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Adding value to Uganda's wood

Towards a sector-level industrial policy agenda

Centre for Development Alternatives

KONRAD ADENAUER STIFTUNG

IN BRIEF:

- **Economic transformation in Uganda** has stalled and must be revived - the wellbeing of the population and the legitimacy of the leadership depend on it. **Industrial policy** has been at the heart of virtually all economic transformation success stories. It has been most effective when it has identified specific **high-potential industries** (including 'industries without smokestacks' such as high-value-added agriculture and services) and galvanised public and private capabilities and incentives around transforming those industries.
- Uganda's **wood processing industry** has a **strong potential** to drive **inclusive and sustainable economic transformation** and the case for prioritising the sector in the national industrial policy agenda is strong**.** A unique opportunity for sector transformation now exists due to a **projected order-of-magnitude growth in timber harvests** from largely high-quality maturing plantations in the coming decade, a strong **alignment with the Government of Uganda's ambitions** to promote domestic value addition to natural resources, and **large potential domestic, regional, and global markets**. The country's wood processing industry is still nascent, with far from sufficient capacity to leverage this opportunity.
- By **2030**, Uganda could boast a **highly competitive wood processing industry f**eaturing at least five medium-scale, high-tech, value-focused firms producing medium- to high-value timber, carpentry, and joinery products for domestic, regional, and overseas markets, as well as hundreds of smaller-scale sawmills and carpentry and joinery firms; altogether **adding value to more than one million cubic metres of wood annually**.
- The sector could create **new job and income opportunities for upwards of 100,000 households, foreign exchange earnings in the hundreds of millions of USD per year,** and **substantial spillover effects into other value-adding sectors.** If plantations are replanted after harvest, a **steady-state annual woodflow of 1.4+ million cubic metres after 2030** would also have **strong positive environmental impacts** in terms of carbon sequestration, substitution, and storage, forest protection, and various local ecosystem services.
- In order to **overcome binding constraints** and **realise this ambitious vision** to transform the wood processing industry, the **Government of Uganda should embark on five "sector missions",** with up to three key **proposed policy actions** under each mission. These sector missions and policy actions are summarised in Table 1 on the next page.

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Table 1: Sector Missions and Policy Actions at a glance

Sector mission	Proposed policy actions
1. Building a conducive export environment	1A. Ensure swift and effective implementation and enforcement of softwood standards and guidelines for grading timber. 1B. Harmonise the timber export licensing process, enhancing its efficiency, predictability, and transparency, and making it accessible for all timber processors across the country.
2. Stimulating investment and rapid learning-by-doing by pioneer firms	2A. Implement **Conditional Investment Agreements** that provide existing and prospective wood industry investors with state benefits (carrots) on the condition that they meet certain targets and requirements (sticks). 2B. Establish a **Technical Centre (Phase I)** for the wood processing industries. 2C. Establish **Wood Industry Clusters (Phase I).**
3. Stimulating demand	3A. Leverage public procurement to create demand for value-added products made from Ugandan plantation wood. 3B. Engage and support potential regional buyers of Ugandan wood products. 3C. Organise sector-level marketing campaigns.
4. Building an inclusive wood industrial ecosystem	4A. Wood Industry Clusters: Phase II. 4B. Technical Centre: Phase II. 4C. Develop further timber grading standards and guidelines to cover the full range of low-, medium-, and high-value eucalyptus and pine products, including furniture.
5. Maximising the sector's sustainability and resilience	5A. Establish a national tree germplasm improvement and diversification programme, potentially as a public-private partnership. 5B. Establish a refinancing scheme for smaller tree growers to ensure that they can effectively replant trees after harvest. 5C. Study the feasibility and expected impact, on both industrialisation and forest protection, of wood export quotas and export bans for certain wood product categories.

Introduction & Methodology

This policy paper makes the case for prioritising the wood processing industry and constructs a proposed industrial policy agenda to drive the sector's transformation. It draws on global learnings from industrial policy and economic transformation success and failure as well as recent findings from Uganda.

The paper is structured as follows. The first section briefly analyses the current status of Uganda's wood processing industry. The second section constructs a vision for what the industry might look like in 2030 following a successful decade of sector transformation. The third section presents five "sector missions", based on an analysis of binding constraints to realising the sector transformation vision outlined in the previous section, and learning from relevant past success cases. The fourth section proposes a number of policy actions under each of the five sector missions, drawing on the analysis of the sector's current status, the vision for the sector's future, and lessons learnt from other countries' experiences. The final section briefly introduces some considerations for ensuring the successful implementation of the proposed policy agenda.

We employed a five-pronged process for formulating a sector transformation strategy and selecting industrial policy instruments. In doing so, we consulted trade and other data, reviewed academic and grey literature, and carried out 18 key stakeholder interviews.

Table 2: Methodology

Assessing the current status	What does the sector currently look like?
Formulating a vision	What could the sector look like in 10+ years, in terms of firms (number, type, size), products/services (diversification, value-added), markets (domestic, foreign), supporting services, and impact (jobs, incomes, linkages, spillovers, environmental impact)? What are the overall objectives of the sector transformation agenda and what competing/complementary objectives need to be balanced?
Diagnosing the binding constraints and setting "sector missions"	What constraints must be overcome now to make progress towards this vision (binding constraints)? What constraints would likely come up in future, further down the sector's transformation pathway? What must happen in the sector in order to overcome these constraints?
Learning from success stories	What lessons can be drawn from other countries' successes (and failures) in the same sector? How have industrial policies helped overcome the same constraints (in any sector) in other countries (or indeed in Uganda)?
Selecting fit-for-purpose industrial policy actions	Map potential instruments from the industrial toolbox and from case studies onto the binding constraints (one instrument might help lift multiple constraints; one constraint might be affected by multiple instruments) Select fit-for-purpose industrial policy instruments that can effectively help deliver each 'sector mission' and that can be implemented given prevailing capacity and political economy conditions

The current status of the wood processing industry

A policy reform process between 1999 and 2004 - including a forestry sector review, the Uganda Forestry Policy (2001), the National Forest Plan (2002), and the National Forestry and Tree Planting Act (2003) - ushered in a major turn of fortunes in Uganda's previously neglected wood value chain. Among other reforms, in an effort to scale up industrial forestry plantations, the National Forestry Authority's (NFA) Plantation Strategy (2005) allocated 200,000 hectares (ha) of Central Forest Reserve (CFR) land for plantation development. 50,000 ha were to be managed by NFA and 150,000 ha were handed over as commercial forestry concessions to the private sector.

From 2004 to 2019, the Sawlog Production Grant Scheme (SPGS) provided performance-based subsidies to private individuals and firms for the establishment of commercial plantations on over 50,000 ha of both NFA-gazetted and private land. A handful of large private companies established eucalyptus (6 – 12 years maturation) and pine (15 - 25 years) plantations covering several thousand hectares each, bringing international skills, experience, and capital into the sector. A few hundred smaller tree growers have established plantations on 5 ha and above. A number of privately delivered supporting functions have also developed with support from SPGS, including tree nurseries, silviculture, land preparation, forest establishment, and plantation management services. The public sector's commercial forestry research capability has been strengthened. Finally, as the first established plantations began reaching maturity in recent years, a nascent wood value addition industry has emerged, focusing largely on timber for the domestic construction market. FCDO, NIRAS-LTS and CDA (forthcoming) summarise the current state of wood processing as follows:

All three major companies produce poles (largely for power transmission) as well as sawn wood at their in-house sawmills. Smaller plantations currently rely on small-scale saw-miller subcontractors, which the larger companies also use to a limited extent. A handful of processing companies, led by Nile Fibreboards, make plywood and some medium-density fibreboard. Two of the "big three" commercial forestry companies make wood pallets (largely destined for Kenya's horticulture and beverage sectors). The production of other fabrications such as doors, joints, frames, and roofing wood as well as furniture is done mainly by small-scale artisanal carpentry workshops and some specialised small and medium-sized enterprises (SMEs). They use mainly hardwoods, in particular mahogany, mvule and nkalati, but plywood and fibreboard are also used increasingly in combination with veneer or laminate. Two of the "big three" make charcoal and briquettes using wood from their own plantations, and all sawmills sell wood chip to smaller scale charcoal producers. There is currently no production of wood pulp in Uganda, and the few companies making paper and paperboard use only scrap paper as inputs.

Almost all wood harvested from plantations is processed and sold domestically as transmission poles, sawn and engineered wood, and fuel wood (much of which is processed into charcoal). Poles are sold to the Government of Uganda (GoU) and some of its neighbours. Timber is sold mostly to the domestic construction industry, with a minority going to the domestic furniture sector, and minor volumes being exported.

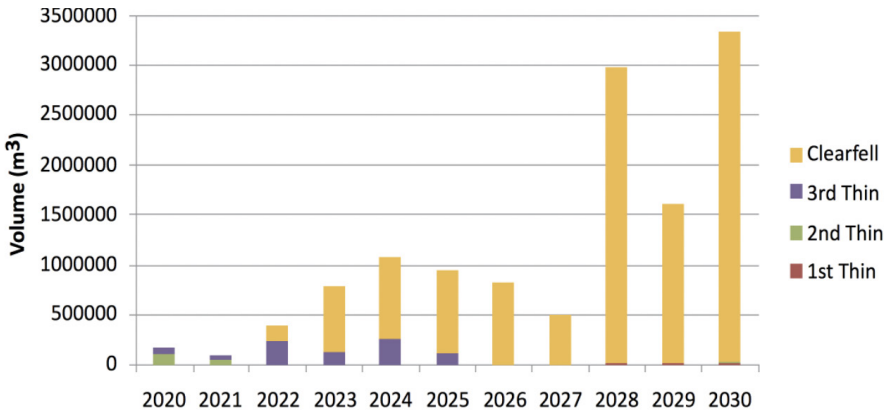
Uganda's wood industry in 2030

This section constructs a high-level "Vision 2030" for Uganda's wood processing sector. The country's roundlog supply from commercial plantations is expected to peak in 2030. After this impending "tsunami of wood", it is hoped that the roundlog supply will settle into a regular annual steady-state. The information input used to construct this vision includes a review of existing raw material projections, sector assessments, stakeholder interviews, and case studies of more developed wood processing sectors in other countries. We posit that, by 2030, Uganda's wood processing industry can transform into a highly competitive and sustainable sector with large economic transformation impact if it takes advantage of the opportunities discussed below.

The incoming "tsunami of wood". Due to the maturing of plantations established in the 2000s, Uganda's timber supply is projected to grow from less than 200,000 cubic metres (m3) of roundlog per year to a steady supply of 1 – 1.5 million m3 after an even higher peak in 2028 – 2030 (SPGS, 2013).

Figure 1: Projected harvest volumes from SPGS approved plantations

Source: SPGS, 2013



Domestic markets. NFA (2016) estimates that the construction and furniture industries are growing at around 10% annually. With an urban population growth rate of around 6% annually (Trading Economics, 2020), Uganda's urban population is projected to almost double between 2020 and 2030. Uganda's National Association of Building and Civil Engineering Contractors (ca. 250 companies) has stated to SPGS that its members would be willing to pay higher prices for quality-differentiated timber, which is not currently available. A very high proportion of Uganda's furniture demand is currently imported. Import duties are in place and GoU has asked ministries, departments and agencies (MDAs) to buy from local producers. There is significant growth potential in home furniture given the emerging middle class.

International markets. On top of satisfying domestic demand, Uganda could tap into a large and growing regional market and potentially niche high-value global timber markets, both of which would fetch significantly higher prices. Uganda has some of the highest-quality plantation timber in the region, thanks to quality germplasm and good silviculture practices. In addition, all large-scale firms in the sector already have certification and a precedent has been set for certifying independent growers under a group scheme. Current exports - worth USD 17.3 million in mostly fibreboards and plywoods to Kenya (AEC, 2020) - are negligible compared to the market potential. Regional demand for high-value wood products is nascent but growing. For instance, this study identified two construction firms in Kenya and Tanzania respectively that have near-term plans to build using cross-laminated timber (CLT), one of the highest-value-per-weight construction wood products, whose production is absent in East Africa and almost absent on the entire continent (to our knowledge, only one firm – XLAM in South Africa – currently produces CLT in Africa). Some observers have recently suggested that Uganda could identify niches in the European market and sell high-grade pine and eucalyptus timber at very high margins if sufficient volumes and quality could be achieved. FCDO, NIRAS-LTS and CDA (forthcoming) note, "with a higher-value, larger-scale market pull, companies would have the revenue streams to re-invest in further efficiency gains in processing operations, which would in turn open further diversification opportunities".

Box 1: International market access for Ugandan wood products

Uganda has duty-free and quota-free access to the following markets:

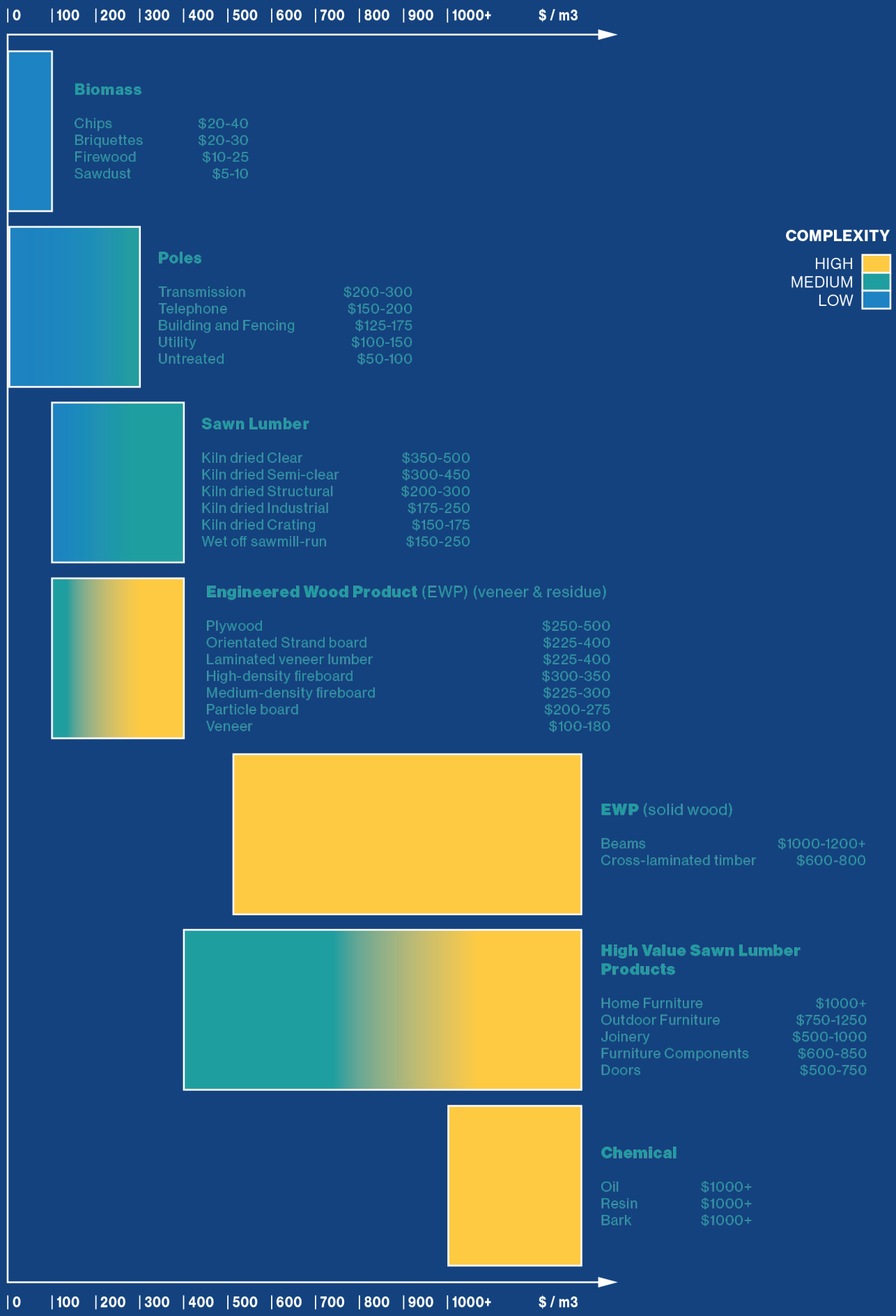
- **The East African Community (EAC): Burundi, Kenya, Rwanda, South Sudan, Tanzania**
  - The Common Market Protocol is a reciprocal free trade agreement trade area, i.e. Uganda's exports are duty- and tariff-free, and Uganda exempts other Member States' imports from duties and tariffs as well
- **The Common Market for Eastern and Southern Africa (COMESA): Burundi, Comoros, Democratic Republic of the Congo, Djibouti, Egypt, Eritrea, Eswatini, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Somalia, Sudan, Tunisia, Zambia, Zimbabwe**
- The **African Continental Free Trade Area (AfCFTA): Africa**
  Still in the early stages of implementation, AfCFTA Member States have committed to removing 90% of tariff lines for intra-continental trade, meaning Ugandan wood products could eventually have tariff-free access to the entire continent
- The **Cotonou Agreement: European Union**
  Uganda is currently granted non-reciprocal free access to European Union (EU) markets as a Least Developed Country (LDC) under the **Everything-But-Arms** treaty, however, when it graduates to middle-income, it will lose the non-reciprocal element; in other words, it will still have duty- and quota- free access to the EU, but the EU will also have duty- and quota- free access to Uganda's market. The Cotonou Agreement is in the process of being replaced by a new Partnership Agreement (not likely before 2022)
- The **African Growth and Opportunity Act (AGOA): United States**
  Eligibility is not always guaranteed as countries' AGOA privileges can be removed for political reasons. Almost all wood products relevant to Uganda's export basket are duty-free under AGOA, but some are not covered by the Act and thus attract tariff and/or non-tariff import duties in the United States

In addition, under the **Generalised System of Preferences (GSP)** Uganda has duty-free and quota-free access to the following markets as long as it is classified as an LDC, but will lose this status when it reaches middle-income status: **Australia, Belarus, Canada, the European Union, Iceland, Japan, Kazakhstan, New Zealand, Norway, Russia, Switzerland, Turkey**

Diversification. Higher-quality wood products that Uganda could build a regional or even global competitive advantage in include sawn timber, fibreboards, oriented strand board (OSB), chipboards, CLT, various industrial wood fabrications such as doors, frames, and joints, and furniture parts as well as finished furniture. A ready market seems to exist in neighbouring countries, especially Kenya, for several of these products. For example, small informal furniture makers in Kampala are already making bookcases and similar products for customers in Nairobi, Juba, and Kigali. Further, the supply of hardwoods such as mvule, mugavu, and mahogany - commonly used in Uganda's furniture industry but also sometimes for construction - is dwindling, largely due to overexploitation without replanting, and in part due to tighter regulations. This was already evident in 2012 (Kizito, S. et al., 2012) and is reiterated in recent interviews with furniture manufacturers. With natural forest hardwood prices rising sharply and supply becoming increasingly unpredictable, the wood industries will rely ever more on plantation wood - overwhelmingly consisting of eucalyptus and pine.[1]

1 Paper and paperboard was also explored but all experts and stakeholders consulted agreed that the volume of wood available in Uganda is too limited, and the regional unmet demand too small and unpredictable to make virgin paper and paperboard production in Uganda viable.

Figure 2: Wood product groups by value-per-m3 & production complexity



VISION 2030

By 2030, if these opportunities are effectively leveraged, Uganda's wood processing industry could look as follows:

- **A steady-state annual woodflow @ 1.4+ million m3** from **100,000+ ha of plantation** under management, with current plantations replanted after the coming harvests.
- A large majority of **logs processed domestically,** creating jobs, industrial capabilities, tax revenue, and export earnings.
- A robust **domestic and regional market for medium- to high-value wood products** coming especially from the construction and furniture sectors.
- A farm-gate (or off-stump) log price that translates into **sufficiently strong internal rates of return (IRR) and net present values (NPV)** to **incentivize** large & small timber **growers** to **replant** existing forest stands after harvest.
- 5+ first-mover firms pioneering value-recovery sawmills and producing timber, carpentry, and joinery products from Uganda's plantation woods:
  - Producing medium-value-added products (e.g. high-quality lumber, finger-jointing, high-grade plywood, kiln-dried timber, furniture, flooring, joints etc.) and later high-value-added products (e.g. mouldings, beams, CLT, high-value furniture, etc.) from sustainable forest plantation harvests.
  - Kiln-drying timber to 8-12% with optimised sawmilling processes.
  - Serving regional markets and breaking into international medium- and high-value wood product markets.
  - Providing direct employment and generating economic spillovers to SMEs in the supply chain and beyond through employee churn (knowledge and skills transfer), steady demand for raw materials and components, demand for services, introduction of higher product standards, tax revenues, foreign exchange earnings, and so on.
  - Making capital expenditure (CAPEX) investments of USD 2M+
- **100 - 300 SME sawmills[2] and 50+ carpentry and joinery SMEs:**
  - Applying affordable technology.
  - Producing low-medium value wood products (e.g. some of the above-listed as well as treated poles, medium-quality lumber, wood chip, etc.) from sustainable plantation timber.
  - Located in tree-growing areas around the country and thus providing local employment, linkages, and spillover effects.
  - Serving domestic and regional construction, public sector, corporate, and household markets.
  - Making CAPEX investments of mostly USD 20,000 - USD 200,000, but up to USD 1M.

Sawmill aerial view | Credit: halbergman

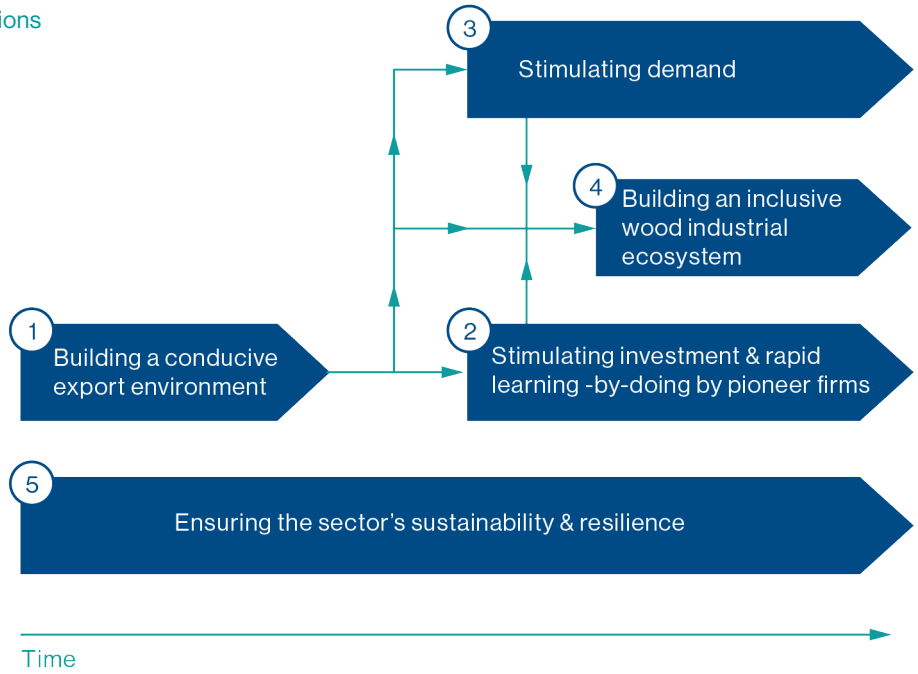
2 In Vietnam there are an estimated 1,500 SME-run sawmills processing 4 - 4.5 million m3 of log inputs annually. That means each SME sawmill processes 2,500 – 3,000 m3 annually. If Uganda produces 1.4 million m3 each year and half of this (700,000) is processed by SME sawmills (and the other half by a handful of large mills), that means there will be space for roughly 200 – 300 SME sawmills in Uganda from 2030 onwards. If only a quarter of total log inputs is processed by SME mills, that implies about 100 – 150 mills in total.

Sector missions

This section lays out a number of "missions" that the sector must complete on its journey towards the "Vision 2030" laid out above. These missions, if successfully completed, will overcome the binding constraints the sector and its actors will face along the transformation journey. The findings are based on a literature review and qualitative interviews with selected sector stakeholders.

Figure 3: Sector missions

Source: Authors



Strategically sequencing sector missions

The **first mission** is to **ensure certain fundamentals are in place**, the most important being the **ability to export** medium- to high-value timber products.

The **second mission** is to **stimulate first-mover investment and rapid learning-by-doing by a small set of pioneer firms** which will kickstart the sector's journey towards higher value addition and international competitiveness. This should be done in a manner that also maximises the positive externalities that pioneer firms often have – these externalities are what cause pioneer firms to catalyse a broader industrial ecosystem. Typically, emerging sectors require a small number of larger "National Champion" pioneer firms that leverage international finance and capabilities to introduce internationally competitive equipment, production processes, expertise, and linkages, thus pushing the sector ahead. These pioneer firms have significant positive externalities on other firms (Amsden, 2001; UNCTAD, 2016; Grossman, 1990) - they act as anchor clients by subcontracting certain types of work and buying raw materials and component parts, they train and expose workers and mid-level managers who often eventually move on to launch their own firms in the same sector, they build the country's brand internationally, they signal to other firms what activities are, and are not, economically viable, they act as innovation and knowledge hubs in the sector, they provide policymakers with important feedback on how to further develop the sector, and so on. Through these externalities, large pioneer firms have often provided the spark for the growth of entire entrepreneurial ecosystems, as with Hewlett-Packard and other major firms which formed a central catalyst force in Silicon Valley (Kushida, 2016). In essence, this approach focuses scarce resources on the most impactful leverage points in the system, only employing less powerful levers later, for problems not already addressed by the systemic impact of the earlier, larger levers.

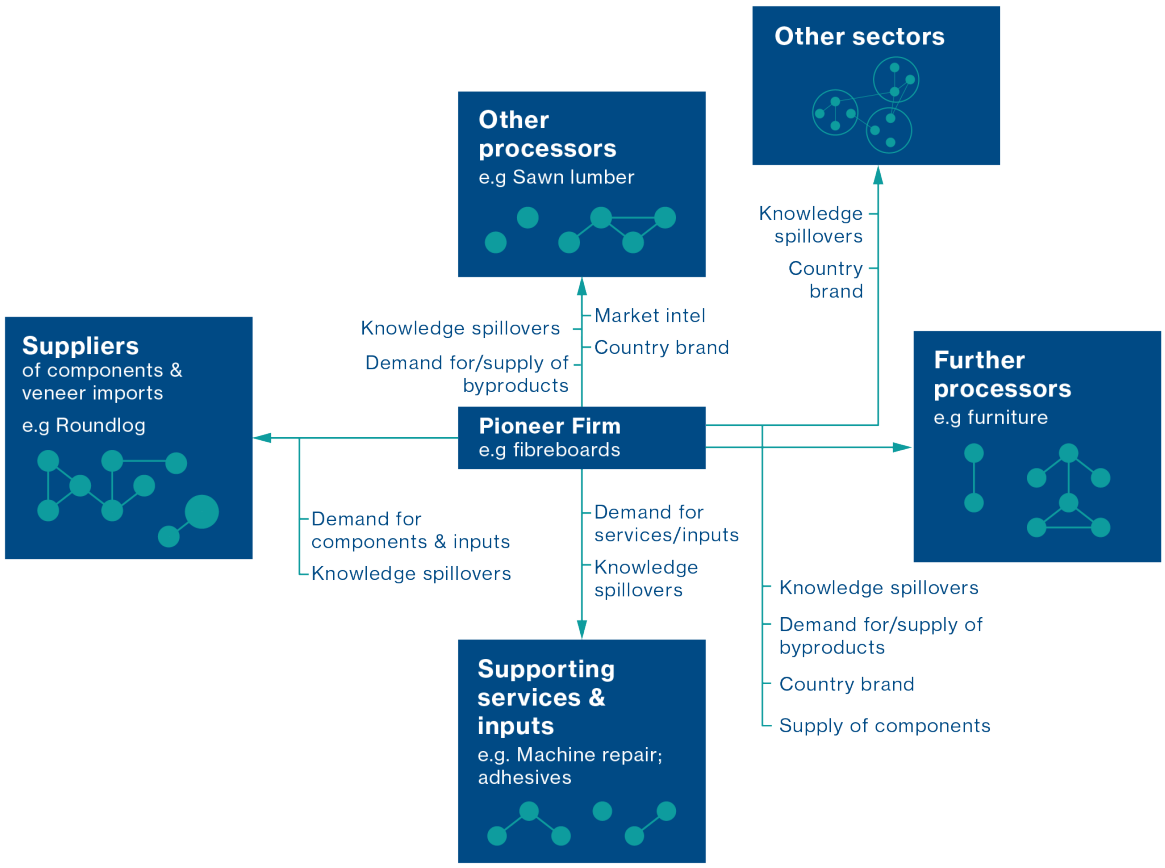
The **third mission** must be pursued in unison with the second: both the supply and **demand for gradually higher-value-added wood-based products need to be stimulated in unison**. Established demand for medium- to high-value wood products is a crucial requisite for the attraction of investment and for the viability of industrial ventures in the sector. Potential demand-centres for

higher-value wood products in the region include building materials such as CLT, OSB, glu-lam beams, and other engineered wood products, which can replace carbon-intensive building materials like concrete and steel to a large extent. As the price of sand in the region rises due to dwindling availability, and affordable production using local wood resources grows, these construction materials may increasingly make not just environmental sense but also commercial sense. Further, fast-growing eucalyptus and pine species can be used to manufacture medium-value furniture. However, on the Ugandan market these types of wood are perceived as low-value, largely due to their currently predominant use for low-value products like utility poles, woodchip, and pallets.

The **fourth mission** is to directly **support the growth of an inclusive industrial ecosystem** that fosters and integrates (i) additional large investors (who are not first-movers like the pioneers discussed above), (ii) SMEs supplying raw materials (such as roundlog) and component parts (such as sawn timber and woodchip), (iii) SMEs using wood products for further value addition (such as furniture workshops), and (iv) SMEs providing ancillary services (such as haulage and machine repair) and non-core inputs (such as adhesives) to firms in the wood value chain. Figure 4 illustrates the various spillover effects pioneer firms can have on several other types of firms in the wood industries ecosystem and beyond.

Figure 4: The catalytic role of pioneer firms

Source: Authors



The **fifth sector mission** should be addressed throughout these stages, with work beginning immediately: **ensuring the sector's sustainability and resilience.** This includes ensuring that there will be a continuous "steady state" and environmentally sustainable supply of raw material, that this raw material supply is resilient to potential shocks such as diseases, and that production processes throughout the value chain maximise the positive environmental impacts of the sector and minimise potential negative environmental impacts.

Sector mission 1: Building a conducive export environment

In order to maximise their transformative potential on Uganda's economy, the wood-based industries must become internationally competitive and must export gradually higher-value-added products. Large demand for medium- and high-value wood products such as industrial grade timber, fibreboards, and furniture components appears to exist in neighbouring countries, especially Kenya, and beyond. But at present a complicated and opaque process for obtaining an export license (involving Ministry of Water and Environment (MWE), Ministry of Trade, Industry and Cooperatives (MTIC), and Uganda National Bureau of Statistics (UNBS)) is disincentivising investment in upgrading in the wood value chain while suppressing domestic timber prices. As a result, wood processors are capturing a fraction of the potential value of Uganda's forest stock. Further, the ability of the leading companies to raise investment capital is limited if they cannot tap into lucrative export markets. FAO (2020)[3] concludes that "without reforms to the current market situation in the country, where local timber prices are traded at 25 percent lower than those in Kenya, plantation owners are unlikely to replant pine once existing trees are harvested". Sawmill investments also have a negative IRR/NPV over 10 years unless the export environment is reformed. The major companies in the sector have lobbied for reform, including directly with the President and some discussions have reportedly taken place at MWE to streamline export licensing. Reforming the export licensing process requires two actions. First, robust timber grading standards are needed because the export of unprocessed timber is currently banned and the obtention of an export license requires timber to be graded. Without clear and robust grading standards the export licensing process cannot be efficient, streamlined, and transparent. Second, the process for obtaining a timber export license needs to be reformed to include fewer administrative steps and actors as well as clearer and more transparent rules and procedures. Both of these steps are crucial for investor confidence.

This sector mission should be prioritised because until a robust and streamlined export licensing process is in place and enforced, efforts to build pioneer firm capabilities (and particularly raise private investment capital) are likely to be futile. Investors are unlikely to provide additional capital to the sector's leading firms unless a very strong business case is made. Even if a new company was set up to specialise in wood processing, it would struggle to attract significant private capital without being able to demonstrate high expected returns - we have seen above that the IRR and NPV of wood processing are pushed down by a lack of quality differentiation on the domestic market as well as suppressed domestic prices and limited accessible demand due to a difficult export environment.

Sector mission 2: Stimulating first-mover investment and rapid learning-by-doing by pioneer firms

Stimulating first-mover investment. Unlocking investment in value-oriented wood processing is the first key lever for building strong pioneer firms in the sector. If the investors' visions are generally aligned with our "Vision 2030", they are likely to ensure that additional capital is invested in upgrading investee firms' machinery, technical leadership and management, marketing capabilities, and frontline worker skills. As such, attracting the right kind of investors to bring new capital into the wood processing sector should be an early priority for GoU. Expert interviews conducted for this paper suggest that a minimum-scale pioneer firm manufacturing quality wood products would need CAPEX investments worth at least USD 3 million. This might be moderately reduced for some of the leading companies that already possess some of the required equipment. A strong investment case will need to be made, proving access to sufficient raw material and export markets while demonstrating high-quality business plans, technical teams, and management teams. The government's Forest Investment Plan has indicated an allocation of USD 2.3 million for investment in forest-based industry. With some crowding in from private investors, this may be sufficient to finance one major new plant.

3 FAO (2020): "The sawmill considered in this analysis is small to medium in size. It is capable of processing 55 m3 of wood per day. At a recovery rate of 40 percent, this mill would produce 22 m3 of timber per day and 33 m3 of by-products (chips, sawdust and shavings). Assuming that it operates for 300 days per year at full capacity, the mill is able to convert 16 500 m3 of wood per year, which amounts to roughly 66 ha of mature pine forest per year. The total capital expenditure required for a mill of this size is USD 560 000. Given the high cost, it is assumed that a loan is required for 50 percent of the capital costs, with a repayment period of five years and an interest rate of 16 percent. Mill delivery price for wood is assumed to be 130 000 UGX per m3, which is comprised of 80 000 UGX for stumpage fee and 50 000 UGX for transport costs per m3. Labour, maintenance, and land lease costs are built into the model, which assumes a 10-year investment period. As shown by the orange bar in Figure 5, under the current market situation for timber in Uganda, an investment in sawmilling would generate a negative NPV over a 10-year period. As result, without changes in the current export policy for timber, investments in sawmilling are unprofitable and unlikely to be made. However… a marginal improvement in timber prices (5 percent and 10 percent above current prices) turns the NPV for sawmill investment positive. Given that timber prices in Nairobi are currently 25 percent above those in Uganda, reducing restrictions on timber exports would likely lift timber prices sufficiently to make investment in sawmills profitable."

Stimulating rapid learning-by-doing. There is a steep learning curve involved in entering the production of new, higher-value products or services, and pushing productivity to globally competitive levels (Chang, 2007). Because local production realities (e.g. the characteristics of the roundlog available), people dynamics (e.g. team and work cultures), and regional market dynamics (e.g. consumer tastes in furniture) are highly location-dependent, there is no detailed global blueprint for becoming a globally competitive firm in any industry, including the wood industry. As such, reaching international competitiveness necessarily entails a process of product experimentation, iterative improvement of production processes, continuous optimisation, team upskilling, market testing, and so on. This learning and accumulation of knowledge takes time, comes with failures along the way, and typically does not happen automatically (or at least not quickly): hence the need for industrial policy to stimulate it by providing incentives and a conducive environment (Andreoni & Chang, 2019; Cramer & Meisel, 2016). In Uganda's wood industries, learning-by-doing is especially needed in the following areas:

- **Upgrading machinery and production processes.** In order to become internationally competitive in the manufacture of medium to high-value-added products, Uganda's major wood processing firms will need to move from off-the-shelf production lines to optimised equipment for the specific logs being processed and products being manufactured. This would significantly reduce product imperfections as well as wear and tear while allowing product specialisation. Modern drying kilns, finger-jointing lines, and planing and crossing technology are also needed in order to access premium export markets. Further, the vast majority of wood processing machinery currently in use in timber, carpentry, and joinery is old, with conversion rates well below potential (EU, 2014; Dinh & Monga, 2013). This means a high proportion of input is wasted or goes into lower-value chip, fibreboard, or fuelwood instead of being sold as much higher-value sawn timber.
- **Fostering technical & managerial leadership.** Among the leading existing wood processing firms, significant investment in human resources is needed - in key positions such as Processing Operations Directors and Mill Technicians - to ensure appropriate skills and experience are in place to design and manage complex production processes.
- **Developing frontline worker skills in efficient and quality-oriented production.** The introduction of new machinery and a re-orientation towards higher-value-added products, including for high-standard export markets, will require new frontline worker skills.
- **Building international marketing capabilities.** The sector's companies currently focus mostly on domestic markets, with little human capacity investment to seek out, understand, and target international market opportunities. To do this, they will need to invest in high-calibre entrepreneurial marketing teams with an awareness of international, niche, and premium markets. As noted by FCDO, NIRAS-LTS and CDA (forthcoming), "identifying, realising, and maintaining routes to high value markets will require a global outlook and marketing departments at the front and centre of the business, with market demand determining the specifications to which the rest of the operation must gear itself".

The right kind of foreign or domestic investment can help overcome several firm-level constraints. Beyond the simple injection of capital, investment from firms with extensive global market experience in the sector - which will mostly be foreign investment as such firms do not exist in Uganda - can also introduce modern production and management processes, the transfer of state-of-the-art technologies and skills, and global market insights and relationships.

Joint ventures between foreign firms and domestic firms have been a particularly powerful vehicle for the development of domestic productive capabilities in successfully industrialising countries. Foreign firms often inject much-needed capital, technologies, managerial and technical know-how, and market linkages. Beyond tangible technology assets, they have what Amsden (2001) calls "knowledge-based assets"[4] at the global cutting-edge, which are proprietary in nature and not easily, nor voluntarily, transferred to new firms. As such, making local co-ownership a requirement, or making it a precondition for receiving state benefits, has been a powerful tool for inducing the transfer of knowledge-based assets.

4 Amsden (2001) defines a knowledge-based asset as follows: "A ''knowledge-based asset'' is a set of skills that allows its owner to produce and distribute a product at or above prevailing market prices (or below market costs). The requisite skills are both managerial and technological in nature. They are science-based or artisan and are embodied in an individual or firm, depending on the scale of the physical plant and the complexity of the production process. Three generic technological capabilities that nurture knowledge-based assets may be distinguished: production capabilities (the skills necessary to transform inputs into outputs); project execution capabilities (the skills necessary to expand capacity); and innovation capabilities (the skills necessary to design entirely new products and processes)".

Box 2: Foreign capital's roles in Uruguay's wood industries and Bangladesh's garments industry

Snoeck et al (2009) found that "the entry of foreign capital pushed [**Uruguay's** wood processing] sector forward and gave credibility to its growth process. There were spillovers because foreign firms defined the technological process in planting and this process was imitated by local firms. They also established links with local firms that became their suppliers of wood, inputs, and services."

The **Uruguayan** case also illustrates how export experience breeds market intelligence. In 1988, **Otegui**, a local firm mainly dedicated to wood commercialization and general trading, discovered the possibility to export Uruguayan eucalyptus roundwood to Finland for pulp production. Because of its trading activities Otegui was used to receiving orders from a range of origins and sectors. In these orders the firm "detected a permanent and steady demand for pulpwood in Finland" (Snoeck et al., 2009). A similar dynamic is already at play in Uganda with regards to the domestic market, for example with furniture importers who recently started producing locally in reaction to higher tariffs on imported furniture. However, diversified international and global traders of higher-value wood products – like Otegui - who have access to international market intelligence, are sorely missing in Uganda's wood value chain.

The story of **Desh Garments**, a **Bangladeshi** pioneer firm, sheds light on the power of joint ventures, conditional investment agreements, and the positive externalities of pioneer firms (Balchin & Calabrese, 2019): "In 1979, when there were virtually no garment exporters in the country, the Bangladeshi government brokered a joint venture between the Bangladeshi Desh Garments and the Korean conglomerate Daewoo." A major part of Daewoo's investment rationale was the fact that Bangladesh, as an LDC, had duty-free access to US garments markets while Korea had recently lost this privilege (Khan, 2019). Daewoo had well-established market relationships, which Bangladesh clearly did not have. It also had production and management skills at the global frontier. Attracted by a generous 8% royalty on the joint venture's eventual sales (representing a much higher return than was typical for the industry), "Daewoo invested in the organisational learning process by hosting around 130 Bangladeshi managers who were seconded to its factory in Busan for several months. When the seconded managers returned to Bangladesh, they applied Korean managerial practices and organisational principles to ensure that Desh exports grew at close to 100% per year." The positive externalities of the joint venture became clear when, "within a few years, 115 of the 130 managers had set up their own garment factories, some supplying Desh and others competing with Desh. The value of the large human capital investment undertaken by Daewoo was clearly not exclusively captured by Daewoo-Desh, but rather by the entire emerging Bangladeshi garments sector."

Box 3: Evidence on furniture manufacturing in selected African and East Asian countries

Having a sustainable domestic supply of affordable high-quality treated timber will be a major advantage for Uganda's furniture sector. A study comparing the competitiveness of furniture manufacturing in China and Vietnam against several African countries found that the high price of wood was a major disadvantage in the African countries (Dinh & Monga, 2013). According to the study (Dinh & Monga, 2013), "large furniture manufacturers in Tanzania import[ed] fully treated (kilned) timber from Cameroon, the Democratic Republic of Congo, Gabon, Mozambique, and Zambia. Long delays in Dar es Salaam Port greatly increase trade costs… The price of wood products is higher in most African countries than in China because the former have not developed sustainable plantations of rapidly growing tree species (such as pine, acacia, bamboo, and eucalyptus)." As wood is a low value-to-weight product, trade costs are a large proportion of wooden furniture production costs.

Production inefficiencies mean that most African furniture manufacturers are far behind East Asia in terms of competitiveness. The cost of producing a chair in China and Vietnam is $13 and $17 whereas it is $30 in Tanzania and Zambia and $40 in Ethiopia (Dinh & Monga, 2013). While nominal wages in Tanzania's wooden chair industry are less than 50% of those in China, Tanzania's labour productivity is only about 10% of China's: "Chinese workers produce 4.5 wooden chairs a day, compared with 0.5 in Tanzania, 0.4 in Zambia, and 0.3 in Ethiopia" (World Bank, 2013). Low labour productivity is an outcome of production inefficiencies arising from (Dinh & Monga, 2013):

- Low quality and old age of equipment (average age 20-65 years in Tanzania versus 3-7 years in China)
- Poor management and production processes (e.g. material waste rate up to 30% in Tanzania versus 10% in China; greater use of expensive consumables such as glues and varnish)
- Low frontline worker skills and high worker absenteeism (10-20% in Tanzania)
- Absence of economies of scale (Chinese furniture manufacturers are operating at scales 20 times greater than those in Tanzania, Ethiopia and Zambia)
- Low capacity utilisation (Tanzanian furniture manufacturers were operating at 50% capacity on average and Uganda's sawmills are similarly under-capacity). However, Uganda's impending "tsunami of wood" will change this. Still, it serves as a reminder that the focus should not be on growing processing capacity per se, but instead on growing actual processing volumes and the level of value addition within that processing.

These factors combine into a compelling argument for the promotion of one or more pioneer firms in the sector. Such pioneer firms would (i) invest in fit-for-purpose machinery, (ii) hire a mix of international and local industry-leading expertise to put in place effective management and production processes, with a focus on rapid skills transfer to Ugandan managers, (iii) invest in training, retaining, and motivating frontline workers, (iv) and invest in larger-scale operations than the rest of the domestic industry in order to attain economies of scale.

Sector mission 3: Stimulating demand

In a regional market where these products are largely absent – they are not being locally produced or imported at scale - demand and supply need to develop in tandem. First movers may begin supplying these products when a critical mass of firms (who will start by importing the products) begin enquiring about local availability. As the market value of higher-value wood products, for instance in construction and furniture, is demonstrated by early movers, other construction firms, furniture retailers, property developers, and so on will begin to design using these products. Similarly, as the business viability of domestic production is demonstrated by pioneering producers, others may crowd-in. In this way, demand and supply for higher-value wood products can grow in tandem in the East African region.

Sector mission 4: Growing an inclusive wood industrial ecosystem

Once a small set of relatively large pioneering firms have become well-established and are serving initial domestic and regional demand for higher-value-added wood products, their positive externalities will provide the spark for the emergence of a broader industrial ecosystem in the sector. The growth and inclusivity of this ecosystem should then be fostered by industrial policy. This should take several forms including:

- **Expanding industry standards** so that higher quality is rewarded with higher prices and firms are induced to innovate and upgrade. The softwood grading standards published in December 2020 by Uganda National Bureau of Standards (UNBS) do not cover either eucalyptus wood (considered a hardwood) or the wide range of engineered wood as well as carpentry and joinery products that Uganda's wood processing industry can target. Variable quality is likely to harm the sector's ability to attract large buyers both domestically and internationally. It also leads to public procurement departments rejecting locally made wood products despite having been instructed to prioritise domestic suppliers where possible.
- **Facilitating SME access to investment finance.** The typical SME sawmill or carpentry workshop requires USD 10,000 – 100,000 in CAPEX and most SMEs fail to access affordable finance with appropriate loan tenures for capital investments.
- **Expanding technical support** to SMEs, including new startups, throughout the ecosystem (all those depicted in Figure 4).
- **Enhancing woodflow predictability** to strengthen investor confidence, production planning, third-party aggregation, and sawmill machinery purchase decisions (as machineries are premised on a certain size and type of log).
- **Supporting the development of third-party aggregation business models.** Third-party aggregation is difficult to render logistically and commercially viable. In South Africa, for instance, log harvest and haulage costs account for half of the cost of logs to processing plants. Supply chain integration, with efficient, sustainable, and transparent timber sourcing from third-party suppliers requires not only cost-effective timber aggregation business models (within off-taker firms or via specialist aggregators), but also, at the industry level, efficient processes to prove chain of custody as required by certification and payment mechanisms, as well as transparent pricing systems benchmarked on quality of raw material.

Modern cutting line in sawmill | Credit: Josef Mohyla

Wooden planks on a furniture backwash | Credit: Sviatlana Lazarenka

Sector mission 5: Maximising the sector's sustainability and resilience

A sustainable commercial forestry and wood industries sector can have profoundly positive environmental impacts. It can produce a "triple emissions benefit" through carbon sequestration (by forests accumulating carbon in soil and soil organic matter), substitution of high-emissions materials (e.g. through lumber composites replacing cement and/or steel in construction), and carbon storage (again via carbon stored in durable wood products from construction timber to furniture). Plantation timber can also offer a more sustainable alternative to natural forest resources as well as providing numerous ecosystem services. The benefits of avoided deforestation are globally recognised and substantial climate change related financing, including carbon credits, can be accessed to fund sustainable forestry schemes.

One key risk to the sector's sustainability is that smaller growers may not set aside the capital needed to effectively replant trees after harvest. If trees are not replanted after harvest, the abovementioned environmental benefits will remain largely unrealised. What is needed, instead, is a "steady-state" of continuously replanted plantation forests.

Some policymakers fear that if Uganda's forest plantations are used almost entirely for exported wood products, unmet domestic demand for timber and firewood will cause growing pressure on the country's natural hardwood forests, leading to environmental damage. This fear is relevant insofar as firewood or timber from Ugandan plantation wood is initially more available, accessible, or affordable than from other sources. At the moment, most firewood is sourced from natural forests at much lower costs (often free) than firewood from plantations. Firewood from plantations may become competitive as natural forest supplies dwindle, due to depletion and/or protection. Some waste from sawmills and other wood processing plants can be turned into woodfuel. But forcing the timber industry to produce low-value woodfuel in place of much higher-value products would seriously suppress the sector's transformational potential and reduce replanting incentives. A better strategy for plugging the foreseeable supply gap in household cooking energy (by far the largest consumer of woodfuel) would be to switch to alternative fuels such as liquid natural gas, electricity, and biogas and briquettes from agricultural waste. Beyond woodfuel, plantations do serve the domestic markets for poles (for utilities and construction) and sawn timber (for construction). A strong focus on exports may raise domestic prices for poles and sawn timber and, as a result, increase pressure on natural forests, making it harder to protect the latter.

Another risk area in Uganda's commercial forestry sector is the lack of improved and diversified tree germplasm used in the country. Calabrese (2021) finds that the commercial forestry sector, while currently thriving, is highly vulnerable to potential future pests and diseases owing to a "lack of appropriate research and development (R&D) to replenish and diversify the genetic pool of clonal material or improved seed". The narrow gene pool of eucalyptus species planted in Uganda and lack of improved seed mean that a single pest could have a devastating effect on Uganda's eucalyptus plantations (ibid). In Uganda, research has been focused on enhancing the performance of existing varieties, not on generating new ones. But international best practice suggests that some of the clonal varieties in use should be replaced by new ones each year. A eucalyptus breeding programme is thus needed to diversify and renew the genetic material used in plantation forestry, optimise species for the intended final product, and ensure the best species are used given each site's soil, climate, and other characteristics.

A forest plantation in Uganda | Credit: Jack Steege

Toward an industrial policy agenda

This section discusses recommended policy tools to tackle each of the identified sector missions in turn:

Table 3: Sector missions and policy actions at a glance

Source: Authors

Sector mission	Proposed policy actions
1. Building a conducive export environment	1A. Ensure swift and effective implementation and enforcement of softwood standards and guidelines for grading timber. 1B. Harmonise the timber export licensing process, enhancing its efficiency, predictability, and transparency, and making it accessible for all timber processors across the country.
2. Stimulating investment and rapid learning-by-doing by pioneer firms	2A. Implement **Conditional Investment Agreements** that provide existing and prospective wood industry investors with state benefits (carrots) on the condition that they meet certain targets and requirements (sticks). 2B. Establish a **Technical Centre (Phase I)** for the wood processing industries. 2C. Establish **Wood Industry Clusters (Phase I).**
3. Stimulating demand	3A. Leverage public procurement to create demand for value-added products made from Ugandan plantation wood. 3B. Engage and support potential regional buyers of Ugandan wood products. 3C. Organise sector-level marketing campaigns.
4. Building an inclusive wood industrial ecosystem	4A. Wood Industry Clusters: Phase II. 4B. Technical Centre: Phase II. 4C. Develop further timber grading standards and guidelines to cover the full range of low-, medium-, and high-value eucalyptus and pine products, including furniture.
5. Maximising the sector's sustainability and resilience	5A. Establish a national tree germplasm improvement and diversification programme, potentially as a public-private partnership. 5B. Establish a refinancing scheme for smaller tree growers to ensure that they can effectively replant trees after harvest. 5C. Study the feasibility and expected impact, on both industrialisation and forest protection, of wood export quotas and export bans for certain wood product categories.

Sector mission 1: Building a conducive export environment

1A. Ensure swift and effective implementation and enforcement of softwood standards and guidelines for grading timber.

FAO (2020) recommend, as a priority, to "quickly finalize standards and guidelines for grading timber", and that "three key points should be kept in mind when developing the standards: a) they should be consistent with regional and global market standards; b) they can be met by local producers and processors, and; c) they do not require expensive equipment and extensive training to assess, thus allowing the standards to be verified in multiple locations of the country." In December 2020 UNBS approved the first set of softwood timber grading standards. The next step is to implement the standards quickly and effectively. Because standards are needed to make the export licensing process work efficiently and transparently, and because it will enable higher-quality products to fetch higher prices, this will give existing and prospective wood industry investors the confidence to invest in processing capabilities, and existing and prospective buyers the confidence in sourcing quality-differentiated products at appropriately higher prices.

1B. Harmonise the timber export licensing process, enhancing its efficiency, predictability, and transparency, and making it accessible for all timber processors across the country.

FAO's (2020) other priority recommendation was to "harmonize the export permit process" to allow exporters to acquire all necessary approvals in a single location. If feasible, the export licensing process should also be decentralised to allow processors and producers outside of Kampala to easily acquire export permits. Finally, Uganda Timber Growing Association and existing wood processors should be actively engaged to foster a better understanding of regional and global markets and export licenses.

Sector mission 2: Stimulating first-mover investment and rapid learning-by-doing by a small set of pioneer firms

2A. Implement Conditional Investment Agreements that provide existing and prospective wood industry investors with state benefits (carrots) on the condition that they meet certain targets and criteria (sticks).

Conditional investment agreements can stimulate the right kind of foreign and domestic investment while also supporting and pushing pioneer firms to build new productive capabilities. Conditional investment agreements provide investors with a range of state benefits on the condition that they meet certain targets or requirements. In essence, this means that the government makes deals with investors that encompass a mix of **carrots** and **sticks**. **Carrots** attract investors to enter the market. They can include access to land and industrial parks, tax incentives, grants, concessional public financing, access to government contracts, expedited import and export processing, and so on. **Sticks**, on the other hand, ensure that these investors contribute significantly toward the overall sector vision. They can include export targets, production targets, local sourcing requirements, local training and hiring requirements, and so on. It is through these control mechanisms that GoU can ensure that new investment capital injected into the sector also tackles other firm capability and ecosystem development constraints. Both the carrots and sticks included in an agreement can and should address one or more of the sector constraints identified. The content of each conditional investment agreement can be negotiated on a case-by-case basis in accordance with each firm's and investor's capabilities and incentives, but some proposed guidance for this deal-making is described below.

Carrots

Concessional finance. Pioneering wood processing firms could be provided with Uganda Development Bank loans and/or Uganda Development Corporation equity capital at below-market rates and with a patient approach that incentivises and enables the learning-by-doing process central to building new productive capabilities. Genuine and long-term investment would also signal to private capital markets that GoU takes the wood processing sector seriously.

Firm-level R&D support. R&D can be promoted as a public good - through publicly funded research institutes - or supported at the firm-level. With the size of Uganda's wood processing sector limited by a modest raw material availability for global standards, it may make more sense to support firm-level R&D rather than making heavy investments in public R&D efforts. Public subsidies or tax breaks for R&D can help private firms solve the specific technical hurdles they face at different points in the sector transformation journey, from developing efficient construction timber production processes that meet export standards, to designing furniture that meets the aesthetic and functional preferences of domestic consumers.

Compensation for staff training. There are already some grants available to firms through the Private Sector Foundation Uganda (PSFU) to cover staff training costs. These could be expanded and adjusted to provide special support to a priority sector such as wood processing. When a firm invests in staff training, it runs the risk that trained staff members are 'poached' by a competitor, such that the first firm bears the full cost of training but reaps very little of the benefit. But this diffusion of human capital into the rest of the sector is highly beneficial for sector transformation. Compensating firms – especially pioneer firms – for staff training means that this positive externality does not disappear (see the **Desh Garments** example).

Preferential treatment in export processing. This would include efforts to decrease the cost, delays, and staff time involved in exporting goods, for instance by reducing port tariffs, expediting applications, or simplifying processes for qualifying firms in the wood industry.

Pre-qualification for GoU public procurement tenders, with preferential treatment for locally manufactured wood products.

Free long-term lease of conveniently located land with good transport, utilities, and other public service links. This entails Uganda Investment Authority (UIA) working with prospective wood processing investors to identify suitable locations and ensure quick and secure access to land. One or more industrial parks, or zones within those parks, could be dedicated exclusively to wood processing industries to create firm clusters (see 2C and 4A below).

Tax incentives and duty exemptions through free zones. GoU is already setting up free zones both in industrial parks and for individual firms, with duty exemptions on imports of inputs and corporate income and other tax exemptions. However, firms locating in free zones are currently required to export 80% of what is produced in the free zone. In a nascent sector like Uganda's wood industry, firms need time and practice to build international competitiveness, so it is not feasible to expect them to immediately export the vast majority of their output. A gradually escalating export requirement starting at a low base (potentially as low as 0% of output) would be more appropriate for inducing the gradual development of productive capabilities and export competitiveness. This could be done by either changing free zone requirements or by setting up a separate tool to provide similar incentives to wood processors. Further, free zone status should be granted specifically to targeted wood processing activities of partner firms – not those firms' other activities (unless these fall into other high-priority economic sectors targeted by GoU industrial policy).

Export promotion. Uganda Export Promotion Board (UEPB) could undertake a country branding campaign showcasing Uganda's high-quality plantation timber resources and its emerging wood products. It could also support wood industry leaders to attend international trade fairs.

Sticks

Business plan approval. Firms wishing to receive the abovementioned benefits can be required to first have a GoU-approved business plan that demonstrates the firm's ability and intention to create significant decent jobs/incomes, off-take significant amounts of plantation timber, transfer jobs to Ugandans, transfer technology and skills, produce and export significant volumes of medium- to high-value wood products, and adopt high environmental standards. This ensures that investors are coming into the sector with the intention to build genuine, long-term, and local productive capabilities. Crucially, **the kind of generous state support described above should be reserved for pioneer firms only!** This means that the recipient firm must be a genuine first-mover in the sector. A "follower" who intends to do broadly similar things as established firms should **not** receive the same support – this would be a waste of precious state resources.

Targets. Firms receiving the abovementioned benefits should be required to meet annually reviewed, revised, and agreed targets for:

- Production of medium- to high-value goods
- Export of medium- to high-value goods
- Decent jobs created
- Local staff training and jobs transfer
- Local sourcing of plantation timber
- Environmental standards

An International Growth Centre policy paper for Uganda argues that time-bound subsidies can also help drive firm capability upgrading, but only if the "time path really is binding", as "lower productivity firms that receive the subsidies have little incentive to upgrade if they believe the government will not follow through on its commitment to repeal the subsidies at a particular time" (Shepherd, 2016).

Box 4: Carrots and sticks for Uruguay's wood industries

Source: Barrios et al, 2009; Snoeck et al., 2009; Mendell et al., 2007

Carrots:

- **Single-enterprise free zones.** International pioneer firms in **Uruguay**'s wood processing sector made extensive use of single-enterprise free zones. In 2004, the government granted free zone status to two firms - Metsä-Botnia (Finland) and ENCE (Spain) – with free zone benefits applying specifically to their wood industries operations, the production of inputs, energy production, and port operations. Qualifying firms were exempted from paying the Global Import Tariff and VAT (for 15 years) on imports of inputs (e.g. fertilizer for forest plantations; glue for wood processing plants) and capital goods (e.g. wood processing machinery). Outbound goods were exempt from all taxes (there are no export levies on wood products in Uganda)
- **Favourable credit conditions** were given to wood processing firms
- **R&D support.** Uruguay has used three institutions successfully: Universidad de la República's School of Agronomy, National Agriculture Research Institute (Instituto Nacional de Investigación Agropecuaria), Technological Laboratory of Uruguay (Laboratorio Tecnológica del Uruguay). At the firm-level, Uruguay granted tax exemptions for the acquisition of research equipment by forestry companies
- **Staff training compensation.** Favourable tax treatment was given to firm spending on personnel education
- **Export support.** Wood exports were granted a one-third reduction in port tariffs

Sticks:

Business plan approval requirement. In 2007, Presidential Decree 455/07 introduced "new criteria for investment evaluation and selection" whereby "projects would be evaluated according to investors' commitment to objectives to be achieved and not based only on a proposed investment project and the history of the investor(s)" (Barrios et al, 2009). A "Matrix of Indicators" establishes "a specific link between incentives and achievement of objectives (Barrios et al, 2009). The selected indicators below are designed to ensure that FDI maximises the creation of decent jobs and incomes, local linkages, export competitiveness (and foreign exchange earnings), sustainability, and local innovation (Barrios et al, 2009):

- Full-time equivalent (FTE) jobs created
- Collective (labour) agreement approved by government
- Change in participation of local salaries and inputs in sales
- New exports relative to no-project scenario
- 'Clean investment' as % of total investment
- R&D as % of total investment OR # of R&D jobs created

Box 5: Sticks in East Asia

Such targets conditioning investment agreements have been extensively used by **East Asia**'s developmental states (Wade, 2018; Lee, 2017; Studwell, 2013; Amsden, 2001). Because "firms that can make money at home in a protected environment are always reluctant to compete globally" (Studwell, 2013), the most successful industrialisers have typically made protection and support conditional upon meeting gradually escalating export targets. In Japan, the size of effective tax breaks extended to firms was determined by their exports; in Korea, firms' export performance determined their access to concessional bank credit and to other forms of support (Amsden, 1989; Studwell, 2013).

Hauge (2019) recounts an example of Taiwan's use of a package of incentives and requirements to attract FDI and ensure that it serves the country's industrialisation goals:

"A good example of the balancing act that Taiwan mastered between welcoming foreign investors and bargaining with them is the polyethylene plant built in the early 1960s by the National Distiller and Chemical Corporation (a US based firm). To attract the company, the Taiwanese government offered a five-year tax holiday, restrictions on imports of polyethylene for three years from start-up, guaranteed supplies of ethylene (an input that goes into making polyethylene) and unlimited repatriation of profits. The Taiwanese government, in return, required that National Distiller should export any surpluses over domestic needs, not establish production facilities in downstream sectors and transfer 50% of shares to Chinese nationals after five years, to make it a 50–50 joint venture."

2B. Establish a Technical Centre (Phase I) for the wood processing industries

A critical requisite for the successful establishment and growth of pioneer firms is access to world-class technical expertise so that the "knowledge assets" (Amsden, 2001) that make or break these firms' international competitiveness can be built. The largest multinational firms in the wood industries can often mobilise world-leading technical expertise via full-time, in-house staff. However, simply by virtue of total expected accessible woodflow levels, Uganda's leading wood processing firms are very unlikely to ever reach this scale. Instead, they will be medium-sized in global comparison. As such, it will not be commercially viable - nor necessary - for these firms to bring world-leading expertise in many technical areas onto the company's full-time payroll. However, if they do not access this kind of expertise, Uganda's pioneer firms are unlikely to reach international competitiveness in higher-value wood products. They should thus make use of short-term technical inputs from world-leading specialists in a range of areas outlined briefly below. But identifying and mobilising the right short-term specialists is time-consuming, difficult, costly, and unpredictable in a context in which such experts are not regularly operating as there is not yet a critical mass of firms demanding their services.

A **Technical Centre** can step in to help overcome this challenge by mobilising specialists to provide on-demand technical support to pioneer firms in the sector. During Phase I of the Technical Centre, it should run a **Flexible Facility** that mobilises short-term inputs from international experts for highly-specialised firm needs. The Technical Centre could sell these services[5] to target firms at a subsidised rate or provide them free-of-charge.

5 An illustrative, non-exhaustive list of technical areas in which specialist support is: investment preparation and execution; harvest and haulage operations; technology (especially machinery) identification, sourcing, installation, operation, and maintenance; FSC and PEFC certification; factory design and setup; production process design and plant optimisation; product design; inputs sourcing strategy and warehouse management; management and frontline worker training; and market linkages and marketing strategy.

Box 6: Manufacturing Extension Programmes

The **United States'** Manufacturing Extension Partnership (MEP) program is a national network of centres that provide SME manufacturers with "custom services… to improve production processes, upgrade technological capabilities, and facilitate product innovation", on topics including "innovation and growth strategies, cybersecurity, commercialization, lean production, process improvements, workforce training, supply chain optimization, and exporting" (Congressional Research Service, 2019). Similarly, SME manufacturing extension programmes in many **Latin America and the Caribbean** (LAC) countries include services such as (Andes et al., 2013):

- Providing audits of firms' **lean manufacturing** & innovation processes and skills
- Providing business advisers who work hands-on with SMEs to improve manufacturing & process techniques
- Promoting technology/knowledge diffusion from universities
- Performing R&D in direct partnership with SMEs
- Providing access to research labs and prototyping facilities
- Providing direct R&D grants
- Funding joint pre-competitive research programmes
- Teaching innovation & new product development skills
- Providing export assistance and training
- Promoting energy-efficient manufacturing skills
- Provide technical assistance with standards
- Acting as a broker to other support services
- Hosting **best practice** events

The annual budgets of these programmes in the surveyed LAC countries range from below 0.005% (El Salvador) to above 0.08% (Brazil) of GDP and typically focus on one or a few priority industrial sectors (Andes et al., 2013). A budget of 0.05% of GDP, or USD 17.5 million, would put Uganda in third place[1], behind Mexico and ahead of Argentina.

1 Note this hypothetical ranking is for illustrative purposes, based on 2013 data for surveyed LAC countries, and refers to the manufacturing extension services budget as a % of GDP.

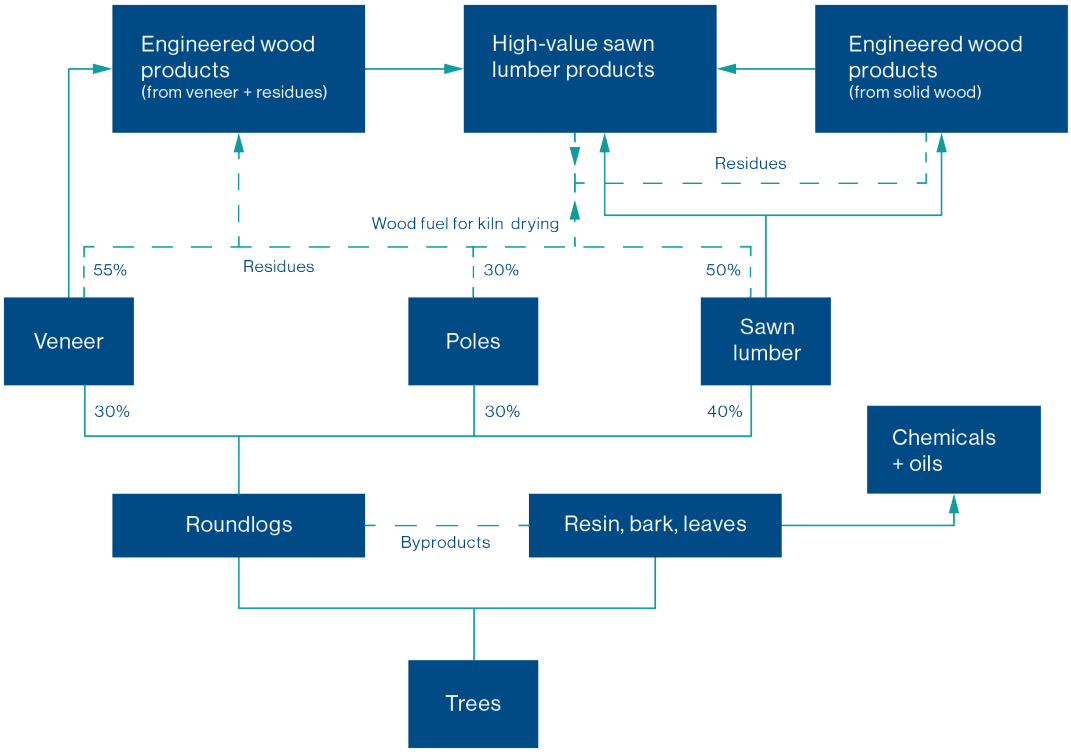
Stacks of sawn timber | Credit: Dmytro Varavin

2C. Establish Wood Industry Clusters (Phase I).

Firm clusters are a powerful lever for facilitating both scale-induced efficiencies and knowledge spillovers (see Figure 4). Scale efficiencies are achieved because when multiple firms aggregate their demand (for inputs, utilities, etc.) within a small physical area, this allows for shared facilities (e.g. factory shells), infrastructure (e.g. power, water, roads), and services (e.g. waste management, technical training with industry placements). In some cases it also allows for shared technology such as sawmilling machinery or kiln-drying. Further, clustering streamlines transport and logistics routes: in this case, it means trucks bringing roundlogs have only one or a few locations to deliver to. This, too, creates scale efficiencies. Clusters facilitate knowledge spillovers because they intensify firm interactions along the value chain as well as between firms and service providers, but also sometimes between competitors or non-competing firms facing similar challenges. Increased interaction spurs increased learning, imitation, staff mobility, and multi-firm collaboration to solve joint challenges or pool resources to leverage opportunities. The Wood Industry Clusters should be designed with later expansion to include SMEs and supporting services in mind (see recommendation 4A below). In the case of the wood processing industries specifically, clusters can facilitate "full tree utilisation" by bringing different types of processing activities together. Figure 5 illustrates an example of integrated wood processing where 30% of the roundlog is used to produce veneer, 30% to make poles, and 40% to make sawn timber. By-products such as leaves and resin are used to make chemicals and oils. Already, then, four quite different types of industrial capability are involved in processing parts of the same tree. These capabilities could be embodied by four or more different firms in a cluster. At the next stage of processing, in this illustrative example, the veneer plant operates at 45% efficiency, meaning that 55% of the raw material used as inputs becomes residue material; residues represent 30% of the pole plant's total output, and 50% of the sawn lumber operation. Nearly all of these residues can be turned into woodchip and used in downstream processing plants making engineered wood products (from veneer and residues) and high-value sawn timber products (e.g. furniture or pre-fabricated houses combining sawn timber and/or beams, with fibreboards). With all of this movement of raw materials, component parts, by-products, and residues between the numerous different processing operations, the further benefits of physical proximity become clear.

Figure 5: Illustrative example of an integrated wood processing ecosystem

Source: Authors



Sector mission 3: Stimulating domestic demand

3A. Leverage public procurement to create demand for value-added products made from Ugandan plantation wood. Through the Public Procurement and Disposal of Public Assets Authority (PPDA), the government can pioneer new standards for furniture products as well as wood-based construction materials, shifting public procurement towards products that use eucalyptus and pine (and other plantation woods) grown in Uganda. Posting orders for high-value, locally manufactured wood products made from sustainably planted and fast-growing trees would simultaneously push the industry into building the requisite productive capabilities and help shift market perceptions of eucalyptus and pine products via a demonstration effect.

3B. Engage and support potential regional buyers of Ugandan wood products. This workstream could identify regional real estate developers, furniture manufacturers, and other businesses with a potential interest in using higher-value wood products and support rapid feasibility assessments for (a) switching to higher-value Ugandan wood products (e.g. from steel and concrete in buildings; from plastic or natural forest hardwoods in furniture) and (b) sourcing these products from Uganda.

3C. Organise sector-level marketing campaigns. Marketing campaigns could showcase high-quality plantation wood products from Uganda to large prospective domestic and regional buyers as well as the mass household market.

Assembly of a prefabricated timber house | Credit: Gabriele Grassl

Sector mission 4: Growing an inclusive wood industrial ecosystem

4A. Wood Industry Clusters: Phase II

When pioneer firms have provided an early spark and the sector becomes ready to mature, the Wood Industry Clusters established above in recommendation 2C should be expanded to include SMEs and supporting service providers. This will lay the foundation for a dense network of linkages that will facilitate supplier relationships, labour mobility between firms in the sector, industry-level coordination efforts (including standards setting and technical training), economies of scale and agglomeration efficiencies in the provision of services such as haulage, storage, log planing, machine maintenance, and more. For small firms in particular, where capital is scarce and technological needs are often relatively generic, access to shared production facilities can be a game-changer. The design of the cluster should be based on a detailed study of the sector's needs and opportunities, but it could include the following features:

- Expanded basic transport, storage, and utilities **infrastructure** tailored to the wood industries
- Shared **workspace and basic production facilities** for carpentry and joinery SMEs
- A **technical training centre** on woodworking set up and managed via a public-private partnership
- **Showroom facilities** for higher-value-added wood products
- Dedicated **timber yard facilities**
- UNBS **testing and grading facilities**
- A **shared office and administration block** including offices for the relevant regulatory authorities

Low-cost housing units using timber under construction | Credit: JohnnyH5

4B. Technical Centre: Phase II

In order to spur the growth of a few hundred SMEs in the sector, it is not enough to wait for spillovers from pioneer firms to occur organically, even within the same cluster. Several market failures are likely to hinder the transfer of skills and technologies as well as the growth of a tight network of production linkages and supply chains involving domestic SMEs.

Phase II of the Technical Centre would expand its mandate into stimulating these spillovers and linkages and providing direct support to SMEs in the sector. The ultimate medium- to long-term goal should be to spur the independent growth of technical and networking services to the industry. The **Technical Centre's** experience under Phase I and in the early stages of Phase II will provide valuable information for envisioning a sustainable future state of the services to the sector in which much of the **Technical Centre** has become obsolete. The detailed design of this expanded **Technical Centre** would need to be based on a deeper, and iterative, analysis of the industry's needs, but it could include the following elements:

- **Provision of technical services**. A small **team of full-time in-house technical experts** based at the **Technical Centre** who provide on-demand technical support to firms in the wood-based industries as well as related service and other input providers combined with the Flexible Facility for highly specialist needs established under Phase I.
- **Collection and dissemination of market and industry information**. E.g. on international industry fora; trade fairs; market price evolution; industry developments; local service providers database; etc.
- **Provision of national woodflow tracking, monitoring, and projections** on timber supply quantities, qualities, locations, and timings.
- **Facilitation of linkages** – using networking events, subsidies, and/or a voucher system – between wood industry firms and domestic/regional service providers, raw material/component part suppliers, and buyers, to simulate ecosystem linkages.
- Housed under the Technical Centre, establish a **Wood Industries Incubator** for wood processing SMEs, providing competitively selected entrepreneurs with up-to-date information on raw material supply, production costs, and market conditions; startup grants or concessional finance; and business development support to build startups to an investable stage.

A sawmill operation in Uganda | Credit: Jack Steege

Box 7: Woodflow predictability

Inspiration can be drawn from the **South African Lumber Index**, a strong industry information system that collects funding through advertising and member subscriptions. Also in **South Africa**, every timber grower is required to complete a specific return annually, and a consulting firm is hired to compile and analyse this information, which is then released to the industry. Forest Research **UK**'s National Forest Inventory produces annual forecasts for timber production across the country at an annual cost of USD 0.42 per ha. For **Uganda**'s roughly 100,000 ha of plantation forests, this would work out at just USD 42,000 annually – a cost the major industrial players may help cover, especially if the value is demonstrated by a government- or donor-funded pilot in the first 1-2 years. The industry could pay for this if well organised - the largest players already reportedly pay over USD 30,000 per year for information systems. Further, large-scale remote sensing technology can be mobilised to achieve yield projection accuracies of around 80%, which is likely to be sufficient for building investor confidence and high-level planning.

4C. Develop further timber grading standards and guidelines to cover the full range of low-, medium-, and high-value eucalyptus and pine products, including furniture.

Quality standards and certification capabilities for the full-range of wood-based products that Ugandan producers could target would help motivate firm learning, upgrading, and innovation, reward quality on markets, build a stronger country brand, ease export market access, and allow buyers (e.g. in the construction sector) to be sure of product quality.

Sector mission 5: Ensuring sector sustainability and resilience

5A. Establish a refinancing scheme for smaller tree growers to ensure that they can effectively replant trees after harvest.

5B. Study the feasibility and expected impact, on both industrialisation and forest protection, of wood export quotas and export bans for certain wood product categories.

A balance must be found between satisfying domestic demand through forestry plantations (thereby protecting natural forests) and allowing the industry to take advantage of premium export markets in order to strengthen the incentives for replanting and investment in value addition. This balance can be achieved via a few tools that can also simultaneously induce the sector to move towards greater value addition:

- **Wood export quotas**. These can be applied only to some lower-value-added wood products, or can be differentiated by product category e.g. higher quotas for higher value-added wood products.

Export bans for certain product categories. Exports of some lower-value-added products could be gradually phased out via the export licensing process. A ban on the export of raw logs and some very low-value-added wood products can be a first step in catalysing domestic value addition. The existing law requires that a timber grading stamp is needed to obtain an export license, and prohibits the export of unlicensed timber. This law can remain in place if robust standards are developed, adopted, and effectively implemented for all relevant wood products. These standards will allow GoU to issue export licenses only for processed wood products that meet the relevant standards (and to deny licenses for raw logs and other products that fail to meet standards). However, the amount of round log excess supply in the country should be carefully monitored and, if there is a large temporary oversupply with insufficient domestic processing capacity, the raw log export ban could be partially and temporarily lifted (e.g. through issuing export quotas). This, of course, should go hand-in-hand with proactive measures to catalyse further processing capacity.

Box 8: Protecting Uganda's natural forests

Aside from controlling the wood products trade, there are other, potentially far more impactful ways to take pressure off natural hardwood forests.

Promoting the establishment of more fast-growing and environmentally-friendly species, especially bamboo, including for firewood;

Promoting agroforestry on smallholder farms to diversify incomes and provide sources of firewood either from whole harvested trees such as Eucalyptus or Casuarina or as scrap wood from fruit and nut trees;

- **Strengthening the enforcement of natural forest protection** and action against illegal hardwood trade;
- **Promoting** the development of **affordable alternative cooking fuels;**
- **Promoting the use of plantation timber** (instead of natural forest timber) in key sectors such as furniture;
- **Promoting agricultural intensification** on existing plots as opposed to land conversion to create new plots; and
- **Improving urban planning near forested areas** to create higher density without congestion in order to decrease the pressure on expanding urban areas into forest areas.

5C. Establish a tree germplasm R&D programme.

A clonal breeding programme should be set up. The option of running this via a public-private partnership should be explored, as should the feasibility of setting up a regional programme vis-à-vis a national one (discussed further in the next section). Such a programme should consider the following targets (Rezende et al., 2014, cited in Calabrese, 2021):

- "Increased productivity
- Wood density, as it impacts productivity and quality
- Adaptation to increasingly harsh climatic conditions
- Increased tolerance to pests and diseases, which impacts on productivity
- Improved rooting ability (and associated complexities associated with costs and benefits)".

A note on delivery mechanisms

This policy paper deals with the design of policy content, but is cognisant of the equally important issue of implementation. As such, this section briefly presents three high-level considerations that should form part of a broader effort to identify and build the right delivery mechanisms for the kinds of policy actions discussed in this paper.

A Wood Industries Task Force. In line with the recommendations in Economic Policy Paper #2, we recommend that a small, high-calibre team should be tasked with driving and monitoring the sector industrial policy efforts outlined in this paper. This paper illustrates that effective industrial policy, including in the wood industry, requires the effective coordination of a wide range of public and private actors, a task that entails significant levels of human, financial, and political resources. In a context of scarcity along all three of these dimensions, it is important to concentrate those resources and focus their efforts on the highest-impact strategic actions. A Task Force - housed inside either a President's Industrialisation Delivery Unit (recommended in EPPS #2), or in a key ministry (e.g. MTIC or Ministry of Finance, Planning and Economic Development (MoFPED)) - is the best institutional form for such a team to take on. The Task Force will have the greatest chance of success if it is politically empowered, technically competent with a focus on meritocratic human resource management, and laser-focused on delivering against the industrial policy missions defined in this paper as well as monitoring the sector's evolving constraints and opportunities. A core recommendation made in this paper – the use of conditional anvestment agreements – underscores the need for the implementation mechanism to be politically empowered: these agreements only work if there is eye-to-eye negotiation with powerful prospective investors and a credible threat of the withdrawal of state benefits if these investors fail to meet targets and requirements.

Iterative Problem-Driven Policy Design. As firms grow and develop their capabilities and new ones enter, unforeseen constraints will emerge that will have to be tackled on the path towards Vision 2030. As such, it will be important to create and sustain an effective **Public-Private Dialogue Mechanism** to continuously monitor sector progress and new emerging challenges, so that sector policies can be course-corrected in reaction to new information. Course correction will take the form of adjusted sticks (including targets) and carrots (including new types of support to tackle new constraints) in the conditional investment agreements as well as other policy actions that benefit the entire sector as opposed to one or more target firms (e.g. infrastructure investment to overcome transport bottlenecks).

Regional collaboration. Regional collaboration will be crucial for the transformation of Uganda's wood industries. The major market for Ugandan wood products in the short- to medium-term will be its regional neighbours, with Kenya representing the greatest demand for higher-value-added products. For example, two companies in Kenya and Tanzania are already developing plans to construct housing using cross-laminated timber, one of the highest-value-per-m3 wood products, but no supply of this exists in the region. The wood industry's fortunes will thus depend on healthy trade relationships and well-functioning trade logistics with regional neighbours. This includes joint policy development and implementation through the East African Community (EAC), for example in the area of import tariffs on furniture and other relevant products. In the realm of trade logistics, it includes working with neighbours to ensure wood product standards are harmonised and non-tariff barriers eliminated. Further, there are potential economies of scale to be attained through regional collaboration. One example from this paper's recommendations is the **Technical Centre**: if it served wood industry firms throughout East Africa it would be able to bring in more technical specialists full-time, provide a richer suite of technical support, and stimulate the emergence of larger-scale and more specialised technical service providers catering to the entire region. Another example is the proposed eucalyptus R&D programme. Calabrese (2021) argues that a national-level programme would be challenging to set up due to the sector's limited scale, the relatively small size of its major companies, and the wide range of potential end-uses of Uganda's plantation wood (as opposed to, say, one very large company focusing solely on pulpwood). Because economies of scale are needed to run an effective R&D programme, a regional initiative at the EAC level could be more feasible (ibid).

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