BioLoop: Decision support model for BIOmass LOgistics OPtimisation

Background

Flanders is advancing towards a biobased economy, capitalizing on its expertise in biomass valorization, green chemistry and industrial biotechnology. The region boasts significant biomass resources and expertise in processing these materials across various applications. However, large quantities of biomass remain underutilized due to challenges such as seasonality and logistic hurdles. Efficient mobilization and a well-organized supply chain are necessary factors to enable the valorization of residues into products with added value. Given its strategic location in Europe, Flanders is poised to leverage its logistical infrastructure and knowledge to turn bioeconomy innovations into viable economic models.

Project Overview

BIOLOOP is an Inter-cluster Strategic Basic Research project that aims to establish a knowledge framework that enables the design and optimization of biomass-based supply chains in Flanders. The project will analyze how key factors, ie. technological, economic, environmental and social factors, impact the mobilization of residual biomass and how to shape both existing and new supply chains. This knowledge will feed into the creation of four robust decision support models (DSMs) that will aid in simulating and optimizing biomass feedstock logistics. The DSMs will optimize logistics for multiple feedstocks and applications while integrating sustainable practices, circular economy principles and innovative collaboration models, in consultation with industrial advisory board and spearhead cluster organizations.

BIOLOOP aligns with Flanders' ambitious plan to catalyze the transition towards a biobased economy, leveraging the region's extensive expertise in biomass valorization, green chemistry and industrial biotechnology. By optimizing biomass supply chains, BIOLOOP will enable the deployment of existing and emerging technologies for biomass valorization, supporting the creation of new supply chains or the improvement of existing ones.

The goal of the BIOLOOP project

The BIOLOOP project aims to strengthen the connection between supply and demand, paving the way for high-value bio-based applications across a wide range of industries. By leveraging

Flanders' strategic position as a central logistics hub, the project seeks to position the region as a leader in the bioeconomy.

At its core, the primary objective of BIOLOOP is to develop a comprehensive knowledge framework that supports the design and optimization of bio-based supply chains within Flanders. This framework will facilitate better resource utilization, improved efficiency, and a more effective alignment of supply chain dynamics with market needs.

To ensure long-term impact, the project integrates circular and sustainable principles into its approach. It also explores innovative business models and collaboration strategies that foster partnerships across industries and stakeholders. By addressing these critical aspects, BIOLOOP not only enhances the regional bioeconomy but also contributes to a more sustainable and circular future.

Impact and Benefits

BIOLOOP will significantly advance Flanders' transition towards a biobased economy by:

- Enhancing the mobilization and utilization of underutilized biomass resources.
- Creating efficient and sustainable biomass supply chains.
- Supporting the development of new business models and collaboration strategies.
- Maximizing resource use through a cascading biorefinery approach.
- Contributing to the region's economic growth by turning bioeconomy innovations into viable economic models.

Key Milestones

1. **Defining Input Parameters**: Identify and prioritize the most decisive techno-economic, environmental and social criteria to improve biomass demand-supply matching.
2. **Developing Optimization Models**: Integrate circularity and collaboration concepts into a multi-objective optimization model for bio-based supply chain design.
3. **Validating Models**: Apply and validate the BIOLOOP DSM through three case studies, optimizing logistics chains from biobased raw materials to high-value end products.
4. **Assessing Collaboration Options**: Explore novel collaboration and gain-sharing models for biomass mobilization and logistics.

5. **Evaluating Model Complexity**: Compare outcomes of different model complexity levels to identify the trade-off between effort and prediction power.

Target Audience

BIOLOOP will benefit a wide range of sectors and companies, including primary producers, waste managers, biomass connectors, food processing companies, retailers, chemical companies, technology providers for bio-energy, fertilizer and substrate companies, animal feed and food companies

Timeline

1/5/2024 – 30/4/2027

Partners

Ghent University

- Prof. Katleen Raes – Research Unit VEG-i-TEC, Faculty of Bioscience Engineering
- Prof. Ramon Ganigué - Center for Microbial Ecology and Technology – Faculty of Bioscience Engineering
- Dr. Nathan De Geyter – IOF-consortium End-of-Waste
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