

Safety and Sustainability – Assessments and Methodologies used in PERFECOAT

Kamal Azrague

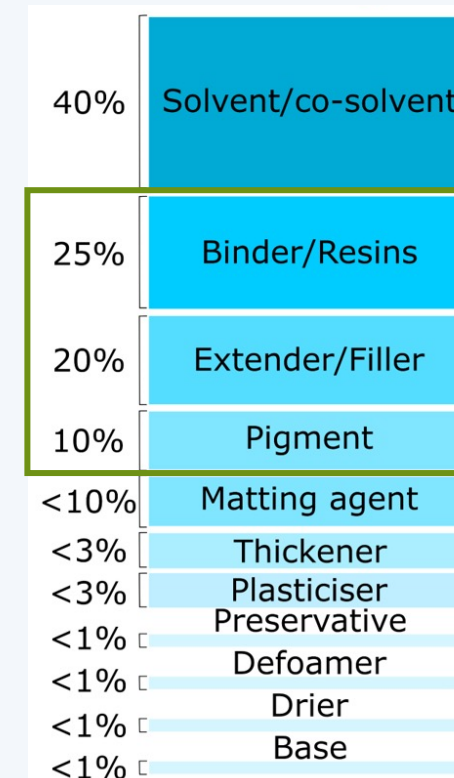
Andy Booth

Assiya Kenzhegaliyeva

Objectives

- The PERFE COAT goal is to develop and validate a **new generation of industrial wood and decorative coatings** with **at least 25% bio-based components** that **meet and even surpass the current quality and sustainability** of fossil fuel coatings.
- **Starting with a very high initial bio-based content of close to 100%** (lignocellulose and marine residues), the project applies **biotechnology to produce various building blocks** (e.g. microbial polymers, lipids, terpenes, pigments, and cell mass from biomass sugars, as well as biopolymers)
- Throughout the development, **skin sensitization and leachate tests, and life cycle assessments (LCA, LCC and social LCA)** have been used to **evaluate the safety and sustainability of bio-based ingredients and coating formulation**. The aim is to **guide and quantitatively demonstrate the sustainability improvements** achieved with the bio-based coating **compared to conventional fossil fuel-based coatings** while minimizing risks.

General composition of coatings



The ambition of PERFE COAT is to identify alternatives to replace major components



High Performance Bio-based Functional Coatings for Wood and Decorative Applications

Environmental impacts assessments in Perfecoat: Methodology and preliminary results

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Life cycle Assessment

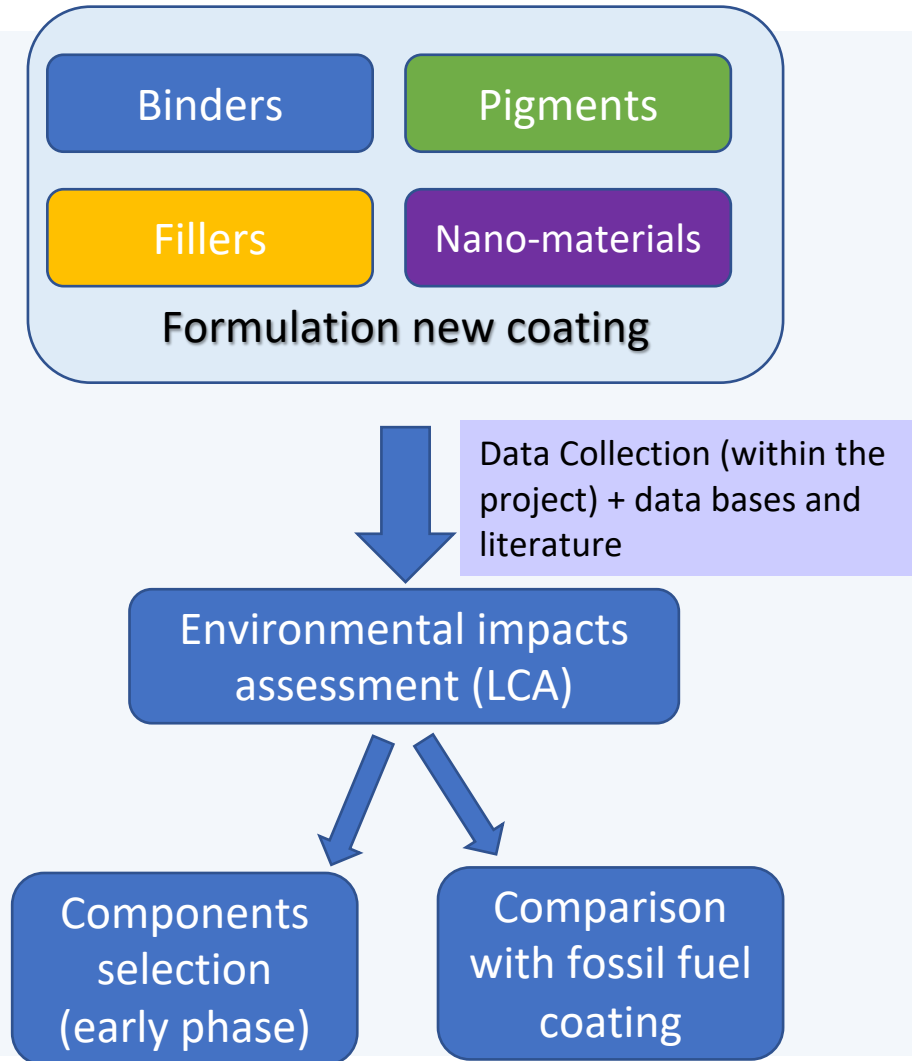
- Environmental Life Cycle Assessment (E-LCA), normally referred to as Life Cycle Assessment (LCA), is a technique that aims at addressing the environmental aspects of a product/service and their potential environmental impacts throughout that product/service's life cycle.
- ISO's standards on environmental management (ISO 14040 and ISO 14044)



Environmental impact (LCA)

Objectives

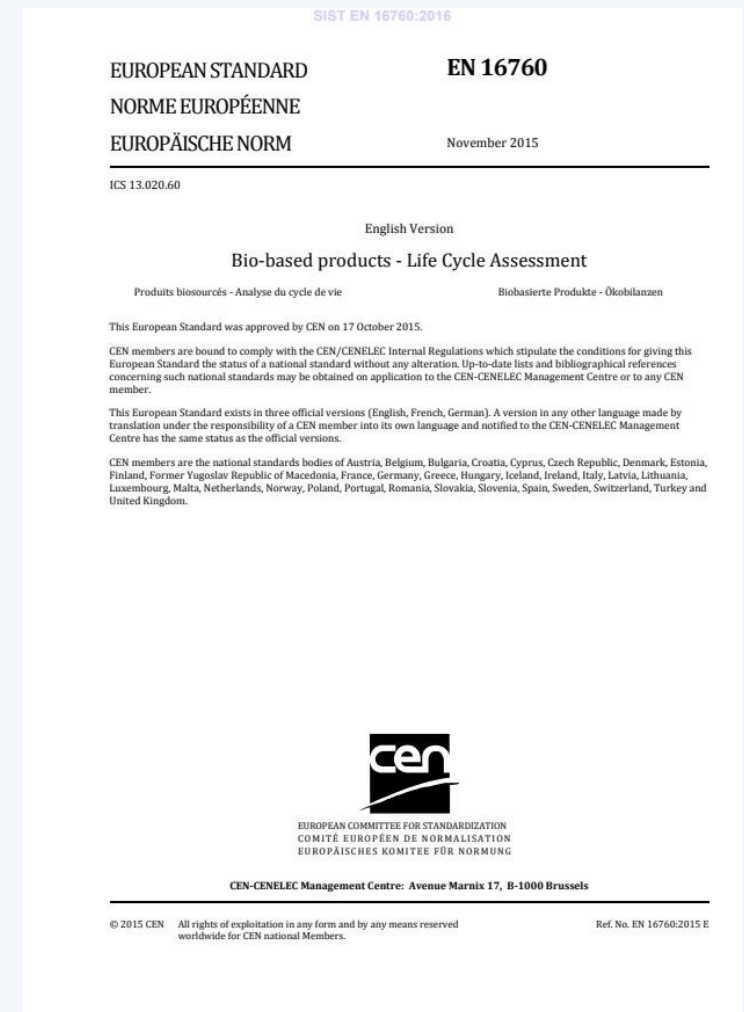
- Life cycle assessment is used to assess the entire value chain (from feedstock to ingredients production and final coating formulations).
- Communicate results to work packages involved in the development to further optimise the proposed strategies with respect to environmental criteria.
- Select components entering the final formulation
- Compare new concepts (ingredients and coatings) with a standard fossil-based counterparts.



Relevant standards

Task 6.2: Life Cycle Assessment

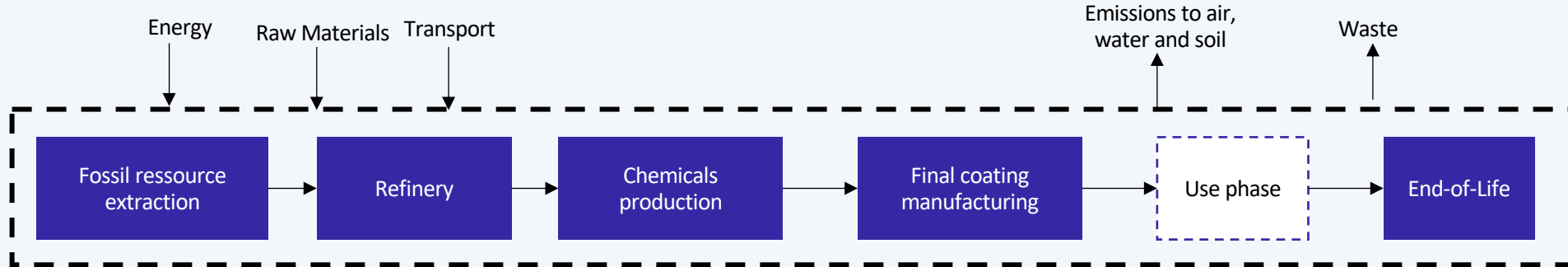
- Literature screening and the review of specific LCA requirements and guidance for bio-based products
 - Standards for bio-based products
 - EN16751:2016 to assess the sustainability of the biomass
 - EN 16760:2015 to assess impacts over the life cycle of bio-based products with focus on the bio-based part of the product
 - CEN/TR 16957:2016 to guide the Life Cycle Inventory for the end-of-life phase
 - ISO 14067 for Carbon Footprint of a Product
 - Reports
 - Scientific papers



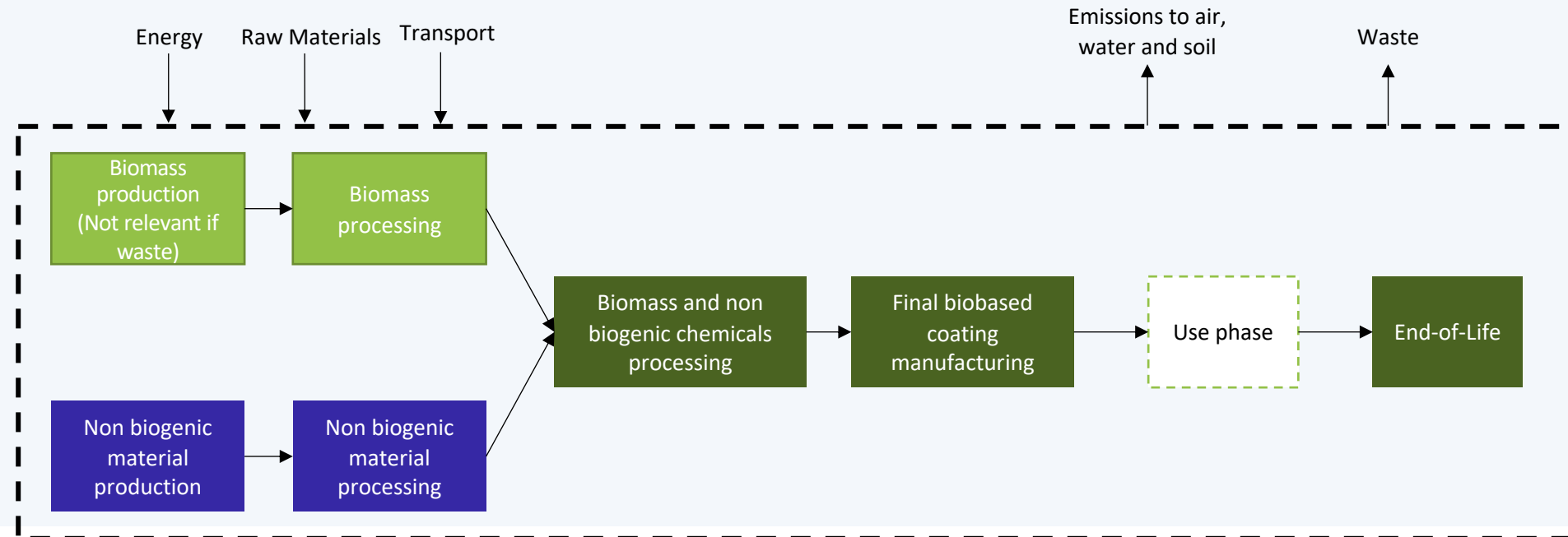
Scope definition

- Analyze environmental impacts of biobased ingredients and new coatings (UV curable and waterborne) and compare them with their fossil fuel counterparts.
- New coating formulations should have similar performance to the existing (fossil fuel) control paints.
- The functional unit of the study is set to 1 kg of product
- Only ingredients present in a quantity greater than or equal to 1% will be included according to UNEP/SETAC guidelines.

System boundary - fossil-based coatings



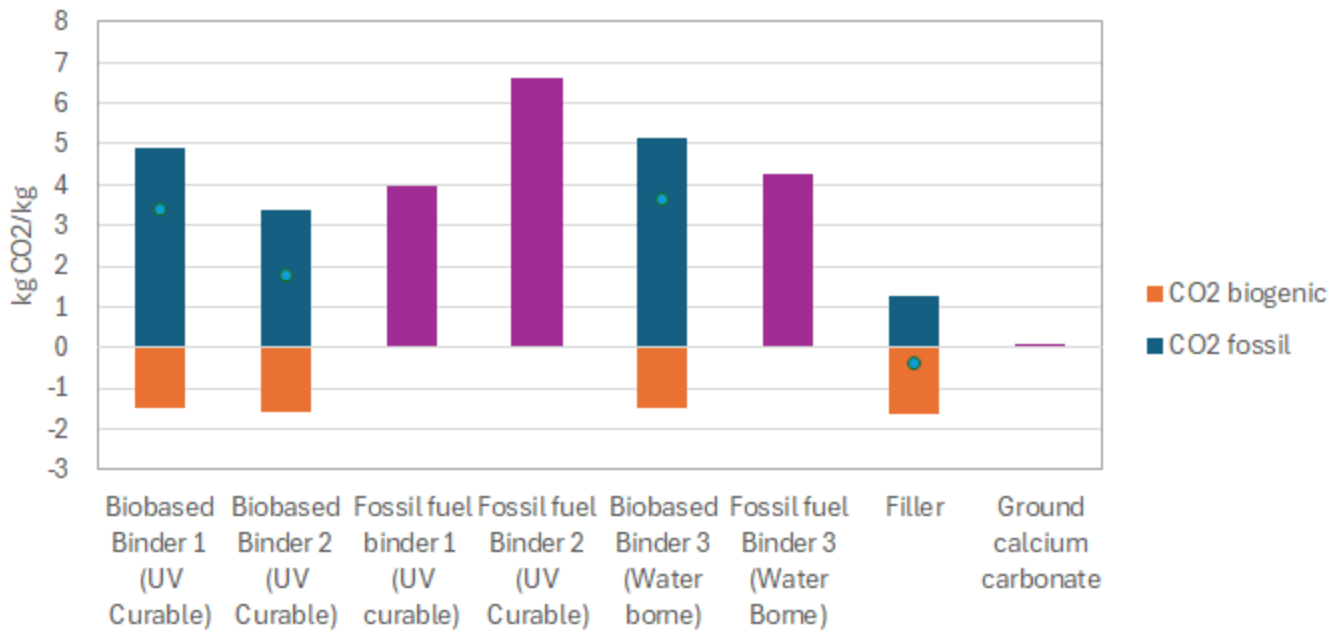
System boundary - bio-based coatings



Life cycle inventory and impacts modelling

- Data was collected from industry partners, laboratory tests and relevant open sources (e.g., Ecoinvent databases, literature, etc.).
- Models have been used to estimate inputs for upscaled production.
- Life cycle impact assessment step was conducted using the software SimaPro and the impact assessment method EF3.0, ILCD 2011 and CML2.
- The greenhouse gases emissions have been the focus so far, but other impact categories are analysed and will be interpreted in a later stage once the final formulations are ready.

Preliminary LCA results on ingredients



- These results are based on estimates from models for industrial production, taking into account possible energy and solvent recovery.
- Chemicals and energy inputs (e.g., compressed air, steam, mixing, and homogenization) are significant hotspots.
- The results are only indicative at this stage as we are still at TRL 5.
- These results are encouraging and indicate that with further optimizations, the new biobased ingredients can outcompete certain fossil fuel counterparts.
- These results will be used to select ingredients for the new biobased coating formulations. In turn, these formulations will be evaluated based on various environmental and economic criteria at a later stage.

Take home message

What can LCA do?

- Understanding your products' environmental impacts and identify hot spots
- Product improvement (eco-design)
- Comparison of products and production routes
- LCA is a powerful tool to ensure environmental sustainability but,
- Keep in mind the uncertainty in the data used especially at low TRL