Ngodwana Energy biomass power plant

Sustainability FAQs

sappi | southern africa

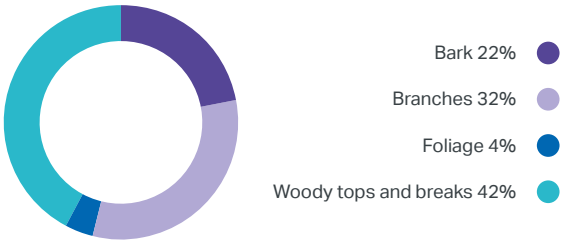
Sappi Southern Africa holds a 30% stake in Ngodwana Energy, a 25 MW biomass energy plant at Ngodwana Mill. The plant, which came on stream in March 2022, uses biomass recovered from surrounding plantations and screened waste material from the mill production process. Up to 35 tonnes an hour of biomass is burned in a boiler to generate steam and drive a turbine to generate electricity which is fed into the national grid. Some questions have been raised about the environmental sustainability of the project, which we have answered here.

Q: The Public Partnership Agreement specifies that all the biomass utilised will be from 'sustainable' sources. What does this mean?

A: This refers to ecological, economic and social sustainability, in line with Forest Stewardship Council™ (FSC™ N003159); and Programme for the Endorsement of Forest Certification™ (PEFC/01-44-43) principles. Sappi's plantations are 100% certified to both these internationally recognised, independently verified accreditation systems.

Q: Leaves are known to be high in nutrients. Won't the process of biomass removal compromise soil fertility?

A: Harvesting procedures that utilise additional woody biomass (large branches, stem tops, non-utilisable wood such as broken trees or non-commercial species) while minimising nutrient removal by leaving nutrient-rich leaves and needles behind, are being used wherever practical. Sappi Forests has estimated that the harvest residue comprises 74% woody material (branches, broken stems and tops), 22% bark and 4% foliage, as set out in the pie chart below.



In addition, timber trees are not heavy feeders and in the case of eucalypts, are only harvested once every ten to twelve years. This means that even with more intensive biomass removal, the nutrient export would still be much less compared to that of agricultural crops. Nutrient budgets comparing the balance between input and output fluxes provide useful information on long-term nutrient supply. Generally, deposition of nutrients, the large buffering capacity of the soils and the rate of resupply through weathering of parent material exceeds the rate of nutrient removal by plantation trees in South Africa.

Fast facts

- In Sappi's plantations, harvesting is balanced with re-growth, thereby enhancing health and vigour and maintaining the carbon balance.
- Recognising that some soils have a higher risk of nutrient depletion than others, Sappi has developed a site sensitivity risk map.
- Depending on the site sensitivity risk rating, sites with moderate to low site sensitivity risk will be prioritised for biomass removal.
- The impact of management practices is being monitored through a long-term soil monitoring network.
- Biogenic CO_2 is part of the 'fast' carbon cycle that recycles CO_2 already in the atmosphere, while fossil fuels like coal, oil and gas, are part of the 'slow' carbon cycle and add additional CO_2 to the atmosphere.

sappi

Ngodwana Energy biomass power plant

Continued

Sustainability
FAQs

Q: Aren't some soils more sensitive to removal than others?

A: Yes, they are. Sappi has developed a site sensitivity risk map that includes various site risks (slope, erodability, soil depth, soil organic carbon content, soil texture, etc.). Recognising that removal of a higher proportion of biomass could potentially reduce the addition of organic matter to the soil carbon pool and site nutrient levels, we have developed specific operational guidelines based on the different site sensitivity classes:

- Depending on the site sensitivity risk rating, sites with moderate to low sites, sensitivity risk will be prioritised for biomass removal.
- On high risk sites, biomass removal will be limited to stemwood and non-utilisable wood.
- On all sites residue removal will focus mainly on woody biomass components with low nutrient content, e.g. currently non-utilisable stemwood and large branches. The nutrient-rich foliage and forest floor litter layer will not be utilised for bioenergy.
- The impact of management practices will be monitored though a long-term soil monitoring network (see next question).
- We will consider returning non-toxic ash to sites from which the biomass was harvested. There are also options to apply additional organic matter such as manures, biosolids, composts and char that are more effective than fresh plant residues in raising soil carbon.

Q: Is soil health being monitored?

A: Yes, it is. Sappi, together with another forestry company has initiated the development of a long-term soil monitoring network with particular focus on soil organic matter, soil nutrients and soil bulk density, in association with Forestry South Africa and the Institute for Commercial Forestry research. Annually, additional monitoring plots are added to the network. The monitoring results will be used to refine the site sensitivity risk rating and potentially modify Sappi's approach to biomass removal.

Q: What if reduction in soil quality requires more chemical fertiliser to be used, resulting in chemical leaching from plantation sites into rivers and streams?

A: Forestry uses extremely low quantities of fertiliser compared to agriculture. Approximately 100 kilograms of fertiliser per hectare is applied the planting of the tree crop, once in ten years in the case of eucalypt crops. Pine trees are not fertilised. The fertiliser is locally applied next to each tree, and there are buffer zones between the plantation and riverine areas. Accordingly, there is no likelihood that there will be any leaching of fertiliser nutrients into waterways.

Q: Aren't the carbon dioxide (CO_2) emissions associated with burning woody biomass as Ngodwana Energy does, greater than for burning coal?

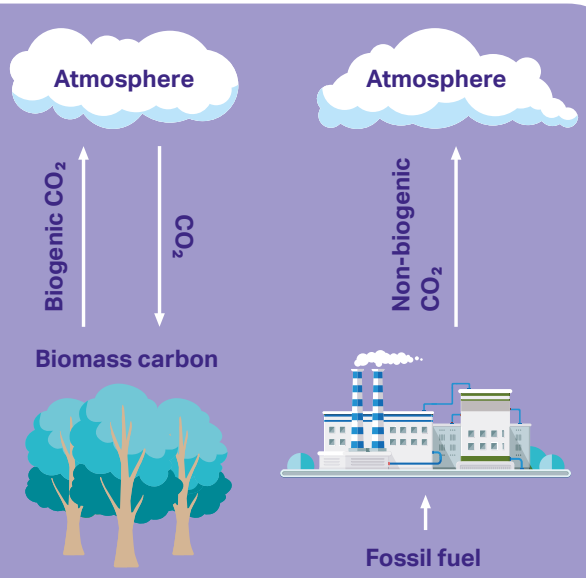
A: It is true that on a kilowatt per hour (kWh)-basis, CO_2 emissions from woody biomass can be higher than those of coal due to wood's lower conversion efficiency – a consequence of the different chemical compositions of biomass and coal. However, the net greenhouse gas (GHG) outcome of using biomass for energy cannot be determined by comparing emissions at the point of combustion.

That's because there is a difference between biogenic[1] and fossil-based CO_2. Burning fossil fuels like coal, gas and oil releases carbon that has been locked up in the ground for millions of years, while burning biomass emits carbon that is part of the biogenic carbon cycle. In other words, the use of fossil fuels increases the total amount of carbon in the biosphere-atmosphere system. Bioenergy, however, operates within this system; biomass combustion simply returns to the atmosphere the carbon that was absorbed as the plants grew.

The Intergovernmental Panel (IPCC) puts it another way: Biogenic CO_2 is part of the 'fast' carbon cycle that recycles CO_2 already in the atmosphere, while fossil fuels like coal, oil and gas are part of the 'slow' carbon cycle and add additional CO_2 to the atmosphere.

[1] *The term 'biogenic' means produced by living organisms – in this case, woodfibre.*

sappi



The IPCC distinguishes between the slow domain of the carbon cycle, where turnover times exceed 10,000 years, and the fast domain (the atmosphere, ocean, vegetation and soil), vegetation and soil carbon have turnover times in the magnitude of 1 – 100 and 10 – 500 years, respectively. Fossil fuel transfers carbon from the slow domain to the fast domain, while bioenergy systems operate within the fast domain.

https://www.ieabioenergy.com/iea-publications/faq/woodybiomass/biogenic-co2/

Q: Can wood sourced from industrial timber plantations ever be sustainable?

A: Forest biomass is renewable if it is harvested from forests (in the case of Sappi Southern Africa, plantation forests) that are managed so that there is no loss of productive capacity – in other words, if harvesting is balanced with regrowth. In this way, the growth rate of the trees and thereby, capacity to sequester carbon, are maintained over successive rotations.

Q: Because wood takes seconds to burn and years to grow back, isn't Ngodwana Energy creating a 'carbon debt'?

A: The carbon-debt concept is only true under certain conditions: If a stand-based carbon accounting approach is used, the carbon accounting starts when the stand is cut down and the assumption is made that if the stand is not harvested, carbon sequestration will continue indefinitely.

Starting the accounting process with the planting of trees which will be harvested later gives a completely different answer. Sustainable forestry management depends on a landscape-scale approach.

Accordingly, as described in the previous question, harvesting volumes from identified stands are balanced with tree growth from other stands that are actively growing. This means that the carbon stock across the entire land holding remains stable, and there is no carbon debt or carbon reduction caused by harvesting. A forest of natural trees or a plantation forest will reach a point where due to increased competition or old age trees start to die. At this point, undisturbed forest or plantations can become a carbon source. Active management that involves harvesting and renewal of forests to enhance health and vigour is required to maintain the carbon stock.

Q: Is it true that if wood is allowed to decompose naturally rather than burned, after 10 years there would be 41%–95% less carbon in the atmosphere, due to the fact that decomposition releases carbon much more slowly than combustion and leaves some carbon behind in the soil?

A: This is highly debatable. Decomposition depends on numerous factors, including climate. Most of the CO_2 contained in harvest residue is released, irrespective of whether it is left to decompose naturally or used as biofuel.

Q: What are the advantages of the project?

A: There are several:

- The removal of additional biomass reduces the risk of wildfire, as well as the associated negative environmental and soil impacts associated with high-intensity uncontrolled burns.
- The project aligns with Sappi's commitment to UN SDG7: *Renewable and Clean Energy* and falls under the South African Government's Renewable Energy Independent Power Producer Programme (REIPPP). This programme is the result of the national need to increase energy capacity and reduce carbon emissions.
- The project is generating income for the individuals – mostly youths and women – involved in biomass collection.