



GenB: Common Ground Camp

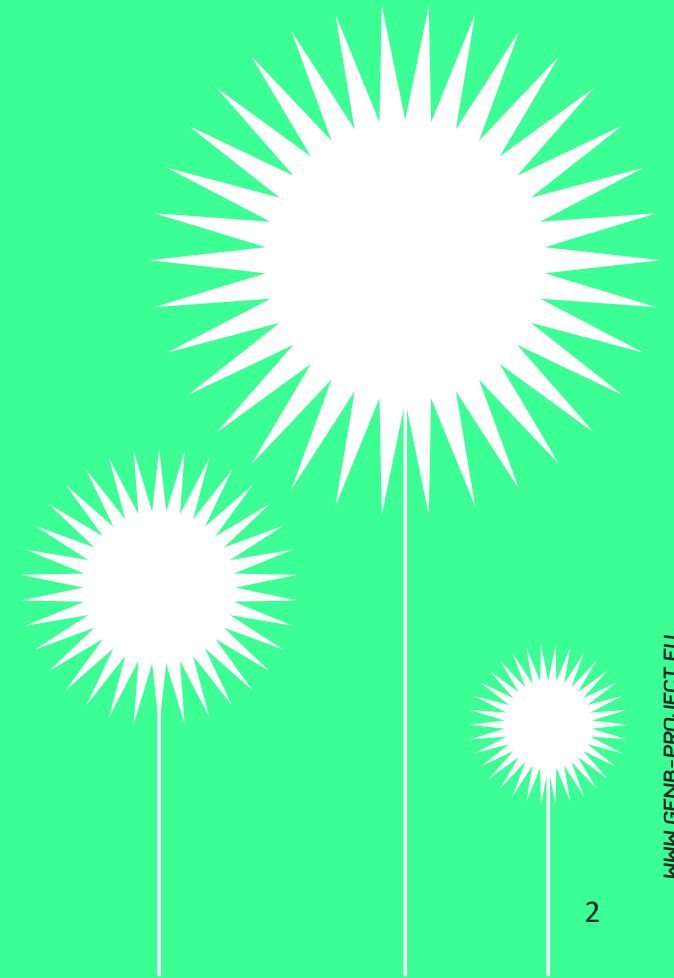
A BRIEF INTRODUCTION TO THE BIOECONOMY

John Vos, BTG Biomass Technology Group BV

21-22 February 2023, Athens

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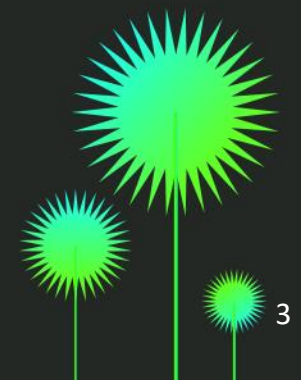
1. Bioeconomy and bio-based products
2. Bioeconomy, bio-based economy, circular economy, and green economy.
3. Bioeconomy and challenges for sustainability
4. Bioeconomy and controversial issues



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Bioeconomy and bio-based products

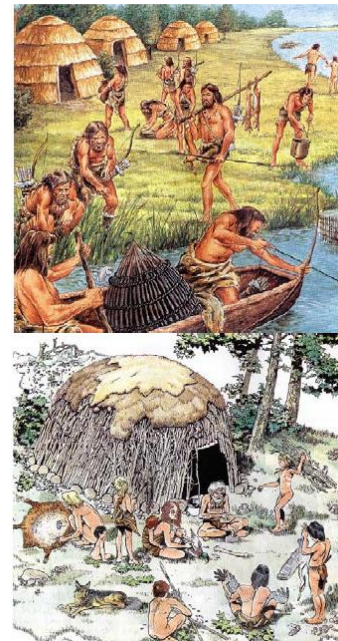


Bioeconomy and bio-based products

- Bioeconomy describes everything that we produce from materials that come from plants and animals. We call such materials “biomass”.
- The word ‘bioeconomy’ is composed of two parts:

bio + economy

- **bio** means life and **economy** comes from the Greek words for management and household.
- In a bioeconomy, goods, services or energy are produced from biomass as the main resource.
- **Bio-based product** = Product wholly or partly derived from biomass.
- Bio-based products can be an intermediate, material, semifinished or final product
- Some of them have been around **for ages!**



Source: Henriette Bos, Wageningen UR, 2014

Biomass and bio-based products – some examples



Wood



Oil crops



Sugar



Waste



Algae

Some examples of biomass feedstock



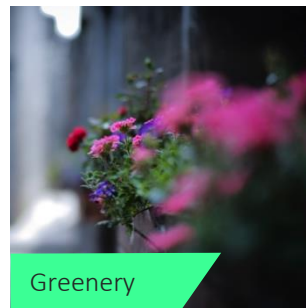
Catering



Cleaning



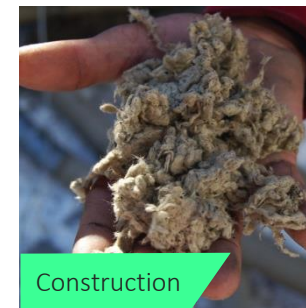
Lubricants



Greenery



Coatings



Construction



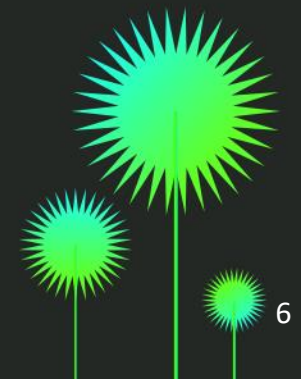
Toys

Some examples of bio-based final products

02



Bioeconomy, circular economy, green economy



Circular economy

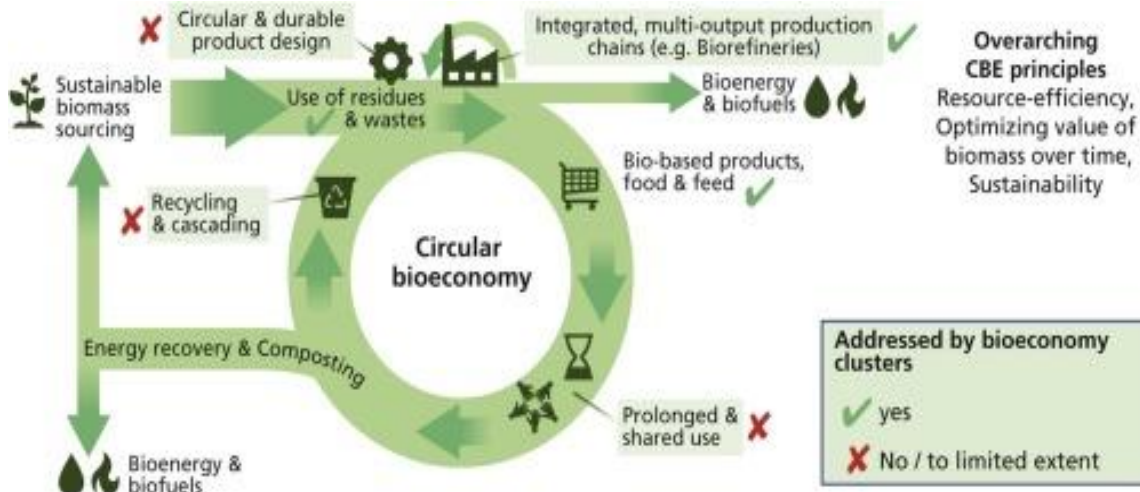
- **Problems of linear economy:** Depletion of natural resources, Environmental pollution & climate change, Damages caused to ecosystem & biodiversity, Economic disadvantages
- A **circular economy** is an economic system of closed loops in which raw materials, components and products lose their value as little as possible, renewable energy sources are used and systems thinking is at the core.
- The circular economy includes **all kind of material streams** with different utilization routes. Organic recycling (= biodegradation) and even the capture and utilization of CO₂ from industrial processes or the atmosphere are included.



- **Rethinking Progress: The Circular Economy**
- Short video by Ellen MacArthur Foundation
- Link: www.youtube.com/watch?v=zCRKvDyyHmI

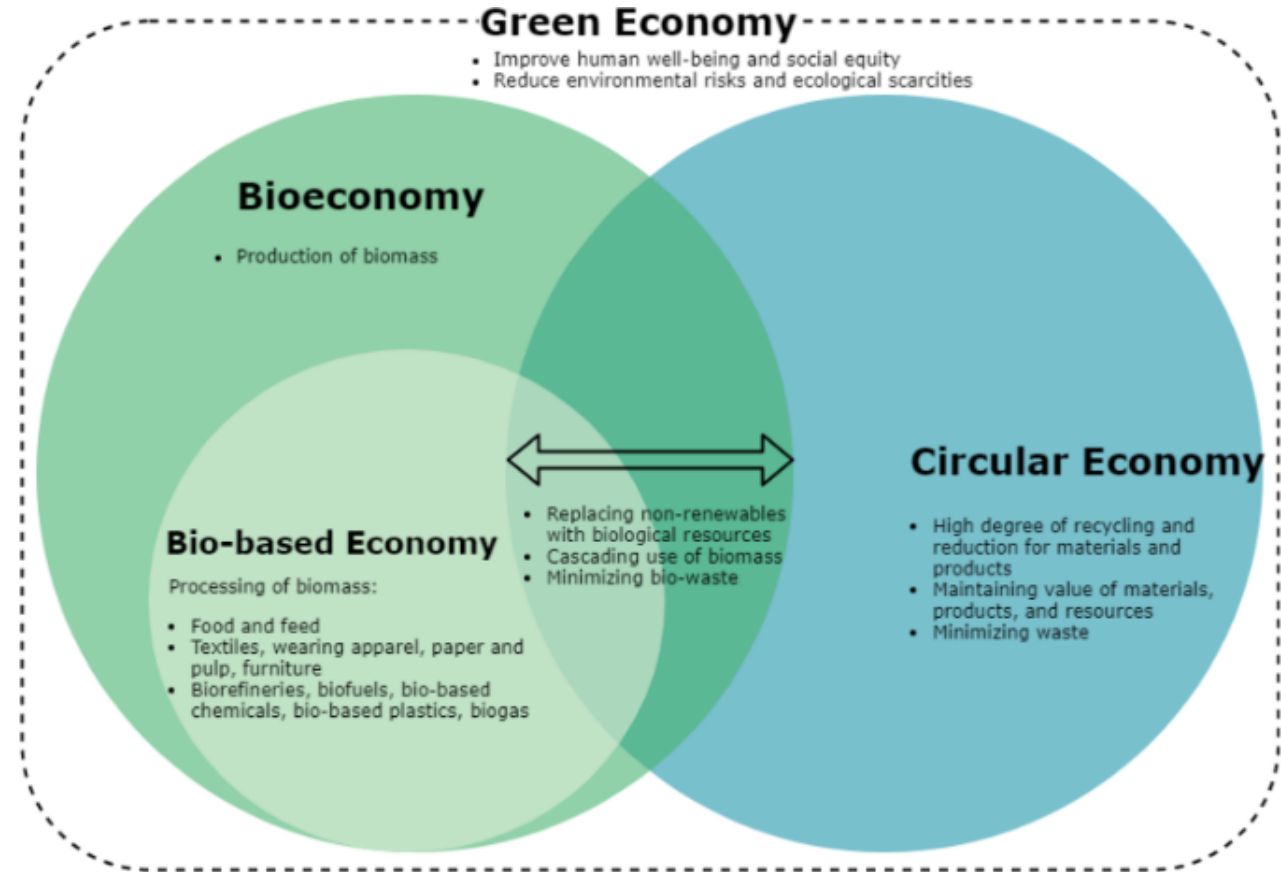
What economy?

From: The circular bioeconomy: Its elements and role in European bioeconomy clusters. Source: <https://www.mdpi.com/2071-1050/13/1/413>



- Elements of the circular bioeconomy

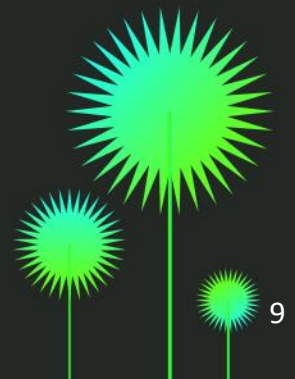
From: Development of the Circular Bioeconomy: Drivers and Indicators.
Source: <https://www.mdpi.com/2071-1050/13/1/413>



- Relations between bioeconomy, bio-based economy, green economy, and circular economy.



Bioeconomy and challenges for sustainability



Bioeconomy and challenges for sustainability

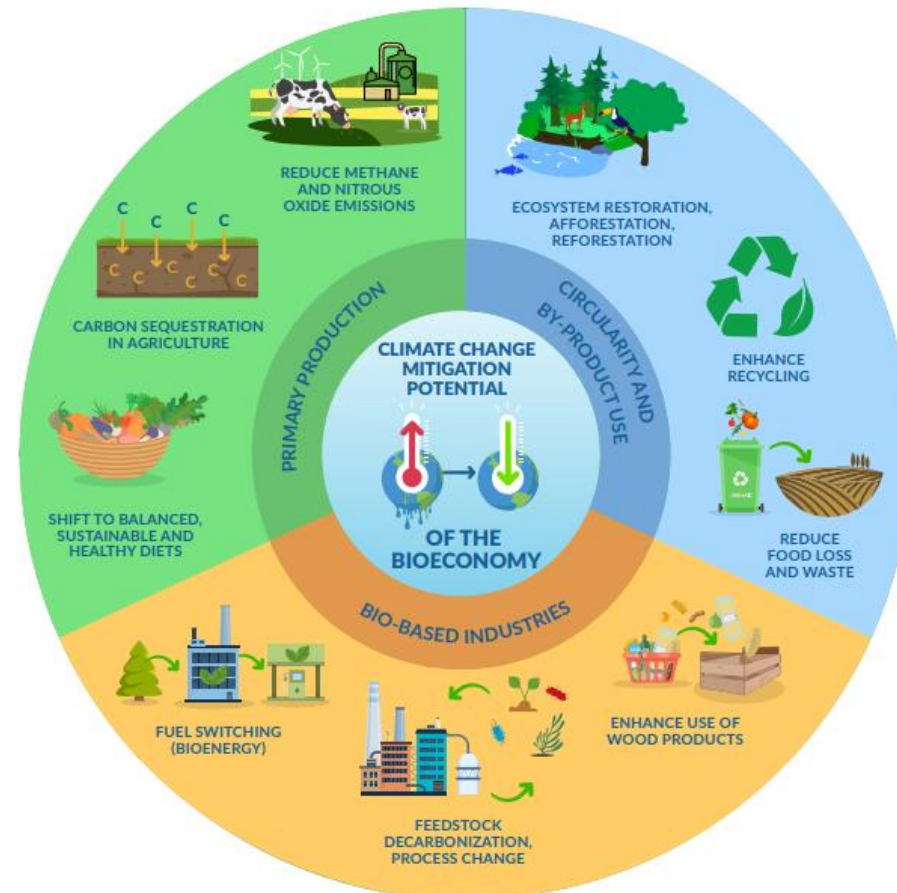
The bioeconomy can play a central role in the challenges facing our planet in the coming years

- Mitigating climate change
- Achieving Sustainable Development Goals
- Reducing Pollution
- Biodiversity
- Healthy soil
- Healthy food for all
- Energy needs
- Efficient use of resources
- Socio-economic impacts



Bioeconomy and climate change

The bioeconomy helps to mitigate the effects of climate change in sectors ranging from **primary production** (e.g. agriculture), to the **promotion of circularity** (of production, consumption and disposal), to the **innovation of industrial processes**.



Bioeconomy and Sustainable Development Goals

Among the 17 Sustainable Development Goals (SDGs) pursued by the United Nations 2030 Agenda, several are closely linked to the bioeconomy sector:

2 ZERO HUNGER
End hunger, achieve food security and improved nutrition and promote sustainable agriculture

8 DECENT WORK AND ECONOMIC GROWTH
Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

12 RESPONSIBLE CONSUMPTION AND PRODUCTION
Ensure sustainable consumption and production patterns

7 AFFORDABLE AND CLEAN ENERGY
Ensure access to affordable, reliable, sustainable and modern energy for all

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

14 LIFE BELOW WATER
Conserve and sustainably use the oceans, seas and marine resources for sustainable development

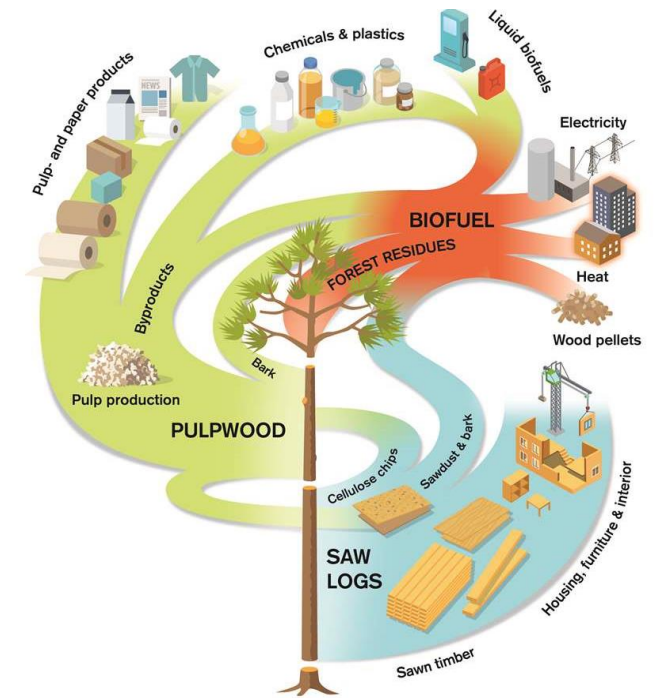
15 LIFE ON LAND
Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation and halt biodiversity loss

Source: Italian Bioeconomy Strategy (Strategia Italiana per la Bioeconomia).

Or check: BE-RURAL Introduction to the Sustainable Development Goals (SDGs) and their links to the bioeconomy.

Bioeconomy and pollution reduction

- The bioeconomy promotes a way of producing, consuming and living that respects health and the environment for present and future generations
- The bioeconomy uses **biological renewable resources**, instead of fossil resources that are finite and contribute to the pollution of land, sea, air, etc.
- The circular bioeconomy uses **secondary raw materials**, reducing waste and enhancing recycling
- The bioeconomy helps to reduce the use of plastics and materials that are dispersed into the environment
- The bioeconomy uses innovation as an engine of sustainable change

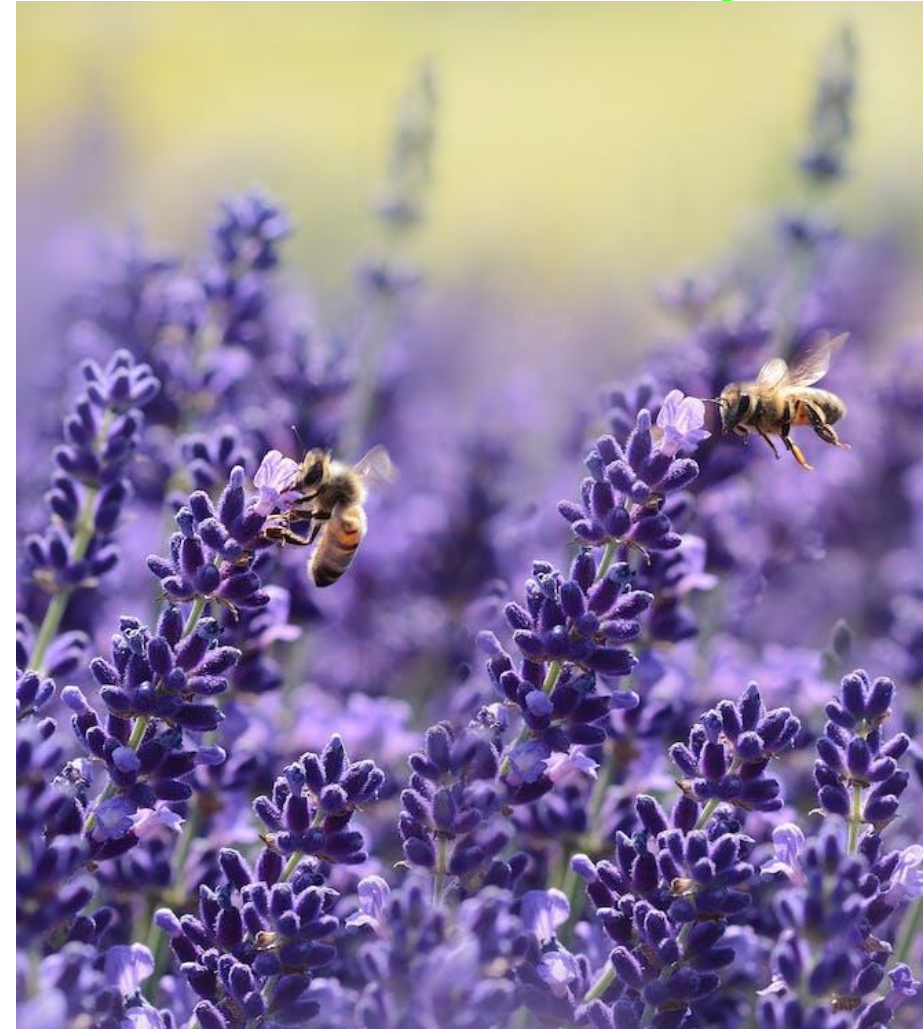


Forestry is a co-production system, i.e. several products are produced simultaneously, such as saw logs, pulpwood and logging residues. Huge of by-products are available. **Source:** Biofuel Region.



Bioeconomy and biodiversity

- The bioeconomy promotes biodiversity as a core value in an economy that respects the planetary boundaries
- **Green chemistry** protects biodiversity and the ecosystem, producing bio-based alternatives to fossil-based chemicals
- **Biotechnology** studies new ways of using biological resources, researching new properties of plants, animals and micro-organisms for new products and services (e.g. insects can be the answer to some diseases)
 - The enhancement of renewable biological resources attracts investments and policies to protect the environment (e.g. laws against deforestation)



Bioeconomy and healthy soil

- Soil provides vital functions and ecosystem services.
 - Soil is an essential, non-renewable resource for agriculture, providing the basis for the production of food, fibre, and other resources for a circular bioeconomy.
 - Soil also supports biodiversity, plays a central role in carbon sequestration and storage, and provides a number of other ecosystem services, such as water regulation and nutrient cycling.
- Healthy soil is fundamental in a bioeconomy that promotes responsible use of resources, using biopesticides and biofertilizers, biodegradable mulching films and sustainable agricultural practices. Compost obtained from organic residues helps to improve and nourish the soil.



Source: DG Agriculture and Rural Development

Bioeconomy and healthy food for all

- The bioeconomy promotes a balanced, sustainable and healthy diet
- Reduces waste and valorises by-products from food processing by creating new products (for example bioplastics from expired milk)
- Promotes new food sources (e.g. from algae, insects, micro-organisms) and more sustainable food sources (e.g. non-meat proteins)
- Thanks to innovation in primary sector practices, it creates new opportunities for income and rural development
- Promotes the use of biofertilizers and biopesticides that are not harmful to health and the environment



Source: [Sustainable and circular bioeconomy in the climate agenda: Opportunities to transform agrifood systems \(fao.org\)](https://www.fao.org)



Upcycling vegetable waste into a biobased plastic.
Source: [BIOSWITCH factsheet La Union](https://www.bioswitch.eu)

Bioeconomy and energy needs

- The bioeconomy uses renewable resources to produce non-polluting alternatives to current energy sources (like coal, oil and gas)
- Biofuels can be produced from waste materials (e.g. biogas from agricultural waste; biofuels from used cooking oil) or from biomass grown in marginal areas (e.g. polluted)
- The bioeconomy promotes the sustainable management of forests and the valorisation of currently underutilised resources to produce e.g. energy (e.g. pruning trees in city parks to make heating pellets)
 - Even urban sludge or animal faeces can be used to produce biofuels!



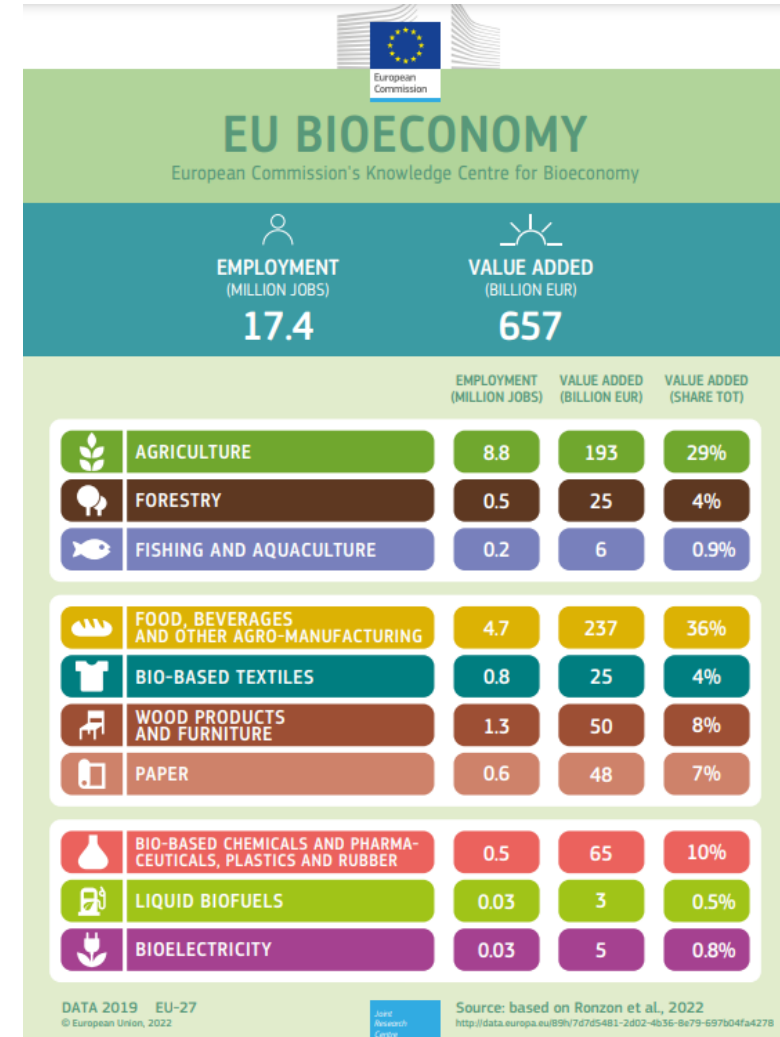
Bioeconomy and efficient use of resources

- The bioeconomy uses waste materials in a circular way to make new products, limiting the use of resources
- Materials such as paper, which is very expensive today, can be produced using fruit peels, agricultural waste, algae and even... poop!
- The bioeconomy promotes scientific research to identify new materials that adopt sustainable approaches for the production of everyday objects



Bioeconomy and socio-economic impacts

- The bioeconomy can have a positive impact on rural developments and local jobs.
- It is critical that investments in the bioeconomy do not increase inequalities in income, power and access to resources such as land and water for food production, community and cultural life.

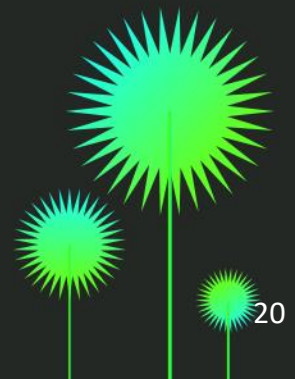


Bioeconomy employment and value added: 2019 data – [Infographic](https://knowledge4policy.ec.europa.eu/publication/bioeconomy-employment-value-added-2019-data-infographic_en).
Source: https://knowledge4policy.ec.europa.eu/publication/bioeconomy-employment-value-added-2019-data-infographic_en

04



Bioeconomy and controversial issues



Bioeconomy and controversial issues

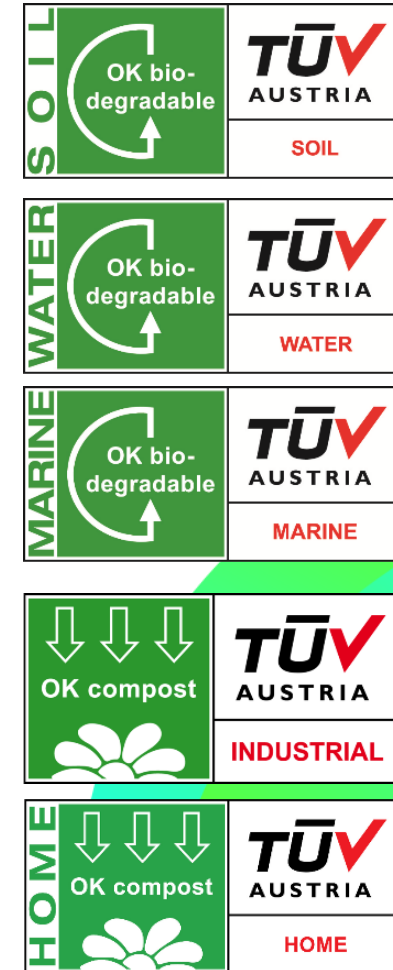
Is all that glitters gold? Is it always sustainable when it is “green”?

- End of life and biodegradability
- Risk of greenwashing
- Sustainability of bio-based products



End of life and biodegradability

- Risks of being thrown away in the environment (... since it is biodegradable...)
- The ecotoxicity of biodegradable products must always be monitored
- Different degrees of biodegradability, depending on the environment (e.g. biodegradation times in marine environments are very long – salt water preserves biological materials well)
- Some products are compostable & non-biodegradable (need controlled temperature, pressure and humidity)
 - Biodegradability may not be the best option as end of life, better to recycle where possible



Risk of greenwashing

- **Greenwashing** is the process of conveying a false impression or providing misleading information about how a company's products are more environmentally sound.
- Greenwashing can convey a false impression that a company or its products are environmentally sound.
- Consumers fear green washing and ask for transparency in information
- Genuinely green products back up their claims with facts and details. But ... there for bio-based products there are no labels and standards recognised and recognisable by consumers
- There are many terminological confusions and this generates uncertainty and distrust in consumers
- Some companies often use generic themes such as "green", "sustainable", "good for the environment" as a red herring, frustrating the work of those who are seriously committed



Sustainability of bio-based products

- Resources: Competition with food (e.g. corn which is used to produce many bio-based plastics), Difficult to preserve (e.g. blueberries for nutraceuticals, seasonality)
- Bio-based plastics and prudent European policies
- Are bio-based products better by default? Life Cycle Assessment - LCA
- Challenging balance between biodegradability and durability/resistance; current compromise is still insufficient (e.g. fishing nets)
 - Standards, labelling and Life Cycle Assessment (LCA) systems are needed to allow companies, policy makers and consumers to make informed choices





Thank you !

John Vos, BTG Biomass Technology Group BV

Special thanks to Susanna Albertini (FVA) for her valuable contributions

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