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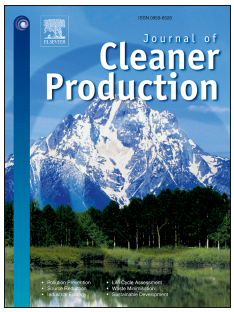

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Sustainable Logistics Network for Wood Flow Considering Cascade Utilisation

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Abstract.

To address the growing demand for wood as a renewable resource, a trend that has arisen in recent years is to follow the principle of cascade utilisation and to use wood residues from by-products. The cascading principle represents a method supporting resource efficiency through the sequential use of the remaining quality resources from previous commodities and substances. The logistics concept deserves special attention with respect to the utilisation of wood resources and the cascading principle as logistics processes constitute the largest share of costs.

This work considers a logistics network for wood flow for different products in various sectors. Examples include a logistics network for particle board in the material-based sector, pulp and paper production in the chemical sector, and wood pellets production in the energy sector using cascade utilisation and recovered wood. A transportation problem is modelled using a mixed-integer linear programming (MILP) model, and it is applied to a case study in Lower Saxony using the software CPLEX v12.5. The aim is to minimise the total logistics costs of a logistics network, including those associated with harvesting, chipping, storage and transportation, for several companies in different sectors. UMBERTO, a life cycle assessment (LCA) software, is used to investigate the potential environmental impacts of the optimised logistics network. The approach is applied to three scenarios in Lower Saxony, a state in Germany. The initial results indicate that the total cost of the considered wood logistics network does not change significantly for the cascading scenarios in comparison to that associated with fresh wood, but there would be a substantial reduction in CO_2 emissions if cascade utilisation is used in the logistics network.