BioBased Circular

Developing biobased value circles for polyester materials

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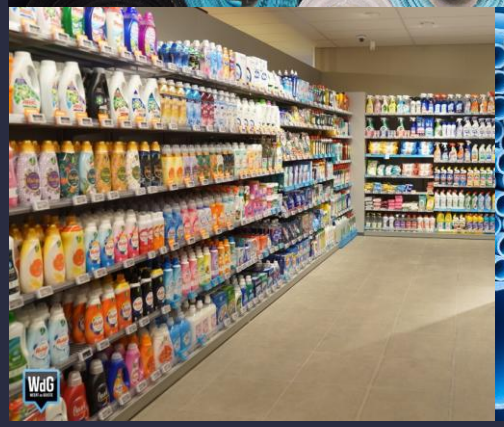
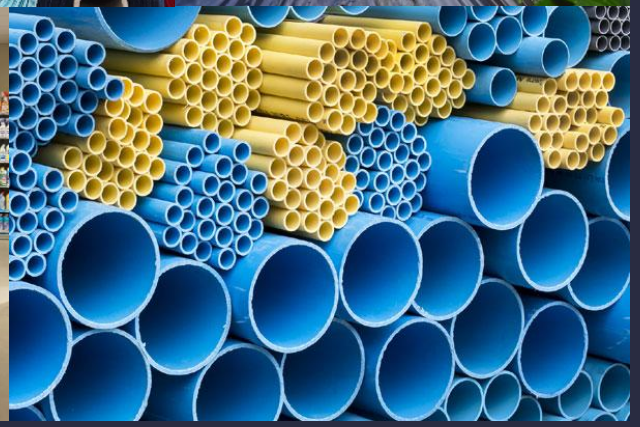
Her future?
But without microplastics
Or climate worries
BioBased Circular enables market introduction of smart biobased solutions and accelerates a smooth transition with respect for the planet
www.biobasedcircular.com

BioBased Circular

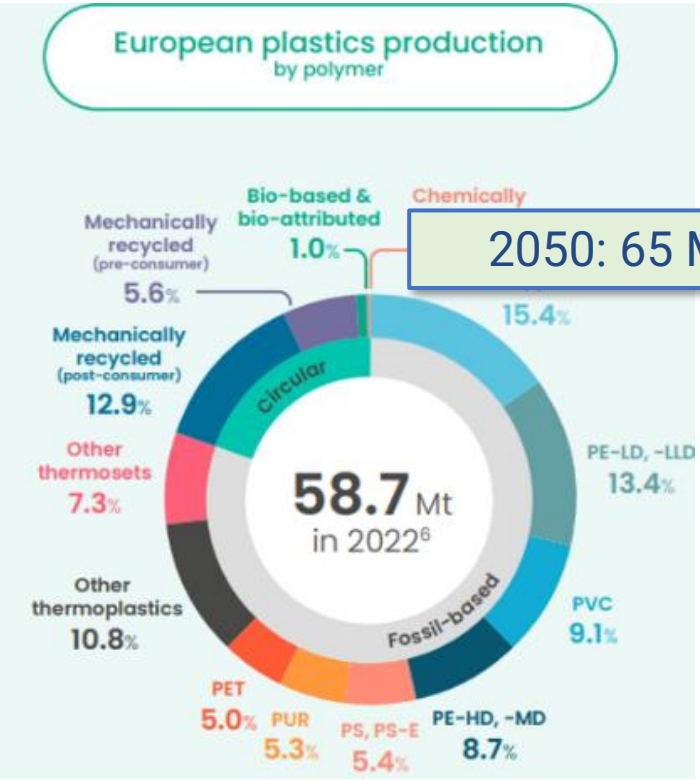
Convenience vs problem of plastic usage





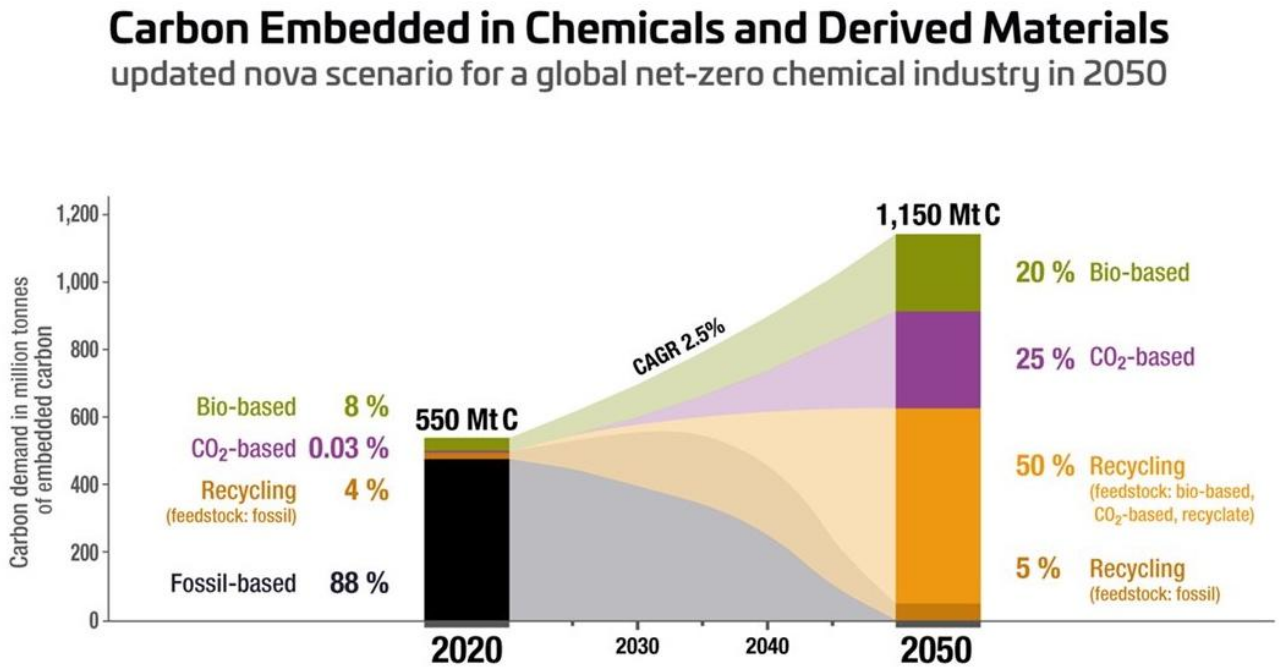
Growing material demand to 2050

European plastics production



2050: 65 Mt/yr

Global carbon industry



available at www.renewable-carbon.eu/graphics

NGF Biobased circular supports a new circular industry for biopolyesters and its applications based on carbohydrate feedstocks

Ambition

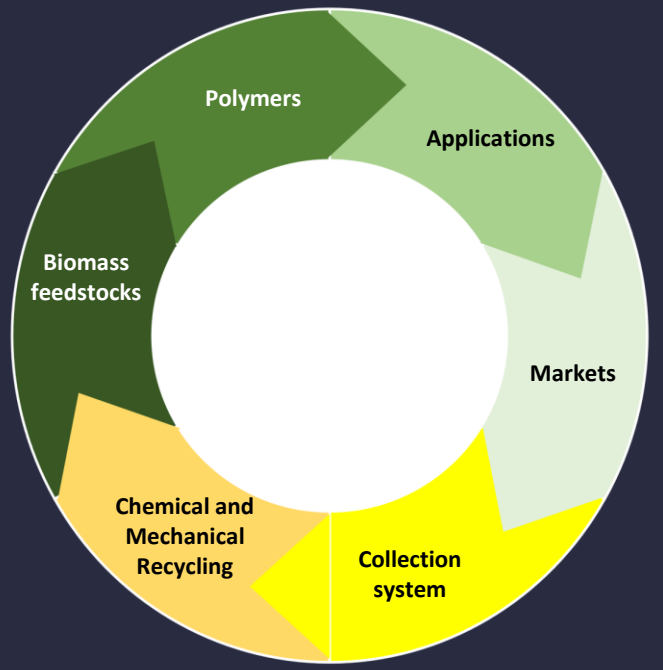
Demonstrate economic and industrial feasibility by establishing five full-scale ‘value circles’ in 2032

Focus

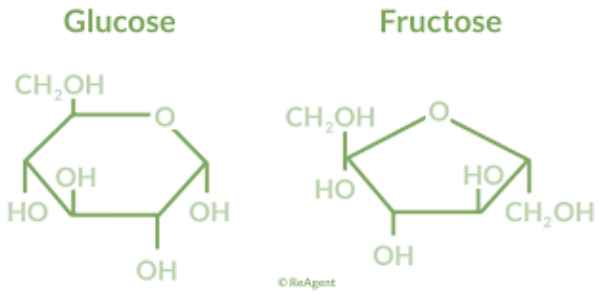
- Carbohydrate-based and waste-derived feedstocks
- PLA, PHA, PEF, Coatings, Resins
- Packaging, Textiles, Building materials, Other impactful markets

Program

- 8 years - 2024-2032
- 338M Euro subsidy

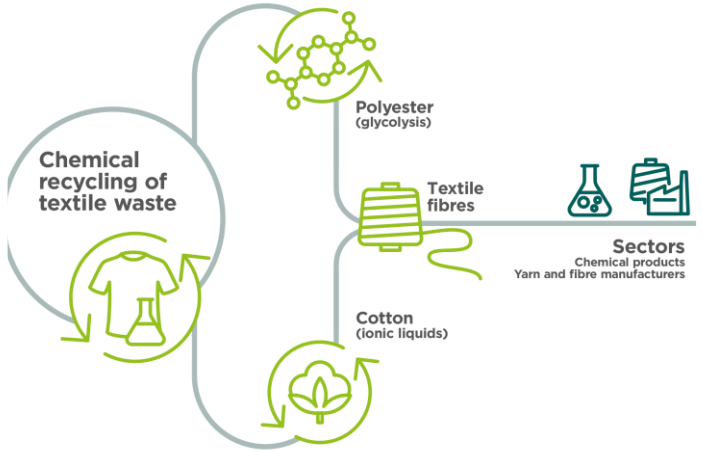


Why polyester?



Maximize yield of biomass feedstocks

- *weight ton/ton*
- *Weight per acre*



Circular by design – versatile end-of-life options

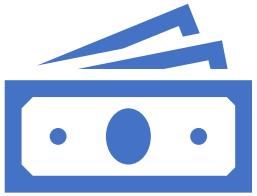
- *Easy to reuse*
- *Higher chemical recycling efficiency*

Biodegradable in shorter and longer scenarios

- Easier degradable then PE, PP
- Avoiding accumulation of microplastics

Approach

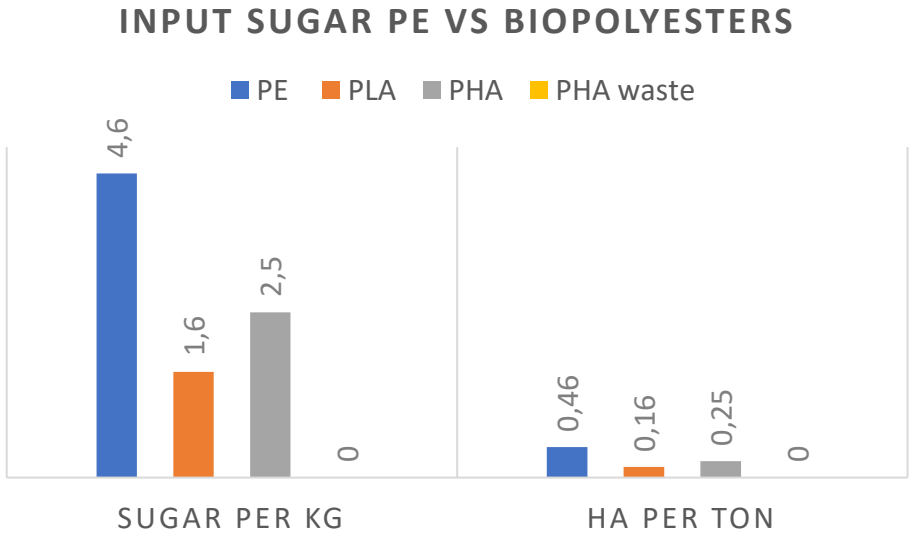
Top down



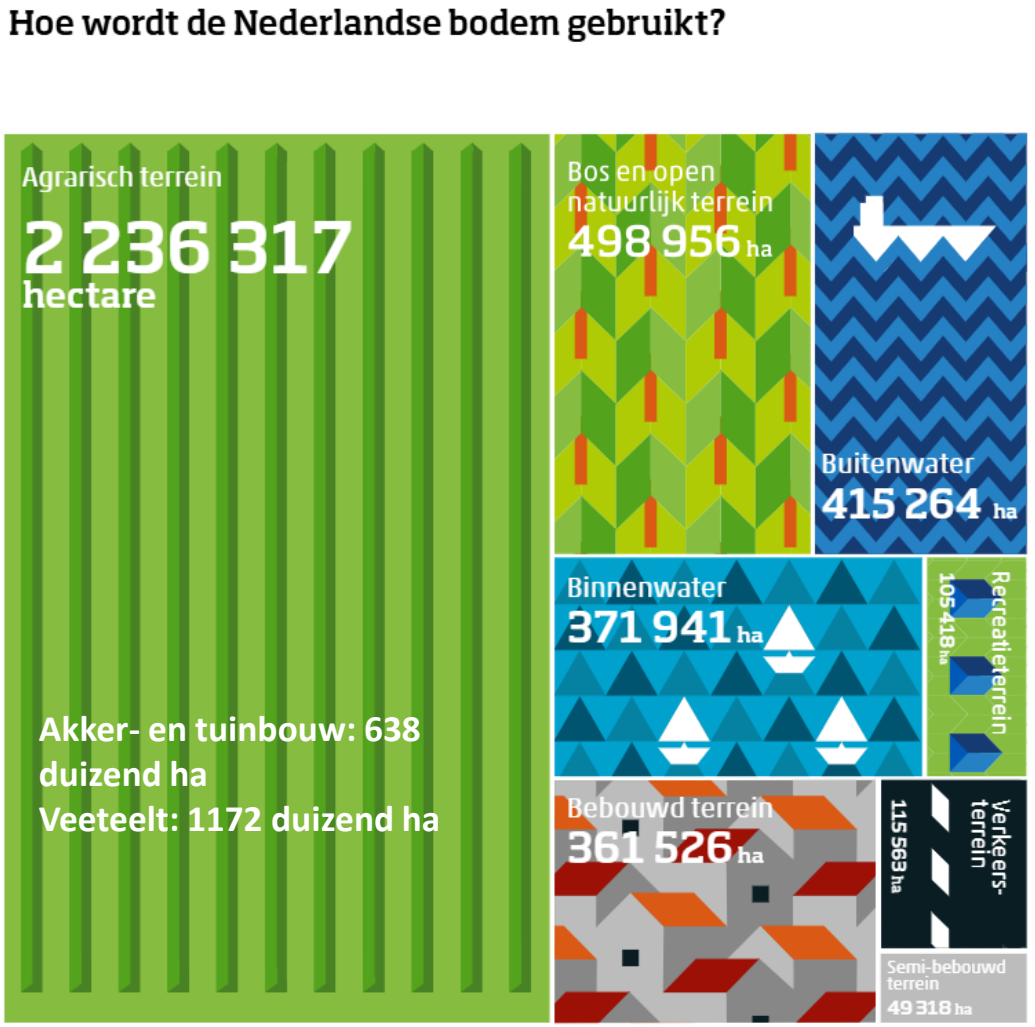
Bottom up

Market driven

Land use in perspective for different polymers



Landuse per polymer	Acre
PE	690.000
PLA	240.000
PHA via sugar	380.000
PHA via Waste	0



CBS 2024

Chemie met biogrondstoffen is een noodzaak

- Kamerbrief Heijnen: Nationaal programma circulaire economie 2023-2030
- SER publicatie: Biomassa in balans
- Kamerbrief van advies: Verduurzaming Maakindustrie
- PBL: “Beschikbaarheid en toepassingsmogelijkheden van duurzame biomassa”23
- Duurzame koolstof visie geleid door EZK/KGG 2025
- Biogrondstoffen strategie geleid door LVVN/I&W en KGG, 2025

Bioraffinage blijkt lastig te organiseren

ADVIES 10/05 | December 2010

2010

Meer chemie tussen groen en groei

De kansen en dilemma's van een biobased economy

SER

Nieuws / 22/09/2016

2015

25 Redefinery-clusters mogelijk in Europa

'Chemiecluster op stoom'

Actieplan chemiecluster Eemsdelta

2014

2015

Noord4Bio

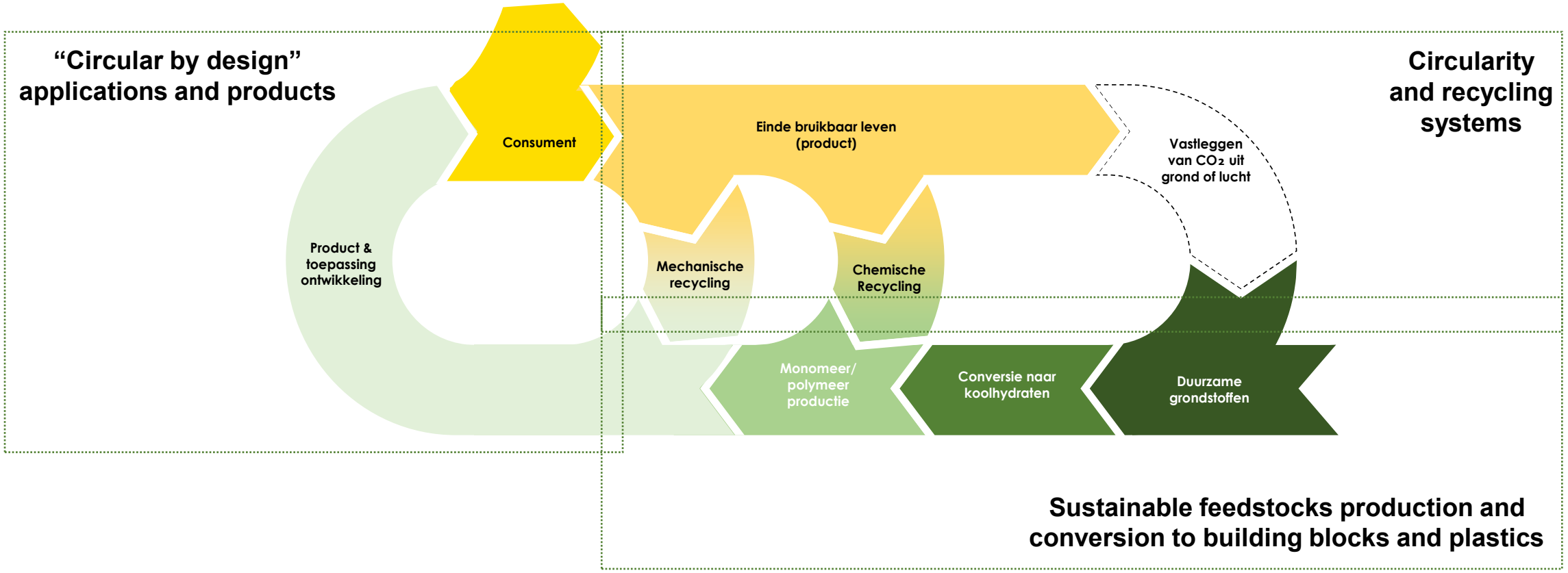
Concrete kansen voor een biobased economy in Noord-Nederland

CHEMPORT EUROPE

2020

Saccharide Agenda

BioBased value circle and activity scope

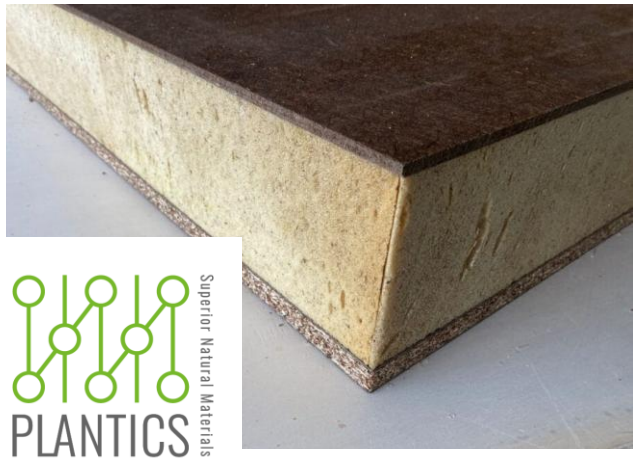


Partnerships and scaling: Value circles formation

Competitiveness and sustainability: Techno-economical evaluations and LCAs

Example of polyester resin (hars)

Short term:	• Small plant: 10 kton panels with 15% resin → 1,5 kton resin
Mid term:	• Commercial plant of 50 kton panels → 5 kton resin
total	• 7 kton sugar • 500 hectare sugarbeet



Example of PLA (polymelkzuur)

Now:
- Annually 91 kton PLA use in Europe

2028:
- New plant 75 kton in France
- 150kton suiker en 10% recycling
- 10.000 hectare suikerbieten

2050
- Two plants in NL 300 kton
- 37.000 hectare

Alternative feedstock is needed

- Novel polyester-based are ideal for a futureproof scenario:
  - Higher conversion efficiency from biomass
  - Higher recycling efficiency
  - Better biodegradability
- Expected need for 2050 biobased polyester industry would need around 80.000-100.000 acres of sugar beet or wheat'equivalents
- Still need processes using 2nd gen or waste stream Swirl (GFE) or wastewater

Organiseren van het speelveld

Biomass in NL

- Agro food sector
- Forestry
- Food waste
- Wastewater

Pretreatment

- Raizen
- Fibenol
- UPM
- Fabiola
- Novamont
- DSD

Intermediate

- C6 sugar Glucose
- C5 sugar Fructose
- Furfural
- HMF
- VFA

Monomer

- Corbion LA
- Avantium
- Tasseikan FDCA
- Relement, bioMPA
- Citribel (CA)
- Nature's Principles, TripleW (LA)

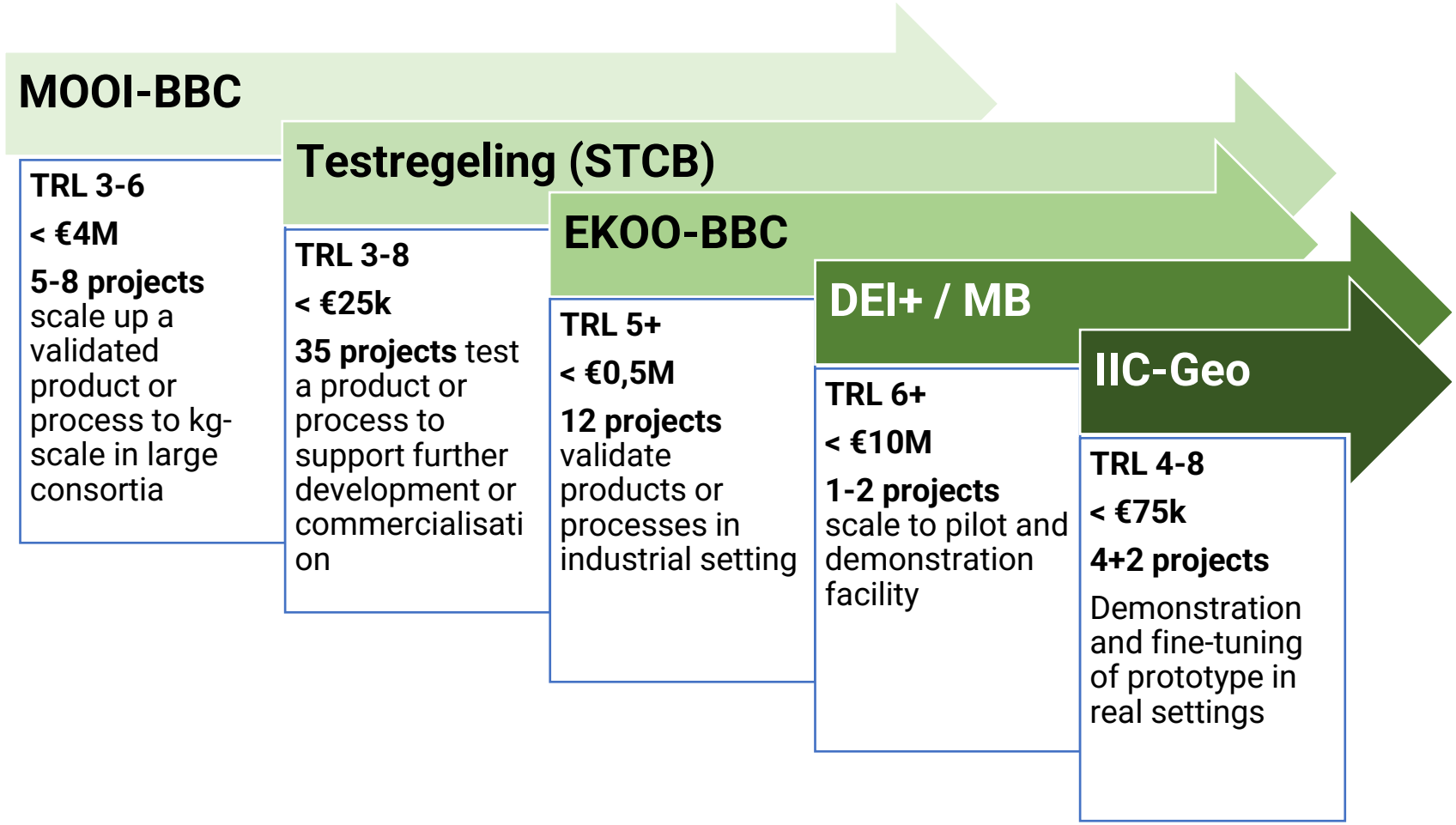
Polymer

- Total energies corbion (PLA)
- Indorama, Cure (PEF)
- Plantics
- Van Wijhe
- Paques Biomateral

Aanbod gedreven

Vraag gedreven

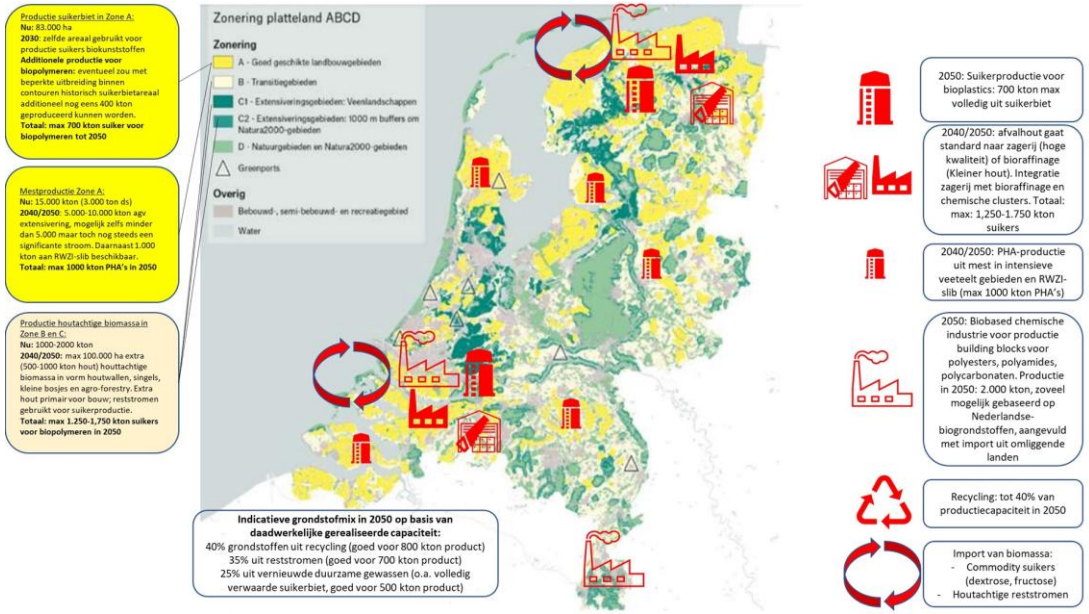
BBC subsidy instruments for R&D support and scaling



- **Focus op implementation**
  - Project financing for ongoing initiatives
  - Value chain approach
- **Focus on success**
  - Addressing entire value cycles
  - Supporting projects aimed at first movers
  - Policy, financing, opportunity, and barrier analysis
- **Risk diversification**
  - Financing multiple emerging players within value cycles

What do we do within BBC on bioresources?

- Biomass inventory and scoping by WFBR
  - Primary crops, Side streams
    - Food wastes, Protein transition
    - Building balance
    - Forestry biomass
  - Wastestreams
- Scan opportunities
  - Market demand
  - Biomass availability
  - Plug in on regional initiatives
- Financial resources to scale biorefineries pilot/demo



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