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FRAUNHOFER
INNOVATION CLUSTER



bioenergy

SUSTAINABLE SUPPLY WITH RAW
MATERIALS AND ENERGY





FRAUNHOFER INNOVATION CLUSTER "BIOENERGY"

EXPLORING POTENTIALS OF BIOMASS – DEVELOPING INNOVATIVE UTILIZATION CONCEPTS

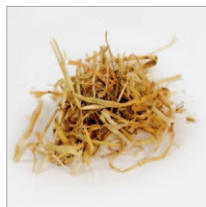
Material and energetic use of biomass are expected to contribute significantly towards satisfaction of the worldwide need for raw material and energy and therefore will help reducing greenhouse gases, especially CO₂. Currently, present conceptions of utilization for biomass base on either lignocellulose-poor biomass (biogas, bioethanol, biodiesel, industrial/white biotechnology) or focus on dry lignocellulose-containing biomass, e.g. for combustion, biomass-to-liquid-processes etc. Examples of global huge quantities of fresh biomass and biogenic residues are grass and green waste as well as harvest residues and process offcut from agricultural production and forestry. Regarding energetic and material utilization of such biomass, effective processes are only limited available. Thus, the Innovation Cluster "Bioenergy" aims at process development for efficient exploitation of such biomass.



Bio waste



Green waste materials



Straw

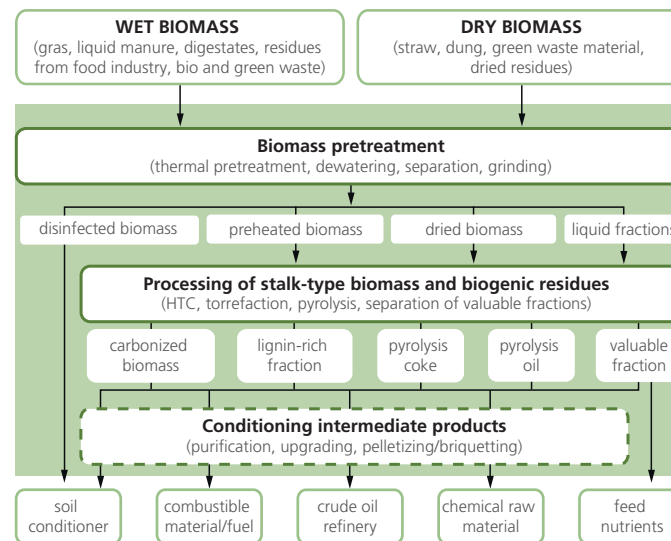
OBJECTIVES

Aim of the Fraunhofer Innovation Cluster "Bioenergy" is to supply mobile or decentralized technologies for the generation of economically transportable and storable intermediate products. These intermediate products from lignocellulose and/or wet biomass, as well as from other related residues, are converted into energy-dense and storage-stable intermediate products in preparation for their subsequent processing in energy business and chemical industry.

Thereby, following goals should be accomplished:

- Conversion into hydrocarbon-rich solid and liquid intermediate products for the resource sector and energy supply
- Use of logistic channels for intermediate products, e.g. co-incineration in heating plants or admixture in crude oil refineries
- Higher efficiency and value creation, particularly in agricultural production

PROJECT SCHEME



Project concept and technology elements in Fraunhofer Innovation Cluster "Bioenergy".

TECHNOLOGICAL APPROACHES

Within the Cluster following technological approaches are being elaborated, which should finally conclude in corresponding technologies to the point of a demonstrator (see project scheme):

- **Biomass pretreatment**
Concept design and development of technologies on basis of pretreatment, and dewatering and separation of valuable fractions for decentral fabrication of economically transportable and storable intermediate products from wet biomass. These come into consideration as e.g. combustible material, soil conditioner or as ingredient for pyrolysis and carbonization (see figure). Previously separated valuable fractions can used e.g. in the chemical industry or feed industry.
- **Processing of stalk-type biomass**
Thermochemical conversion of stalk-type biomass into pyrolysis oil and into pyrolysis coke by ablative flash-pyrolysis, both worth storing and transporting. Beside the power and heat generation, after treatment, pyrolysis oils are also applicable as raw material for fuels and chemicals.
- **Processing of local/regional accruing biogenic residues**
Static, small-scaled conversion of residues from agricultural production or food industry into carbonic intermediate products, especially for energy business basing on hydrothermal carbonization (HTC) as well as torrefaction.



HTC char



Pyrolysis oil



Pyrolysis coke

PARTNERS INVOLVED IN FRAUNHOFER INNOVATION CLUSTER "BIOENERGY"

AIRTECH Stickstoff GmbH	:metabolon/Bergischer Abfallwirtschaftsverband
Aquattro GmbH	Pfeifer & Langen GmbH & Co. KG
CLAAS KGaA mbH	PROWICO
EnergyAgency.NRW	Proteingewinnungs GmbH
ENTRADE Energiesysteme AG	Phytowelt
Franz-Josef Kipp GmbH & Co. KG	GreenTechnologies GmbH
Fraunhofer Institute for Environmental, Safety, and Energy Technology UMSICHT	Ruhr University Bochum, Chair of Process Engineering for Transport Processes
GEA Westfalia Separator Group	STEAG GmbH
GRONEMEYER & BANCK GmbH & Co. KG	Thünen-Institut für Holzforschung (TI-HF)
Kreis Weseler Abfallgesellschaft mbH & Co. KG	Wirtschaftsbetrieb Hagen WBH
Loick Bioenergie GmbH	



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Pyrolysis oil



Solid fuels

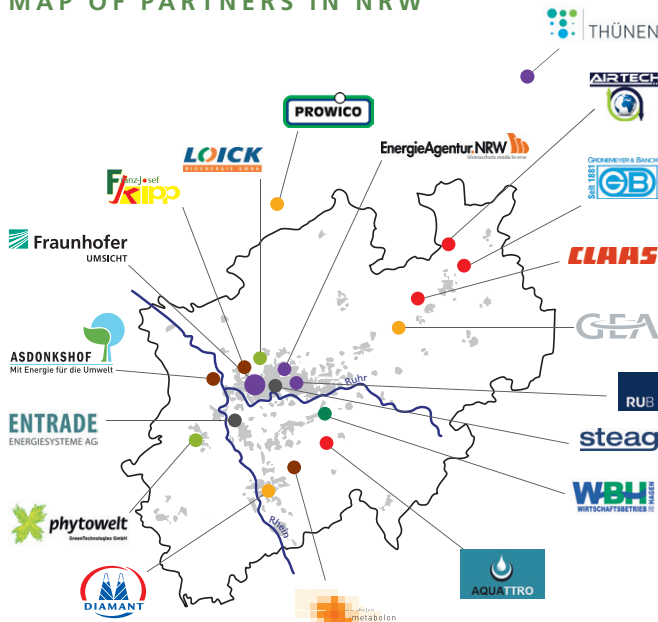


Biochar



Chemistry raw material

MAP OF PARTNERS IN NRW



● Agriculture/Biomass supply	● Energy industry
● Food industry	● Waste management industry
● (Agricultural machine and) mechanical engineering	● Research/Innovation
	● Publicly owned undertaking

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Fraunhofer-Innovation Clusters are framed and performed within the "Pact for Research and Innovation" of the Fraunhofer-Society. They network existing structures – research facilities, industrial partners and universities – and promote a seminal research area, regionally dedicated. The Fraunhofer-Innovation Cluster "Bioenergy" in Oberhausen accumulates the competences of industry, science and the federal state of North Rhine-Westphalia to draft novel conceptions of use for biomass.

FUNDED BY



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