Technische Universität München

Prospective life cycle assessment of innovative wood-based products from post-calamity deciduous pioneer tree species (birch and poplar) in Germany, with a focus on uncertainties

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Background

- Project: REGULUS – LabForest
- AP7: Dynamic carbon (C)- and prospective life cycle assessent of wood products
- Real-world laboratory in the LMU University Forest near Landshut
- Threatened resilience and productivity of forests by increase in extreme events induced by climate change.
- Ecological and economic impacts from various forest management strategies after a simulated disturbance.
- Pioneer species as cheap and robust natural regeneration with protection function for other sensitive tree species
- Possibilities of the material wood use of such pioneer tree species not exhausted so far.

(Fotos: © T. Thymian; G. Weber-Blaschke 2025)

Goals

i) To assess the environmental impacts of several innovative wood-based products from two post-calamity pioneer species (birch and poplar) in Germany by conducting a cradle-to-gate prospective life cycle assessment (pLCA).

ii) To identify the various types and sources of uncertainty and to understand their impacts on the results by conducting a quantitative uncertainty analysis.

Research Questions

- What are the potential environmental impacts of the innovative utilization pathways from post-calamity naturally regenerated birch and poplar in 2040 ?
- Are there any trade-offs between the impact types?
- What are the types and the main sources of uncertainty given the modelled future scenarios, and how can they be reduced?
- How do these uncertainties affect the study results?

Products life cycle analysis

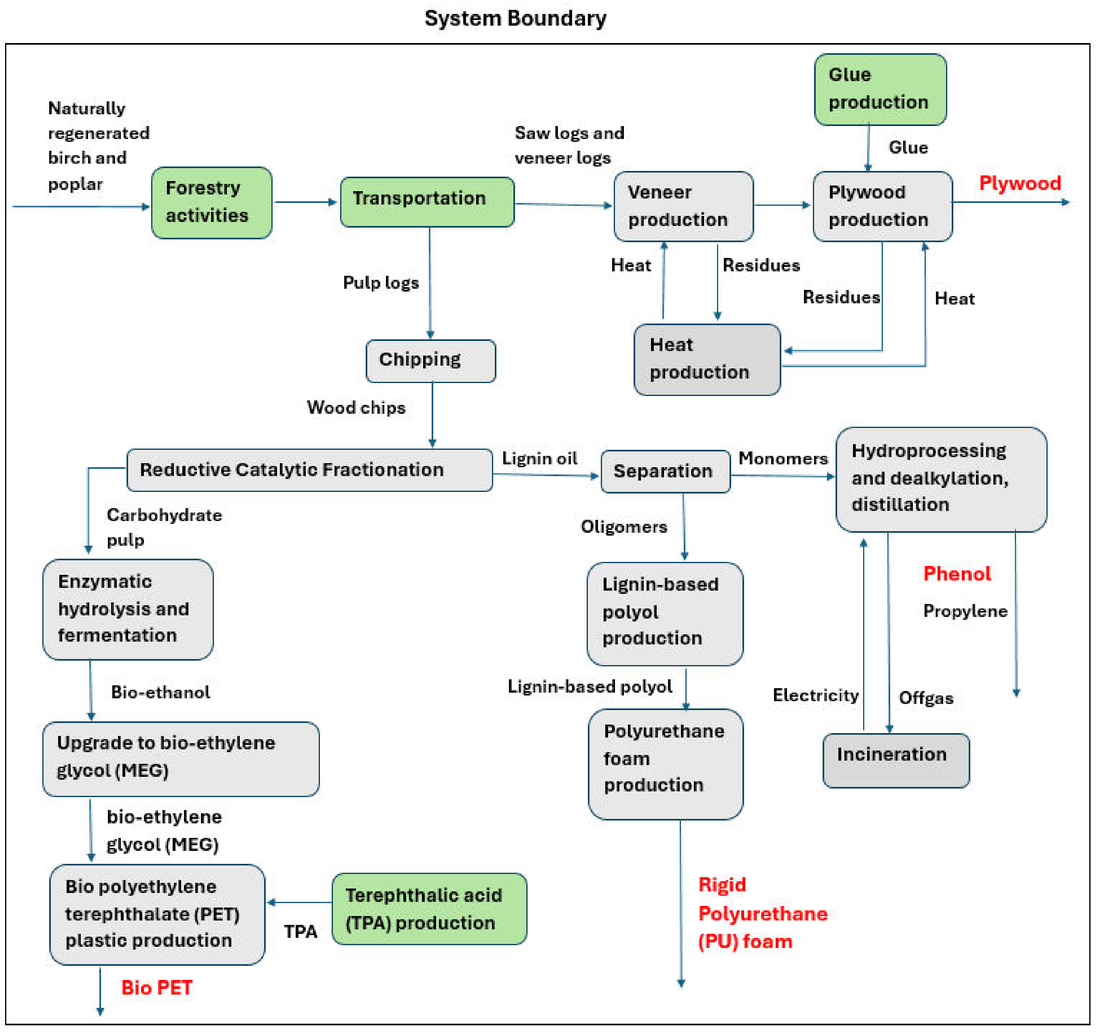

Figure 1. A simplified flowchart of the system under study, illustrating the main processes from forest management to the production of the four selected products. The green boxes represent background processes, and the grey boxes represent foreground processes. Note: not all inputs and outputs are shown.

Declared units:

- 1 m3 plywood,
- 1 kg lignin-based phenol
- 1 kg bio rigid polyurethane (PU) foam
- 1 kg bio-polyethylene terephthalate (PET) plastic

System boundary:

- Cradle-to-gate

Data sources:

- Ecoinvent database, literature, expert interviews, documents and reports

Allocation:

- Mass, Economic

Uncertainty Analysis

Scenario uncertainty

- Allocation method, electricity mix, plywood glue type, solvent type for the reductive catalytic fractionation process, and metal catalyst type.

Parameter uncertainty

- The most important parameter uncertainties and the uncertainty ranges are currently being identified.

Project: LabForest REGULUS Regionale Innovationsgruppen für eine klimaschützende Wald- und Holzwirtschaft

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