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Policy Briefing Paper

Bioenergy in the Wood Processing Sector in Tanzania

SUMMARY

Tanzania has some of the most extensive forest resources in East Africa and some of the region's largest, most successful wood processing industries.

Most of these facilities are in the south-west of the country, where the largest forest plantations are located. Combined heat and power (CHP) production from wood residues commenced at Mufindi Paper Mills (MPM) in 1986, followed by the Tanganyika Wattle Company (TANWAT, Figure one) in 1995. Other smaller electricity generation projects using wood residues started during the 2010s but have ceased operations due to lack of Government support in approving power purchase agreements (PPAs) and applying commercially-viable feed-in-tariffs (FiTs).

The Government of Tanzania embarked upon major energy sector policy liberalisation and institutional development during the 2000s, with the establishment of the Energy and Water Utilities Regulatory Authority (EWURA) in the first decade of the 21st century (under the EWURA Act 2006), the formation of the Rural Energy Agency (under the Rural Energy Act 2005) and the passing of the landmark Electricity Act in 2008. This brought about the possibility of unbundling the state-owned Tanzania Electric Supply Company (TANESCO) and promoting independent power generation under a strong framework for Standardised Small Power Projects (SSPPs), particularly in the renewable electricity sector.

The forestry sector simultaneously underwent significant transformation with the passing of a new Forest Act (1998), leading to the formation of the Tanzania Forest Services Agency (TFS) and other major reforms supporting community and private sector participation in forestry management and commercial utilisation.

However, liberalisation in the electricity sector has stalled. No additional wood processing residue electricity projects or capacity have been successfully installed and remained operational in the last 20 years. All such projects have failed, primarily due to a lack of off-take agreements with TANESCO and FiTs that are too low to be commercially viable. The highest tariff available under EWURA's SSPP Tariff Order of 2019 is US¢ 10.15 per kWh.[1] Companies such as Sao Hill Industries (SHI) and TANWAT, which were looking to expand generation from wood residues in the early 2010s, have shelved those plans as a result. Today, Tanzania is at a standstill in terms of expanding bioenergy-based electricity generation, despite an institutional and regulatory framework that appears to be conducive to such investments. This policy paper provides an overview of the wood processing industry in Tanzania, the key policies, regulations and institutions that relate to bioenergy development in this sector, and recommendations to stimulate the further adoption of CHP.

[1] EWURA - Electricity (Standardized Small Power Projects Tariff) Order, under the Electricity Act (Cap. 133) Order 2009 (section 23).

SECTOR OVERVIEW

Approximately 70% of Tanzania's 47 million ha of mostly natural forests is in productive use...

...the rest is protected. Plantations cover only about 1% of the forest land (280,000 ha) but provide most of the country's industrial wood, with some of the largest wood processing concerns in East Africa. Over 80% of Tanzania's plantations are in the Southern Highlands and Morogoro Region. These are home to most of the country's important forest sector companies, including TANWAT, SHI, Kilombero Valley Teak Company (KVTC) and MPM (Figure two). They are major economic concerns that provide significant employment in forest management and wood processing.

These companies source raw materials either from their own estates (TANWAT and KVTC) or primarily or exclusively from state-owned forest plantations (SHI). They produce high-grade timber (primarily teak and pine), electricity transmission poles (mainly eucalyptus), tannin extracts for export (from black wattle), construction materials, plywood, particle board, pallets and paper (from a variety of species). In doing so, they generate about 140,000 tonnes of wood residues per annum, with significant potential for commercial energy use.

TANWAT, located in Njombe District, uses its own wood residues to supply a 2 MW CHP plant to meet its own heat and power needs (Figure one). It exports surplus electricity to the TANESCO grid. MPM has a 7 MW CHP plant which supplies only its own heat and power requirements. KVTC and SHI use sawmill wastes to generate a small amount of heat for wood drying.

Figure one:
TANWAT CHP Plant, Njombe
(Source: Author's own photograph)

Kisiwa Farming (on Mafia Island) is developing a small gasification-based electricity plant that will be fuelled with chipped coconut wood sawmill residues and intercropped coppice species offcuts.

Besides the large wood-processing enterprises, there are numerous other small wood processing facilities dotted around the country. While some may be using their residues for heat production, e.g. for timber drying, none are known to be producing both heat and power on-site. If not used for energy, waste biomass from the wood processing sector is given away as household fuel, sold at low price to industrial users, dumped or burned.

Figure two: *Tanzania's Major Wood Processing Region & Factories (Source: Author's own mapping)*

KEY POLICIES, REGULATIONS AND INSTITUTIONS

Tanzania has strong policy, regulatory and financial support for wood processing industries, ranging from production and export high-value wood products to decentralised electricity generation in rural areas. The country's forestry institutional and regulatory framework provides a strong basis for supporting sustainable commercial wood processing than at any time in decades (Figure 3).

Tanzania's wood processing sector falls under the Forestry and Beekeeping Division (FBD) of the Ministry of Natural Resources and Tourism, with technical support from the TFS. The Forestry Utilization Section and Forest Development Section of the FBD are the most relevant to bioenergy production using forest residues. The FBD and the TFS work with communities and the private sector to support Tanzania's commercial wood energy sector in forest management, harvesting and utilisation, both on private land and state land. Tanzania's Forest Act (2002), supplemented by the Forest Regulations of 2017 and 2019, promotes sustainable, commercial forestry with extended and new forest licences for commercial wood processing industries, including sawmilling and forest products.

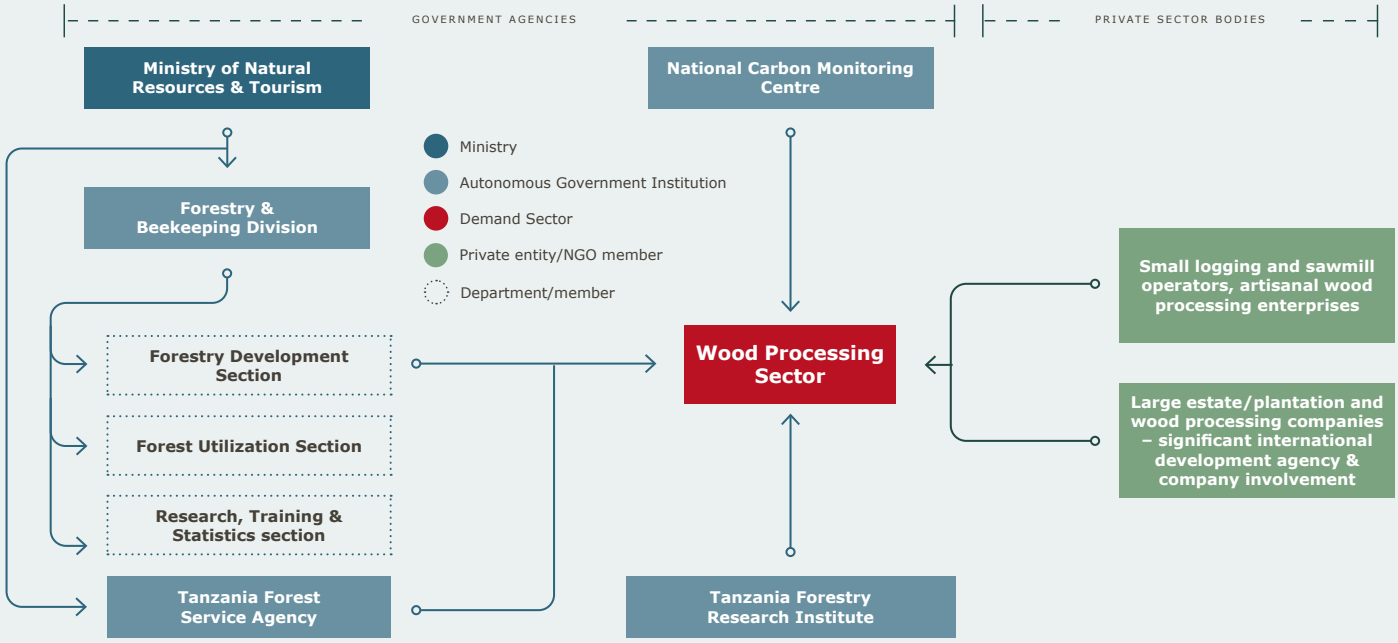
The National Environmental Management Council (NEMC), established under the Environmental Management Act (2004) is the government's paramount environmental agency that oversees and administers environmental laws and policies.

While the FBD and TFS focus on sustainable and best-practice forest product extraction and utilisation, the NEMC is responsible for ensuring that forestry activities comply with Tanzania's environmental legislation.

Tanzania's institutional framework for bioenergy starts with the Ministry of Energy (especially its Renewable Energy Section in the Electricity & Renewable Energy Division), EWURA, TANESCO and the Rural Energy Agency (Figure 3). Even though the Electricity Act 2008 liberalised the electricity sector from a state monopoly to encourage private sector participation, well over 80% of national electricity generation, and all transmission and the electricity distribution infrastructure remain with TANESCO, the state-owned utility, making it the only grid-based off-taker (Figure 4)

The Ministry of Energy's Renewable Energy Section is responsible for bioenergy policy and strategy. It facilitates the development of new sources of electricity generation such as mini-hydro, wind, geothermal, biomass and solar photovoltaic, for both on- and off-grid networks.

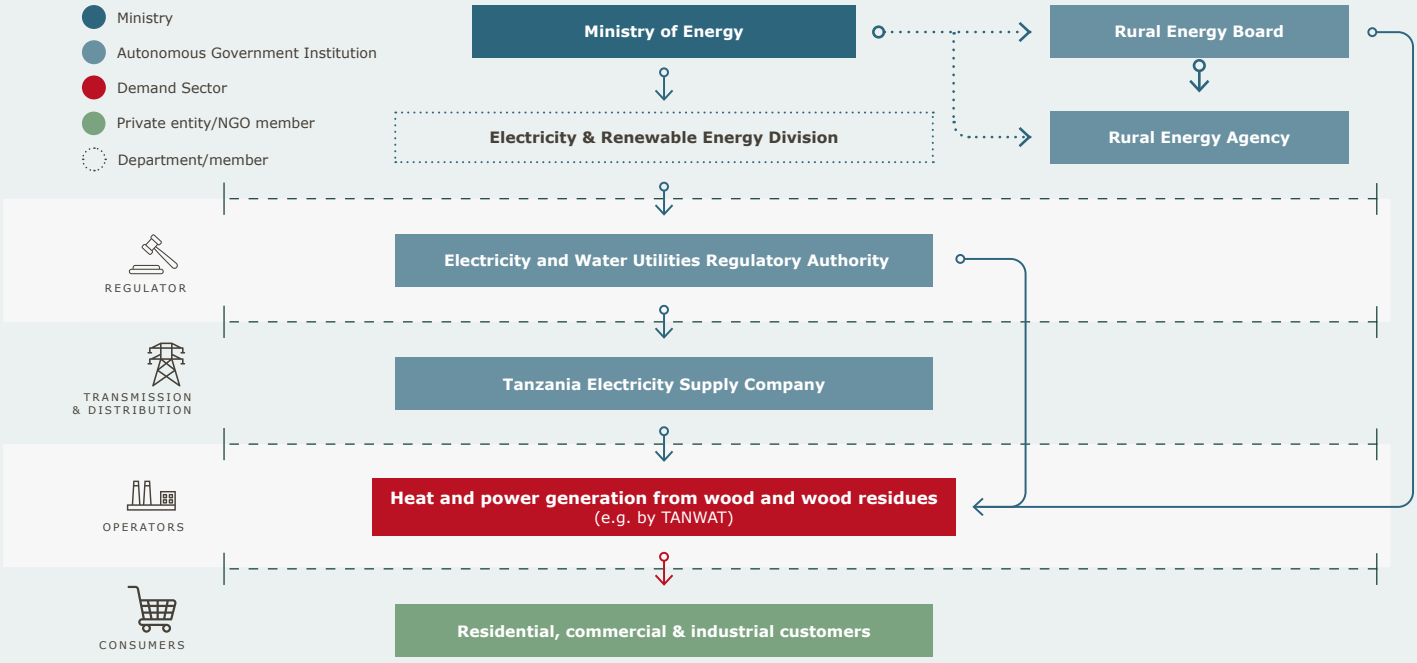
Figure three: *Institutional framework for bioenergy in Tanzania (Source: Author's own compilation)*



The National Energy Policy (1992, revised in 2003 and 2015) sets the framework for implementation of energy matters, and highlights the role of various energy sources in developing the sector, including bioenergy for power generation. The policy stresses the role of private initiatives and investments for exploitation of local energy sources, including bioenergy from wood processing residues.

EWURA is responsible for electricity regulation, setting the framework for, and approving, electricity PPAs, registration of all independent power (electricity) producers (IPPs), and setting and administering FiTs for renewable energy with a specific framework for bioenergy. It sets a strong supportive framework for wood processing IPPs. Tanzania established a Small Power Projects Programme (SPPP) with the support of the Swedish Sida and introduced the FiT programme for renewables through EWURA in 2008 (revised in 2015 and 2019). Small Power Projects (SPPs) are defined as having generating capacity of 100 kW to 10 MW. Small power projects based on hydro and biomass qualify under EWURA's FiT programme. Projects <1 MW do not require a licence, but need to register with EWURA, while projects <100 kW are also exempt from tariff approval (though the regulator may review the tariff should that need arise).

Figure four: *Tanzania's Electricity Institutional Framework (Source: Author's own compilation)*



The Rural Energy Fund (REF) is funded by the Government through levies paid on sales of electricity and petroleum products, with additional financing from the development partner community, which includes the World Bank, International Finance Corporation (IFC), Sweden, Norway, UK, African Development Bank (AfDB), USAID and others.

The REF is mandated to provide finance to bioenergy projects, including forestry/wood-based bioenergy (heat and electricity) complementing the Forest Act (2008). However, thus far, only a few small bioenergy projects have been funded by the REF.

IMPACT OF POLICIES ON ADOPTION OF BIOENERGY IN THE WOOD-PROCESSING SECTOR

Tanzania has a very supportive regulatory framework for the wood processing sector to invest in CHP using processing residues to meet its own heat and power needs, and to export electricity to the grid and any other off-takers.

However, Government support for electricity generation from wood residues exists only on paper, without substantive financial and licensing support due to the prioritization of national grid extension by TANESCO (supported substantially by the World Bank through the REA).

From a Sustainable Energy for All (SEforALL) electricity access framework, national grid extension, primarily funded by the World Bank and AfDB, particularly for rural electrification, has been remarkably successful in extending the grid and connecting businesses, industries, institutions and households at electricity prices far lower than any off-grid bioenergy-based supplier could charge to be commercially viable.

Herein lies the weakness in actual support for bioenergy electricity generation development from wood residues (indeed all biomass). For the past decade, rural electrification has not emphasised the development of grid-connected small-scale (<10 MW) rural embedded electricity generation capacity. Rather, rural electrification has focused on grid extension and grid connectivity as the key benchmarks for energy access. This focus has diverted funds, resources and policy support towards expanding rural electricity connections to the national grid through TANESCO, rather than supporting investment in rural bioenergy generation capacity.

The Ministry of Energy, the Rural Energy Agency/Fund and EWURA have not made practical use of the policy, regulatory and financial framework that was set out in the ground-breaking 2008 Electricity Act, to promote investment in biomass electricity generation in the wood processing sector, or in any other bioenergy sector. TANESCO has little interest in purchasing bioenergy and paying power purchase prices set in law under the FiTs authorised by EWURA (which are already very low by international standards). As shown in the 2019 rural electrification tariff framework, biomass-generated electricity receives the lowest FiTs of all renewable electricity sources. It is these factors that have brought investments in electricity generation from wood residues in Tanzania to a virtual halt over the past five years.

RECOMMENDATIONS

The following recommendations could substantially increase investment in CHP based on wood processing residues:

- The Ministry of Energy, as the institution responsible for energy generation policy, should work with EWURA to use existing legislation and frameworks to increase FiTs for bioenergy-generated electricity from the current US¢ 10.15 per kWh to US¢ 20 per kWh;
- Oblige TANESCO to negotiate PPAs with eligible wood bioenergy electricity producers, in coordination with EWURA;
- Stimulate and diversify Tanzania's renewable electricity technology and generation base, by promoting bioenergy from Tanzania's extensive commercial woody biomass residues;
- Support climate change mitigation by reducing reliance on fossil fuels (61% of generation) and large hydro (35% of generation) for electricity generation, using renewable energy which stands at 82.4 MW, with less than 10.5 MW of installed bioenergy capacity;
- Promote grid stability and reliability by generating renewable electricity from embedded bioenergy generation in areas in the south and southwest where electricity transmission distances are long, thereby strengthening rural grids and reduce rural system losses.

Such an approach, which has been set out in numerous acts, regulations and guidelines by Government since the mid-2000s, would create 'win-win' opportunities not only for rural Tanzania, but also for the entire country. It would complement Tanzania's existing efforts to extend the national grid to ensure that 70% of rural consumers have access to grid electricity by 2030.

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