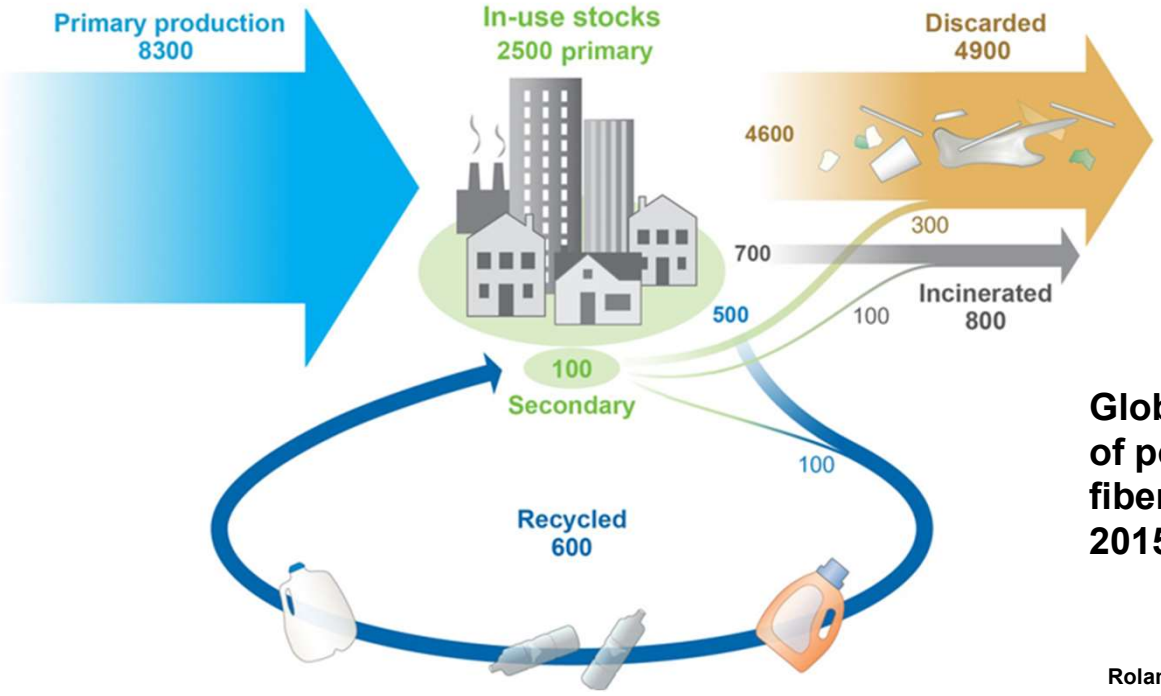
Is there a fair future with plastic? Theory and practical solutions

BSSSC ANNUAL CONFERENCE 2020
30.09.2020

Professor Ali Harlin

Global plastics presence in total

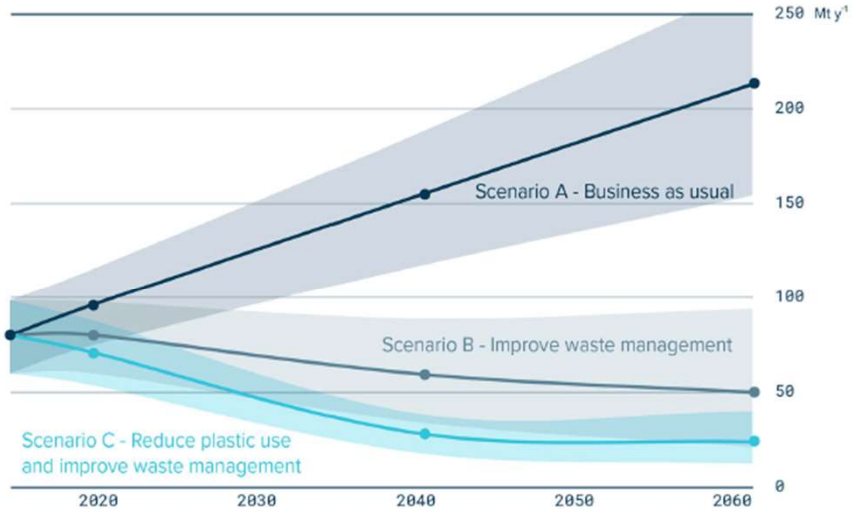


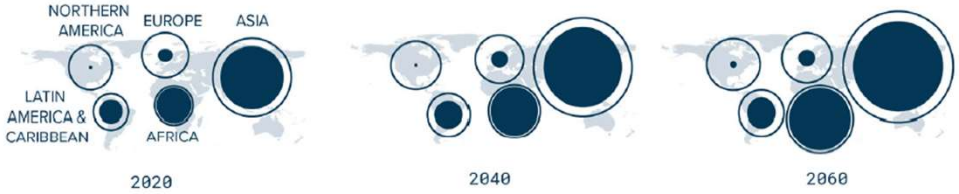
Global production, use, and fate of polymer resins, synthetic fibers, and additives (1950 to 2015; in million metric tons).

ScienceAdvances
AAAS

Roland Geyer et al. Sci Adv 2017;3:e1700782

Future scenarios of global plastic waste generation and disposal

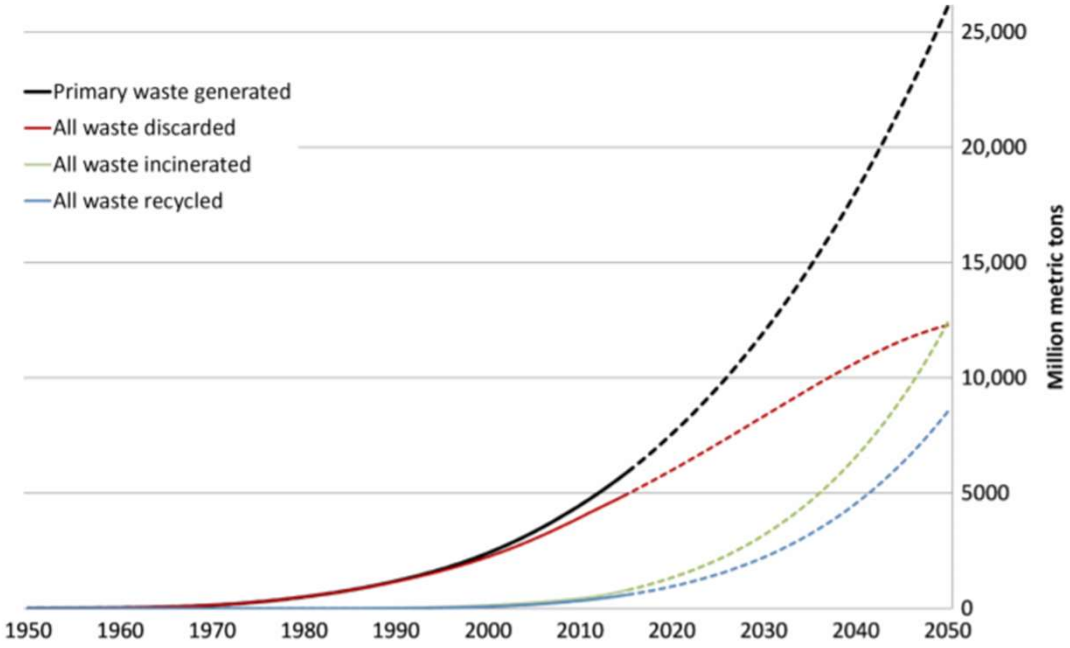




The accumulation of mismanaged plastic waste (MPW) in the environment is estimated between 60 and 99 million metric tonnes (Mt) of MPW were produced globally in 2015. In a business-asusual scenario, this figure could triple to 155–265 Mt y−1 by 2060.

Laurent Lebreton& Anthony Andrady
PALGRAVE COMMUNICATIONS | (2019) 5:6 |
https://doi.org/10.1057/s41599-018-0212-7 | www.nature.com/palcomms

Cumulative plastics waste generation and disposal



Cumulative plastic waste generation and disposal (in million metric tons). Solid lines show historical data from 1950 to 2015; dashed lines show projections of historical trends to 2050.

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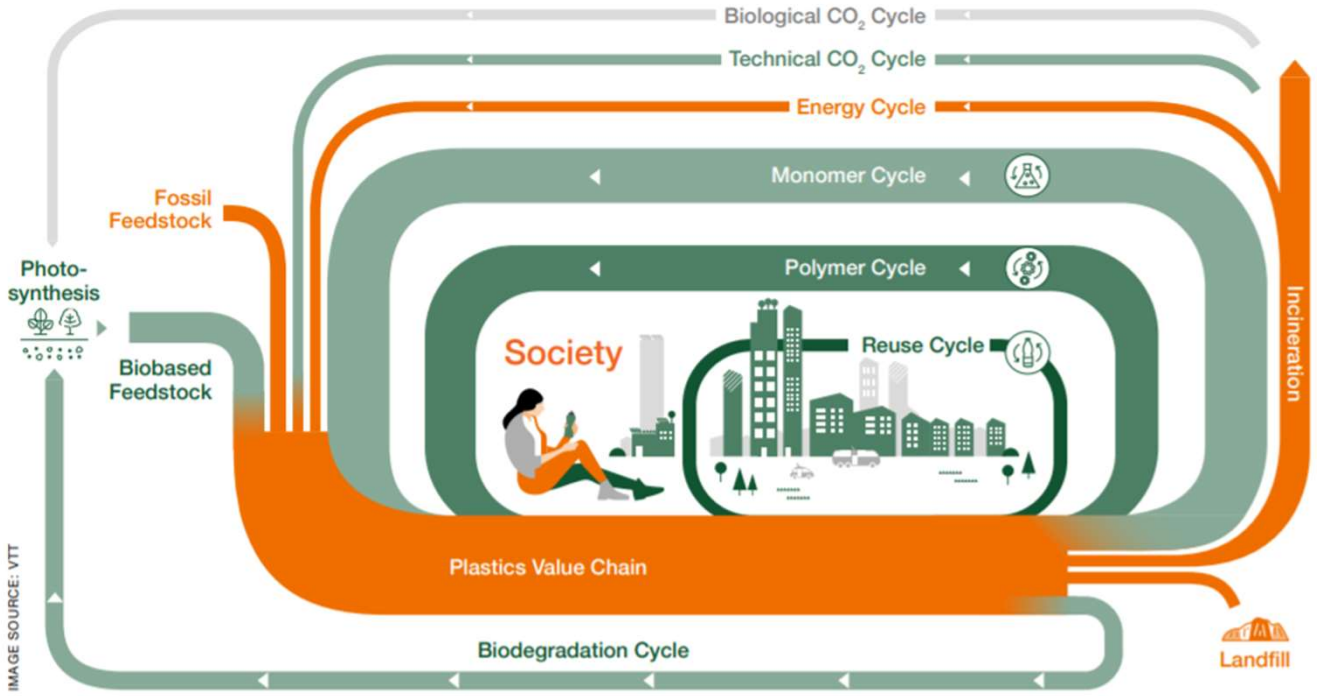
A Circular Economy of Plastics

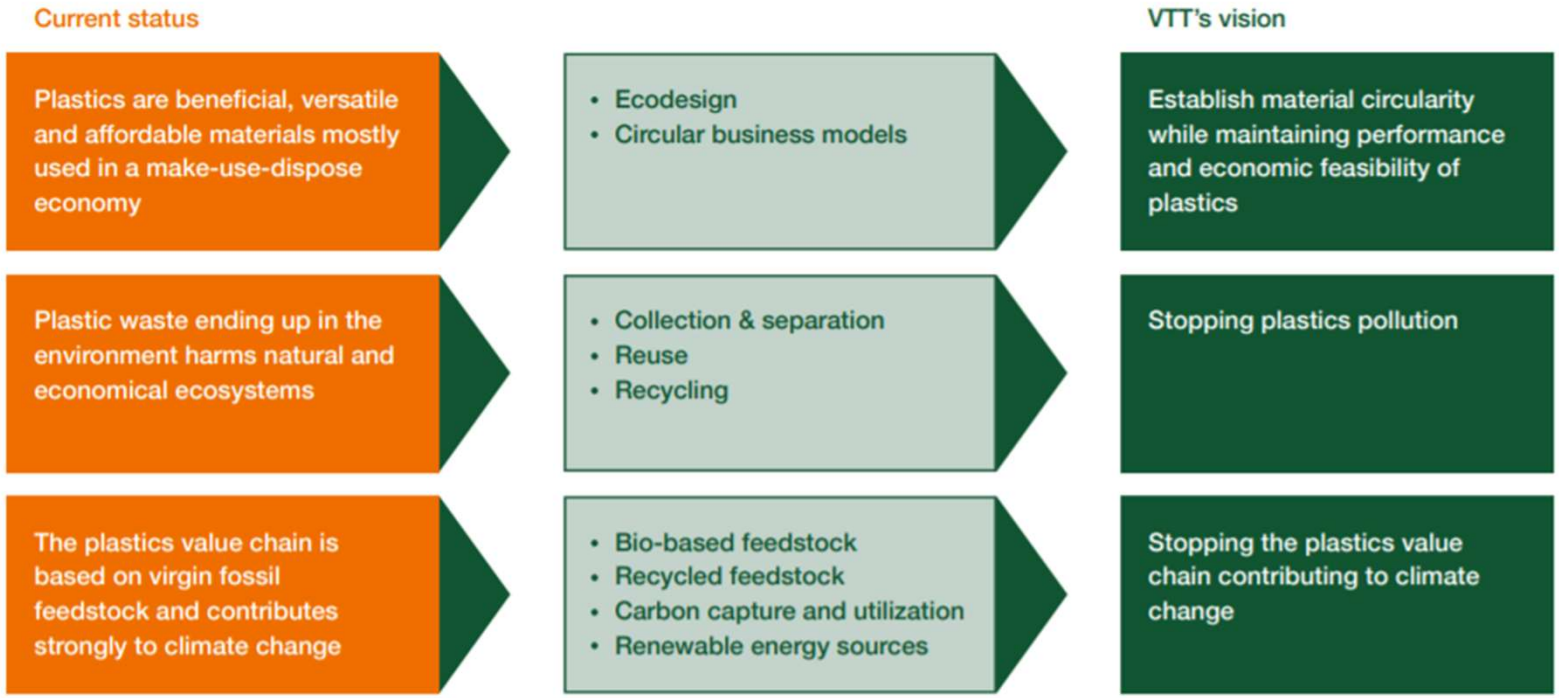
A vision for redesigning plastics value chains

VTT's vision for circularity of plastics

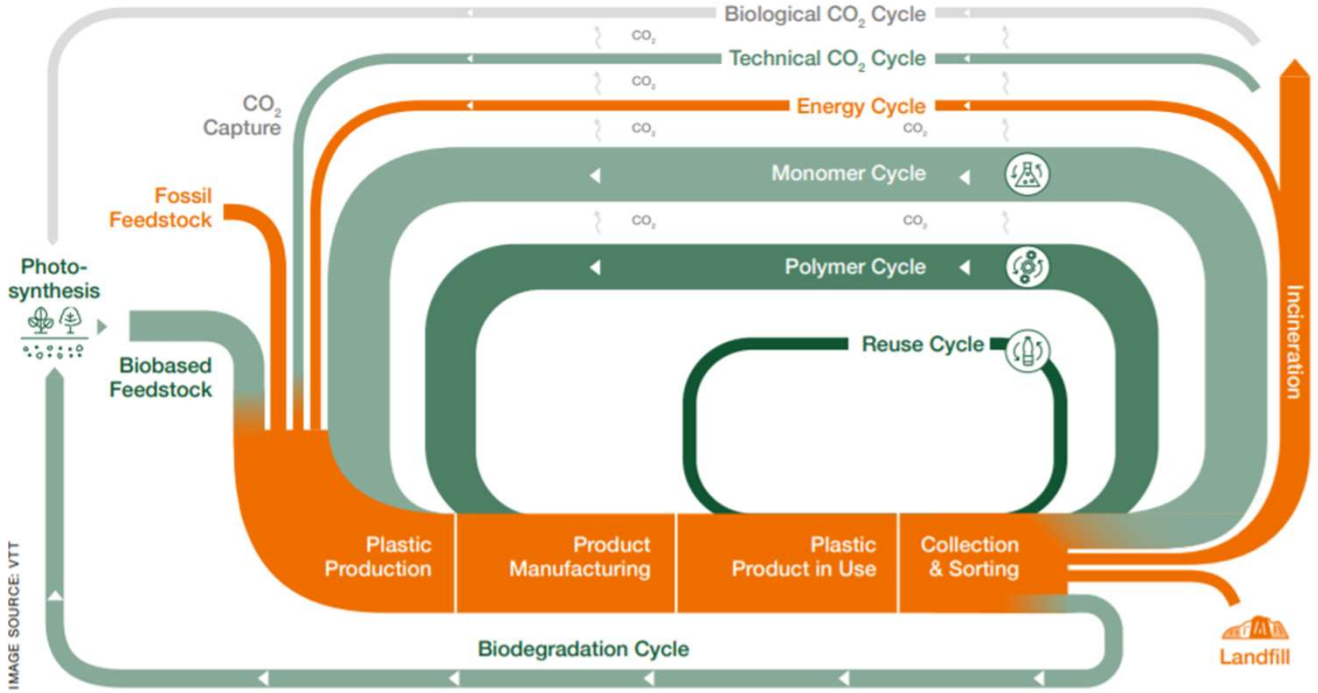


https://info.vttresearch.com/hubfs/pdf/articles/VTT_Circular_economy_of_plastics.pdf?hsLang=en

VTT's roadmap for creating a circular economy for plastics



VTT's technology vision for circular plastics



Renew material platform

Towards recycle and reuse

Single use plastic SUP

- The products on the EU's ban list include cotton swab shafts, cutlery, plates, straws, drinks stirrers, and sticks for balloons.They will need to be made with more sustainable materials.
- Single-use plastic drink containers will be allowed only if their caps remain attached. Other products are subject to awareness-raising and cleanup measures.
- Together with fishing gear, the products targeted constitute 70% of all marine litter, the EC says.

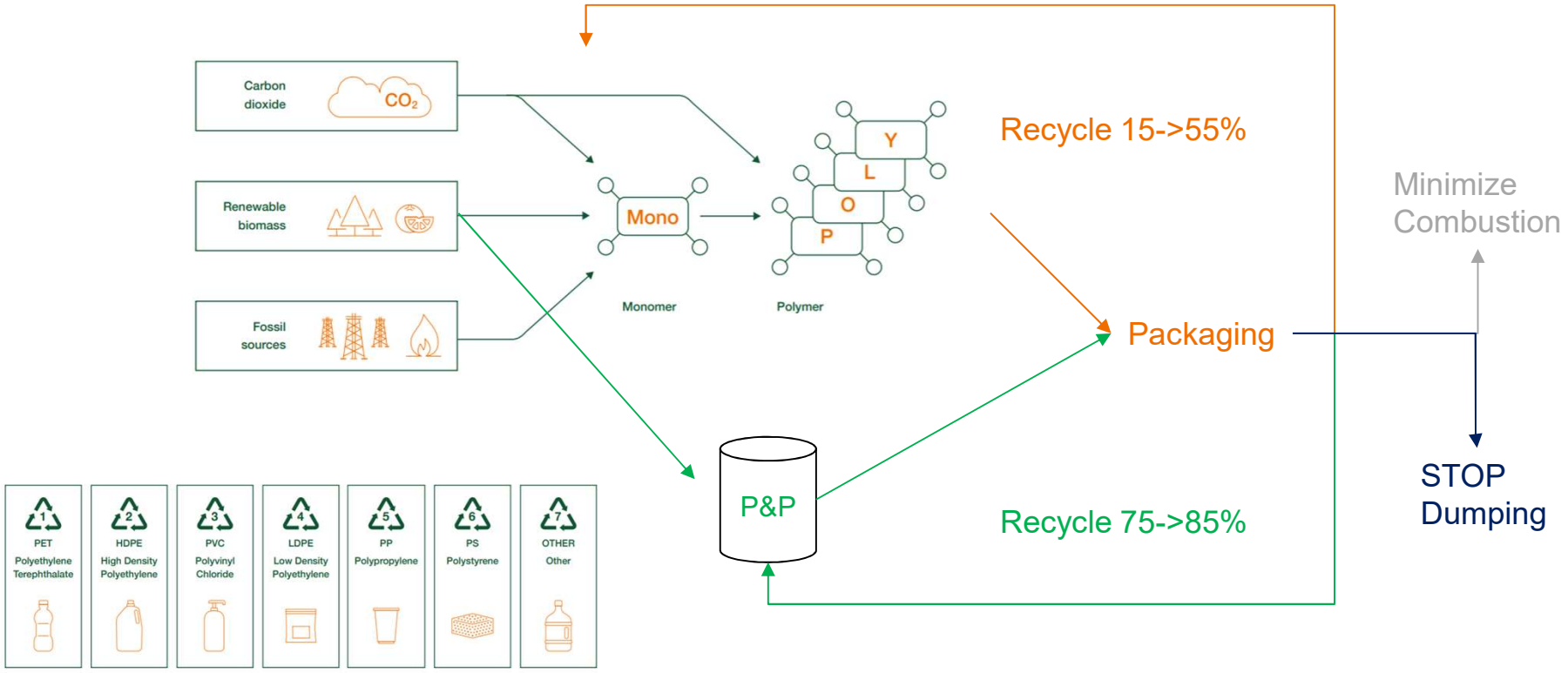
https://cen.acs.org/environment/pollution/Europe-ban-single-use-plastics/96/i23

Why we need plastic in future

- In packaging food losses vs.
  GHG and waste
- High performance technical use

Produce	Cucumber	Zucchini slices	Banana (distribution)	Cherries	Pear	Fish	Cheese	(Whole) Chicken
Shelf life: no packaging with plastic packaging	3 days 14 days	1–2 days 4–5 days	15 days 36 days	14 days 28 days	7–10 22–25	7 days 12 days	190 days 280 days	7 days 20 days
Difference	**11 days**	**2–4 days**	**21 days**	**14 days**	**15 days**	**5 days**	**90 days**	**13 days**

Material platform



These are the cornerstones of plastic usage approach in future

Retail Brands Turning Towards Biomaterials

Coca-Cola: ”PlantBottle”

“…Our vision was to maximize game changing technology, using responsibly sourced plant-based materials to create the globe’s first fully recyclable PET plastic bottle made entirely from renewable materials.”

BiofuelsDigest – June 2015

THE WORLD’S FIRST FULLY RENEWABLE CARTON

In January 2015, Tetra Pak delivered a world first, when customer Valio started using our fully renewable cartons for its Eila® lactose-free semi-skimmed milk drink.

https://www.tetrapak.com/sustainability/cases-and-articles/tetra-rex-bio-based

IKEA has set targets to use 100% recycled or renewable plastics by 2020

"The scale of the climate challenge requires bold commitments and bold action. That is why we are committing to go 100% renewable or recycled material for the plastic we use in our home furnishing products, building on our 100% goal for renewable energy, and our goal for 100% of our cotton and wood to come from more sustainable sources"

Plastics Today - September 2014

LEGO group

“… the current raw materials we use for manufacturing Lego bricks are oil-based, and that is a scarce resource….So we are searching for a new material that is not based on oil”

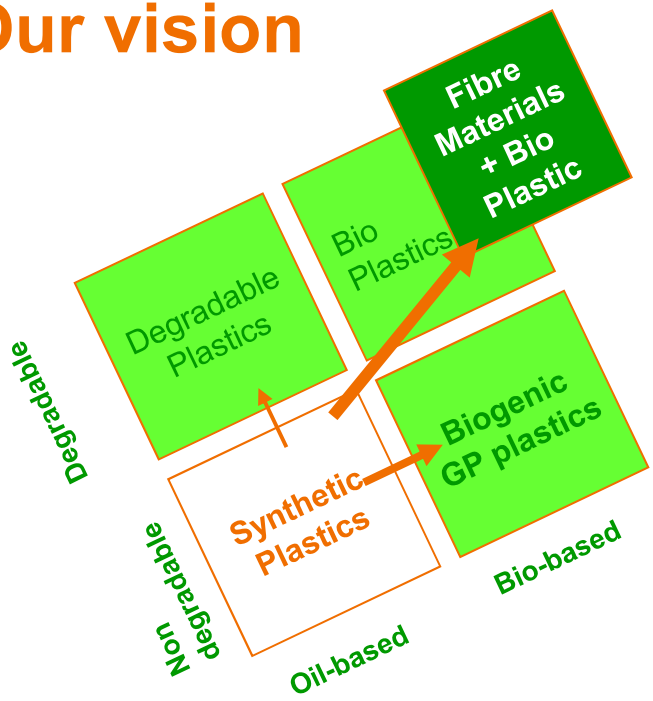
Environmental Leader.com – June 2016

FORD, Heinz, Jose Cuervo

“… “As a leader in the sustainability space, we are developing new technologies to efficiently employ discarded materials and fibers, while potentially reducing the use of petrochemicals and light-weighting our vehicles for desired fuel economy.”

Brandchannel.com – July 2016

Our vision



Fibrematerials are renewing:

- **Recycling enables efficient solutions**
- **Environmental risk reduction**
- **Synergy with plastics**

Benefits and advances of biogenic products:

- Biofuels increses biochemical production
- General puprose plastics remain highly efficient
  - World economics and logistics requirements
  - Reduction of wasted goods, e.g. food
- Waste managemt in future: recycling and energy use

Benefiters:

- Brandowners find answers for their customer request on sustainable products
- Chemical and material companies find added value and stability against oil price

Novel material solutions: Prototypes

Packading

Nonwovens

Stand-up pouch

Bio-PE/CNF/PLA/Paper

Bag-in-Box

Bio-HDPE/CNF/(BioLDPE)

MAP

Bio-HDPE/PGA/(BioLDPE)

Multilayered films

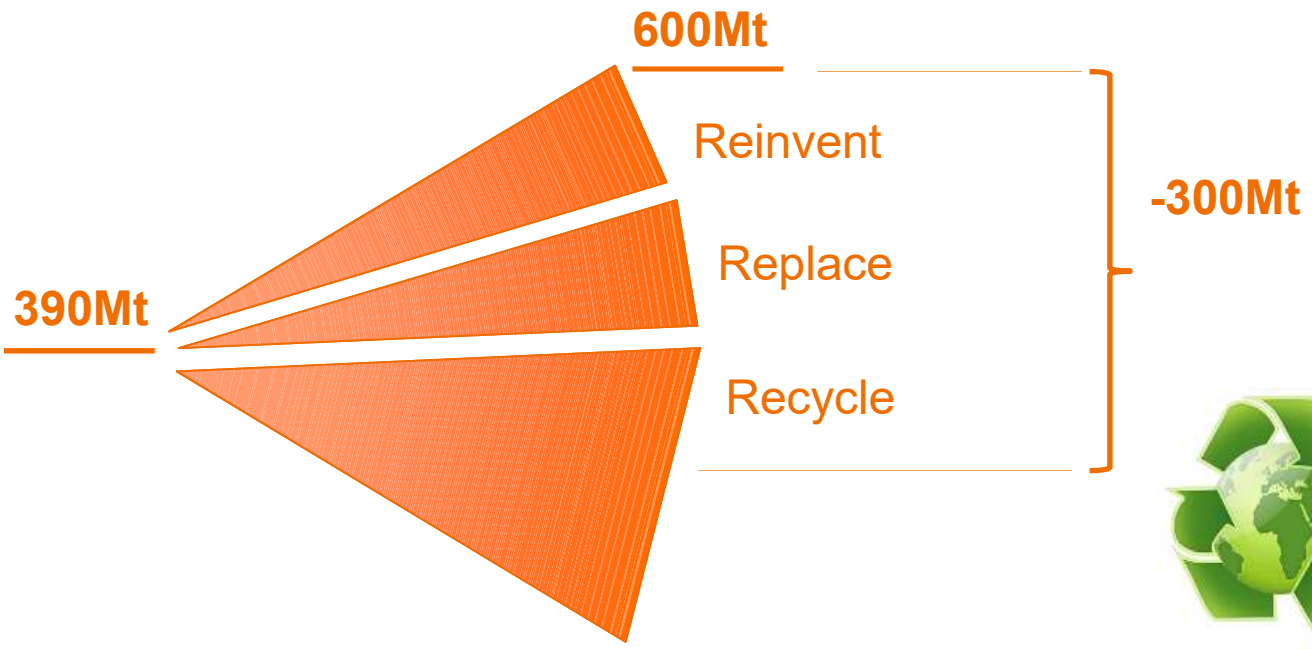
3D prints

Ellen MacArthur prize

3D VTT &Aalto cooperation

PE can be replaced with ThermoCell

Scenario for future



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