De circulaire melkveehouderij: ‘Waarde creëren met reststromen’

Circular & Biobased Economy

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Hengelo, 19 mei 2017

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Voor vanmiddag

- CO_2 en mineralen
- Waar gaat het om
- Intro in Biobased Economy (BbE) en verband met Circular Economy
- Nieuwe business modellen
- Werkgelegenheid, economie
- Vragen, dialoog

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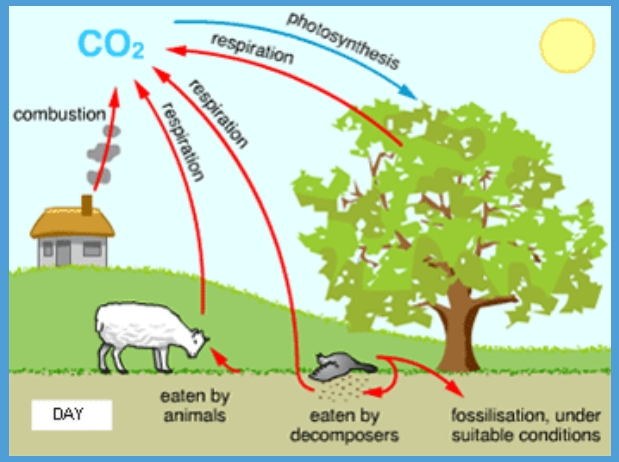
De natuur is circulair: eerst kijken naar CO_2



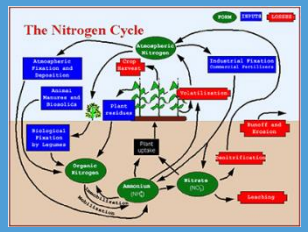
- Koolstof (C) zit in bouwstenen van de levende materie en ook in aardolie, -gas en steenkool
- CO_2 is een verbrandingsgas: de (chemische) energie is eruit en de functionaliteit is weg
- Hoe energie & functionaliteit weer inbouwen?

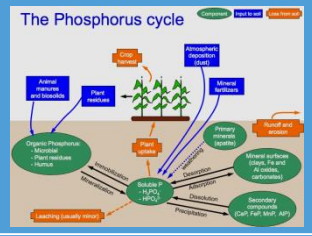
- In de natuur, door fotosynthese (in planten/algen; met water..): CO_2 + energie uit zonlicht -> energierijke functionele bouwstenen planten -> dieren/mens -> CO_2

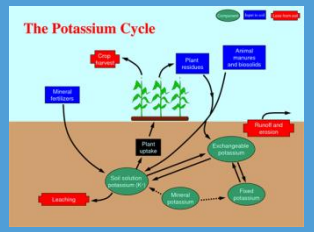
Biomassa -> voedsel & Biobased producten

- In innovatieve processen uit R&D (in chemie en industriële biotechnologie): CO_2 + (elektriciteit uit) zon -> energierijke functionele bouwstenen -> materialen/energie -> CO_2

Elektrificatie van de chemie & artificiële fotosynthese







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De toekomst...2030...2050

Resource efficiency

Circular economy

Direct use of solar energy

Vernieuwde (regionale) Bedrijvigheid en maakindustrie

Vernieuwde (economische & business) modellen

Schaalbare en rendabele conversie

Mineralen blijven (lokaal) beschikbaar

Low (fossil) carbon economy

Direct conversion of CO_2 in target molecules

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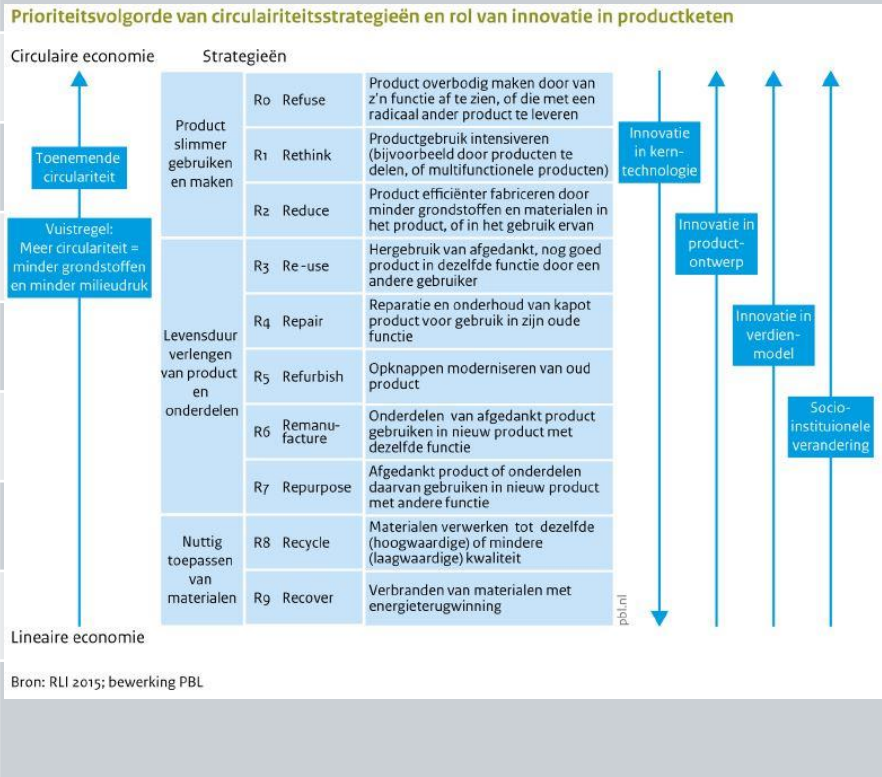
Nine Circular Strategies

Strategy		
R1 – Refuse	Smarter use & production	
R2 – Rethink		
R3 – Reduce		
R4 – Re-use	Prolong life time of products & parts	
R5 – Refurbish		
R6 – Remanufacture		
R7 – Repurpose		
R8 – Recycle	Useful application of materials	
R9 - Recover		



Reference: PBL (2016)

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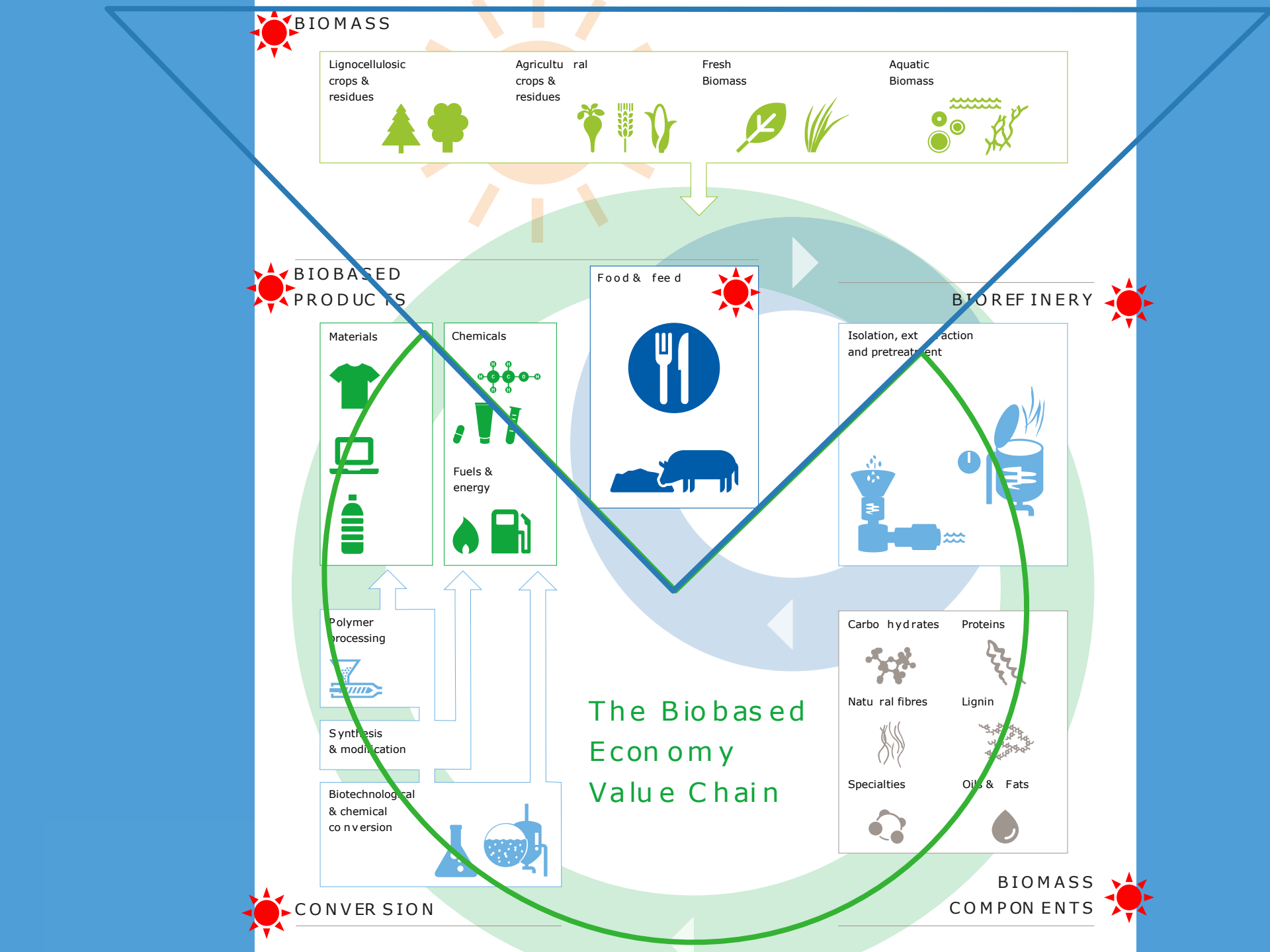
BIOMASS
Lignocellulosic crops & residues
Agricultu ral crops & residues
Fresh Biomass
Aquatic Biomass
BIOBASED PRODUCTS
Materials
Chemicals
Fuels & energy
Food & fee d
BIOREFINERY
Isolation, ext raction and pretreat ent
Polymer rocessing
Synthesis & modification
Biotechnolog cal & chemical co nversion
The Biobased Economy Value Chain
Carbo hydrates
Proteins
Natu ral fibres
Lignin
Specialties
Oils & Fats
CONVER SION
BIOMASS COMPON ENTS

Circular & Biobased Economy: Start with Sun, CO_2 and water

Innovation areas

Circular design & loop closure

CO_2 as raw material & dedicated crops

Consumption
Food
Feed
Chemicals
Materials
Energy

Re-use

Biobased & Circular resources

Food | Feed

Final application development

Sustainable chain design and social aspects

Sustainable production of chemicals, materials, fuels & energy

Total use via Biorefinery

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Photrophic microorganism

AlgaeParc, Production And Research Center.

- Microalgae strain development
  - For production at industrial scale.
- Microalgae cultivation
  - Up-scaling and algae reactor designs

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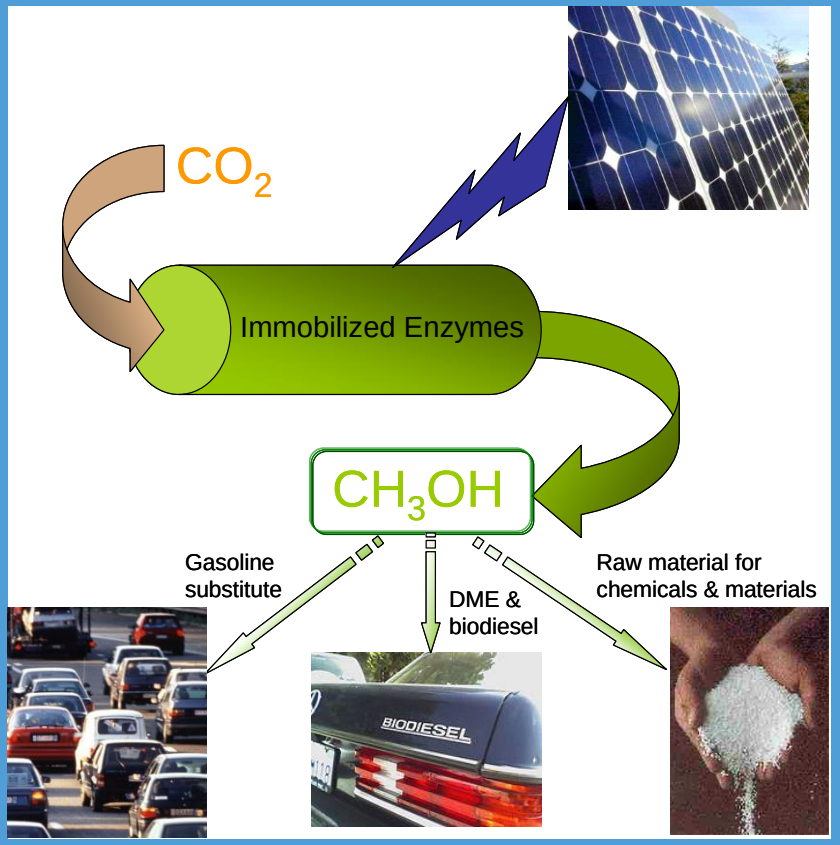
Direct CO_2 conversion (Enzymatic)

Develop a green technology to produce chemicals (MeOH) from CO_2 and sunlight

- New sustainable technology
- Mild process conditions (T, pH)
- Solar energy
  & low energy consumption
- Low environmental impacts,
  low wastes
- Small or medium size facilities,
  at various locations



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Biorefinery examples

Total use
via Biorefinery

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Sheet: Martijn Hackmann

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Biobased chemicals & fuels program

Sustainable production of chemicals, materials, fuels & energy

Innovative production of biobased chemicals
* Low-capital investment
* low-energy consumption

Connection chemical catalysis & biotechnology
* New & drop-in aromatic chemicals
* Algal and (anaerobe) microbial derived chemicals

Polymer synthesis
* Biobased polymers
* Water-borne polymers

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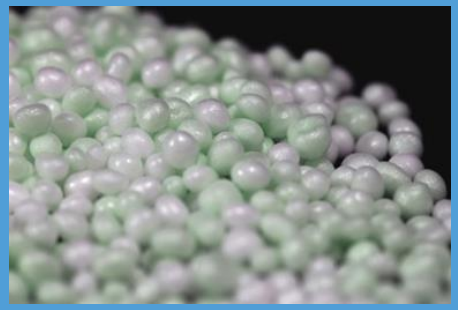
Biobased Materials; R&D topics

Sustainable production of biobased materials



Biobased material development
* Bioplastics from biobased building blocks
* Innovative blends -> smart materials

Unique functional properties
* Tg, Tm, gas barrier, UV-stability, water sensitivity
* Biodegradability
* Strength, impact

Regulation support at NL and EU level
* Normalisation
* Standardization
* Certification
* Recycling

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Sheet: Harriëtte Bos

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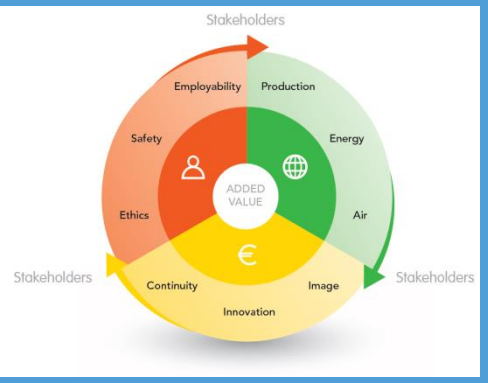


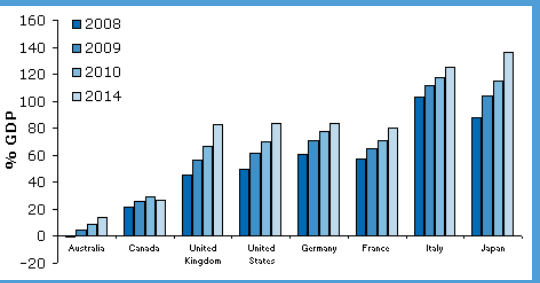
Sustainable chain design and social aspects

Sustainable chain design

* Combining food security, sustainable agriculture and resource efficiency with Bb&CE
* Optimal process design / technical development
* Sustainability analyses
* Optimal logistics, organization & cluster development

To a new NL manufactoring industry

* New competitive business cases
* B&CE education to support the human capital agenda
* Impact of technology & BbE industrial development
* Development of regional circular production to avoid material depletion or accumulation and conflicts



Models & method development NL & EU

* Multi-criteria analyses, scenario analyses
* Macro-economic (impact) analyses
* Societal acceptance and sustainability analyses
* Coherent policy, creating level playing field, policy advice
* Price/supply/demand/alternative relations & CO_2 & GHG costs
* Land-use, institutions, market intelligence, etc.

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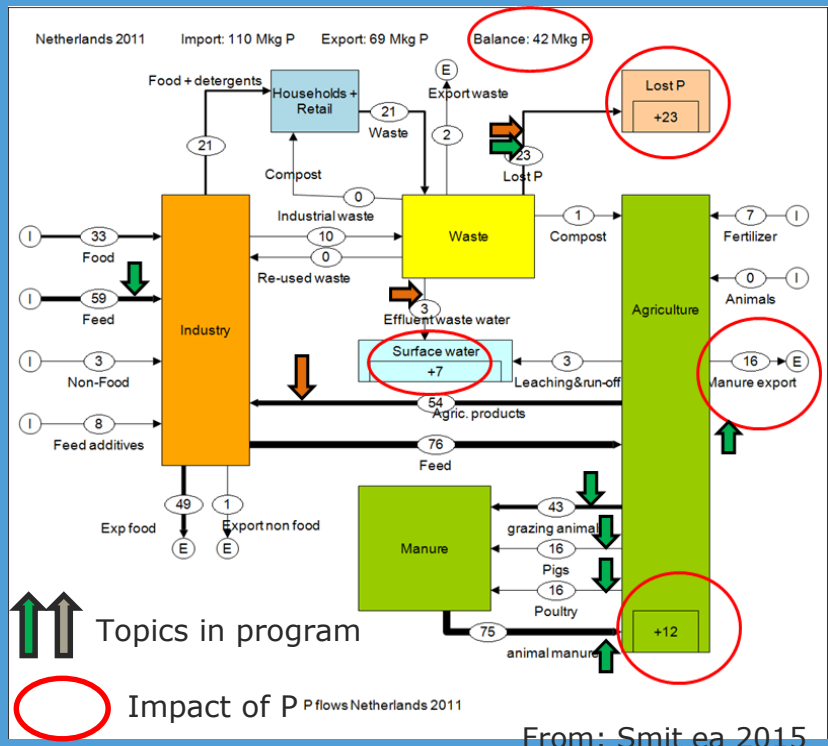
Closing the P cycle across farm and regional scale

The Netherlands is a net importer of P.
The P surplus threatens the environment or is made "inert" while the original P resource rock phosphate is non-renewable.
The program "Closing the P cycle" aims to
1) improve the P use efficiency (PUE) in individual processes in the P cycle
2) explore the coherence between PUE's on NL scale to identify where improving is most effective.

- The impact we want to reach is help stakeholders to decide which investment is most effective to increase PUE.



From: Smit ea 2015

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Circular design & loop closure

- Hierna twee plaatjes van de EZ site Biobasedeconomy.nl over:
  The New Plastics Economy, Rethinking the future of plastics @ World Economic Forum

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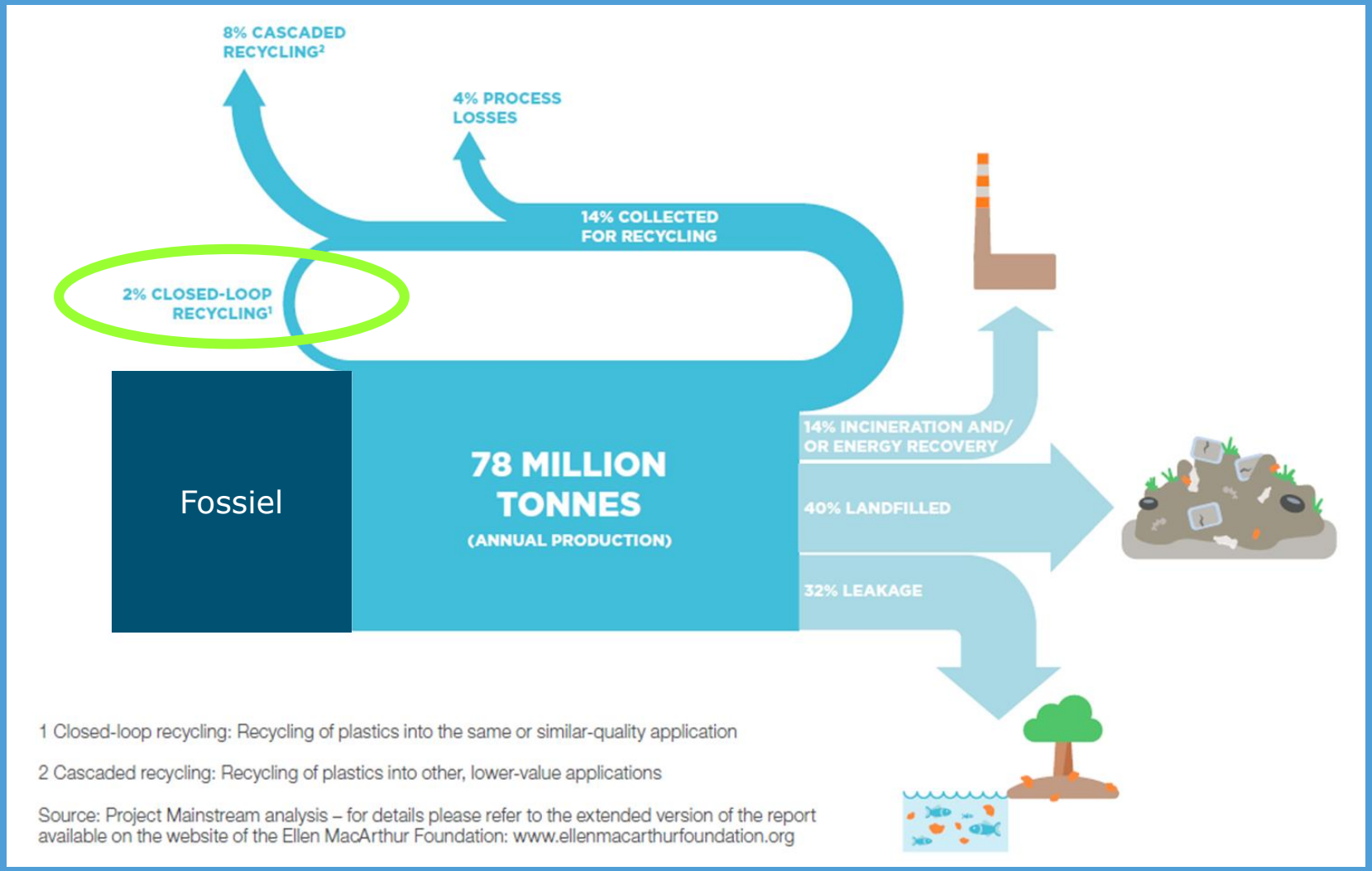
Global flows of Plastic packaging materials 2013*)



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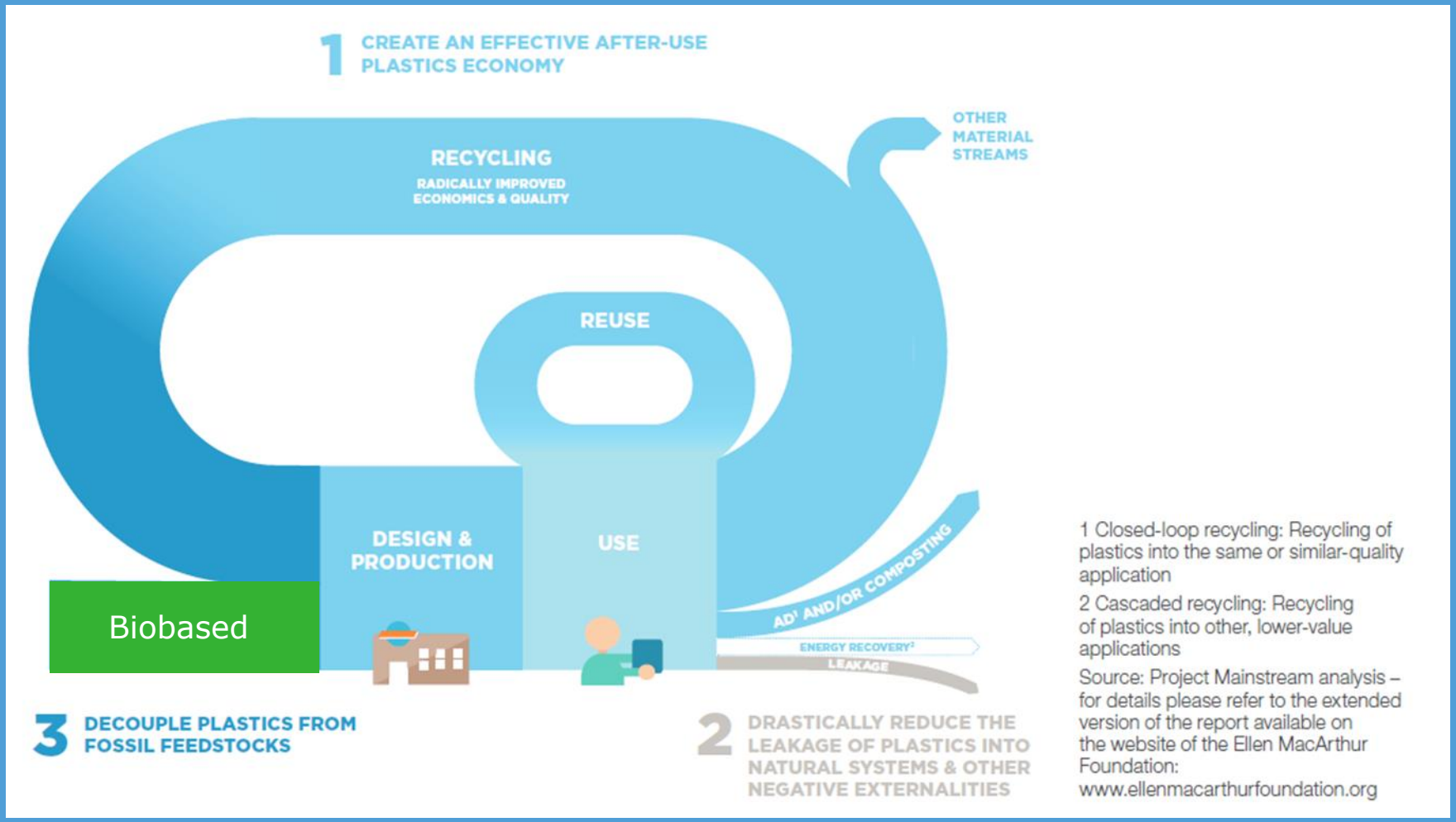
*) Source: Biobasedeconomy.nl,WORLD ECONOMIC FORUM, 2016

Ambitions of the New Plastics Economy*)



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*) Source: Biobasedeconomy.nl,WORLD ECONOMIC FORUM, 2016

Nieuwe business modellen

- Van water*zuivering* -> grondstofproducent
- Van tomatenstengel -> tomaten bakje en misschien later -> verpakkingsleverancier
- Van bermgras onderhoudslast -> grondstof voor chemie
- Van suikerbieten coöperatie -> producent van tussenproducten voor de chemie
- Van fossiel EPS (”piepschuim”) producent -> biofoam producent
- Van huidige regio -> netwerk regio

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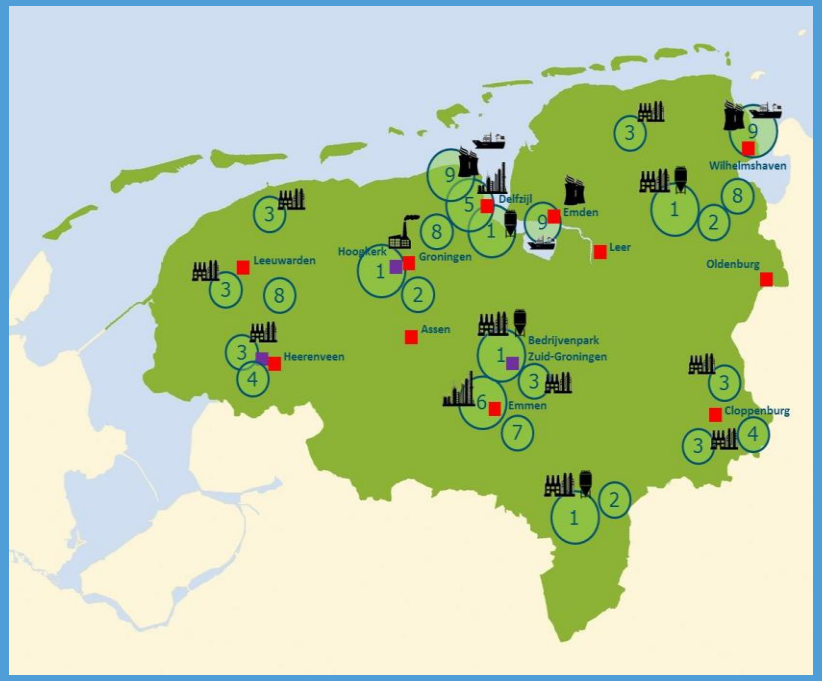
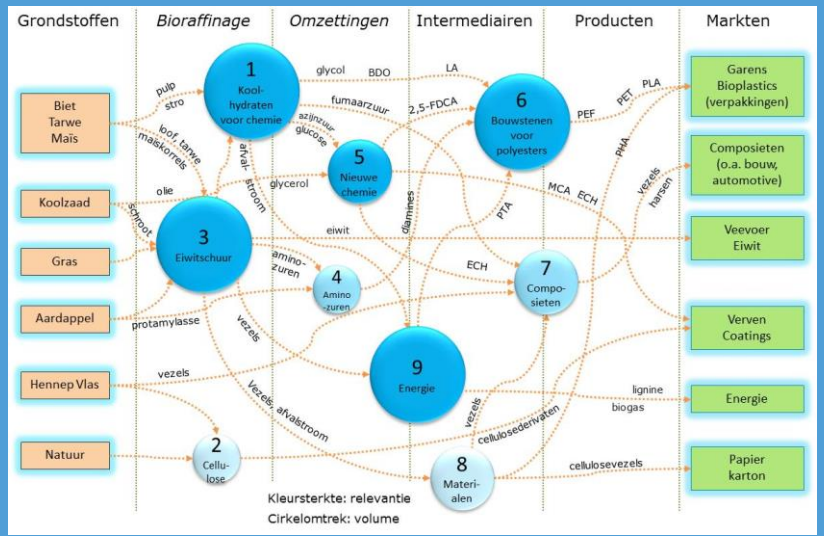
Noord4Bio

- Define concrete chances for development of Biobased Economy in the North of the Netherlands
- Ministry of EZ and 3 Provinces
- Approach
  - Strengths & Weaknesses
  - List of chances
  - Confrontation matrix
  - Clustering and defining of concrete cases





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Werkgelegenheid en economie

- Innovatie en veranderingen in business modellen ->
- Nieuwe bedrijven in de maak- en verwerkende industrie, logistiek, machinebouw, installatie, service en R&D ->
- Nodig: MBO, HBO, WO niveau: nieuw onderwijs aanbod
- Profitable, sustainable recycling: collection, sorting, reprocessing, innovation
- MEV BbE: effecten zijn lastig te kwantificeren:
    - Olie prijs = ??? & CO_2 prijs = ???
    - Bij innovatie & high-tech lijkt 40% GHG reductie & GDP groei in 2030 mogelijk

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Risico @ business as usual

Concurrentie zorgt voor:

- Flexibiliteit “dual feed-stock”
- Verlagen resource footprint -> trekt investors, creëert ruimte voor cost leadership en/of levert marge
- Substitutie

Omgeving zorgt voor:

- Veranderende wetgeving
- Veranderende consumenten percepties en preferenties
- Veranderingen in social acceptance

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Thank you for your attention

Bridging the Innovation Gap

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