DATE: 23.01.2024

FINAL CONFERENCE

BIO-PLASTICS EUROPE

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 860407.
BIO-PLASTICS EUROPE project website: www.bioplasticseurope.eu

Session 1: Introducing bio-based plastics and BIO-PLASTICS EUROPE project

Moderator: Prof. Dr. Žaneta Stasiškienė

Kaunas University of Technology

Prof. Walter Leal, Hamburg

University of Applied Sciences, Germany

Opening and welcome notes

Dr. Evdokia Achilleos

REA, EU Officer

Welcome by the BIO-PLASTICS EUROPE EU officer

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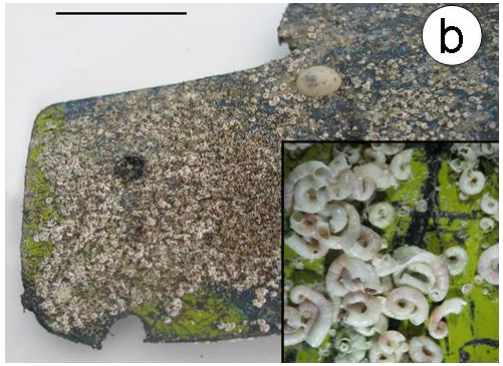
Global Ocean Plastic Pollution

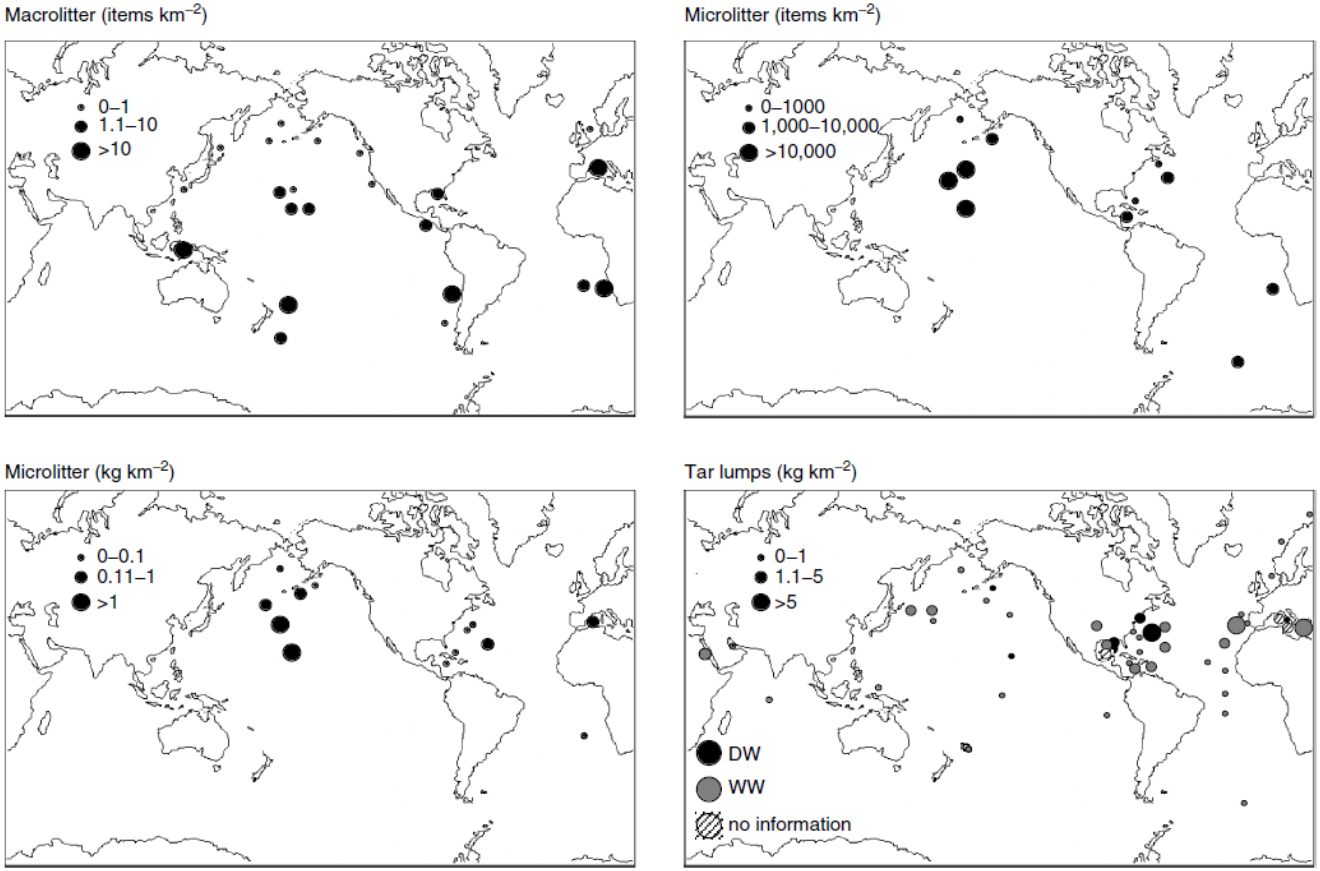
Lars Gutow · Lukas Miksch · Reinhard Saborowski

In the beginning was the bug…

In the beginning was the bug…

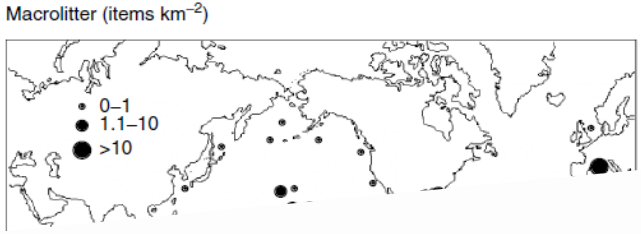


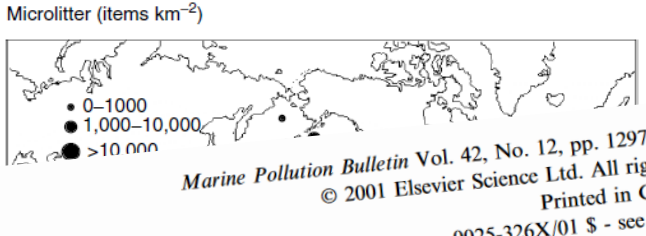
Distribution of flotsam



Thiel & Gutow 2005

Distribution of flotsam





Marine Pollution Bulletin Vol. 42, No. 12, pp. 1297–1300, 2001

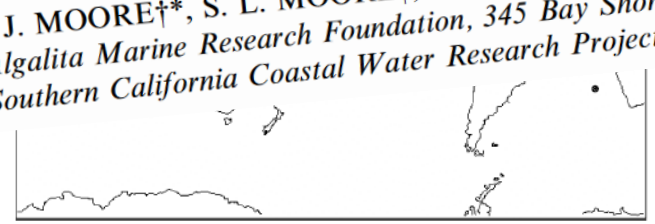
0025-326X/01 $ - see front matter

Pergamon

PII: S0025-326X(01)00114-X

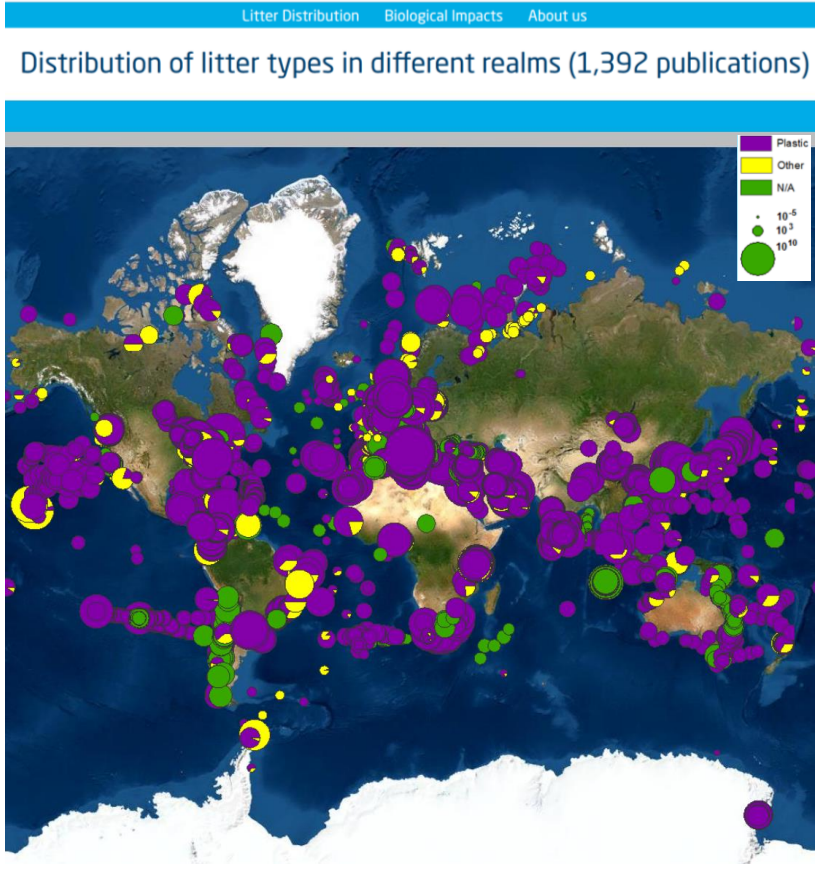
A Comparison of Plastic and Plankton in the North Pacific Central Gyre

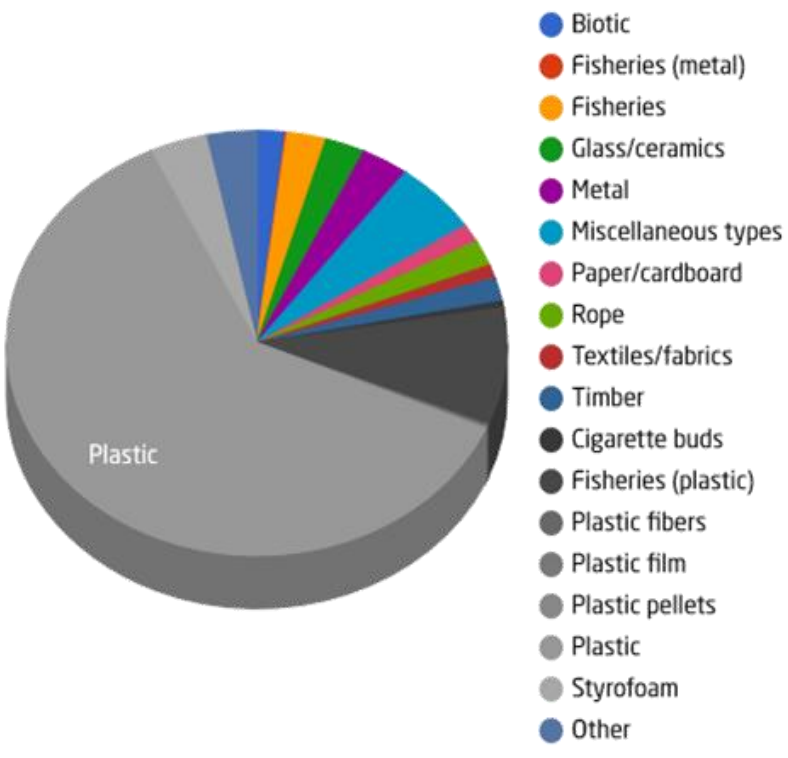
C. J. MOORE†*, S. L. MOORE†, M. K. LEECASTER‡,[1] and S. B. WEISBERG‡
†*Algalita Marine Research Foundation, 345 Bay Shore Avenue, Long Beach, CA 90803, USA*
‡*Southern California Coastal Water Research Project, 7171 Fenwick Lane, Westminster, CA 92683, USA*



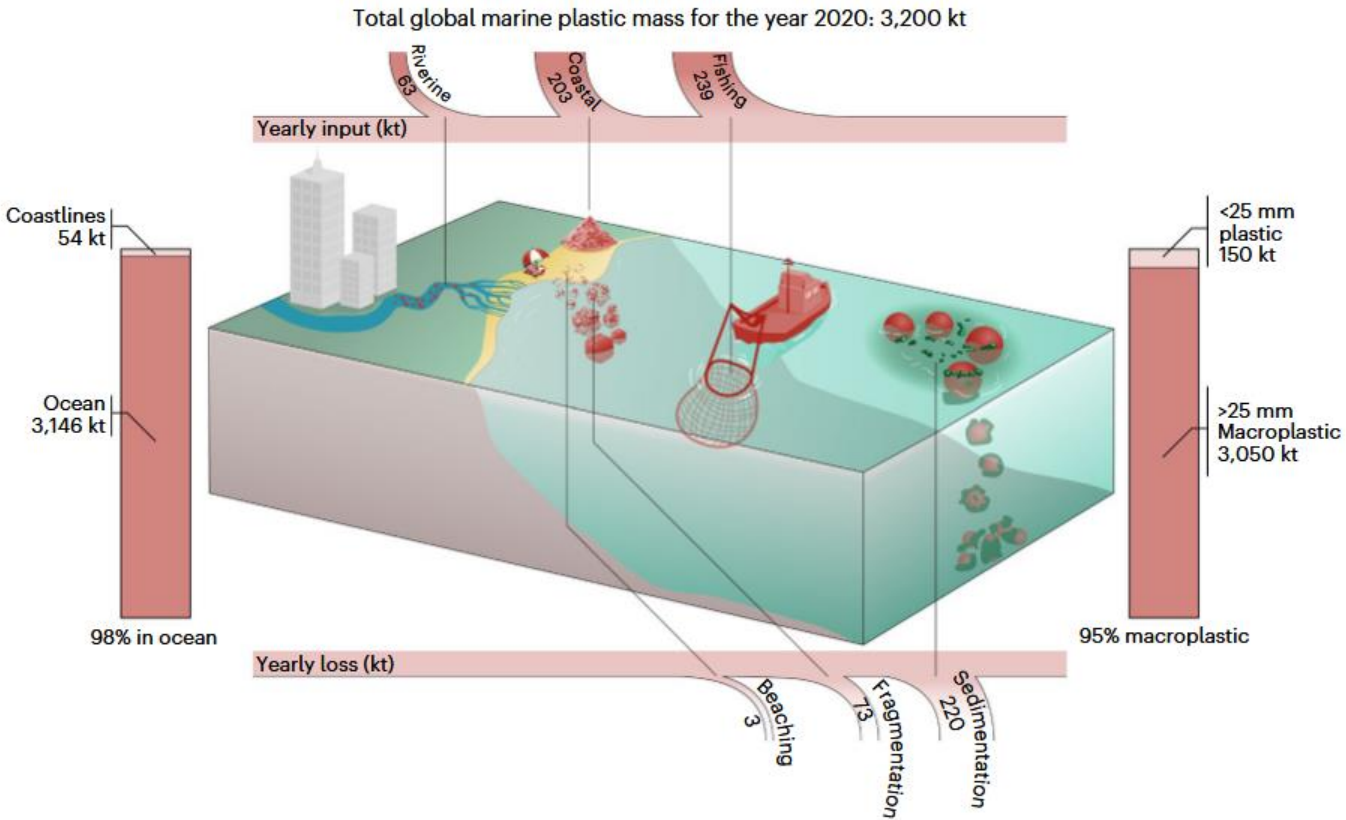
Thiel & Gutow 2005

LITTERBASE (https://litterbase.awi.de/)



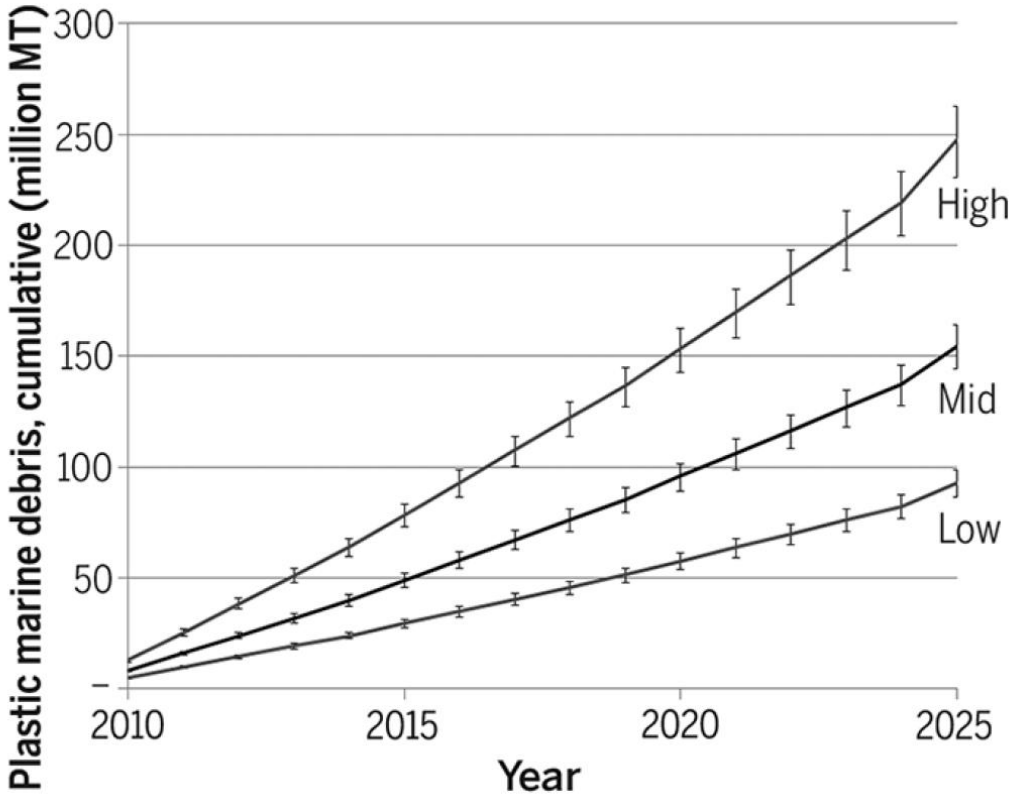


Quantities of plastics in the oceans



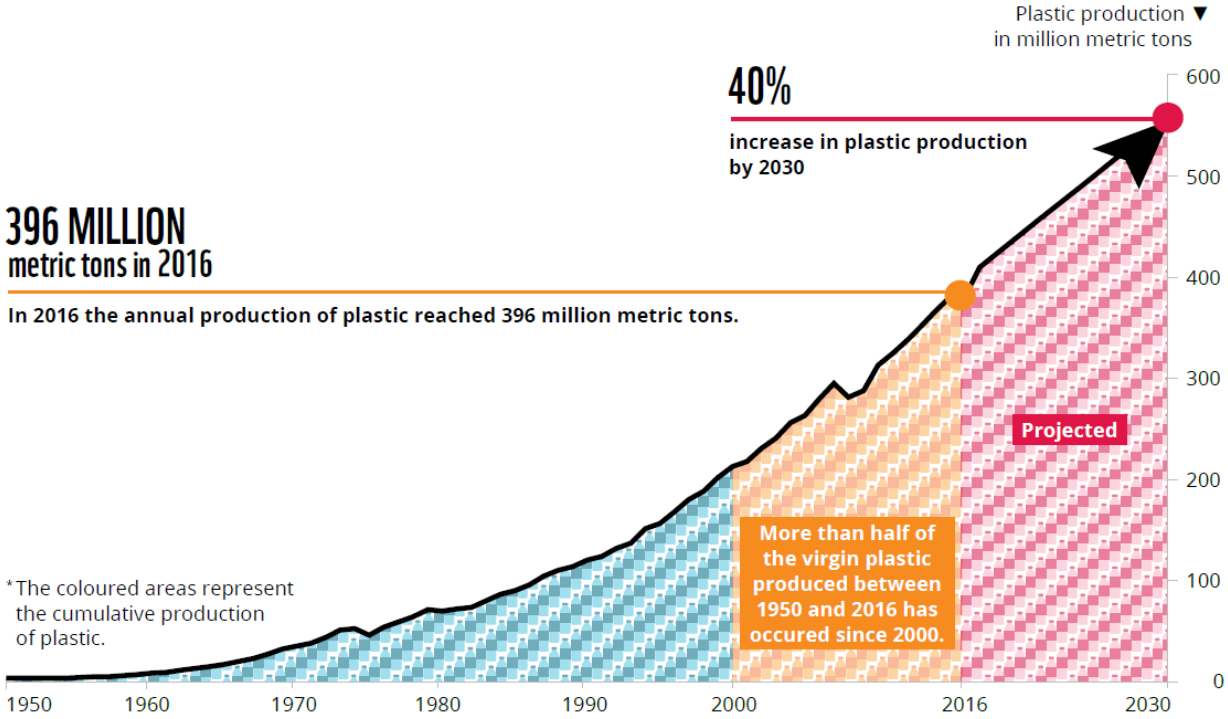
Kaandorp et al. 2023 - doi: 10.1038/s41561-023-01216-0

Quantities of plastics in the oceans



Jambeck et al. 2015 – doi: 10.1126/science.1260352

Global plastic production



Tekman et al. 2022 - doi: 10.5281/zenodo.5898684"
based on data from Geyer et al. 2017 - doi: 10.1126/sciadv.1700782

To do better…

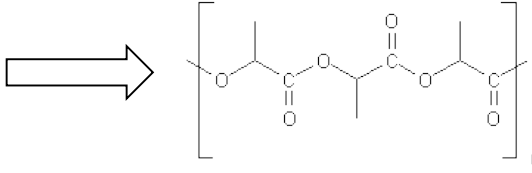
- Improve waste management

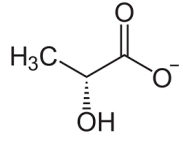
Recycling and contaminants

To do better…

- Improve waste management
- Improve recycling

Degradation





BIO PLASTICS EUROPE

HELMHOLTZ

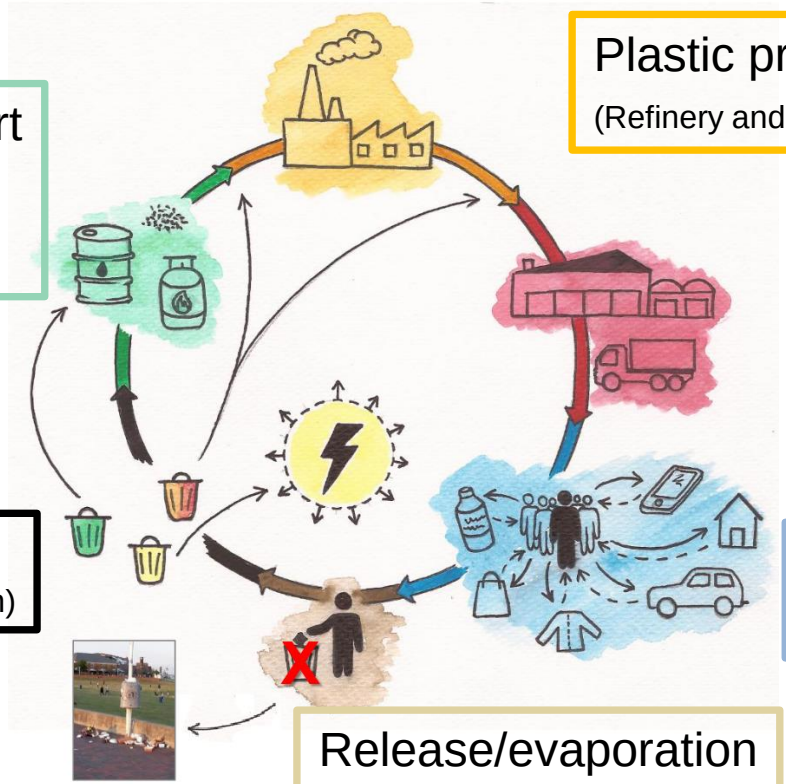
Degradability

To do better…

- Improve waste management
- Improve recycling
- Understand degradation and improve degradability

Plastic life-cycle greenhouse gas emissions

Extraction and transport of fossil feedstock
(deforestation, fuel consumption, emissions/loss)



Plastic production
(Refinery and processing)

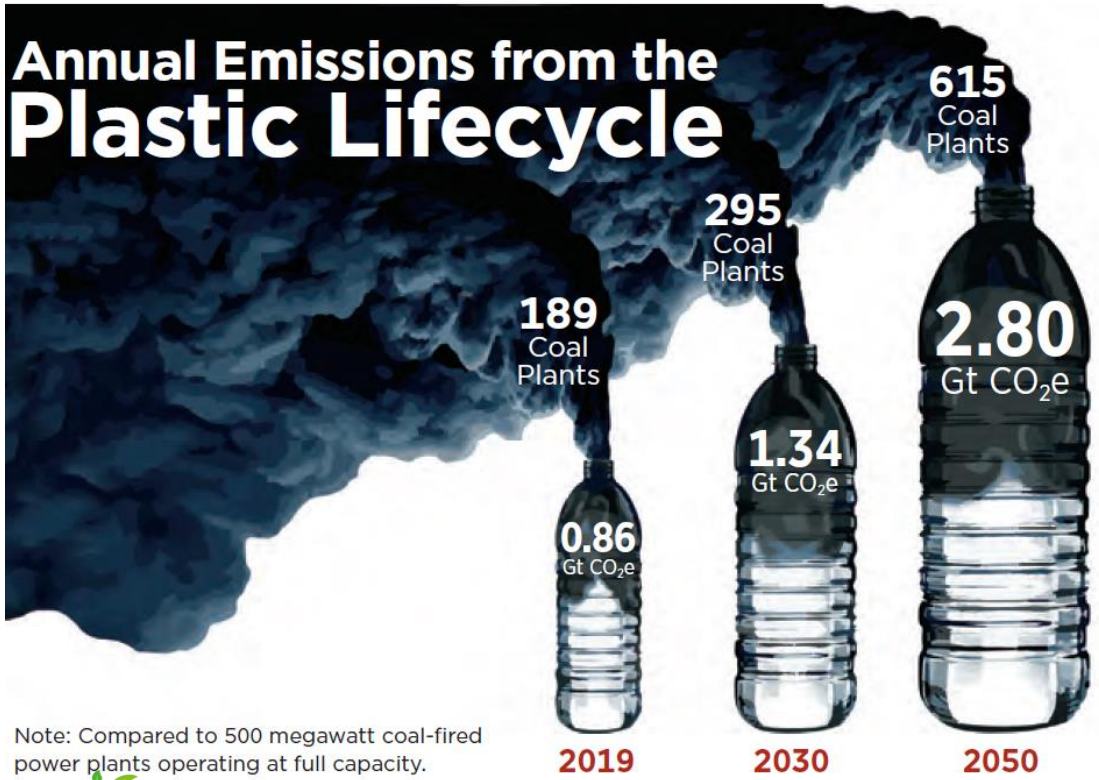
Transport

Release/evaporation of carbonic compounds

Release/evaporation from debris

Disposal
(landfills, recycling, combustion)

Plastic life-cycle greenhouse gas emissions



≙ cumulative 10-15 % of the remaining CO_2-budget to meet the 1.5 °C climate target

CIEL 2019 - https://www.ciel.org/wp-content/uploads/2019/05/Plastic-and-Climate-FINAL-2019.pdf

To do better…

- Improve waste management
- Improve recycling
- Understand degradation and improve degradability
- Reduce life-cycle greenhouse gas emissions

Biota interactions and effects

Interactions

Ingestion | Entenglement | Coverage | Colonization

Growth | Toxicity | Reproduction | Nutrition | Injury | Respiration | Behavior / Mobility | Distribution

Effects

To do better…

- Improve waste management
- Improve recycling
- Understand degradation and improve degradability
- Reduce life-cycle greenhouse gas emissions
- Reduce impacts on species and ecosystems

Can bioplastics do better?

- Improve waste management
- Improve recycling
- Understand degradation and improve degradability
- Reduce life-cycle greenhouse gas emissions
- Reduce impacts on species and ecosystems

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Bioplastics fit for the future: opportunities and challenges

BIO-PLASTICS EUROPE– FINAL CONFERENCE

21 January 2024, Hamburg

europeanbioplastics

Agenda

1

About European Bioplastics (EUBP)

2

What are bioplastics?

3

Market

4

Myths and Facts

5

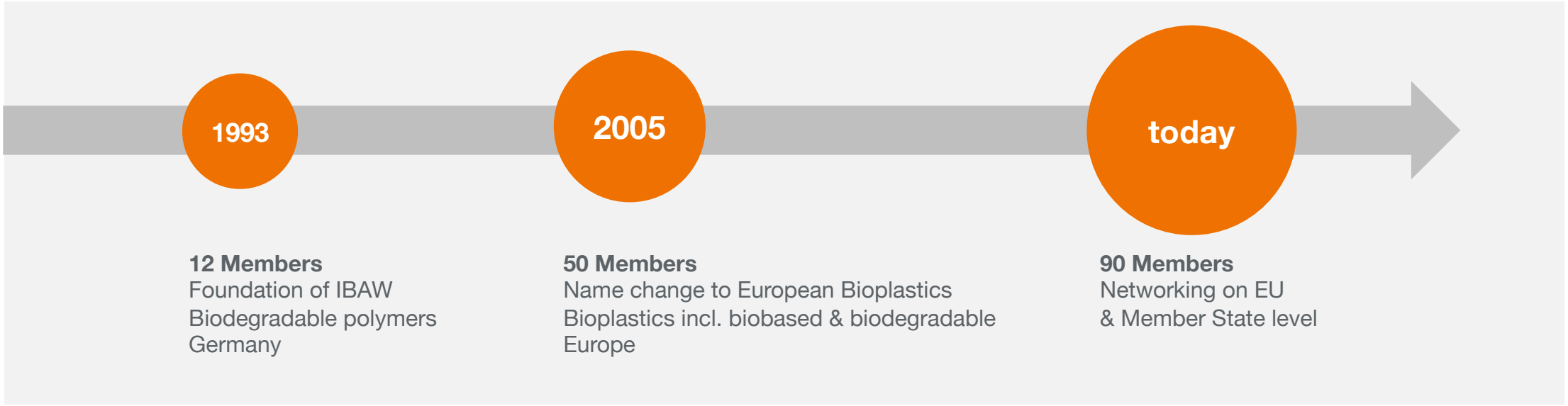
Conclusion

About European Bioplastics (EUBP)

europeanbioplastics

European Bioplastics: 30 years of bioplastics experience

- European Bioplastics represents the interest of the bioplastics industry along the entire value chain in Europe.
- Our foremost goal and commitment is to build and strengthen a supporting policy framework in the EU for bioplastics to thrive through a strong network and engagement in dialogue with all relevant stakeholders.



Activities and services

EUBP is a knowledge partner and business network for companies, experts, and all relevant stakeholder groups of the bioplastics industry.

Our activities and services at a glance

- Gathering insights and knowledge about the industry
- Formulating and communicating our industry's key positions
- Representing our members' policy interests in Europe
- Connecting our members with potential business partners
- Facilitating a dynamic stakeholder dialogue


european bioplastics

Position of European Bioplastics concerning

BIOPLASTICS AND THE CIRCULAR ECONOMY

European Bioplastics (EUBP) welcomes the transition away from a linear to a circular economy, whilst urging legislators to consider measures, which accelerate the sustainable development of Europe's bio-economy by promoting

Just as traditional refineries, biorefineries maximize the use and value of feedstock and exploit all of the elements of the feedstock, recycling secondary products and wastes into valuable products, often using bi-products which fuel the

What are Bioplastics?

BIOPLASTICS

biobased
(e.g. bio-PE)

biodegradable
(e.g. PBAT)

or both
(e.g. starch blends)

Terminology

biobased

The term biobased describes a material or product that is (at least in part) derived from biomass.

biodegradable

Biodegradation is a natural chemical process in which materials are being transformed into natural substances such as water, carbon and biomass with the help of microorganisms. The process of biodegradation depends on the environmental conditions as well as on the material or application itself. Consequently, the process and its outcome can vary considerably.

Biodegradability is linked to the structure of the polymer chain and does not depend on the origin of the raw materials.

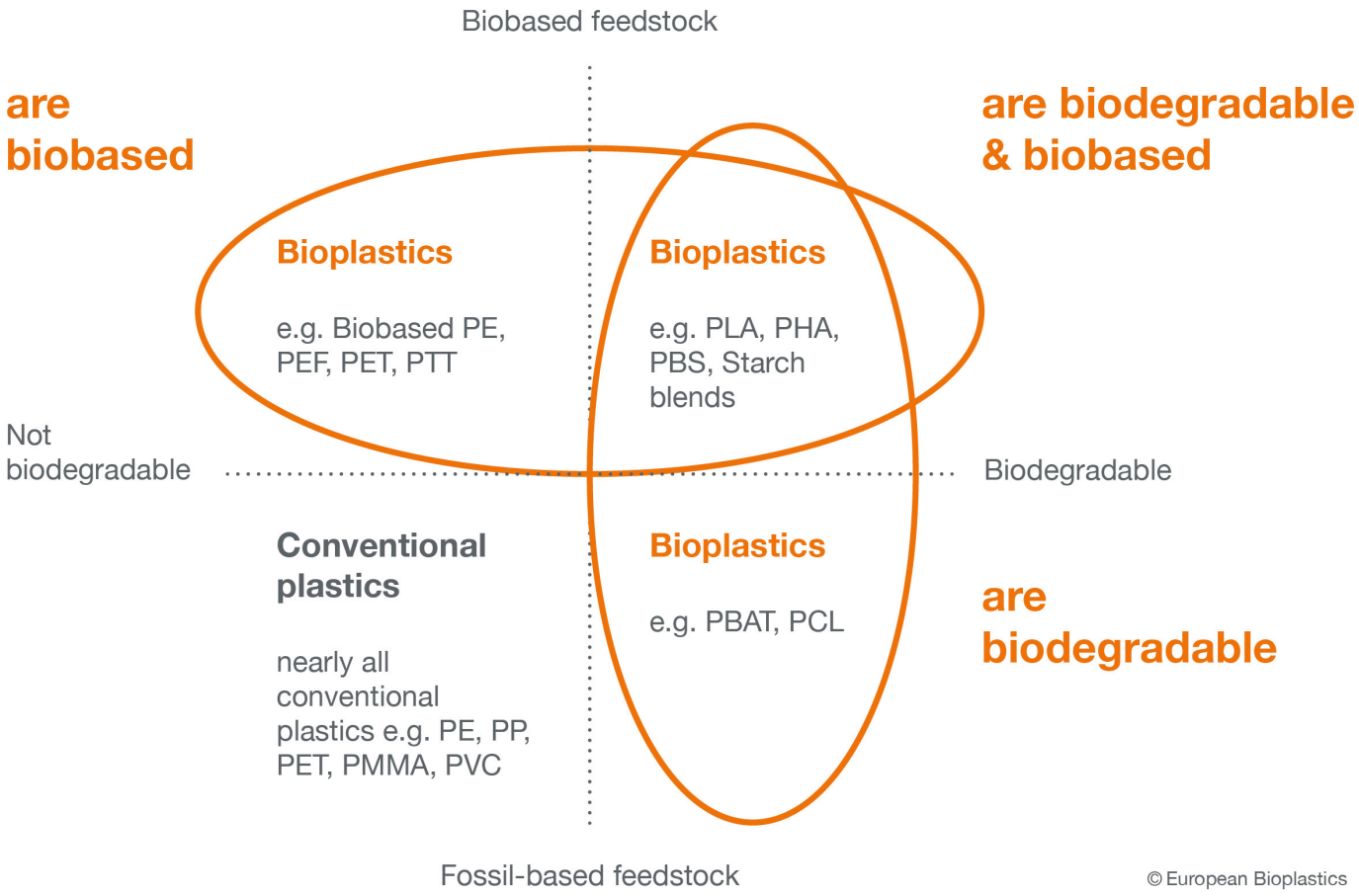
compostable

Compostability is a characteristic of a product that enables biodegradation under specific conditions (i.e. a certain temperature, timeframe, etc.). At the end of this process, for example in an industrial composting plant, only natural products remain (water, carbon, biomass).

Currently, the distinction is made between industrial and home composting.

Material coordinate system for bioplastics

Bioplastics are biobased, biodegradable, or both.



Source: Institute for Bioplastics and Biocomposites (IfBB) and European Bioplastics (EUBP)

Market

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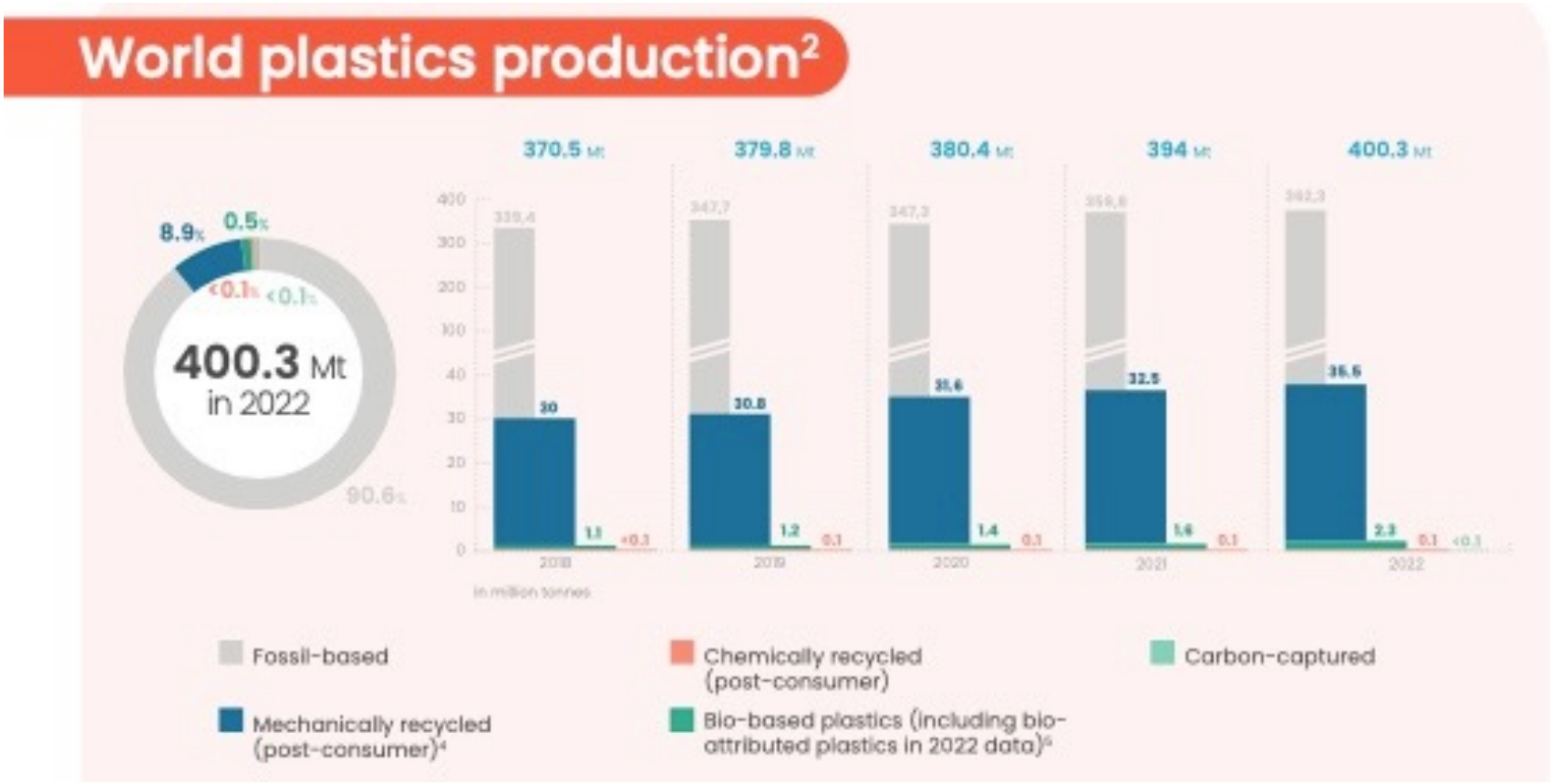
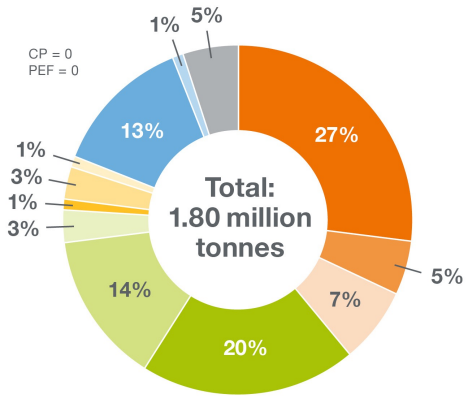
Global Plastics Production (Plastics Europe)



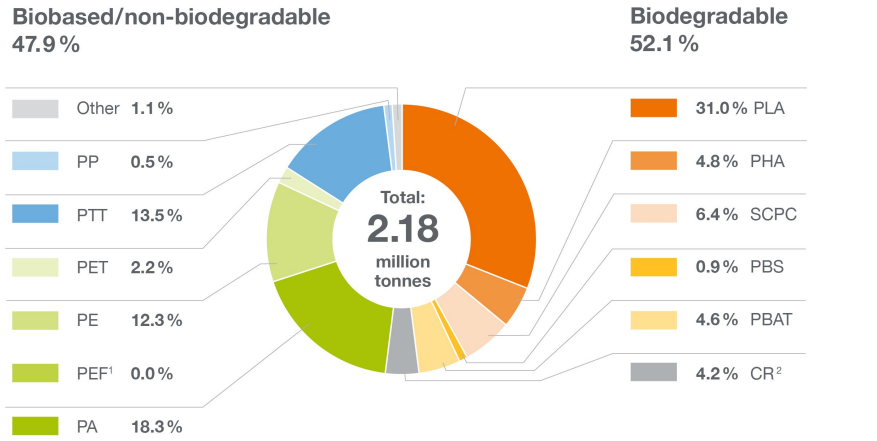
Global production of bioplastics 2023



PLA
PHA
SCPC
PA
PE
PET
PBS
PBAT
APC
PTT
PP
CR

APC Aliphatic polycarbonates
CP Casein polymers
CR Cellulose films
PA Polyamides
PBAT Poly(butylene adipate-co-terephthalate)
PBS Polybutylene succinate and copolymers
PE Polyethylene
PEF Polyethylene furanoate
PET Polyethylene terephthalate
PHA Polyhydroxyalkanoates
PLA Polylactic acid
PP Polypropylene
PTT Polytrimethylene terephthalate
SCPC Starch blends

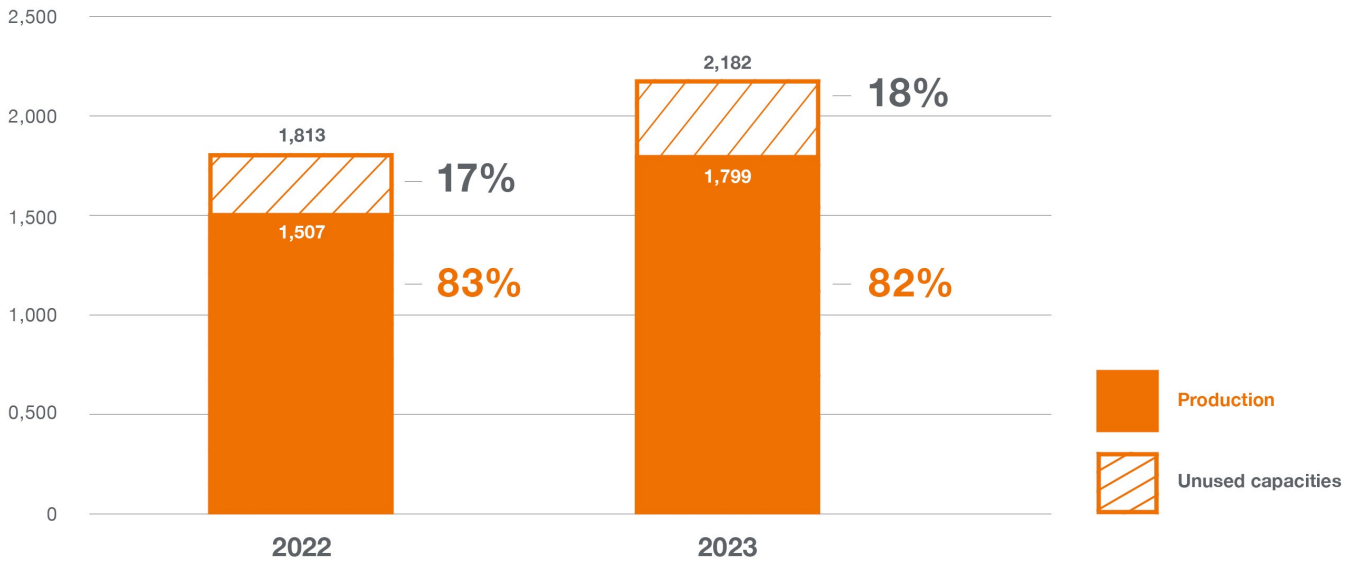
Global production capacities of bioplastics 2023



[1] PEF is currently in development and predicted to be available in commercial scale in 2024. [2] regenerated cellulose films

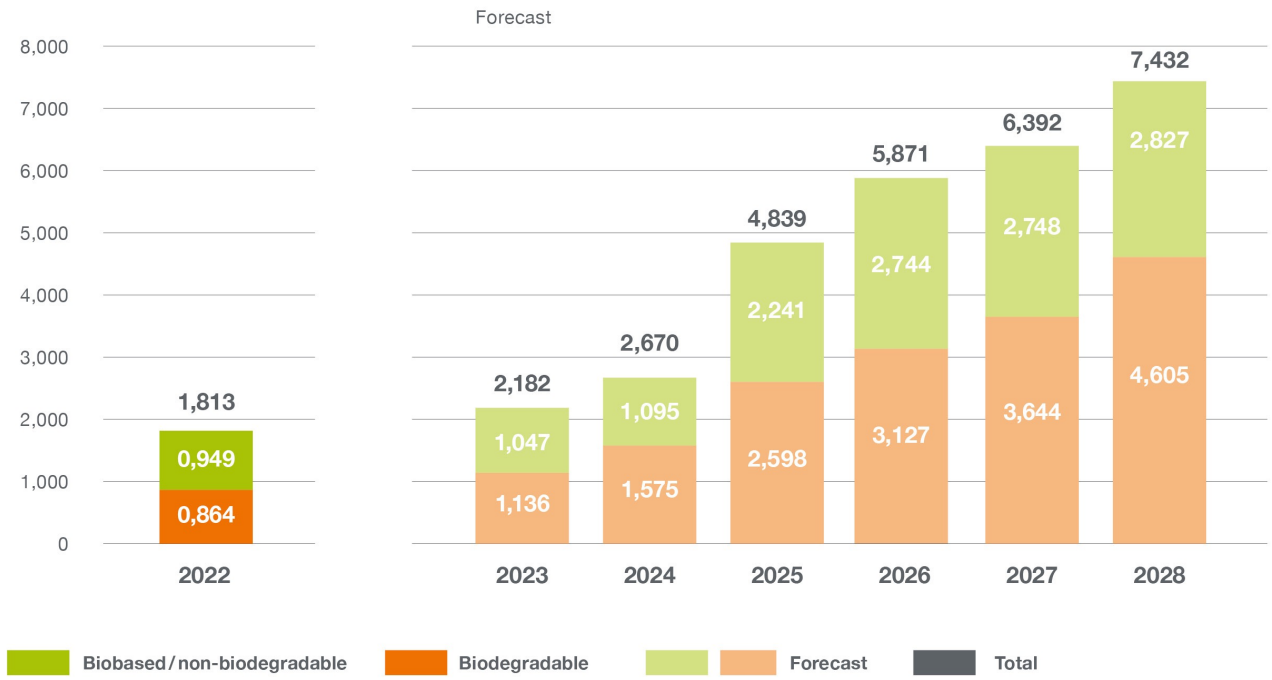
Utilisation rates of bioplastics 2023

in 1,000 tonnes

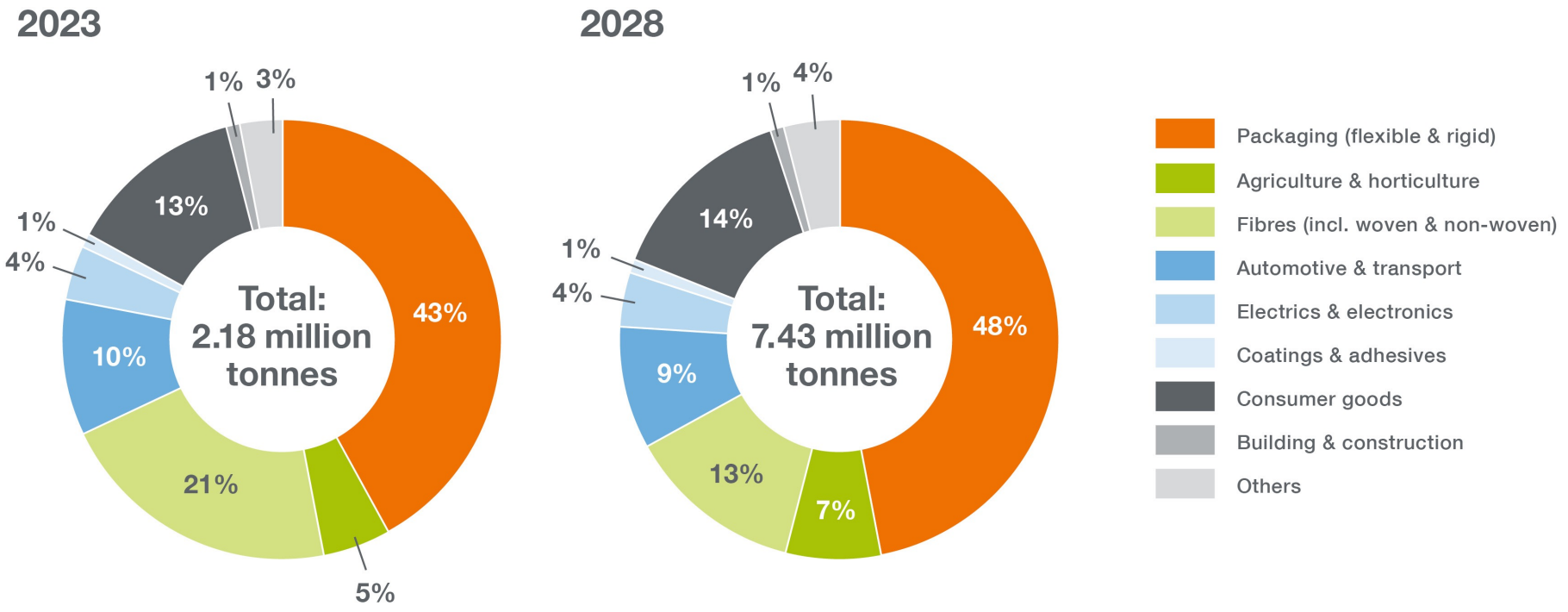


Global production capacities of bioplastics

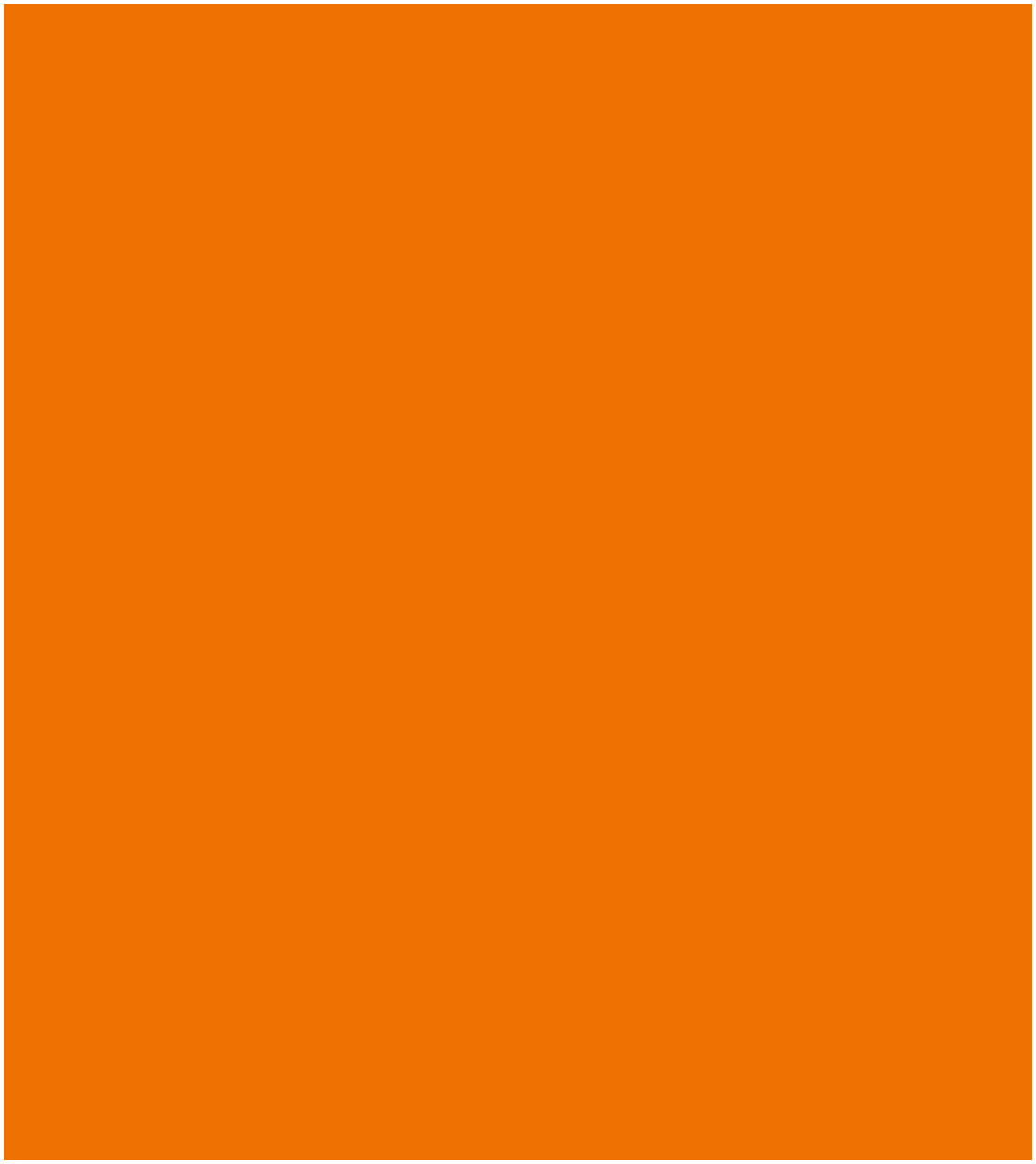
in 1,000 tonnes



Global production capacities of bioplastics (by market segment)



Myths and Facts



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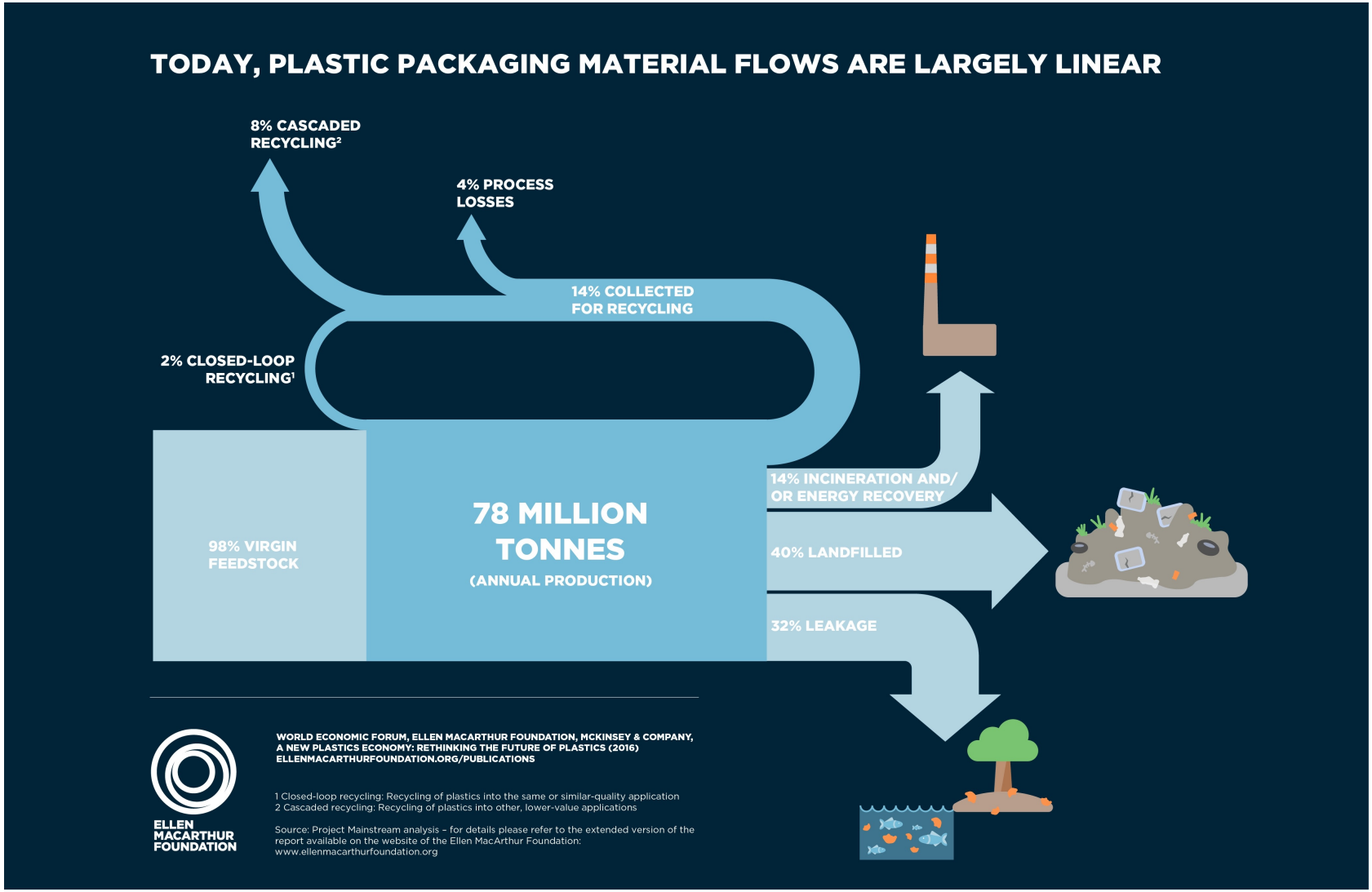
Myths and facts about bioplastics

Myth

- Bio(degradable)plastics disturb mechanical recycling

Fact(s)

- Bioplastics production capacities below 0,5% of overall plastic production
- 48% bio-based durable and recyclable (mostly “drop-ins”)
- 58% biodegradable products (e.g., biowaste bags) intended for biowaste collection
- Pre-sorting always necessary to avoid contamination and widely available (NIR)
- Potential contamination rate is near zero
- Contamination rate of up to 3% rarely poses a problem


TODAY, PLASTIC PACKAGING MATERIAL FLOWS ARE LARGELY LINEAR
8% CASCADED RECYCLING²
4% PROCESS LOSSES
14% COLLECTED FOR RECYCLING
2% CLOSED-LOOP RECYCLING¹
98% VIRGIN FEEDSTOCK
78 MILLION TONNES
(ANNUAL PRODUCTION)
14% INCINERATION AND/ OR ENERGY RECOVERY
40% LANDFILLED
32% LEAKAGE
ELLEN MACARTHUR FOUNDATION
WORLD ECONOMIC FORUM, ELLEN MACARTHUR FOUNDATION, MCKINSEY & COMPANY, A NEW PLASTICS ECONOMY: RETHINKING THE FUTURE OF PLASTICS (2016) ELLENMACARTHURFOUNDATION.ORG/PUBLICATIONS
1 Closed-loop recycling: Recycling of plastics into the same or similar-quality application
2 Cascaded recycling: Recycling of plastics into other, lower-value applications
Source: Project Mainstream analysis – for details please refer to the extended version of the report available on the website of the Ellen MacArthur Foundation: www.ellenmacarthurfoundation.org

Myths and facts about bioplastics

Myth

- Mechanical recycling is the silver bullet

Fact(s)

- Huge amounts of plastic packaging waste is not and will not be recycled – mainly for economic, but also for technical reasons
- These include but are not limited to:
  - Small-format packaging
  - Multi-material packaging
  - Food-waste contaminated packaging
- Incineration with energy recovery is best option
- Landfilling should be phased out

Myths and facts about bioplastics

Myth

- Biodegradable plastics certified according to EN 13432 need only to prove 90% biodegradation.
- That means that up to 10% need not to biodegrade and are liable to remain as microplastics in the compost.

Fact

- The 90% biodegradation rate refers to the conversion of the carbon (C) into carbon dioxide (CO_2).
- However, given that up to 40% of the C is converted into new biomass, the requirement of 90% CO_2 conversion poses a high barrier, as this can only be achieved if part of the newly built biomass is mineralized again.

Myths and facts about bioplastics

Myth

- Biodegradable plastics certified according to EN 13432 need 12 weeks to disintegrate in industrial composting facilities.
- But because modern composting facilities mostly allow for an active rotting phase of only between 3 to 6 weeks, the tested materials or product will not biodegrade in time.

Fact(s)

- This timeframe sets the boundaries for the maximum thickness of a product to be certifiable according to EN 13432.
- However, the thickness of most products sent in for testing and certification is far below the certifiable thickness.
- In the case of biowaste bags, the thickness is often in the range of 5-10% of the certifiable maximum thickness. This means that they will completely biodegrade in just a few weeks.

Conclusion

- At first glance, the on-going transition from a linear to a circular economy in Europe is liable to hold a range of opportunities for the bioplastics industry.
- Circular by design, bioplastics combine numerous properties that make them virtually predestined for a circular economy.
- Their advance, however, is slowed down by several factors. These include, but are not limited to lack of knowledge, persistent misinformation, communicational challenges and, eventually, poor legislative framework.
- The way the bioplastics industry will be able to tackle these challenges in the coming years will determine the destiny of bioplastics in the near and distant future.

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www.european-bioplastics.org

twitter.com/EUBioplastics

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DATE: 23.01.2024

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cep | Berlin
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Centrum für Europäische Politik
FREIBURG | BERLIN

PERSPECTIVES OF THE EUROPEAN BIOECONOMY: ROLE OF BIO-BASED PLASTICS

Presentation at the
Final Conference H2020 Project “Bio-Plastics Europe”
Hamburg, January 23rd 2024

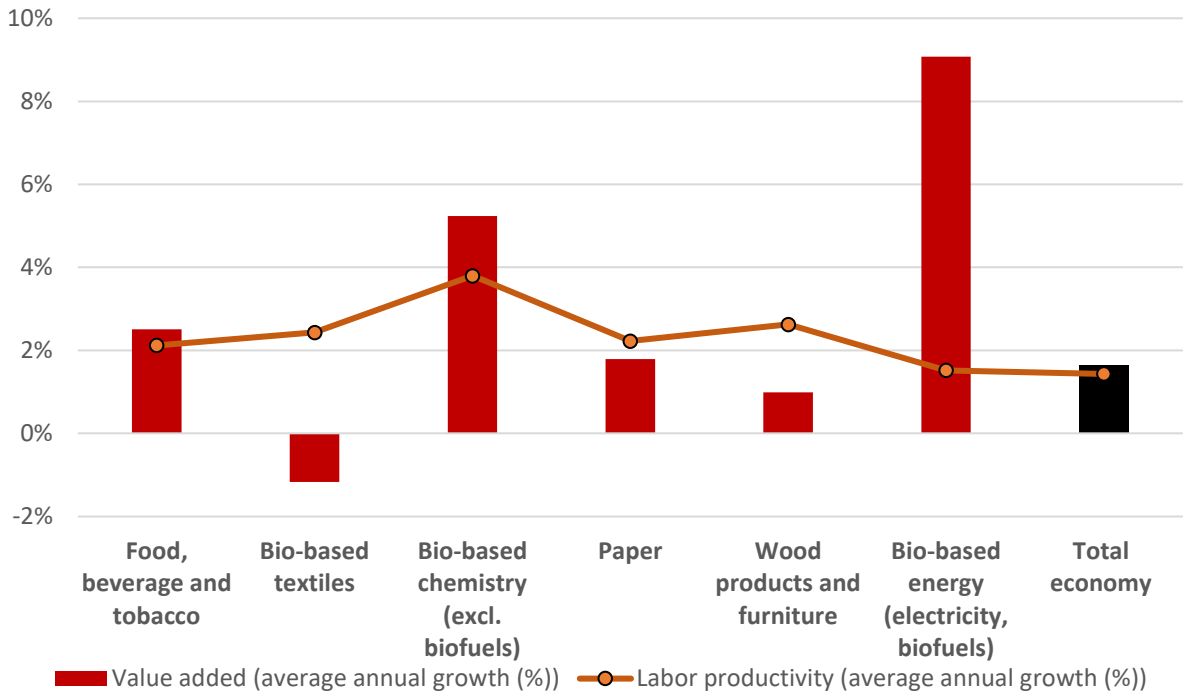
Dr. André Wolf
Head Division “Technology, Infrastructure and Industrial Development“
Centre for European Policy (cep), Berlin

Agenda

1. Economic relevance of the EU bioeconomy
2. Future potentials and challenges
3. Bio-based and biodegradable plastics: EU policies in the context of the Green Deal
4. The EU Biotechnology Initiative: Key fields of action
5. Recommendations for a future-proof policy framework

Economic Relevance of the Bioeconomy

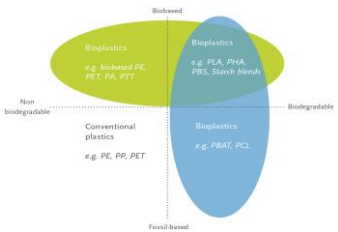
Evolution EU27 bioeconomy 2008-2019



Source: JRC Bioeconomy Knowledge Observatory (2024), own calculations

- **Key characteristics of bio-based industry segments:**
  - EU27: More than EUR 400 billion annual Value Added, about 8 million people employed
  - Development and manufacturing very capital- and knowledge-intensive, with need for competencies from many disciplines
  - High potential for groundbreaking inventions, but long development phases
  - Strong interlinkages with other key technology fields (e.g. nanotechnology, ICT)
  - Successful innovation equally dependent on basic research and venture capital
  - Subject to a complex set of policy regulations

Future Potentials and Challenges



Limitations / Challenges

Limitations access venture capital

Limitations access skilled labor

Potentials of bio-based value chains

Source of **growth-enhancing innovation** (jobs, value added)

Reduce **CO2-footprint** of industry, energy, transport

Improve resource efficiency through new **circularity channels**

Strengthen **supply security** (reduced dependence on external fossils)

Ecological boundaries land use

Heterogeneity product properties

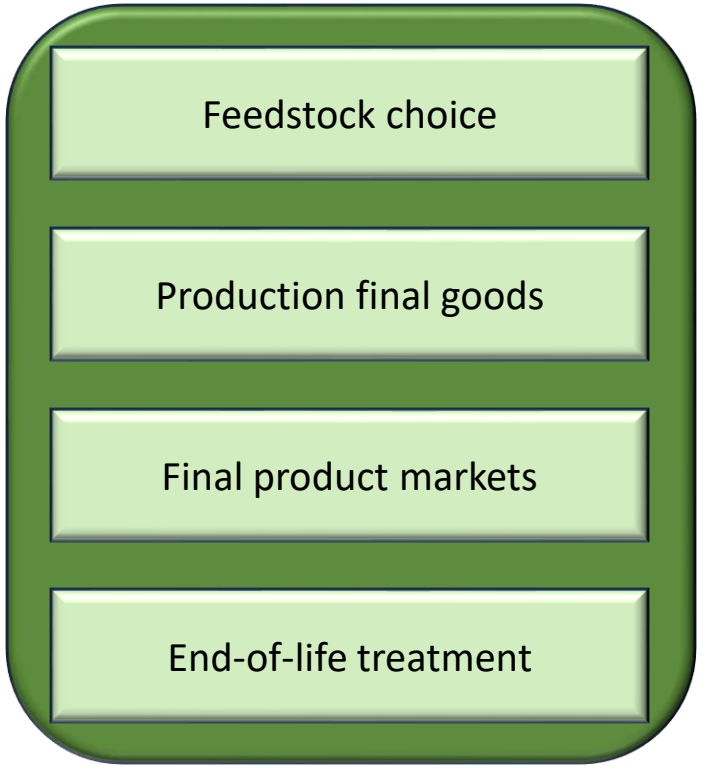
→ Positive feedback effect

Bio-based and Biodegradable Plastics: EU Policies

Sustainable Carbon Cycles
(COM(800) 2021)
Target 2030: 20 % of non-fossil plastics and chemicals

Amendment REACH Regulation
(Commission Regulation (EU) 2023/2055)
Restriction for the use of microplastics in production

Plastics Directive
(Directive (EU) 2019/904)
Ban of specific single-use plastic goods (e.g. straws, cutlery)



Policy framework on biobased, biodegradable and compostable plastics
(COM(682) 2022)
Clarifying conditions for the use of the terms

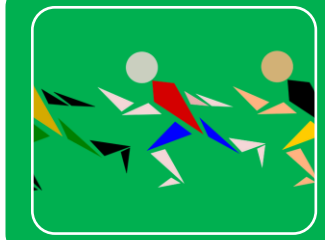
Revision Packaging and Packaging Waste Regulation
(Proposal COM(2022) 677)
Requirement of compostability for certain packaging (a.o. very lightweight plastic bags); no interference with other waste streams

Legislative
Non-legislative (Communication)
Proposal

EU Biotechnology Initiative: Key Fields of Action

Secure access to critical resources

- Sustainable biomass
- Venture Capital
- Skilled labor



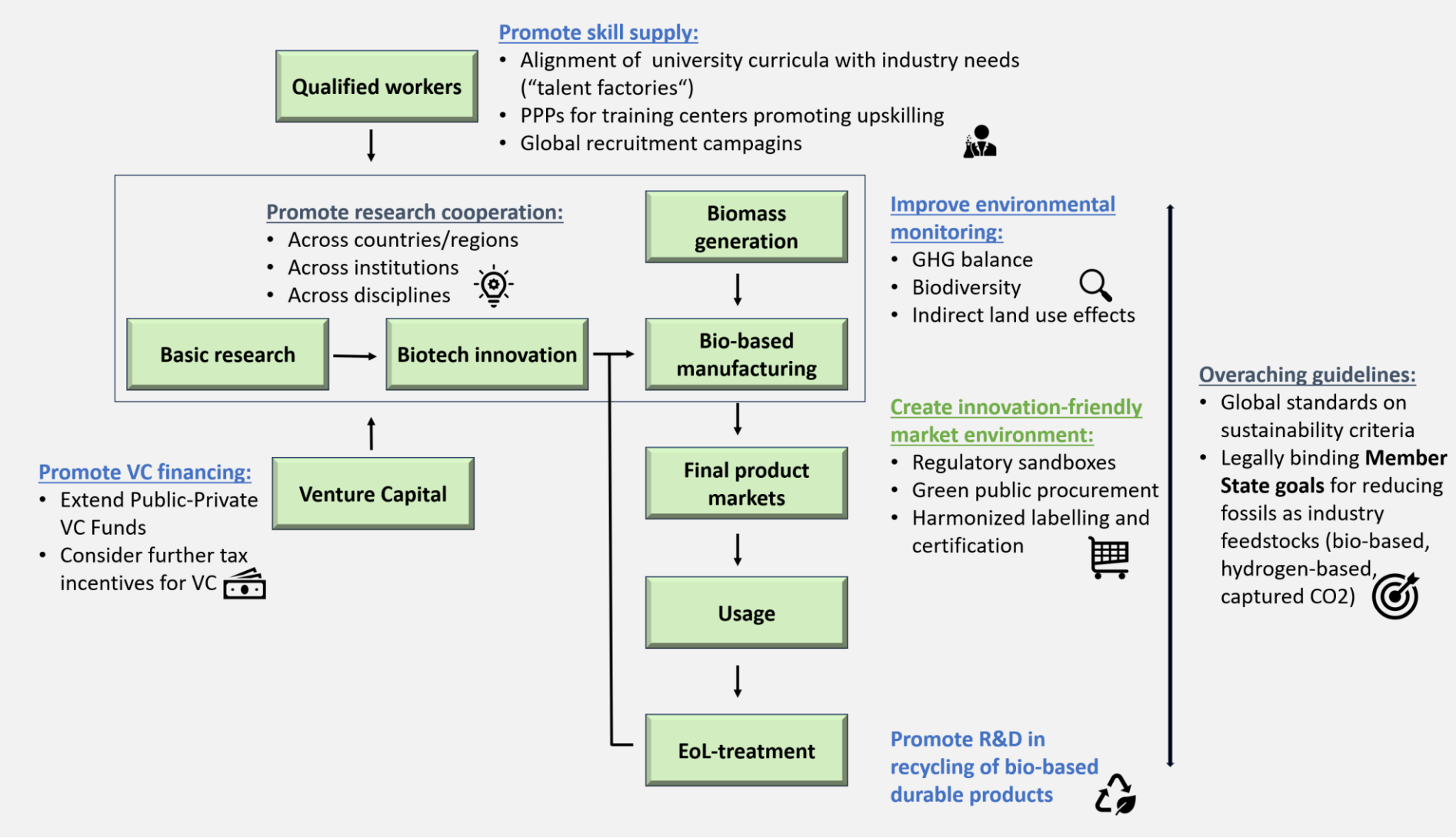
Ensure formation of competitve markets

- Clear standards
- Consumer education
- Green procurement

Strenghen cooperation in and across value chains

- Research (across regions and disciplines)
- Education (public-private)
- Regulation (EU – Member States; EU – Global level)

Recommendations for a Future-Proof Policy Framework



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No. 1 | 2024 16 January 2024

Paving the Way for a European Carbon Market

A framework for initiating the uptake of carbon capture technologies

André Wolf

With increasing time pressure, it is becoming more and more evident that reducing greenhouse gas emissions alone will not suffice to achieve the EU's ambitious long-term climate targets. Carbon capture solutions, specifically Negative Emission Technologies, offer an opportunity to diversify the existing mitigation portfolio, thus providing a form of technology insurance. With the EU-ETS being firmly established as a separate system, no conflict with emission reduction goals will arise. However, several barriers remain for establishing a European market for captured CO_2. This cepInput analyzes the technical and economic potential of carbon capture and defines key requirements for a future support framework.

- **Specific long-term targets and reliable certification schemes:** As strategical guidance, the EU should formulate legally binding long-term targets for annual carbon removals, complementing the emission reduction targets. These should rest on the requirements defined by the future certification scheme currently being negotiated.
- **EU-wide tendering for carbon contracts specifically involving Negative Emission Technologies:** To initiate a timely uptake of infant but promising technologies like Direct Air Capture, investments in this area should be promoted by two-sided Carbon-Contracts-for-Difference. These should be allocated through competitive EU-wide tender schemes.
- **Harmonized rules for building a cross-border CO_2 infrastructure:** The build-up of a European carbon market promoting spatial specialization requires a coordinated development of CO_2 infrastructure, especially pipelines and long-term storage sites. To this end, a uniform position on carbon storage must be established across Member States as well as common rules for CO_2 transport.
- **A transatlantic CCS research partnership:** The implementation of its own carbon capture strategy must not lead to the EU's splendid isolation. A large part of the global investment dynamics will emanate from the Anglo-American countries in the medium term. The EU should take advantage of this by initiating a transatlantic research partnership. This will allow it to benefit from future research findings and experience gained on the other side of the Atlantic.

THANKS FOR YOUR ATTENTION!

Andrė Wolf

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Centrum für Europäische Politik
FREIBURG | BERLIN

cepInput

No. 13 | 2023 31 October 2023

A Bank to Boost Renewable Hydrogen

In search of policies to establish a first-mover-advantage

André Wolf

Renewable hydrogen is in the midst of an upscaling process in the EU and worldwide. But revenue uncertainty and coordination externalities in market development threaten to restrain Europe in this race. Policymakers need new means to counter the disincentive of the "second-mover advantage" and initiate long-term investments. In this spirit, the Commission is currently launching a new funding instrument, the European Hydrogen Bank.

Key propositions:

- The auctioning of production premiums for renewable hydrogen implemented by the European Hydrogen Bank fills a gap in the hydrogen funding landscape. **It could become an effective tool for stimulating capacity-building** by providing compensation for system-wide cost and revenue uncertainties. However, the terms and conditions of the auction applicable in the pilot phase risk giving rise to **excessive support for large hydrogen producers** and generally low support efficiency.
- **The maximum permitted bidding level (ceiling price) should be reduced significantly.** At the same time, participation should be opened up to smaller producers to generate more competition. The conditions for cumulation with other subsidies should also be reviewed, to avoid the risk of the Hydrogen Bank contributing to a sectoral misallocation of renewable hydrogen.
- The premium scheme can only be effective if it is embedded in a **holistic support framework addressing bottlenecks in all parts of the supply chains.** The establishment of an H_2-certification system, the reduction of barriers to infrastructure investment and the promotion of the industrial transformation all remain key policy priorities for market formation.

DATE: 23.01.2024

FINAL CONFERENCE

BIO-PLASTICS EUROPE

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 860407.
BIO-PLASTICS EUROPE project website: www.bioplasticseurope.eu

DATE: 23.01.2024

Final Conference

Session 1

Contribution of BIO-PLASTICS EUROPE project

Speaker: Dr. Jelena Barbir
HAW Hamburg

BIO-PLASTICS EUROPE

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Warm welcome from BIO-PLASTICS EUROPE Consortium!

BIO-PLASTICS EUROPE

Developing and Implementing Sustainability-Based Solutions for Bio-Based Plastic Production and Use to Preserve Land and Sea Environmental Quality in Europe

October 2019 – September 2023

Kick-off in October 2019

After 1,5 years – in M18!

After 3 years – in M36!

Project was operating under COVID-19 restrictions for 2 years

PARTNERSHIP

22 partners
13 countries
8.5 million Euros
8.2 millions by EU

CONTACT INFO

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Ulmenliet 20, 21033 Hamburg, Germany
E-mail: bioplastics@ls.haw-hamburg.de, www.bioplasticseurope.eu

SCAN ME

CO2 NEUTRAL DE201680959X01 by flyeralarm

BIO PLASTICS EUROPE

BIO-PLASTICS EUROPE

Pushes towards circular economy

- **WP3** Identification and test of innovative product design
- **WP4** Plastic waste collection, recycling and littering
- **WP5** Prenormative research and field tests
- **WP6** Health and environmental safety
- **WP7** Replication, policy-making, capacity-building and upscaling
- **WP8** Life cycle assessment environmental and economic
- **WP9** Information, communication, and dissemination of results

RESULTS

GOAL IS FOR SOLUTION TO BE SUSTAINABLE

2019

EXPECTED RESULTS

FOCUS
Cutlery, Soft and Rigid Packaging,

Agricultural Mulch Film, Toys and Aquatic Materials

INNOVATIVE MATERIALS
to foster and encourage deployment of innovative bio-based and biodegradable materials

STAKEHOLDERS ENGAGEMENT
to ensure strong commitment of producers, politicians, industrial and private consumers

BUSINESS MODELS
to experiment with innovative business models by incorporating circularity and sustainability
to maximize the value of materials along the entire value chain

SAFETY PROTOCOLS
to ensure the safe use and end-of-life management on innovative bio-based plastics

RESULTS

GOAL IS FOR SOLUTION TO BE SUSTAINABLE

2024 ~~EXPECTED~~ RESULTS

FOCUS
Cutlery, Soft and Rigid Packaging,

Agricultural Mulch Film, Toys and Aquatic Materials

INNOVATIVE MATERIALS — Environmental
to foster and encourage deployment of innovative bio-based and biodegradable materials

STAKEHOLDERS ENGAGEMENT — Social
to ensure strong commitment of producers, politicians, industrial and private consumers

BUSINESS MODELS — Economical
to experiment with innovative business models by incorporating circularity and sustainability
to maximize the value of materials along the entire value chain

SAFETY PROTOCOLS — Environmental/Social
to ensure the safe use and end-of-life management on innovative bio-based plastics

The BIO-PLASTICS EUROPE Safety Protocol can be accessed directly through this link (it is best viewed on a computer screen, laptop, or tablet): https://xd.adobe.com/view/2c735ca9-34c2-4b6f-b596-d9afdffbdb84-7920/?fullscreen

Material development

5 Prototypes by M18:
The prototypes under development are:

1. **BPE-SP-PBS ----- Soft Packaging**
2. **BPE-RP-PLA ----- Rigid Packaging + Fishing Crates**
3. **BPE-T-PHBV ---- Toys + Fishing Bait**
4. **BPE-AMF-PLA – Agricultural Mulch + Marine Geomaterial**
5. **BPE-C-PLA ------ Cutlery**

WP5

SENT FOR LABORATORY AND FIELD TESTS FOR BIODEGRADATION AND TOXICITY
- Samples prepared
- Test Protocols finished
- Tests started 1st of September 2020
- First results obtained autumn 2021

WP3

ARCTIC BIOMATERIALS - Finland ABM COMPOSITE Arctic Biomaterials
NATURE PLAST - France NaturePlast Bioplastics Expert

Selected polymers for the demo applications are polylactic acid (PLA), polybutylene succinate (PBS), and one type of polyhydroxyalkanoate (namely PHBV). All three are commonly produced from renewable sources.

MODIFICATION of the compounds after 1st round tests (2022)

WP5

2nd round of TESTS (2022/23)

2nd round of MODIFICATIONS (2023)

WP3

BIO PLASTICS EUROPE

DEMONSTRATORS: Toys, Cutlery, Agricultural Mulch, Soft packaging (lab scale) 2024

Test sites

AGENDA

MODIFICATION OF COMPOUNDS ● 4

BIODEGRADATION (11)
- Soil ▲ 2
- Sea ▲ 2
- River ▲ 1
- Composting ▲ 3
- Laboratory Tests ▲ 4

ECOTOXICITY (4)
- Biota ◆ 4 + Migration tests ◆

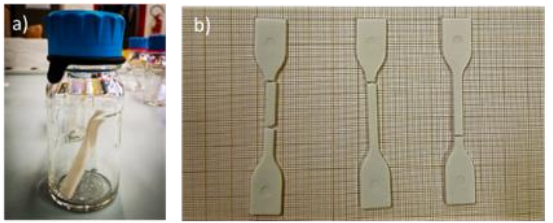
CONTROLLED CONDITIONS (7)
- Structure ■ 3
- Stability ■ 2
- Recyclability ■ 2

+ Recyclability ■

BIO PLASTICS EUROPE

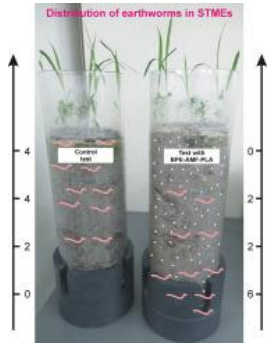
FIRST ROUND TESTS

Degradation and Biodegradation



Deg. under controlled conditions

Ecotoxicity



MODIFIED COMPOUNDS

lab-scale flat extrusion of
BPE-T-PHBV-02, April 2022, @LBF

SECOND ROUND TESTS

\+

Recyclability

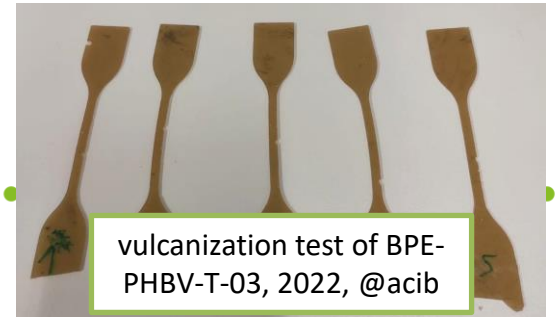
Migration tests

Pilot-scale

production test injection moulding of BPE-PHBV-T-02, July 2022 @eKoala

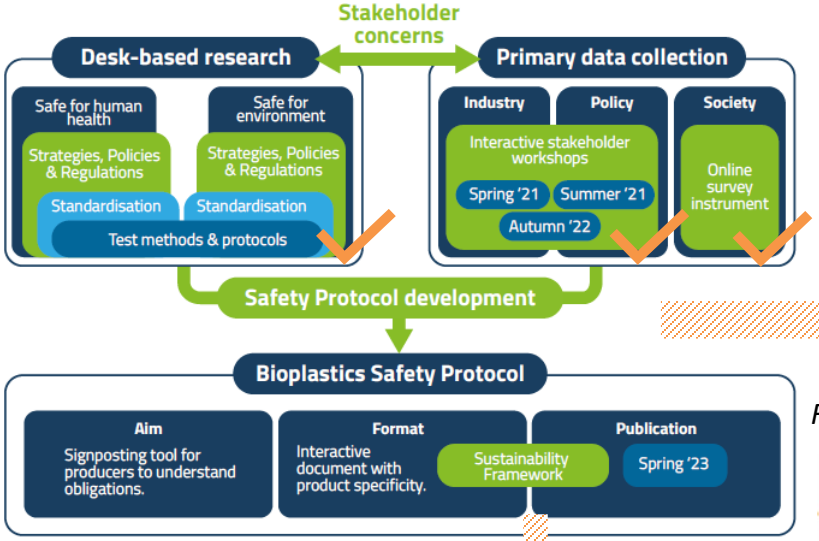
quality check, pilot-scale film blowing of BPE-AMF-PLA-02, November 2022 @Reyenvas

pilot-scale film blowing of BPE-SP-PBS-02, 2022 @CNR-IPCB

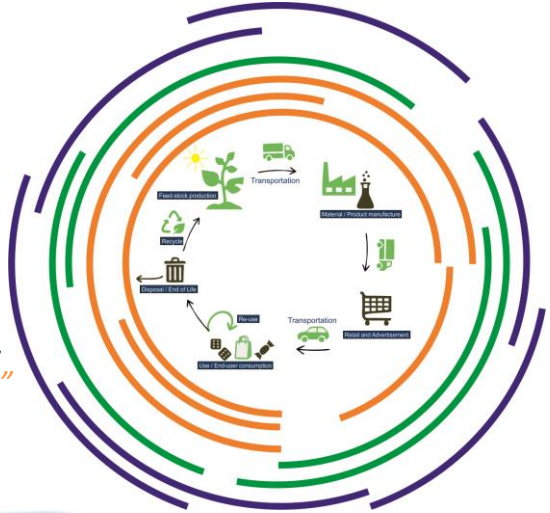


vulcanization test of BPE-PHBV-T-03, 2022, @acib

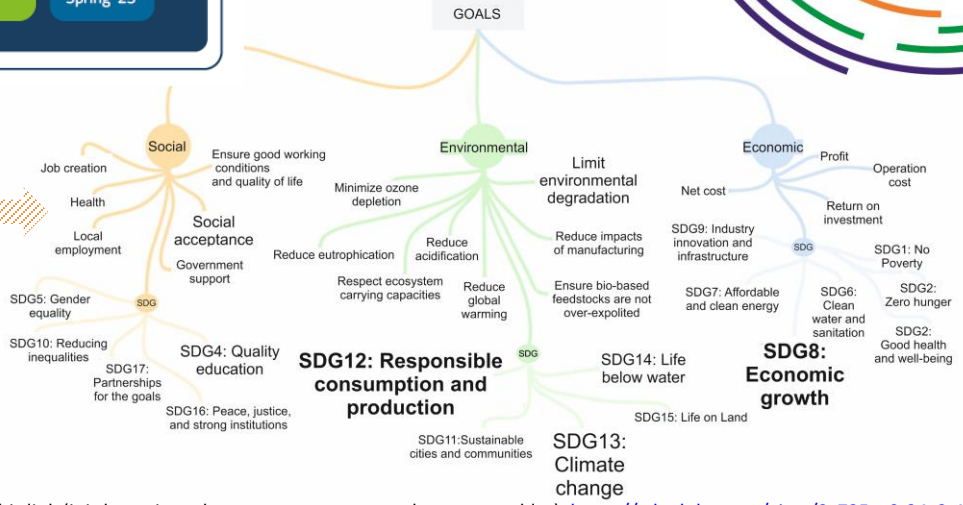
pilot-scale injection molding of BPE-T-PHBV-03, November 2022, @NaKu



Preliminary concept established.
Final "Bioplastics Safety Protocol" Available online



Themes that should be included within a sustainability framework have been identified.
Final "Bioplastics Sustainability Framework" finalised.



The BIO-PLASTICS EUROPE Safety Protocol can be accessed directly through this link (it is best viewed on a computer screen, laptop, or tablet): https://xd.adobe.com/view/2c735ca9-34c2-4b6f-b596-d9afdffbdb84-7920/?fullscreen

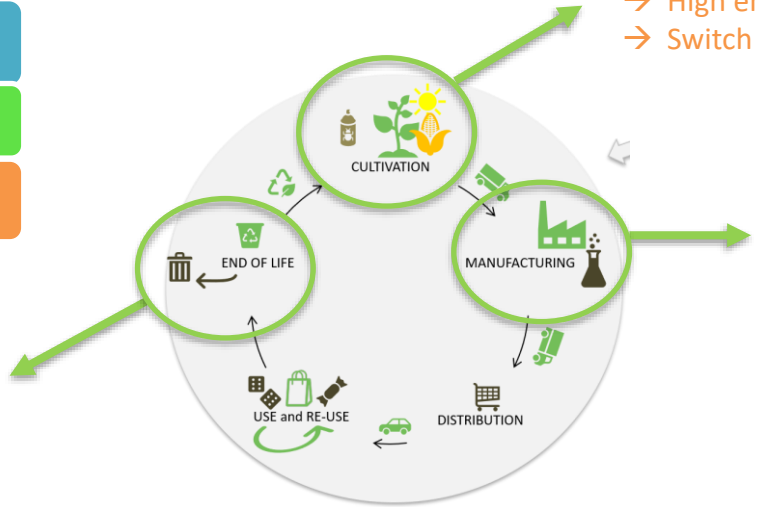
Evaluation of the total impacts of biodegradable bio-based plastics:

Task 8.1: Environmental life cycle assessment (D 8.1/ D 8.2)

Task 8.2: Life cycle costing (D 8.3/ D 8.4)

Task 8.3: Definition and evaluation of business scenarios (D 8.5/ D 8.6)

First generation feedstocks:
→ High environmental impacts
→ Switch to 2nd & 3rd generation



Improvement needed in BBP manufacturing

Crucial differences between different EoL-options

LIFE CYCLE PERSPECTIVE

Handbook on the impacts of bio-based and biodegradable plastics on existing waste management frameworks

Horizon 2020 | This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 860407

The Handbook was presented and evaluated in the Stakeholders meeting, which was held in Brussels, October 21st , 2021 (Hybrid event).
The following questions were discussed:
Integrating new Biodegradable Bio-Based Plastic Materials into Waste Management and EOL Scenarios: What are the Priority Areas?
Integrating new Biodegradable Bio-Based Plastic Materials into Waste Streams: What support is needed in the priority areas?

The test of usability and practical applicability the Handbook performed during the stakeholders' event which was held in Brussels, November 30th – December 1st 2022.
The ideas and suggestions for the effective use and dissemination of the handbook collected.

You can download it for free:
https://bioplasticseurope.eu/downloads/public-deliverables

HISCAP

HISCAP seeks to support especially historic cities and municipalities in need of the latest knowledge and effective, real-life solutions to cope with the many problems caused by plastic waste.

6 online events – accross Europe 2020-2022

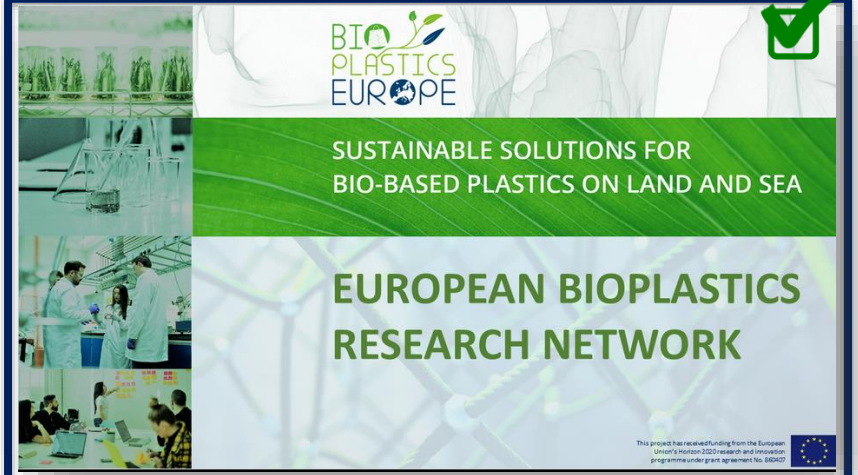
Workshops Series (in person):

"Bio-based Biodegradable Plastics: Impact on Waste Management Frameworks"

1. Brussels, Belgium, November 2022
2. Tallin, Estonia, October 2023
3. Vilnus, Lithuania, October 2023
4. Athens, Greece, November 2023

88 members, 2 scientific papers (submitted)

EBRN



LinkedIn: over 1030 members
Preparing events
Foster communication between science & policy
Share experience

7 online events – science & policy 2020-2023

Collaborations:

1. Other projects
2. Scientific Experts
3. EC officers
4. Companies

Developed Projects2Policy Concept

Explained in session 3

MOOC “The new plastics economy: circular business models and sustainability”

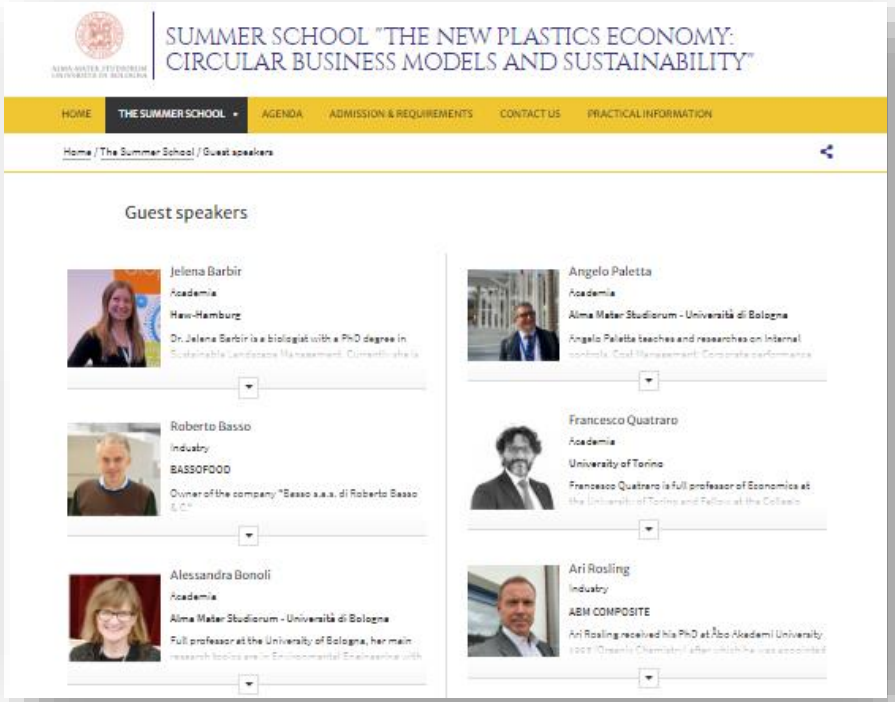
- is led by University of Bologna with the scientific contribution of 16 project partners from 11 different countries and many guest speakers from public and private sectors.

- 4 weeks: Each week has modules and units consisting in listening, reading, case studies, roundtable, and success stories in the form of interviews.

- • WEEK 1 - Introduction to BIO-PLASTICS EUROPE PROJECT;
  • WEEK 2 - Plastic and bioplastic materials;
  • WEEK 3 - The plastic value chain;
  • WEEK 4 - Circularity and sustainability in the plastics economy.

Summer School Bologna – July 2023

29 participants from 16 different EU countries



BIO-PLASTICS EUROPE IMPACT

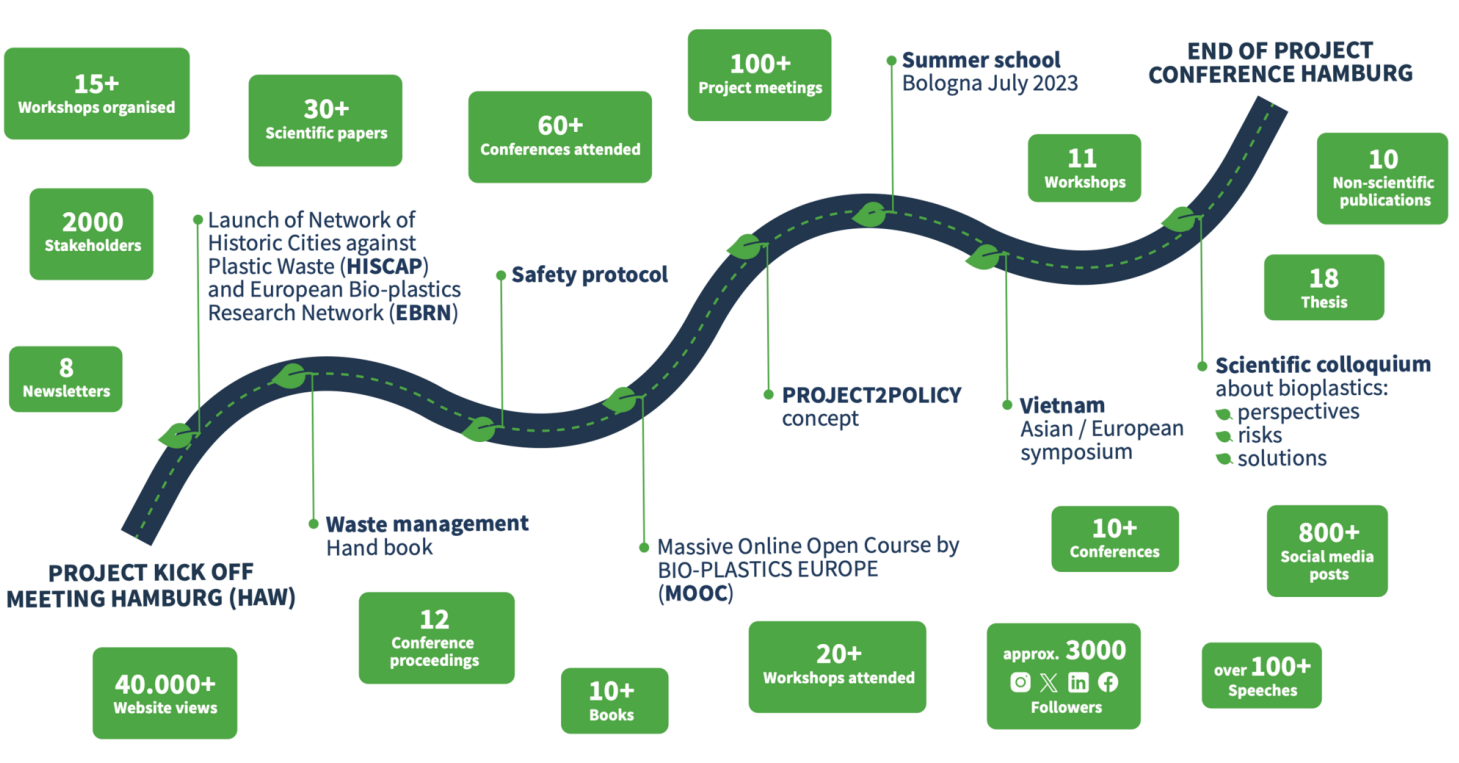
- Development of **5 bio-based and biodegradable prototypes** for different applications and specific protocols
- Creation of **Safety Protocol** for companies & **Sustainability Framework**
- Contributions to current **plastic waste management strategies through the public deliverable** "Handbook on the impacts of bio-based and biodegradable plastics on existing waste management frameworks"
- Development of **business models** through circular economy principles and cross-chain collaboration technique
- **1 Massive Online Open Course** titled *"The new plastics economy: circular business models and sustainability"* **+ 1 Summer school**

BIO-PLASTICS EUROPE IMPACT

- ***Recommendations** to current **EU policies** on bio-based and biodegradable plastics
- *Creation of **Projects2Policy** concept with EuBioNet (grouping 49 EU projects)
- *Active engagement of over **2000 stakeholders** within scope of the project

- **Over 30 Scientific publications** on bio-based and biodegradable plastics (IF>3)
- **C&D (M36)**: 500+ followers **Facebook,** 1000+ followers on **Instagram,** 600+ followers on **Twitter,** 1000+ followers **LinkedIn,** 600+ subscriptions to **Newsletter,** 40.000+ visits **Website**

BIO-PLASTICS EUROPE IMPACT



Thank you for joining us today…..

HAMBURG UNIVERSITY OF APPLIED SCIENCES

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Email: bioplastics@ls.haw-hamburg.de
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BIO PLASTICS EUROPE

HAW Hamburg

Horizon 2020

DATE: 23.01.2024

FINAL CONFERENCE

BIO-PLASTICS EUROPE

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Session 2:
Role of Science in Bio-Plastics Industry

Moderator: Carolyn Brand

Prospex Institute

Challenges and opportunities in Bioplastic's world for producers

R&D Director Ari Rosling

Arctic Biomaterials (ABM)

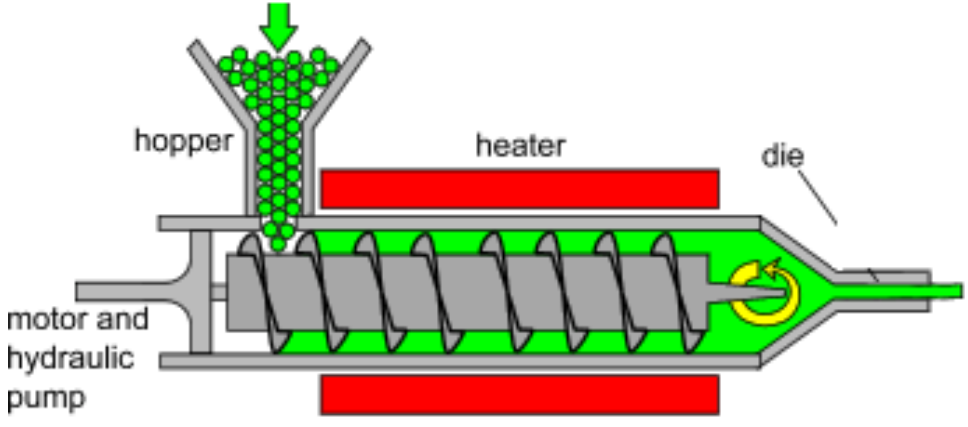
BIO-PLASTICS EUROPE Final Conference
23rd January 2024 in Hamburg, Germany

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 860407. BIOPLASTICS EUROPE project website: www.bioplasticseurope.eu

Arctic Biomaterials - Compounding

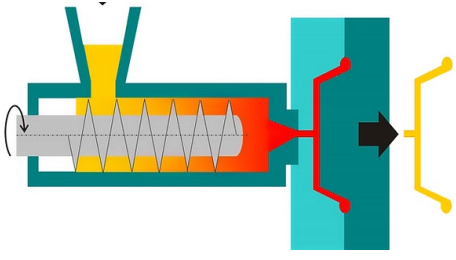
Polymer granules
Functional additives

Plastic granules with specific properties (material/processing)

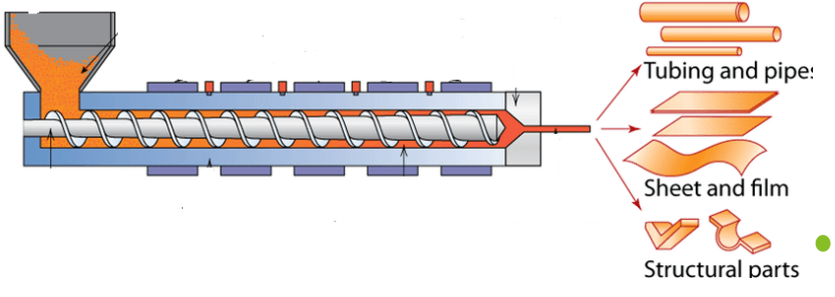


Converters

Injection molding



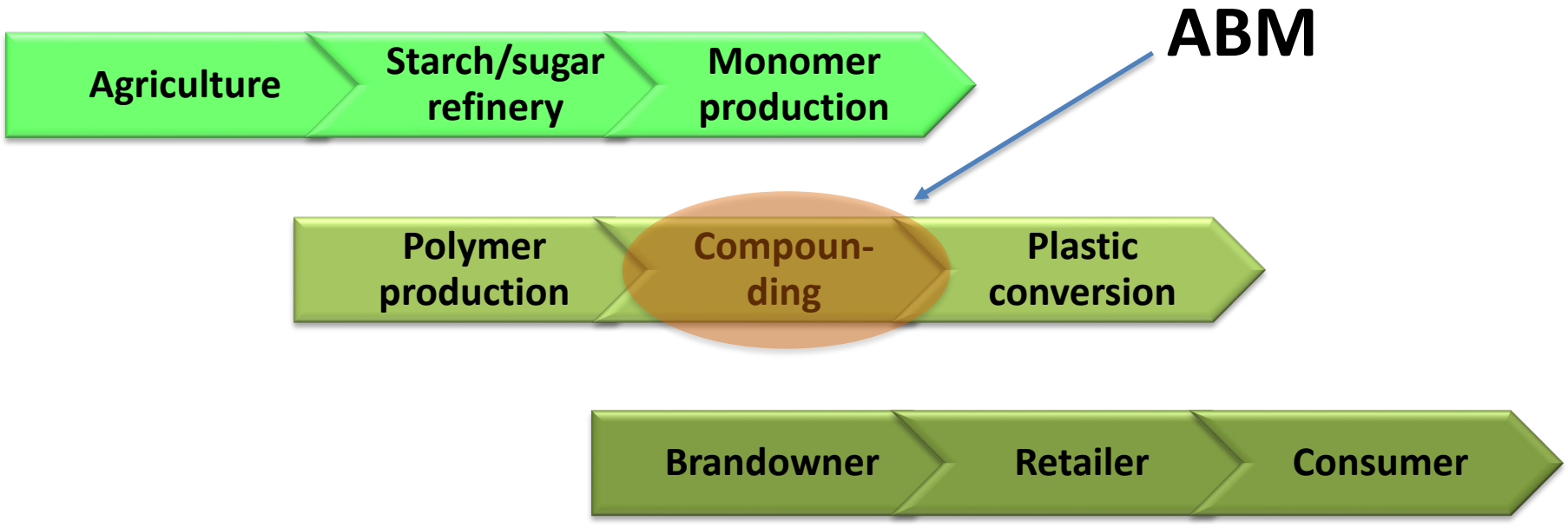
Profile extrusion



BIO PLASTICS EUROPE

ABM COMPOSITE
Arctic Biomaterials

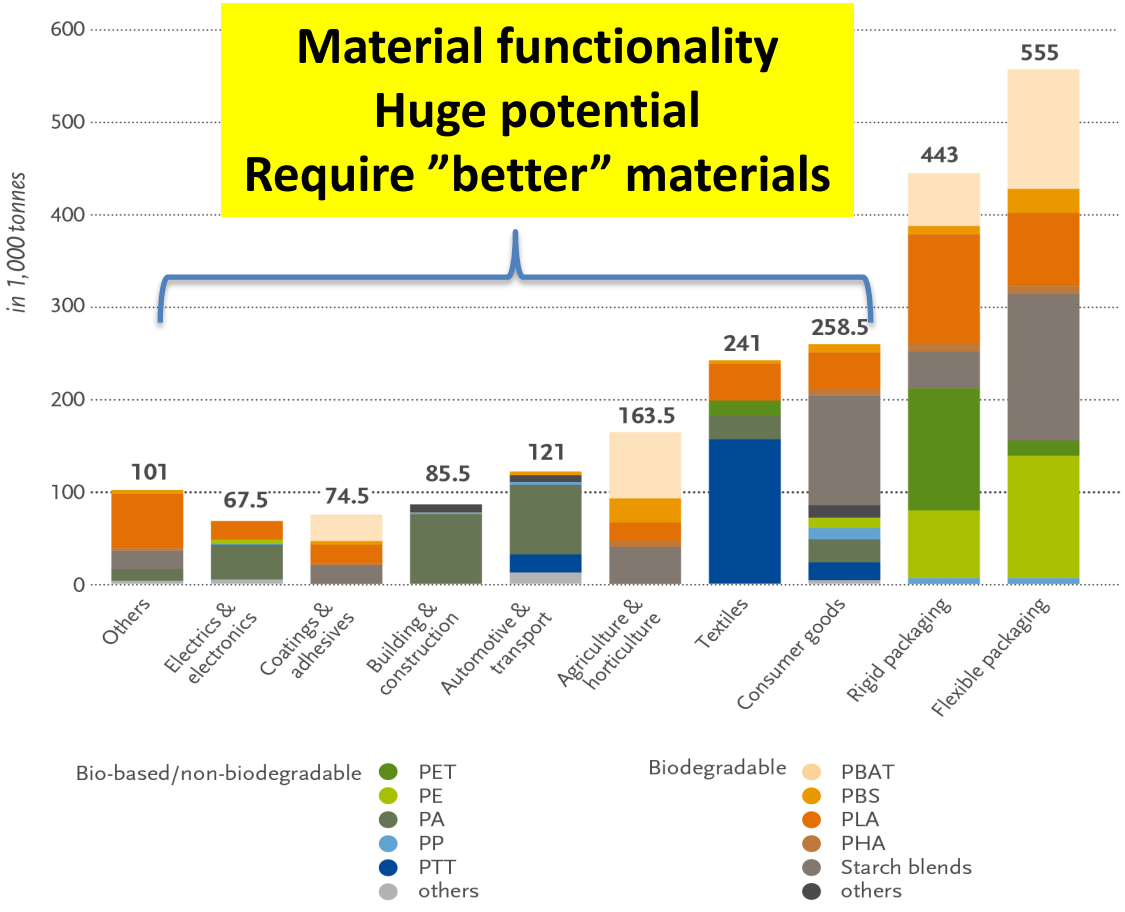
Bioplastic's supply-chain



BIO PLASTICS EUROPE

ABM COMPOSITE
Arctic Biomaterials

Bioplastics and market segments



Source: European Bioplastics, nova-Institute (2020). More information: ***www.european-bioplastics.org/market*** *and* ***www.bio-based.eu/markets***

The application place specific requirements on the material performance and properties

BIO PLAS EUR

ABM COMPOSITE
Arctic Biomaterials

ABM - Bio-based biodegradable plastics with focus on material performance

=> *alternatives to fossil-based commodity plastics (ABS, PP, PE)*

Disposables

Semi-Durables

Requirements/Challanges
Appliaction dependent

Polymer/additive producers

Polymer & functional additives

- **Specific material properties**
- **Availability**
- **Bio-based/biocontent**
- **Biodegradable**
- **Compostable**
- Processability

Complies with regula-tions(eg. Food contact)

Price

Arctic Biomaterials

Brandowners/consumers

Material performance

- Mechanical
- Heat resistance
- Colorability
- Dishwasher safe
- Processability
- Shelf-life

Biocontent Feed stock

Regulatory (FCA)

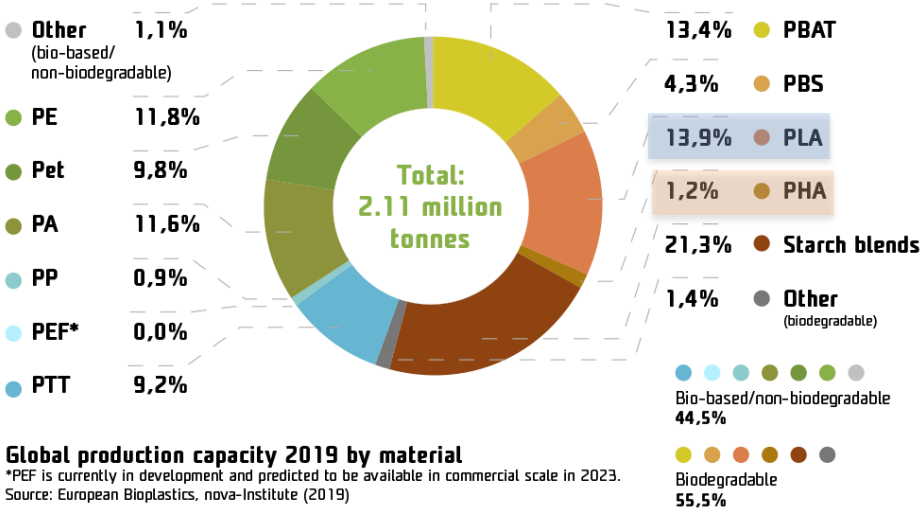
EoL (recycling)

Price

Bioplastics pool - challange

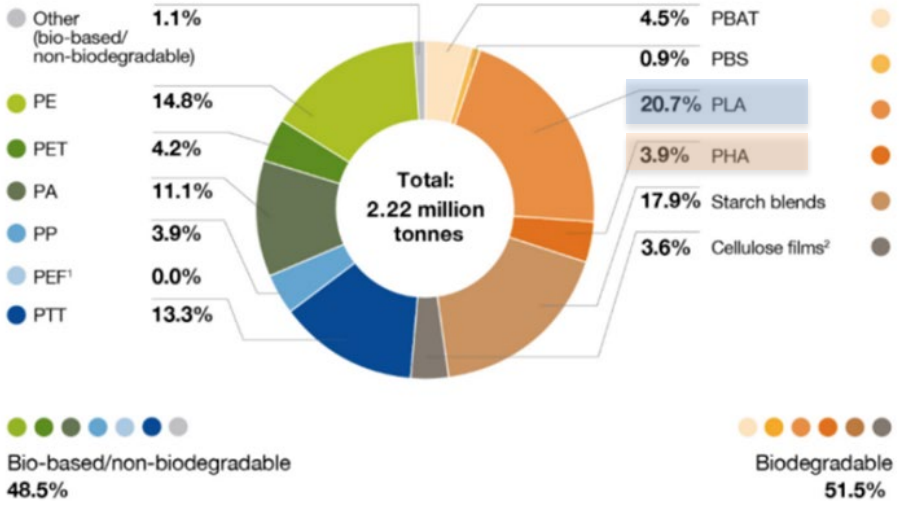
Global production capacities by material type

2019



Global production capacity 2019 by material
*PEF is currently in development and predicted to be available in commercial scale in 2023.
Source: European Bioplastics, nova-Institute (2019)

2022



Bio-based biodegradable plastics - Drivers

- **Decoupling from fossil resources**
  - Use of plant based raw materials (corn, sugar cane -> biowaste (non-food) ->algea)
- **Environmental aspects**
  - Production less energy demanding
  - Reduced carbon footprint
  - Address the littering problem
  - Utilisation of various biomass & waste streams for polymer production
- **Positive perception/image**
  - Brandowners' sustainability policies
  - Consumer awareness
  - Success in medical field
- **Regulative & economical incentives ARE NEEDED**
  - SUP directive in Europe
  - In January 2020, China's government banned several types of single-use plastics (degradable are exempt)
  - Tax reduction on bio-based plastics in Thailand

Bio-based biodegradable plastics - Barriers

- **The bioplastic space is confusing - <u>education</u>**
  - Misleading information/definitions
- **Availability** (raw materials; feedstock issues) **- <u>ethics</u>**
- **Incompatiblity with present process equipment**
- **Uncertainty in functional performance**
- **Development of appropriate infrastructure for recycling**->Sustainability &circular economy – **<u>EoL & Effiency</u>**
- **Present regulatory requirements (SUP; natural polymers)**
- **Expensive - <u>economics</u>**

Summary

- Increasing production and use of fossil-based plastics and, overwhelming environmental pollution is intolarable

- **A ”bio-future” is inevitable**

  + Functional & Sustainable bioplastic solutions available

  + Continous improvements in use of feedstocks for monomer production

  + Legislation and incentives drive and support bio-based plastic solutions

  - Limited availability of polymers & additives fulfilling regulatory and price issues

  - Collection/Recycling infrastructure is needed for circularity

  - Expensive

BIOPL EUROPE

ABM COMPOSITE
Arctic Biomaterials

Contact details

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info@arcticbiomaterials.com
www.abmcomposite.com

Ari Rosling (R&D Director) +358 (0)405726951
(ari.rosling@abmcomposite.com)

DATE: 23.01.2024

FINAL CONFERENCE

BIO-PLASTICS EUROPE

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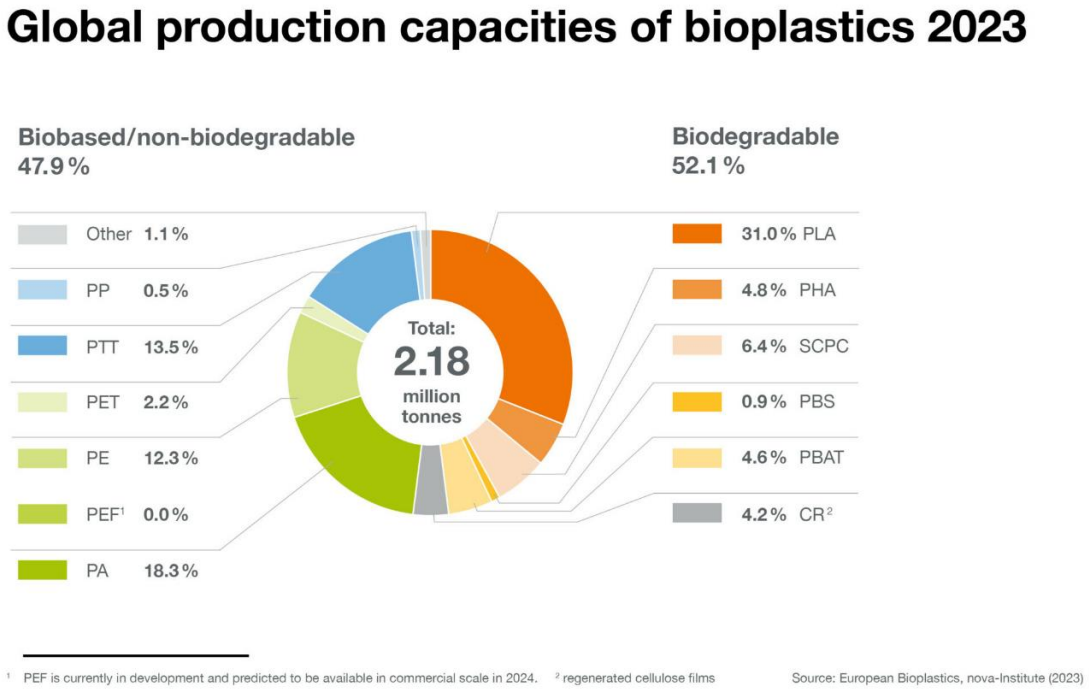
Bio-based and biodegradable plastics through the lens of the scientists

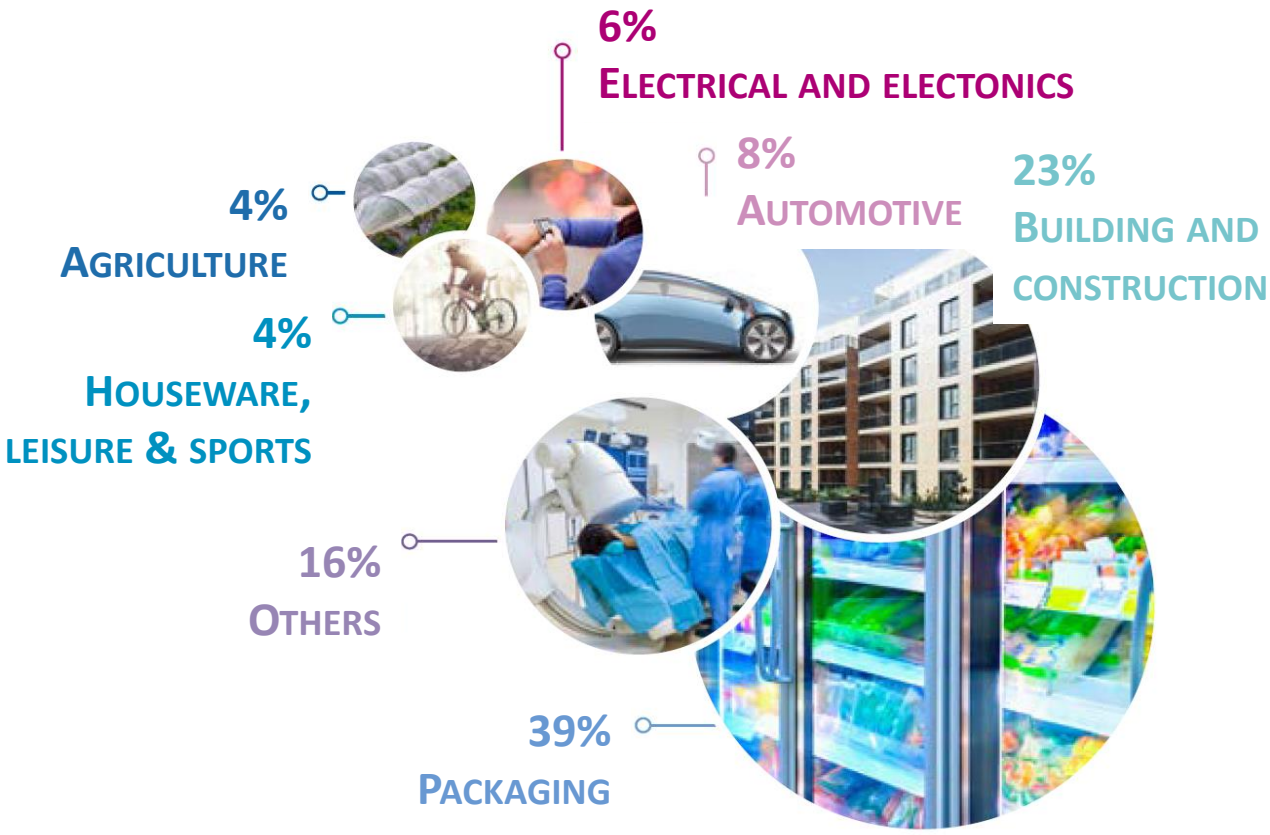
Emma Strömberg

BIO-PLASTICS EUROPE Final conference

ivl
Swedish Environmental Research Institute

Bio-based and biodegradable plastic materials





Global plastic production 2022: 400 Mt

Source:
www.european-bioplastics.org
www.plasticseurope.org

ivl
Swedish Environmental
Research Institute

BIOPLASTIC

BIOMATERIAL

BIOPOLYMER

BIO-BASED PLASTIC

DROP-IN PLASTIC

(BIO)DEGRADABLE PLASTIC

COMPOSTABLE PLASTIC

I'm green™ Plastic
Renewable source
Carbon reduction

ivl
Swedish Environmental
Research Institute

Bio-based plastic materials

- **DEFINITION: BIO-BASED - DERIVED FROM BIOMASS**
- **DEFINITION: BIO-BASED PLASTIC - PLASTIC WHOLLY OR PARTLY DERIVED FROM BIOMASS**
- First, second and third generation raw materials
  - Corn, sugarcanes
  - Waste and biproducts – cooking oil, lignocellulosic biomass
  - Algae, bacterial, ($CO_{2)}$
- Plastics marketed as bio-based are rarely 100 percent bio-based, but are partly made from biomass
- Biodegradability might change

Source: CEN, EN 17615:2022 E

ivl
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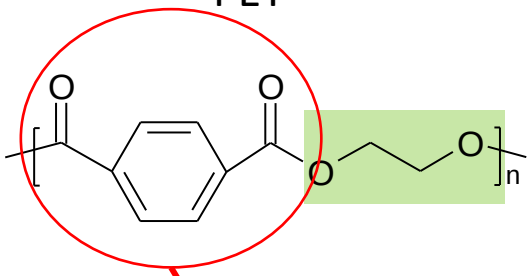
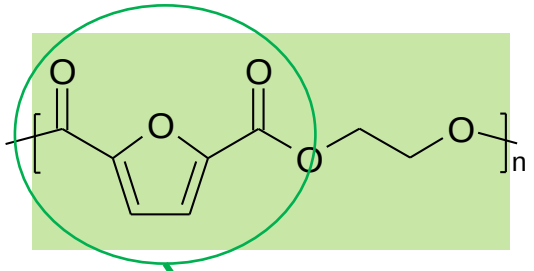
Bio-based plastic materials

PET



20% bio-based and 80% fossil-based

PEF



100% bio-based

Non-biodegradable plastic

Transition to bio-based materials - beneficial from a climate point of view, but...

The difference in climate impact compared to fossil-based plastic depends, among other things, on the type of plastic, the raw materials used and how they have been cultivated and processed

Some challenges

- Eutrophication and acidification
- Land use
- Water use
- Use of pesticides
- Biodiversity

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(Bio)degradable plastic materials

- **Definition: Biodegradability - potential for a polymeric material to undergo a biodegradation process**
- **Definition: Biodegradation - process leading to the breakdown of an organic compound by microorganisms in the presence of oxygen to carbon dioxide, water, mineral salts and new biomass, or in the absence of oxygen to carbon dioxide, methane, mineral salts and new biomass**
- In nature – combination of degradation mechanisms
- Lab studies vs natural environments
- Specific environmental conditions
- Necessary applications/products
- Prevent littering

PLA film
6 months exposure

Source: CEN, EN 17615:2022 E

Swedish Environmental Research Institute

Bio-based ≠ Biodegradable
Biodegradable ≠ Bio-based

Compostable plastic materials

- **DEFINITION: COMPOSTABILITY - POTENTIAL OF ITEMS OR MATERIALS TO BE COMPOSTED AS DEFINED BY THE RELEVANT STANDARDS AND REGULATIONS IN FORCE**
- Industrial composting vs home composting
- Green-wash
- Varying infrastructure
- Confusing for consumers

Source: CEN, EN 17615:2022 E

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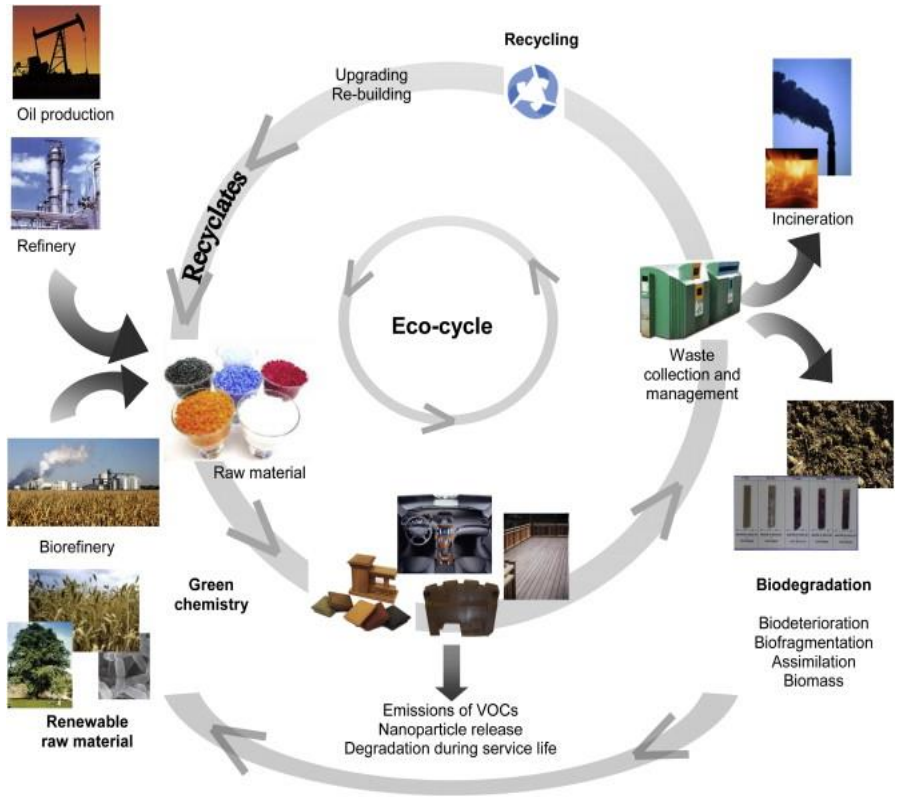
Life cycle perspective

- Integrated safety and sustainability in the design
- Sustainable raw materials
- Green and sustainable chemistry
- Recyclability of bio-based materials
- Importance of additives
- Technological development



F. Vilaplana, E. Strömberg, S. Karlsson; PDS, 95, 11, 2010, 2147–2161

Clear regulation and financial incentives are essential to scale from niche polymers to large-scale bio-based market applications with truly sustainable impact

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The role of science

- Facilitate the transition to bio-based solutions
- Develop, transfer and interpret knowledge and skills
- Independent research
- International collaboration
- Support industrial implementation
- Support legislation

Thank you for your attention!

Emma Strömberg
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DATE: 23.01.2024

FINAL CONFERENCE

BIO-PLASTICS EUROPE

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 860407.
BIO-PLASTICS EUROPE project website: www.bioplasticseurope.eu

THE BUSINESS PERSPECTIVE AND THE ROLE OF INNOVATIVE BUSINESS MODELS IN PROMOTING CIRCULAR BIOECONOMY

Eleonora Foschi (University of Bologna)

BIOPLASTICS EUROPE

Co-funded by the Horizon 2020 Framework Programme of the European Union – Grant Agreement N° 860407

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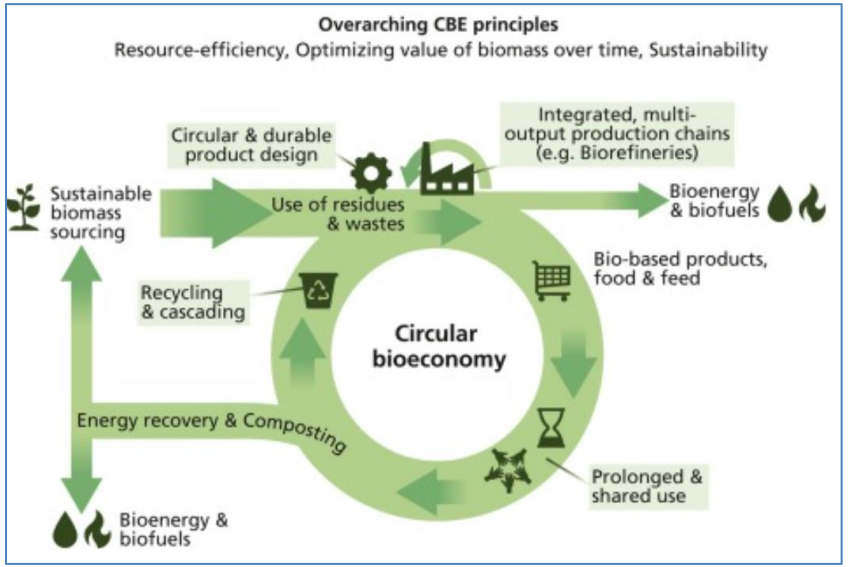
Hamburg, 23/01/2024

Background

While making plastics from biomass or ensuring that plastic products can biodegrade in some receiving environments can bring a number of benefits compared to conventional plastics, ***these solutions have their own sustainability challenges and trade-offs that should be well understood and duly taken into account****.*
They should also not detract from the need to align the lifecycle of plastics with the circular economy [..] .

Literature review

Circular bioeconomy is *"an economic model in which bioresources are used to make products* ***with the highest possible added value in a sustainable way, with a cascaded use of materials*** *and minimizing resource inputs and outputs to the natural environment".*
(Stegmann et al., 2020)



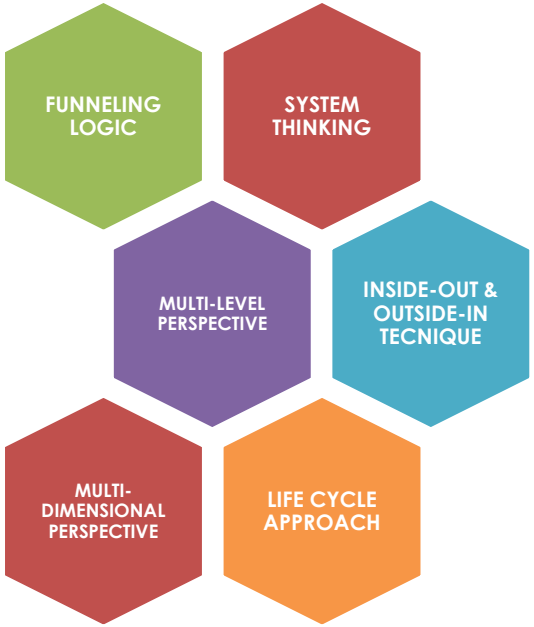
Source: Stegmann et al., 2020

→ ***Bio-based plastics contribute to the circular bioeconomy when added value is created and retained along value chains.***

Research design

STEPS

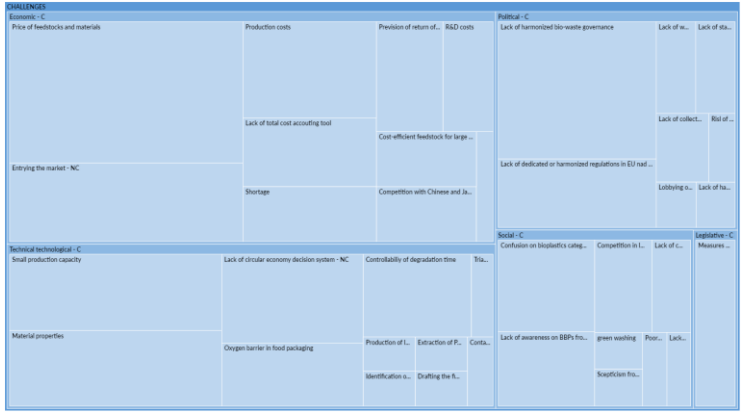
1. Literature review
2. Stakeholder engagement strategy
3. Sectorial analysis based on semi-structured interviews
4. Business cases:
   a. Call for action
   b. Research & development partnership
   c. Industrial demo
   d. Focus groups
   e. Business modelling sessions



Aureli, S., Foschi, E., & Paletta, A. (2023). Management accounting for a circular economy: current limits and avenue for a dialogic approach. Accounting, Auditing & Accountability Journal. (Research article)

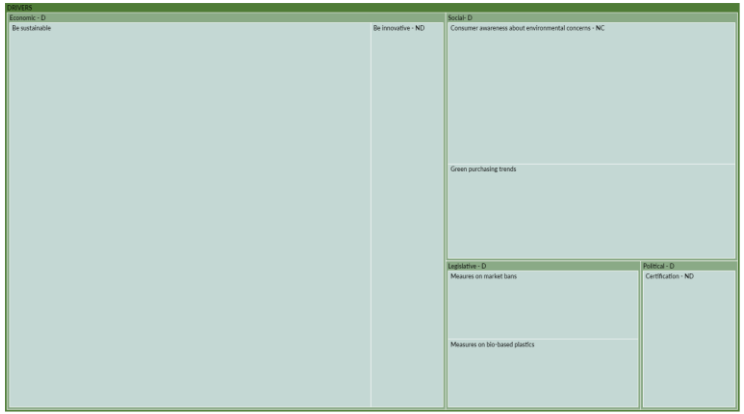
Sectoral analysis

- ✓ The market of BBPs is led by large companies
- ✓ Production is mainly based on the supply of 1st generation feedstock



- ✓ Use of BBPs is observed in established firms mainly
- ✓ BBPs are commonly recognized as innovative and green
- ✓ Long R&D period (> 5 years)

- ✓ Distant or missing contribution to the fully circular bioeconomy

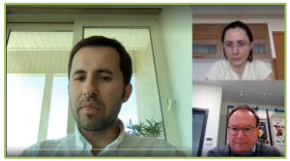


Source: Foschi, E., Aureli, S., & Paletta, A. (2023). Linking bioeconomy, circular economy, and sustainability: Trends, gaps and future orientation in the bio-based and biodegradable plastics industry. European Journal of Social Impact and Circular Economy, 4(2), 16-31. (Research article)

Mulch film producer

*"Technical challenges are normal, you have a new material, the material have their properties and sometimes the properties are not well suited, so **you need to adapt**".*

Packaging manufacturer



*"The important thing is **to do it in the right directions, where this type of solution makes sense**. We need to well understand what is behind. Most of them just say I want a bio- degradable material because I don't want to see any plastic waste and this is not the right approach. **You really have to think about the product and the end of life** so saying I want a bio-degradable material".*

Raw material producers

*"There are a few projects where we do work with waste management facilities but the problem is that **waste management facilities are not the end of the chain but the beginning of the chain**".*

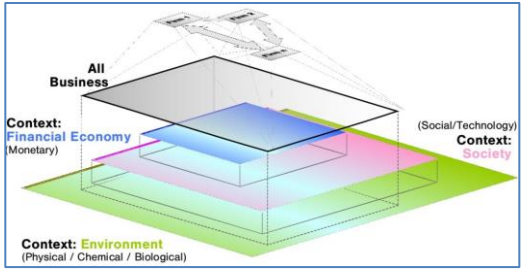
Toys manufacturer

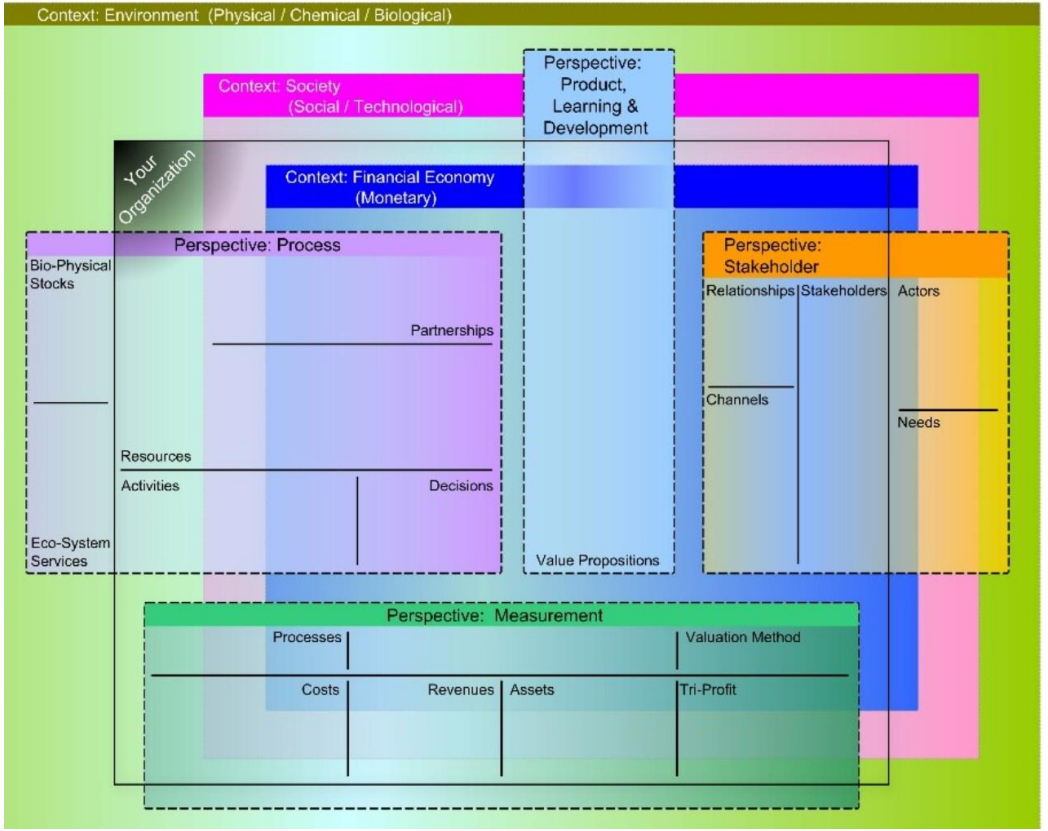
***"No issues on machinability or changing production processes or the personnel**. We use the same machinery that processes the fossil-based plastics. And that's what makes the **shift very easy** as if we need to invent or invest on new factory".*

Compounders

*Some of the products we produce have this characteristic. Producing a plastic that is only **bio-based can make sense or could make sense**... **we need to understand in which application segment...***

Fluorishing business model canvas





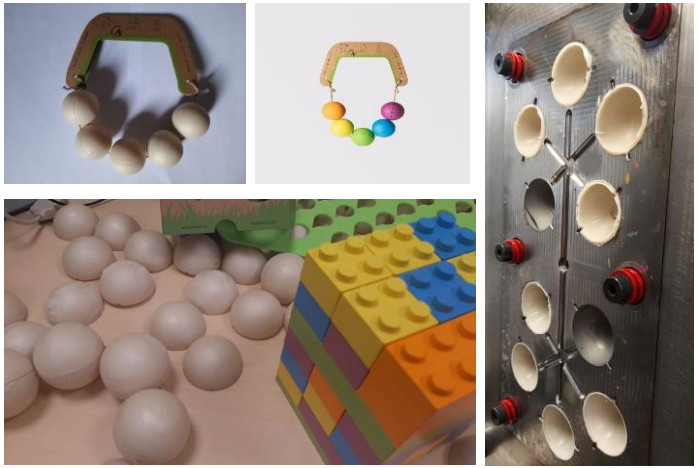
Source: Upward, 2014

Business case: eKoala

- **SECTOR:** toys
- **COMPANY SIZE:** Small enterprise
- **COMPANY LOCATION:** Italy
- **VALUE PROPOSITION:** produce and commercialize safe, healthy and environmental-friendly toys
- **MATERIALS:** only BBPs
- **MARKET:** mainly national

→ **TEST based on BPE-T-PHBV-02**

APPLICATION: SAND TOYS



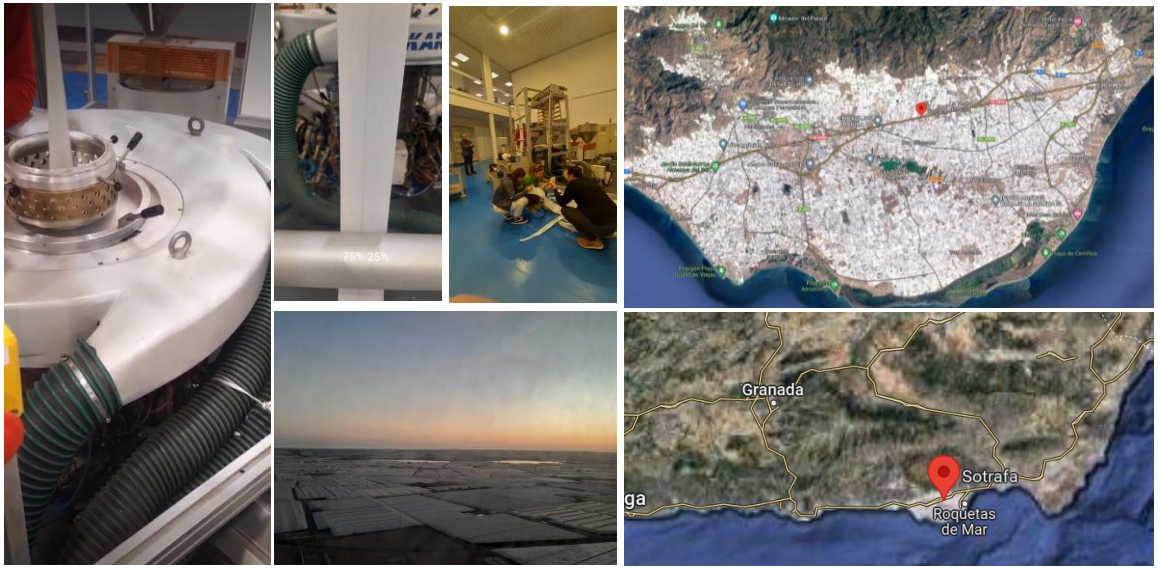
Source: Eleonora Foschi, Selena Aureli, Angelo Paletta. eKoala: transitioning towards a sustainable business models in the toys industry. The case centre (Teaching case)

Business case: agricultural much film sector

- **SECTOR:** agriculture
- **COMPANY SIZE:** big multi-national corporation
- **COMPANY LOCATION:** Spain
- **VALUE PROPOSITION:**
- **MATERIALS:** from conventional plastics to BnBPs and BBPs
- **MARKET:** both national and international
- →**I TEST based on BPE-AMF-PLA**

  II TEST based on BPE-PHA

APPLICATION: MULCH FILM

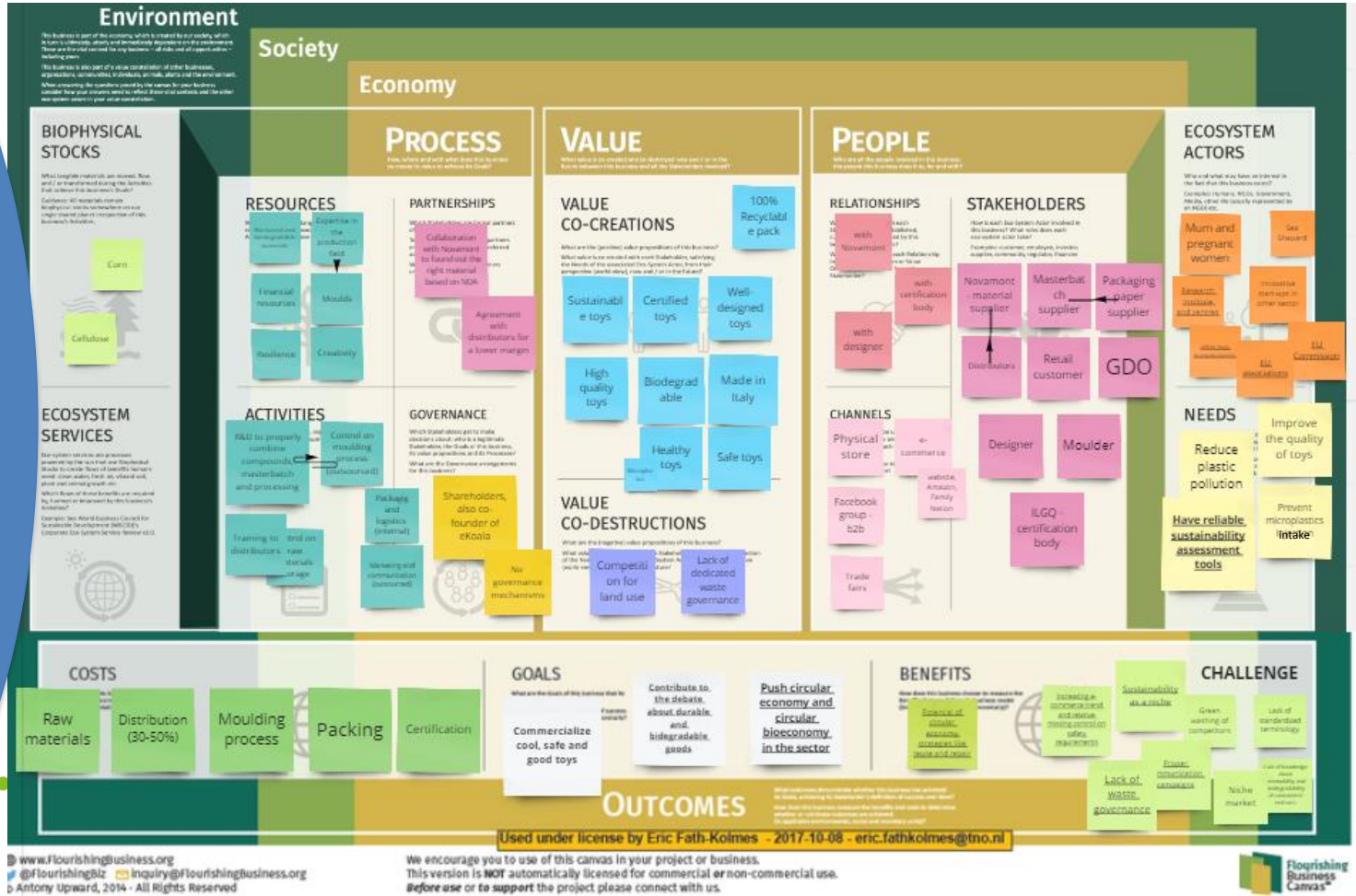


Toys found in beaches (JRC): **1234 toys & partypoppers** normalised with transect lengths of 100m

Toys incenerated , disposed or littered (Sanchez): **80%**

Toys exported from China to Europe: **86%**

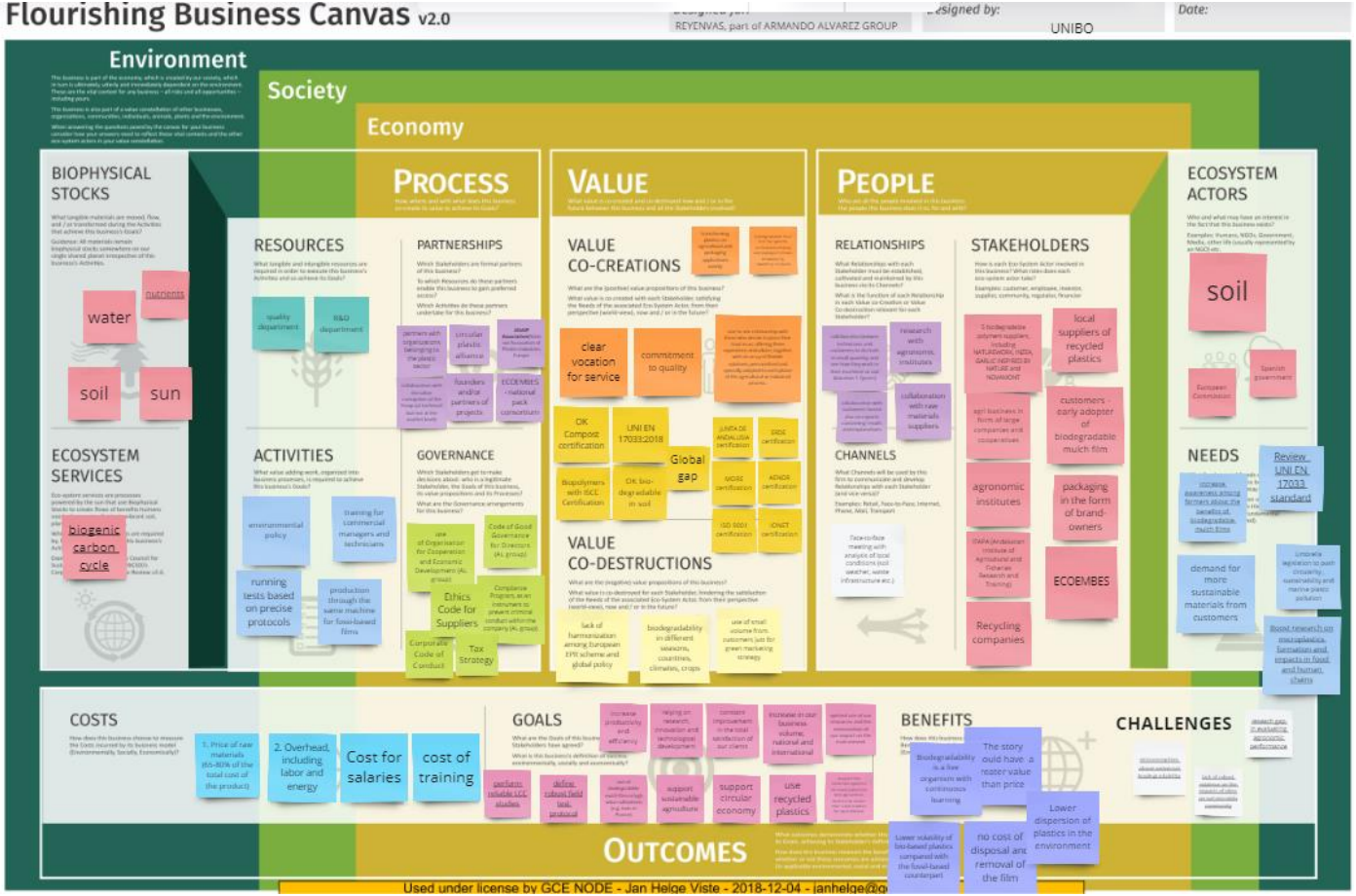
Toys containing carcinogenic, allergenic and hormonal disrupting substances in 2022: **27%** of total notification



Agricultural film collected in EU in 2019 (EC): **63%**

Agricultural film stored, bunt, burnied or other: **37%**

Agricultural film recycled: **24%**



Conclusions

Firms cannot achieve circularity on their own but in ecosystems based on concerted, global, systemic and collaborative initiatives.

TOYS

- While bio-based plastic is perceived as social added-value, environmental value may be provided by marine biodegradability because of the potential to reduce negative impacts from unintentional littering.
- Value retention poses questions on the link between durability and biodegradability.

AGRICULTURE

- Added value is provided by soil biodegradability which is perceived from the economic and environmental viewpoint but major evidence is necessary.
- Value retention is underestimated because of the misconception about universal biodegradability.

DATE: 23.01.2024

FINAL CONFERENCE

BIO-PLASTICS EUROPE

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 860407.
BIO-PLASTICS EUROPE project website: www.bioplasticseurope.eu

FINAL CONFERENCE

January 23rd, 2024

Waste management companies - role of bioplastics

Prof. Dr. Žaneta Stasiškienė

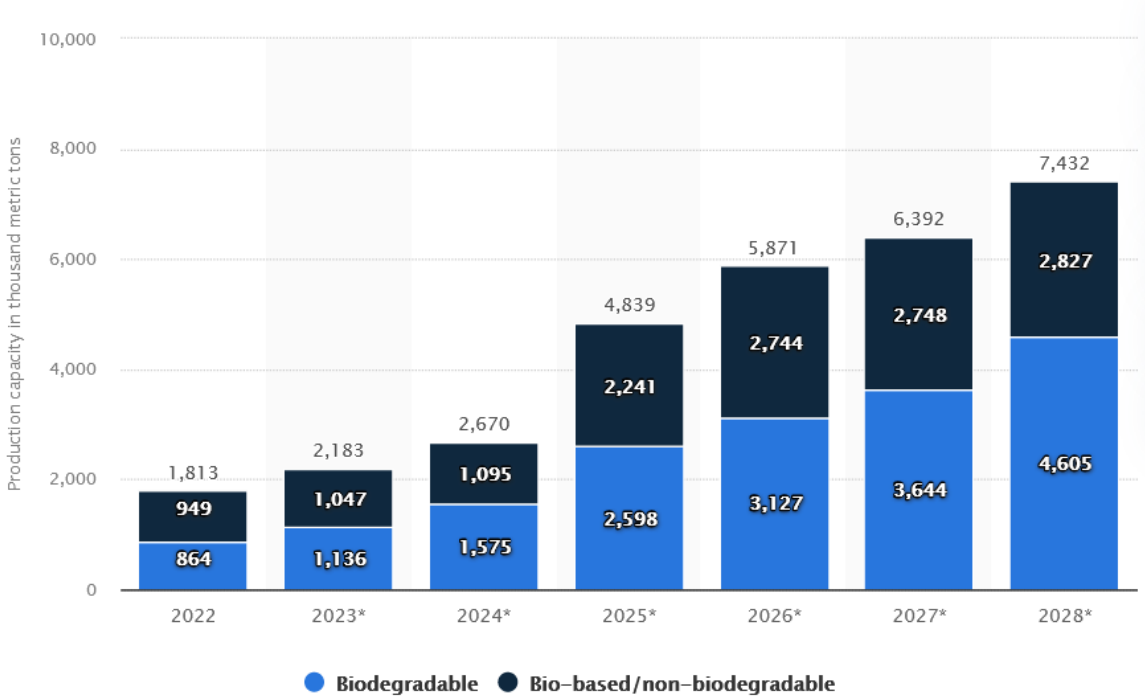
Kaunas University of Technology, Lithuania)

BIO-PLASTICS EUROPE

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 860407. BIOPLASTICS EUROPE project website: www.bioplasticseurope.eu

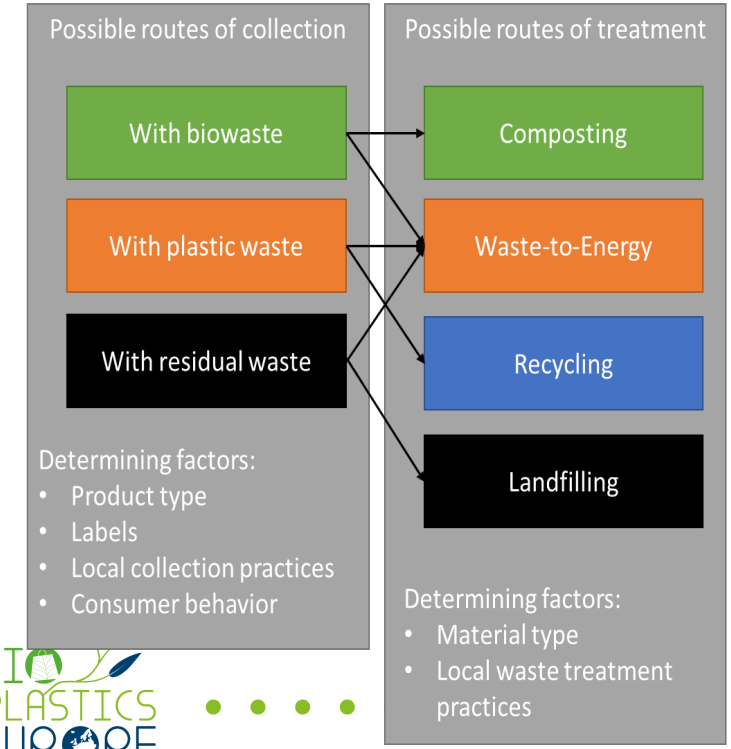
Production capacity of bioplastics worldwide from 2022 to 2028, by type (in 1,000 metric tons)

The global production capacity of bioplastics increased in 2022 to 1.8 million metric tons. Biodegradable bioplastics accounted for 864 thousand metric tons of the total capacity in 2022. Growth is expected to continue in the coming years, with projections showing that global production capacities of bioplastics could reach in 7.4 million metric tons by 2028.



Bioplastics are suitable for a broad range of end-of-life options, including reuse, mechanical recycling, organic recycling, and energy recovery. The overwhelming part of the bioplastic volume produced today can easily be recycled alongside their conventional counterparts where separate recycling streams for certain material types exist (e.g. biobased PE in the PE-stream or biobased PET in the PET-stream). This way, bioplastics contribute to higher recycling quotas in the EU and the implementation of the circular economy.

Bio-based plastic waste collection



It is important to note that the **current material flows of bio-based and biodegradable plastic is not commonly tracked**. In general, bio-based and biodegradable plastics are either:

- **separately collected with organic waste** with the aim of composting, when the labels on the products guide the consumers to do so;
- **separately collected with conventional plastics** (recyclable waste), especially for bio-based "drop-in" plastics that are chemically similar to conventional petroleum-based plastics;
- **disposed of in residual waste**.

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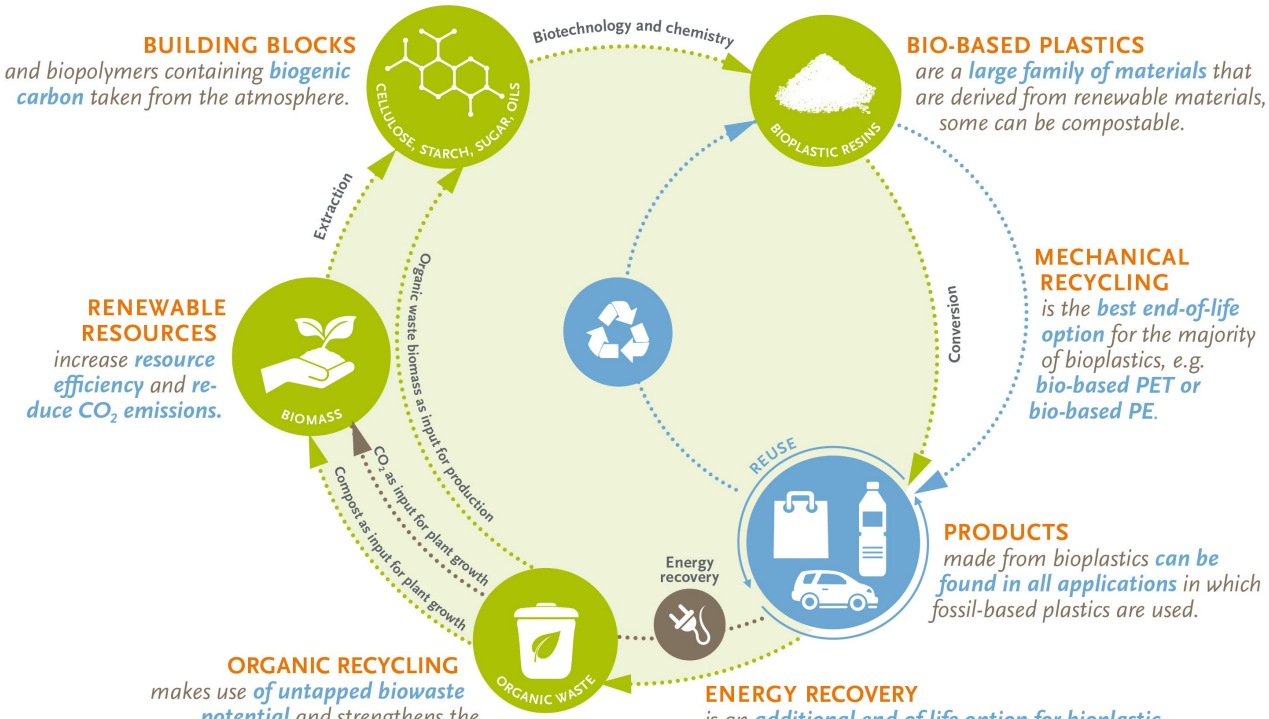
Bioplastics – closing the loop



source: European Bioplastics

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COLLECTION
Consumer discards product and decides on its fate
Plastics and packaging waste collection
Sorting
Mixed plastic stream split into homogenous fractions
Processing
Remelting or granulation
Biobased refuse derived fuels for renewable energy
Recycled plastics in different qualities
Biowaste collection
Sorting
Not applicable
Processing
Organic recycling
Residues
Compost as valuable soil improver
Biogas as renewable energy

The social – behavioural factors impacting plastic waste management

People are conditioned when it comes to recycling by factors such as:

- available infrastructure,
- awareness,
- knowledge and environmental concern,
- type and area of residence,
- perceived social pressure,
- legislation, and
- attitudes towards recycling.

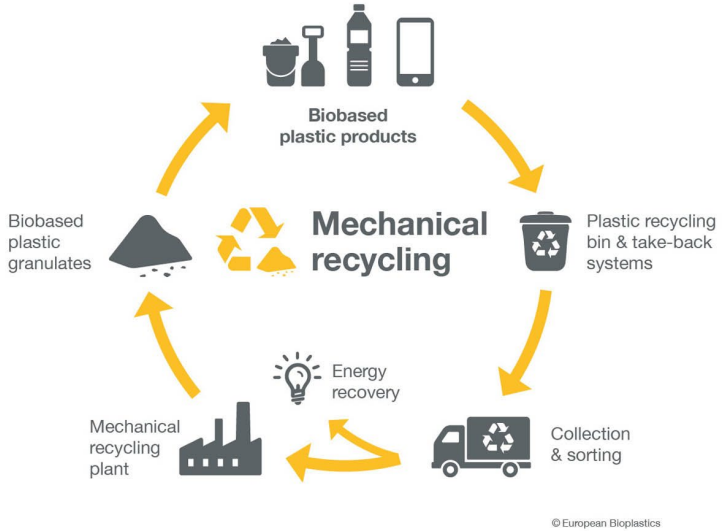
Technologies (present and approaching) for plastic waste and bio-based plastic waste and management

- Manual sorting based on markers and labels
- Separation by density differences
- Optical system, fluorescent and colouring dyes
- Separation by dissolution
- Near infrared
- Digital identity for plastics (packaging)
- Mechanical recycling
- Chemical recycling

Mechanical recycling

As most conventional plastics, bio-based plastics need to be recycled in separate streams for each material type. Where a recycling stream for a specific plastic type is established (e.g. PE or PET), the bio-based alternatives (bio-PE, bio-PET) can be recycled together with their conventional counterparts.

Furthermore, PLA is a bioplastic that is potentially recyclable but for which no separate recycling stream yet exists. The corresponding sorting technology is, however, already available. Specific material recycling of clean production scraps is established and saves valuable resources. The recycling of PLA after its use (so called post consumer plastics) will be feasible as soon as the commercial volumes and sales increase sufficiently to cover the investments required.



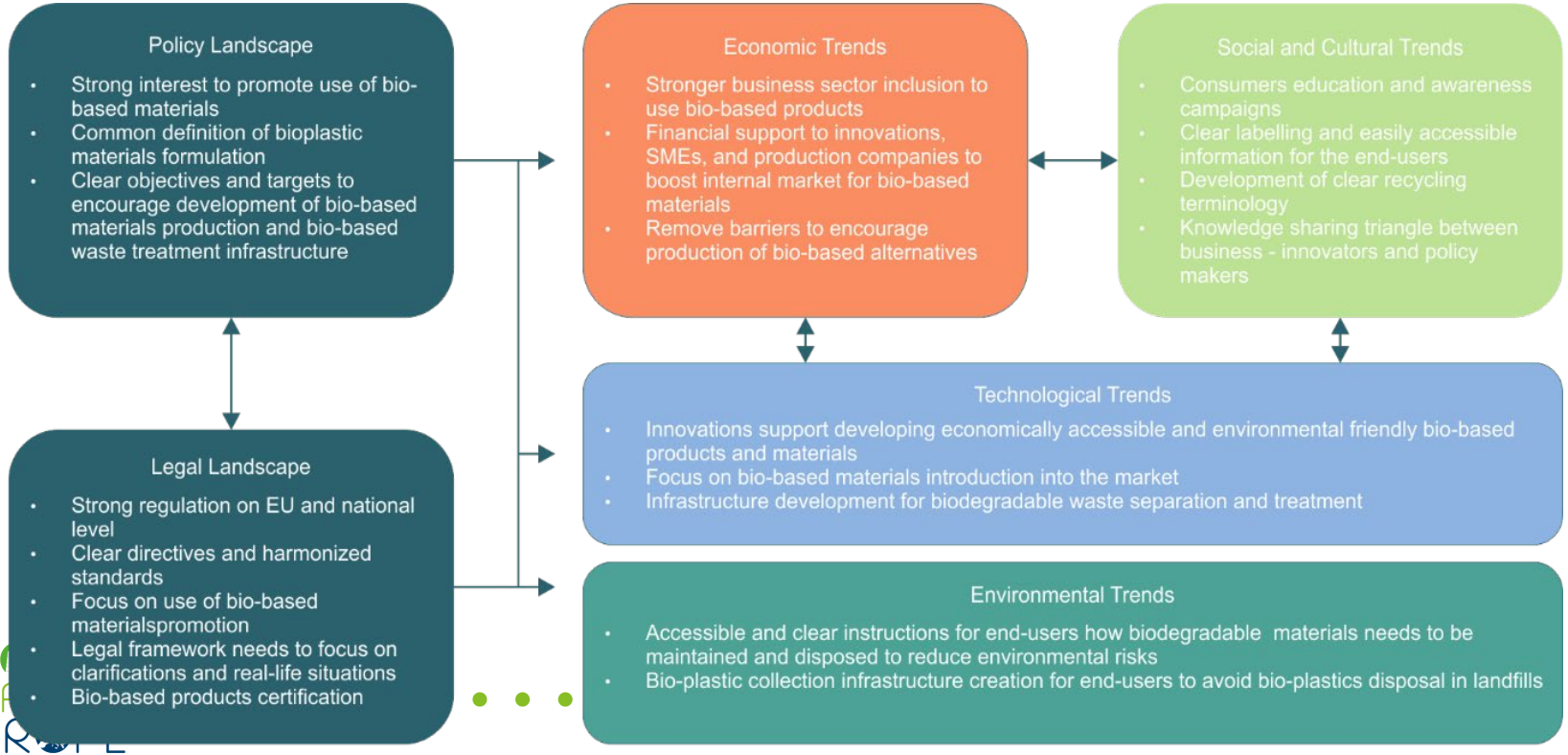
Composting

Certified compostable plastic bags & packaging

help to **collect more biowaste,** which can be turned into **valuable compost** or into **biogas.**

* Industrial composting or anaerobic digestion (AD) with composting step.
** Only in case of AD.

The sustainable model to promote transition from non-degradable plastics to bio-based materials



The priority areas for waste collection and management are summarized as (1):

- Establish the need and standards for LCA based screening methods when deploying bio-based biodegradable plastics to substitute other materials

- Establish and strive for universal access to easy-to-use collection schemes to reduce the barrier to waste segregation for bio-based biodegradable plastics
    - Include strong incentives for participation
    - Consider EPR system(s) specific for bio-based biodegradable plastics to deal with the financing and additional requirements for the recycling (if feasible) or composting of these materials

The priority areas for waste collection and management are summarized as (2):

- Increase awareness on the impact of mismanaged plastic waste, including bio-based biodegradable plastics, and provide clear guidance on disposal (i.e. through labelling) based on product type
- Set standards for the design of bio-based biodegradable products to reduce the complexity in terms of additives, recyclability, sorting accuracy in a sorting plant and improve compostability
- Test and evaluate pilot sorting and separation systems for bio-based biodegradable plastics for the case of reuse, mechanical recycling and in composting plants
- Test and evaluate the feasibility of post-consumer mechanical recycling and chemical recycling systems for bio-based biodegradable plastics

Thank You

Contact:
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DATE: 23.01.2024

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Session 3:
Policy Session

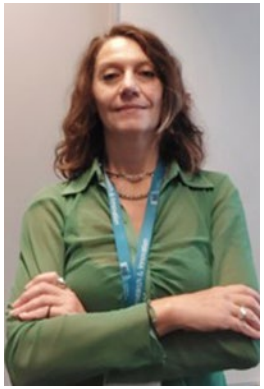
Moderator: Emma Strömberg

Swedish Environmental Research Institute

Dr. Paola Migliorini

EU Policy Officer – Deputy head of Unit ENV.B1

A European policy framework for bio-based, biodegradable and compostable plastics



Dr. Silvia Maltagliati

EU Policy Officer, Unit B1 – Green Transitions

Horizon Europe R&I programming on bio-based and biodegradable plastics

DATE: 23.01.2024

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DATE: 23.01.2024

Final Conference

Session 3

BIO-PLASTICS EUROPE: Projects2Policy Concept

Speaker: Dr. Jelena Barbir
HAW Hamburg

BIO-PLASTICS EUROPE

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BIO-PLASTIC EUROPE: POLICY FRAMEWORK

Applications

Inputs from project partners

Work packages

- **WP3** Identification and testing of innovative product design
- **WP4** Plastic waste collection, recycling and littering
- **WP5** Pre-normative research and field tests
- **WP6** Bio-based plastic safety components
- **WP7** Replication, policy-making, capacity-building and upscaling
- **WP8** Environmental and economic assessments of product life cycles and business models
- **WP9** Information, communication and dissemination

INPUTS

Bio-based plastic policies

MACRO LEVEL

Stakeholder Engagement Process

EU bio-plastics engaged stakeholders — **WP9** — External stakeholders

BIO-BASED PLASTIC INDUSTRY LEVEL

Bio-based plastic industry strategies

- Resource efficiency strategy
- Eneabling technologies
- Regulatory measures
- Waste collection, composing and feedstock

WP5, **WP6**

- Bioeconomy strategy
- Circular economy action plan
- Incentives / long-term investment security

FIRM LEVEL

Firms´ industrial and managerial bio-based plastic practices

KEY VALUE CHAIN SUPPLIERS

- Feedstock companies
- Bio-refining companies
- Chemical industry as bio-based plastic producers
- Bio-based plastic manufacturers

WP3, **WP4**, **WP7**, **WP8**

- Plastic waste collection and sorting organisations
- Recycling and composting plants
- Materials developers
- Business model developers

INDIVIDUAL LEVEL

Sustainable consumption and plastic destination

WP4

OUTCOMES

UE policy recommendations

White paper

WP5

D5.2 - Technical report: biodegradable and compostable solutions supporting policymaking in research, innovation and technology with focus on the EU plastic strategy

D5.3 - Report: strategies for circular innovation of the whole bio-based plastics system

D5.4 - Policy brief

WP6

D6.4 - A comprehensive report with the measures required to allow the safe use of bio-based plastic materials used for toys, packaging of food stuffs and shipping, fishing, and aquaculture equipment to allow a simpler way of standardising products comprised of bioplast

WP7

D7.5 - Guidelines and summary document for policy makers

WP8

D8.6 - Report on definition and evaluation of business scenarios

HAW HAMBURG

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 860407

Introducing the BIO-PLASTICS EUROPE project white paper

- A white paper informs readers concisely about a complex issue and presents the producers philosophy on the matter.

- Built on the expertise of the writers, in this case;
  - brings together all the work that has been completed in the BPE project, and,
  - uses project outputs (papers, deliverables, policy briefs, tools, frameworks, etc.) to tell a story.

- Structure:
  - **Problem statement**
  - **Background**
  - **Solutions**

From afterthought to strategic positioning - a white paper on how a future bioplastic system could contribute to EU policies in the transition to a circular economy.

Date of publication:

January 2024

This document has been produced on behalf of, and in collaboration with, the BIO-PLASTICS EUROPE project.

Authors (BIOPLASTICS EUROPE policy sub-group)

- Dr Jelena Barbir – Hamburg University of Applied Sciences
- Dr Carly Fletcher – Manchester Metropolitan University
- Flintull Annica Eriksson – IVL
- Michela Mazzoccoli – TICASS scrl
- Carolyn Brand – Prospex Institute
- Angela Hann – Prospex Institute

BPE white paper: **Problem statement**

Bioplastics are often an afterthought within current EU policy and therefore not properly considered or accommodated within evolving policy developments. As such, the European Bioplastic system is not functioning as well as it could be and its contribution to the circular economy is not being fully realised.

BPE white paper: **Background**

- Plastic has become ubiquitous in modern society.
- Huge environmental implications regarding its production and disposal.

BIO PLASTICS EUROPE

BPE white paper: **Background**

Are “bioplastics” sustainable?

..abstract concept – highly dependent on context..

Bio-based materials decouple production from fossil resources

Functionality of biodegradability enables other waste management routes..

Concerns related to social implications (1st Gen feedstocks).

Doesn’t necessarily encourage REFUSE/REDUCE elements of the waste hierarchy

LCA studies are inconclusive or contradictory or lack the data needed!

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BPE white paper: **Background**

How have bioplastics been acknowledged by current EU policy??

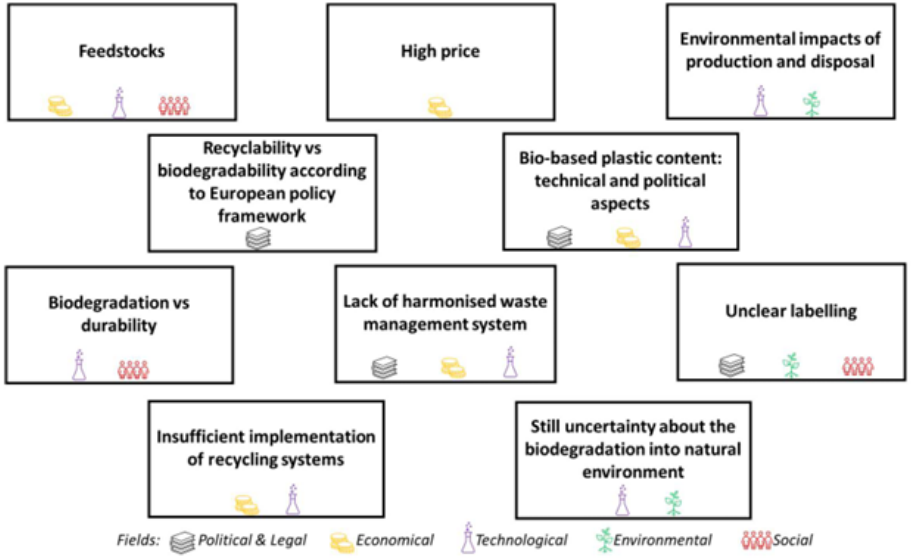
- **Single-Use Plastic (SUP) Directive**
- **Plastic Bags (PB) Directive**
- **Plastic Packaging and Packaging waste (PPPW) Directive**
- **Waste Framework Directive**
- **Biobased, biodegradable and compostable plastics (policy framework)**

"The adapted definition of plastics should therefore cover […] and bio-based and biodegradable plastics regardless of whether they are derived from biomass or are intended to biodegrade over time. " (SUP)

"The Commission should ask the European Committee for Standardization to develop a separate standard for home-compostable packaging." (PB)

BPE white paper: **Solutions – Policy Briefs**

Focus on broader system vs. Circular Economy



Focus on specific market / application

BPE white paper: **Solutions – Other tools**

- **Sustainability Framework for Bio-based projects:**

How can we ensure that bio-based projects of the future consider ALL aspects of sustainability.

- **Suitability Assessment Framework:**

Determines if the property of biodegradability adds value for an application

- **Safety Protocol for companies:**

A tool to navigate the different standards, rules and regulation associated with bio-based and biodegradable plastics

- **Analytical testing protocols and recommendations:**

Critique of current testing methods and standards

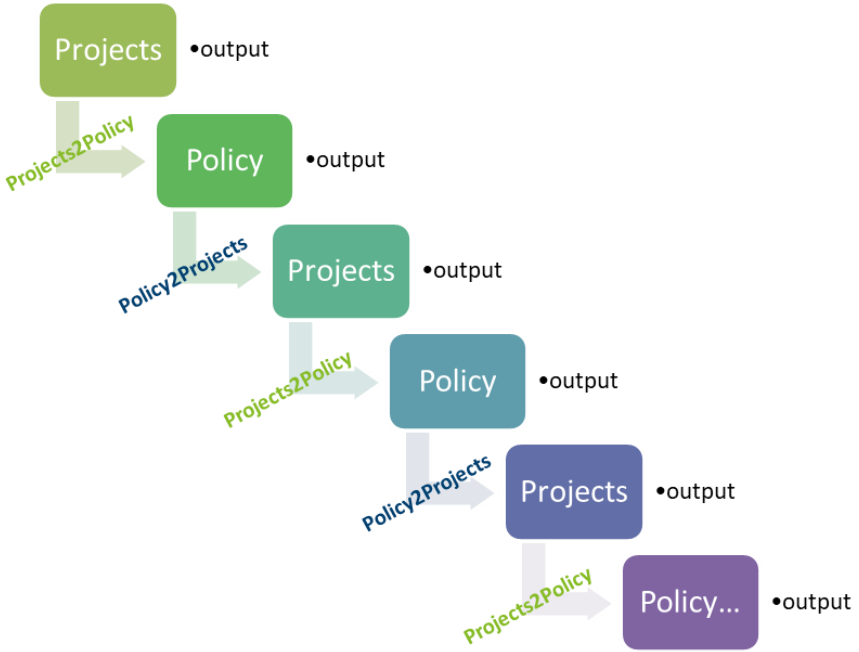
Virtual communication tools:

BIO PLASTICS EUROPE

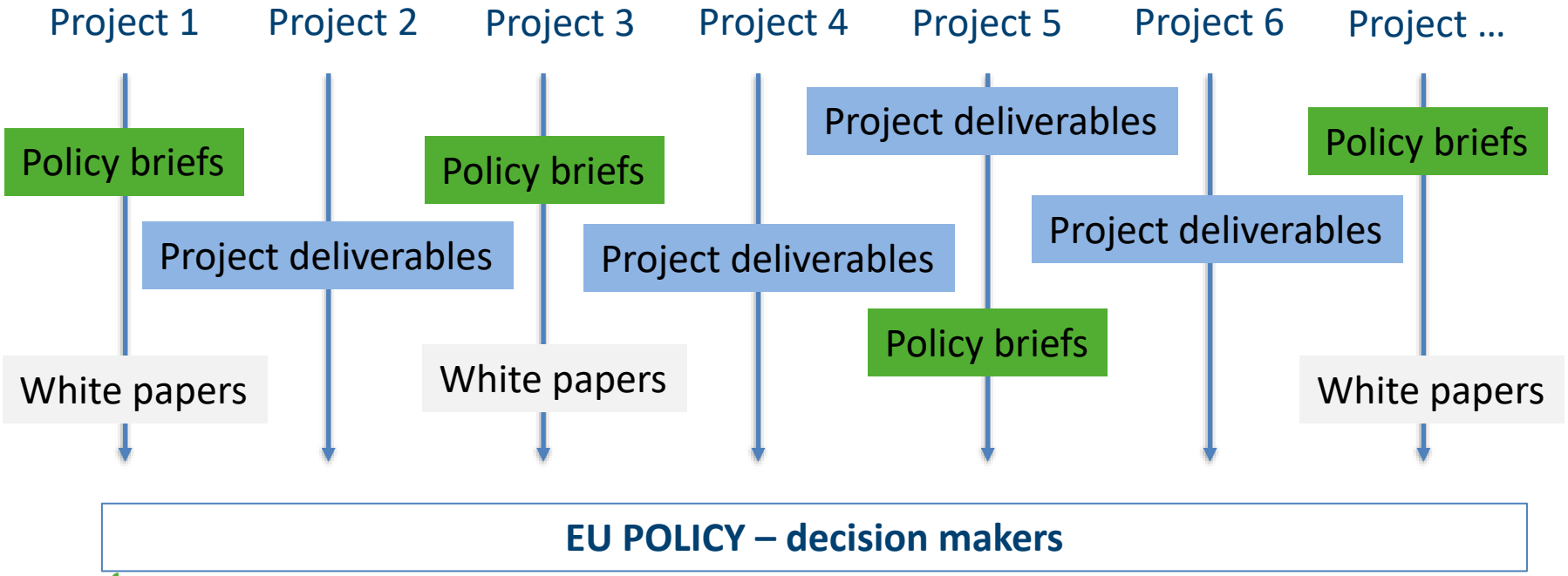
BPE white paper: **Solutions –Networks & Concepts**

Networks:

Concepts:



Contributions of EU Projects to the Policy

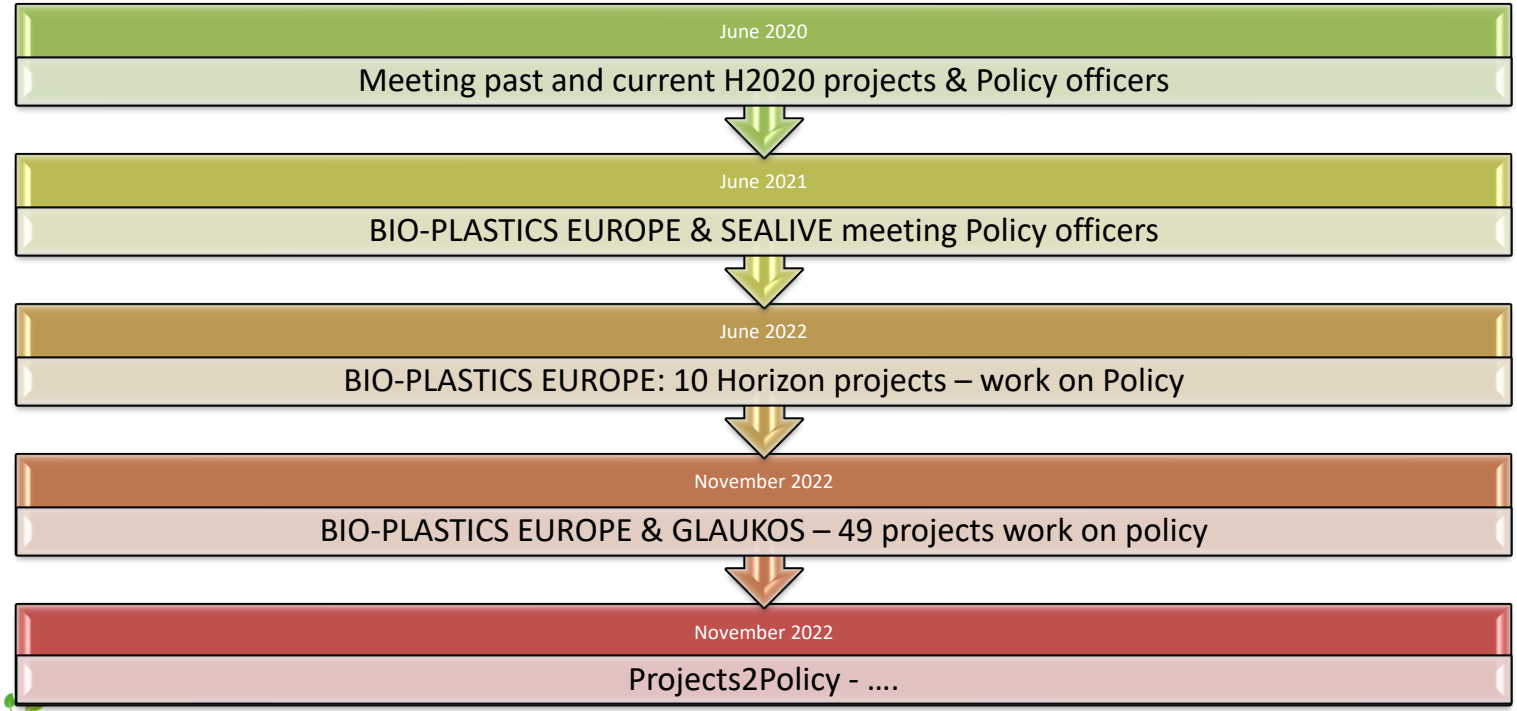


This is really nice…

…BUT we need a holistic approach!

There is an urgent need to **encourage a holistic, collaborative debate, shortening the gap between research projects (SCIENCE) and decision-makers (POLICY).**

Gathering projects and policy makers



Projects2Policy CONCEPT

The collaboration between the GLAUKOS project, BIO-PLASTICS EUROPE project, European Bioplastics Research Network (EBRN) and the European Bioeconomy Network (EuBioNet). (EuBioNet) led to the organisation of:

- WORKSHOP: “Unlock the potential of bio-based and biodegradable plastics: challenges to be addressed”, held online on 3rd November 2022 from 09:00-12:00 (CET).
- 7th EBRN EVENT: “Aligning outcomes from EU projects with the EU policy for bio-based and biodegradable plastics” - the outcomes of the previous workshop were used to engage in the discussion between projects and policy officers.

PROJECTS TO POLICY

WORKSHOP …

- efficient way to gather inputs
- by optimising time and efforts (from projects and policy makers)
- optimum outputs

HOW IT WORKED IN PRACTICE….

BIO PLASTICS EUROPE

M38: WORKSHOP

- The 4 main topics were: 1) LCA of bio-based vs conventional plastics, 2) end-of-life options, 3) raising awareness, stakeholder engagement, collaboration and coordination and 4) projects' contribution to EU policies.

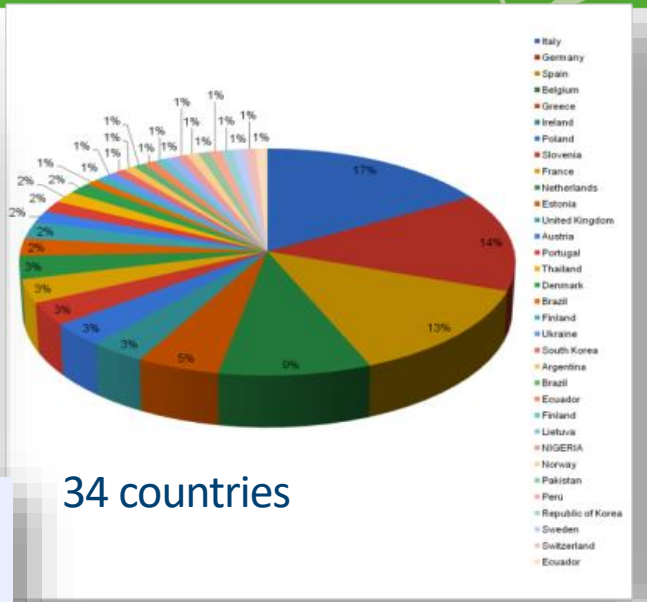
- In total, **over 70 active participants** took part in the workshop, representing **49 relevant EU projects**.

11. Nov 2022

Unlock the potential of bio-based and biodegradable plastics: challenges to be addressed

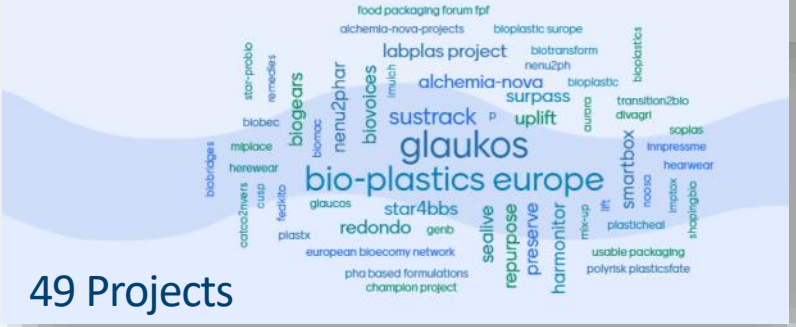
Here you can read a summary of the workshop organized by Glaukos and BIO-PLASTICS EUROPE projects, which took place online on 3rd November 2022, from 9.00 to 12.00 (CET).

Overview of 3rd November workshop



34 countries

What project are you involved in?



49 Projects

120 registered participants

> 90 unique visitors

> 70 active participants

M38: 7th EBRN

- BIO-PLASTICS EUROPE and GLAUKOS continued their fruitful collaboration with the event on the 23rd November that was attended by **50 participants, 12 of which were EU policy officers, and viewed by 59 people in the livestream.**

- The event built on previous joint work between the two projects, presenting the outcomes of a workshop organised earlier in November, **where 49 EU projects discussed possible policy recommendations and challenges to be addressed in the field of bio-based and biodegradable plastics**.

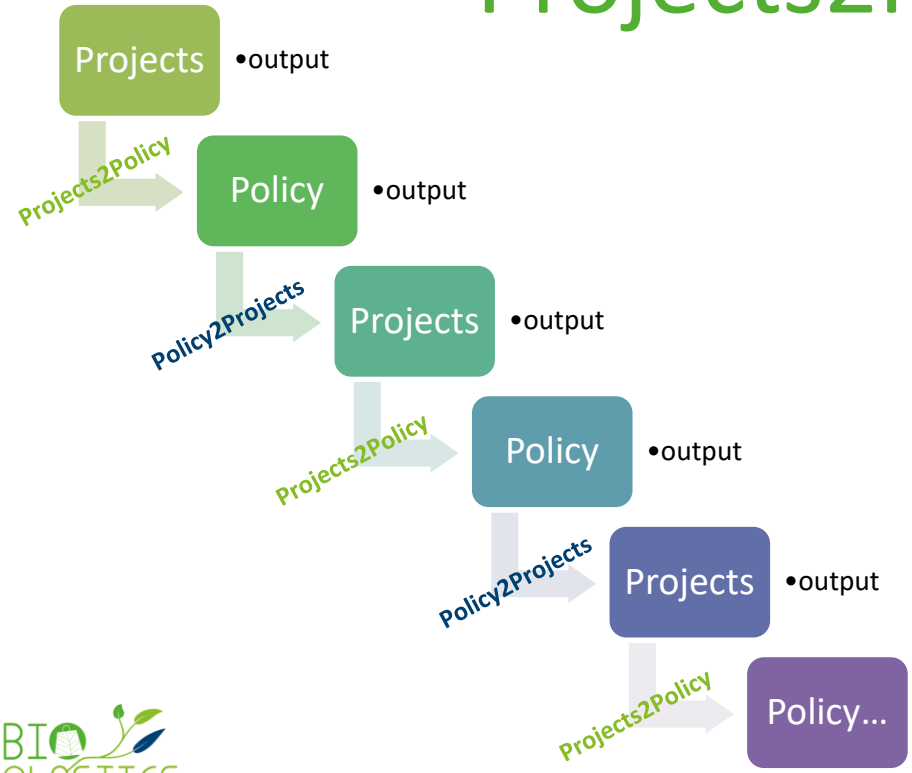
25. Nov 2022

Projects2policy: "Aligning outcomes from EU projects with the EU policy for bio-based and biodegradable plastics"

On 23rd November 2022, BIO-PLASTICS EUROPE hosted the 7th EBRN event in collaboration with GLAUKOS project. The event took place online from 10 to 12h (CET) and was also streamed live. The workshop was joined by representatives of EU research projects as well as EU policy officers.

BIO-PLASTICS EUROPE and GLAUKOS continued their fruitful collaboration with the event on the 23rd November that was attended by 50 participants, 12 of which were EU policy officers, and viewed by 59 people in the livestream. The event built on previous joint work between the two projects, presenting the outcomes of a workshop organised earlier in November, where 49 EU projects discussed possible policy recommendations and challenges to be addressed in the field of bio-based and biodegradable plastics.

Projects2Policy CONCEPT



This format (Projects2Policy) can be replicated in different domain to shorten the gap between projects and policies, by facilitating the exploitation of Actionable Knowledge for policies, generated by EU funded projects.

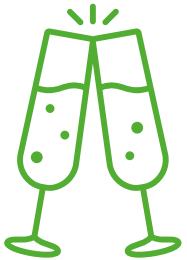
LET US USE ITS ADVANTAGES IN THE FUTURE…

BIO PLASTICS EUROPE

BIO PLASTICS EUROPE

COORDINATION: **HAW HAMBURG**
DURATION: **10/2019 - 09/2023**
BUDGET: **8.3 M EUR**
FUNDING: **EU HORIZON 2020**
PARTNERS: **22**

DEVELOPING AND IMPLEMENTING SUSTAINABILITY-BASED SOLUTIONS FOR BIO-BASED PLASTIC PRODUCTION AND USE TO PRESERVE LAND AND SEA ENVIRONMENTAL QUALITY IN EUROPE



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Email: bioplastics@ls.haw-hamburg.de
Website: https://bioplasticseurope.eu/

…… THANK YOU FOR YOUR ATTENTION!

HAW Hamburg

Horizon 2020

BIO PLASTICS EUROPE

DATE: 23.01.2024

FINAL CONFERENCE

BIO-PLASTICS EUROPE

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 860407.
BIO-PLASTICS EUROPE project website: www.bioplasticseurope.eu

SEALIVE

Strategies of circular Economy and Advanced bio-based solutions to keep our Lands and seas alIVE from plastics contamination

Policy Conclusions from the SEALIVE Project

BIO-PLASTICS EUROPE Final Conference
Hamburg 23 January 2024

Dr Andrew Farmer, IEEP

This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement No 862910 (SEALIVE). This output reflects only the author's view and the European Union cannot be held responsible for any use that may be made of the information contained therein.

Introduction

SEALIVE: a H2020 Project running October 2019 to March 2024. Aims to demonstrate innovative circular strategies for bio-based plastics so to reduce plastic waste & contamination.

Research includes: developing polymers, developing products, business models, testing (e.g. biodegradability), developing standards, policy analysis, communication.

This presentation sets out some policy conclusions from the research. Some Key Questions that policy needs to address:

- What is the nature of sustainable sourcing?
- What can be composted, where and how to tell consumers?
- What are biodegradables useful for? Solve/reduce a problem?
- What is interaction with waste management. Can you recycle? Will you recycle? Consumers again!
- Comparison to status quo/other alternatives

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The Policy Uncertainty

On production of bio-based materials

Use of compostables

Biodegradable products – what, where, etc?

The Policy Foundation (lacking)

Extent/detail of desired bioeconomy

Circular economy:

- What is the end point?
- What materials/waste management needed to deliver this?

Plastics policy (EU/UN):

- What do we need plastics for?
- What types of plastics are best for these uses?
- How to make these as circular as possible?
- How to reduce their negative impacts?

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Definitions

- Law and policy must have clear definitions
  - “Bio-based”, “biodegradable”, “compostable” – all used in different ways in different policies
  - “Bio-based” – the raw polymer, the plastic, the product?
  - “Biodegradable” – an intrinsic and/or extrinsic property?
  - “Compostable” – industrial, home?
- Define all terms in law in clear way and be consistent across policies
- Challenge of scientific vs legal definitions (e.g. links to standards)

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Consistent Approach to Plastics

- Much debate on bio-based and biodegradable plastics takes the “plastics are bad” view.
- As a result, we often don’t see a consistent approach to plastics.
- There are statements that biodegradable plastics should only be used if they don’t cause harm:
- UN Treaty Revised Zero Draft (option): “Parties shall ensure that alternative plastics and plastic products are safe, environmentally sound and sustainable”
    - Why is this not a requirement for all plastic?
    - Note one option is “safer” rather than “safe”

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Challenges – practical and research

- We live in an imperfect system – policies on plastics must take account of continued littering, illegal waste activity.
- How will consumers behave? How much information can they process?
    - Littering of biodegradables?
    - Composting, recycling, etc in household waste separation
- How well designed are (will be) our materials systems to cope with failure in the system from human behaviour?

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Conclusions

- The policy environment is always changing, so conclusions for bio-based and biodegradable plastics will change
- The technical environment is always changing – waste management techniques, economics of value chains, new plastics behaviour, etc., so conclusions for bio-based and biodegradable plastics will change
- Some principles are clear – definitions, innovation, etc.
- Need for EU policy to update (e.g. Plastics Strategy) and UN Treaty to be robust and consistent
- SEALIVE Policy Briefs:
    - Ensuring policy supports innovation
    - Littering
    - Definitions
    - Packaging and Packaging Waste Proposal
    - UN Treaty

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SEALIVE Final Policy Conference

- Online: Tuesday February 13th 9.30-13.00 CET
- Will explore findings from products developed in SEALIVE, research on end-of-life, biodegradation testing, development of standards, wider policy work, etc.
- Register: https://forms.office.com/r/LuZRdVkUhQ

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SEALIVE

Strategies of circular **E**conomy and **A**dvanced bio-based solutions to keep our **L**ands and seas al**IVE** from plastics contamination

Thank you

Andrew Farmer

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