

From biobased niche to norm?

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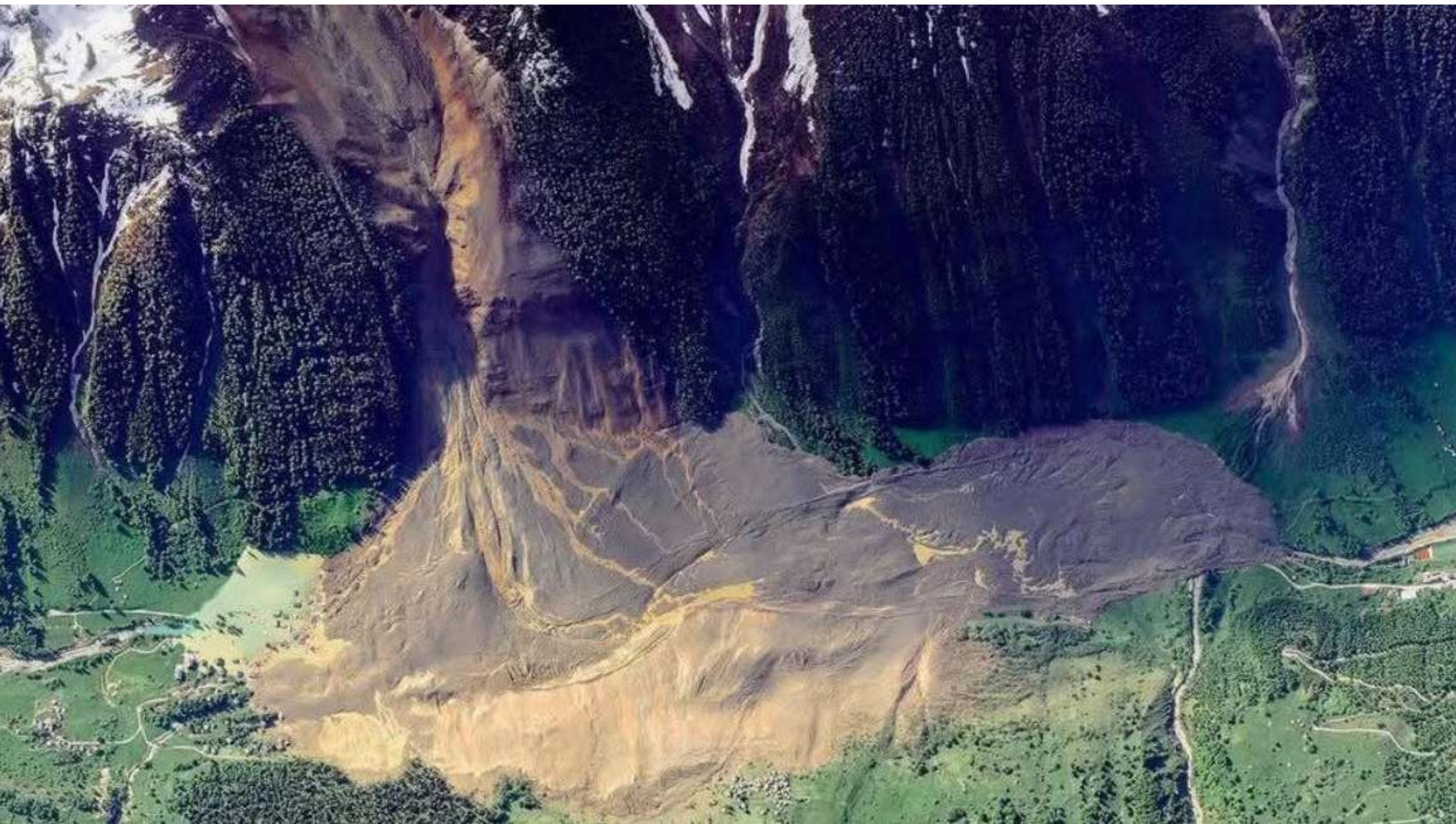
WERKAGENDA
Chemie/Kunststoffen

SAMEN MAKEN WE
MORGEN MOOIER
OVAM



essenscia
Chemistry meets life sciences

vlaanderen-circulair.be 



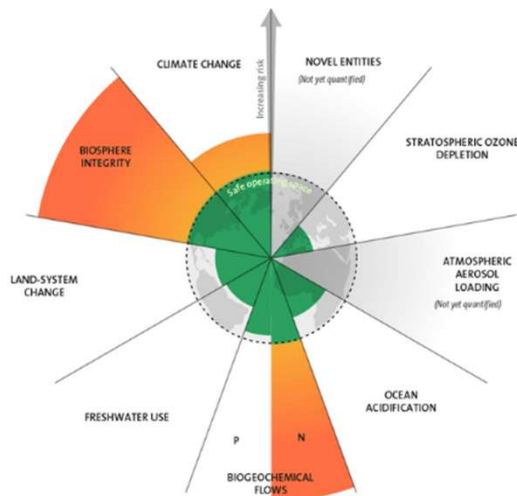


"We are the first generation to feel the effect of climate change and the last generation who can do something about it." - Barack Obama

Planetary Boundaries

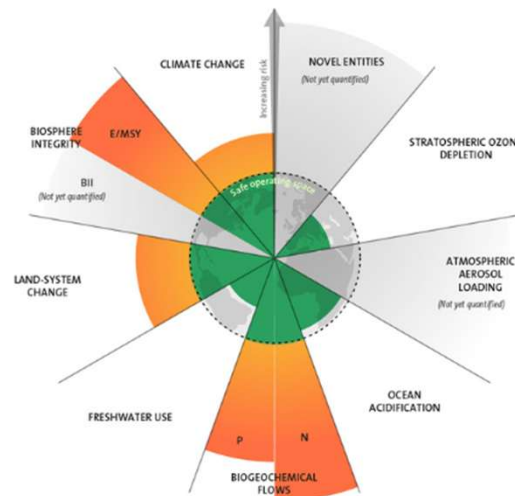


2009



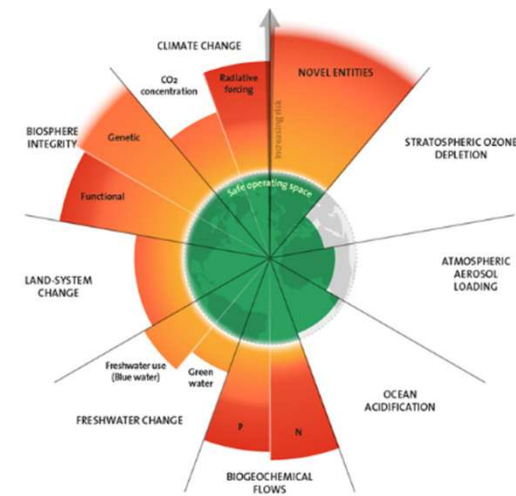
7 boundaries assessed,
3 crossed

2015



7 boundaries assessed,
4 crossed

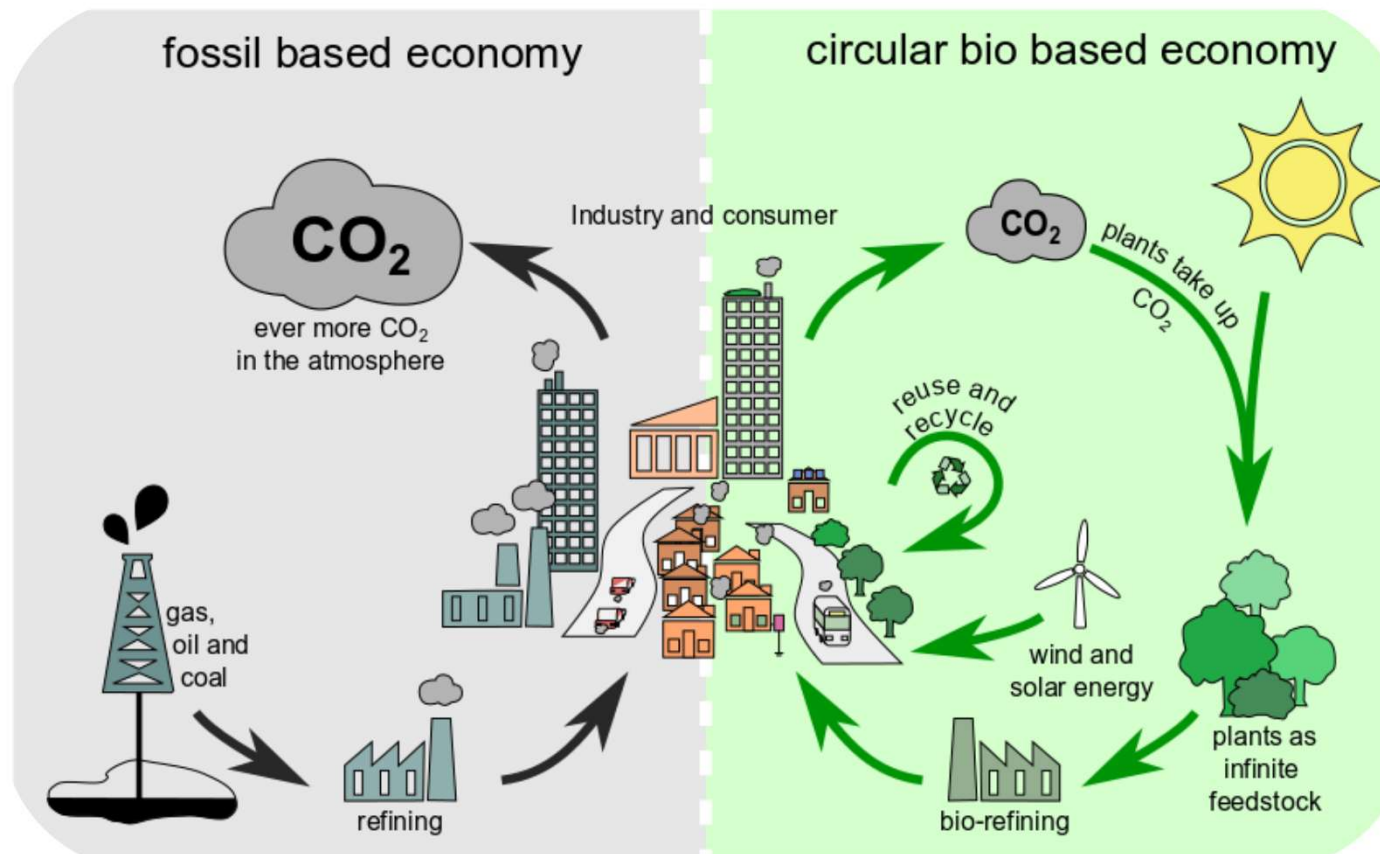
2023



9 boundaries assessed,
6 crossed

The evolution of the planetary boundaries framework. Licenced under CC BY-NC-ND 3.0 (Credit: Azote for Stockholm Resilience Centre, Stockholm University. Based on Richardson et al. 2023, Steffen et al. 2015, and Rockström et al. 2009)

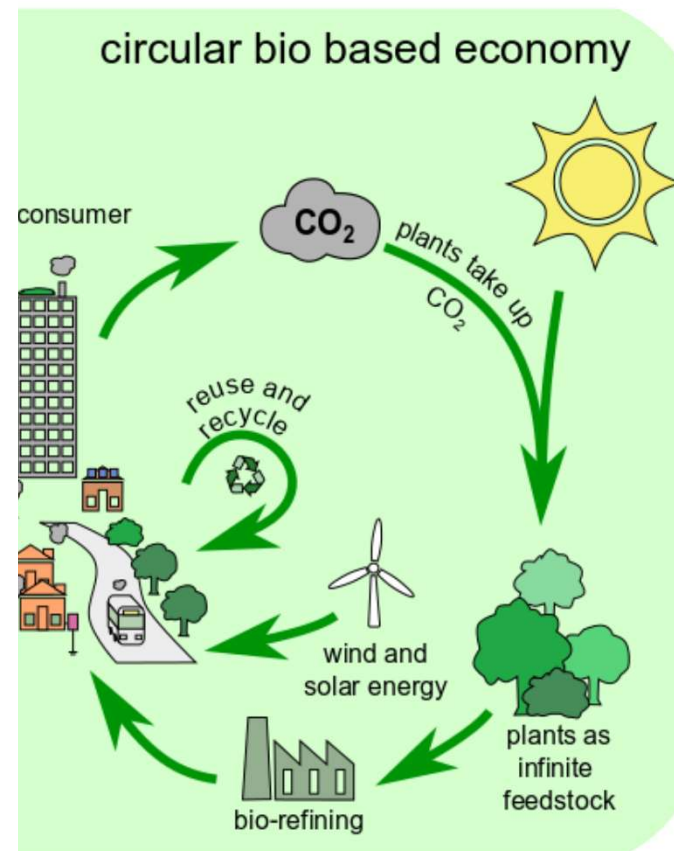
Bioeconomy is part of the solution



<https://www.boerjanlab.be/research/relevance-lignin-research-more-sustainable-society>

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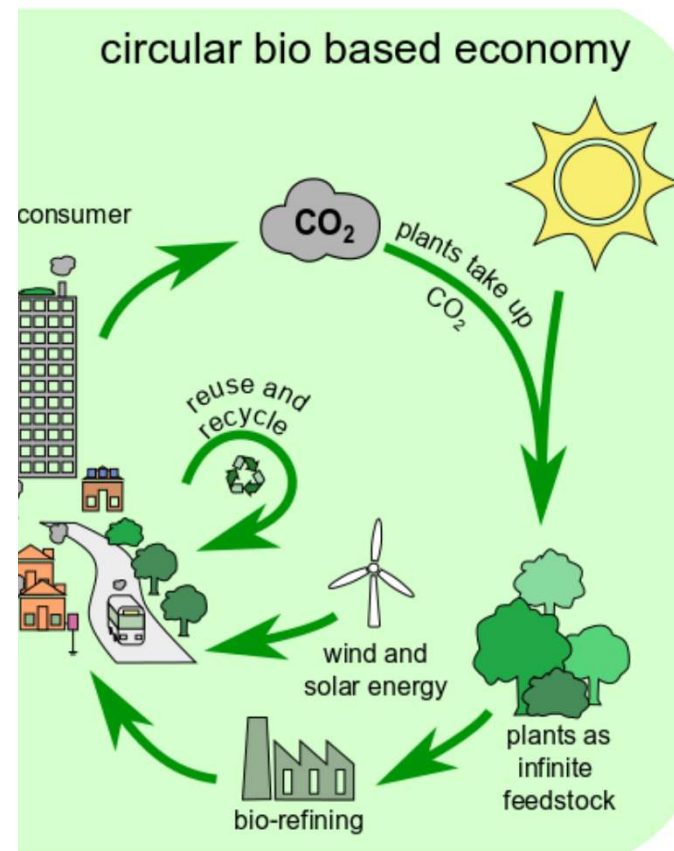
- + Often less waste
- + Often lower toxicity
- + Often lower emissions
- + Sometimes cost reduction
- + Sometimes new or improved functionalities



<https://www.boerjanlab.be/research/relevance-lignin-research-more-sustainable-society>

Bioeconomy is part of the solution

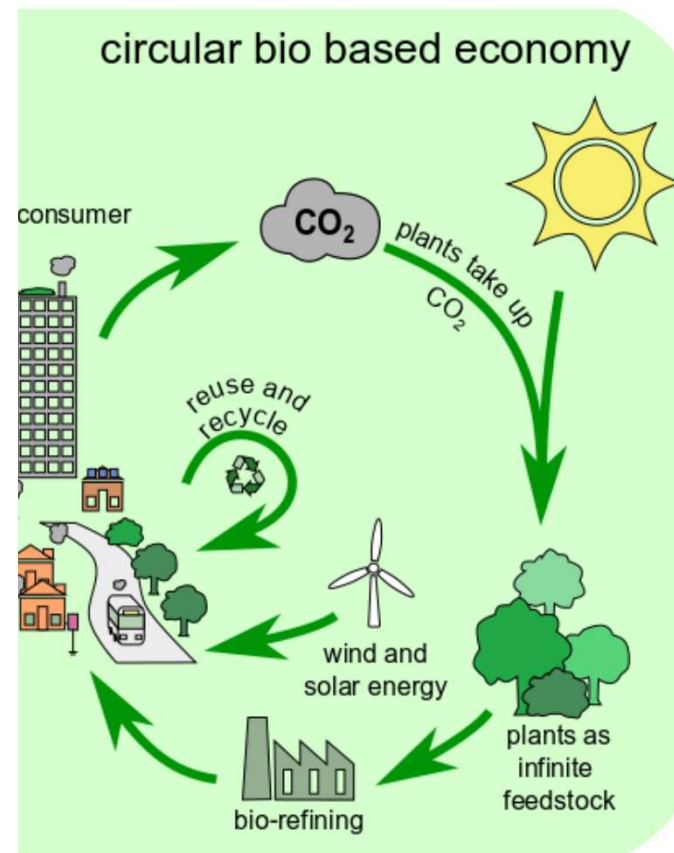
- + Often less waste
- + Often lower toxicity
- + Often lower emissions
- Often green premium
- Often difficult to get = performance
- More variability



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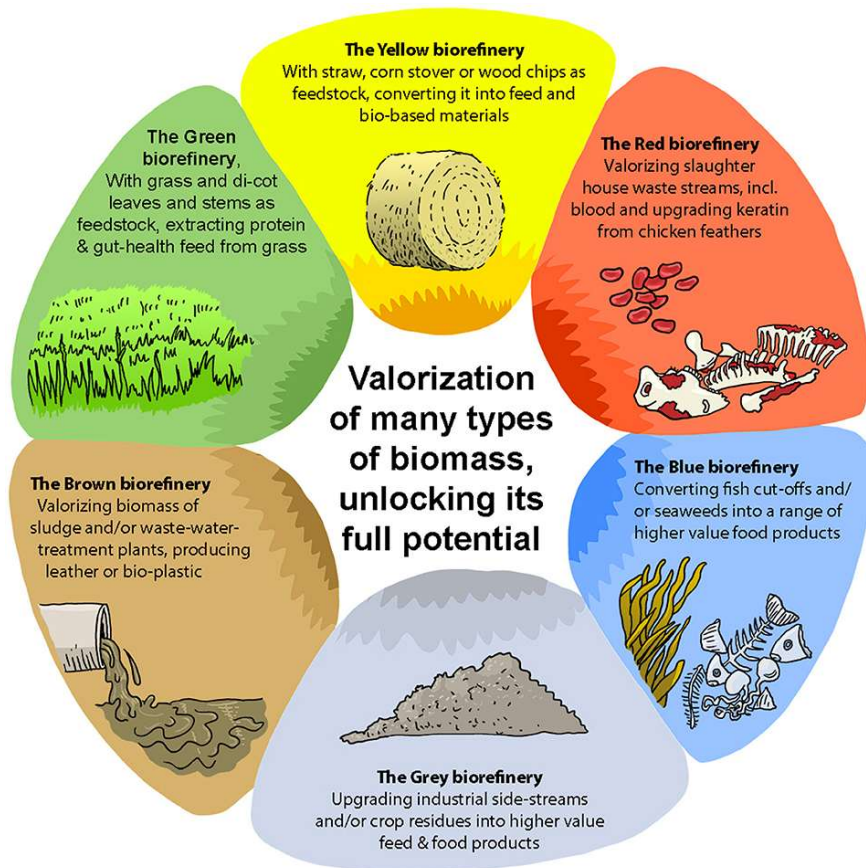
Bioeconomy is part of the solution

- + Often less waste
- + Often lower toxicity
- + Often lower emissions
- Often green premium
- Often difficult to get = performance
- More variability
- Biobased ≠ sustainable
- Biobased ≠ biodegradable



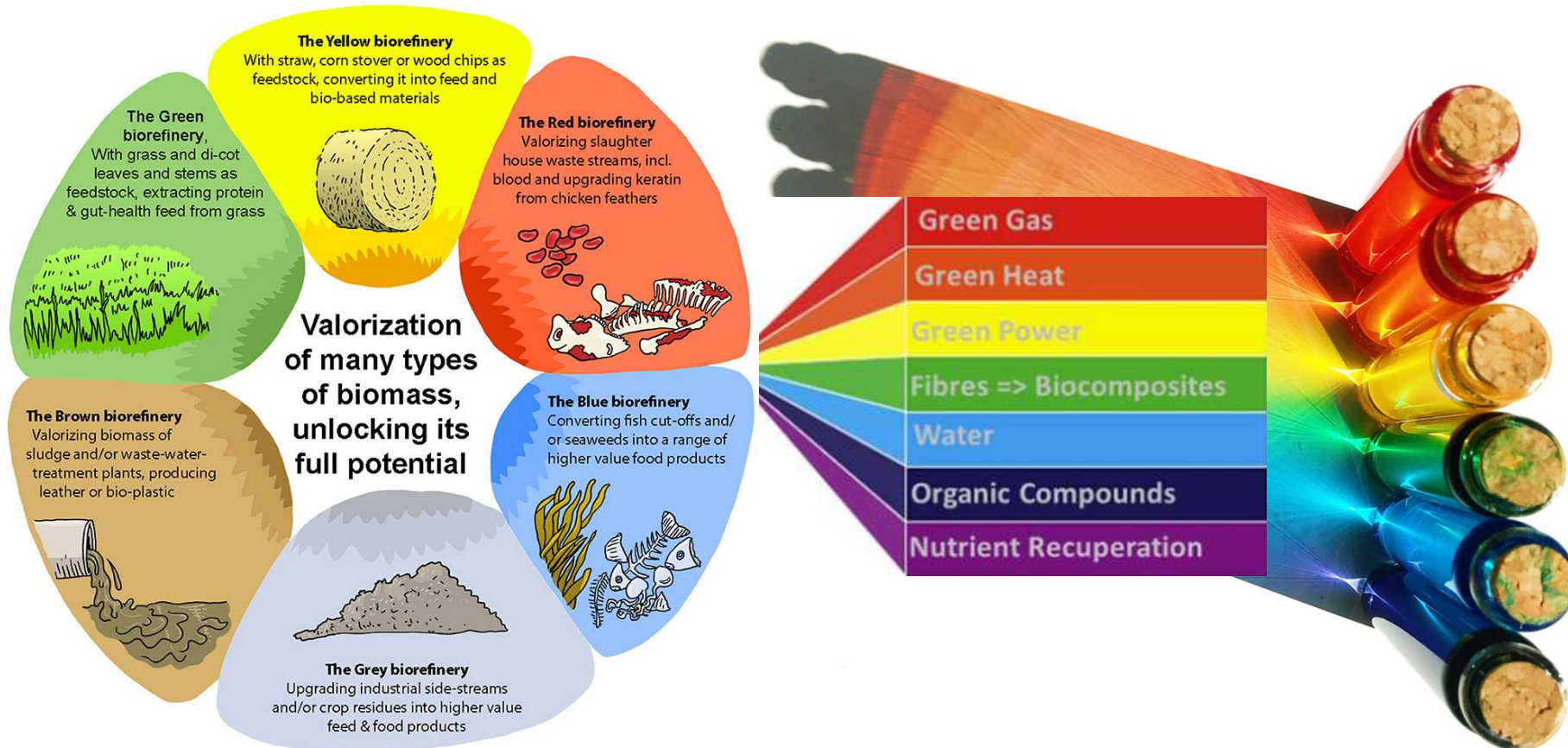
<https://www.boerjanlab.be/research/relevance-lignin-research-more-sustainable-society>

What is biorefining/-manufacturing?



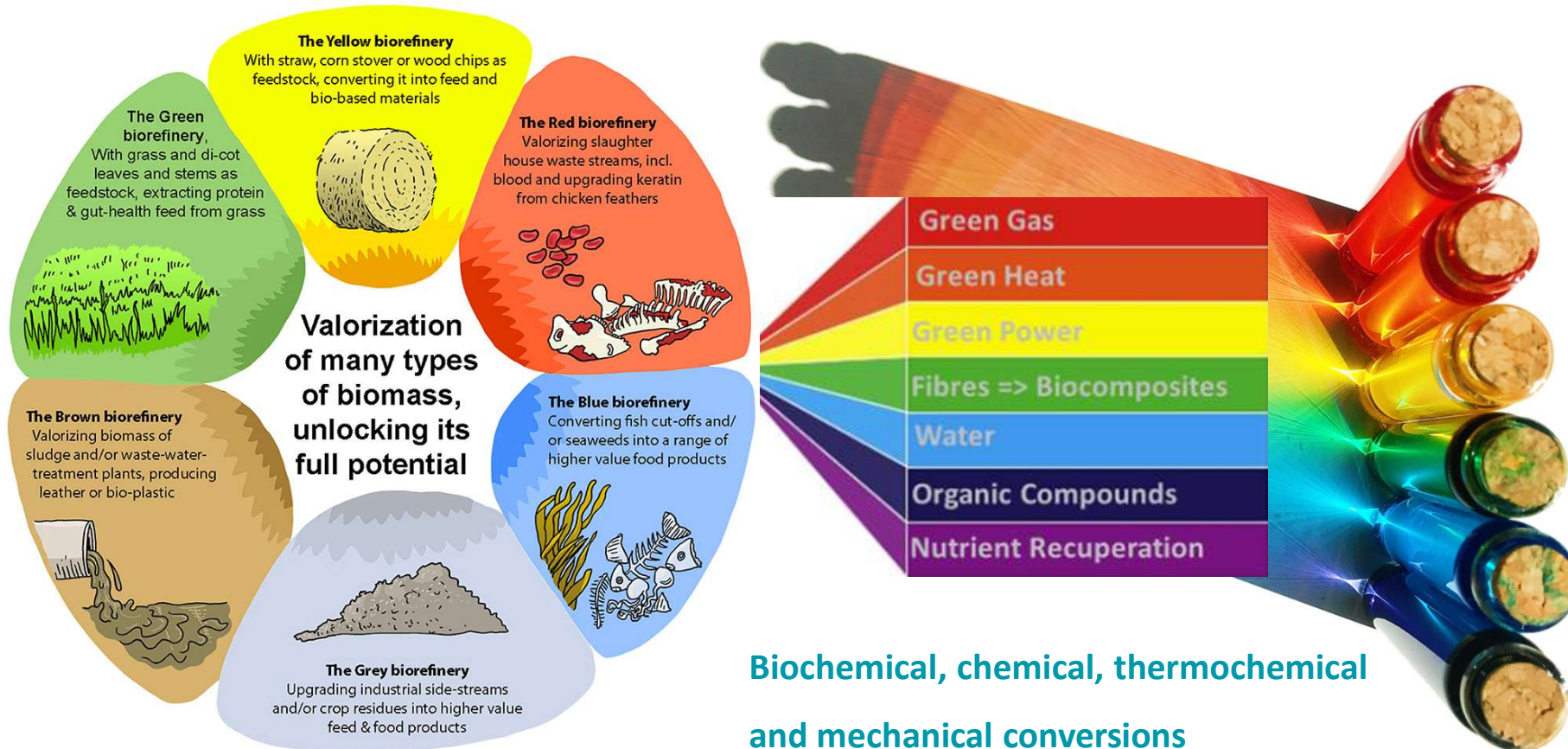
Lange L (2022) Business Models, Including Higher Value Products for the New Circular, Resource-Efficient Biobased Industry. *Front. Sustain.* 3:789435. doi: 10.3389/frsus.2022.789435

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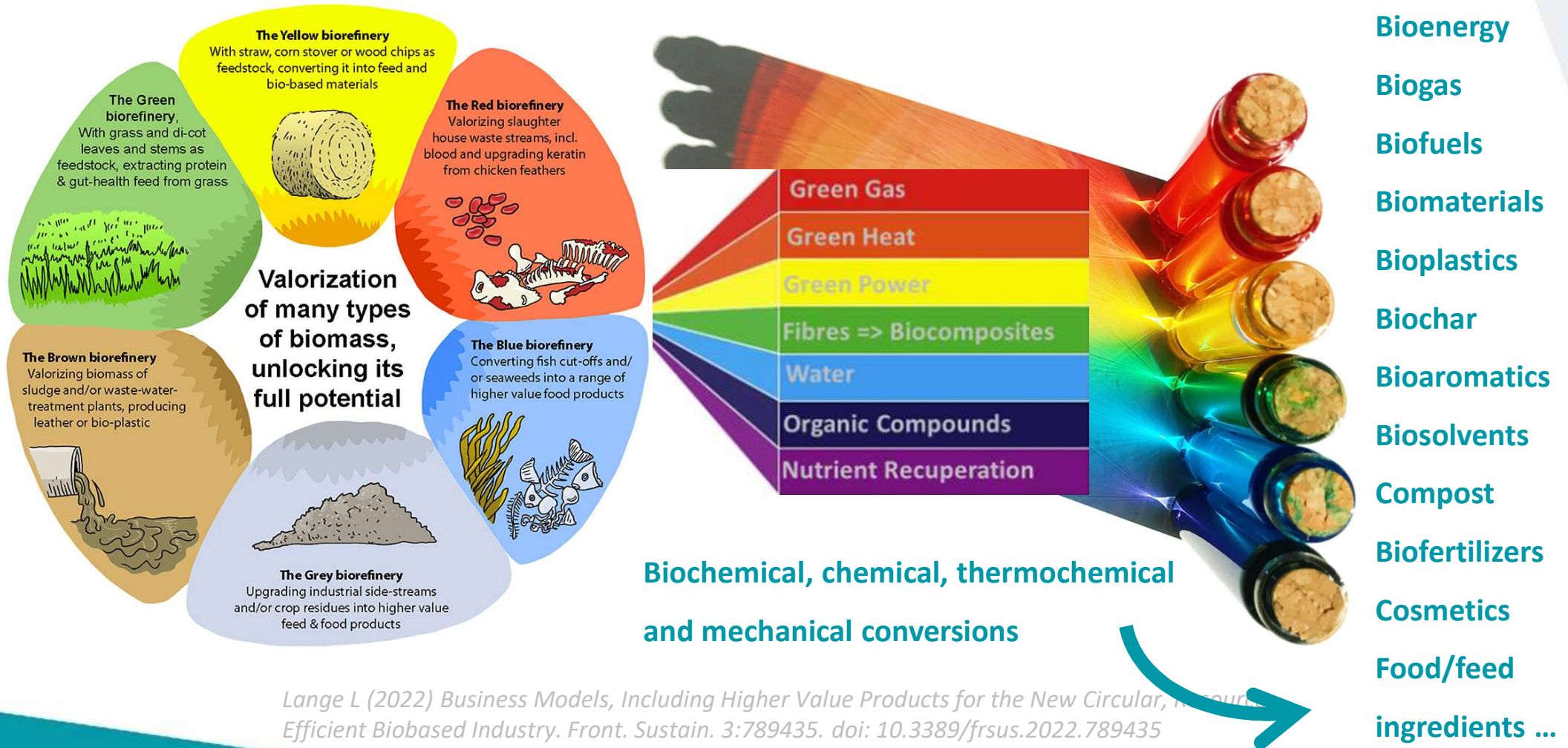
What is biorefining/-manufacturing?



Biochemical, chemical, thermochemical
and mechanical conversions

Lange L (2022) Business Models, Including Higher Value Products for the New Circular, Resource-Efficient Biobased Industry. *Front. Sustain.* 3:789435. doi: 10.3389/frsus.2022.789435

What is biorefining/-manufacturing?



Who decides where biomass goes?

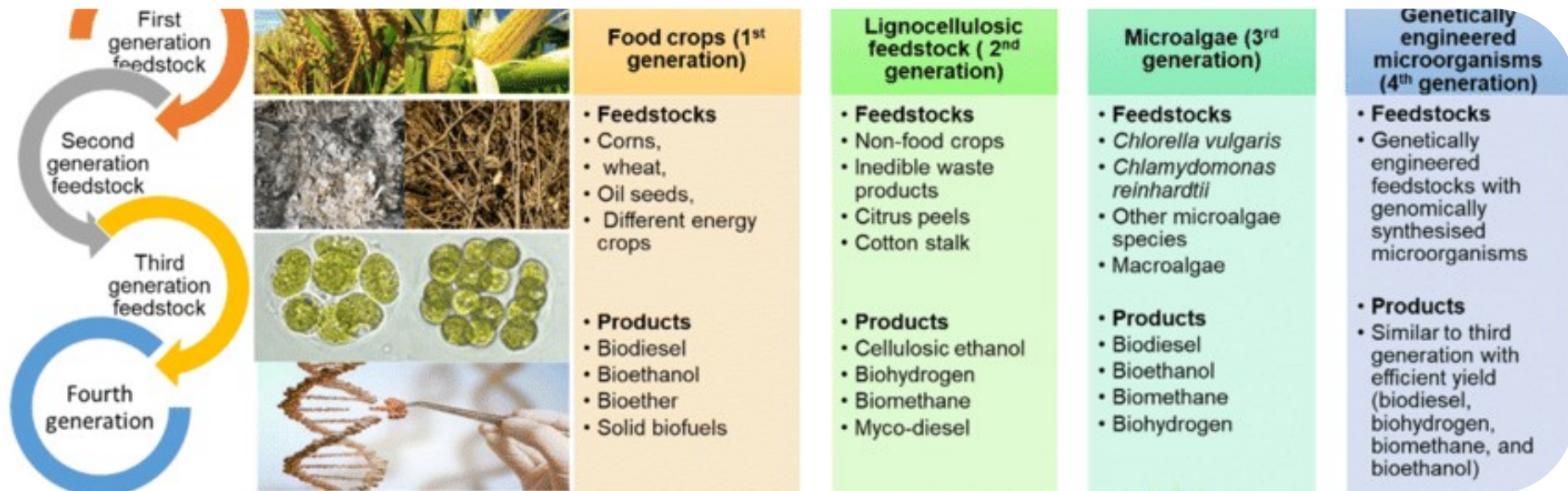
Biomass: cascade of value retention



Sources: **OVAM**, Food loss from a chain perspective (2012);
ILVO, Valorisation of vegetable and fruit residual flows: opportunities and bottlenecks (2014);
OVAM, Action Plan on Sustainable Management of Biomass (residual) flows 2015-2020 (2015)



Food vs fuel



https://www.researchgate.net/publication/345973981_Microalgal_growth_coupled_with_wastewater_treatment_in_open_and_closed_systems_for_advanced_biofuel_generation

Food vs fuel

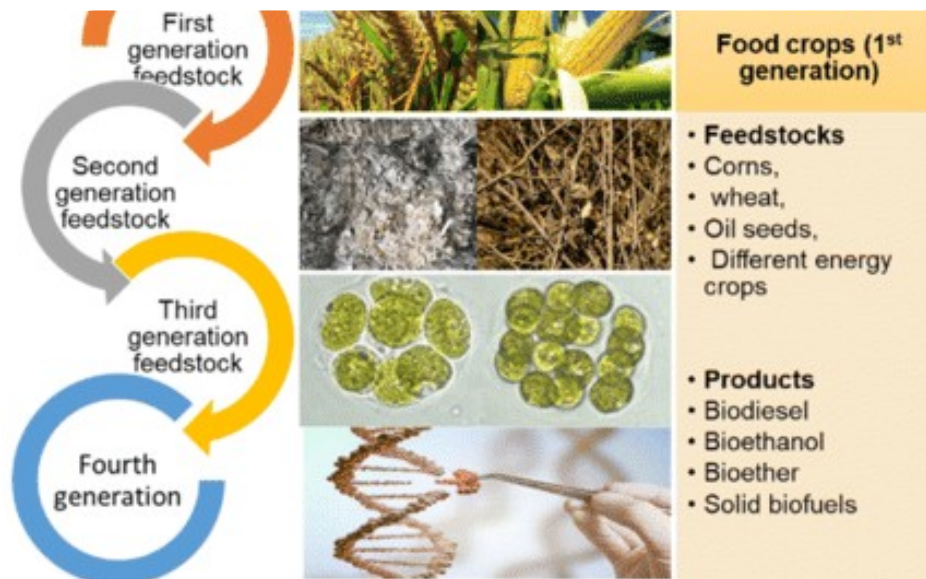
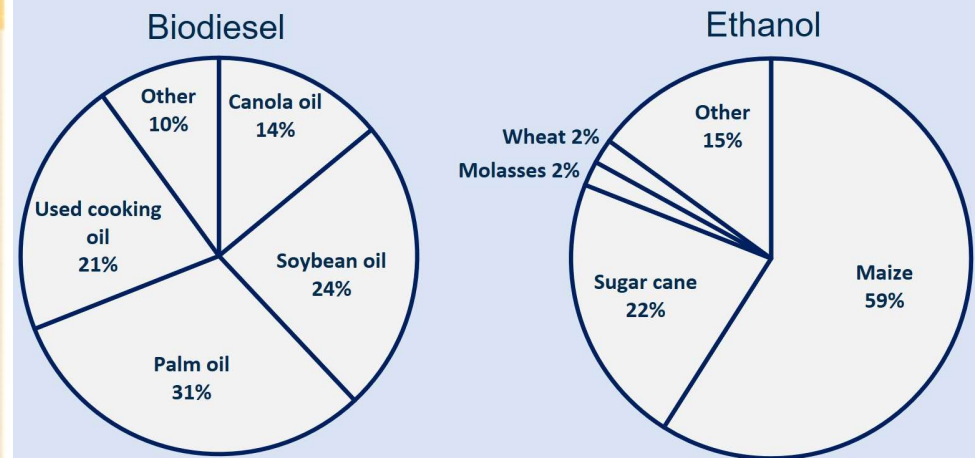


Figure 2: World feedstock crops for biofuel production



Source: [OECD-FAO Agricultural Outlook 2021-2031](https://www.oecd-ilibrary.org/agriculture-and-rural-development/oecd-fao-agricultural-outlook-2021-2031)

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Over 20% of global sugarcane and over 15% of global maize is produced for biofuels!

Food vs fuel

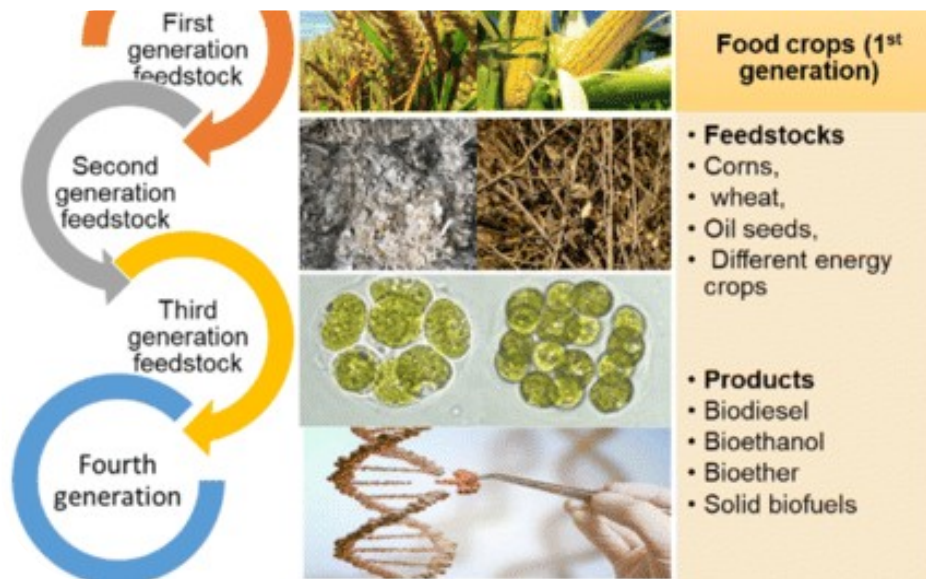
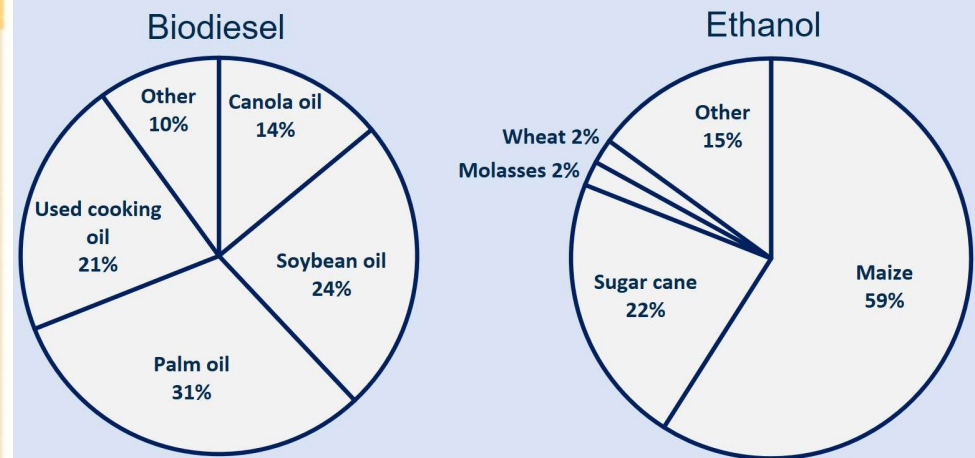


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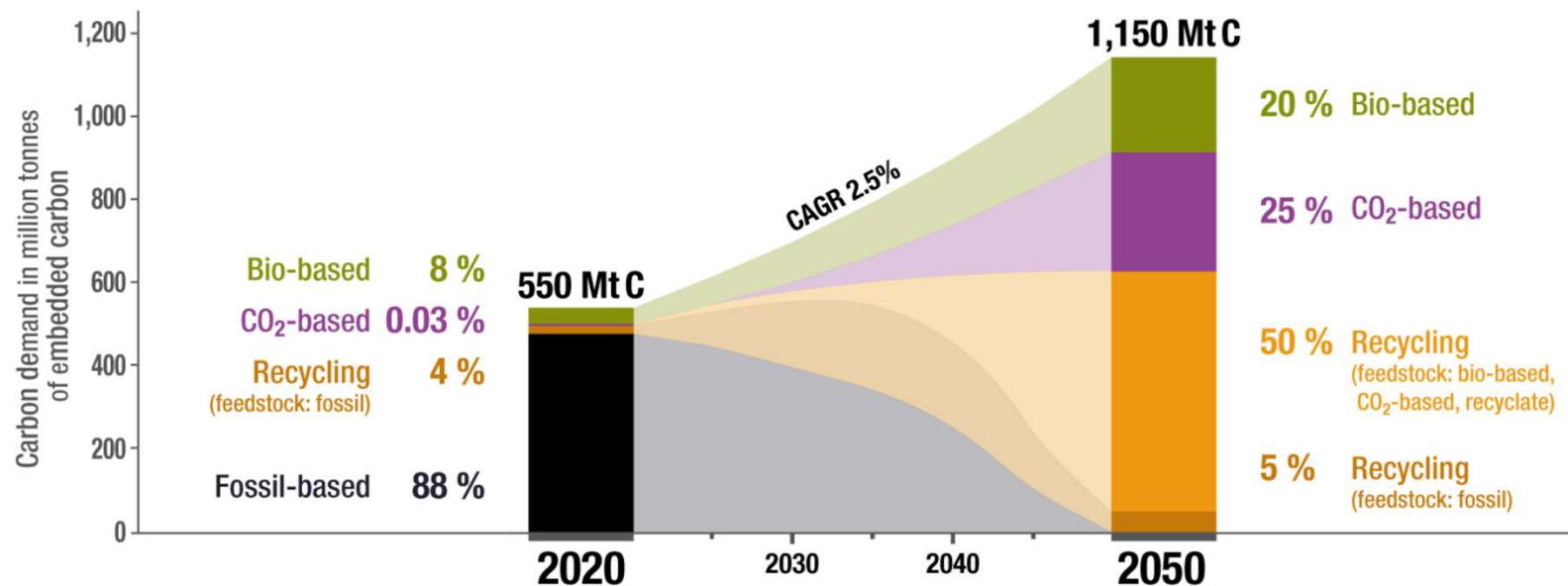
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1. The 'free' market decides. Nonetheless, regulations help shape this!
2. To be cost-competitive you need scale!

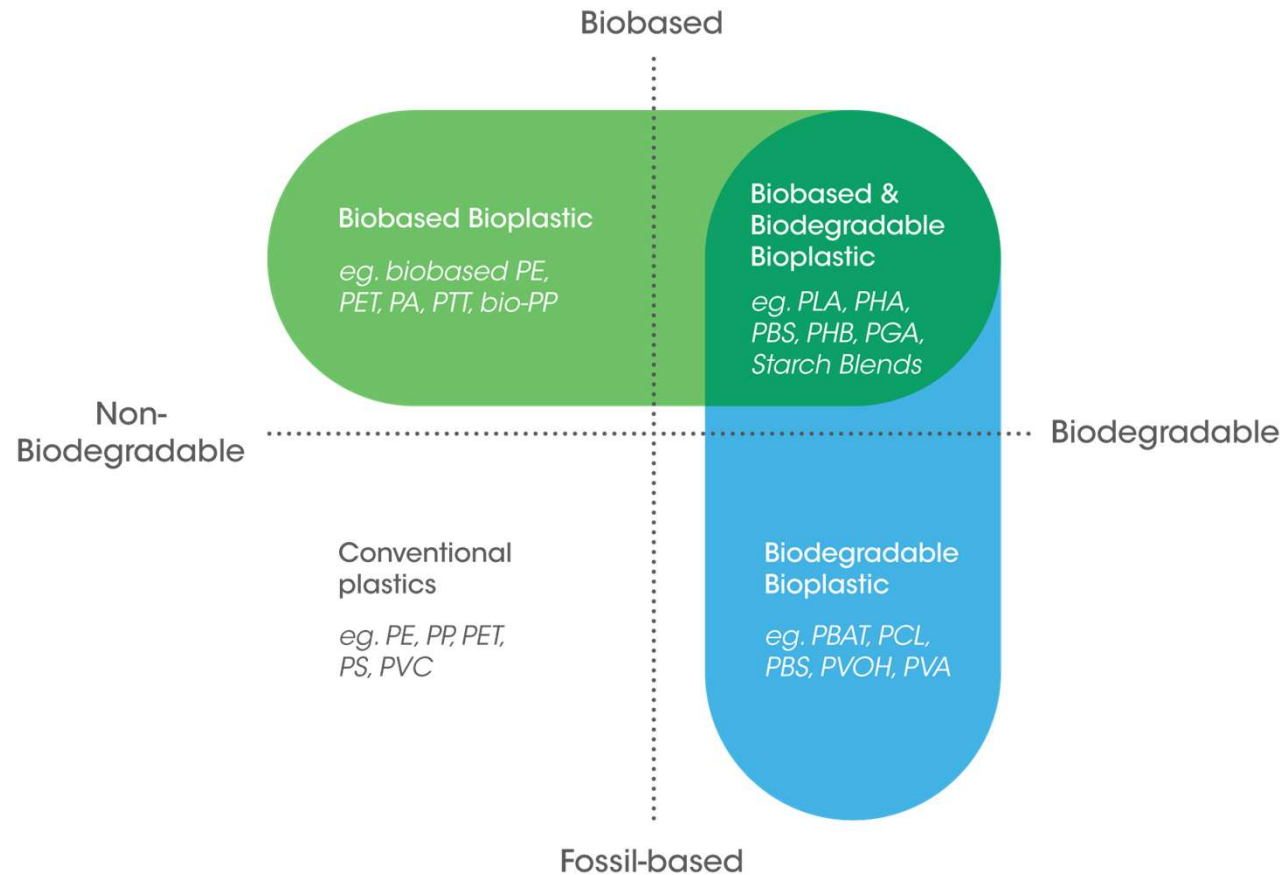
Is there enough biomass?

Carbon Embedded in Chemicals and Derived Materials updated nova scenario for a global net-zero chemical industry in 2050

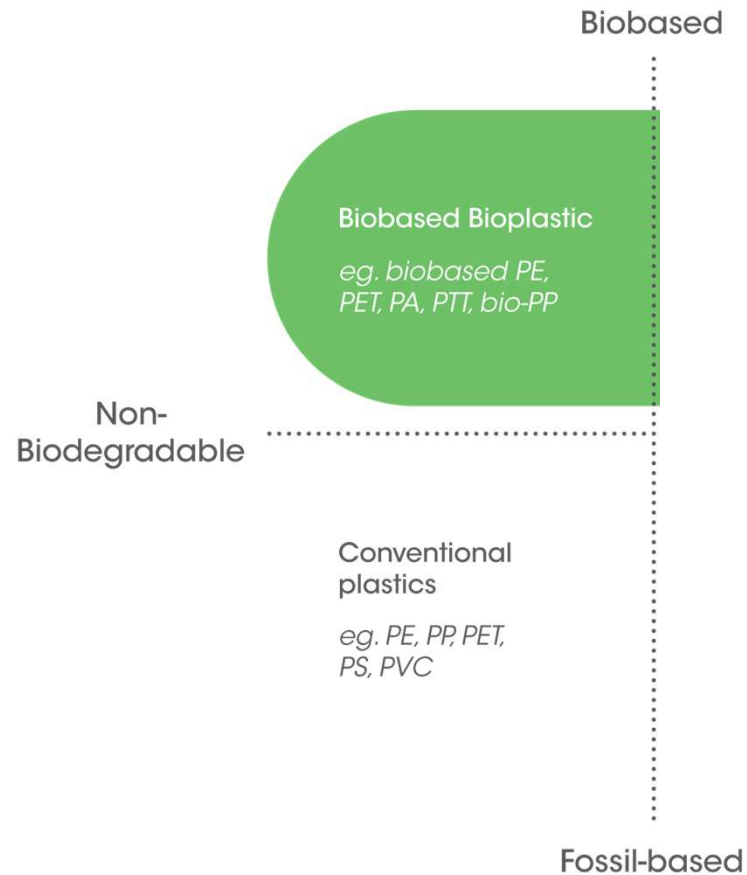


<https://biconsortium.eu/publication/there-enough-biomass-defossilise-chemicals-and-derived-materials-sector-2050>

Biobased ≠ biodegradable ≠ circular



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Biobased ≠ biodegradable ≠ circular

CATCH-22

Non-Biodegradable

Biobased Bioplastic

eg. biobased PE, PET, PA, PTT, bio-PP

Conventional plastics

eg. PE, PP, PET, PS, PVC

Biobased

Fossil-based



<https://prosperbioplastics.eu/>



Bio based Industries Consortium

Co-funded by the European Union

SUP Directive on mandatory EU recycled content target for plastics packaging of 30% by 2030

Biobased ≠ biodegradable ≠ circular

CATCH-22

Non-Biodegradable

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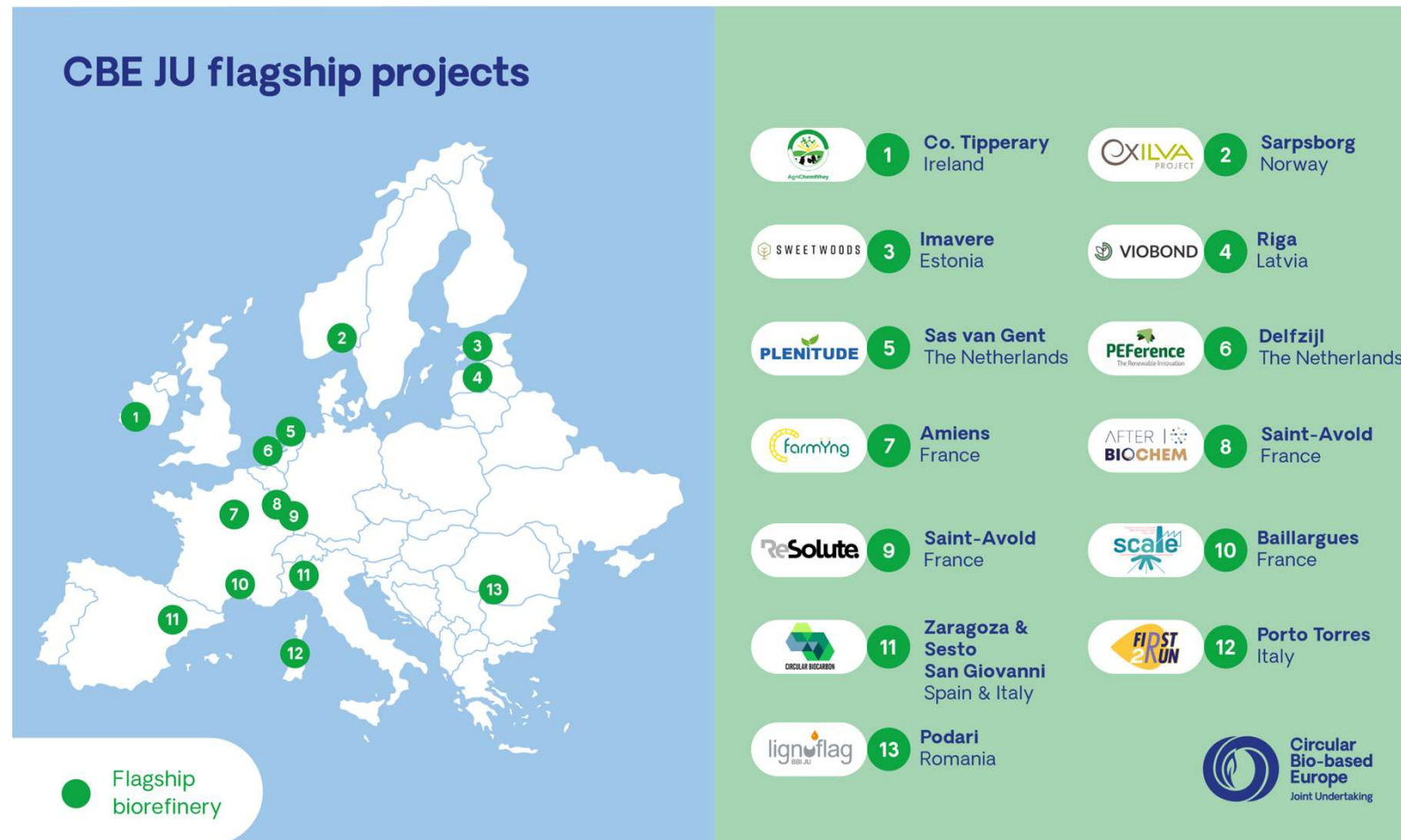


Co-funded by the European Union

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Also to be circular you need scale!

Bioeconomy Succes Stories



<https://www.cbe.europa.eu/projects>

Bioeconomy Succes Stories



SWEETWOODS Imavere, Estonia



CBE JU contribution: €20.96 million

Duration: June 2018 – May 2024



Objective: to establish an industrial biorefinery for the fractionation of residual hardwood into cellulosic sugars and high purity lignin to be used in insulation and bioplastics applications

Feedstock: forest based (residual hardwood)

Applications: Construction

Webpage: <https://sweetwoods.eu/>

Video: <https://youtu.be/asRGF4PSsxE>

<https://www.cbe.europa.eu/projects>

Bioeconomy Succes Stories



PEference Delfzijl, the Netherlands



CBE JU contribution: €24.99 million

Duration: September 2017 – February 2025



Objective: establish a unique, industrial scale, cost-effective biorefinery flagship plant **producing FDCA (furan dicarboxylic acid) and then PEF (polyethylene furanoate)**, a 100 % bio-based polyester used to make bottles, films and fibres

Feedstock: agri-based (sugar)

Applications: Packaging

Webpage: <https://peference.eu/>

Video: <https://youtu.be/e7zOKHE03tA>

<https://www.cbe.europa.eu/projects>

Conclusion

- There is enough biomass, if you include pro(s)per reuse and recycling!
- Biobased is not inherently more sustainable, but it can and should be!
- The circular bioeconomy is here to stay and is going from niche to norm!
- To achieve its full potential, many biobased products need to reach a bigger scale and regulations can help!