increase investment in forest establishment and management, and (b) access to the appropriate skills and knowledge on the most appropriate practices to apply in different contexts.

**Imports**

Given the supply constraints, imports have played an increasingly important role in meeting Kenya’s demand for wood products. The scale of imports has grown from a little under US\$2m per year in 2000 to US\$76m in 2021, with wood-based panels representing the largest shares (FAO, 2023). The sawn timber imports include pine for construction from Uganda and Tanzania and indigenous hardwoods from the Democratic Republic of the Congo. It also includes some higher-grade construction timber from as far as Canada and northern Europe. While plywood (principally low-quality boards for construction) previously came mainly from China, recent investments in production in neighbouring Tanzania and Uganda mean that supply to Kenya is increasingly coming from within East Africa.

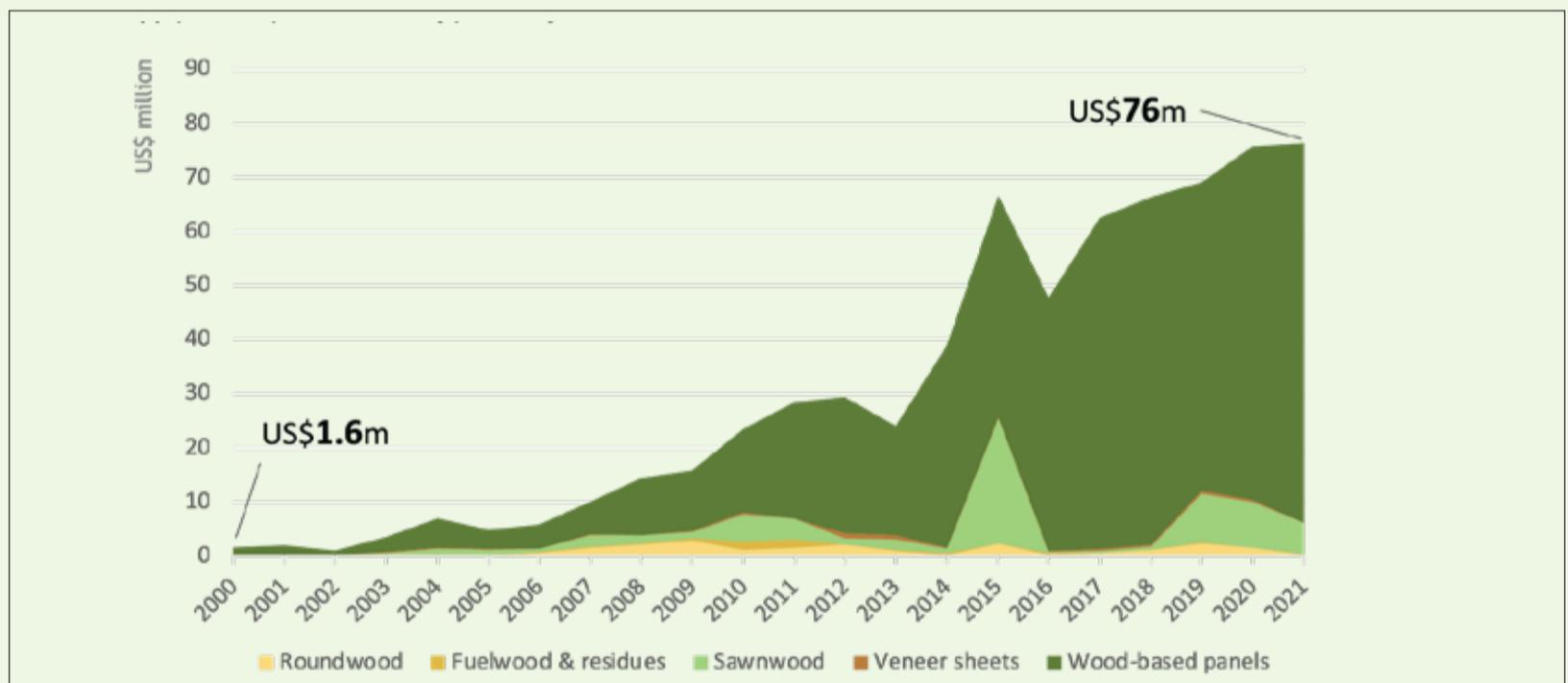


Figure 6: Imported wood products

**3.1.3 STATUS QUO GROWTH PROSPECTS**

Continuation of business-as-usual conditions would likely see a slight shrinking of area planted for the industrial wood sector over time (Figure 7). As climate change drives hotter, dryer conditions in many parts of the country, the total area of land suitable for commercial forestry is expected to contract, even if a degree of adaptation is considered (i.e., switching to more suitable species). While this will primarily affect more marginal areas (outside of core growing locations of existing larger plantations and woodlots), the total area of planted trees for industrial wood could shrink by around 20% between 2023 and 2050. However, in certain areas of Kenya, several commercial tree species are expected to perform better under climate change. Climate adaptation efforts should focus on providing growers with access to information and inputs that help to build climate resilience.

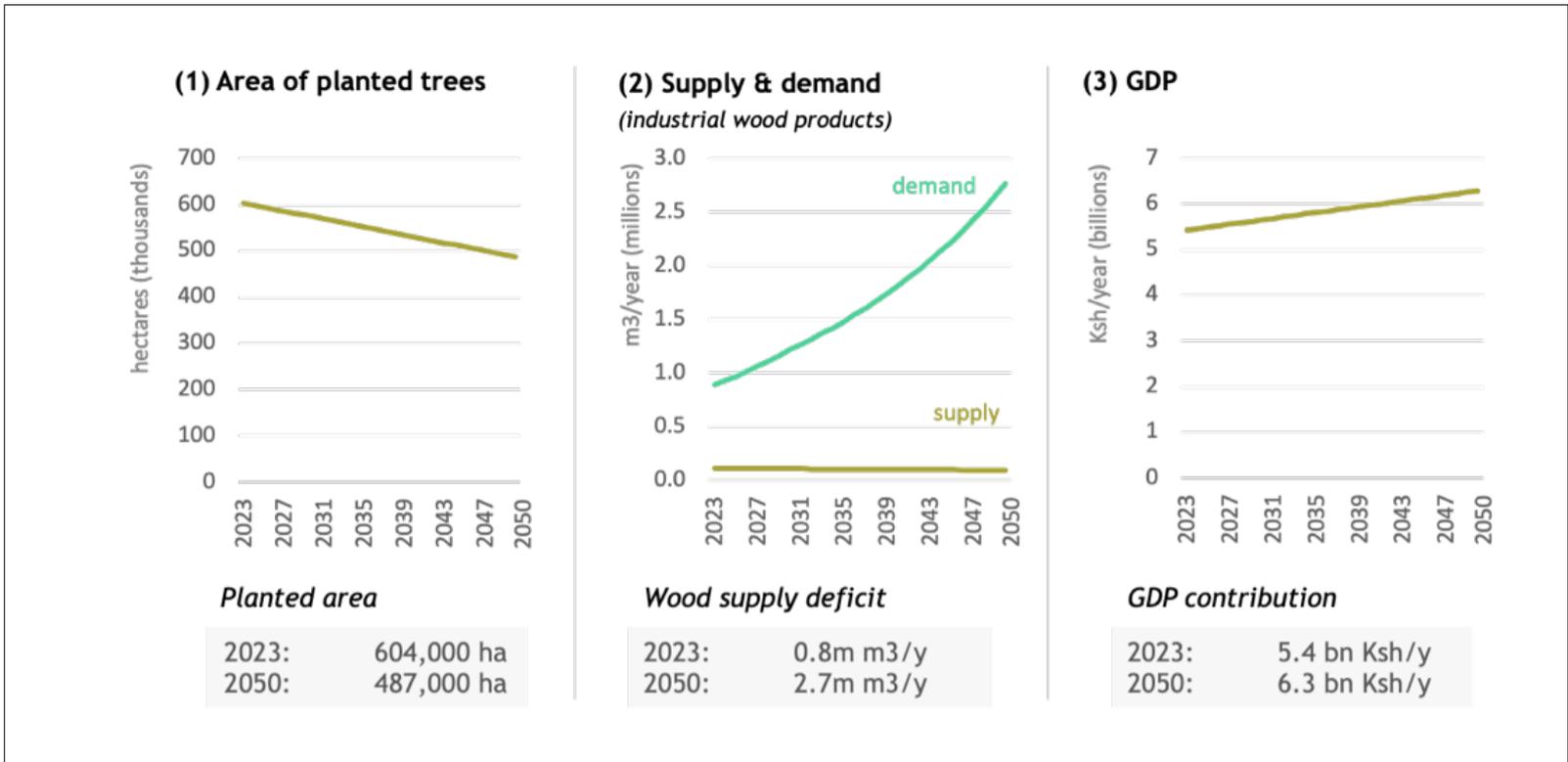


Figure 7: Business as usual projections

Faced with the dual pressures of fast-rising demand and adverse climate change impacts, the status quo in the sector could see the industrial wood product deficit more than triple, to 2.7 million m<sup>3</sup>/year by 2050. Despite these effects, total forestry GDP is expected to continue to grow slightly, largely a result of falling transmission pole demand seeing larger shares of wood volumes being directed into higher-value timber and panels markets.

A large and growing wood product deficit has several implications. Perhaps the most tangible implication is increased prices of wood products. KEFRI estimated that prices of wood products surged after the moratorium was introduced in 2017, putting a significant strain on households and businesses that rely on timber and wood fuel (Kagombe et al., 2020b). Imports also affects Kenya's balance of trade and depress the value of the Kenyan Shilling, which has lost more than 30% of its value against the US dollar over the last two years (World Bank Group, 2022).

Finally, a shortage of sustainably produced wood products, particularly fuelwood, places increasing pressure on Kenya's remaining natural forests, undermining the Government's commitments on forest cover, climate change, and eroding the precious natural capital that underpins the livelihoods of millions of Kenyans (Government of Kenya, 2019).



## 3.2 POTENTIAL IMPACTS OF AN UPGRADED SECTOR

### 3.2.1 RESOURCE BASE

In future, planted area could as much as double from just over 600,000 hectares to almost 1.2 million hectares of trees, primarily driven by the expansion of farm forestry to 10% cover on farms. Limited feasibility of large-scale plantation establishment means that the sector will remain dominated by small private growers (farm forestry and woodlots), who account for almost 90% of planted area in both current and future scenarios. We model the expansion in planted area as taking place between now and 2040<sup>21</sup>.

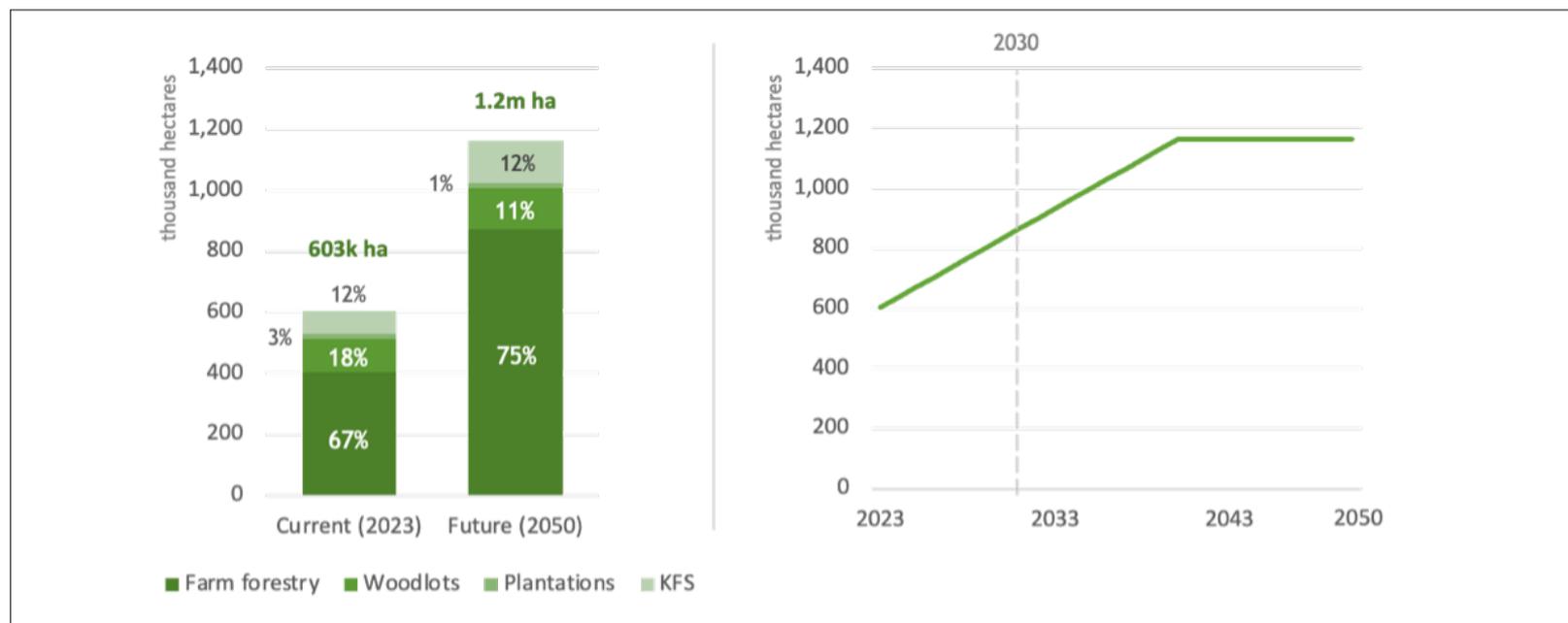


Figure 8: Tree cover

### 3.2.2 WOOD SUPPLY

A corresponding increase in wood supply would begin in earnest around 2035, as the first rotations of new planting are harvested<sup>22</sup>. A combination of increased planting and productivity could see a more than fourfold increase in roundwood supply, from 1.3 million m<sup>3</sup>/year in 2023 to 7.1 million m<sup>3</sup>/year in 2050. High productivity KFS plantations could account for over a quarter of total supply in future, despite only having a footprint of 12% of planted area.

Shorter-term gains in wood supply can be achieved by (a) lifting the logging moratorium, and (b) improving the integration of farm forestry into formal value chains. Combining the latter with on-farm productivity improvements could see farm forestry accounting for over 40% of total wood supply in future, compared to just 13% today.

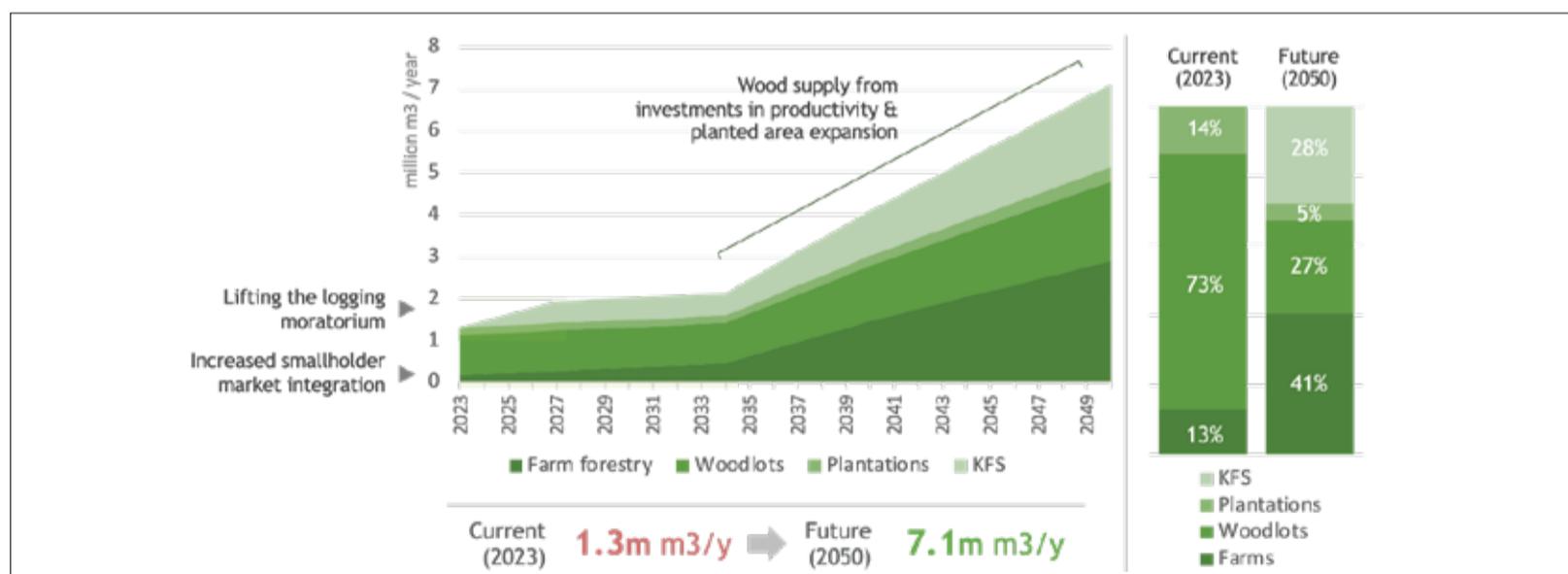


Figure 9: Roundwood supply

<sup>21</sup> By comparison, Uganda's Sawlog Production Grant Scheme (SPGS) supported 47,000 hectares of additional planting over 10 years (SPGS, 2014).

<sup>22</sup> Based on an average sector-wide rotation of 12 years, which is skewed by short-rotation small grower forestry. Longer rotations – and therefore longer lags until supply increases – are expected on KFS land and private plantations.

Converting this increased supply of roundwood into industrial wood products through high-productivity processing operations could substantially close the current supply deficit for multiple products, with overall domestic supply as a percentage of demand rising from 9% today to 54% in 2050. Moreover, improvements in processing and greater recognition of quality in markets should lead to price differentiation between timber grades, as well as the emergence of high-quality markets for plywood and other boards, driving greater value addition across the sector. However, modest wood deficits would still require a degree of imports or substitutes.

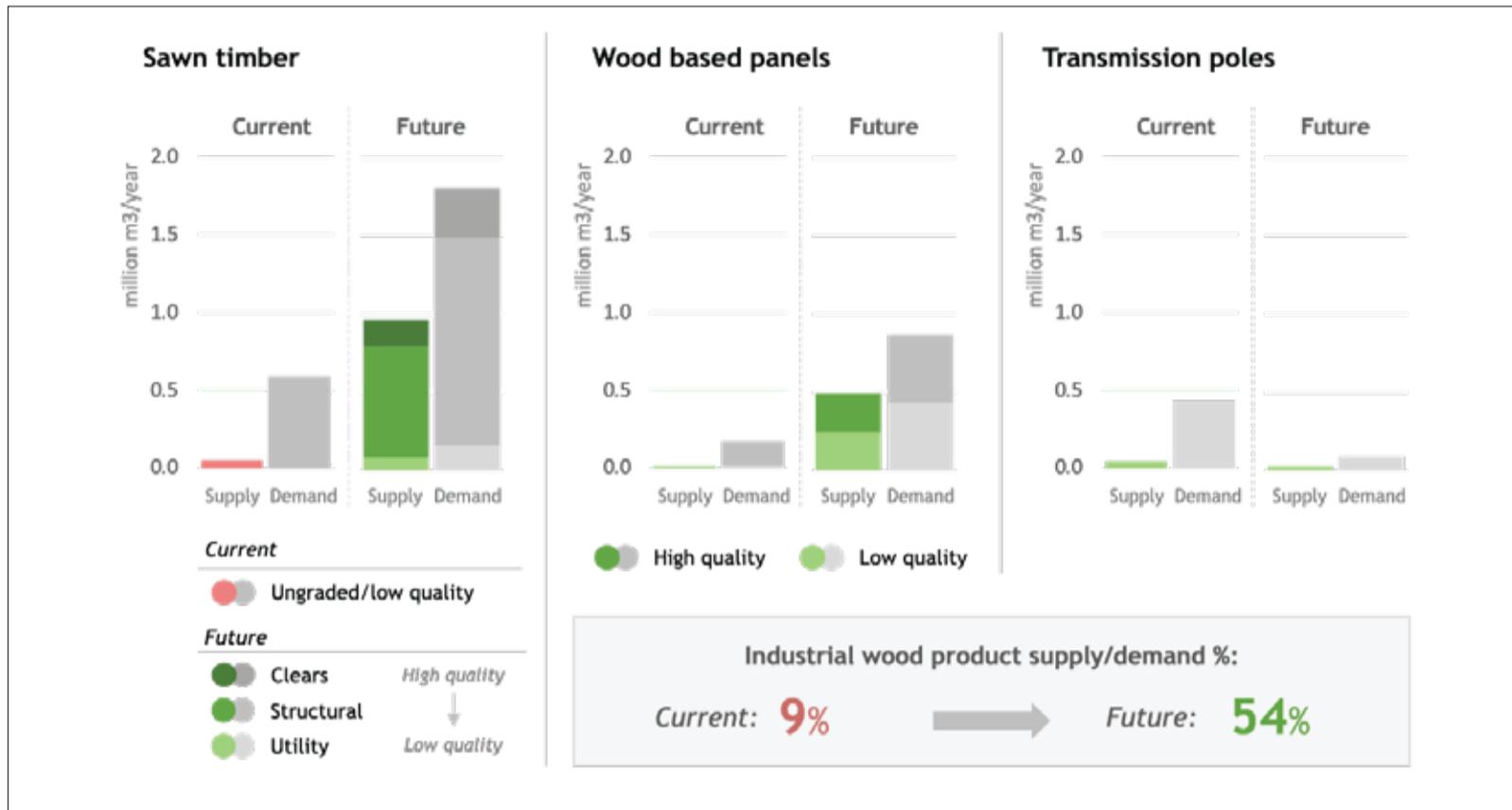


Figure 10: Industrial wood product supply and demand



### 3.2.3 ECONOMIC IMPACTS

#### Macro level

Altogether, the above improvements could drive a more than tenfold increase in the industrial wood sector’s contribution to GDP between now and 2050, rising from Ksh 5 billion to Ksh 137 billion per year (Figure 11), with wood product manufacturing becoming one of Kenya’s leading manufacturing sectors (Figure 12).

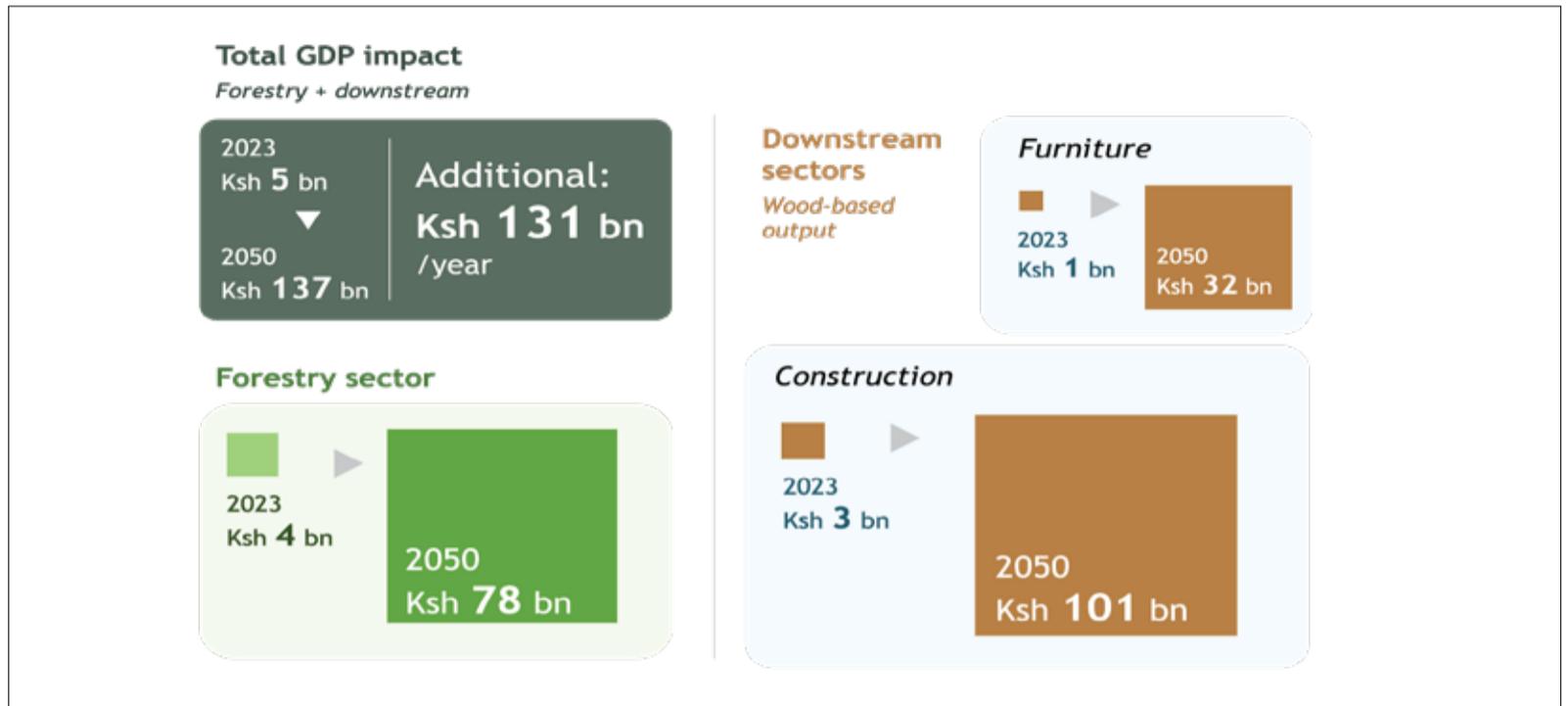


Figure 11: Contribution to GDP

Forestry sector output (growing and primary processing) is expected to rise from Ksh 4 billion to Ksh 78 billion per year, while downstream wood-based output values are expected to rise from Ksh 1 billion per year to Ksh 32 billion per year in the furniture sector and Ksh 3 billion to Ksh 101 billion in the construction sector.

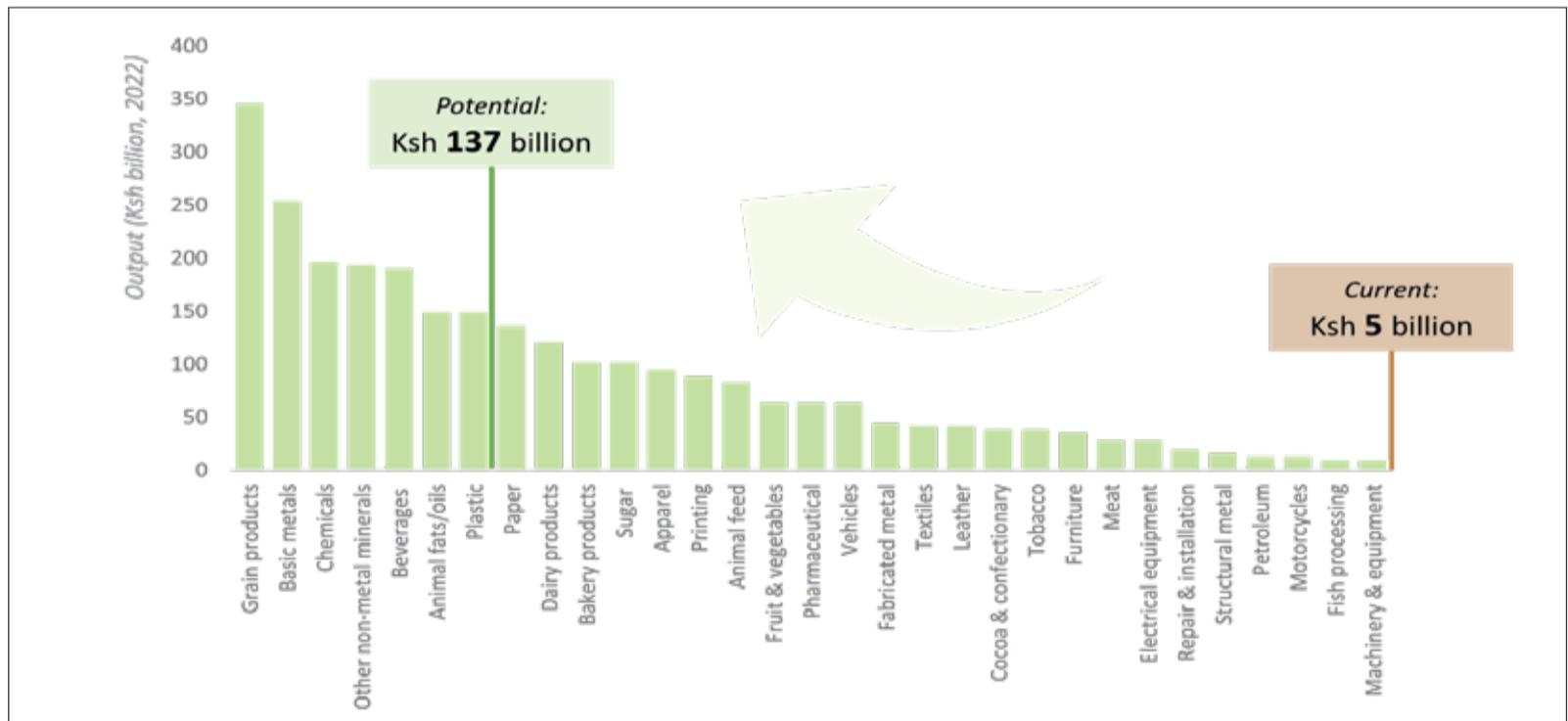


Figure 12: Wood manufacturing relative to other sectors

This vast expansion in economic activity is reflected in Figure 13, with in-country value addition in the forestry sector rising both in absolute terms and proportional to outputs. While total growing output is currently valued at less than the sum of its inputs, future growing value addition would rise to 36% of output, while GVA would more than quadruple in primary wood processing (from 6% to 25%), and more than double in downstream sectors (from 20% to 42%).

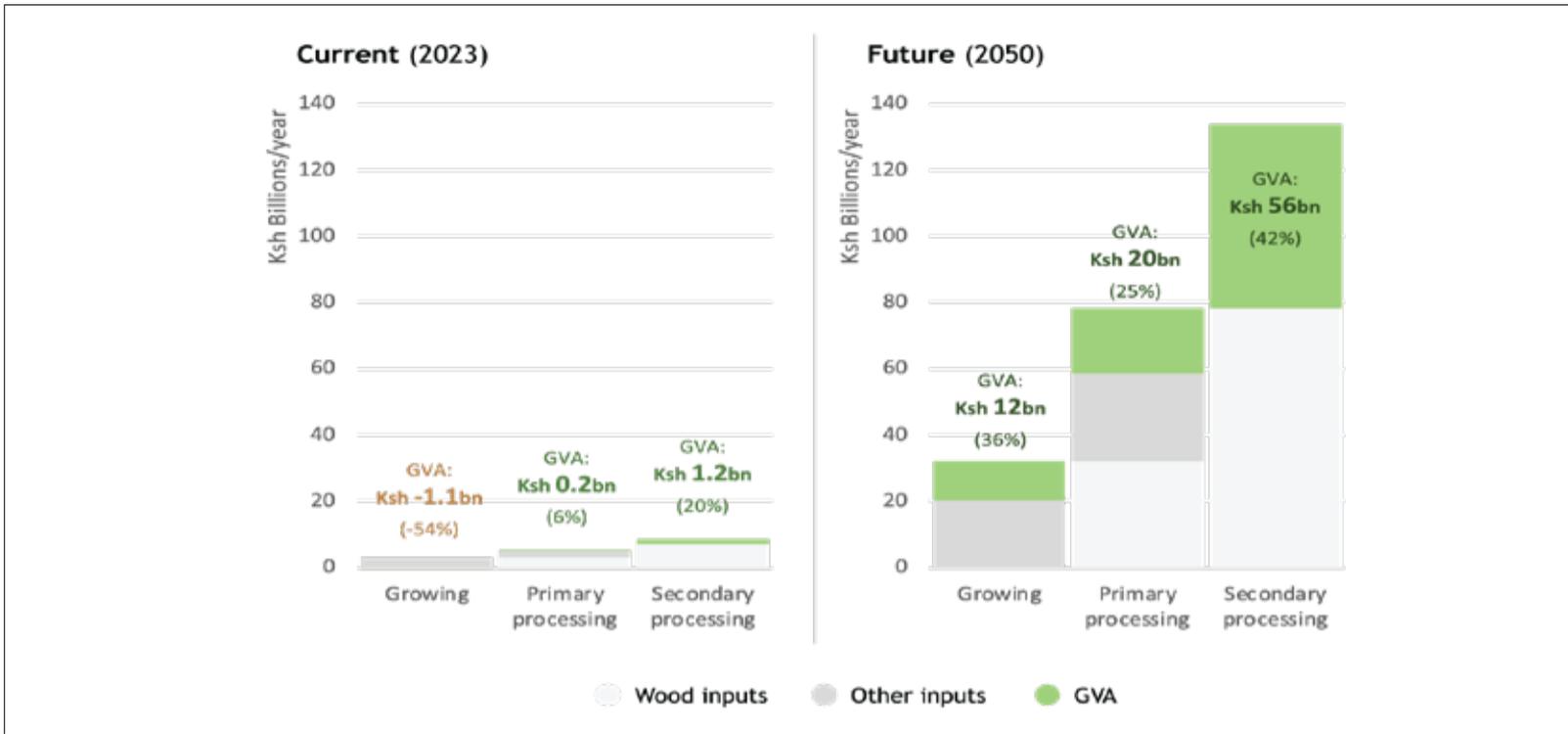


Figure 13: Gross value addition

The number of jobs supported by the sector is forecast to rise from around 15,000 to 85,000, of which almost 50,000 will be in the forestry sector itself (growing and primary processing) and the remainder in downstream sectors, particularly in the labour-intensive construction sector (Figure 14). Note that these modelled job numbers do not include jobs in the wider enabling environment (e.g., providers of inputs, technical assistance, training, machinery, equipment, and finance), which could add many more to the total. In addition, the job numbers presented here are full time equivalents – in reality, the sector likely supports a far larger number of individuals through seasonal or periodic work at different times during the growing cycle. Finally, while we note that many more jobs are likely to be supported via multiplier effects in the wider economy, we focus here on direct job creation within the sector.

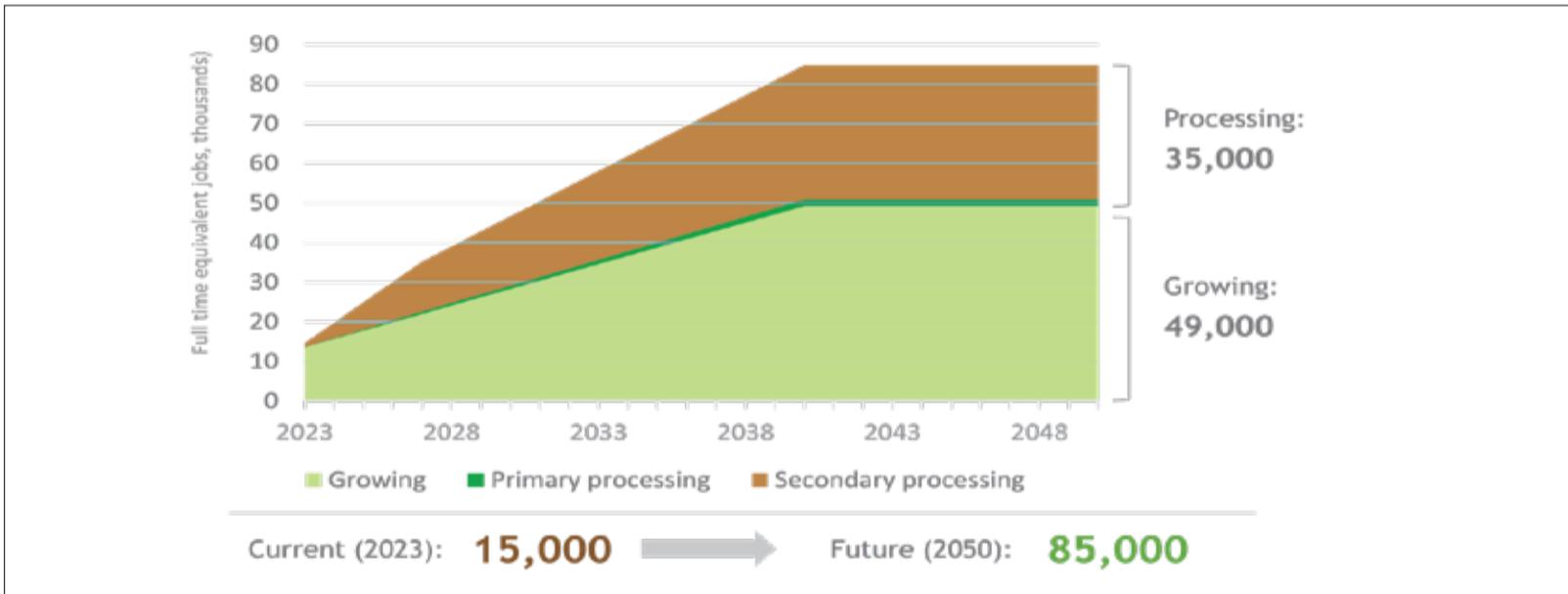


Figure 14: Jobs (full time equivalents)

The overall impact on the wider forestry sector (including informal wood product markets and economic activity in natural forests) is shown in Figure 15. Currently, the sector is dominated by charcoal production, valued at Ksh 181 billion/year. Other wood products (e.g., timber and poles) harvested from community natural forests and wood products from farm forestry remaining in informal markets (e.g., on-farm consumption or local construction) contribute Ksh 10 billion and Ksh 7 billion respectively. At present, commercial planted forestry supplying formal value chains – the focus of this study – is the smallest forestry subsector, at just Ksh 5 billion/year, or a 2% share of forestry sector GDP. The total forestry sector contribution of just over Ksh 200 billion represents 1.5% of Kenya’s GDP in 2023, in line with the 2018-22 average reported by the Kenya Bureau of National Statistics of 1.54% (Kenya National Bureau of Statistics, 2023).

If the industrial wood sector’s potential is realised, it would grow substantially to almost 30% of the total forestry sector, which itself is expected to more than double to Ksh 469 billion/year by 2050. Co-benefits in other subsectors can also be expected, including by (a) diverting a portion of charcoal supply from natural forests to sustainable plantations (3.2.4Section 3.2.4, below), (b) incorporating an increasing share of farm forestry into formal value chains, (c) increasing wood supply security on farms by generally improving farm forestry productivity, and (d) promoting a modernised wood processing industry that may also add value to sustainably sourced natural forest outputs.

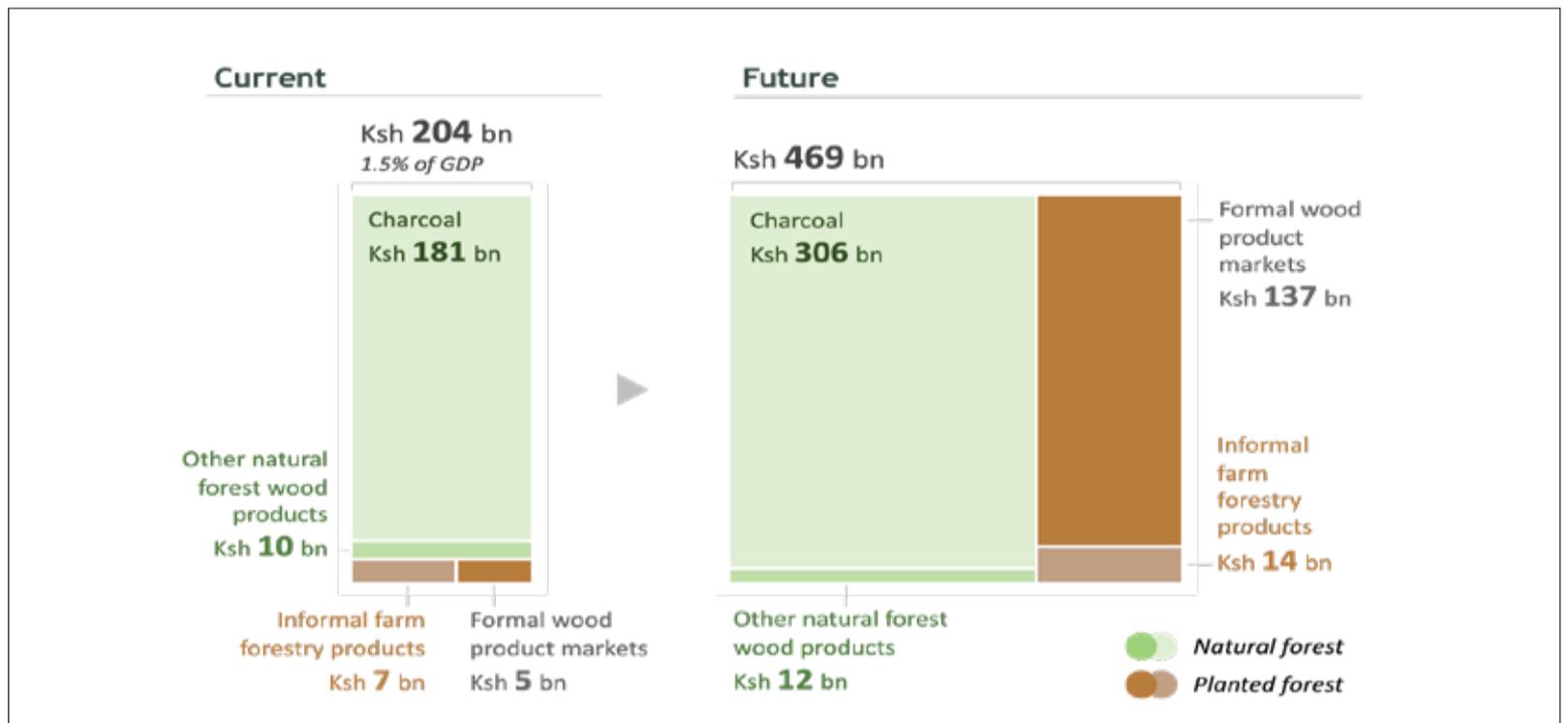


Figure 15: Wider forestry sector impact

### Firm level

At the level of individual growers and processors, in most cases profitability and return on investment will increase substantially, particularly on the growing side, where greater profits will be driven by investments in higher volume and higher quality production, which in turn are rewarded by more advanced wood processing in markets that reward quality with corresponding price premiums.

The expected spread of prices is shown in Figure 16. While basic roundwood prices are expected to fall slightly in future (correcting today’s inflated prices resulting from the logging moratorium), quality differentiation, particularly in timber and panels, means that growers accessing higher-value markets could see more lucrative returns. High quality sawn timber (clears), for example, are expected to fetch more than three times the current ungraded price of timber in future.



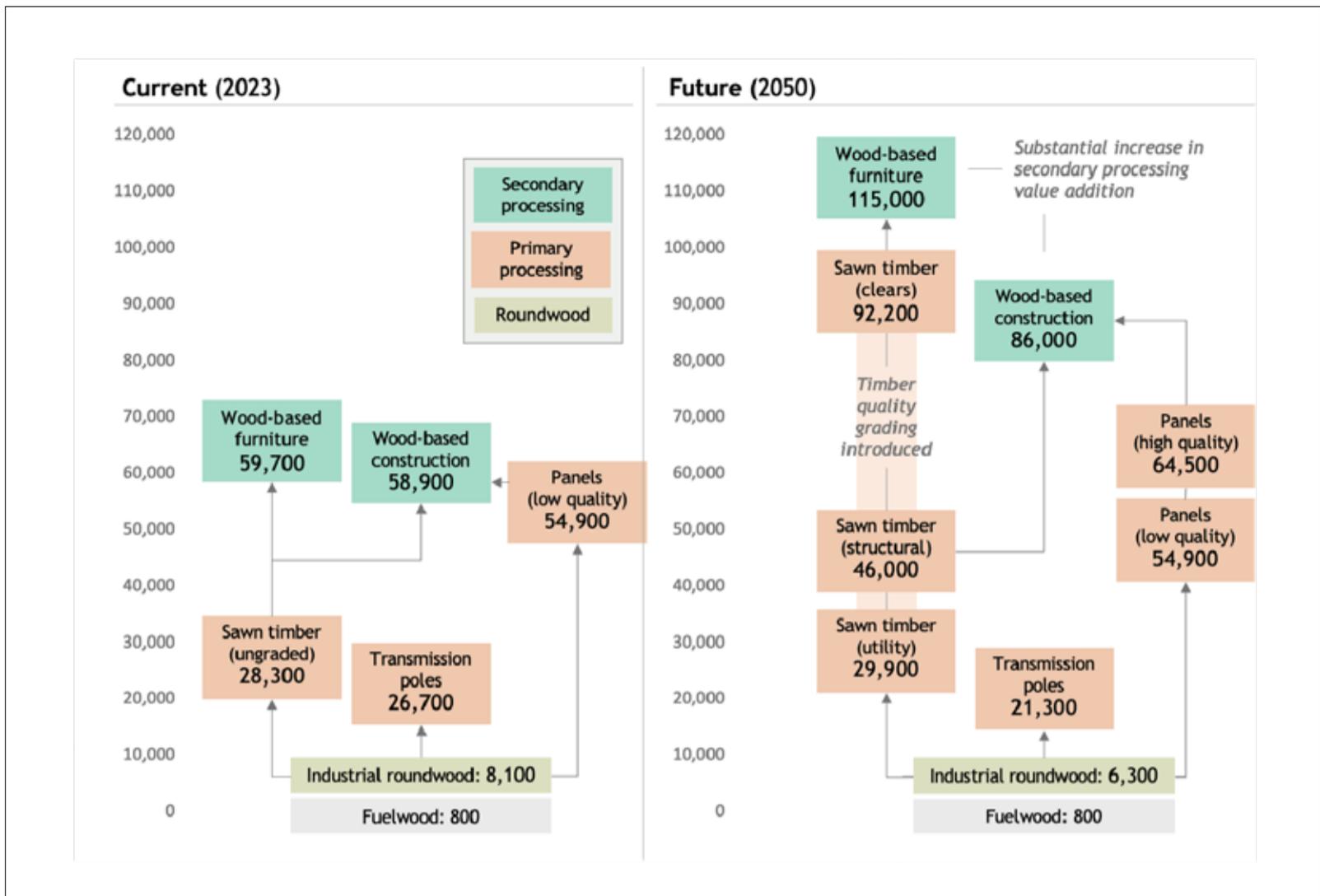


Figure 16: Wood product prices (Ksh/m<sup>3</sup>)

Such prices are expected to more than reward the increased level of investment required to upgrade growing and processing operations, as the profitability charts in Figure 17 show. While many forestry operations are currently expected to be loss-making overall, future profit margins could range from 30-40% (for growers of all scales). Processor margins are also expected to grow, particularly for sawmilling, which is currently expected to be loss-making on average, due to a combination of insecurity of supply and a lack of quality differentiation in the market. Production of wood-based panels is expected to see more than a 50% increase in profitability (from 18% to 28%), making it the most profitable primary processing operation. Transmission pole production is the only area expected to see a slight retraction, as demand and prices fall once rural electrification efforts transition from an initial expansion phase to one of replacing existing infrastructure as necessary.



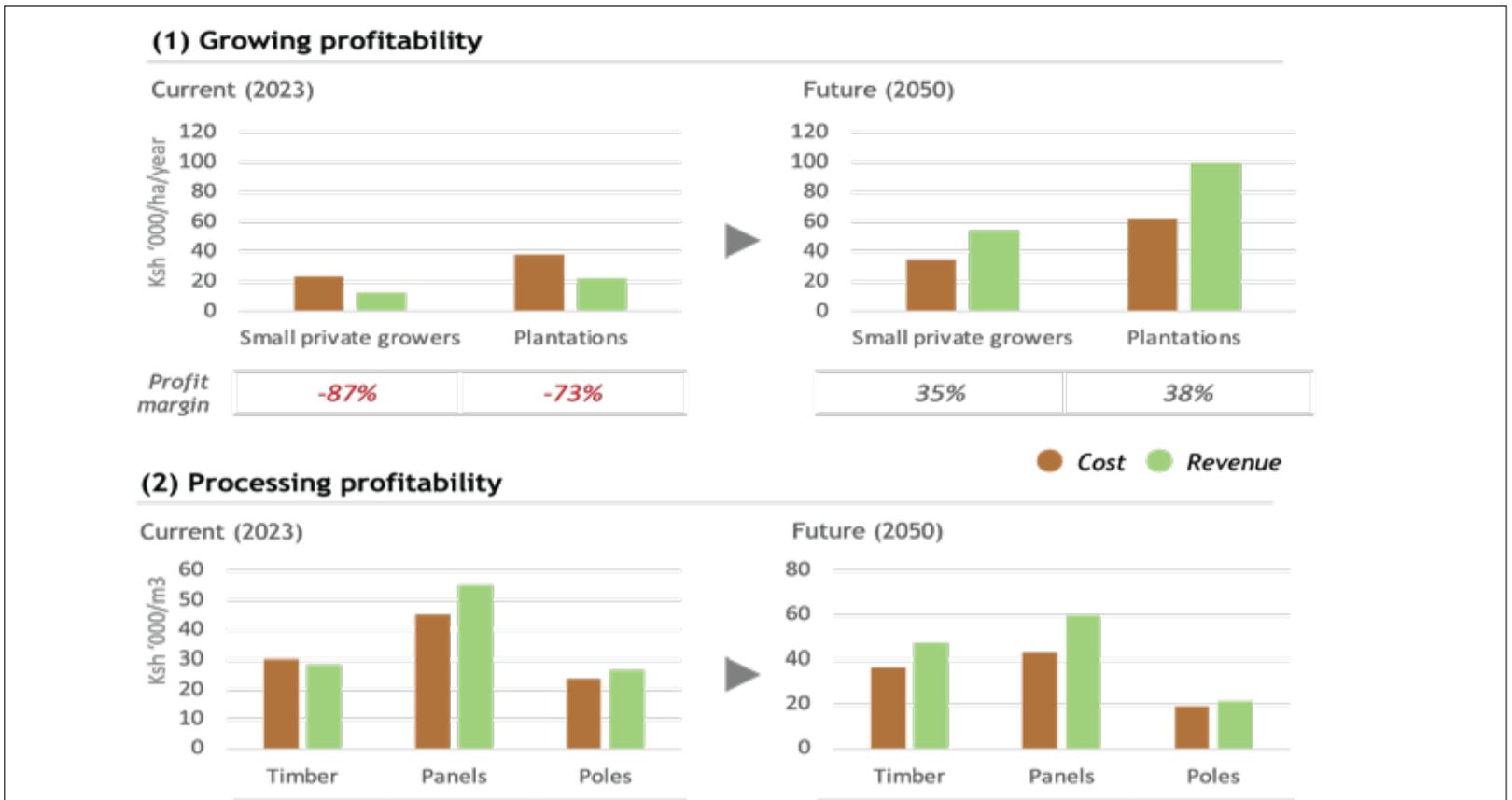


Figure 17: Grower and processor profitability

Importantly, the return on investment on tree growing of all scales and most processing operations is expected to substantially improve, making the sector an attractive proposition to new investors (Figure 18). This is particularly important on the growing side, where the long lag between initial investment and first revenues upon sale of mature trees can be discouraging to investors.

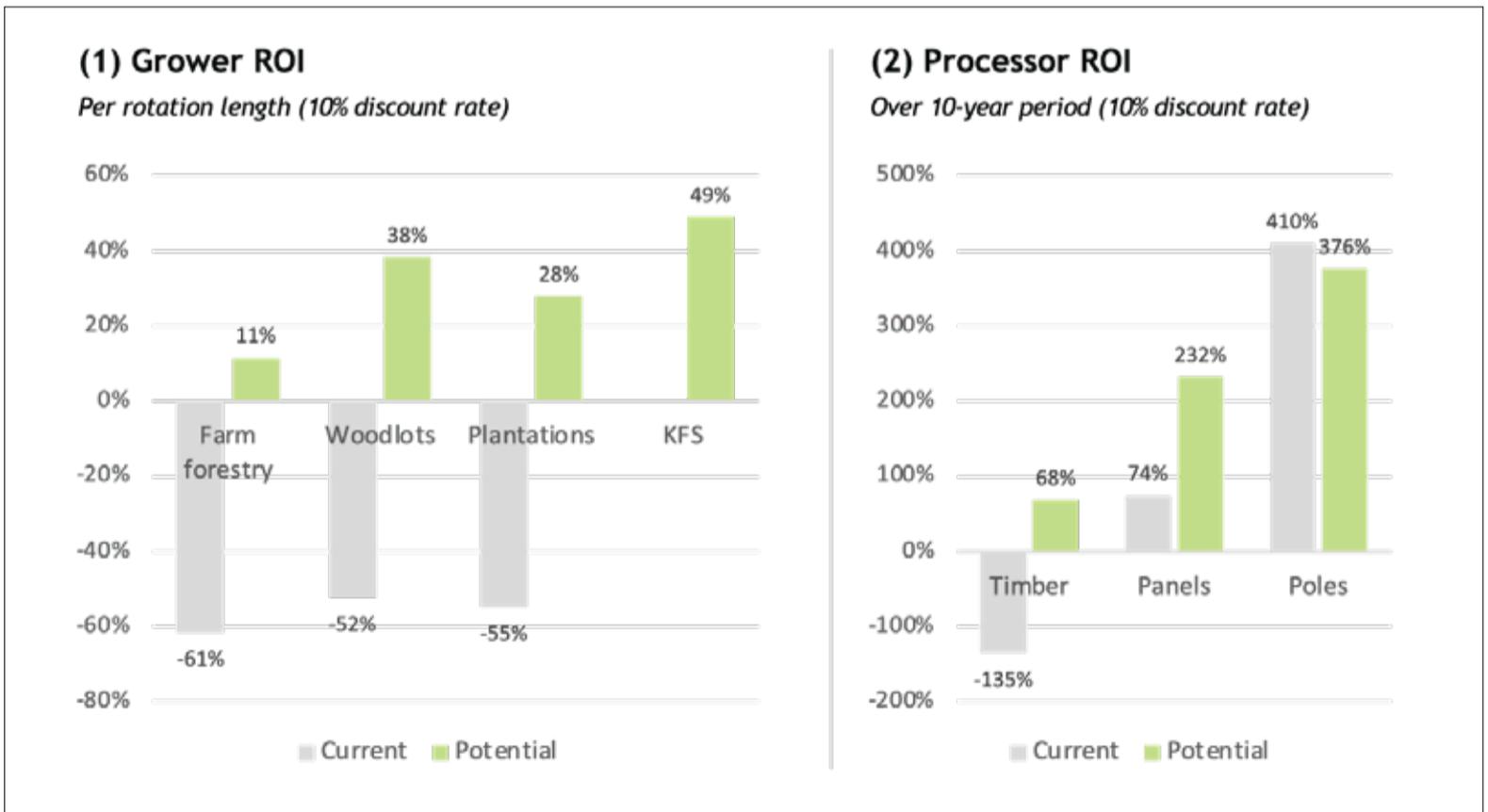


Figure 18: Grower and processor return on investment

### 3.2.4 ENVIRONMENTAL IMPACTS

Positive environmental impacts arising under the future vision come from a combination of increasing the area of planted commercial forest and reducing pressure on natural forests through wood product substitution effects. For the latter, we focus on two effects – substitution of fuelwood and tropical hardwoods.

#### Fuelwood substitution

Commercial planted forests currently have the capacity to satisfy around 3% of national fuelwood demand. While natural forests can tolerate a degree of sustainable fuelwood harvesting, most national fuelwood consumption is understood to come from unsustainable extraction from natural forests – the primary driver of deforestation and forest degradation across most of Kenya.

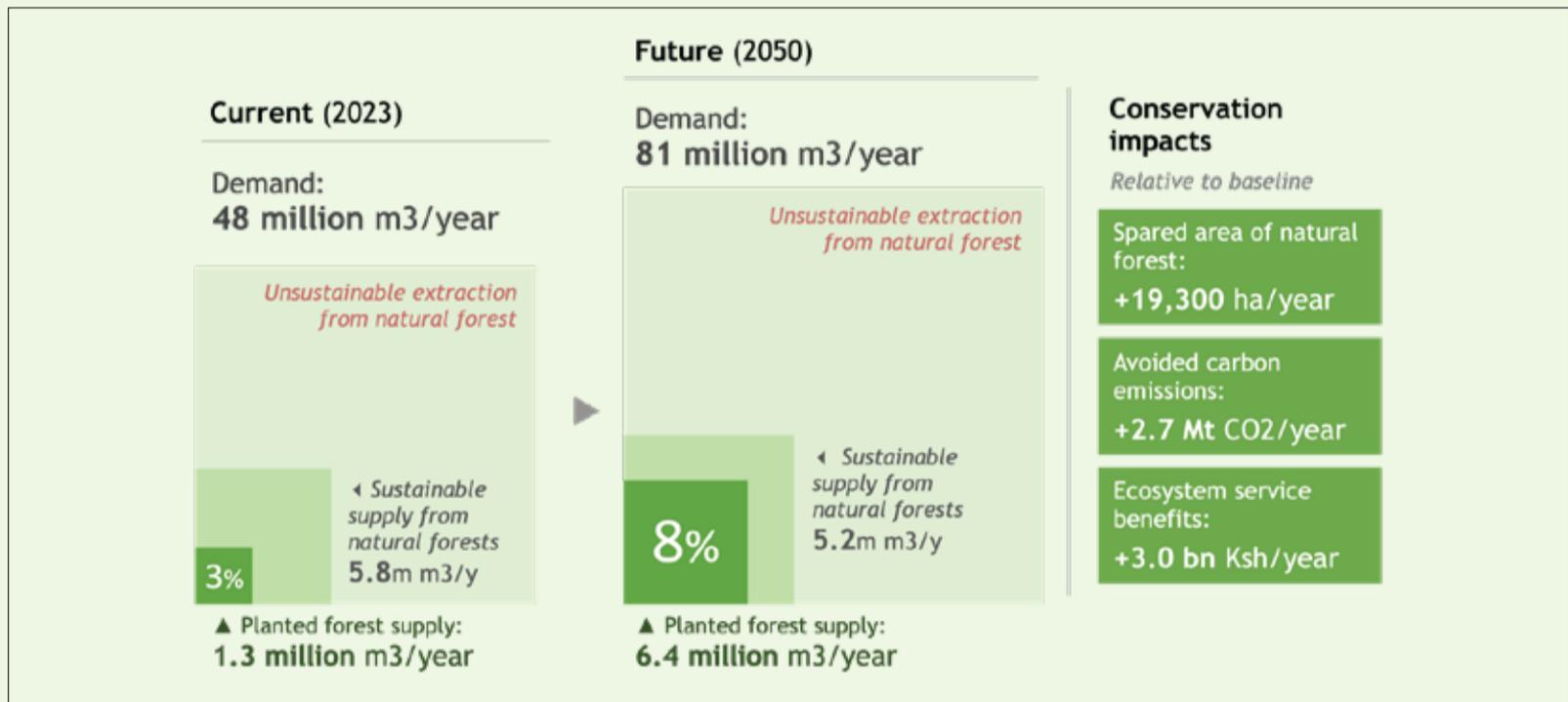


Figure 19: Fuelwood substitution effects

While fuelwood demand growth is expected to slow in future, mitigated by urbanisation and energy switching to alternative sources, demand is still forecast to rise to over 80 million m<sup>3</sup>/year by 2050. Under the future vision of the industrial wood sector, supply from planted forests would more than double to meet 8% of this demand (Figure 19). Though unsustainable extraction from natural forests will remain dominant, the land sparing effect of fuelwood supply from planted forests has the potential to spare 19,300 hectares of natural forest per year, avoiding some 2.7 Mt CO<sub>2</sub> of emissions annually.

Beyond the carbon sequestration effects, fuelwood substitution effects are expected to generate some Ksh 3.7 billion/year in ecosystem service benefits from natural forest conservation in Kenya, with key services including oxygen generation, tourism, food provisioning, hydropower, and soil and water regulation (Figure 20).

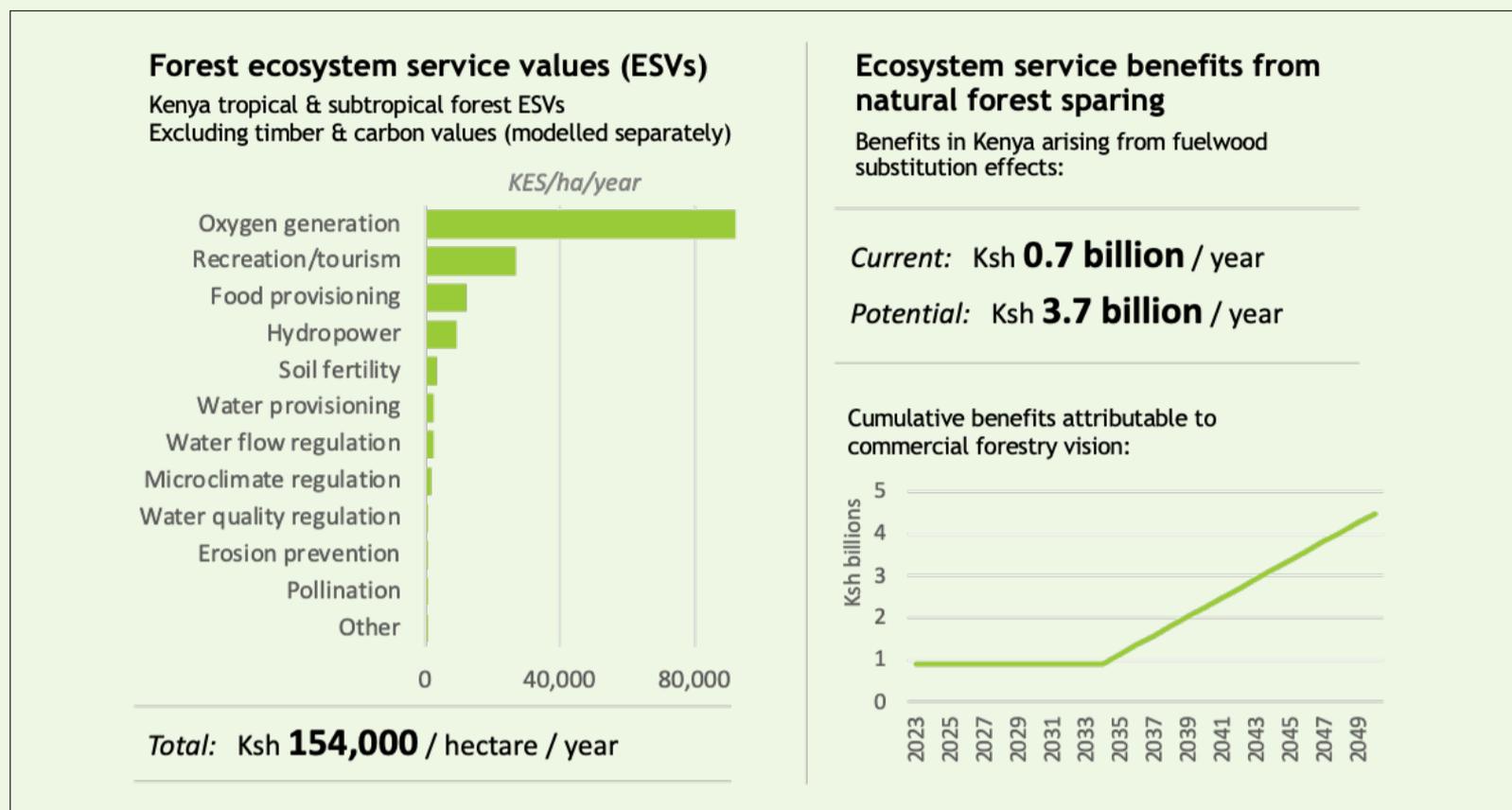


Figure 20: Ecosystem service benefits

### Hardwood substitution

Smaller growers tend to grow eucalyptus because it offers faster growth rates and attractive returns. Eucalyptus has the potential to produce high-quality hardwood timber that can substitute for native hardwoods, though it needs to be grown and processed correctly. Poor processing practices and early harvesting result in warping and splitting such that eucalyptus is currently perceived as a low-quality product in Kenya.

Current mahogany imports are estimated at between 32,000 and 50,000 m<sup>3</sup>/year, with a central estimate of 35,000 m<sup>3</sup>/year, mostly arriving from the DRC via Uganda (Nielson, 2023). In the present study, we estimate that while demand for tropical hardwood for furniture will roughly double in future, high quality sawn eucalyptus could substitute for around half of this, sparing some 233 hectares of natural forest per year in the Congo Basin, and thereby avoiding some 33,000 tCO<sub>2</sub>e/year in emissions.

### Forest cover

In terms of net effects on national forest cover, these land sparing effects have the potential to substantially outweigh the impacts of new commercial forest planting, with the latter averaging 3,400 hectares per year. However, new planting rates will be higher in earlier years, while land sparing effects will take longer to feed through, as they are dependent on lagged wood supply increases. In addition, it should be noted that the largest increase in planted area – that of farm forestry, with almost half a million hectares of additional trees to be planted – is not expected to count towards Kenya’s forest cover targets, since trees on farms are too sparsely planted to meet the 15% canopy cover threshold used by the Government of Kenya – though it could make a significant difference to national tree cover targets.

The combination of new planting and land sparing effects are ultimately expected to lead to some 23,700 additional hectares of planted or spared forest per year. Given that the country's REDD+ reference levels estimated a net forest loss of around 12,000 hectares per year, the industrial wood sector vision could tip the country into a net forest gain position, all else being equal (Government of Kenya, 2019) (Figure 21).

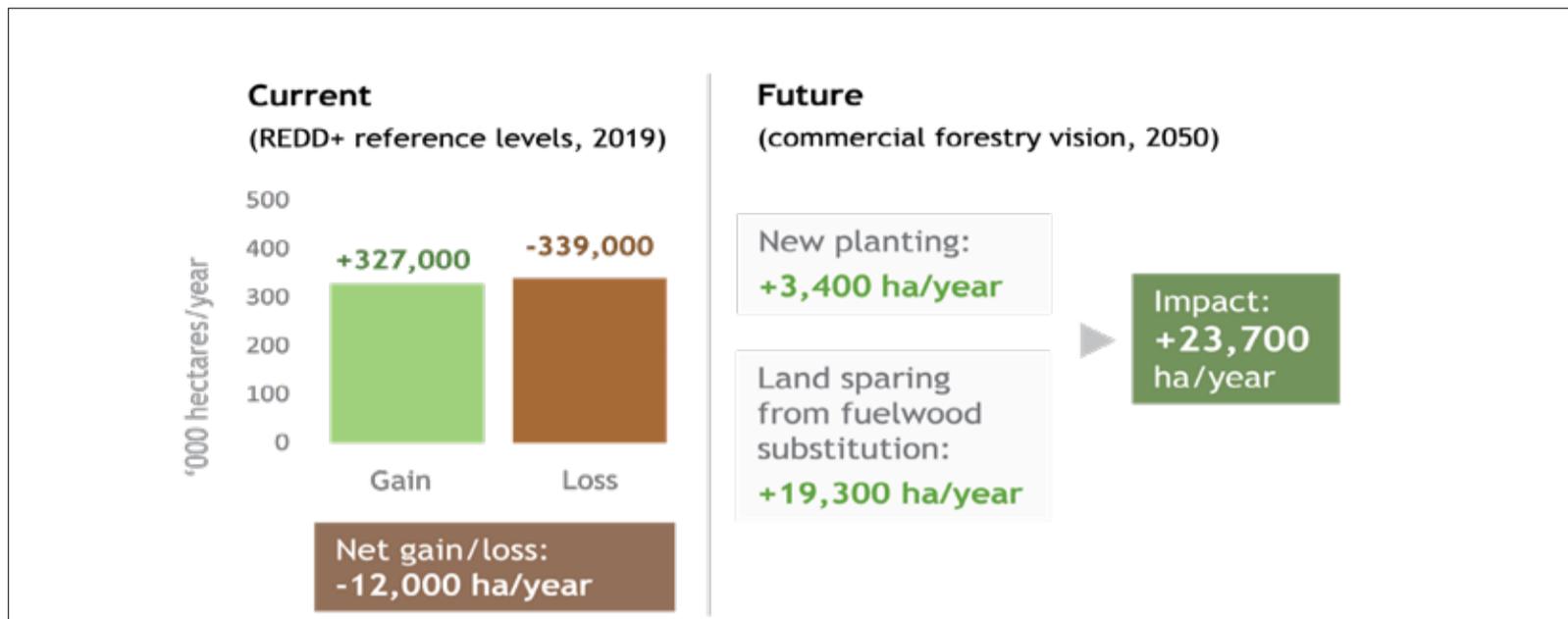


Figure 21: Forest gain and loss

### Tree cover

While farm forestry is not expected to meet the 15% canopy cover threshold to be formally defined as a forest, the area of tree cover from planting on farms could rise from just over 400,000 hectares in 2023 to almost 900,000 hectares by 2050. Combined with the expansion in forest cover noted above, the total commercially planted tree cover could double from 600,000 hectares to 1.2 million hectares (Figure 22).

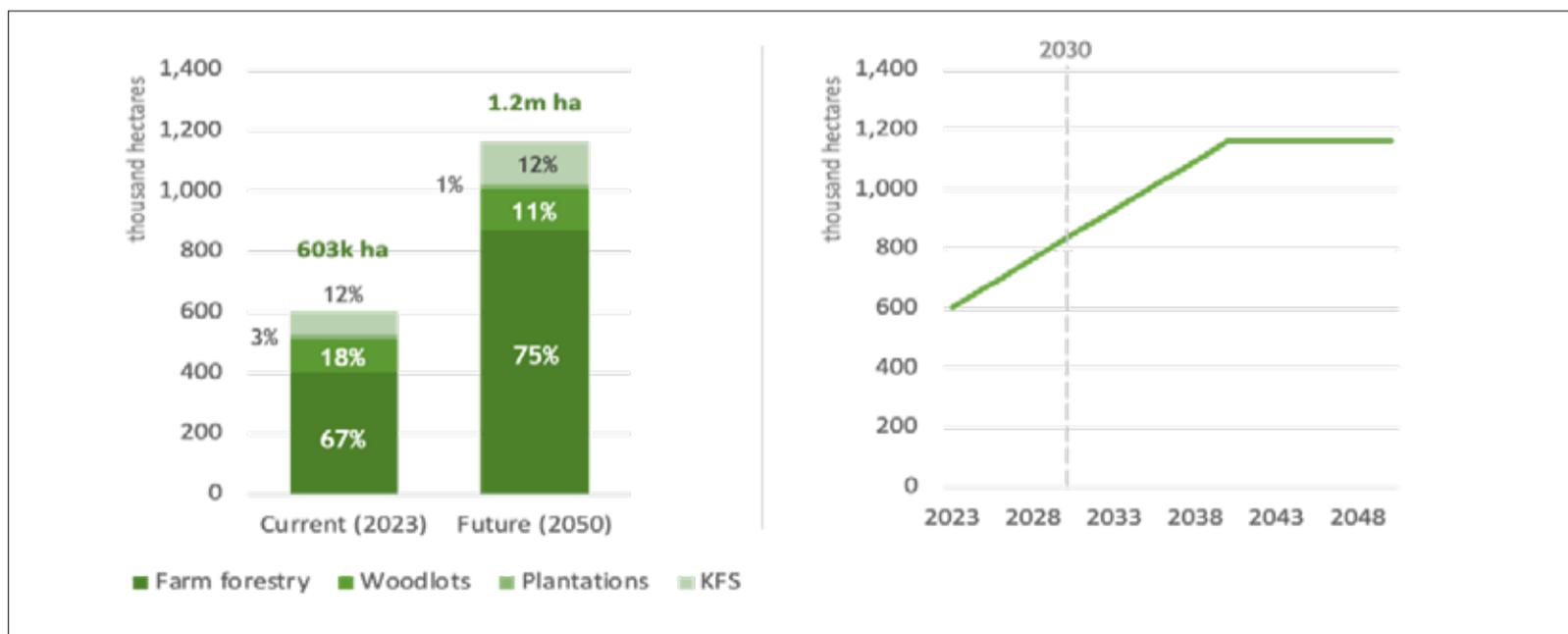


Figure 22: Tree cover

### Carbon

The overall carbon impacts of the vision are summarised in Figure 23. The average carbon stock sequestered in planted trees is projected to increase from 45 Mt CO<sub>2</sub> to 144 Mt CO<sub>2</sub> – for comparison, Kenya's total national emissions in 2015 were 94 Mt CO<sub>2</sub>e, projected to rise to 143 Mt CO<sub>2</sub>e under a business-as-usual scenario by 2030. Avoided emissions through natural forest land sparing effects are expected to peak at 3.4 Mt CO<sub>2</sub>/year via fuelwood substitution (inside Kenya) and 33,000t CO<sub>2</sub>/year via hardwood substitution (outside of Kenya).

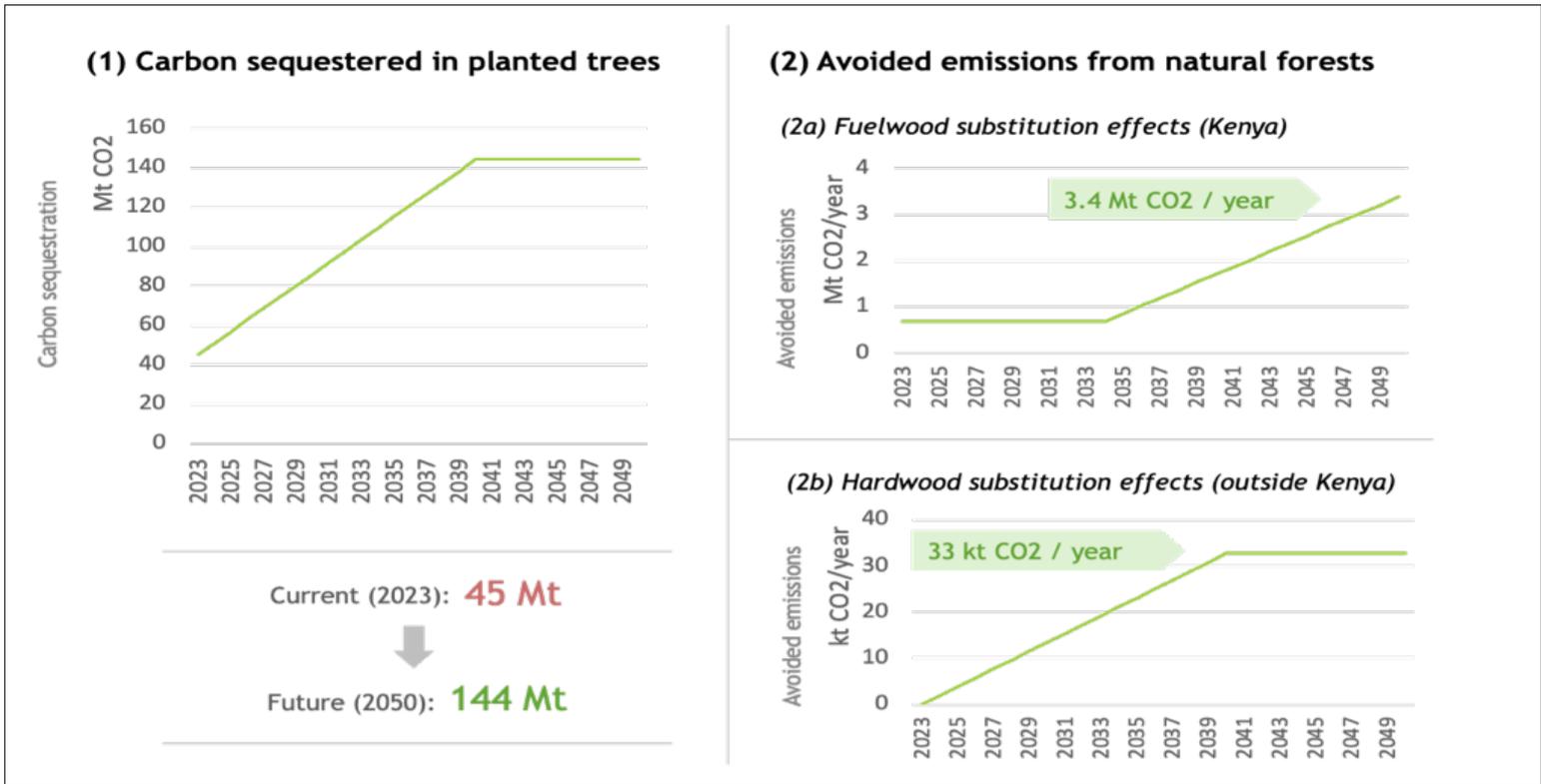


Figure 23: Carbon sequestration and avoided emissions

### 3.2.5 REGIONAL IMPACTS

The regional impacts of the sector vision are summarised in Figure 24, with gains in trees planted for commercial purposes in all the Regional Economic Blocs except for the Frontier Counties, where the effects on climate change in reducing the area suitable for tree planting are expected to be most pronounced. The economic impacts of an upgraded industrial wood sector are expected to be concentrated in the Central, Lake, and North Rift blocs.

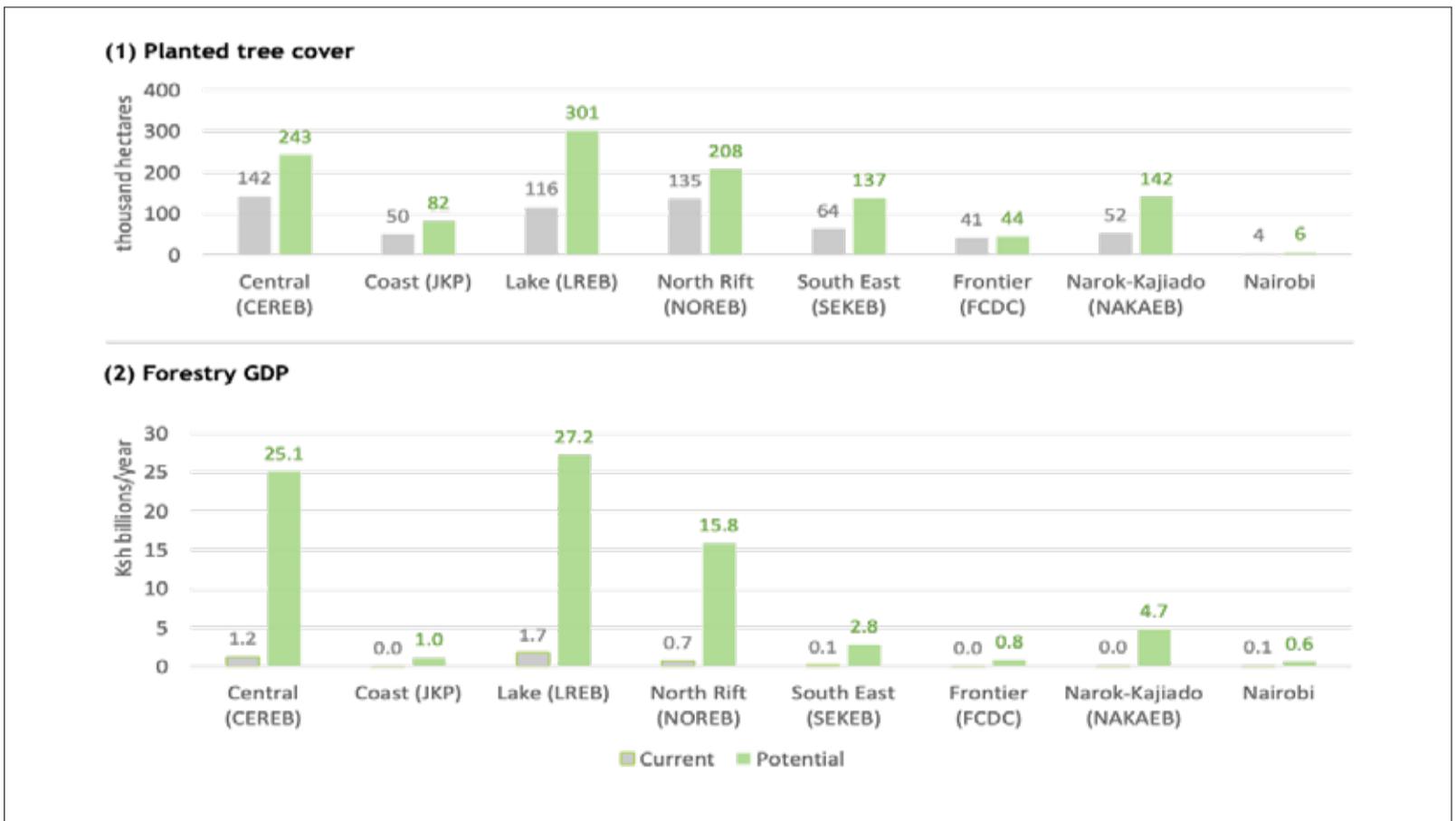


Figure 24: Impact by Regional Economic Bloc

### 3.3 DRIVERS OF SUCCESS

The relative contribution of each factor in the model to the projected change in GDP is summarised<sup>23</sup>. The impact drivers can be broadly split into three priority pillars – improvements to KFS plantations, an enhanced role for small private growers, and increased processing productivity. Each are discussed in turn below.

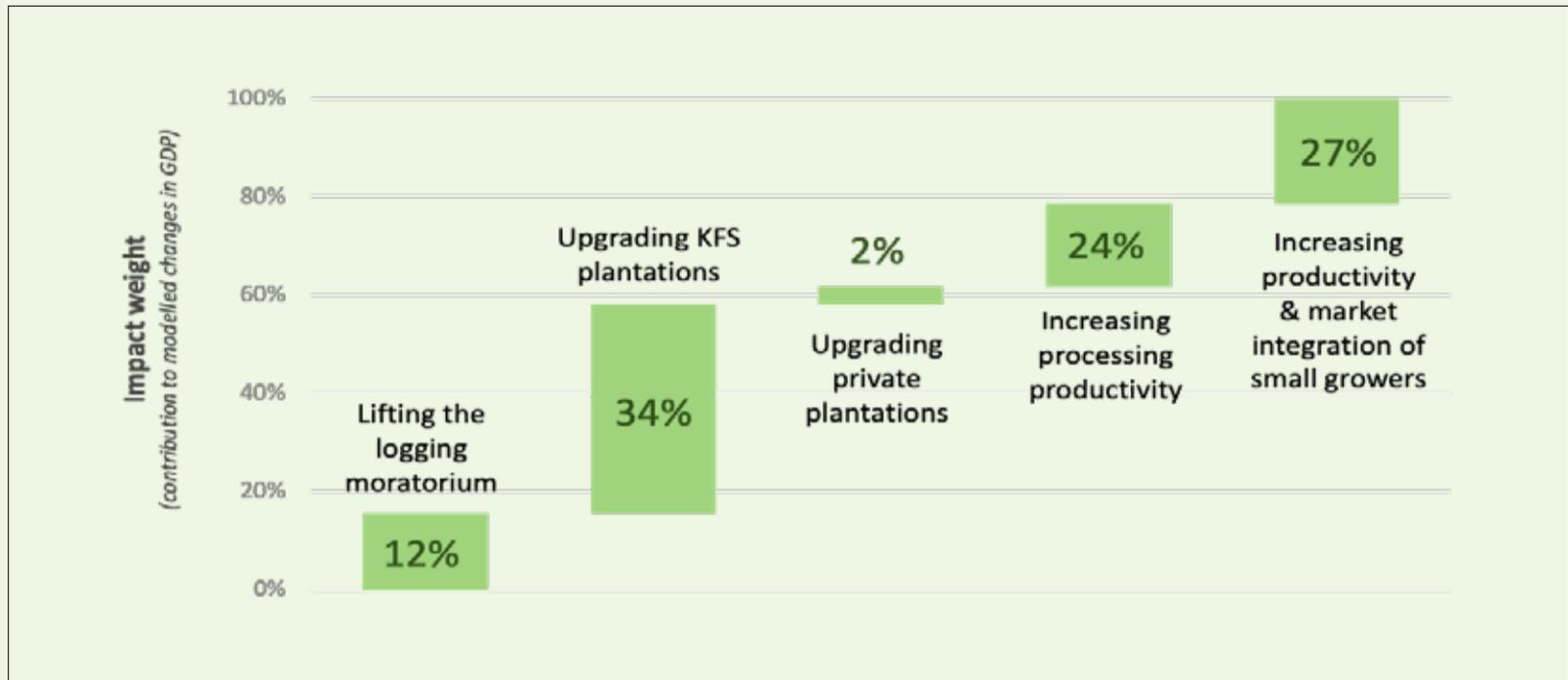


Figure 25: Drivers of success

#### 3.3.1 HIGH PRODUCTIVITY KFS PLANTATIONS

The largest single factor driving the anticipated results is the upgrading of KFS plantations to fully stocked, high-productivity forest:

- Lifting the logging ban:** Ending the logging moratorium and restoring wood supply from KFS plantations would be the clearest 'quick win' for the sector, with few cost implications for KFS, and immediate positive impacts throughout wood value chains. Re-establishing a reliable supply of quality roundwood would serve as a basis for increased investment in wood processing and create incentives for additional private growing in the vicinity. Notably, the above results could be achieved through a partial lifting of the logging moratorium freeing up only resources from gazetted government forests designated as productive plantation forests. Extraction from Government-managed natural forests – the primary concern of environmentalists given their much larger extent and importance for conservation – would not be required to deliver the industrial wood sector impacts modelled here.
- Full stocking of KFS plantation areas:** The current stocked area of KFS plantations is estimated at 75,000 hectares. With full stocking, the area would almost double to around 137,000 hectares, the current area of gazetted forest dedicated to commercial plantation forestry, allowing output to eventually double as well.
- Increasing productivity in KFS plantations:** Current productivity levels are thought to be around half of their potential levels. By applying a range of improved practices (use of improved seedlings, application of fertiliser and herbicide, intensified weeding, pruning, and thinning, and longer rotations), productivity could more than double (see Box 3 on productivity challenges).

The combination of the above could see KFS output rise to almost 2 million m<sup>3</sup>/year, anchoring the sector's resource base, and de-risking wider investment in processing and private growing.

#### 3.3.2 THE ROLE OF SMALL PRIVATE GROWERS

Enhancing the role of small private growers in the model includes the following factors:

- Increased farm forestry area:** Expanding farm forestry to cover 10% of cropland (from the current average of 4%).
- Increased woodlot area:** Expanding woodlots by 20% on cropland currently dedicated to cash crops (so as not to compete with food security concerns).

<sup>23</sup> Impact weights are calculated by applying each scenario setting in isolation to an otherwise status quo configuration of the model. For each case, the projected change in GDP relative to the baseline is recorded. Impact weights are then calculated by dividing the individual factor contribution by the total of all factors. It should be noted that the weights are intended only as broad indicators of relative importance of each factor and should not be used as a basis for the calculation of specific GDP effects of any one factor.

- **Improved small grower productivity:** Use of improved seeds; application of fertiliser; appropriate land preparation, weeding, pruning, thinning and fire management; slightly longer rotations (while still acknowledging the preference for short rotation forestry overall on farms).
- **Farm forestry market integration:** While data is lacking, we currently assume that 10% of farms engaged in farm forestry sell into formal wood value chains. With improved aggregation models, we anticipate the total could rise to 50% of farms. In addition, while we expect small growers to still predominantly use trees for on-farm fuelwood, we expect this percentage to fall from its current level of around three-quarters of volume produced to around 50%, allowing for greater volumes to be converted into higher-value wood products.

Success in this area will require aggregation models to capture dispersed planting in agricultural landscapes, as well as processing models better tailored to roundwood of smaller dimensions and lower quality than large plantation output (Box 4).

*Box 4: Inclusive primary processing models*

While small private growers represent the largest planted area of the industrial wood sector, many are not connected to formal value chains, investing little in forest management, and selling locally into low-quality, low-return informal markets, or keeping wood onsite for household consumption. In order to add value to this vast resource base, and drive greater returns to growers, smallholder-oriented aggregation and processing models are required.

Wood aggregation could take the form of conventional outgrower or contract farming schemes, whereby farmers are connected to integrated forestry companies or standalone processors via formal contractual relationships, with the buyer often providing additional support in the form of inputs, training, or financing.

Alternatively, a 'hub and spoke' model could involve a series of small-scale, relatively low-technology initial processing 'spokes' (e.g., veneer peelers) placed across a landscape, all feeding into a more sophisticated secondary processing 'hub' (e.g., plywood plant). Instead of the contractual arrangement (and associated transaction costs) of an outgrower scheme, a hub and spoke approach strategically locates processing facilities within the landscape, creating market opportunities for farmers without any binding commitments.

Finally, better integrating small growers will likely require the choice of processing technology and end product to be tailored to the nature of smallholder forestry. Even in an improved scenario, we expect small growers to prefer short-rotation forestry, and to produce lower quality roundwood than larger plantations. Production of engineered wood products such as plywood and other wood-based panels may be a better match for farm forestry than traditional sawmilling, which often requires long-rotation, large-diameter timber.

### 3.3.3 INCREASING PROCESSING PRODUCTIVITY

Increasing processing productivity in the model includes the following factors:

- **Improved recovery rates:** Combining improved skills with better machinery to ensure a greater percentage of input biomass is retained in the finished product.
- **Improved efficiency:** Increasing the operational time of processing by reducing stoppages due to machinery, staffing issues, supply, or other logistical barriers. Deploying movable machinery to woodlot areas will reduce loading time. Waste material left on farm for domestic use as fuelwood or charcoal or manure on farms.
- **Increased value addition to eucalyptus:** Transitioning from eucalyptus being primarily grown for low-value fuelwood to high-value timber and engineered wood products, through improved skills and machinery.
- **Timber quality grading:** Formalising grading (and corresponding pricing) of timber by quality and end use (e.g., low-value utility timber, medium-value structural timber, high-value clears).
- **High quality wood-based panels:** Accessing higher-end wood panel markets through improved skills and machinery.

These improvements in the sector will require a combination of a reliable supply base (anchored in KFS assets and complemented with small grower supply) and growing demand for high quality wood products in maturing markets – particularly in the furniture and construction sectors. Adding greater value in-country will in turn make higher farmgate roundwood prices feasible, which can drive quality improvements across the resource base.

In terms of sequencing, while domestic demand for high quality products remains at a relatively nascent stage, opportunities already exist to adopt an import substitution strategy, targeting higher quality wood panels and timber currently being imported from China, as well as far afield as Finland and Canada. There is also an opportunity for Kenya to target export markets while local quality differentiated demand grows (predominantly in the wider East Africa region, as well as the Middle East and Asia). If Kenyan processors can gain a foothold in these markets today, they will be well-placed to capitalise on future market opportunities driven by the country's fast-growing middle class and urbanisation.

*Box 5: Opportunities in the furniture sector*

Between 32,000 m<sup>3</sup> and 50,000 m<sup>3</sup> of unsustainably harvested native hardwoods are imported into Kenya each year, principally for furniture makers, equivalent to almost 300 hectares of deforestation of central African forests every year.

In many countries, eucalyptus competes with mahogany and teak in high-value wood furniture markets, having the same underlying qualities, but with the added benefits of sustainable plantation-based production and more affordable prices for consumers. In Kenya, however, eucalyptus is currently sold as a low value timber because of its tendency to split or warp, resulting from a combination of poor growing and processing practices.

Some firms are already exploring how higher quality processing can change perceptions of eucalyptus. Several furniture SMEs are starting to use Kenyan eucalyptus to produce high quality wood furniture (see prototype table and chairs below). Given the lower cost relative to indigenous hardwoods, eucalyptus furniture offers a great opportunity as a mid-priced, high-quality market segment. However, success will require a reliable supply of high-quality timber which continues to be a challenge.



*Fetchers of South Africa use high-quality eucalyptus in place of teak in their patio furniture. This table retails at KES 71k and the chairs at KES 20k each.*

*Box 6: Opportunities in the construction sector*

Construction accounts for an estimated 50% of industrial wood product demand. However, constrained supply and the associated rising prices has led to increased use of imports and substitutes – predominantly concrete and steel. Increased supply of quality differentiated wood products will allow timber to compete with steel and concrete, thereby offering a more environmentally friendly resource base for Kenya's continued growth.

It will also unlock new building methods. For example, The Burj Zanzibar, being developed by CPS, a Tanzanian property developer, will be the tallest residential building constructed primarily from timber in the world. Burj Zanzibar is built within special economic zone, using timber imported from South Africa and Europe, with associated transport costs amounting to as much as the materials themselves. Kenya has the potential to supply these high value products from within the region at lower cost, unlocking investment in local manufacturing. Similar timber developments are planned in Kenya, including by developers BuildX, and potentially the tower section of the GoDown Arts Centre in Nairobi. Driving scale of manufacturing will also bring down the cost and increase the speed of local construction, supporting Kenya's, and East Africa's, large and growing housing deficit.





# 4. Discussion & recommendations

Building on the key drivers of success identified in the previous section, the following sets out policy recommendations for upgrading of KFS plantations (Section 4.1), which should serve as an anchor for wider sector development through processing investments and smallholder integration (Section 4.1.2). The overall financing requirements for the delivery of this sector vision are discussed in Section 4.3, while a corresponding sector development roadmap sets out the potential sequencing of activities and impacts between now and 2050 in Section 4.4.

## 4.1 POLICY RECOMMENDATIONS

### 4.1.1 PUBLIC-PRIVATE PARTNERSHIPS

Fostering public private partnership in the management of public plantations is key to inspire private sector engagement and investment in the industrial wood sector. Restoring and upgrading supply from KFS plantations should be seen as the primary policy priority going forward, providing an anchor for wider sector development. Upgrading and expanding KFS planted area would require an estimated investment of around Ksh 90 billion, split roughly 50:50 between new planting and upgrading of existing planted areas, likely spread over a 10-year period. While such investment levels may be challenging for KFS through the Exchequer, in the immediate future, the solution lies in attracting private capital via concessioning of public forests/ a public-private partnership (PPP) arrangement, whereby private operators enter a long-term agreement with Government to operate plantations on Government land, under a benefit sharing agreement between the various partners (Government of Kenya, 2016b).

#### Public-private partnership options

Two potential PPP models are outlined in Table 3. Under a lease agreement, a private operator leases land from the Government, has full operational control and ownership of the trees, and pays both the lease and stumpage (a unit price on standing timber for the right to harvest it) to the Government. Alternatively, a joint venture model would see a private enterprise formed with the Government, investor, and local communities for the joint management of growing and potentially processing operations on site.

Table 3: Public-private partnership options

	Lease agreement/Concessions	Joint Venture
Operation	Individuals or firms lease land from Government on long-term basis (typically three rotations, >25yrs). Government owns land, investors own trees and has operational control of plantation.  Government agency provides oversight and enforcement based on quality conditions in lease.	A private enterprise is established (special purpose vehicle) with shareholding from a private investor, Government, and communities. The investor has operational control, while the relevant Government agency provides oversight and enforcement of standards. Communities benefit through shareholding and potential for employment.
Scale	Suitable at all scales.  Good option for smaller, remote, or marginal areas of public plantations.	Suitable for larger areas (>5,000 ha).  Not suitable for smaller areas.
Benefit sharing	Investor pays lease and stumpage to Government.  Specific community benefits can be written into the lease, including a levee for community development fund.	Share of profits based on shareholding.  Community and Government revenues likely to be greatest under joint venture, particularly if it covers processing and production.
Downstream investments	Larger areas (>5,000 ha) can support vertically integrated firms. Smaller areas likely to supply into existing processors.	Private investment includes processing and potentially other downstream value addition.

Variations on either model could potentially work in the Kenyan context, indeed both models could be applied in different contexts in Kenya. Figure 25 provides several examples of their application elsewhere. Whichever model is chosen for a given location; several key principles should be adhered to when designing PPPs.

Governments are motivated by improving living standards through socio-economic development but also want to see returns from their land in the form of direct revenue and indirect fiscal revenues. Exports from value-added products and carbon will strengthen a country's currency position, as will large inflows of investment. Counties and their forest adjacent communities have a lot to gain through well implemented PPPs.

PPP agreements require consideration of local content and consider employment for local communities, or integration of local enterprises as sub-contractors. Governments also need to ensure investors operate to the highest social and environmental standards.

From the investor perspective, operational control over the forestry asset is critical. This gives them confidence that the wood supply will be of sufficient volume and quality to deliver on their business model. Secure tenure and a stable operating environment are also important in justifying large initial investments.

Finally, the design of PPPs should consider to what extent the proposed investment will meet the needs of downstream industry. If industry are provided with a dependable, quality wood supply it will go a long way to justifying their own investment case. Increasing in-country value addition will also further reinforce the Governments objectives.

Table 5: International examples of successful forestry PPPs

South Africa	Ghana	Uganda
<p>South Africa has several different models in place.</p> <p>Merensky Weza is a joint venture between Merensky Timber Limited (private investor), the Government and the local community. The jointly owned Special Purpose Vehicle has a 100 yr lease on 65k ha of community owned land. Merensky has operational control which gives it the confidence to invest US\$40m every twenty years in upgrading the latest processing technologies and US\$10m every ten years on forestry equipment – critical for maintaining competitiveness.</p> <p>As a result of this investment, and its advanced tree breeding programme, Merensky is a global leader in high quality eucalyptus production and processing, servicing a range of local and export markets.</p>	<p>Ghana has two key programmes in place to drive investment in commercial forest areas.</p> <p>The first, called the Modified Taungya System is similar to Kenya's Shamba system of community-led replanting. However, communities are given 40% of the proceeds after harvesting the trees, thus aligning incentives of the communities with successful plantations.</p> <p>However, it is recognised that even this does not deliver commercial quality plantations and does not provide the conditions for investment in value addition. Ghana has introduced PPPs, 50-year leases, for this purpose. To date it has allocated over 100,000 ha to more than 350 investors of different sizes. Miro, one of the larger investors, has invested over US\$100m in production and processing on its 10,000ha plot.</p>	<p>In 2004 Uganda had about 4,000ha of forest plantations, today they have more than 200,000 ha of commercial quality plantations.</p> <p>The initial enabler to this investment was the introduction of PPPs. In Uganda firms of different sizes (25ha to &gt;5,000ha) are offered up to 50 year leases. Fees are based on the attractiveness of different blocks (e.g. distance to market, growing conditions) with competitive tendering.</p> <p>The sector is a mix of large-scale integrated firms who bring technology and routes to market, and smaller scale producers. One challenge currently being faced is around export restrictions, however the Government is engaging in dialogue to resolve this with the aim of maintaining incentives for investment.</p>

#### 4.1.2 ADDITIONAL POLICY RECOMMENDATIONS

In addition to the above, a range of further policy recommendations are set out in Table 4 that are likely to be critical for the delivery of the sector vision.

Table 6: Additional policy recommendations

Topic	Policy instruments	Recommendations
<b>Supply</b>		
<p><b>Improved planting material</b></p> <ul style="list-style-type: none"> <li>Increasing access to high quality <b>planting material</b> for private growers and investors from the best sources globally.</li> <li>Incentivising private sector investments in <b>research and development</b> and <b>marketing</b> of forest tree seeds and seedlings.</li> <li>Position Kenya as a competitive <b>exports</b> source for planting materials in the region.</li> </ul>	<p>The draft Seeds and Plant Varieties (Forest Tree Seeds) Regulations 2021 (Government of Kenya, 2022a)</p>	<ul style="list-style-type: none"> <li>Finalisation and implementation of the draft regulations.</li> </ul>
<p><b>Licensing, permits, leases, and concessions</b></p> <ul style="list-style-type: none"> <li>Streamlined and efficient licensing, permitting, leases, and concessions in support of private forestry.</li> </ul>	<p>Draft Concessions on public forests Regulations (2025).</p> <p>As indicated in Forest Conservation and Management Act 2016, Section 72 (2) (m), "providing the circumstances in which licences, permits, leases, concessions and other agreements may be applied for, granted, varied or cancelled, and the manner in which a person to whom a licence is granted may exercise a right or privilege conferred upon him/her by the licence"</p>	<ul style="list-style-type: none"> <li>Finalize and enact the Draft Regulations.</li> </ul>
<p><b>Logging moratorium</b></p> <ul style="list-style-type: none"> <li>Sustainable forest management of gazetted industrial plantations.</li> <li>Address overmature plantations in the gazetted forest.</li> <li>Restoring supply to local industries to address wood deficit.</li> </ul>	<p>The logging moratorium was lifted by the government through a declaration in July 2023 but was later challenged in court in October 2023 which led to a directive dismissing the lifting.</p> <p>The courts, however, allowed harvesting of 5,000 hectares of mature and over mature forest plantation trees identified by the Multi-Agency Oversight Team.</p>	<ul style="list-style-type: none"> <li>Lifting logging moratorium</li> </ul>
<p><b>Silviculture and plantation management</b></p> <p>Support for high quality silviculture and plantation management, including skills, knowledge, standards, certification, and forest enterprise development.</p>	<p>Ministry of Environment, Climate Change, and Forestry strategic plan (Government of Kenya, 2023), specifically:</p> <ul style="list-style-type: none"> <li>Strategic Objective 12: To strengthen commercial forestry development</li> <li>Strategic Objective 14: To enhance enterprise development for agroforestry and commercial forestry</li> </ul>	<ul style="list-style-type: none"> <li>Develop Guidelines for establishment of commercial forest plantations</li> <li>Develop framework to incentivize investment in forest plantations on public and community lands</li> <li>Restocking of commercial plantations in public forest</li> <li>Institutionalize knowledge sharing in commercial forestry</li> <li>Implement innovative models of plantation establishment and management</li> <li>Undertake development of forest certification schemes</li> </ul>

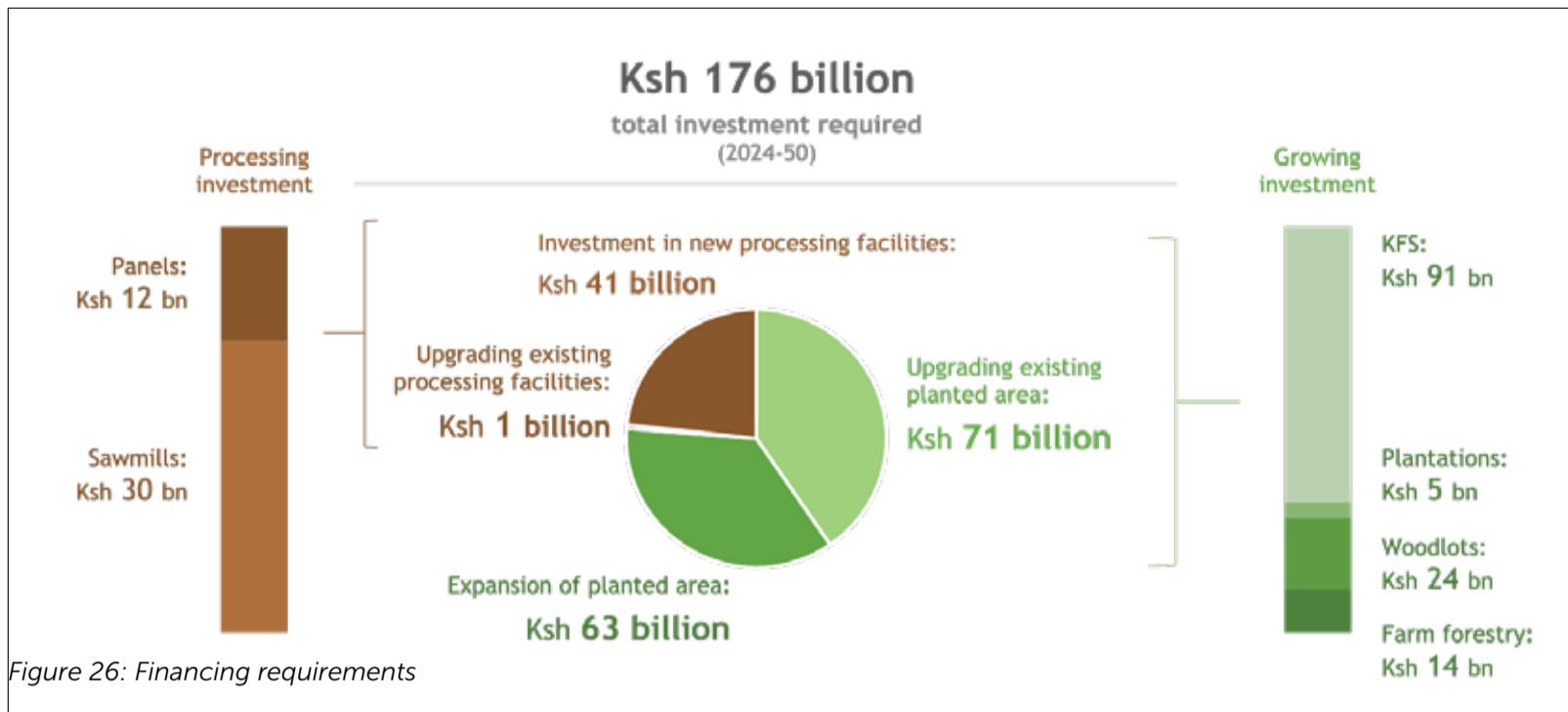
Topic	Policy instruments	Recommendations
<b>Demand</b>		
<p><b>Timber grading</b></p> <p>Re-instal timber grading which was repealed with the enactment of FCMA, 2016</p> <p>As stipulated in FCMA 2016 59. Grading and valuation of timber and other forest products (1) The Cabinet Secretary in consultation with the relevant stakeholders shall prescribe Regulations for the grading and valuation of timber and other forest products.</p> <p>Enable local processing investors to access export market</p>	<p>Draft Forests (Grading and Valuation of Timber and Other Forest Products) Regulations 2025</p>	<ul style="list-style-type: none"> <li>• Conclude and gazette the Draft Regulations</li> </ul>
<p><b>Construction</b></p> <ul style="list-style-type: none"> <li>• Enable and incentivise awareness, adoption, and wide scale of sustainable timber as a building material.</li> <li>• Allow for multi-storey construction using timber.</li> <li>• Recognize innovative engineered wood products (EWPs) such as Cross Laminated Timber (CLT), Glulam, finger-jointed wood.</li> </ul>	<p>National Building Code 2024.</p> <p>Ministerial position declared at COP 28 (2023): "Recognizing that wood from sustainably managed forests provides climate solutions within the construction sector, we commit to, by 2030, advancing policies and approaches that support low carbon construction and increase the use of wood from sustainably managed forests in the built environment. Such policies and approaches will result in reduced GHG emissions and an increase in stored carbon".</p>	<ul style="list-style-type: none"> <li>• Enact and implement the National Building Code 2024</li> </ul>
<p><b>International and regional trade</b></p> <ul style="list-style-type: none"> <li>• Facilitate access to high quality certified timber from neighbouring countries.</li> <li>• Enable processing investors in Kenya to access raw material (kiln-dried and dimension cut timber) to operate at higher capacity and efficiency.</li> </ul>	<p>Regional trade instruments (e.g., COMESA, EAC, AfCTA) and common tariffs; coordination with regional partners.</p>	<ul style="list-style-type: none"> <li>• Apply and review these instruments to ensure that they are working for the timber value chain.</li> </ul>

## 4.2 OTHER RECOMMENDATIONS

The combination of increased investment in KFS plantations and range of supporting policy recommendations outlined above should serve as an anchor for the sector, crowding in investment and technical support from the private sector and development partners with a focus on the two other major pillars of sector identified in this study – wood processing and smallholder market integration. Investment in high-performing, large-scale KFS plantations would send a positive signal to potential wood processors that a reliable source of high-quality sustainable wood supply is on the horizon, incentivizing corresponding investments in upgraded and expanded processing capacity. This in turn should enable the emergence of processing hubs across the country that serve as markets for smallholder farmers to sell into, achieving higher prices than would otherwise have been possible under business models that incorporate all scales of tree growing (Box 4), as well as a range of supporting services such as nurseries, training centres, machinery and equipment providers, and financial services. Private growers and processors across the sector will benefit from the implementation of the policy recommendations outlined in Table 4, facilitating a strong enabling environment that should position Kenya as a regional leader in the industrial wood sector.

### 4.3 FINANCING THE VISION

Achieving the vision set out above is expected to require some Ksh 176 billion in new investment in the sector (Figure 26).



Breaking this down by year, investment in upgrading existing growing (i.e., applying better silvicultural practices) and expanding the planted area would require Ksh 4.2 billion per year between now and 2040. Upgrading existing processing facilities over the same period would require just over Ksh 52 million per year. Investment in new processing facilities is estimated at Ksh 1.6 billion per year between now and 2027, as restored supply from KFS forests creates new investment opportunities. A lower rate of Ksh 500 million per year is estimated for expansion of processing, as smallholders are gradually incorporated into the market. The largest investments in processing would correspond with new and improved wood supply coming online in the mid-2030s, from which point almost Ksh 4 billion per year could be required to meet the vision.



Figure 27: Financing requirements by year

## 4.4 SEQUENCING

An overview of the potential sequencing of Kenya's industrial wood sector development is provided in Figure 28. The clearest 'quick wins' for the sector involve lifting the logging moratorium on KFS forests, and piloting aggregation and processing models that can better incorporate small growers into formal value chain. Building on restored KFS supply by seeking investment for upgraded and expanded planting on KFS land should also be a priority, since reliable, high-quality wood supply from the government forest estate should serve as an anchor for the sector, de-risking wider investment in private growing and processing.

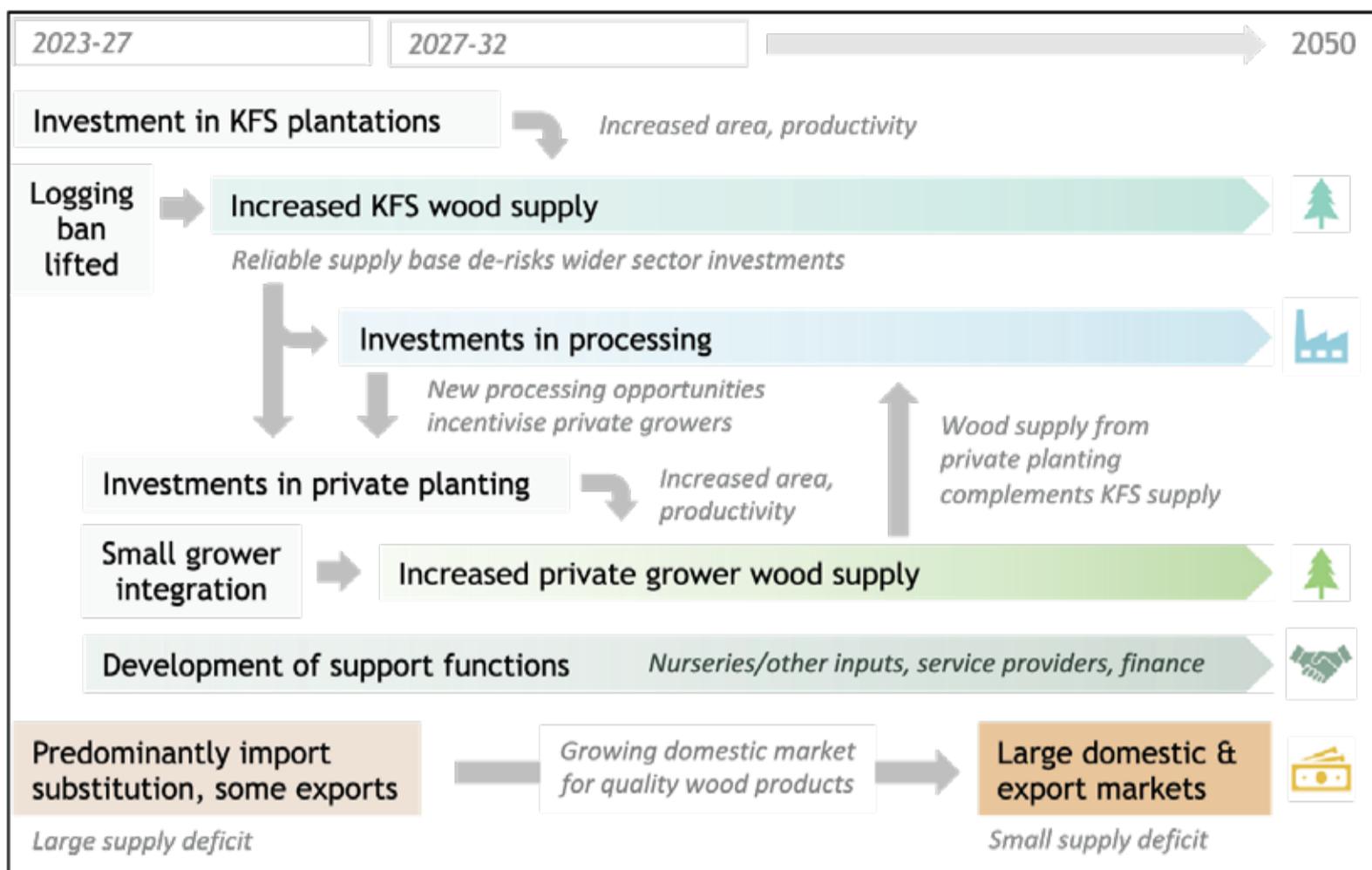


Figure 28: Sector development roadmap

New processing investments centred on KFS supply are likely to incentivise complementary private growing in the vicinity, leading to a virtuous cycle of increased (and improved) supply from both public and private forests and increased value addition through processing – the returns from which can drive higher productivity growing, while also enabling the emergence of an SME-dominated ecosystem of input and other supporting service providers.

On the demand side, opportunities will likely focus initially on import substitution (competing with imported higher-value wood products and substitute materials) and export markets. As Kenya's domestic market grows and matures, however, domestic growers and processors will increasingly supply high-value local markets, substantially closing the supply deficit by 2050.



# 5. Conclusions

After many years of underperformance, the Kenyan Government has recently made a range of commitments to the sustainable growth of the industrial wood sector as part of a wider program of green economic development. This study has demonstrated the wide range of potential socio-economic and environmental benefits of a productive, competitive, inclusive, and environmentally sustainable industrial wood sector.

Delivering this future vision of the sector will require substantial investments in both tree growing and wood processing, anchored in high-performing Government plantations as the foundation of a reliable, high-quality wood resource base. Given the financial hurdle to achieve this, attracting private investment via concessions and other public-private partnerships, successful models used in several other countries, could kick-start Kenya's forestry sector development, while bringing substantial benefits to local communities and other stakeholders.



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