BrightCon

20.-25.9.2026
Aalborg (DK) / Online

organized by: DÉPART DE SENTIER, AALBORG UNIVERSITY

sponsored by: One Click LCA, 2-0 LCA, ecoinvent

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Modeling competition for biomass in a constrained bioeconomy

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23/09/2026

LCA4bio

Funded by the European Union

LIFE CYCLE SUSTAINABILITY

Project funded by the European Union with the number 101135371

Agenda

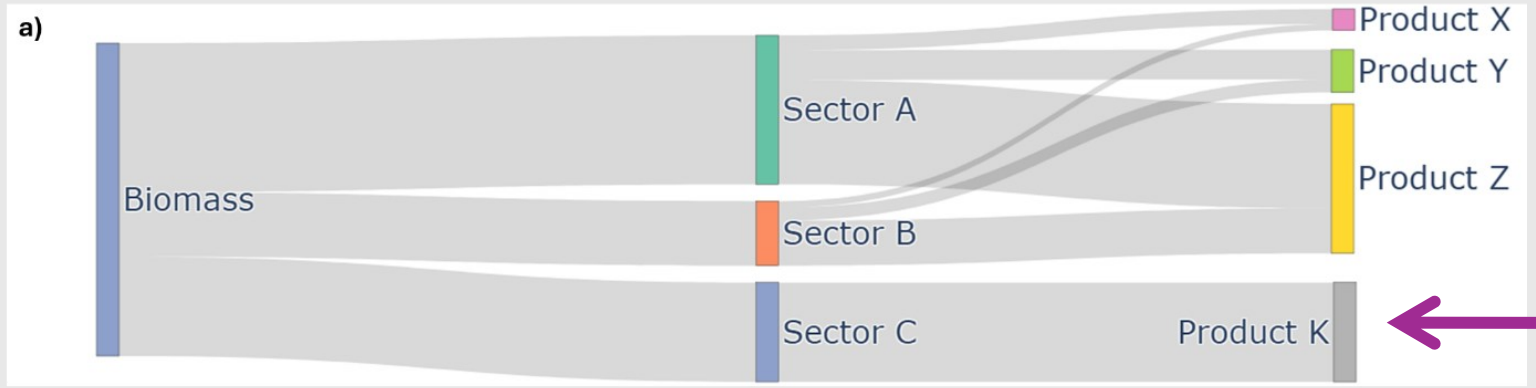
1. Objective of the model (3 min)
2. Potential applications (2 min)
3. Model settings (5 min)
4. Hands on group work (25 min)
5. Q&A, futures, wrap up (10 min)



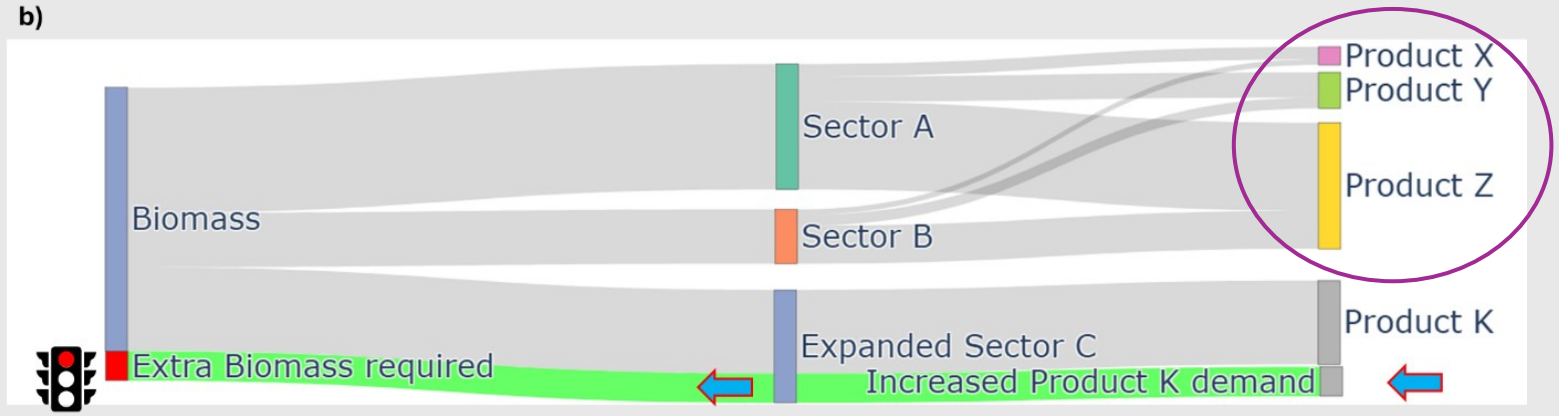
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Objective: identify the market mix for biomass

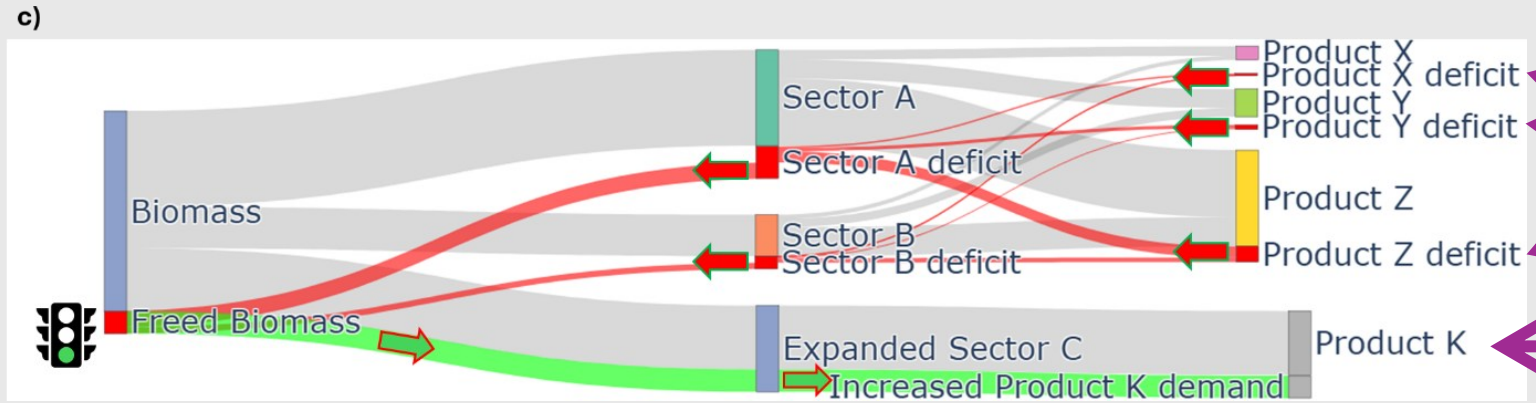


Target product



Competitors

To be **minimized**



Resulting deficit in competitors

Supply matching demand

Potential applications

1) Add emerging products to the bioeconomy

2) Identify potential suppliers of biomass as feedstock – based on absolute availability

3) Quantify their potential to cut production – incurring deficit

4) Minimize deficit across products (unintended consequences)

5) Identify different marginal mixes variation depending on the scale of the new demand

6) Upcoming: prospective applications with future state of the bioeconomy and future demand

Key features

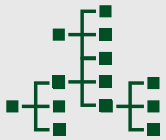
Database



Sources



Sectors



Absolute mass flows



Absolute constraints



The computational core

- Network mapping

The supply chain from final product to primary sources is backtracked nodes to identify competitors (shared nodes)

- Optimization

An objective function is set, subject to balancing, bill of materials, and co-production constraints

- Resolution

The solver generates a new network and details on the affected flows

- Tweaks

Some extra features for fine-tune modeling

The basics: key parameters



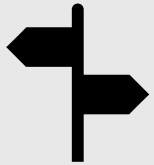
1) **Class**: primary sources, intermediate nodes, or outputs – what leaves the bioeconomy system



2) **Target**(s) and **new demand**(s): what you want to model, and how much do you need



3) **Exclusions**: protect flows from cuts or surpluses

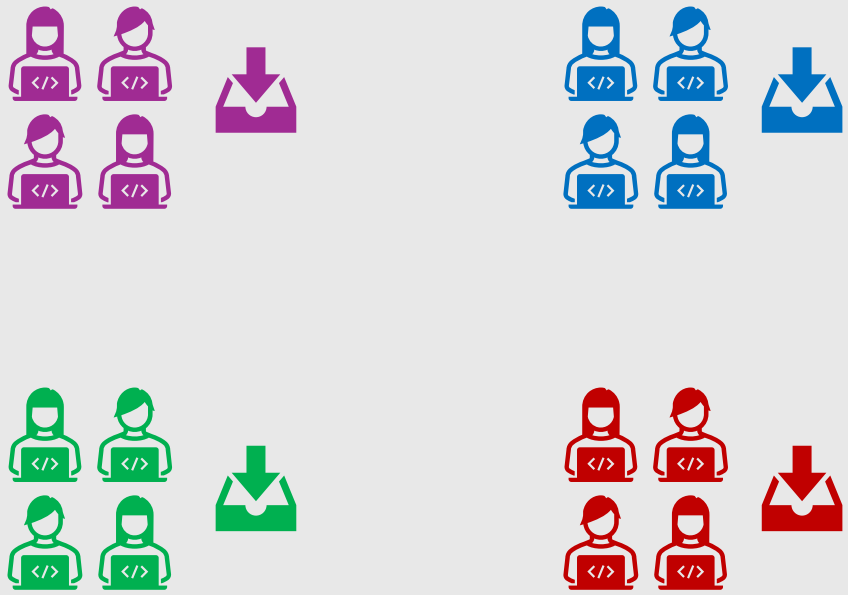


4) **Special rows**: these are commonly loss flows occurring during conversion, or to prioritize some flows over others

Now let's try it 💪

1. Download the library – we'll skip the matrix building
2. Download the database – check out the matrix
3. Open the notebook *3-Demand_competition_examples.ipynb*
4. Have a quick look and update file paths (if needed)

Group work



- You'll be randomly assigned to a group
- Familiarize with the guided examples available in the notebook
- Try to solve the task
- Investigate alternatives
- Interpret the results
- Draft a potential substitution pathway based on the results

Task by group

Use crop ***residues*** (pick one crop) as feedstock to produce a biochemical dye

Take the feedstock from the pool of residues already harvested

Add a flow to represent the loss within the chemical process based on a yield of choice



Use ***Industrial by-products*** to produce a biochemical adhesive. Assume no losses

Prioritize one (or more) of the affected competitors by excluding them from deficits



Use ***Bark*** to produce a biobased packaging material

Add a flow to represent the loss within the chemical process based on a yield of choice

Link the loss flow to the ***Woody biomass for energy*** node



Use ***Root crops*** and ***Bark*** (1:2 fixed ratio) to produce a biobased fiber (zero losses)

Prioritize one (or more) of the affected competitors by excluding them from deficits



Identify marginal suppliers and quantify their potential deficit

Try different demands: e.g. 10 kt, 100 kt, 1000 kt

Interpreting the results

- What's a deficit?
- Now what?

Extra: exploring alternatives

1. Alternative pathways? Upstream linkage?
2. Safeguarding strategic products – exclude them from deficits
3. Policy alternatives – e.g., “Food first”
4. Other strategic choices: loosen constraints on exports – or exclude them entirely

Future developments

- Updating structure to ensure seamless flow across database versions
- Implementing prospective scenarios
- Increasing the details (geographic and sector)
- Simplifying linkage with other tools

Wrapping up

The model facilitates the identification of the marginal mix for biomass

The approach relies on an open database

Absolute quantities are utilized, meaning that absolute constraints are modeled

Harmonized dry mass unit facilitates mapping and flows understanding

Towards a less normative approach to marginal biomas mixes

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Thank you!

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