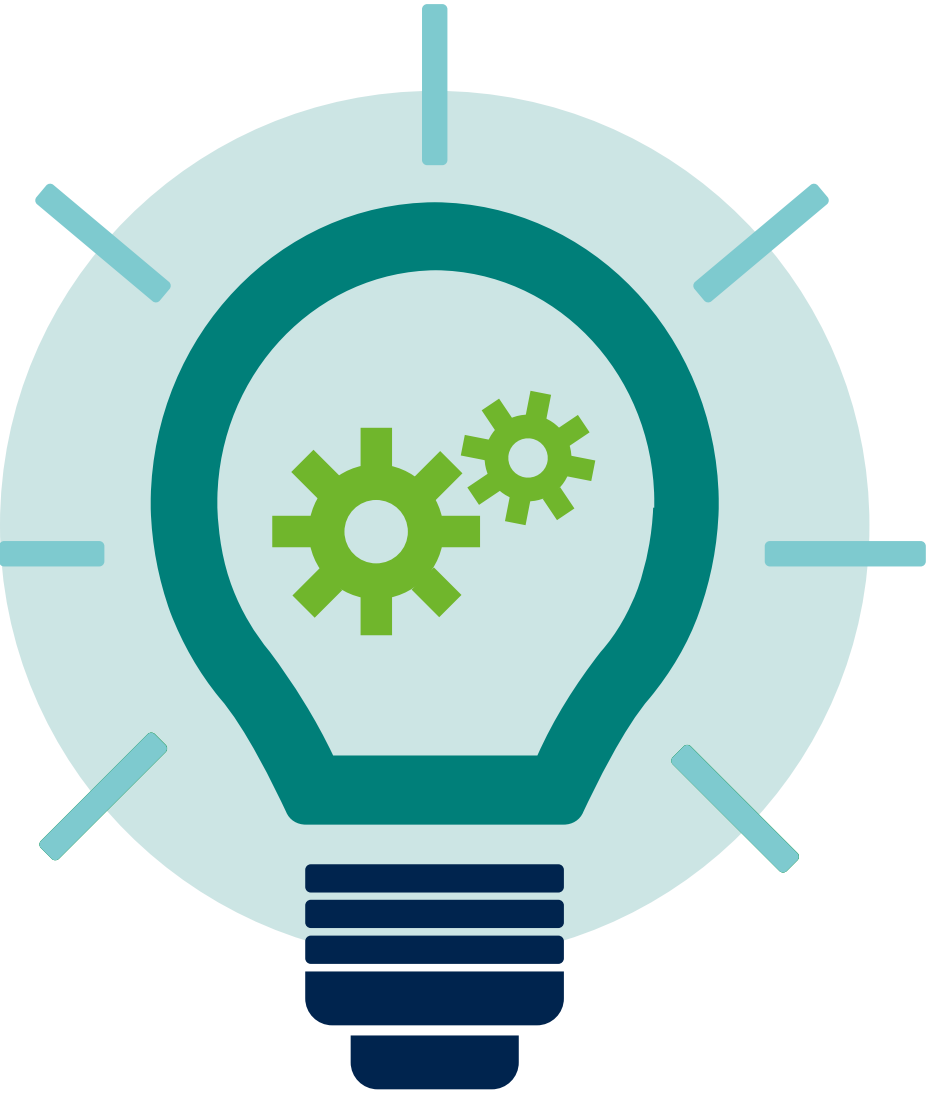
TransBiB
Boost. Industrial. Bioeconomy.



Bioökonomie - compact

Definition, motivation, challenges & strategies

Discover – Develop – Connect

Gefördert durch:

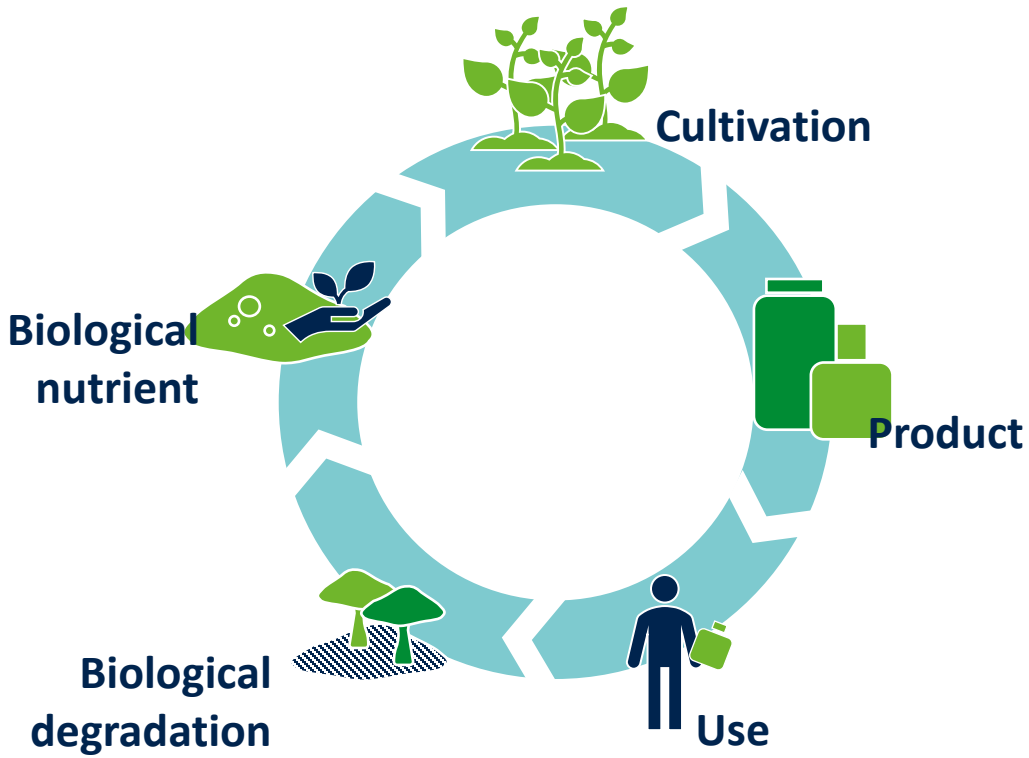
Bundesministerium
für Wirtschaft
und Klimaschutz

aufgrund eines Beschlusses
des Deutschen Bundestages

What is bioeconomy?

„Bioeconomy encompasses the production, development, and use of **biological resources, processes, and systems** to provide products, processes, and services **in all economic sectors** for a **sustainable economic system.**“

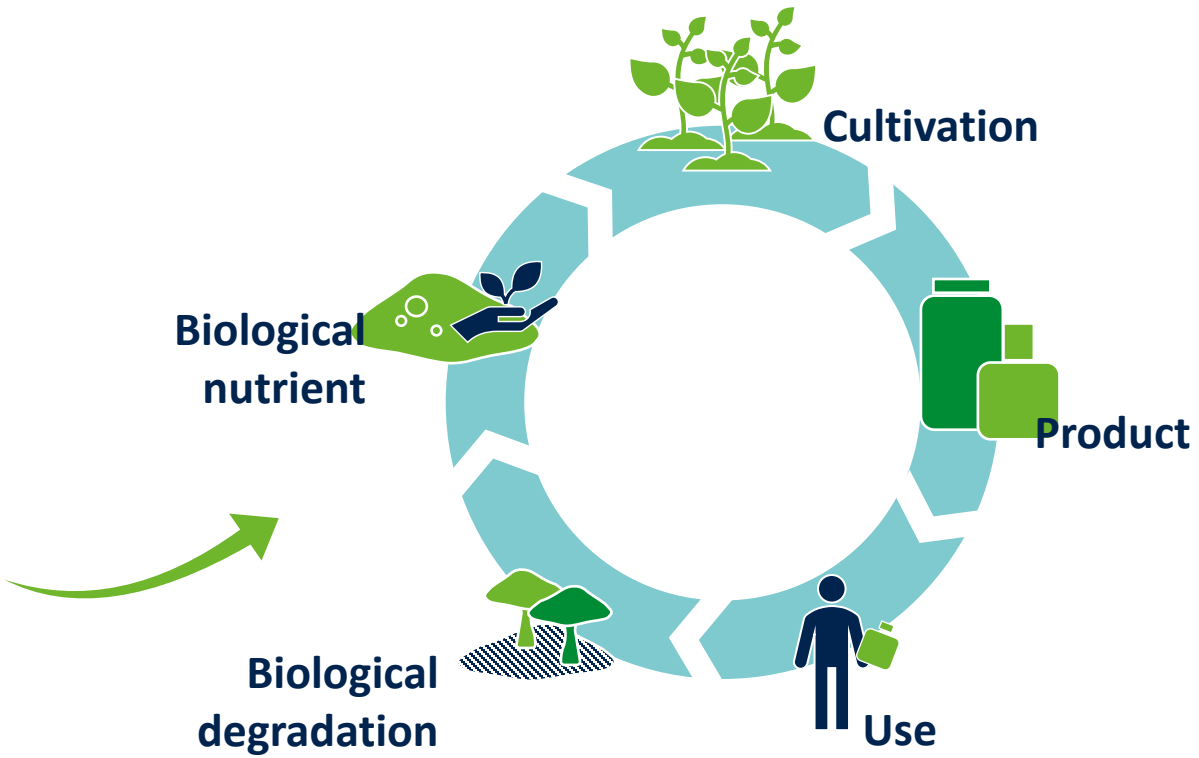
[Source: Federal Government]



What is bioeconomy?

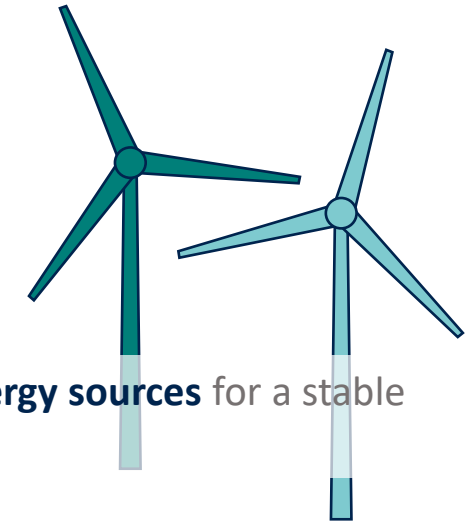
- Our economic system must take into account the **entire life cycle** of a product in order to achieve a **climate-neutral circular economy!**
- The **biological cycle** serves as a model for the **technical cycle:**

Cultivation – product production – use – (biological) degradation – nutrient recovery & reuse.



Motivation for bioeconomy

- **Reduction of greenhouse gas emissions** (especially CO_2).
- **Long-term carbon sequestration** in bio-based materials (e.g., wood in construction).



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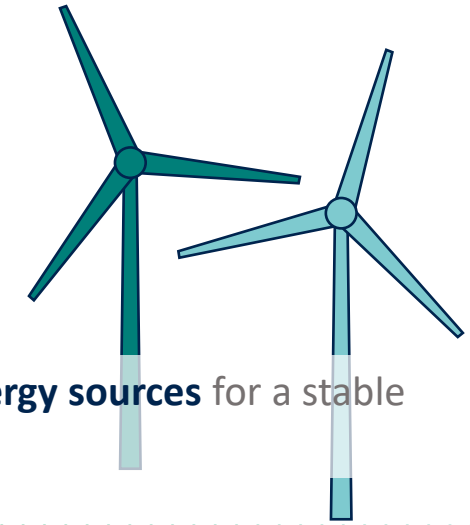

- **Diversification of energy sources** for a stable energy supply.

- Improving **resource efficiency** by using **renewable raw materials** instead of finite/fossil resources.
- Focusing on a **circular economy** with **reduced waste volumes** and improved ecosystem health.

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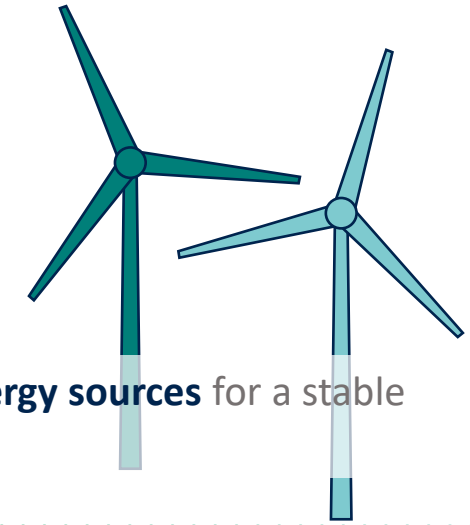
- Increased resilience through **adaptive agriculture.**
- Efficient land use for **high value-added products.**
- **New markets and products.**



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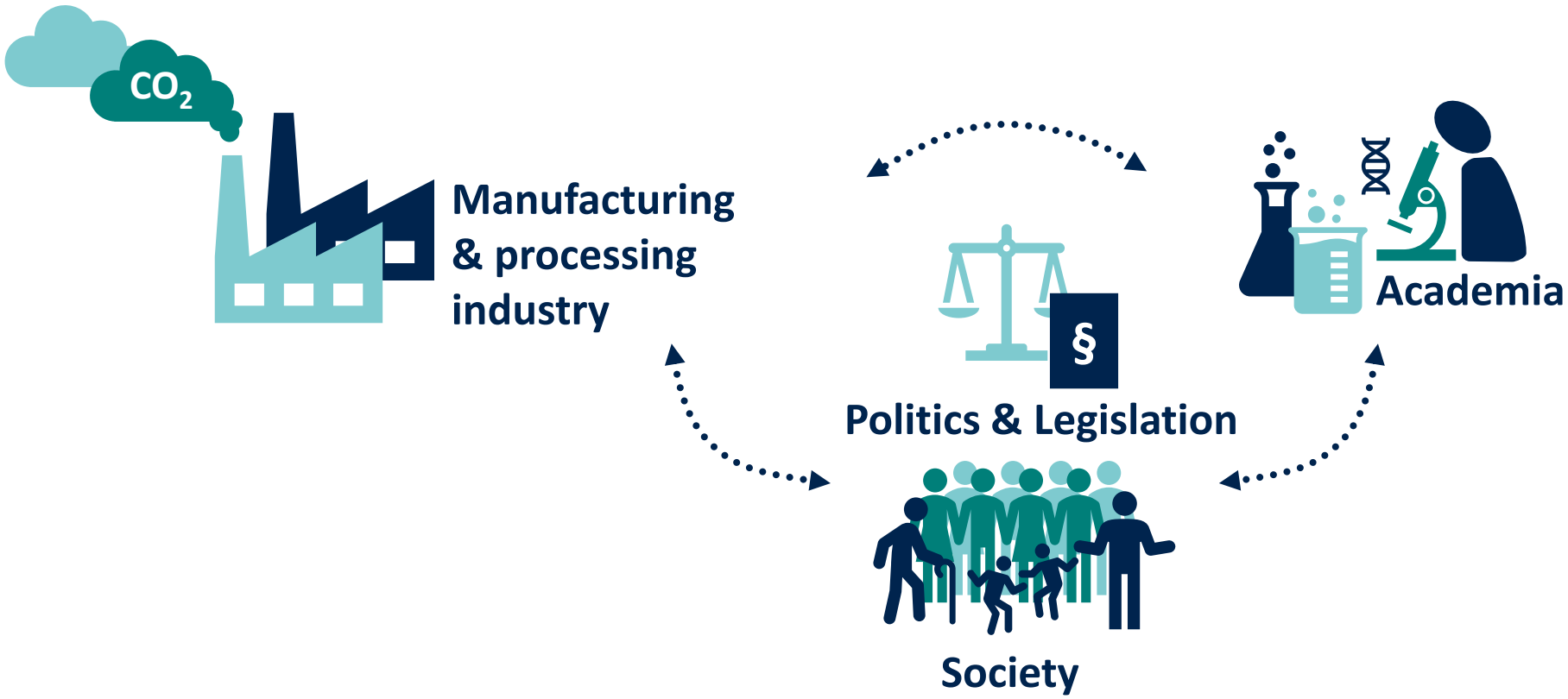
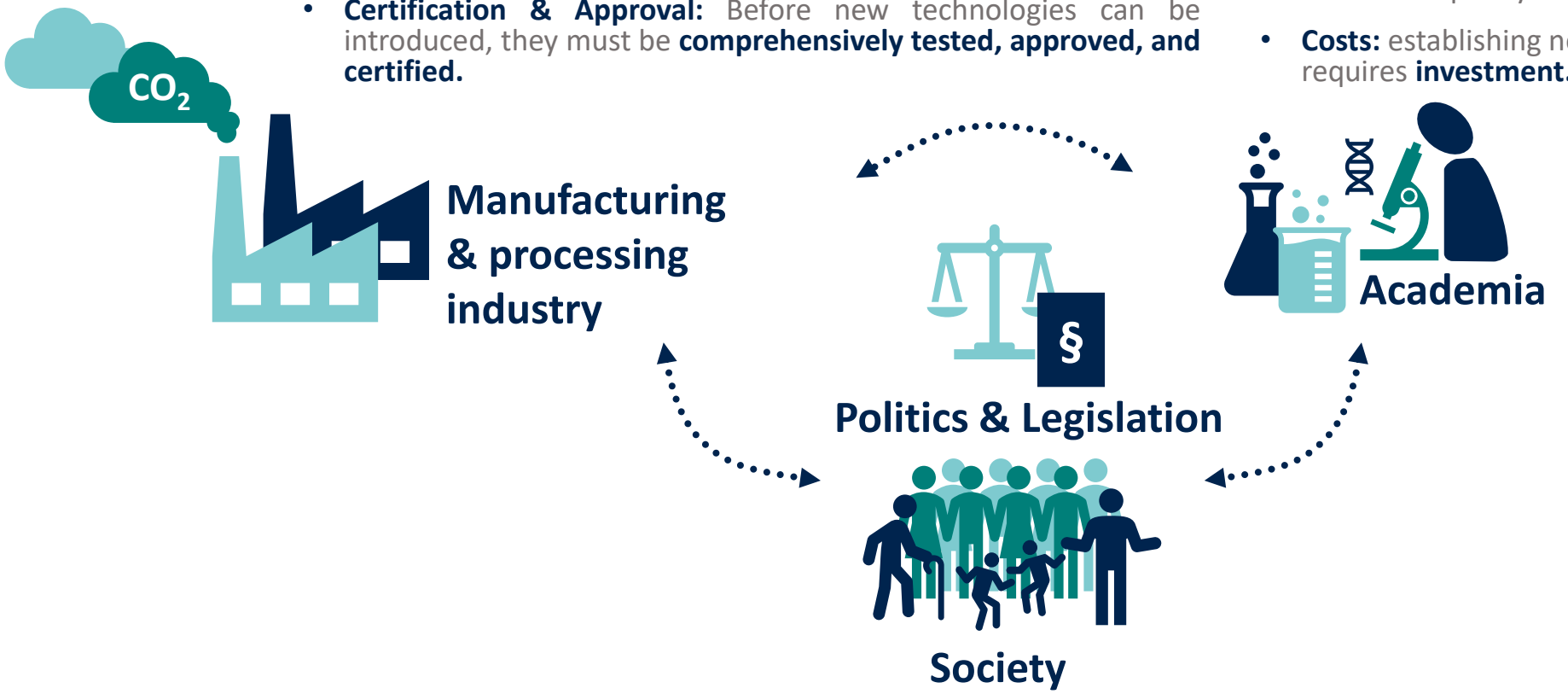
Important stakeholders



Important stakeholders

- **Expertise:** Processing and properties must be relearned/taught so that skilled workers can use new materials and technologies.
- **Certification & Approval:** Before new technologies can be introduced, they must be **comprehensively tested, approved, and certified.**
- **Technology readiness level:** new technologies and products are needed quickly and must be scalable and of controlled quality.
- **Costs:** establishing new technologies and products usually requires **investment.**



Important stakeholders

Manufacturing & processing industry

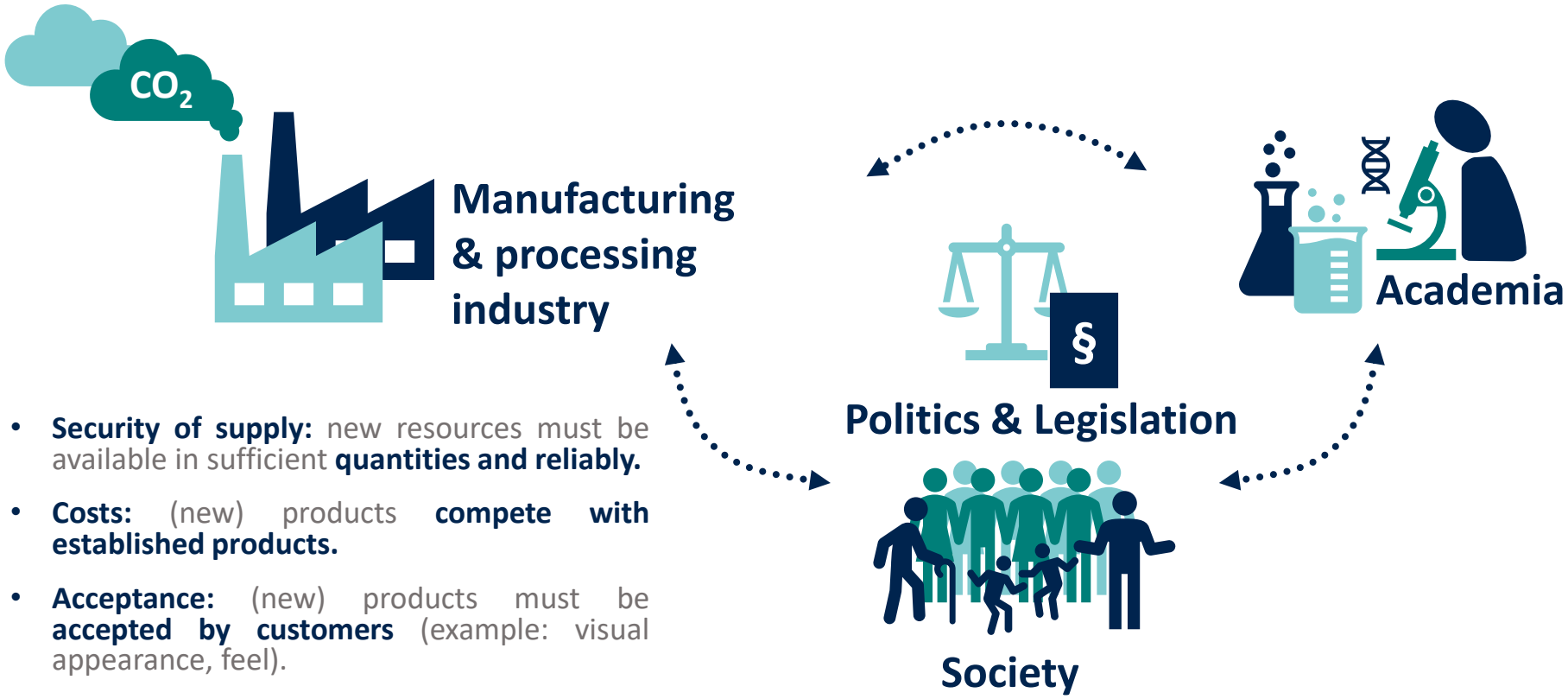
Politics & Legislation

Academia

Society

- **Uncertainty:** Lack of understanding, misinformation, and communication that is not tailored to the target audience lead to **incomprehension, skepticism, and rejection.**
- **Socioeconomics:** Concerns about high initial **costs, job losses, or favoritism** toward certain groups of people.
- **Ethics & morals:** new technologies can conflict with **existing beliefs** (example: GMOs = genetically modified organisms).

Important stakeholders



- **Security of supply:** new resources must be available in sufficient **quantities and reliably.**
- **Costs:** (new) products **compete with established products.**
- **Acceptance:** (new) products must be **accepted by customers** (example: visual appearance, feel).

Explanation of terms

Biogen

Materials that are metabolic products, i.e., processes and occurrences **generated by living organisms** (plant and animal). These are explicitly different from materials obtained through chemical synthesis processes.

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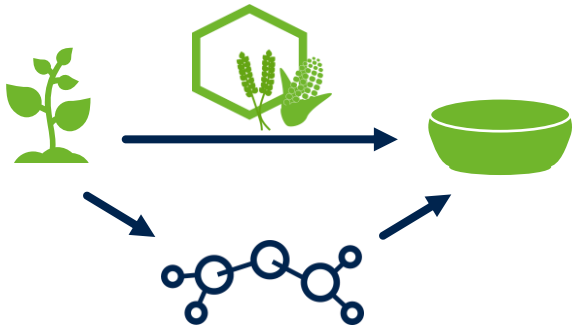
Biobased

Materials produced from biomass,* i.e., organic substances. This can mean both the production of derived **platform substances** and the direct use of **biomass.**



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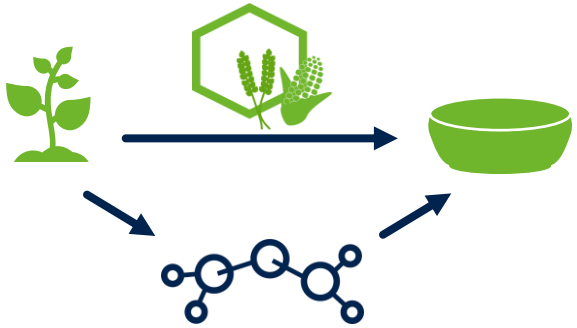

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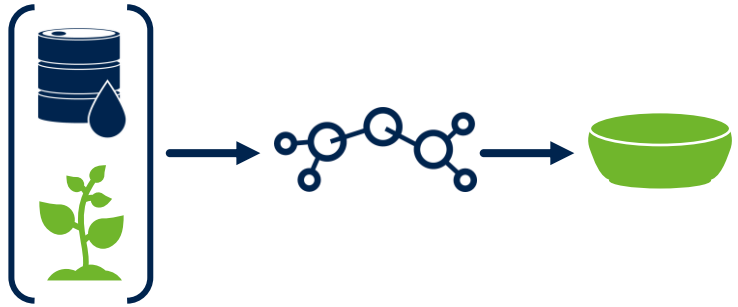
„Bio-attributed“ / mass balanced

Materials that originate from a **mass balance approach** of raw material. The exact proportion of bio-based material in the end product cannot be determined, as the proportion of bio-based material refers to a so-called **balance space**.



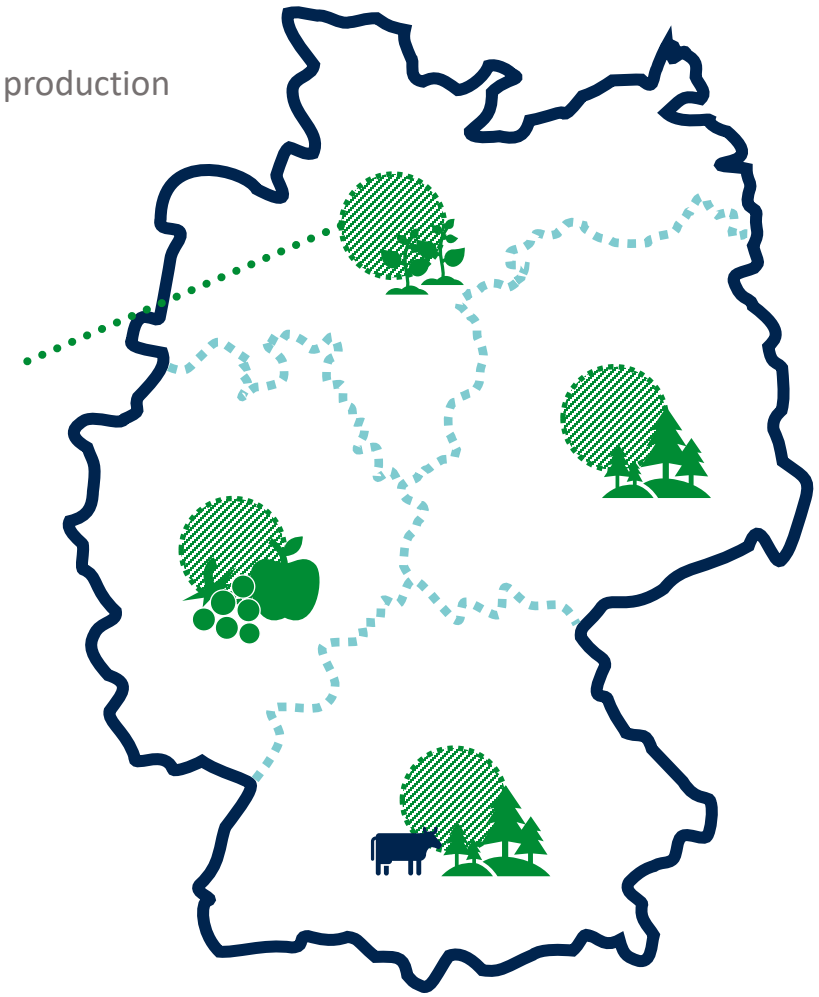
Biomass map

Regional most important types of biomass production

Energy crops: corn for biogas, rapeseed for biodiesel

Cereals: wheat and barley straw

Pasture land: hay and silage for biogas and animal feed



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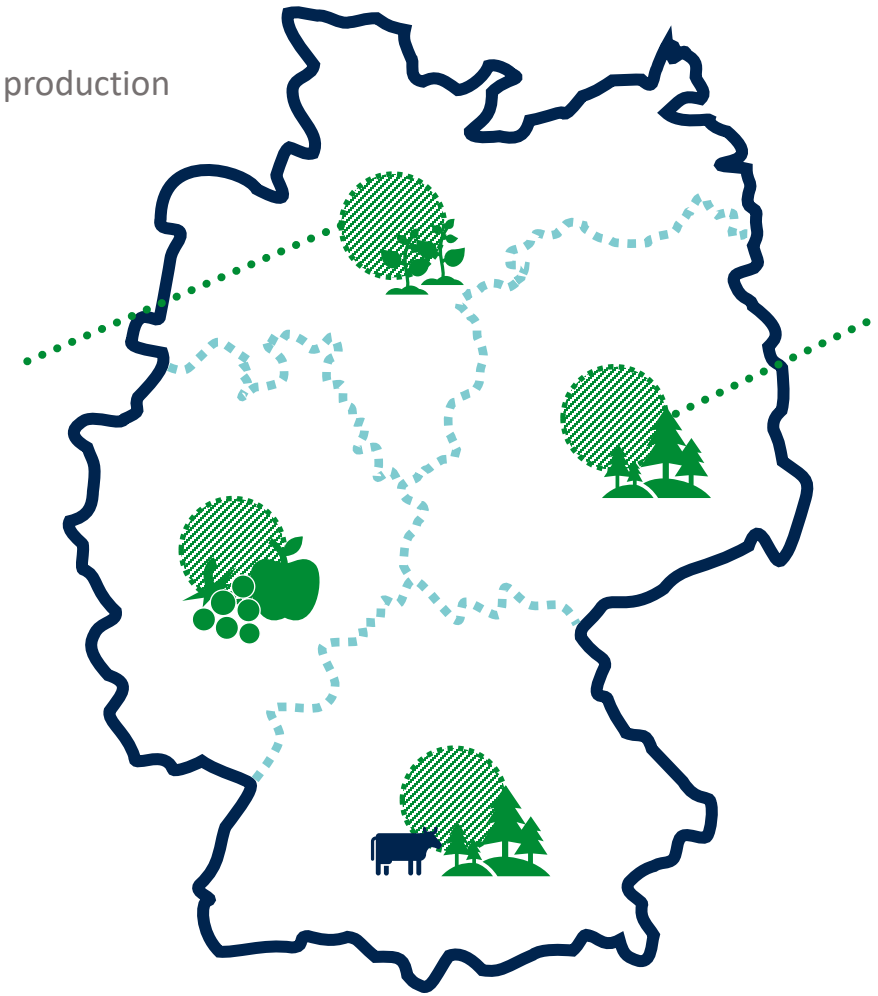

Energy crops: corn and sugar beet for biogas and bioethanol production

Forestry: wood chips, sawdust, and bark for heat, energy, and pellet production

Pasture land: increasing amounts of miscanthus

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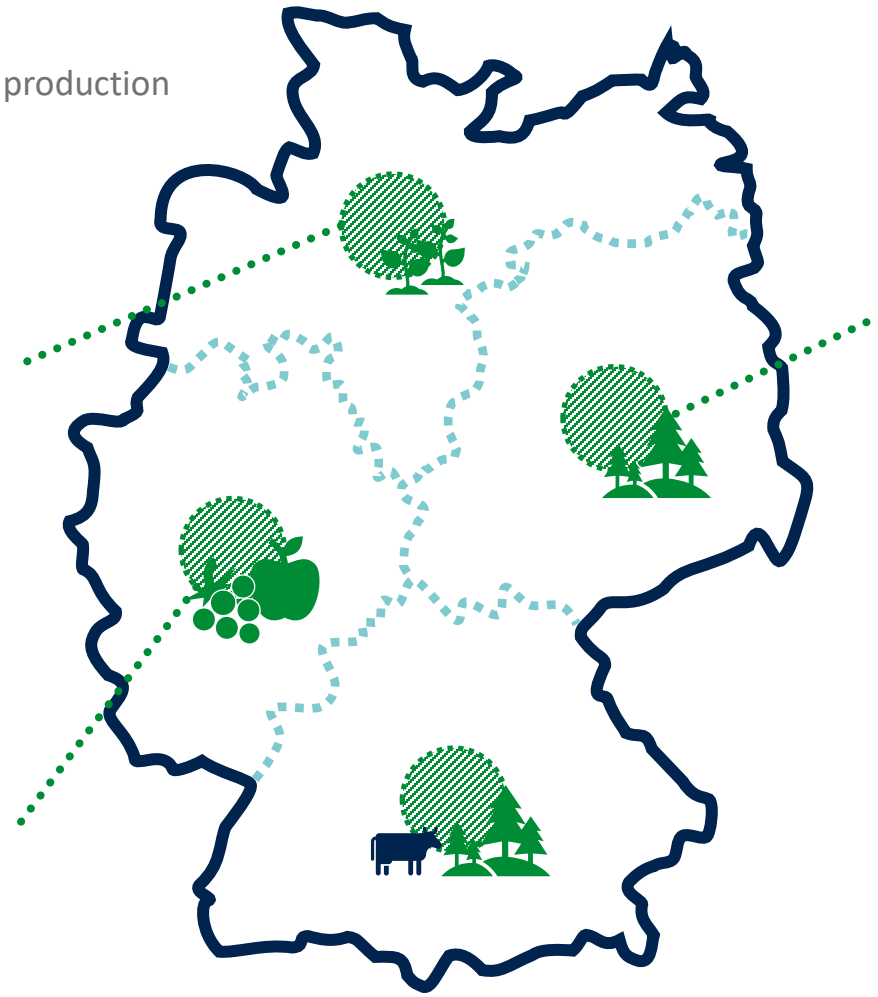
Field residues: straw, fruit and vegetable residues

Viticulture residues: grape marc and pruning waste for energy production



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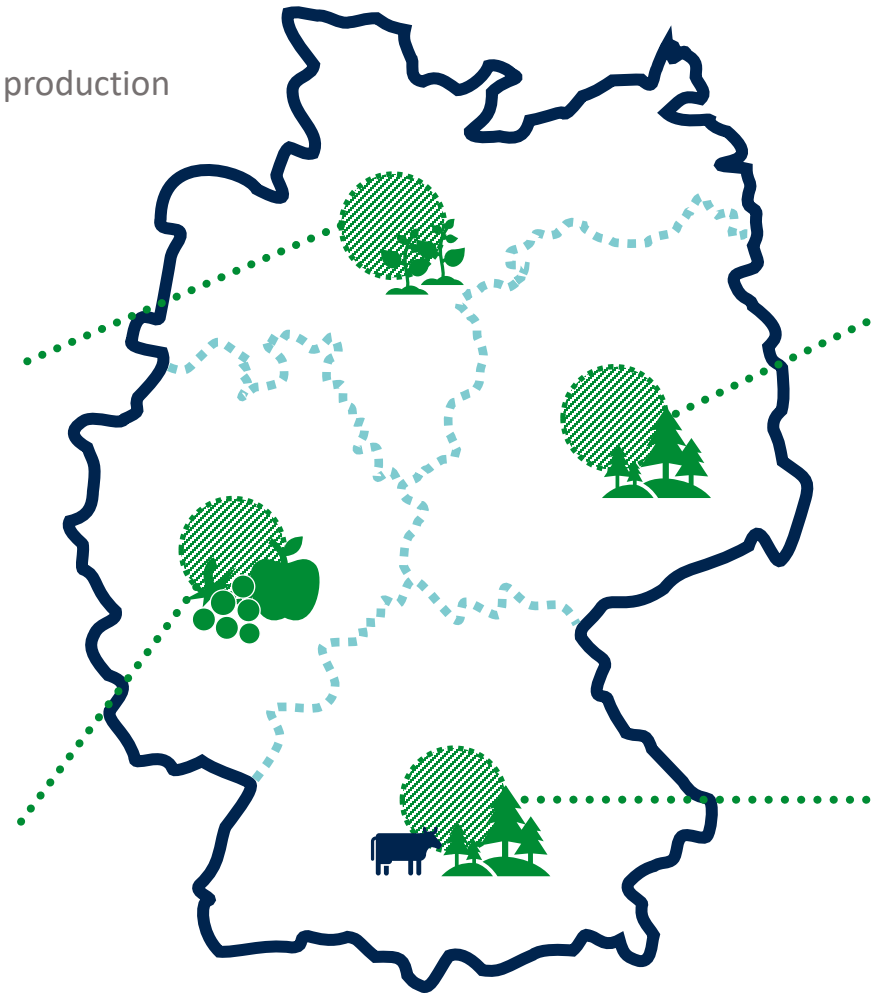

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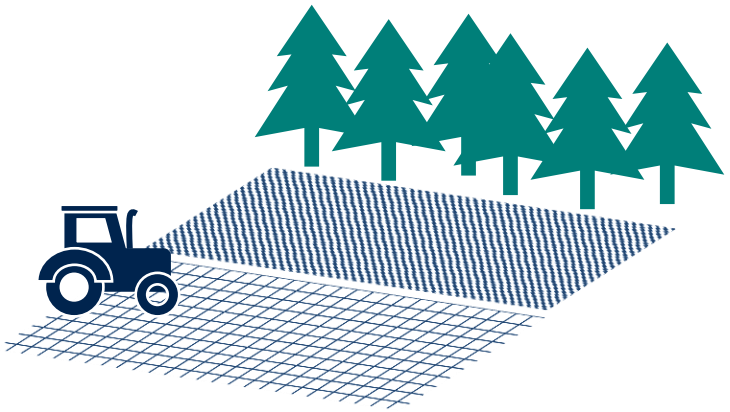
Livestock farming: manure and slurry for biogas production

Energy crops: corn and grass silage for biogas production

Forestry: wood residues and firewood

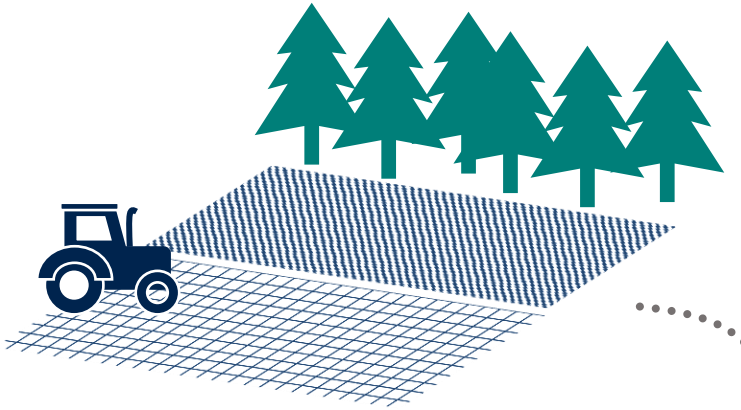
Challenges



Biomass production

- Expansion of biomass use competes with **limited available cultivation area.**
- Overuse of biogenic resources can lead to **soil damage through intensive agriculture** and forestry, monocultures, and soil leaching.
- Germany is already a net importer of agricultural products.

Challenges



Biomass utilization

- Waste streams are sometimes irregular and **vary greatly in quantity.**
- Fluctuations occur more frequently in the **quality of biogenic raw materials.**
- Biogenic raw materials often have a **limited shelf life.**

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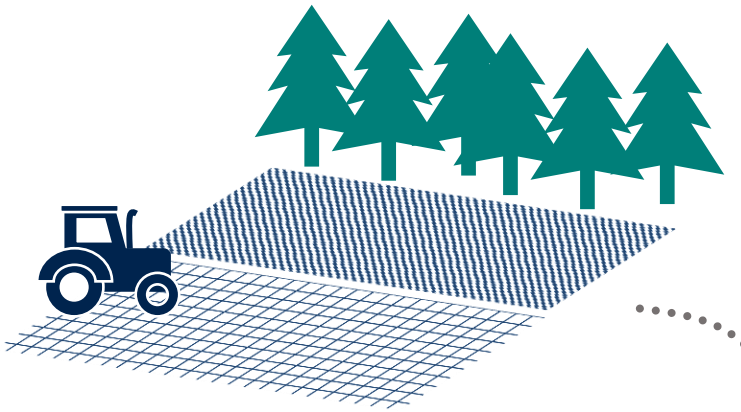

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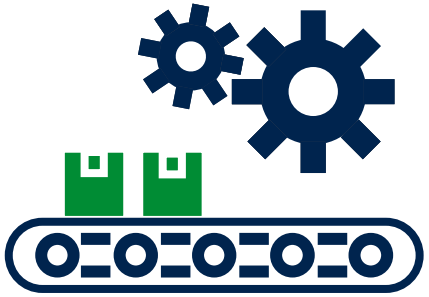
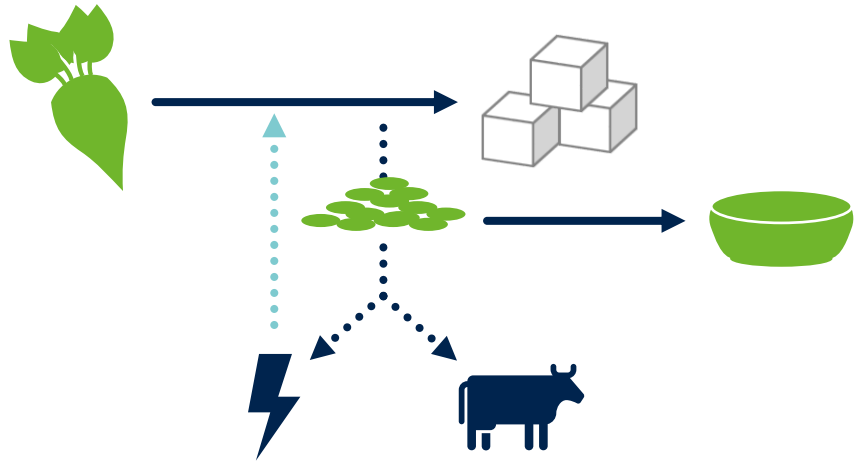


Product manufacturing

- Ideally, new materials and products should be processed and manufactured using **existing equipment**.
- **Scalable biocompatible production technology** must be considered during the development phase.
- Bio-based does not necessarily mean sustainable in all aspects.
- **Technological innovations** are needed within a very short time frame.

Strategies & demands

- **Prioritization:** material use before use for energy production.
- **Cascade utilization**
- Prioritizing the **use of waste and by-products** over primary biomass: many agricultural residues from existing industrial production are not yet being used optimally.
- **Generation of maximum value.**



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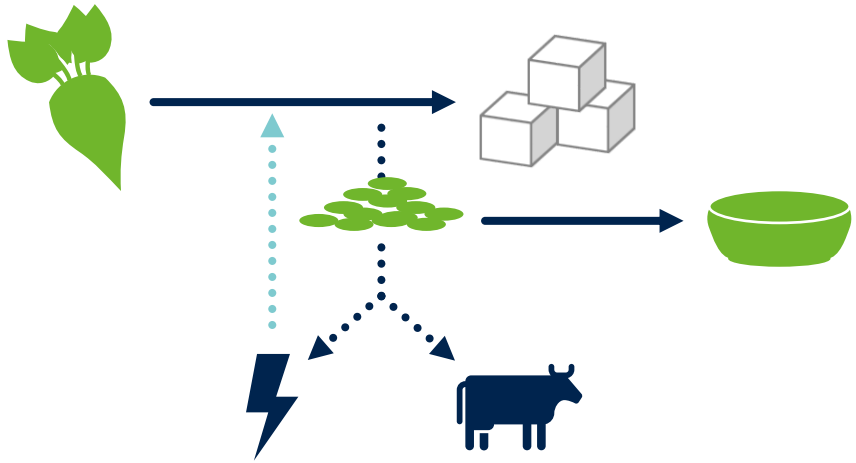

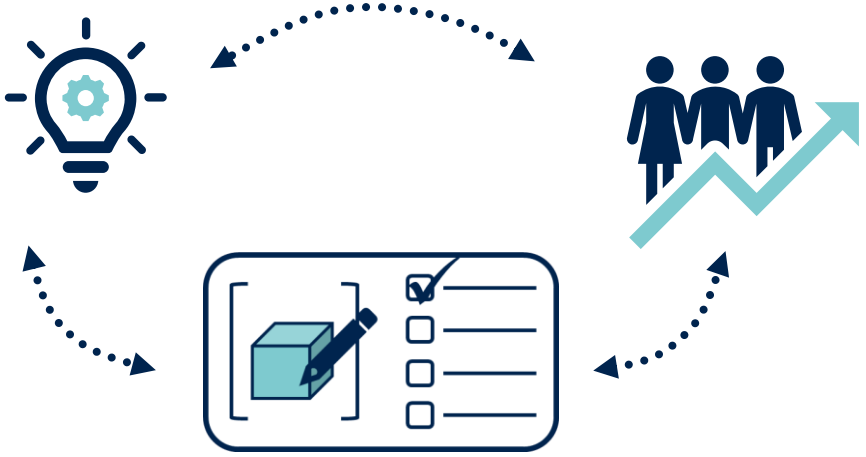

- Product design that takes the **entire life cycle** into account.
- **Innovative new technologies** and efficient, scalable production of forward-looking materials/products.
- Better **integration of material flows** to generate new value chains and networks.
- **New partnerships:** between industries, and between industry and research.

"The bioeconomy has the potential to be the key to a sustainable future in which innovations transform biological resources into solutions for food security, renewable energy, and environmental resilience — for prosperity in harmony with the planet."

Discover – Develop – Connect

Your contact and partner regarding Bioeconomy

Dr. Thomke Bergs
Institute of Biotechnology,
RWTH Aachen University

transbib@rwth-aachen.de

Self check

True or false? Evaluate the following statements based on the content from the recent chapter (solutions are presented on the following slide).

(1) The bioeconomy concerns us all.

(2) The use of biomass for energy should be the top priority.

(3) The establishment of new materials and products should, ideally, rely on known production technologies.

(4) Today's value chains should be maintained unchanged.

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Correct! This applies both to our affiliation with key stakeholders—industry, society, science—and to the various industrial sectors in which the bioeconomy is expected to make a decisive contribution to the circular economy.

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False! Simply put, the worst thing you can do with biomass is simply burn it. Instead, it needs to be used in a cascade with the aim of utilizing biomass as a material and achieving the highest possible added value.

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Correct! The use of established technologies and process equipment is essential for the rapid establishment of new materials. Therefore, (biocompatible) scalable production technology must be taken into account as early as the development stage of new materials and products.

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False! In order to generate added value from previously untapped potential in by-products and residual flows, value chains must be rethought and new networks established. This transformation must involve all stakeholders along the value chain.

Note

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