



Assessing emerging technologies

LCA supporting policies

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76th LCA Discussion Forum

Contents

- EU policy and innovation
- Why is prospective LCA relevant in EU policy
- How can prospective LCA support EU policy
- The Planet Bio Project
- Conclusions and way forward

EU policy drives innovation



Europe Carbon Neutral
2030
EU Green Deal

A European Green Deal

Modernisation and
strengthening EU industry
EU Industrial Policy



Resource Efficiency and
Closed Loops
Circular Economy Plan

Healthy Ecosystems
Sustainable
Development Goals



Sustainable Bioeconomy
Bioeconomy Strategy

Prospective LCA supporting EU policies

EU Green Deal

- **European Green Deal** aims at having Europe as a **climate-neutral continent by 2030**
- **Bioeconomy related innovations** are fundamental to the development of a more **circular and decarbonized economy**

EU Circular Economy Plan

- Essential to ensure at an early stage of development that such **technologies present indeed less environmental burdens** to guide investment and technology deployment towards a sustainable economy

EU Bioeconomy Strategy



Need to ensure the selection of sustainable production pathways from early stages of development

The example of the bio-based industry



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Bio-based Industries Joint Undertaking: a €3.7 billion partnership between the EU and the Bio-based Industries Consortium

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'Several technologies that had achieved commercial scale in bio-based industries would not have passed the research and innovation stages without the BBI JU's support.'

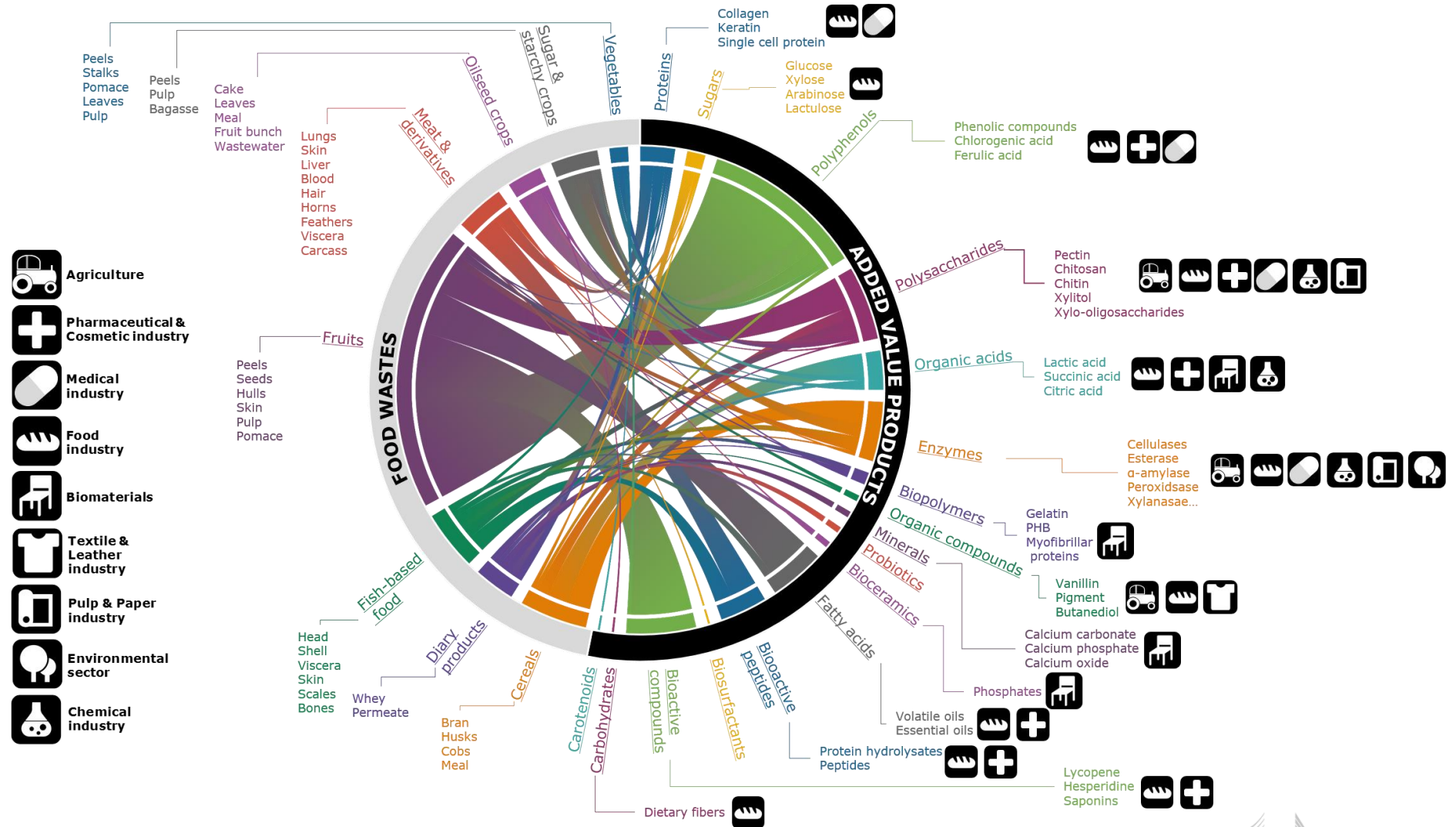


BBI JU found crucial for the transformation of bio-based industries

Read a new scientific article on the impacts of BBI JU.



Multiple valorization pathways e.g. food waste



Aspects to consider to design effective policies



Feedstock security

Techno-economic assessment

Environmental Impacts

Social Impacts

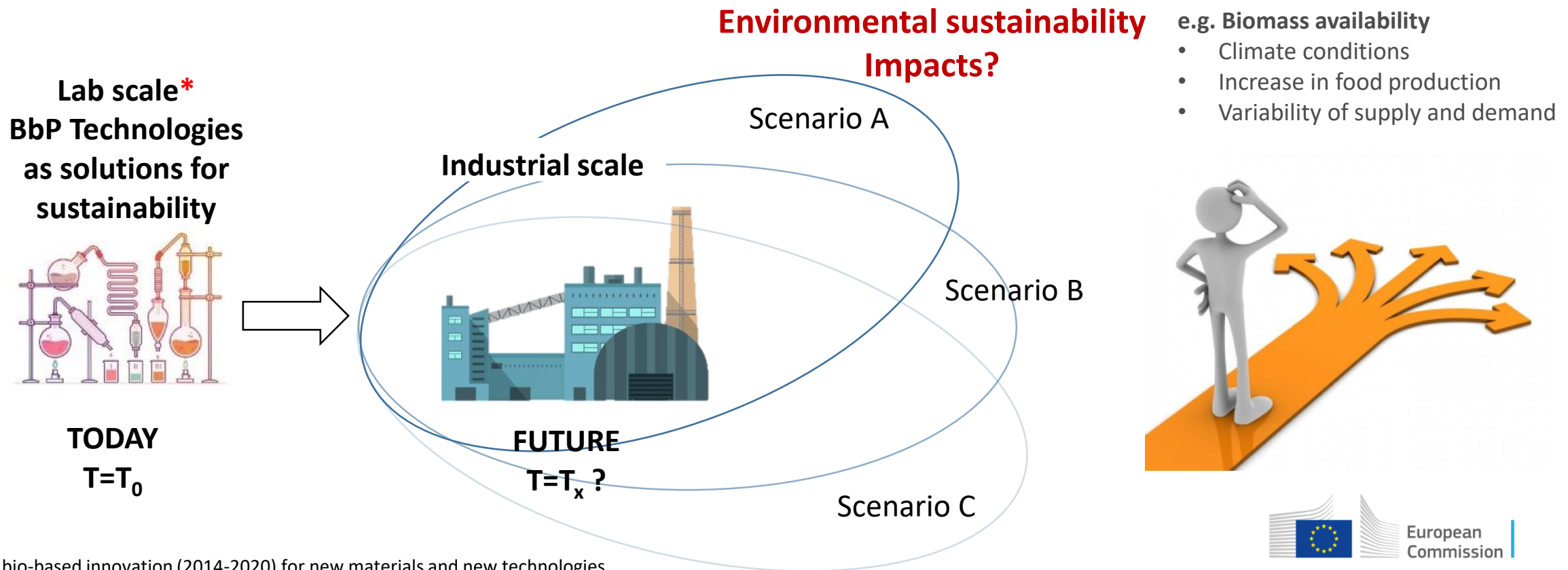
Prospective LCA

Today

Future

Challenges in assessing Innovative and disruptive technologies

Bio-based products (BbP) related innovations are fundamental for the development of a more circular and decarbonized economy



*€3.7 bln in bio-based innovation (2014-2020) for new materials and new technologies

Example of the issue....

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Polymer Degradation and Stability

Volume 144, October 2017, Pages 83-92



Leveraging flame retardant efficacy of pomegranate rind extract, a novel biomolecule, on ligno-cellulosic materials

Santanu Basak, S. Wazed Ali

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<https://doi.org/10.1016/j.polydegradstab.2017.07.025>

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Abstract

For the first time, pomegranate rind extract (PRE), a wastage agricultural product, has been explored as novel **fire retardant** (FR) material. The fire retardancy of PRE has been successfully demonstrated on ligno-cellulosic jute material where it was incorporated at different application pH. PRE contains nitrogenous compounds, polyphenolic components and other metallic elements in the form of salts or oxides. Metallic salts and other polar groups present in PRE help to improve moisture uptake (observed from DSC analysis), **phenolic compounds** present in PRE have improved the smoldering and char promoting behavior. Combinedly all these components present in PRE assisted to exhibit intumescent **condensed phase** mechanism of fire retardancy when it was applied on the ligno-cellulosic material.



- **How much is available, when, and where?**
- **Is there any element which will influence the availability in future?**
- Which are the **biochemical transformation** needed to produce the extract? Is there any alternative pathway for their production?
- Which is the **expected industrial scale** process for the production?
- Which are the current/available **substitute of the new products?** Which are their current environmental impacts?
- Etc...

P_{rospective} L_{CA} for N_{ovel} and E_{merging} T_{echnologies} for B_{IO}-based products



Develop a robust and *highly interdisciplinary* framework for environmental assessment of emerging technologies for bio-based products to support policymakers and industries in the selection of sustainable production pathways

PLANET BIO

PROSPECTIVE LCA



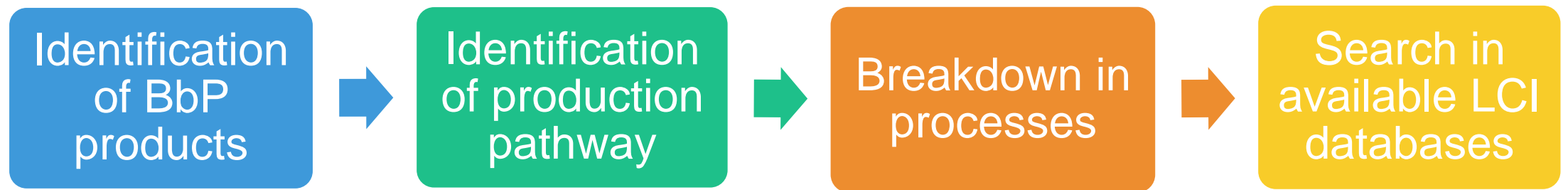
SCENARIO ANALYSIS

- **TASK 1- a) Carrying out a systematic identification and classification of emerging processes for bio-based products production and b) up-scaling approaches** (scale dimension)
- **TASK 2- Developing an approach that enables the modelling of processes that will be at industrial scale in a future time** (time dimension)

Developing scenario analysis by considering several factors that influence the development of bio-based products processes as for example

- biomass availability,
- climate conditions, or
- increase in food production

PLANET BIO (Task 1a)

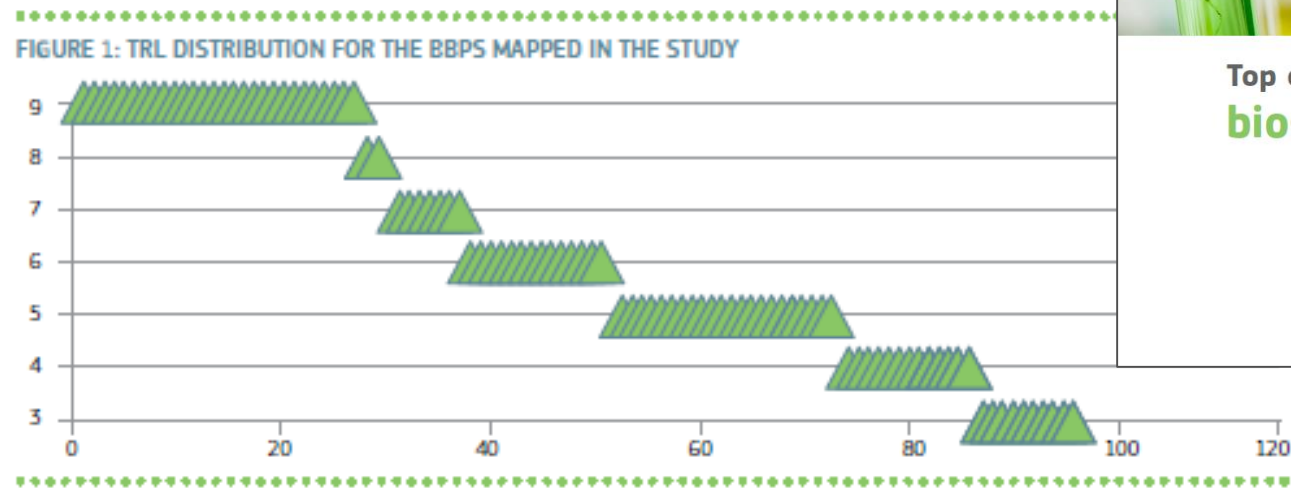


Identify data missing in LCI databases and develop upscale approaches for key processes (Task 1b)

PLANET BIO

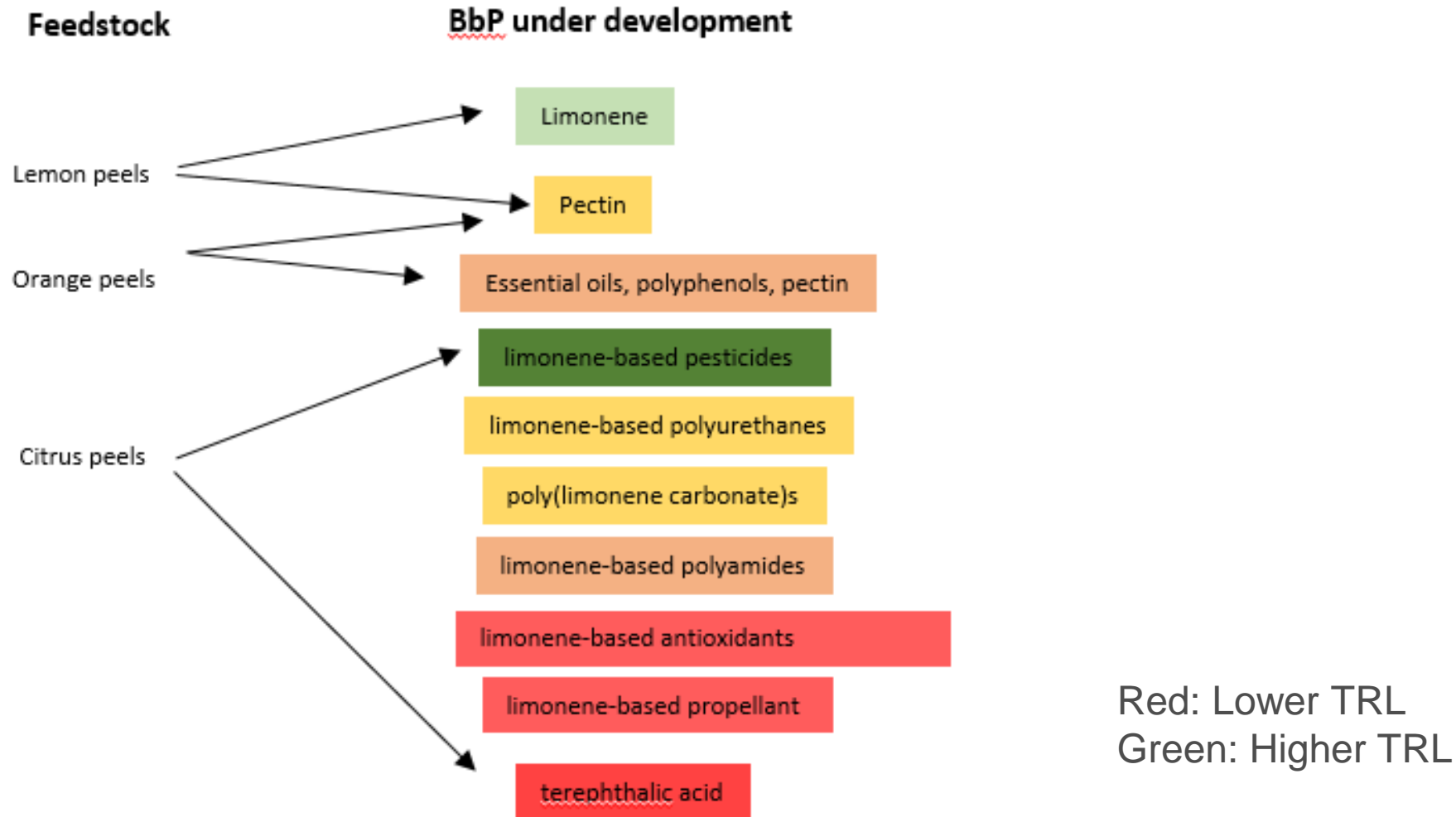
Systematic identification and classification of emerging processes for bio-based products production

- Literature review
- Study developed for DG RTD, coordinated by University of Bologna and other partners



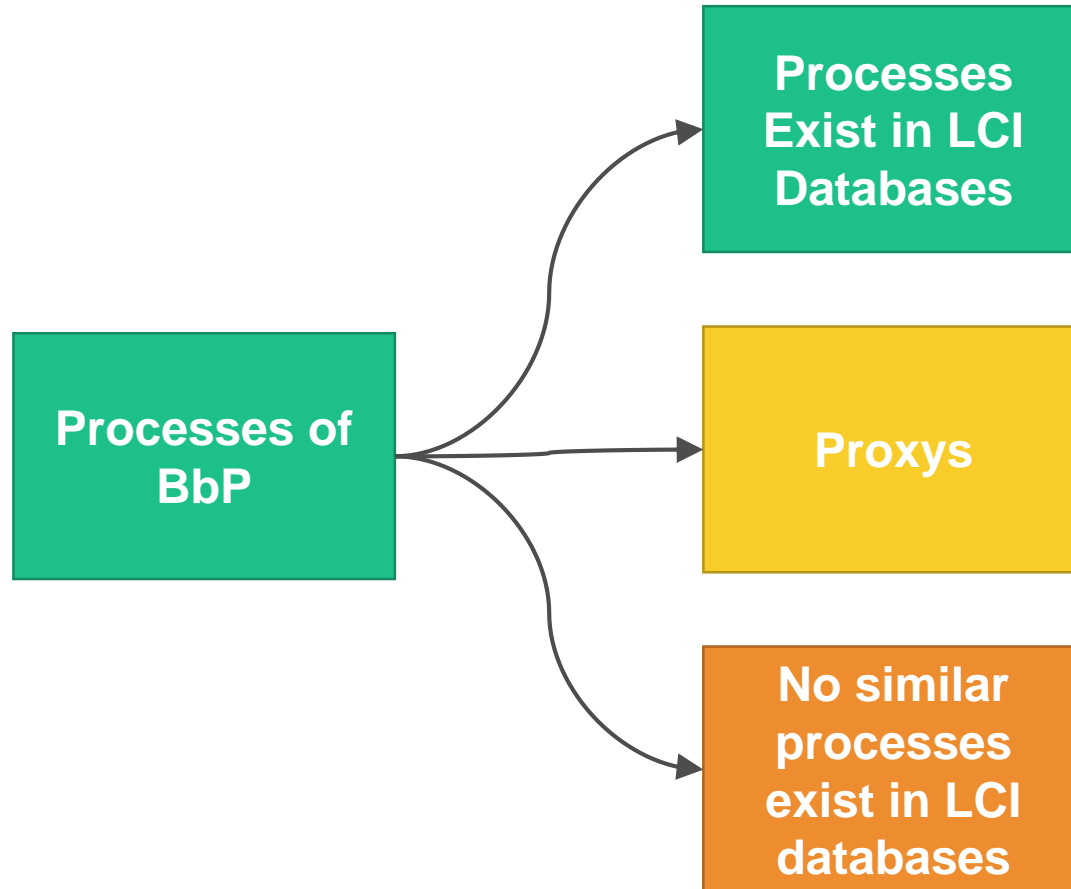
Identification of relevant products from food waste, wood waste and urban waste

Example of products that can be obtained from the food processing industry



Red: Lower TRL
Green: Higher TRL

Search in available LCI databases



- Scan all available LCI databases
 - Ecoinvent 3
 - Agrifootprint
 - USLCI
 - Sphera DB, Professional + Extension databases
- In most, if not all, of the processes, data are illustrated as aggregated results and not as individual processes

Conclusions and way forward

- Prospective LCA might play an important role in informing the design of EU policies that foster a sustainable economy
- It is key to develop tools to support policymakers and industries in the selection of sustainable production pathway, identifying trade-offs and establishing mitigation measures for their reduction
- Several methodological limitations relevant for the goal, scope, and inventory modelling in prospective LCA need to be addressed

Thank you