CICAT 2025

Finnish Nutrient Recycling as a Circular Economy Ecosystem: Actors and Catalysts

Nutrient recycling

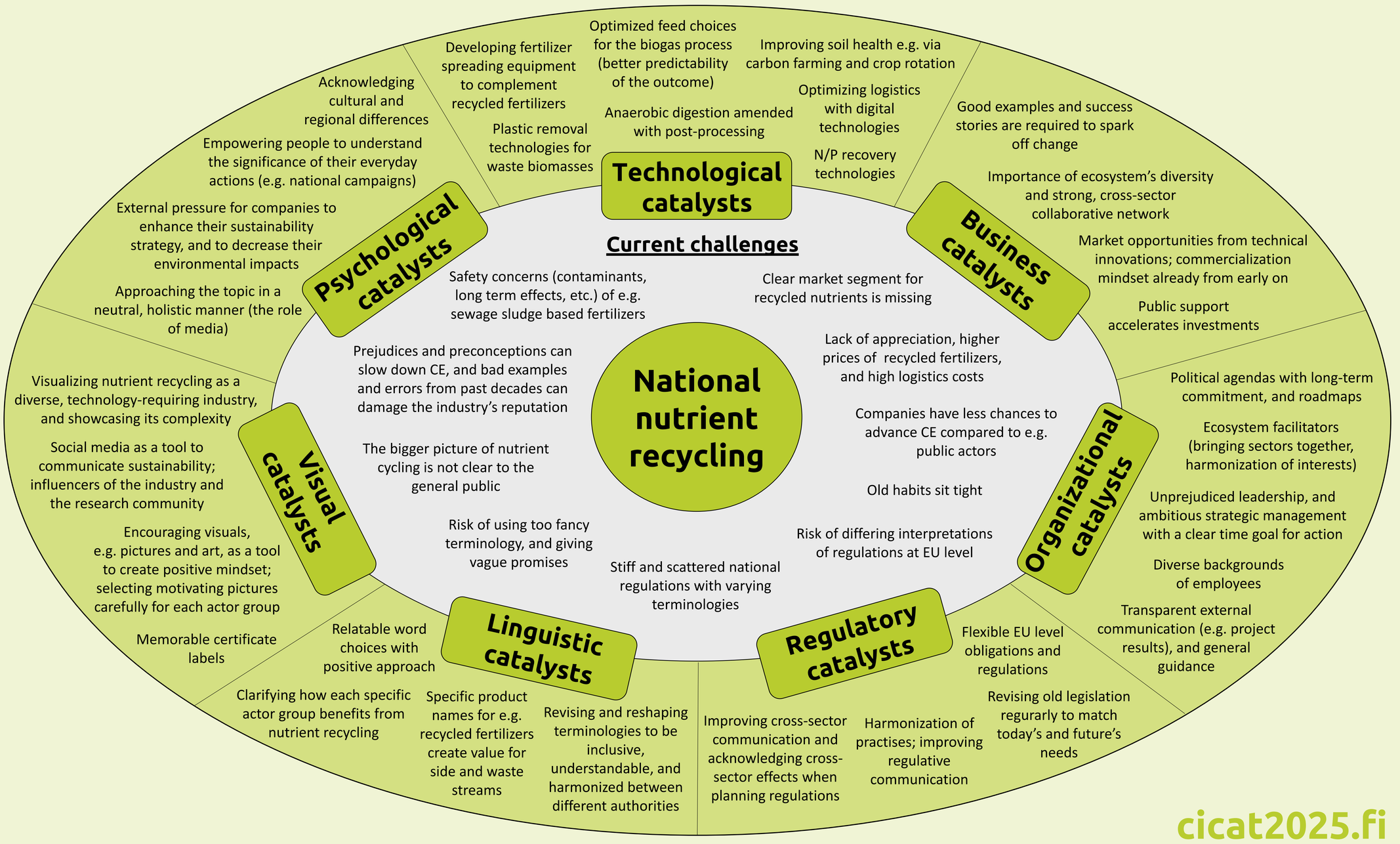
Cycling of nutrients, such as phosphorus (P) and nitrogen (N), is one of nature's supporting ecosystem services and essential for all life on Earth. In a societal setting, nutrients are crucial for securing the food system and valuable raw materials for industrial processes. However, global P reserves are diminishing, and fixing N from the atmosphere adds to the already alarming levels of greenhouse gases. In order to operate within the planetary boundaries, recycling nutrients from various side and waste streams and utilizing recycled instead of virgin nutrients has become of great interest. There are diverse barriers and drivers for human and societal action for increased nutrient recycling. In this study, the diverse actors that are able to contribute to nutrient circulation are considered as a circular economy ecosystem for nutrient recycling.

This poster summarizes the findings of a qualitative case study, which examined nutrient recycling of P and N in a Finnish context, focusing on three societal biomass sources: biowaste, agricultural biomasses, and sewage sludge from municipal wastewater treatment. Diverse actors from the national nutrient recycling ecosystem were interviewed (N = 22), with an aim to shed light on the catalyzing forces that advance sustainable recycling of nutrients.

Ecosystem actors and catalysts

The ecosystem of nutrient recycling extends throughout the society and includes multiple actor groups, such as municipal waste and wastewater treatment facilities, biogas producers, farmers, fertilizer manufacturers, food and processing industry actors, media, consumer-citizens, authorities, interest groups, and research organizations.

Diverse, multi-disciplinary catalysts and synergies of catalysts are needed for different actor groups to adopt and advocate CE and nutrient recycling. For example, various technological improvements, such as more efficient P and N recovery processes, and better compatibilities of the recycled fertilizers and the fertilizer spreading equipment on farms, are required. However, technical feasibility alone is not enough to guarantee sustainable nutrient recycling, but socio-cultural support and favorable regulatory environment are also necessary. The catalysts for nutrient recycling range from more flexible legislation, ecosystem facilitators, and supportive political agendas to unification of terminology, carefully selected visuals in articles and holistic understanding of nutrient cycles. Combined, these catalysts provide a comprehensive toolbox for understanding the mechanisms that determine the recycling of material streams and shape the future of nutrient recycling.



cicat2025.fi

Eeva Pohls (eeva-leena.pohls@tuni.fi), Marika Kokko (marika.kokko@tuni.fi), Leena Aarikka-Stenroos (leena.aarikka-stenroos@tuni.fi)

strategic RESEARCH · ACADEMY OF FINLAND · Tampere University · UNIVERSITY OF EASTERN FINLAND · JYVÄSKYLÄN YLIOPISTO UNIVERSITY OF JYVÄSKYLÄ · UNIVERSITY OF TURKU · Tampere University of Applied Sciences · TURKU AMK TURKU UNIVERSITY OF APPLIED SCIENCES