



ENVIRONMENTAL ASSESSMENT OF TRADITIONAL AND ALTERNATIVE PULPS, LIFE CYCLE ASSESSMENT AND CARBON BALANCE

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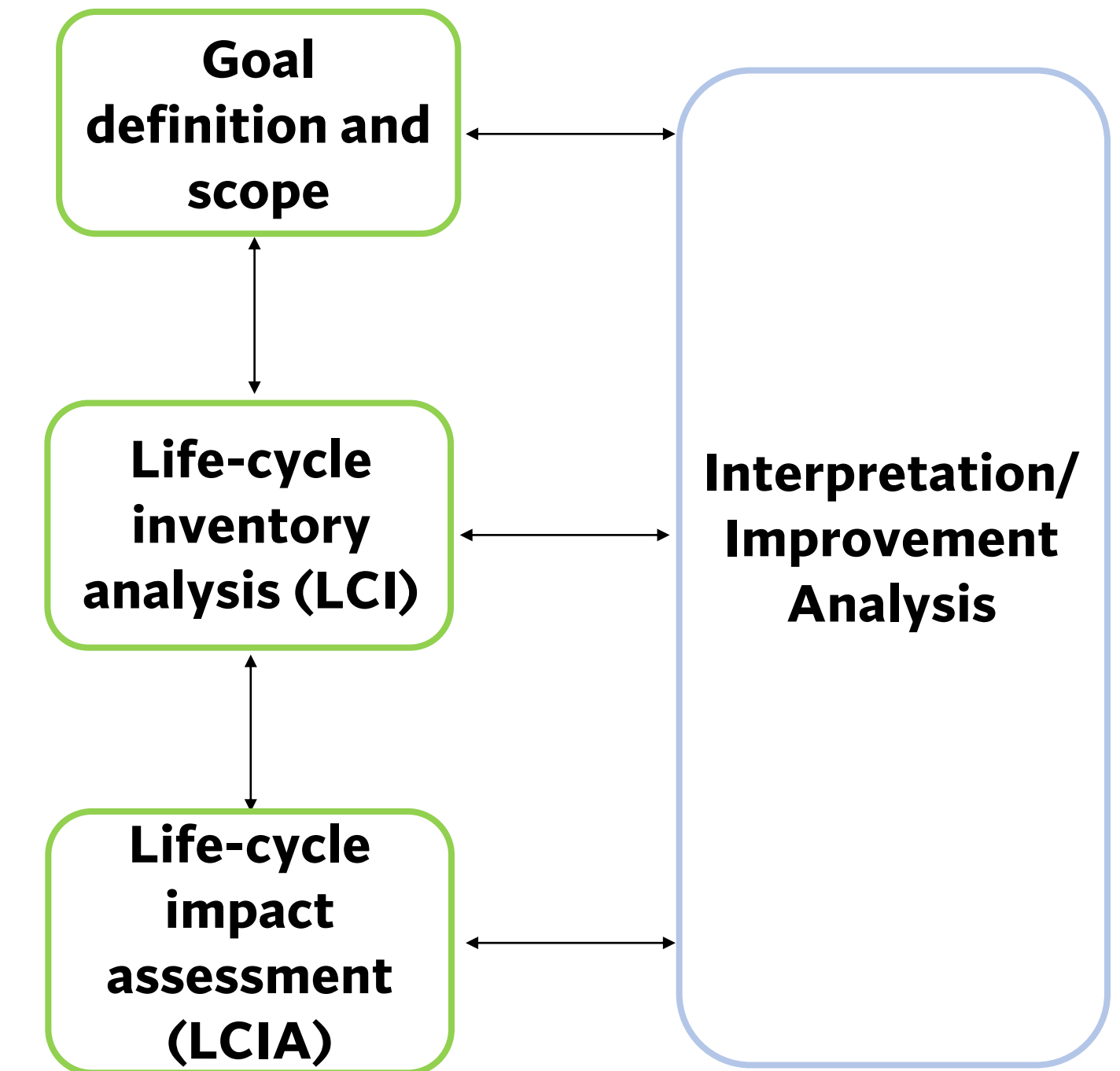
OBJECTIVE

Our main goal is to compare the carbon footprints of NBSK, a conventional tissue production raw material, with switchgrass-derived APMP.

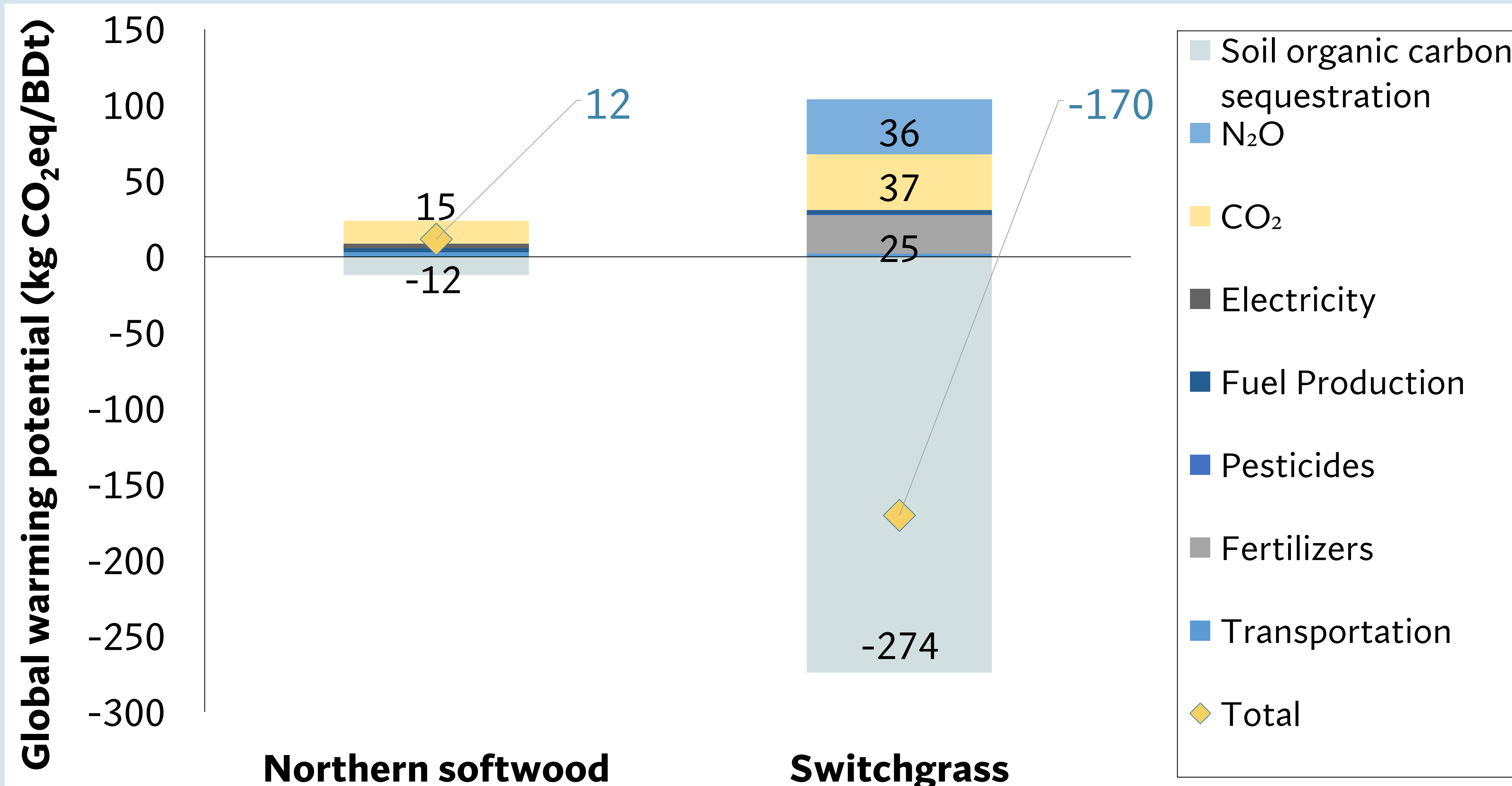
This assessment determines the viability of switchgrass-based mechanical pulp in tissue furnish blends, with the aim of reducing the environmental impact of the pulp and paper (P&P) industry and mitigating climate change challenges.

METHODOLOGY

- System Boundary: Cradle to pulp mill gate. Time horizon: 100 years.
- Below-ground biomass calculations: root-to-shoot ratios.
- Total carbon inputs to soil: Coarse roots and rhizodeposition^[1].
- Stabilization factor or C root inputs: 0.15^[2].
- Time considerations: inclusion of GWP-biogenic factors for tissue applications^[3].
- Software and methodology: Open LCA, WinGEMS, TRACI V.2.



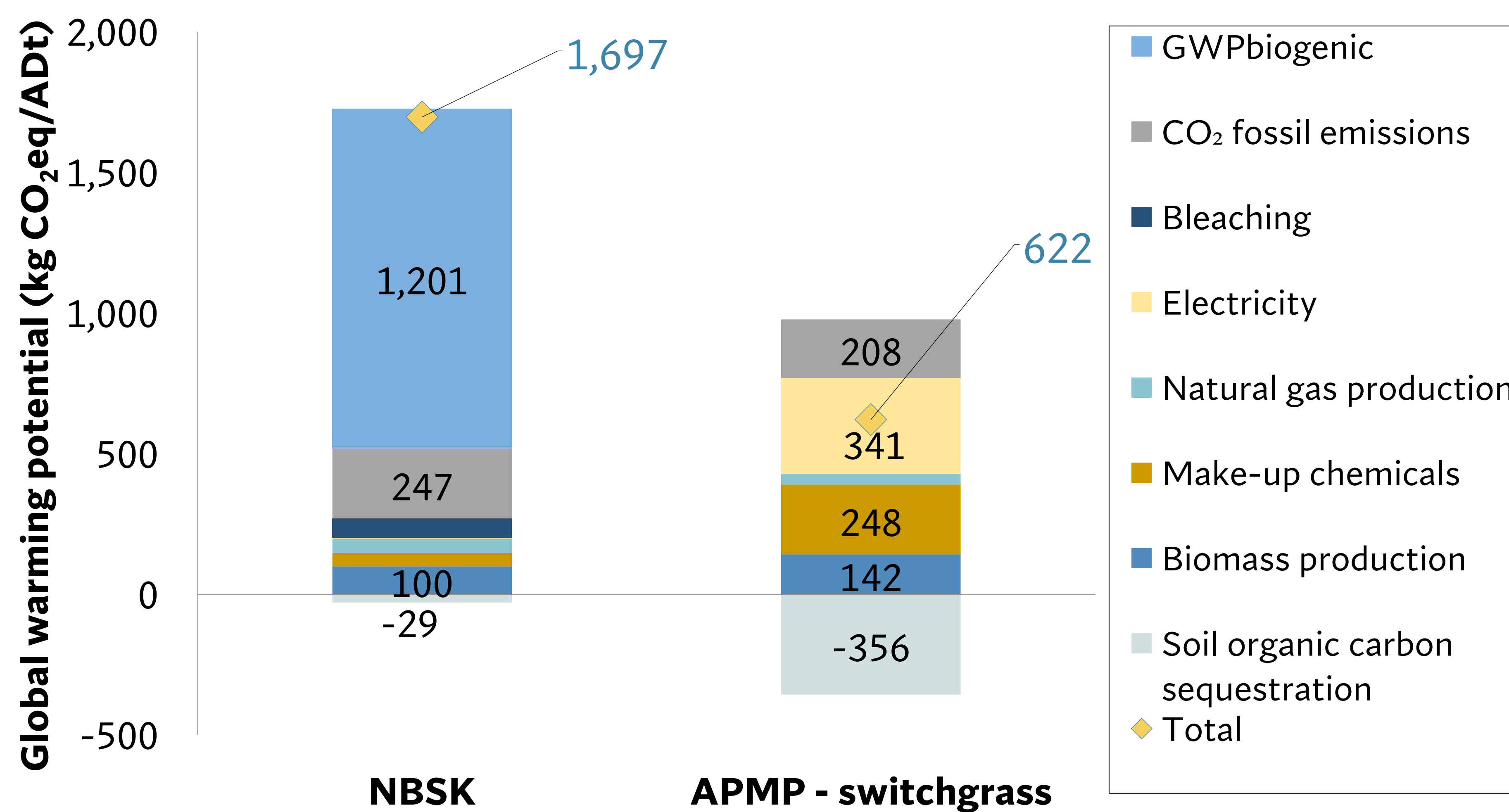
BIOMASS ASSESSMENT



Perennial grasses, with their deep root systems, annually contribute more carbon to the soil compared to saturated ecosystems like northern softwood forests.

This biomass offers a dual benefit: enhancing soil fertility on degraded land and serving as a renewable resource for the P&P industry.

PULP PRODUCTION ASSESSMENT



Long-rotation biomass systems like northern softwood require many years to sequester the carbon dioxide removed during logging. This issue is further compounded when such biomass is employed in single-use products, such as tissue.

Therefore, the extended period of CO₂ retention in the atmosphere leads to a more prolonged and cumulative radiative forcing effect within the designated time frame.

CONCLUSIONS

In this analysis, we have uncovered a substantial contrast in carbon footprints between NBSK and switchgrass-APMP, with the latter showing significantly lower emissions (622 kg CO₂eq/ADt compared to 1,697 kg CO₂eq/ADt). These results underscore the importance of considering factors like soil carbon sequestration and CO₂ re-capture in biomass production systems, highlighting the path to more sustainable choices within the pulp and paper industry.

Ref: [1] Bolinder et al. (2007). An approach for estimating net primary productivity and annual carbon inputs to soil for common agricultural crops in Canada. [2] Berti et al. (2016). Organic input quality is more important than its quantity: C turnover coefficients in different cropping systems. [3] Guest et al. (2013). Global Warming Potential of Carbon Dioxide Emissions from Biomass Stored in the Anthroposphere and Used for Bioenergy at End of Life.