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AGENCY FOR RENEWABLE RESOURCES

Conference BIOEAST as driving force in the context of the Green Deal:
TWG: Bioenergy and bio-based materials - Biorefineries in BIOEAST macro-region

Source: FNR/Dr.Peters

Martin Behrens
20.02.2020
Brüssel

Federal Ministry
of Food
and Agriculture

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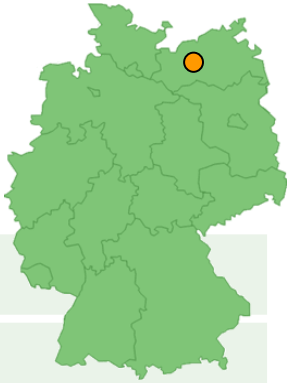


Facts

Foundation:	October 1993
Main office:	18276 Gülzow-Prüzen
Support:	Federal Ministry of Food and Agriculture (BMEL) and State of Mecklenburg- Western Pomerania
Employees:	111
Legal status:	Registered association with 85 members (7 voting members)
Tasks:	• Promotion of research, development and demonstration (project management) • Information & advice • Public relations • International and EU activities
Target groups:	Industry, SME, public and private research institutes, universities, government agencies

currant state: 02.01.2020

Biorefineries in the European Bioeconomy Strategy

"The transformation towards sustainable, healthy, nutrition-sensitive, resource-efficient, resilient, circular and inclusive food and farming systems needs to accelerate. This includes turning organic waste, residues and food discards into valuable and safe bio-based products, for instance by deploying small-scale biorefineries, helping farmers, foresters and fishermen to diversify their revenue sources and better manage market risks, all while achieving the goals of the Circular Economy." p.6

"1.5 Facilitate the development of new sustainable biorefinieres and confirm the type and estimated potential* (Who: Commission and Member States)" p.12

*some reports estimate this potential with up to 300 new biorefineries by 2030

Biorefineries: Definitions

Specific Definition:

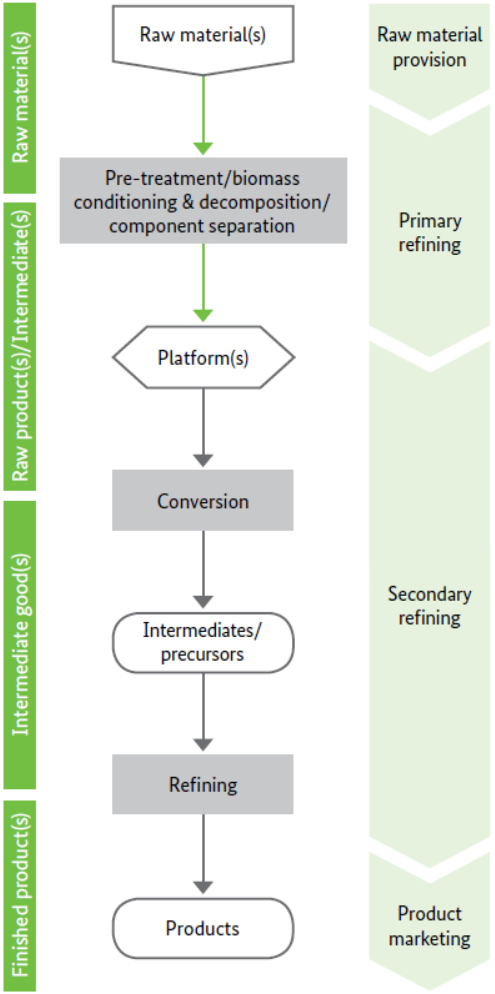
The sustainable processing of biomass into a spectrum of marketable products (food, feed, materials, chemicals) and energy (fuels, power, heat), using a wide variety of conversion technologies in an integrated manner.

(de Jong; E., Higson, A.; Walsh, P.; Wellisch, M. (2012): Bio-based chemicals. Value added products from biorefineries. Task 42 Biorefinery BIC: https://biconsortium.eu/news/mapping-european-biorefinieries)

Broad Definition:

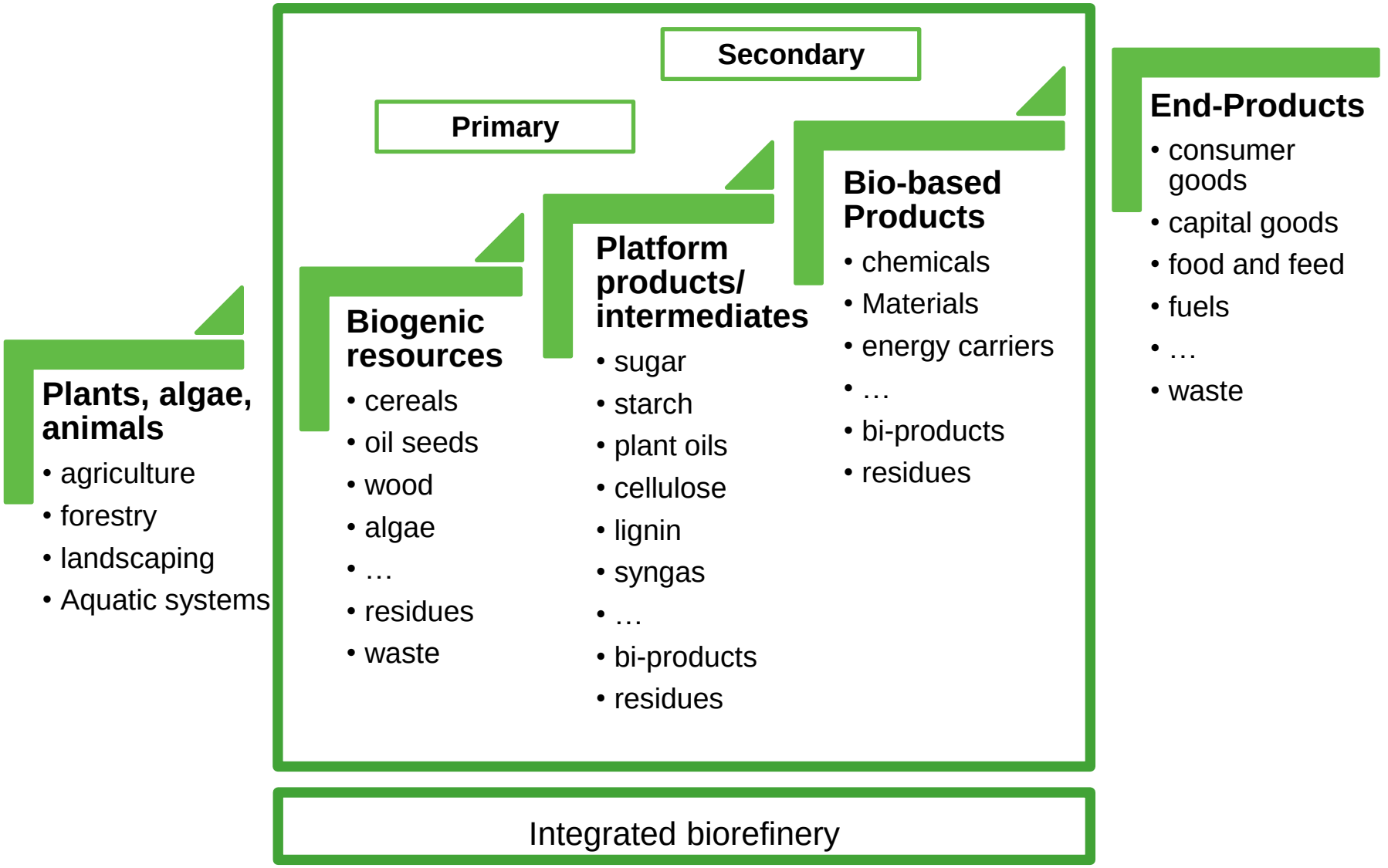
An overall concept of a processing plant where biomass feedstocks are converted and extracted into a spectrum of valuable products.

(US DOE (1997): Energy, Environmental and Economics (e3) Handbook, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Washington D.C.)



Biorefinery process chain (German Biorefineries Roadmap (2012), p.22)

Biorefining



Integrated Biorefineries

Product focus of biorefineries

Chemical/material based biorefinery: Biorefinery produces based on the quantity and/or value of its products a portfolio of chemicals and materials. Co-products and residues are used to produce food, feed and bioenergy.

Energy based biorefinery: Biorefinery produces based on the quantity and/or value of its products one or more energy carrier products. Compared to these products chemicals and materials are only produced in low quantities. Co-products and residues are used to produce food, feed, chemicals and materials.

Approaches to further develop

Bottom-up approach: Extension of existing biomass processing plants (e.g. plants to produce sugar, starch, cellulose, oil or ethanol) which only produce a small number of products, to a biorefinery which allows to use more biomass fractions and/or to produce more products.

– Brown field biorefinery

Top-down approach: Development of a new and highly integrated biorefinery aiming to produce a high variety of products for different markets based on different biomass fractions, aiming to use the entire feedstock without creating any waste (whole plant).

– Green field biorefinery

Integrated Biorefineries – Status Quo

Primary refining

- Commercially established
- Sugar/starch/plant oils are dominating platforms
- Concepts on the basis of platforms such as ligno-cellulose and syngas are mostly R&D scale (exeption: pulp mills)
- Over estimation of residues and waste as resources, underestimation of agricultural feedstocks

Secondary refining

- Secondary refining of sugar/starch/plant oil platforms is mainly aiming at food/feed products (partly also non-food products)
- Integrated plants of sugar/starch/plant oil platforms aim to enlarge product portfolio towards non-food products
- Innovation focus on secondary refining and specifically bio-based fine and specialty chemicals; drop-in vs. new products depends on market situation
- Creation of new value chain partnerships with industry higher up value chain just started (positive example: Cargill)

Integrated biorefineries – Future Trends (1)

Relocation of primary refining to most competitive biomass providers

- Primary refining (platforms: short chain plant oils or raw sugar/manioc-starch) and partly also production of first intermediaries relocated to biomass production countries outside Europe (Malaysia, Indonesia, Brazil, Thailand)

De-coupling of primary and secondary refining

- Production of non-food products from pre-products or intermediaries imported from global market (increasingly only secondary refining done in Europe)

Secondary refining in emerging countries

- Increasing role of local chemical production (China, South-East Asia, South America), increased differentiation of local value chains
- High demand and high growth increase local production

Pull-Effect on Demand Side

- American and European Companies as Technology Drivers (Joint Venture, Licences, Global Player), Demand by market leaders of bio-based products (e.g. Coca-Cola, P&G, Nestle, Toyota)

Integrated Biorefineries – Future Trends (2)

R&D-Phase of Top-Down Biorefineries not completed

- Primary and secondary refining in all TRLs (Concept, Proof-of-Concept, Lab scale, pilot and demonstration) exist; however almost no commercial plants
- Primary and secondary refining made progress, but no break-through
- Demonstration of syngas-based concepts
  - has been successful in electricity and heat sector
  - However needs to be demonstrated as integrated biorefinery including a product portfolio with fuels, chemicals and/or materials
- **Demonstration of ligno-cellulose concepts**
  - Has been successful in the area of pre-treatment, depolymerisation and hydrolysis
  - Remains to be further developed when looking at bio-based products of the secondary refining (cellulose follow-up products, fermentation products, lignin products); focus on lignocellulose ethanol (US, international) has been corrected by the market
  - Looking at algae there is intensive R&D, with some progress (however a gap between ambitions and reality), potential of algae, especially an algae-based biorefiniery yet remains to be exploited

Tender Study: Biorefineries Pathways and outlook for deployment for DG Research & Innovation

Bioeconomy Strategy Key Action: Facilitate the **development of new sustainable biorefineries**

Aim:

To provide an **outlook for integrated chemical/material biorefineries** enabling **stakeholders** such as the scientific community, industry (primary producers and manufacturers), investors, policymakers, and NGOs to take the present-day **decisions** necessary **to shape the future** sustainable bioeconomy

Objectives:

- Describe, categorise and develop a robust **classification system** for different types of biorefineries and the products they could produce
- Determine the **attractiveness of different bio-based products** and their **market potential** based on drivers and benefits of chemical/material biorefineries, bio-based products and the applications and markets they could access
- Report on the **status of biorefinery development** and the **markets** for related bio-based products

Partner:

E4tech Strategy | Energy | Sustainability

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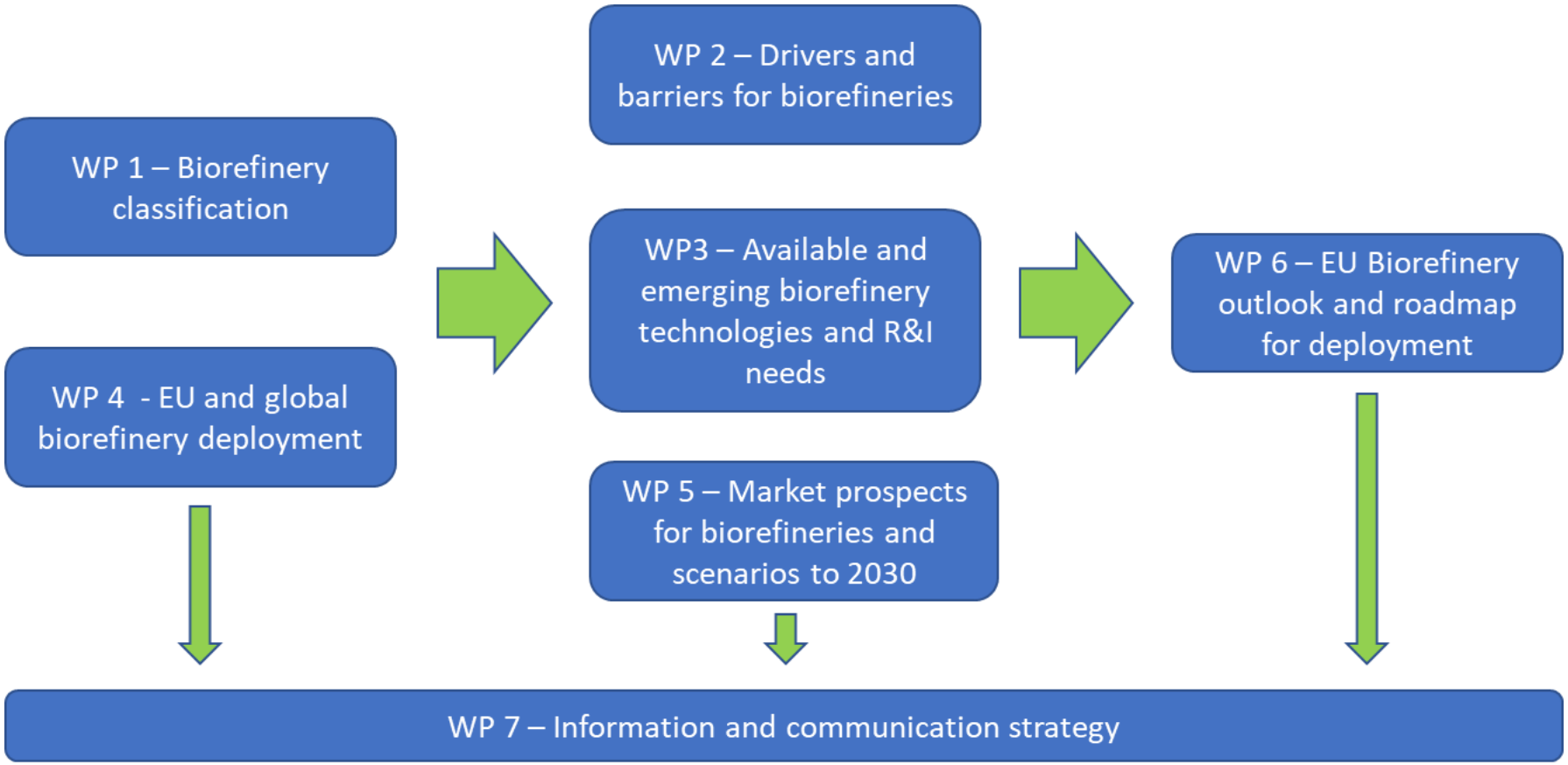
Objectives continued…

- Identify the **technical and market challenges** that need to be overcome to commercialise biorefineries
- Identify the **R&D&I needs** of biorefinery pathways and the policies that could incentivise their uptake
- Develop **scenarios** for the potential **ramp up of biorefinery deployment** in Europe to **2030** taking into consideration technology, market and resource considerations
- Develop a **roadmap** for biorefinery deployment in the EU to **2030** segmented by biorefinery classification, including the number of biorefineries, installed capacity by volume and capital investment in new biorefinery construction, type of actions required by different actors, and impact in terms of sustainability and societal benefit
- Engage **stakeholders** in activities aimed at meeting above objective
- Develop **communication materials** to effectively communicate the outputs of the study.

Project scope, project management and governance



Stakeholder Engagement

Objective: to enable policy makers, investors, the scientific community, business enterprises, primary producers and other stakeholders in their present-day decisions and support them in shaping the future of bioeconomy deployment in their respective constituencies.

- **Stakeholder Advisory Group:** key experts (including BIOEAST Initiative Representative)
- **Stakeholder Workshops** in May/June 2020; October/November 2020
- **Bi-lateral Interaction** with individual stakeholder

Why is this important for BIO east **?**

- high biomass potential in macro-region
- Explicit interest of DG AGRI to boost small/medium scale biorefineries development in rural area including this macro-region

Food for thought

- Good reasons for simple or integrated biomass processing, however integrated biorefineries **have higher value creation potential**
- Biorefineries provide **opportunities to create value and jobs in rural areas**, already today many biorefinieres are based in rural areas or close to small/medium size urban areas
- **Existing strengths in integrated biomass processing in Europe** should be further developed (platforms: sugar, starch)
- **Biorefineries with development potential in Europe** (Platform: rapeseeds, ligno-cellulose)
- **Growth in key sectors** (automobile, chemistry, polymers, electronics) **will increase demand of chemicals and materials.** Biorefineries should **focus on these sectors** which will create highest demands.
- Demand side sector will change in future, **value chains will become more complex, new businesses and value chains will be developed**. Biorefineries need to adapt to these developments.
- **Future growth will be value-based, while volume-based growth will happen in emerging countries**. Therefore biorefineries in Europe should focus on high-value bio-based products. It makes sense to consider new processes also for established products (e.g. using biotechnology).

Contact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