

This thesis presents work that was done within the Swedish Centre for Resource Recovery (SCRR). Research and education performed within SCRR identifies new and improved methods to convert residuals into value-added products. SCRR covers technical, environmental and social aspects of sustainable resource recovery.

DOCTORAL THESIS

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Resource Recovery



The transition toward sustainable and efficient waste management requires innovative solutions for industrial waste. Anaerobic digestion is a well-established technology for organic waste treatment, yet its byproducts, including nutrient-rich liquid digestate and CO<sub>2</sub>, remain significant environmental challenges. This thesis investigates the valorization of these effluents using native Nordic microalgae, presenting a dual-benefit strategy that simultaneously remediates wastewater, captures carbon, and generates valuable biomass for sustainable applications.

By utilizing the natural resilience of local microalgal strains, this research moves beyond traditional waste treatment approaches to achieve efficient assimilation of nitrogen, carbon, and phosphorus. Through a series of investigations ranging from initial strain selection across diverse industrial sources like chicken manure and pulp and paper sludge to using bench-scale photobioreactor configurations using municipal sewage sludge, this work identifies the biological and technical keys to effective resource recovery. The study examines how nitrogen content, light, CO<sub>2</sub> concentrations, and different reactor designs influence the balance between effluent remediation and biomass production.

Ultimately, the characterization of the produced biomass highlights the potential of native Nordic strains to serve as a sustainable biological resource. This research provides valuable insights for integrating microalgal biotechnology into sustainable waste management while further research is required to evaluate the technical and economic viability of specific biomass applications.

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*Nordic Microalgae-Assisted Valorization of Anaerobic Digestion Liquid and Gas Effluents*



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