

VALORIZACIÓN de RESIDUOS, BIOECONOMÍA y ECONOMÍA CIRCULAR

Bioeconomía. Principios generales

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CONTEXT

The EU currently produced between 1.6 and 2.2 billion tons of biomass fresh matter yearly:

- in dry matter agriculture produces almost 1 billion tons and forestry produces 0.5 billion tons;
- the agricultural biomass used (dry matter) is composed of ca. 0.5 billion tons crop economic production, 0.1 bt crop residues (another 0.3 bt of residues are not used), 0.1 bt grazing biomass and 0.1 bt imports (the latter comprises 60% food products, 30% non-manufactured crop products and 10% material products), exports are of similar magnitude;
- out of the 0.1 bt of biowaste generated in the EU, about 25% are recycled;
- 62% of EU's biomass use is for food and feed, 19% for bioenergy and 19% for biomaterials; 65% of the EU's agricultural biomass use is for feed;
- forest biomass net annual increment in the EU is 0.4-0.5 billion tons in dry matter of which about 70% is harvested;
- forest standing biomass / stock in the EU increases at more than 1% annually;
- 52% of woody biomass is used for materials and 48% for energy.



Aggregated biomass flows of the EU27+UK bioeconomy

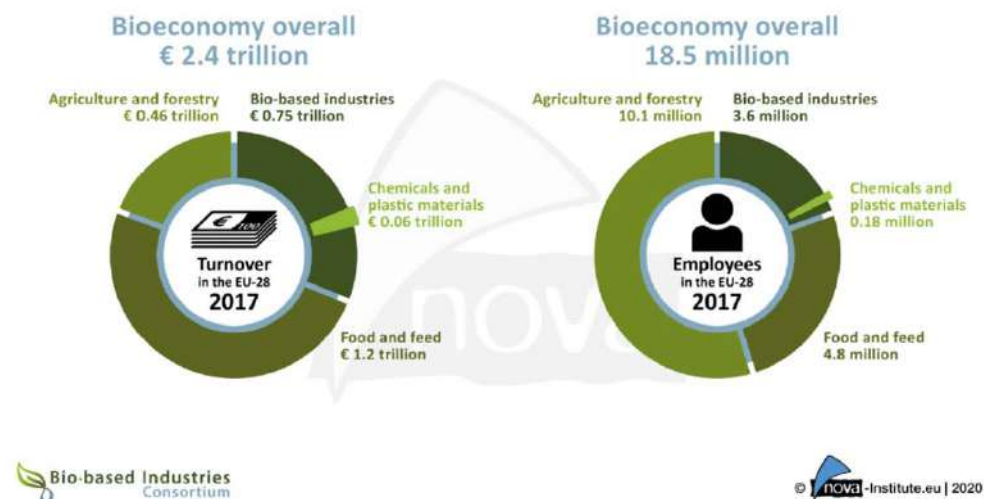
Source: JRC https://ec.europa.eu/knowledge4policy/sites/know4pol/files/20190925_jrc_biomass_ri_days_final_pubsy_0.pdf

BIOECONOMY DEFINITION

The bioeconomy “encompasses the production of renewable biological resources and the conversion of these resources and waste streams into value-added products, such as food, feed, bio-based products, and bioenergy”.

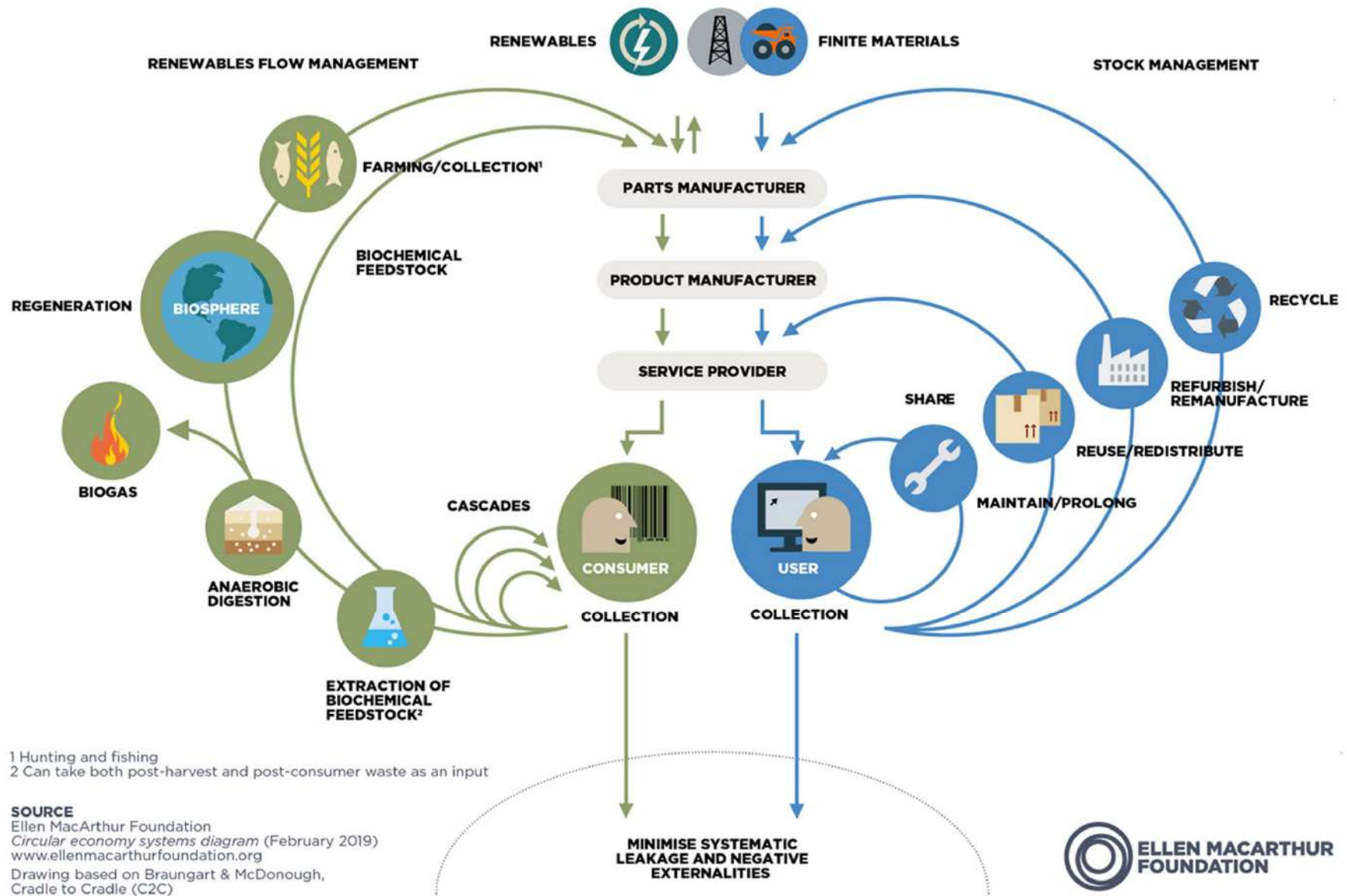
IMPORTANCE

- The bioeconomy employs around 18 million people
- It could generate a further 1 million jobs , particularly in rural and coastal areas , by 2030
- It has an annual turnover of 2.3 trillion
- It has a great potential to boost the reduction of our dependence on fossil fuels

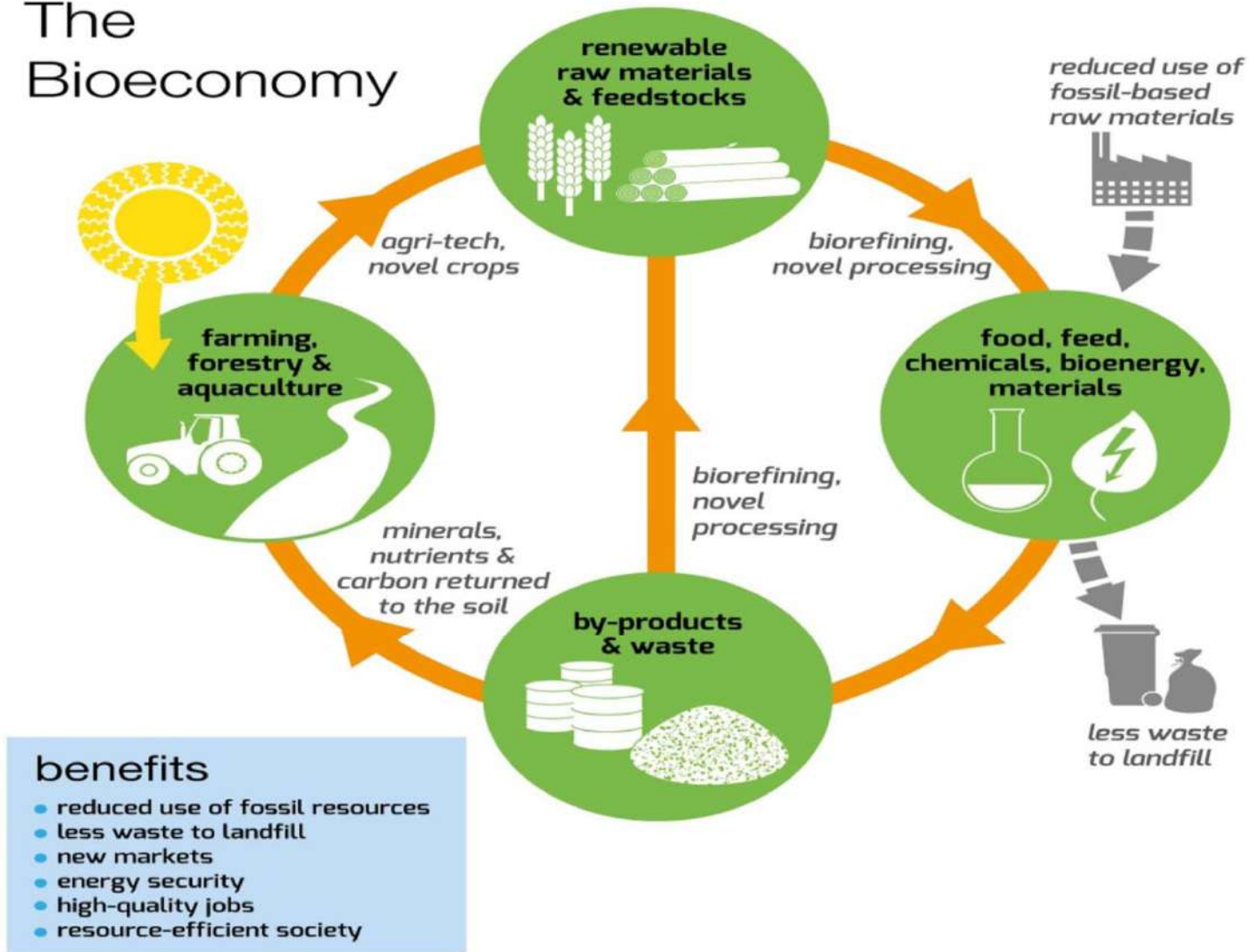


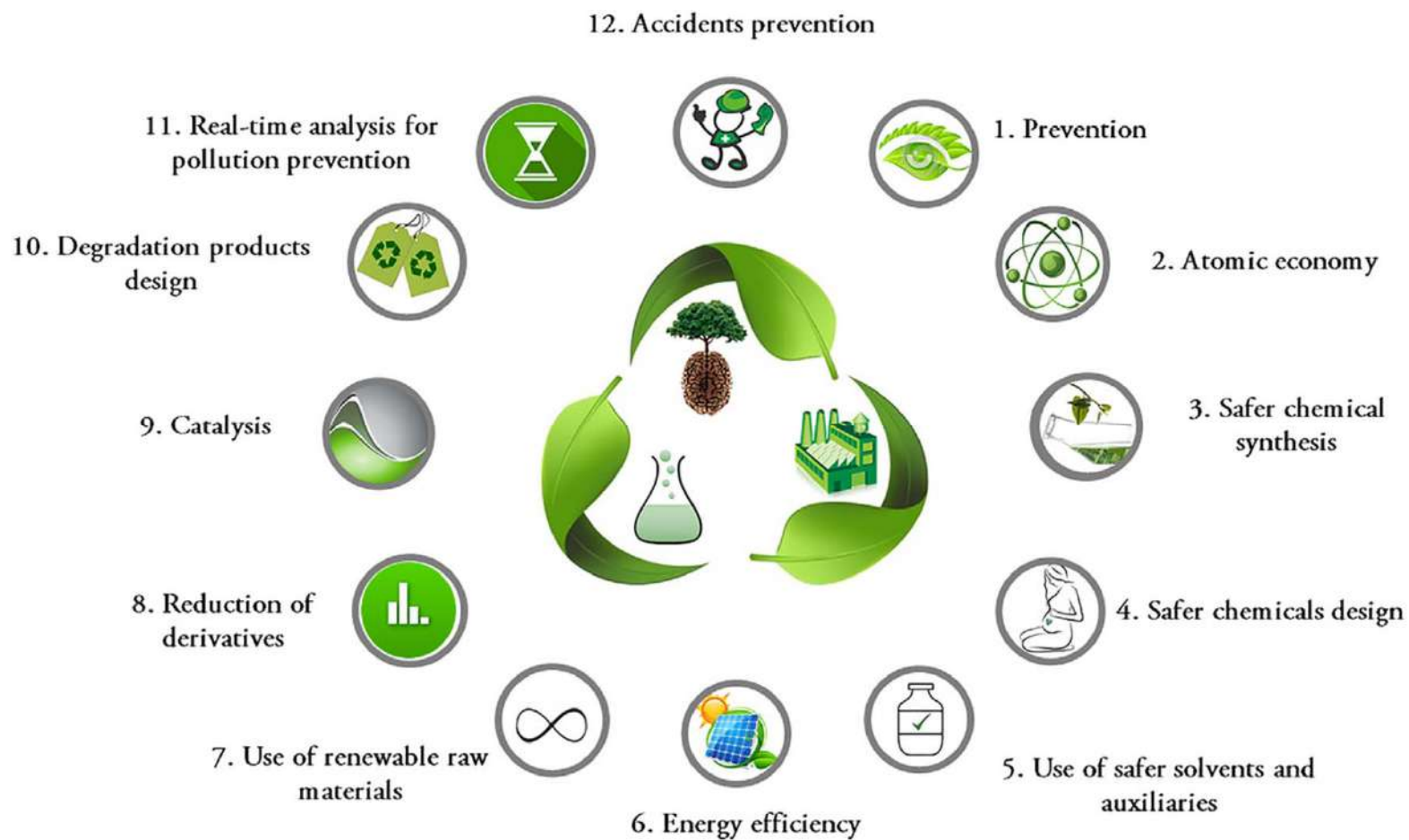
Overall turnover and employment of the bioeconomy and its bio-based industries in the EU-28 in 2017

You can find these and other related facts and figures at: ec.europa.eu/research/bioeconomy/



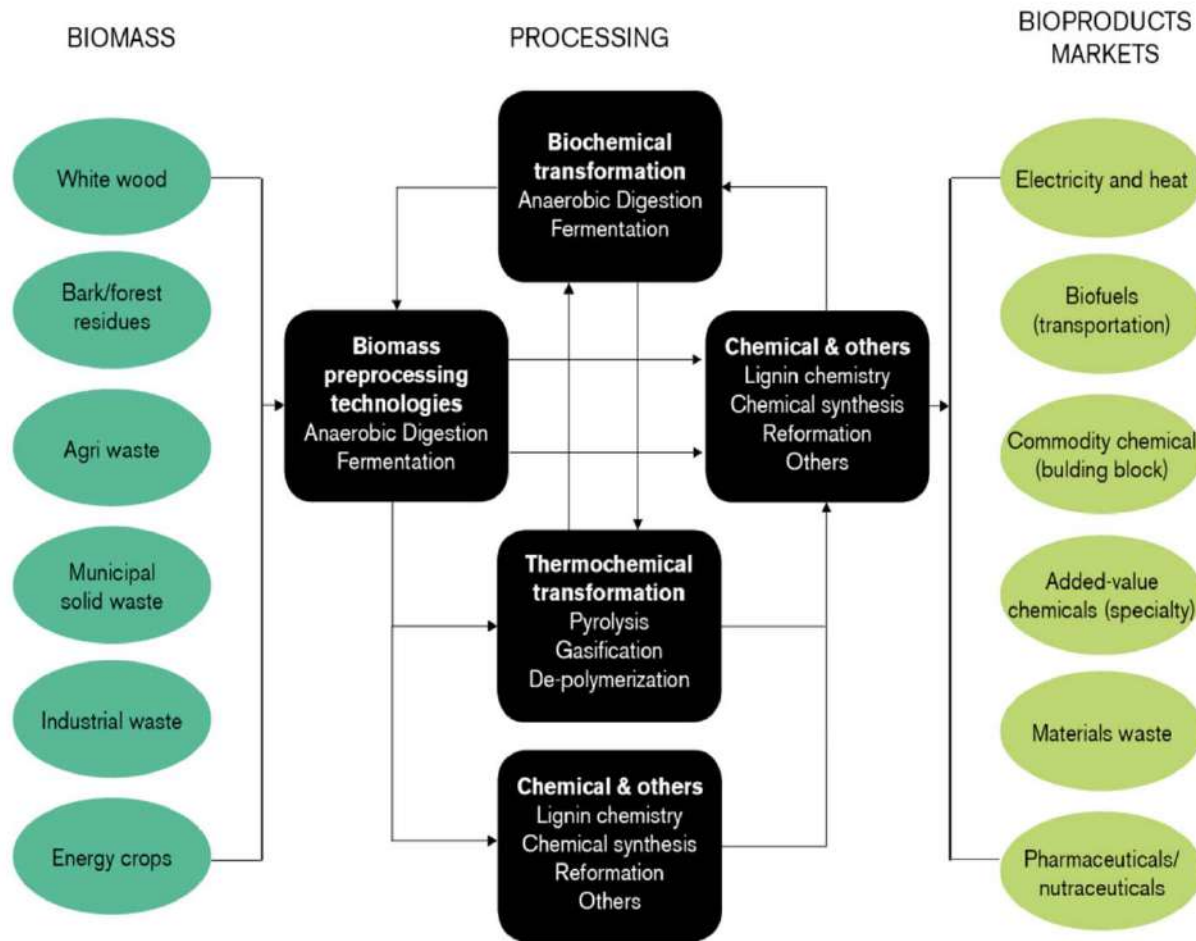
The Bioeconomy





12 Principles of Green Chemistry proposed by Anastas and Warner (Anastas and Warner, 1998).

PROCESSES AND PRODUCTS OF BIOREFINERY



EXAMPLE OF BIOREFINERY

Example: Perstorp

The origin of the chemicals manufacturer Perstorp, in the south of Sweden, was a company established in the 1880's with the intention to produce acetic acid, tar, charcoal and wood alcohol. The products were successively developed into new product lines. In 1907, formalin production started and formed the basis of a long line of products. Formalin based products are still produced by Perstorp, but now with natural gas as the feedstock basis (Perstorp 2012).

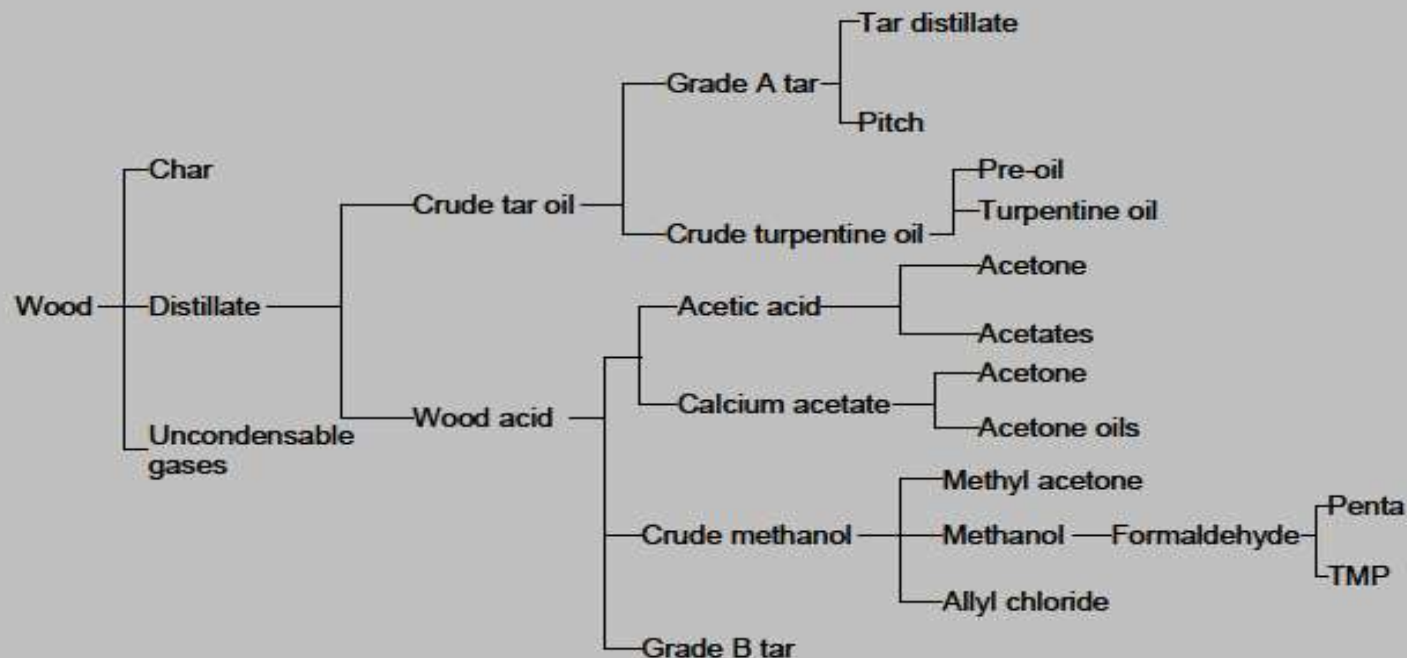


Figure 2. Historic production lines of Perstorp. Redrawn and translated from (Rex 2012).

Chemical products: Current Market Size

Fossil based Chemicals: 330 million tonnes

Main molecules:

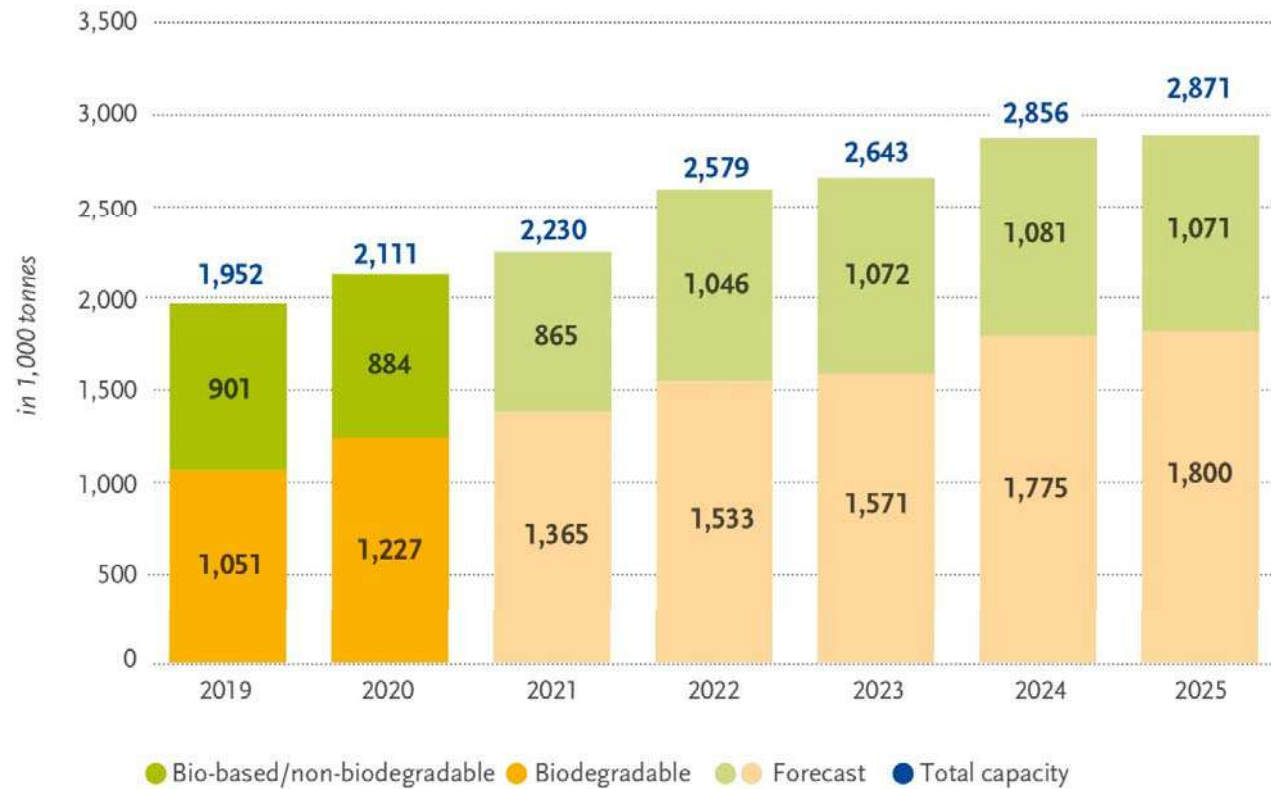
methanol, ethylene, propylene, butadiene, benzene,
toluene and xylene

Biobased Chemicals & Materials: 50 million tonnes

Main molecules:

Non-food starch, cellulose fibres/derivatives, tall oils, fatty acids
and fermentation products

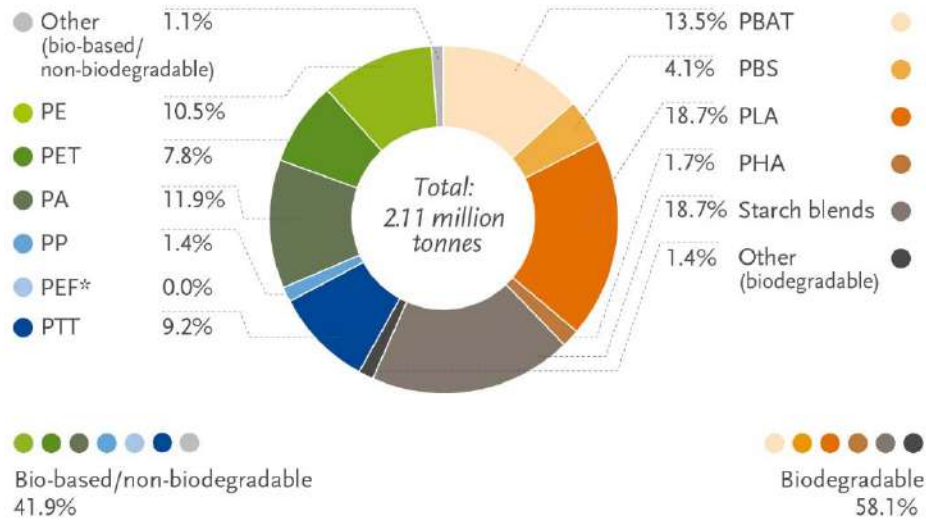
Global production capacities of bioplastics



Source: European Bioplastics, nova-Institute (2020)

More information: www.european-bioplastics.org/market and www.bio-based.eu/markets

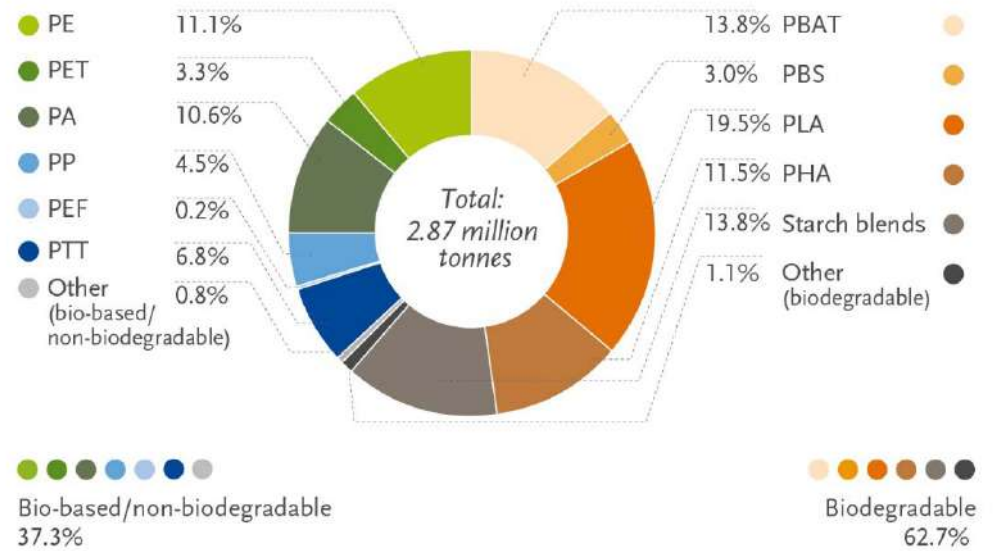
Global production capacities of bioplastics 2020 (by material type)



*PEF is currently in development and predicted to be available in commercial scale in 2023.

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

Global production capacities of bioplastics 2025 (by material type)



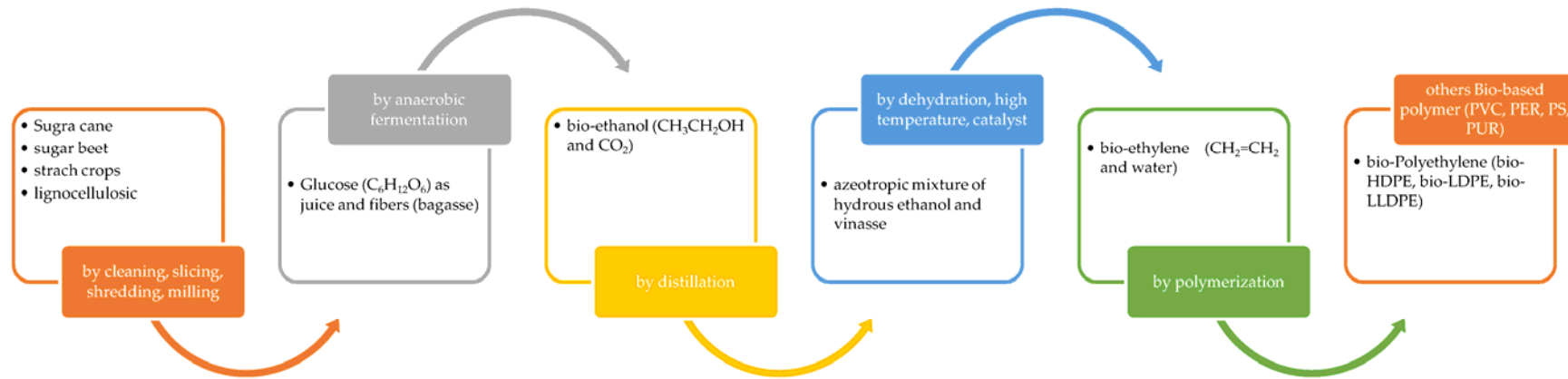
Source: European Bioplastics, nova-Institute (2020)
More information: www.european-bioplastics.org/market and www.bio-based.eu/markets



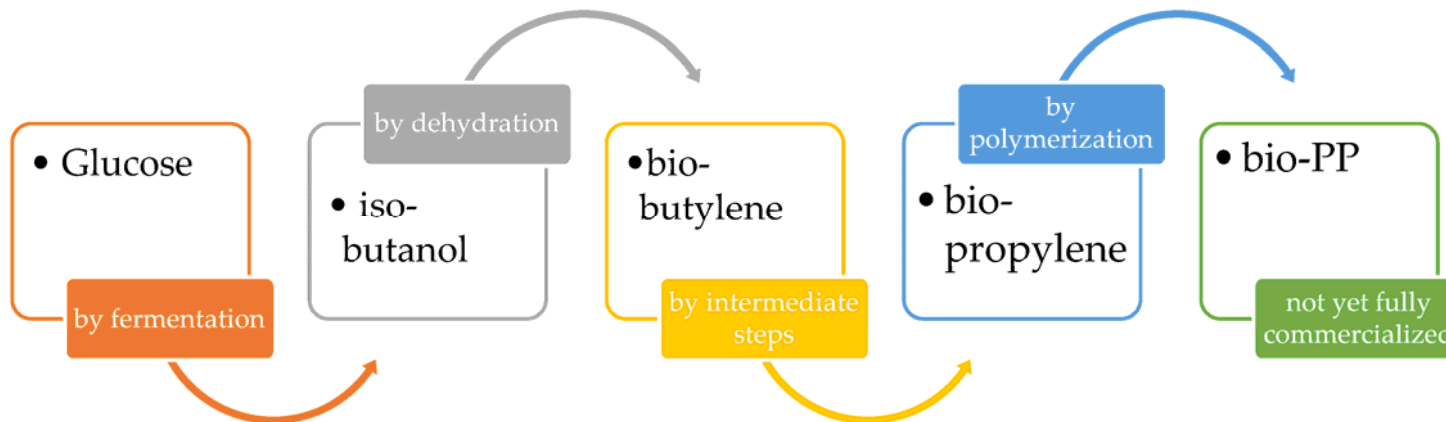
Two possibilities:

- New products (biodegradable plastics, antioxidants, antibiotics, ...)
- Substitution of existing products (ethanol, Bio-Polyethylene,..)

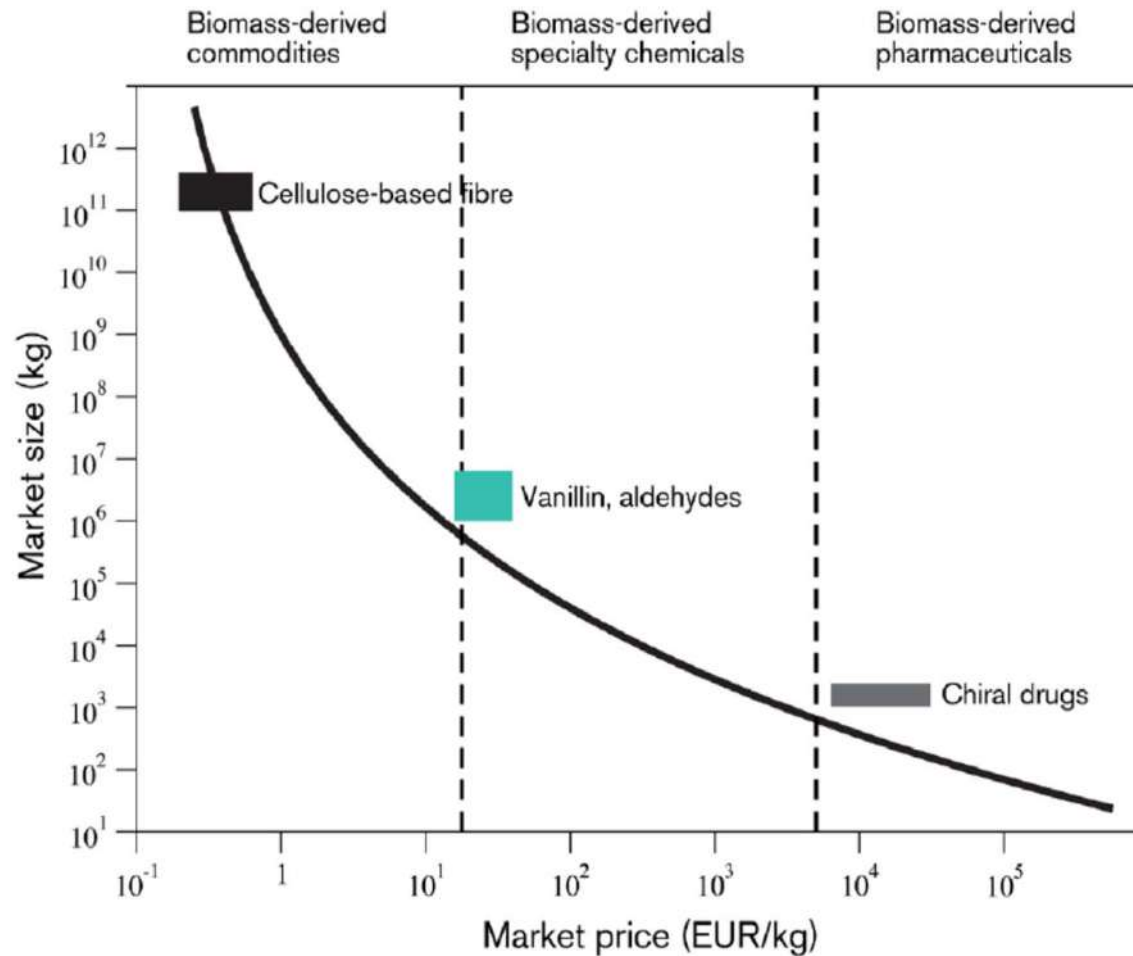
Production process of Bio-Polyethylene



Production process of Bio-Polypropylene



Relationship Cost/Volume of biorefinery products



Flagship projects

- SWEETWOODS : <https://sweetwoods.eu/project/>

Production and deploying of high purity lignin and affordable platform chemicals through wood-based sugars

- EXILVA: <http://www.h2020-exilva.com/>

The Exilva project is Borregaard's set-up and running of the first industrial scale plant for producing Microfibrillated cellulose (MFC) in addition to develop advance market segments for the use of this product.

- FARMYNG: <https://www.farmyng.eu/>

Flagship demonstration of industrial scale production of nutrient resources from mealworms to develop a bioeconomy new generation

- AFTERBIOCHEM: <http://after-biochem.eu/>

Anaerobic fermentation & esterification of biomass for producing fine chemicals

SUSTAINABLE BIOECONOMY

A sustainable bioeconomy requires that bio-based production systems are managed so that the rate of extraction does not exceed the rate of regeneration, and that the regenerative capacity of the resource stock is maintained

Even though environmental sustainability is at the core of the European bioeconomy strategy, a fossil-free economy, built upon bio-based production, the cascading use of resources, and advanced green technologies, is not sustainable by default.

Biodiversity loss, ecosystem degradation, land-use-change, freshwater depletion, and greenhouse gas emissions are all examples of possible environmental impacts from unsustainably managed bio-based systems.

THE FIVE PRINCIPLES FOR SUSTAINABLE BIOECONOMY

Sustainable resource management – responsible use of our shared resources

- Develop new technologies to increase output from harvested biomass through resource efficiency
- Upgrade residues and waste to higher value products and services to optimise the quality and value of biomass
- Contribute to circular bio-solutions that reuse and recycle materials throughout the value chain.

Food security and health – sufficient and nutritious food for all

- Support production and innovation in alternative proteins for both feed and food
- Improve general health and nutrition by developing new, sustainable and healthy food and pharmaceutical products
- Guarantee food security and safety for all.

Resilient and diverse ecosystems – a liveable planet

- Support action to cut air pollution and reduce CO2 emissions throughout the value chain and refine renewable alternatives to fossil-based products and processes
- Enhance biodiversity both on land and below water
- Restore and sustain soil fertility, protect water quality by lowering usage and use proper purification processes for recycling.

THE FIVE PRINCIPLES FOR SUSTAINABLE BIOECONOMY

Inclusive economic and social prosperity – sustainable societies

- Create decent new jobs and retain existing ones, especially in rural and coastal areas
- Develop and share financially viable and sustainable business models
- Provide rural and urban areas with environmental, social and economic opportunities and encourage new partnerships – at local, regional, national and global levels.

Sustainable consumption – changing consumer behaviour

- Provide infrastructure that facilitates the reuse, recycling and upcycling of bio-based products
- Encourage green procurement in both the public and private sectors
- Commit to education and awareness of sustainable practices from kindergarten to university.

Thank you for your attention



www.ehu.eus/es/web/biorp/home