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Certified Compostable Fiber-Based Packaging Enables Circular Economy

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Nordic Bioplastic Conference, 26th April 2022, Copenhagen

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The era of linear economy is ending because we simply cannot afford it anymore!



Stakeholders are already driving the transformation to a Circular Economy

Markets





Various players across **all markets** have set **ambitious Circular Economy targets**

Legislators





Incoming EU **levy effective** as of January 2021: **€800 per ton for non-recycled plastic packaging waste**

Investors

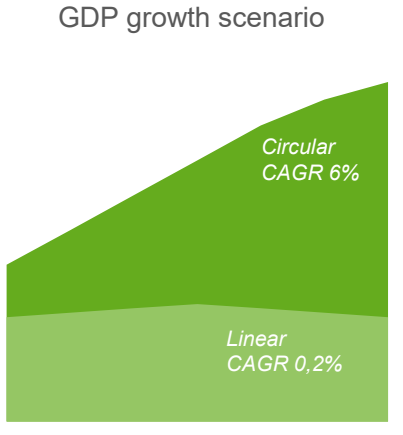




The BlackRock **Circular Economy Fund** has raised **€900 million** in its first year.



GDP growth scenario



Circular Economy business models grow significantly stronger than linear ones.

Circular Economy principles has TWO cycles!



Compost is essential for closing the biological cycle of circular economy!

Why should we care to compost ?

- Reduce harmful effects of leaving biowastes to rot in landfill sites or be lost through incineration
- Keep soil healthy by bringing the nutrients back to agricultural fields, and secure soil fertility
- Restore soil organic carbon¹
- Avoid emissions as fertilizer

► *Fertilizer Regulation (EU Commission)²:*

“Currently, only 5% of waste organic material is recycled and used as fertilizers, but recycled bio-waste could substitute up to 30% of inorganic fertilizers!”

and

Compost mitigates climate change!



¹ [Restoring soils could remove up to '5.5bn tonnes' of greenhouse gases every year \(carbonbrief.org\)](https://www.carbonbrief.org/restoring-soils-could-remove-up-to-5.5bn-tonnes-of-greenhouse-gases-every-year)

² [FAQs: New Regulation to boost the use of organic and waste-based fertilisers \(europa.eu\)](https://ec.europa.eu/euro-press/faq-new-regulation-boost-use-organic-and-waste-based-fertilisers)

Compost mitigates climate change¹

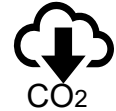
Biowaste recycled (tonnes/ year)



Current 83 million
POTENTIAL 1,000 million



Climate change mitigation (tonnes of CO₂ equivalents/ year)



Current 9 million
POTENTIAL 98 million

Carbon stored in soil & Avoided emissions as fertilizer

That is equivalent to²

Km driven in a car



Current 36 billion
POTENTIAL 396 billion

Smartphone charges



Current 608 billion
POTENTIAL 12 trillion

¹ SOC initiative and Global compost awareness week (aora.org.au)

² www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

What is the value of certified compostable materials?

- Supporting **easier collection of organics waste** (e.g., bags, brewing aid, selected fruit/ vegetable/ food packaging)
- Safeguard the compost quality **by prevention of microplastics** coming from conventional plastics in organics recycling streams

Smart usage of certified compostable material increase amount and quality of compost!



Organics waste and shopping bags



Fruits and vegetable bags



Flexible packaging



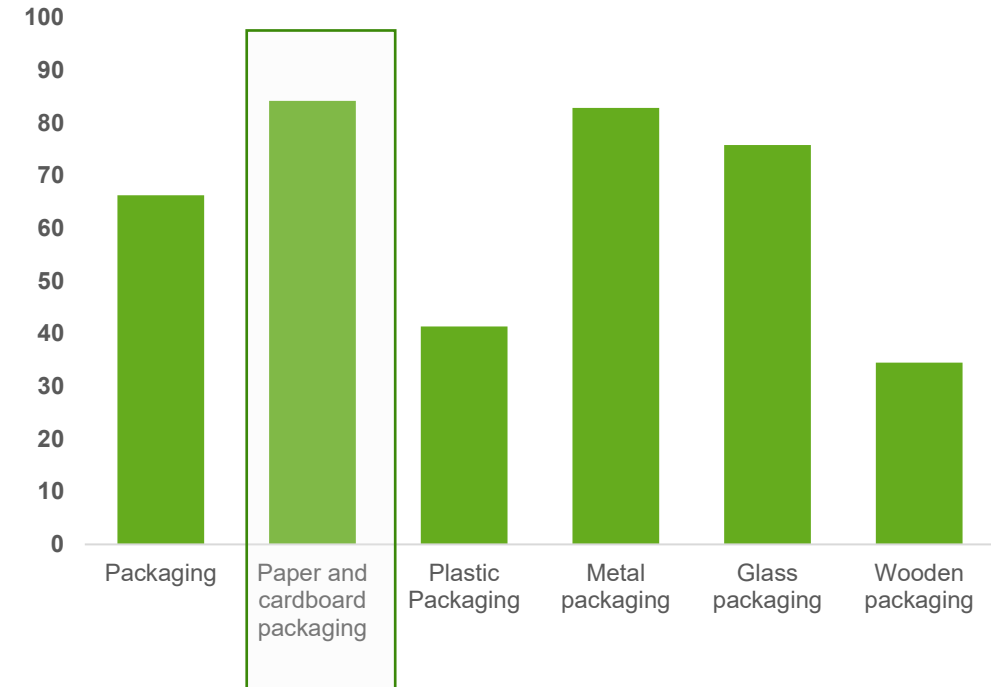
Rigid packaging



Fiber-based packaging

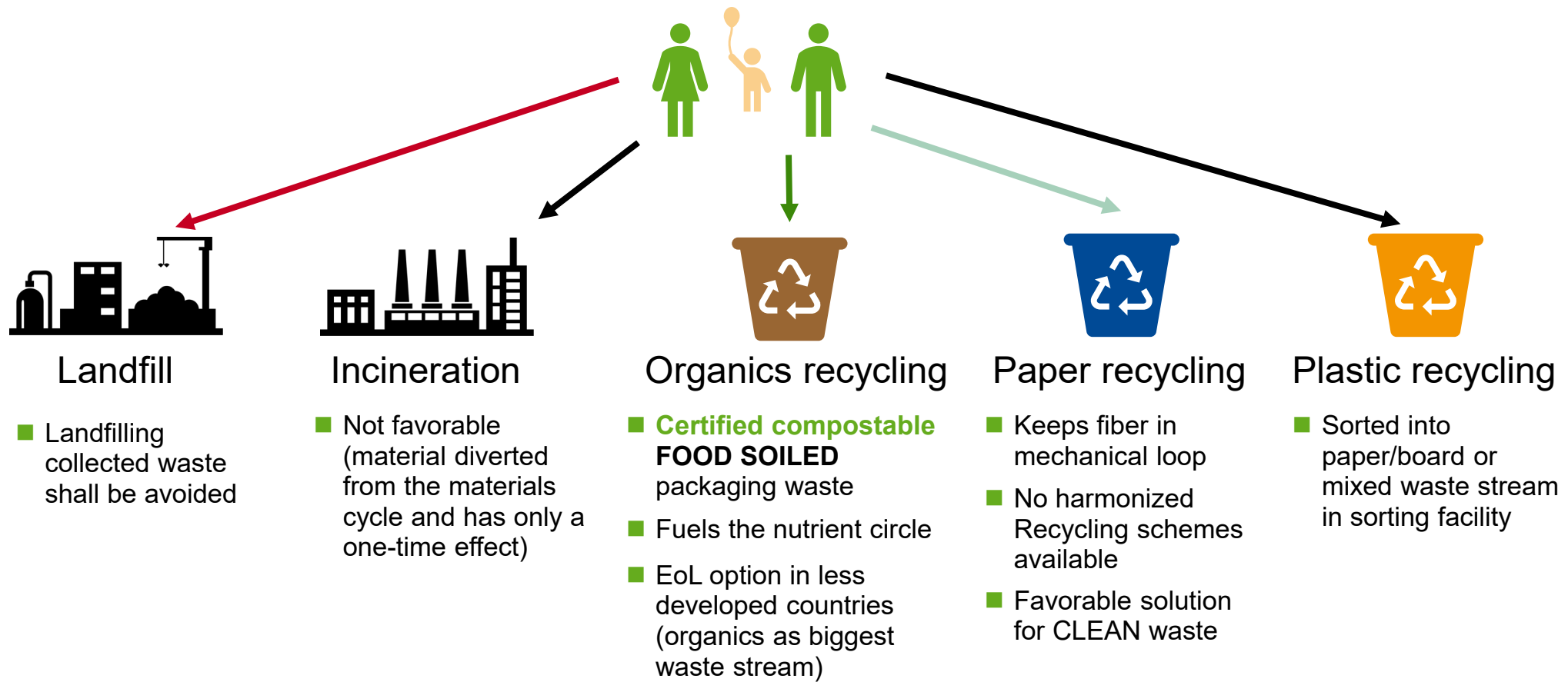
Trend in the market to push for sustainable packaging solutions

- Fiber-based packaging identified as sustainable choice
 - Renewable origin
 - Existing recycling infrastructure and high recycling rate
 - Established secondary markets
 - Alternative fiber (sugar cane, bamboo, silphie, etc.)
- While keeping all benefits, **compostable** fiber-based packaging broadens end of life options!



Collected for recycling in 2018 in EU-27; Source: [Eurostat](#)

Fiber-based packaging: potential end-of-life scenarios



Certified compostable solution broaden end of life options for fiber-based packaging!

BASF offerings for certified compostable fiber-based packaging



ecovio® PS1606: extrusion coating grade

Key technical benefits & Processability

Key Technical Benefits

- Excellent barrier properties against liquids, fats, grease, and mineral oil
- Suitable for food contact (also when microwaved)
- Temperature stability at boiling water
- Excellent adhesion to many types of paper/paperboard

Processability

- Stable at high coating line speed (> 300 m/min)
- No adhesion to chill roll
- Possible to achieve typical coating weight ($17\text{--}30$ g/m²) depending on application and equipment
- Good printability
- Good sealing properties
- Low failure rate in further packaging converting (cup making, thermoforming, etc.)



ecovio® PS1606: extrusion coating grade

Bio-based & Certified compostable

■ 74% average bio-based carbon content*



■ Certified industrial compostable



European Standard
EN 13432



European Standard
EN 13432,
Australian Standard
AS 4736



American Standard
ASTM D6400,
ASTM D6868



Japanese Standard
GreenPla



ecovio® PS1606: extrusion coating grade

Classified “recyclable” in standard repulping process

- Pilot scale repulping trials were performed on one-side ecovio® coated paperboard at Centre Technique de l'Industrie des Papiers (CTP)
 - ▶ ecovio® PS1606 was classified repulpable and performed comparably to PE coated paperboard
- One-sided paper and paperboard ecovio® coated samples “recyclable” according to PTS-RH 021:2019 – Category II

Sample code		One-sided ecovio® PS1606 on <u>paper</u>	One-sided ecovio® PS1606 on <u>board</u>
Disinte- gratability	Non-paper constituents ¹		
	Total reject ²	13.2 %	13.1 %
	Recyclable percentage ³	86.8 %	86.9 %
Sheet formation	Adhesive impurities	None.	Present but not damaging.
	Optical Inhomogeneities	None.	None.
OVERALL RATING Recyclability		Recyclable.	Recyclable.



ecovio® PS1606: extrusion coating grade

Typical applications



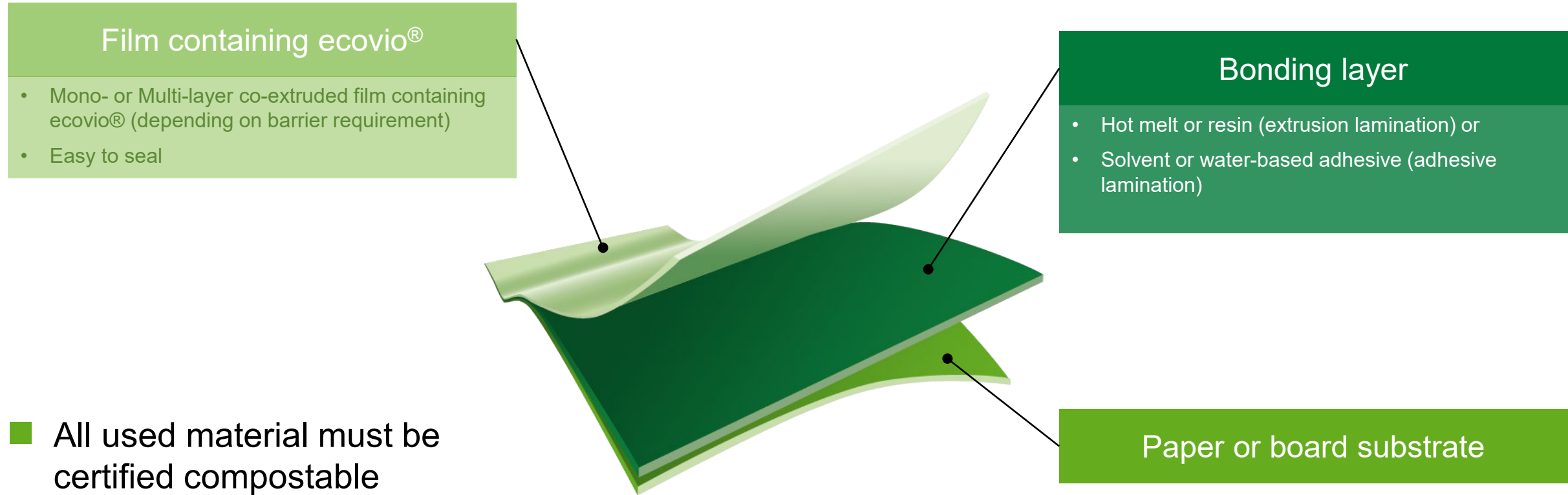
- Cups/ bowls for hot (coffee/ soup) or cold (ice cream) content



- Boxes, plates, trays with dry, solid, fluid or fatty content

ecovio® film grades for lamination to paper and board

Alternative technology to generate compostable solutions



- All used material must be certified compostable
- Depending on the grades used
Home or Industrial compostable

ecovio® Lamination technology

Typical applications*



Concluding Remarks

- Organics recycling is essential to:
 - ▶ Recycle the nutrients back to agricultural fields
 - ▶ Reduce global GHG emissions helping to mitigate climate change
- Smart usage of certified compostable material increase the amount and quality of compost
- **Certified compostable fiber-based** packaging **broaden end of life options** for fiber-based packaging!
 - ▶ BASF offers ecovio® grades for both extrusion coating and lamination technology
 - ▶ Depending on ecovio® grades used in combination with type of paper/board, Home and Industrial compostable solutions are realizable

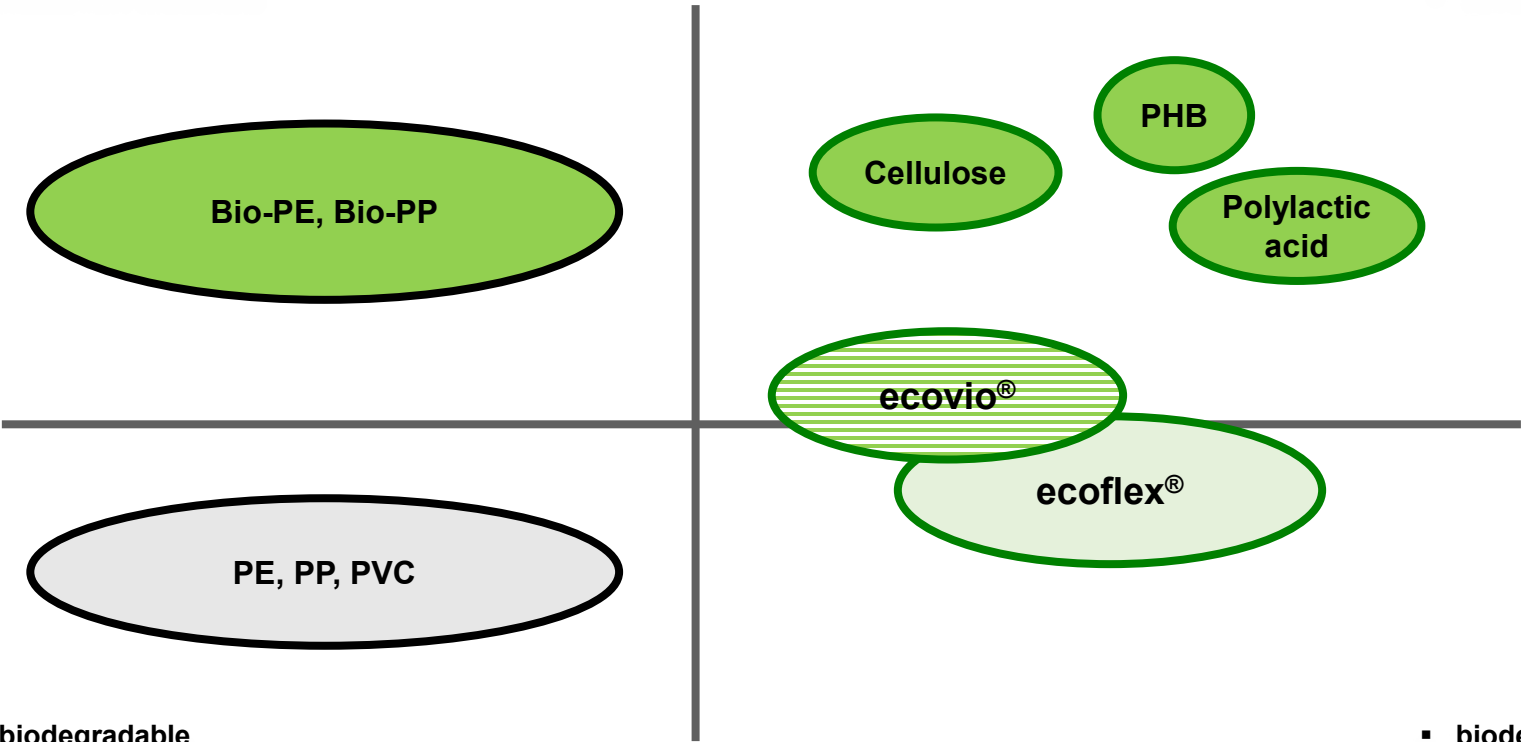




We create chemistry

Biopolymer: Definition of bio based and biodegradable polymers

- not biodegradable
- renewable raw materials



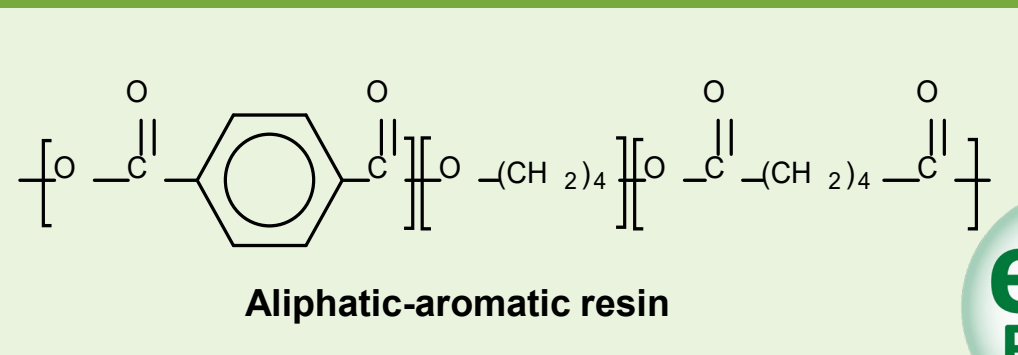
- biodegradable
- renewable raw materials

- not biodegradable
- fossil raw materials

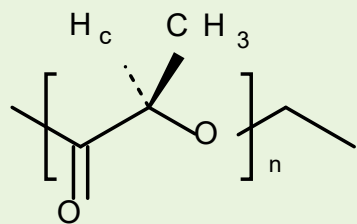
- biodegradable
- fossil raw materials

→ Biodegradable polymers can be bio based on fossil or renewable raw materials.

ecovio®: Bio-based and certified compostable polymer blend

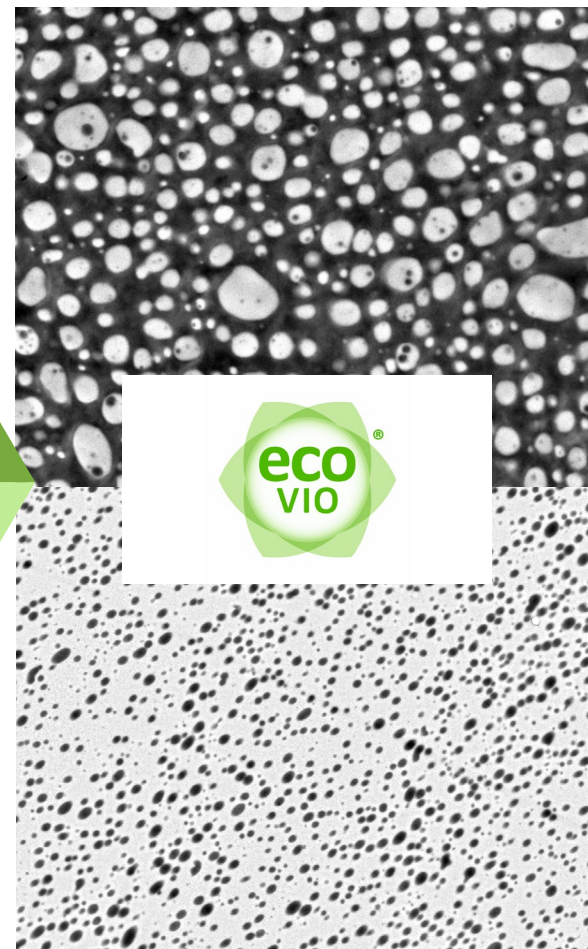


ecoflex® - partly renewable



Polylactic acid

PLA – renewable



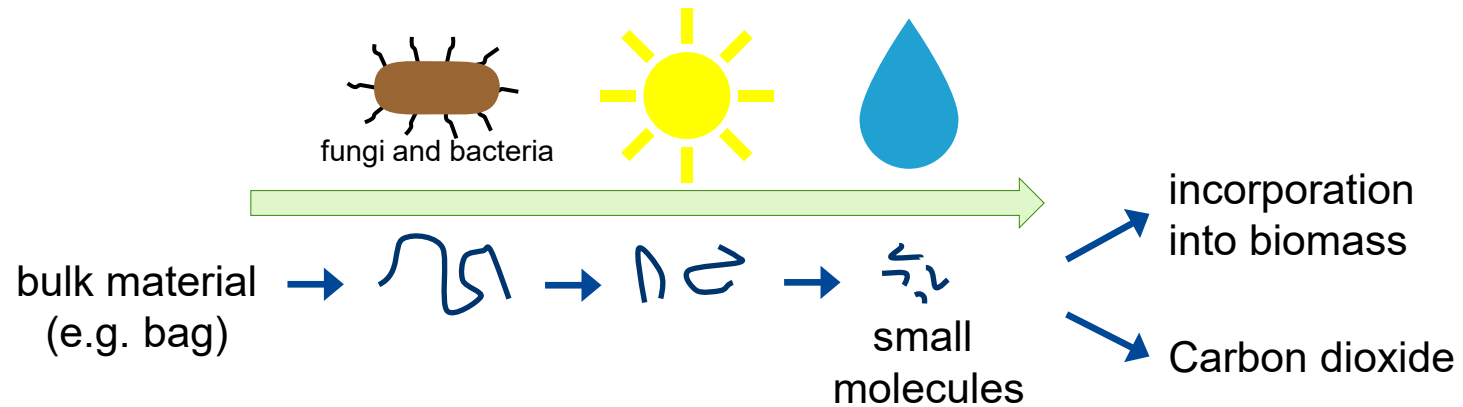
flexible



stiff

PLA

Let's talk about end of life



Legend: Microbial: bacteria and fungi Abiotic: e. g temperature, water Photochemical: UV light
Biomass: mass of living biological organisms

- Biodegradation by natural organisms to CO₂ and microbial biomass
- Carbon dioxide is indicator for biodegradability measurement