



Dr. Jan Jager

Circular Economy in Northern Netherlands

Lectorship Circular Plastics
NHL University of Applied Sciences in Leeuwarden

Lectorship Sustainable Plastics
Stenden University of Applied Sciences in Emmen



Stenden University of Applied Sciences

- Leeuwarden
- Groningen
- Assen
- Meppel
- Emmen (Life Science, Engineering and ICT)
 - Minor Sustainable Plastics (30 EC, 15 EC education and 15 EC projects)
 - Minor Circular Plastics (30 EC, 15 EC education and 15 EC projects)
- Bali
- Bangkok
- Quatar
- South Africa
- Collaboration with IFCE in Fortaleza



“Groningen en Drenthe door Brussel aangewezen als voorbeeldregio voor groene chemie”

Drenthe koert
naar een Biobased Economy

provincie Drenthe



Innovatieve tuinbouw
en agribusiness



Biobased opbinddraad
voor tomaten
en komkommers



Drenthe geeft waarde aan
groene producten



Medicijn tegen hartfalen
uit planten



Meer informatie
www.biobaseddrenthe.nl

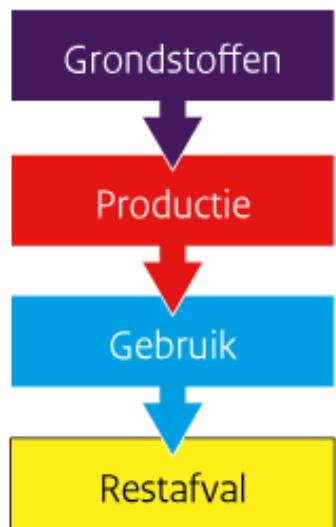


Drenthe
prominent en
succesvol
in biobased
innovatie

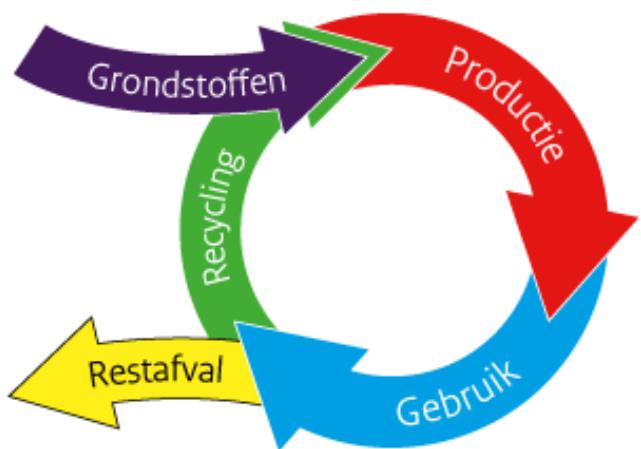




Lineaire economie



Keteneconomie met recycling



Circulaire economie



Van Afval Naar Grondstof

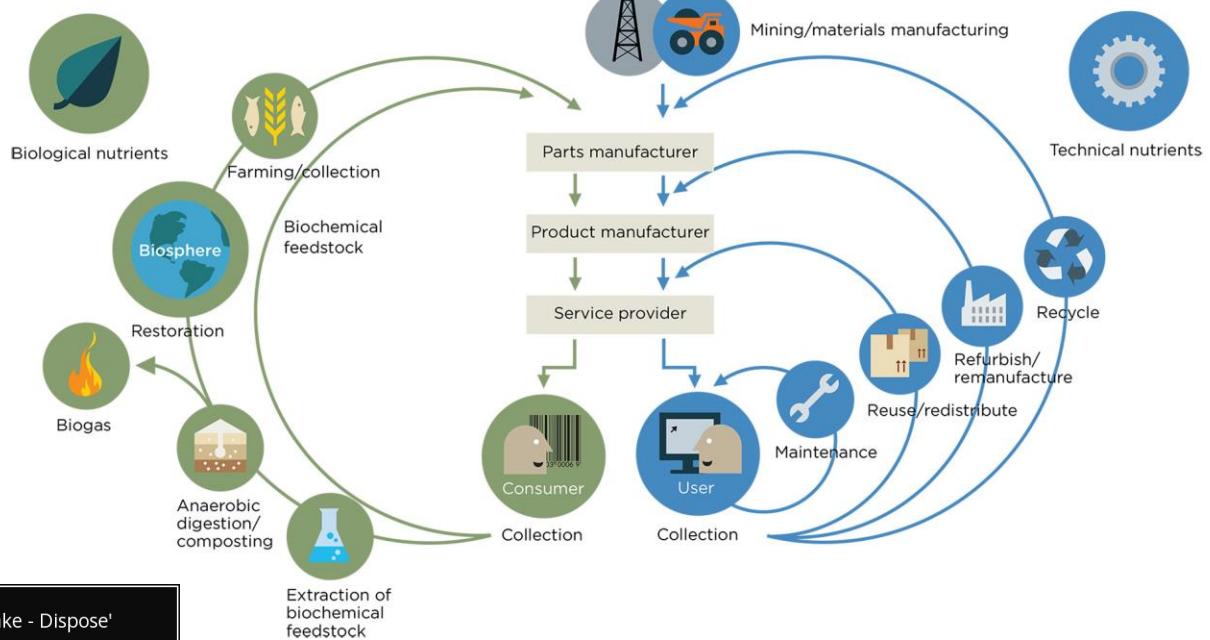




Where does this company sit within the circular economy?



**ELLEN
MACARTHUR
FOUNDATION**
Rethink the future



The linear 'Take - Make - Dispose' system, which depletes natural resources and generates waste, is deeply flawed and can be productively replaced by a restorative model in which waste does not exist as such but is only food for the next cycle

— Ellen MacArthur —

AZ QUOTES



The Emmen-area

This area is specialized in plastics and plastic products (including synthetic fibers).

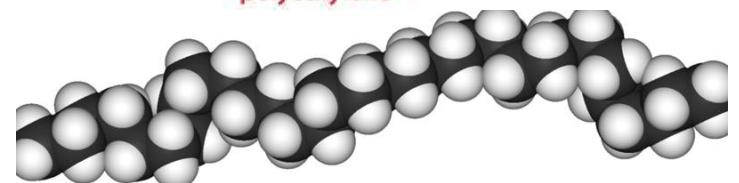
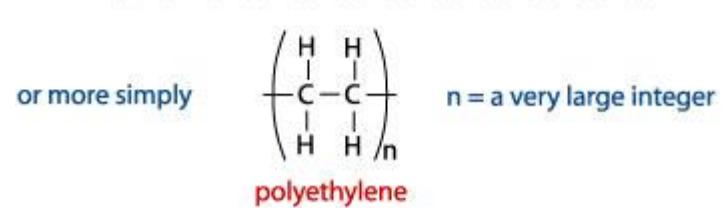
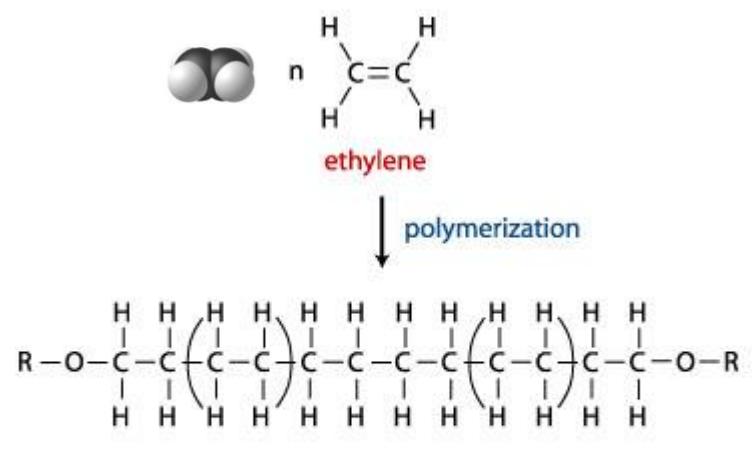
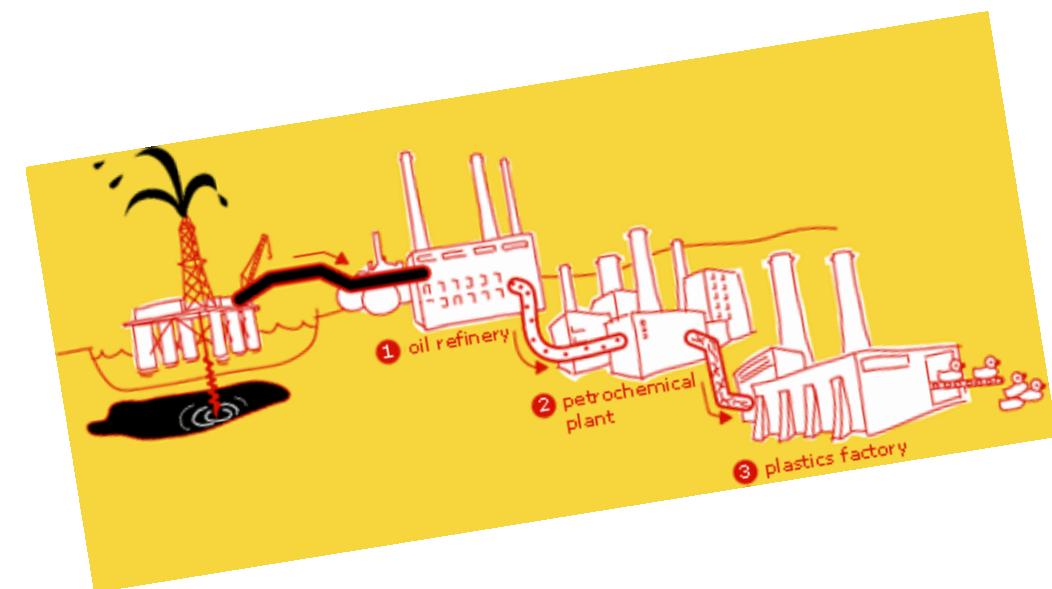
This specialization originates from the 50's when AKU, later Akzo Nobel, started a 100 hectare location in Emmen for PA6 fibers and PET textile and technical fibers.

Nowadays, it is a multi-company location with global companies DSM and Teijin Aramid, and other companies like SunOil, Cumapol, Morssinkhof Plastics, Low & Bonar, and Senbis Polymer Innovations.





What are polymers and plastics?



Monomeer

Ethylene
Propylene
Styrene
Vinylchloride
Caprolactam

Ethyleneglycol
Terephthalic

Polymeer

Polyethylene
Polypropylene
Polystyrene
Polyvinylchloride
Polyamide 6 (Nylon 6)

Polyethyleentereftaat

Abbreviation

PE (biobased)
PP
PS
PVC
PA6

PET (partially biobased)

Corn (lactic acid)*

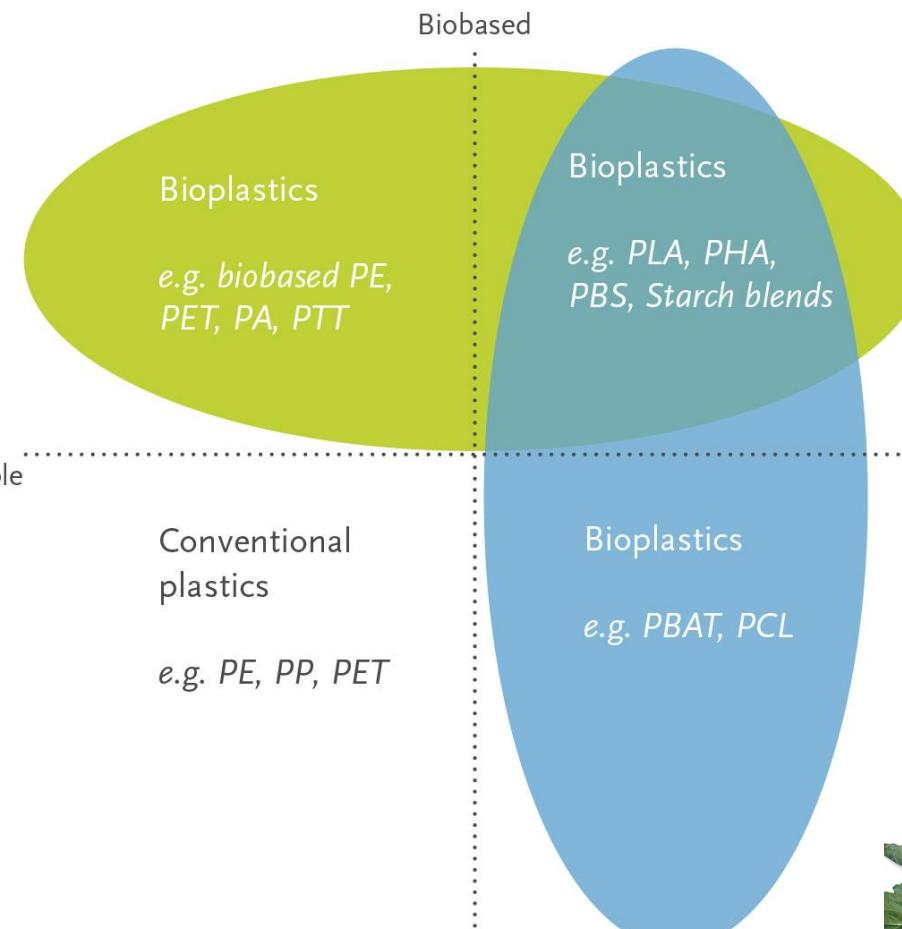
Polylactic acid

PLA (compostable)





Non
biodegradable





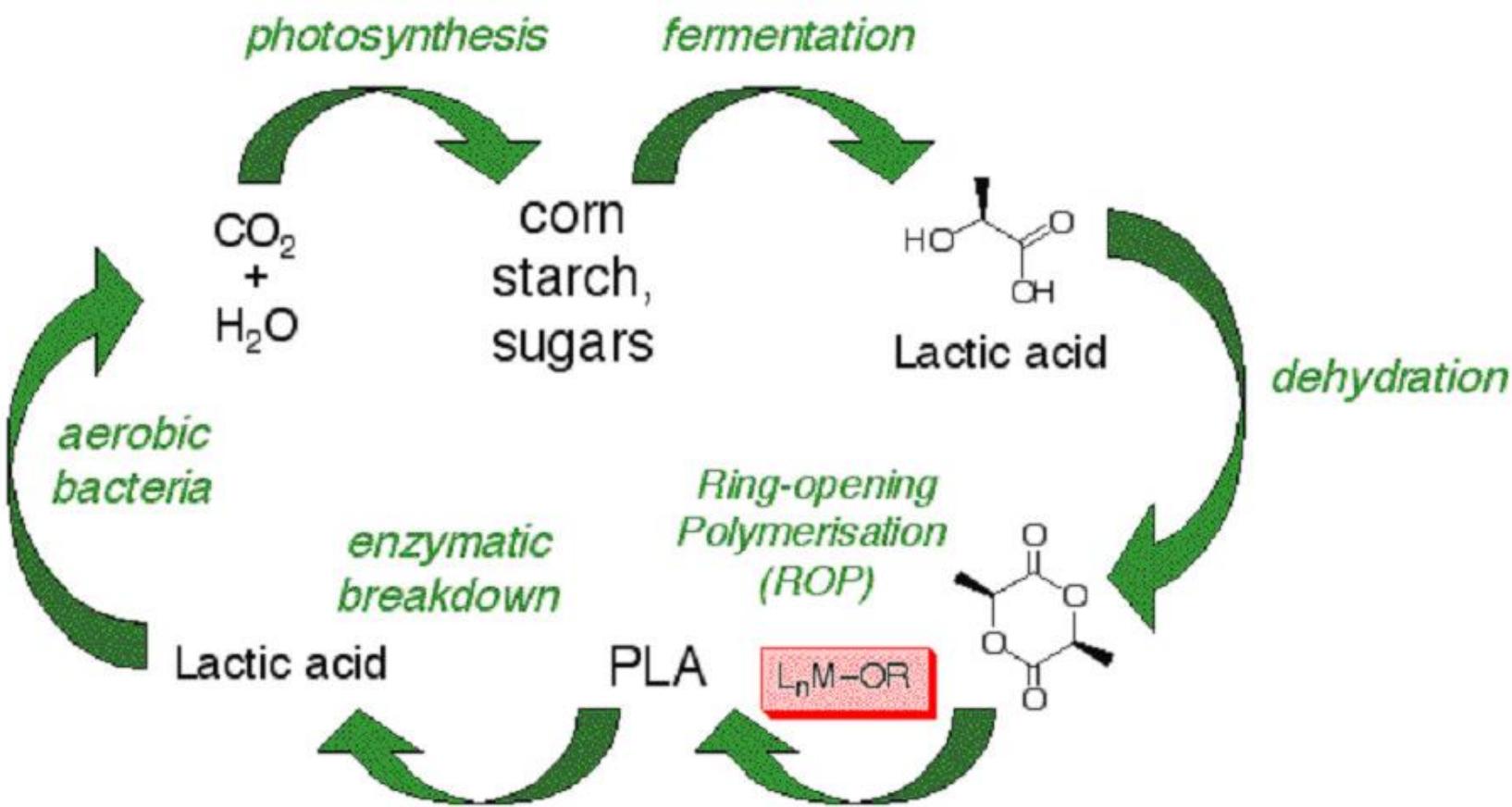
Plastics are:

- Cheap
- Easy processable
- Light weight
- And can have different properties
- Easy recyclable

But:

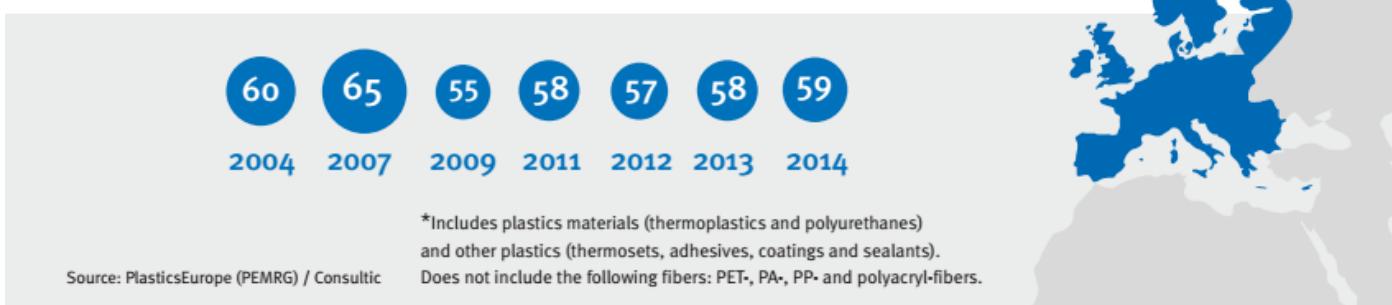
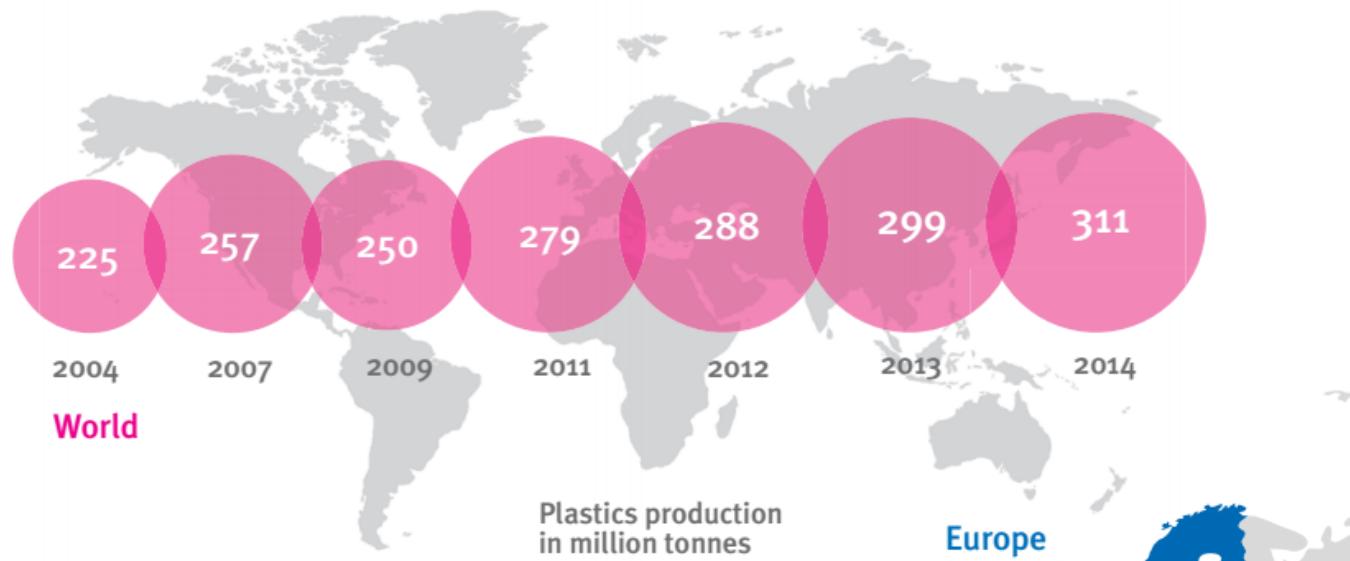
- Plastic Soup (The Great Pacific Garbage Patch)







Plastics* production is stable in Europe and grows globally

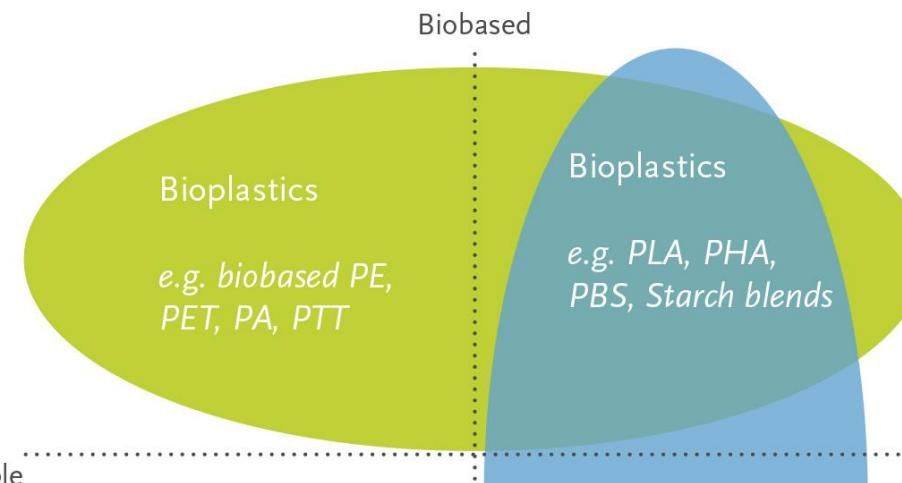




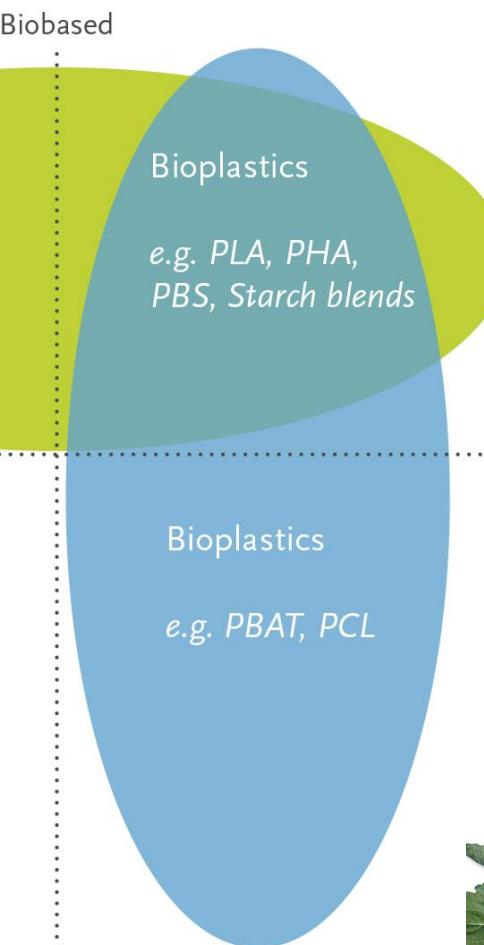
up to 30% plant-based
100% recyclable bottle
redesigned plastic,
recyclable as ever.



Non
biodegradable



Fossil-based





Green PAC (Green Polymer Application Centre)

- Initiative of Stenden University and Windesheim University (Zwolle)
- Centre of Expertise on Smart Polymeric Materials
 - Master Polymer Engineering (dual master with RUG, WUR and uTwente)

Projects (always with regional companies):

- 3D printing (new monofilaments on own extrusion line): e.g. elastic materials
- 3D printing education
- Biocomposites (bridge in Emmen Wildlands Zoo and bicycle bridge in Leeuwarden)
- Sustainable Fibers (rPET, bioPET, PLA, and PBS)
- Biocomposite bicycle lane, incl. smart lightning
- High-end composites (WCCS, World Class Composite Solutions, light weight construction)
- Recycling projects (e.g. sorting, cleaning and both product and business development)

Realized:



EMMEN - Emmen krijgt het eerste houten fietspad ter wereld. Er wordt een strook van 200 meter aangelegd tussen Klazienaveen en Weiteveen waar een nieuw materiaal wordt getest.

morssinkhof Sustainable Products

An advertisement for morssinkhof Sustainable Products. It features a large blue and white geometric graphic on the left. On the right, there's a portrait of a man in a suit standing outdoors near some industrial structures. Below the portrait, text reads: "A new generation of rPET based industrial yarns".

Discover industrial yarns based on recycled polymer made from post consumer and industrial plastics.

For industries that want to keep up with the increasing demands from customers with a sustainable lifestyle.



Green.PAC Polymer Application Centre

An advertisement for Green.PAC. It features a photograph of two giraffes in a natural, open landscape. The text reads: "Bioklapbrug WILDLANDS, Adventure Zoo Emmen".

Met dit project is een biocomposieten sandwich brugdek ontwikkeld voor het nieuwe dierenpark in Emmen dat bestaat uit natuurvezelversterking met biofibres.

Kenmerken

- Het resultaat is een dek dat het verschijnbaar weegt en flexibel; Onderste laag is een thermisch en mechanisch afgestempten vloerlaag.
- De duur van redelijkerhand beschikbare biocomposieten constructies kan worden vergroot door gebruik te maken van deze biocomposieten.
- De kosten voor de productie van het dek kunnen worden verlaagd door gebruik te maken van meer herbruikbare biocomposieten.
- De mogelijkheid om de productie van het dek te beschrijven te brengen.

Voordeelen

- Met behulp van de kennis die het voordeel heeft dat nog veel voor gebruikt kan worden.
- Levensduur en onderhoudsgraad zijn vergelijkbaar met traditionele houten bruggen.
- Het gebruik van meer herbruikbare biocomposieten.
- De mogelijkheid om de productie van het dek te beschrijven te brengen.

Partners

- WILDLANDS, Adventure Zoo Emmen
- Universiteit Twente
- Composite Technology Centre
- ArcelorMittal
- Weldseal

Thema's

- Biofibres
- Weg- en wegenbouw

www.greenpac.eu



BERNN: new initiative

Bio Economy Region Northern Netherlands



- Van Hall Larenstein University of Applied Sciences, Leeuwarden
 - NHL University of Applied Sciences, Leeuwarden
 - Stenden University of Applied Sciences, Leeuwarden
 - Hanze University of Applied Sciences, Groningen
 - RUG
-
- EFRO project with focus on cellulose and PHA's



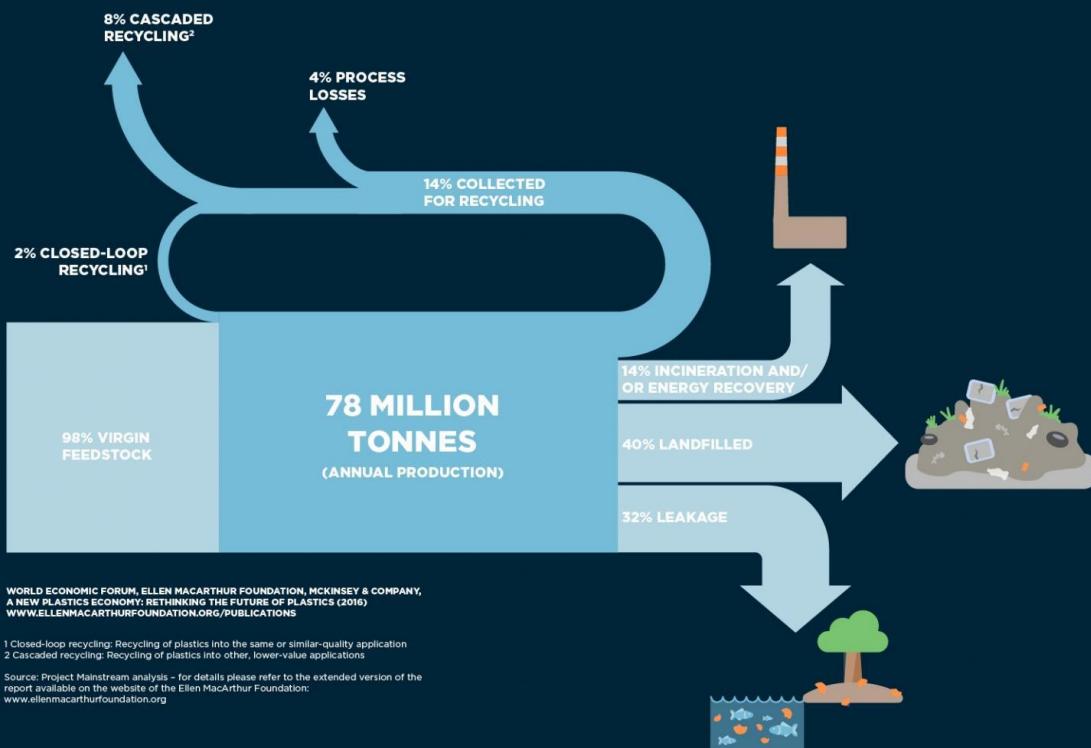
Europese Unie
Europees Fonds voor Regionale Ontwikkeling

Ellen MacArthur
Foundation
World Economic Forum
McKinsey & Company





TODAY, PLASTIC PACKAGING MATERIAL FLOWS ARE LARGELY LINEAR





WITH AN EXPECTED SURGE IN CONSUMPTION, NEGATIVE EXTERNALITIES RELATED TO PLASTICS WILL MULTIPLY

2014

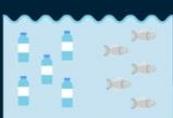
PLASTICS PRODUCTION



RATIO OF PLASTICS TO FISH IN THE OCEAN¹ (BY WEIGHT)



2050



PLASTICS' SHARE OF GLOBAL OIL CONSUMPTION²



PLASTICS' SHARE OF CARBON BUDGET³



WORLD ECONOMIC FORUM, ELLEN MACARTHUR FOUNDATION, MCKINSEY & COMPANY,
A NEW PLASTICS ECONOMY: RETHINKING THE FUTURE OF PLASTICS (2016)
WWW.ELLENMACARTHURFOUNDATION.ORG/PUBLICATIONS

1 Total ocean plastics growth ($\times 5$) is faster than plastics production growth ($\times 3$) as the majority of consumption growth will be in high-leakage markets. Fish stocks are assumed to be constant (conservative assumption).

2 Total oil consumption expected to grow slower (0.5% p.a.) than plastics production (3.6% until 2030 then 3.5% to 2050).

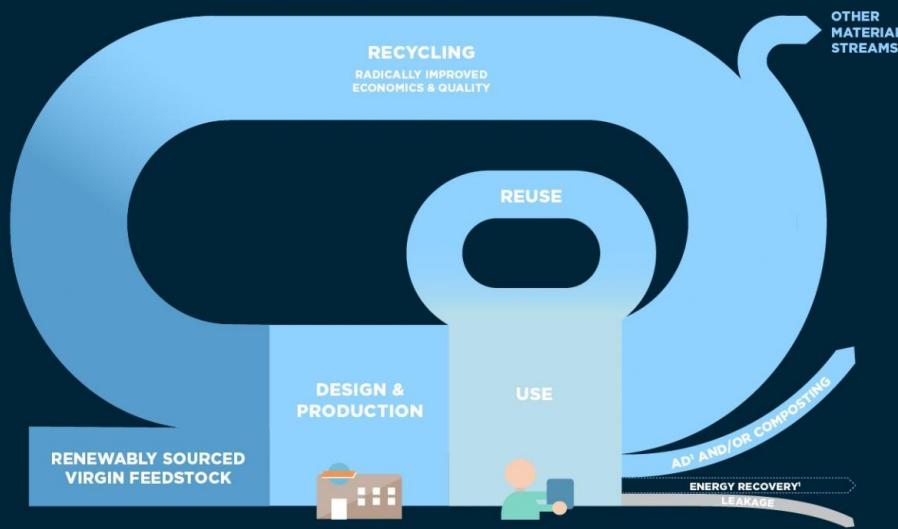
3 Carbon from plastics includes energy used in production and carbon released through incineration and/or energy recovery after-use. The latter is based on 14% incinerated and/or energy recovery in 2014 and 20% in 2050. Carbon budget based on 2 degrees scenario

Source: Plastics Europe, ICS Supply and Demand; IEA World Energy Outlook (2015) global GDP projection 2015–2040, assumed to continue to 2050; Ocean Conservancy and McKinsey Center for Business and Environment, Stemming the Tide: Land-based strategies for a plastic-free ocean; H. van der Ryn et al., “Plastics from and to the Sea,” Science (13 March 2015); IEA World Energy Outlook (2015) central “New Policies” scenario oil demand projection 2014–2040, assumed to continue to 2050; J. Hopwood et al., “Plastic recycling: Challenges and opportunities,” Philosophical Transactions of the Royal Society B, 2009; IEA CO₂ emissions from fuel combustion (2014); IEA World Energy Outlook Special Report: Energy and Climate Change; Carbon Tracker Initiative Unburnable Carbon (2013)



THE NEW PLASTICS ECONOMY

1 CREATE AN EFFECTIVE AFTER-USE PLASTICS ECONOMY



3 DECOUPLE PLASTICS FROM FOSSIL FEEDSTOCKS

2 DRASTICALLY REDUCE THE LEAKAGE OF PLASTICS INTO NATURAL SYSTEMS & OTHER NEGATIVE EXTERNALITIES

WORLD ECONOMIC FORUM, ELLEN MACARTHUR FOUNDATION, MCKINSEY & COMPANY,
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¹Anaerobic digestion

²The role of, and boundary conditions for, energy recovery in the New Plastics Economy needs to be further investigated.

Source: Project Mainstream analysis

Bedankt voor uw aandacht