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FORSCHUNGSZENTRUM

Bio-economy: opportunities and challenges

Uli Schurr
Forschungszentrum Jülich
Germany

CEPLAS

Deutsches Pflanzen Phänotypisierungs-Netzwerk
DPPN

European Plant Phenotyping Network
EPPN

BioSC
Bioeconomy Science Center

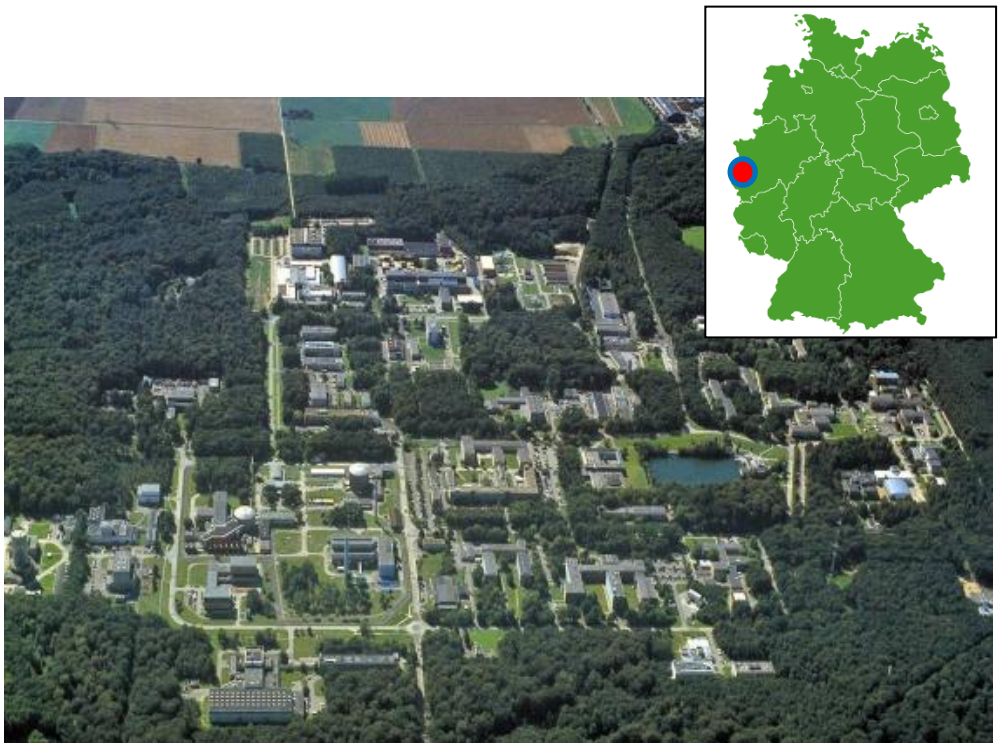
Facts and Figures on Forschungszentrum Jülich

People

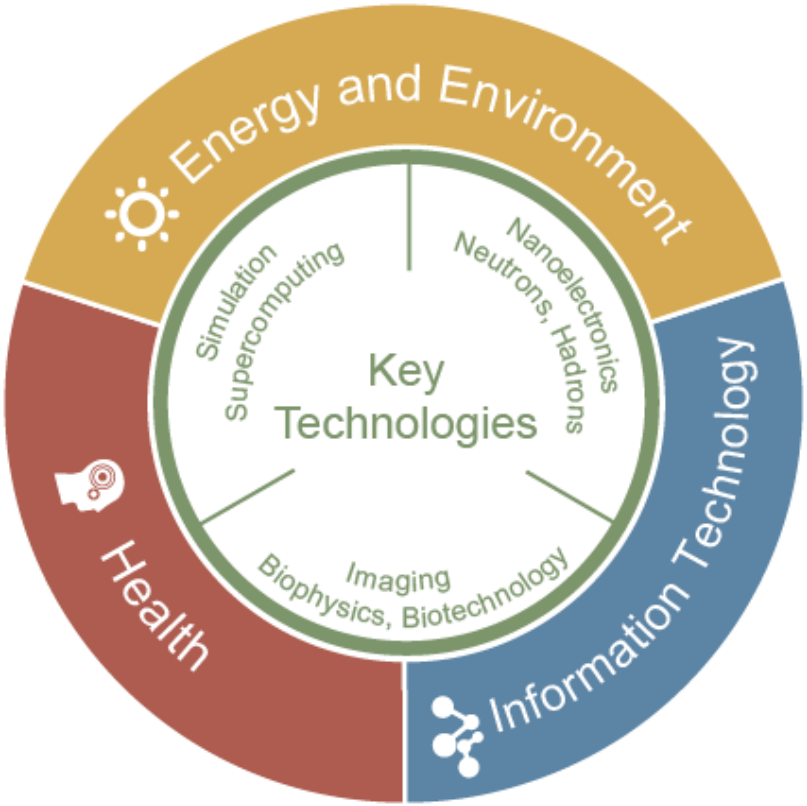
- Employees: 5.534
- 900+ guest scientists (>45 countries)

Budget

- Budget: 560 Mio €
- Third-party funding: ~ 170 Mio €



Science Strategy



Sustainable Bioeconomy –
Knowledge about biological systems for adressing grand challenges of society

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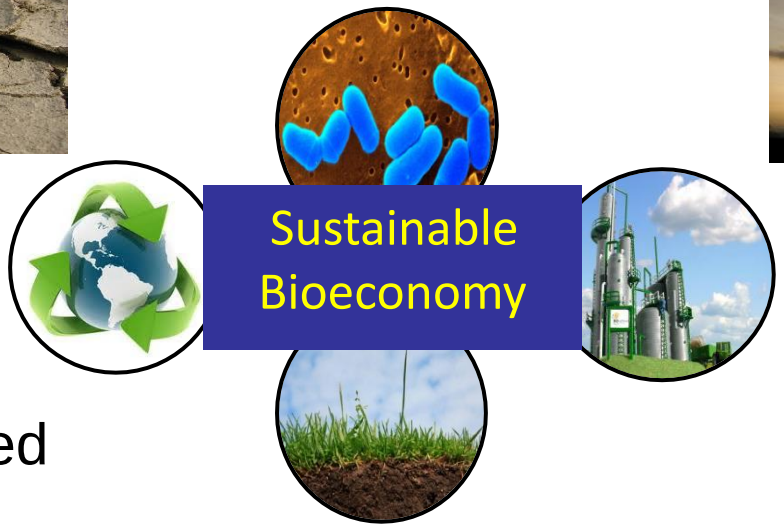
Climate Change

Energy

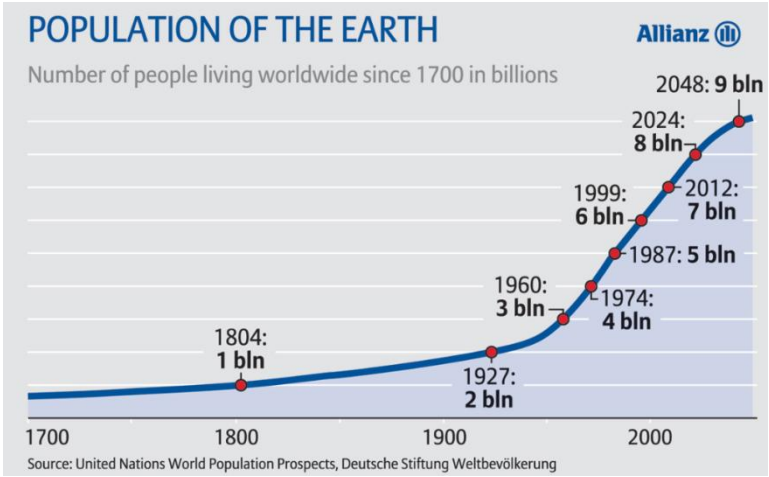


Food and Feed

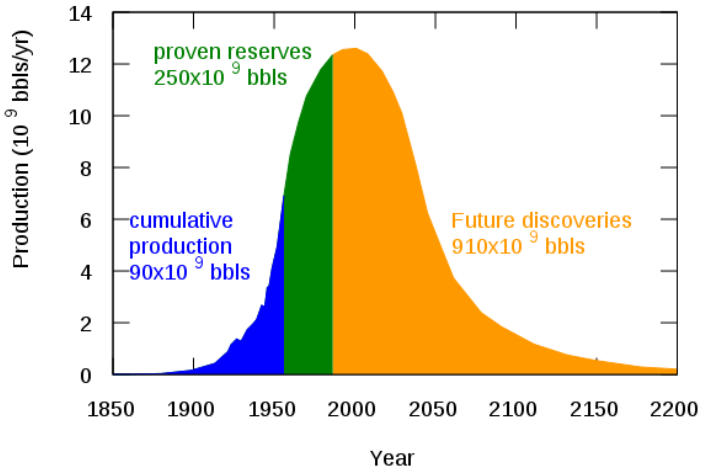
Natural Ressources

Major societal challenges: plants are key

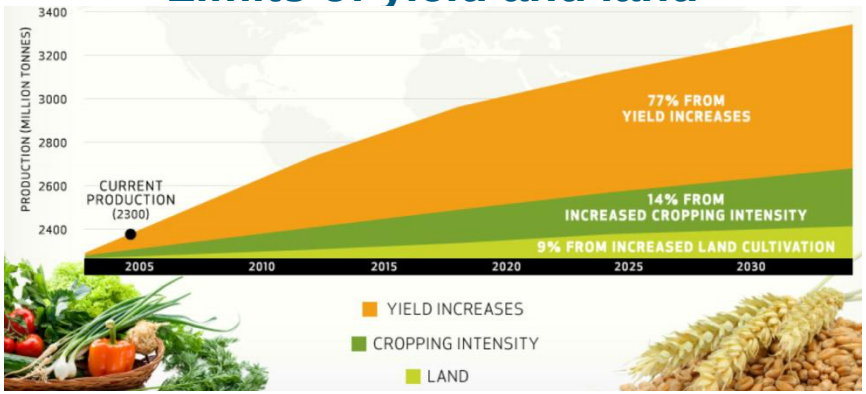
Global and climate change



Fossil resources

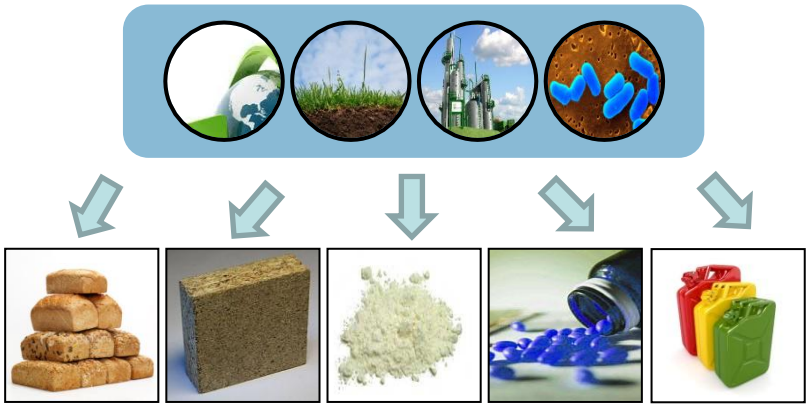


Limits of yield and land



Need for sustainable intensification
(Resource outlook, J. Bruinsma, 2013)

Novel demands in quality and scale



Need for diversification

European Strategies for Bioeconomy

Strategies
- Europe 2030
- International cooperation strategies

Bioeconomy Panel

Bioeconomy Observatory (JRC)

Bioeconomy stakeholder conferences

H2020
- Infrastructure
- About 50% DG Agri and 50% DG Research
- Multi-stakeholder approaches

EIP
- Focus groups
- Operational groups

German national strategies for bioeconomy

Research strategy (2011)

Policy strategy (2013)

"a natural cycle-oriented, sustainable bio-based economy that carries the promise of **global food supplies** that are both ample and healthy, and of **high quality products** from renewable resources"

National Research Strategy Bioeconomy 2030

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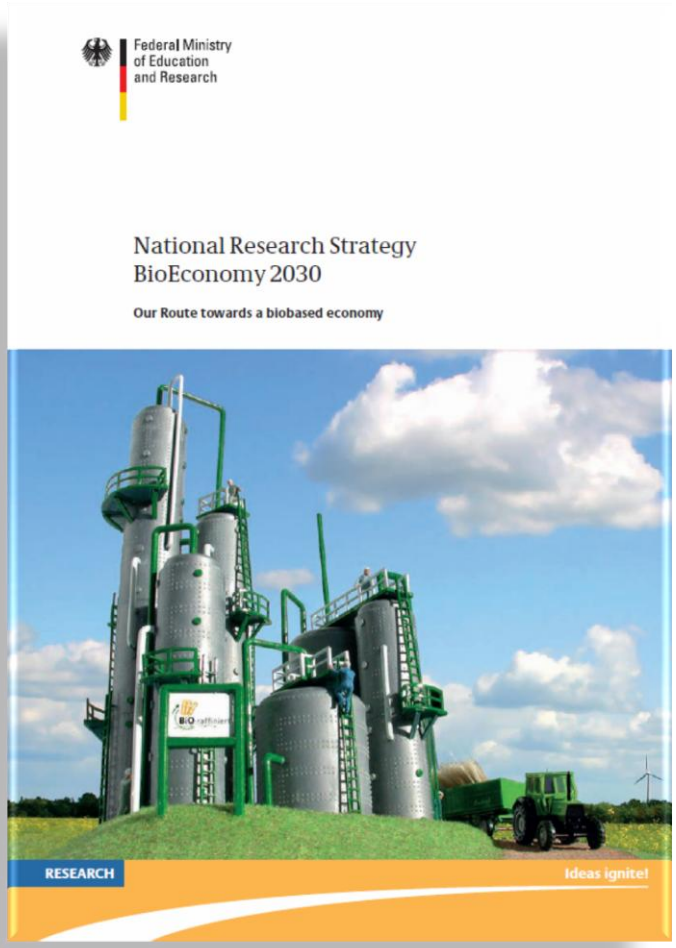
- **BMBF** **Federal Ministry of education and research**
- BMEL Federal Ministry of food and agriculture
- BMWI, BMZ, BMUB…
- Research Institutes: HGF, WGL, FhG, MPG
- Industry
- Federal states (NRW, …)
- European and International cooperation

➢ starting November 2010; duration 6 years

Project funding	1 457.6 Mio €
Institutional funding	976.6 Mio €
Total funding	2 400.0 Mio €



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Securing global nutrition

Producing healthy and safe foods

Using renewable resources for industry

Sustainable agricultural production

Developing biomass-based energy carriers

International Cooperation

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Bioeconomy Funding programs in Germany

GlobE

Plant Biotechnology

BioIndustry 2021

PLANT-KBBE

Biotechnology 2020+

DPPN - Phenotyping

Enabling Technologies/ Research Award: Next Generation biotech. Processes

Innovative Plant Breeding within the cultivation system

Innovation initiative ind. Biotechnology

Bioeconomy International

BioEnergy 2021

FACCE-JPI

Cluster BioEconomy

ERANet SUSFOOD

KMU-innovativ

ERANet EMIDA

GoBio

ERANet ANIHWA

ERANet EuroTransBio

ERANet IB 2

Integrated Policy Strategy Bioeconomy

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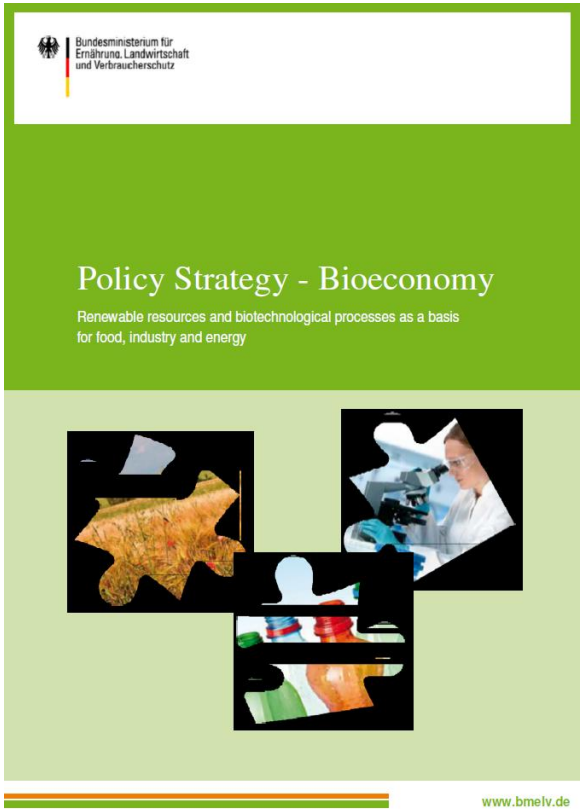
Bundesministerium für Ernährung, Landwirtschaft und Verbraucherschutz

Renewable resources and biotechnological processes as a basis for food, industry and energy

- Bioeconomy as an opportunity for the 21st century
- Goals and guiding concepts for a sustainable bioeconomy
- Challenges and drivers of the bioeconomy
- Growth markets, innovative technologies and products – Industrial biotechnology, bio-based products and bioenergy, food and feed
- Areas of action, strategic approaches and measures – Cross-sectoral and thematic areas of action



Inter-ministerial workgroup on bioeconomy

Action Plans and Roadmaps for Bioeconomy

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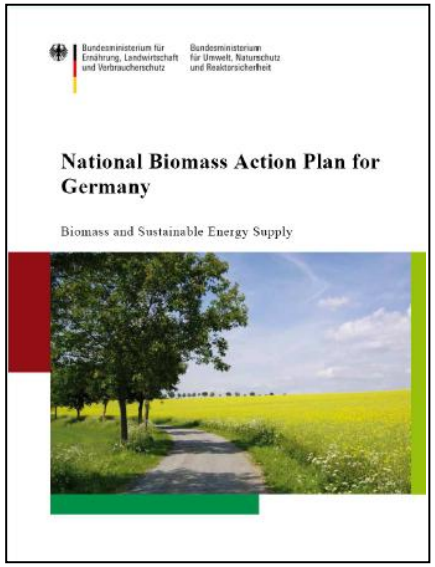
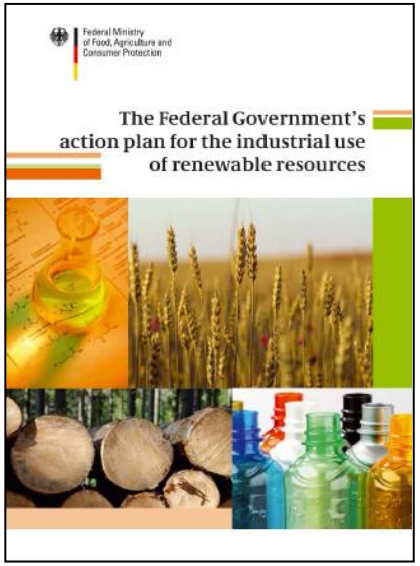
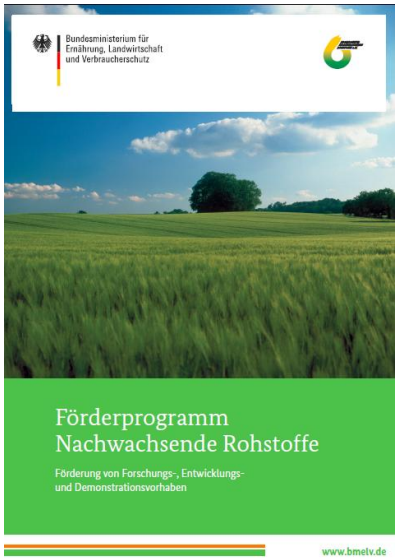
Action Plan Bioenergy



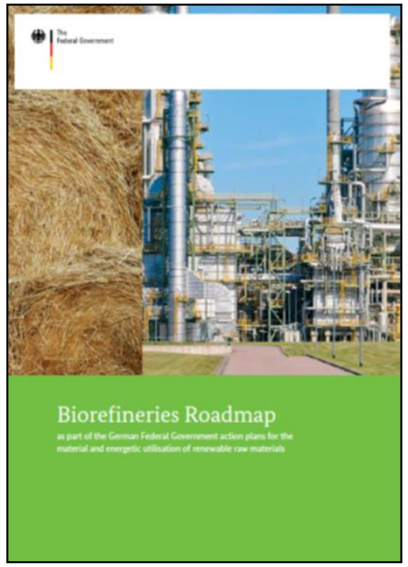
Action Plan Industrial use of renewable resources

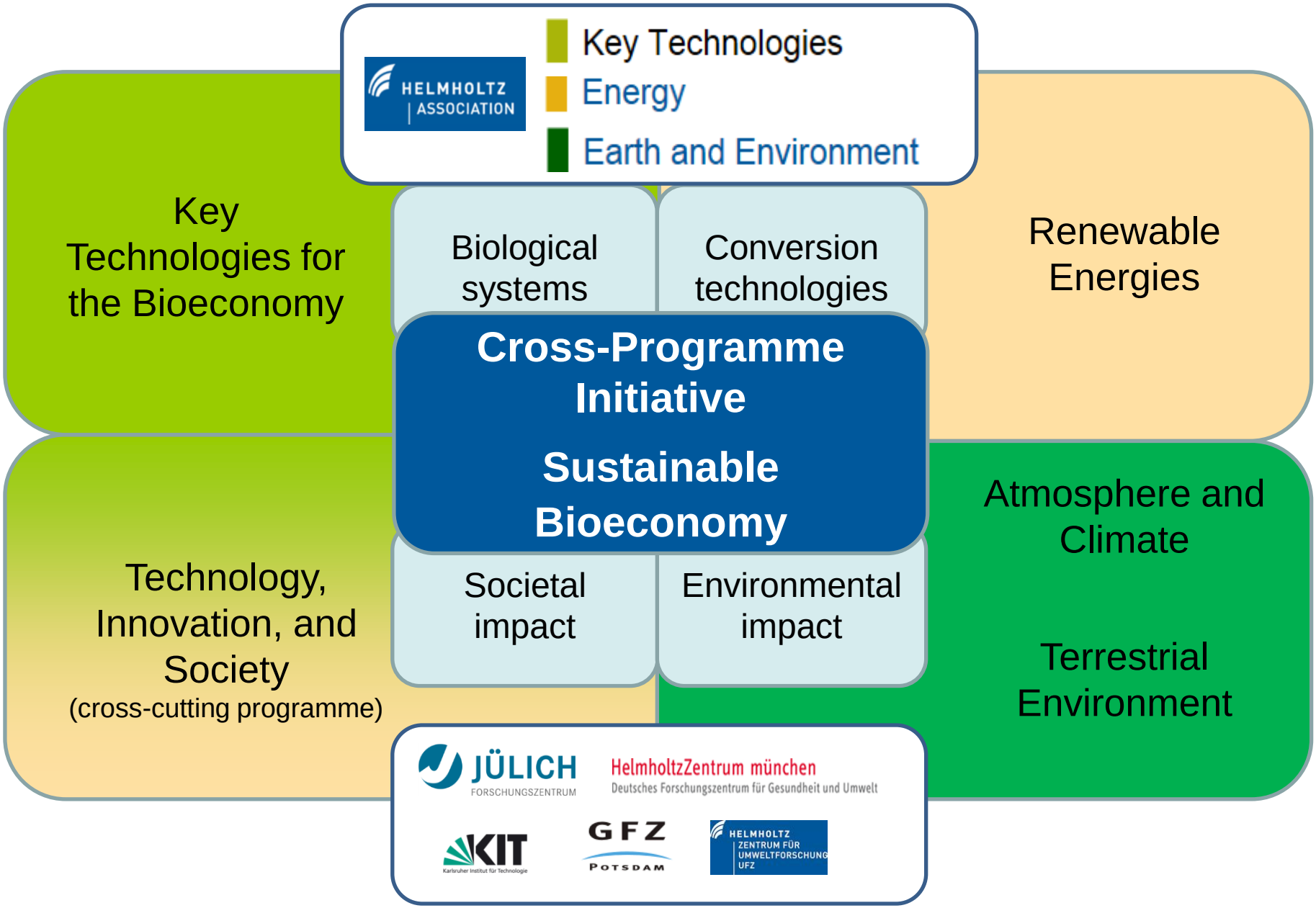


Strategy Renewable resources



Biorefineries Roadmap




HELMHOLTZ ASSOCIATION
Key Technologies
Energy
Earth and Environment
Key Technologies for the Bioeconomy
Biological systems
Conversion technologies
Renewable Energies
Cross-Programme Initiative
Sustainable Bioeconomy
Technology, Innovation, and Society
(cross-cutting programme)
Societal impact
Environmental impact
Atmosphere and Climate
Terrestrial Environment
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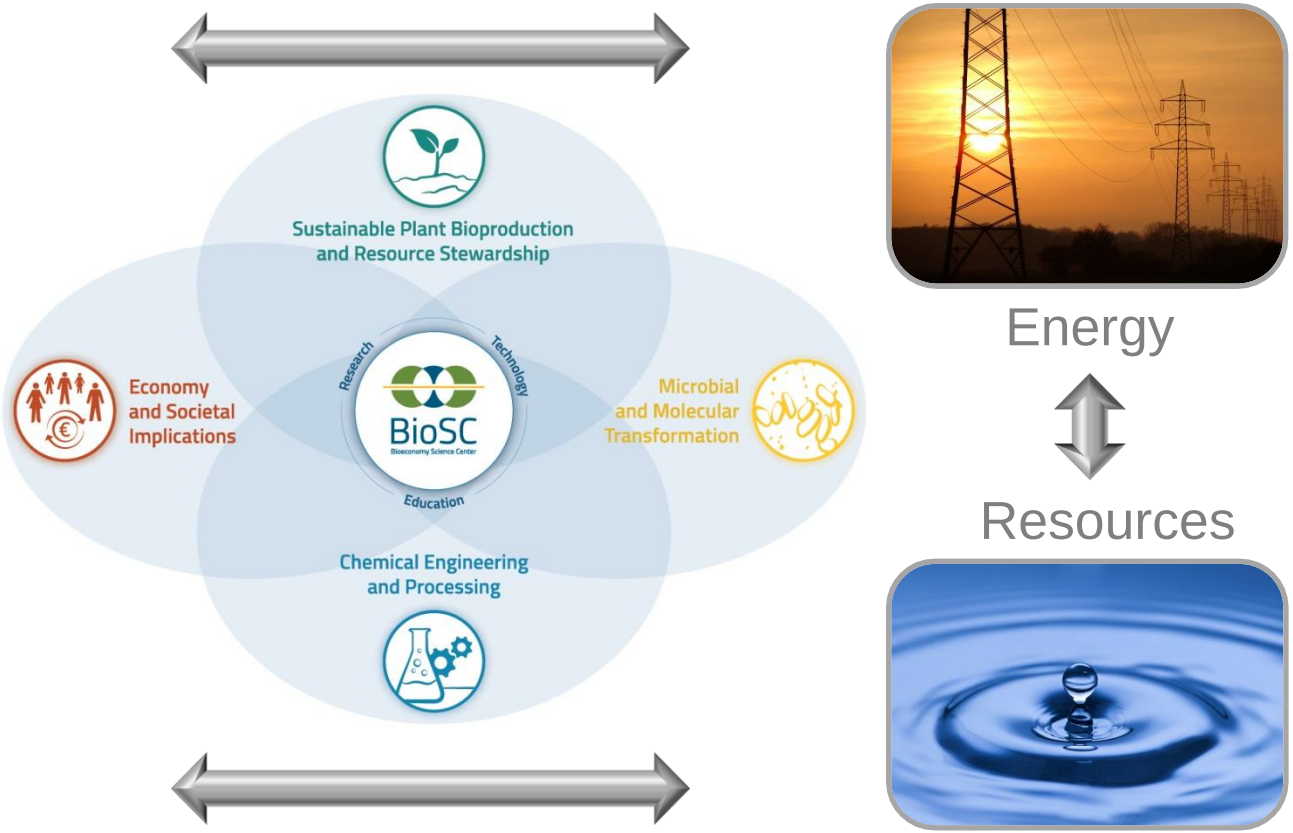
HelmholtzZentrum münchen
Deutsches Forschungszentrum für Gesundheit und Umwelt
KIT
Karlsruher Institut für Technologie
GFZ
POTSDAM
HELMHOLTZ ZENTRUM FÜR UMWELTFORSCHUNG UFZ

Sustainable Bioeconomy

Knowledge about biological systems for adressing grand societal challenges

Climate change

Food/feed

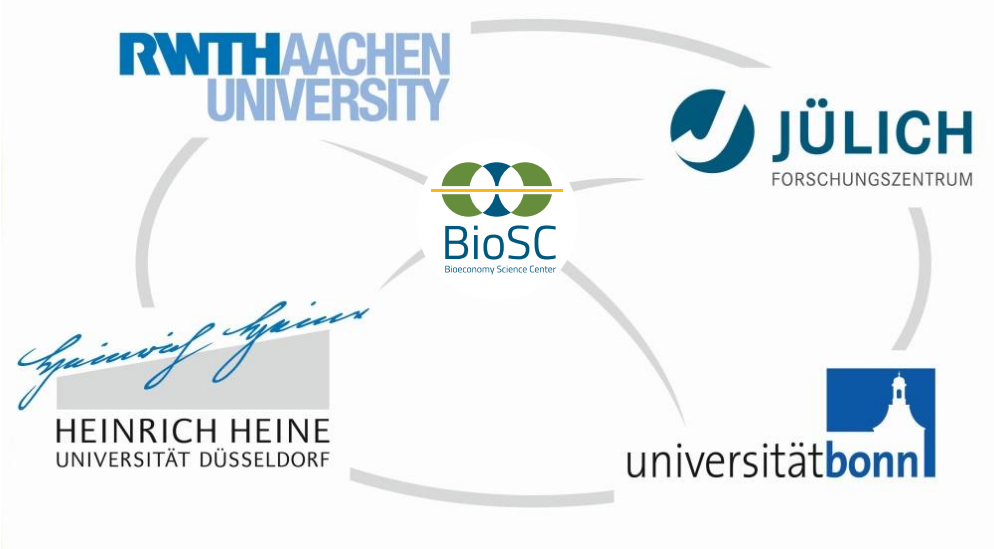


Energy

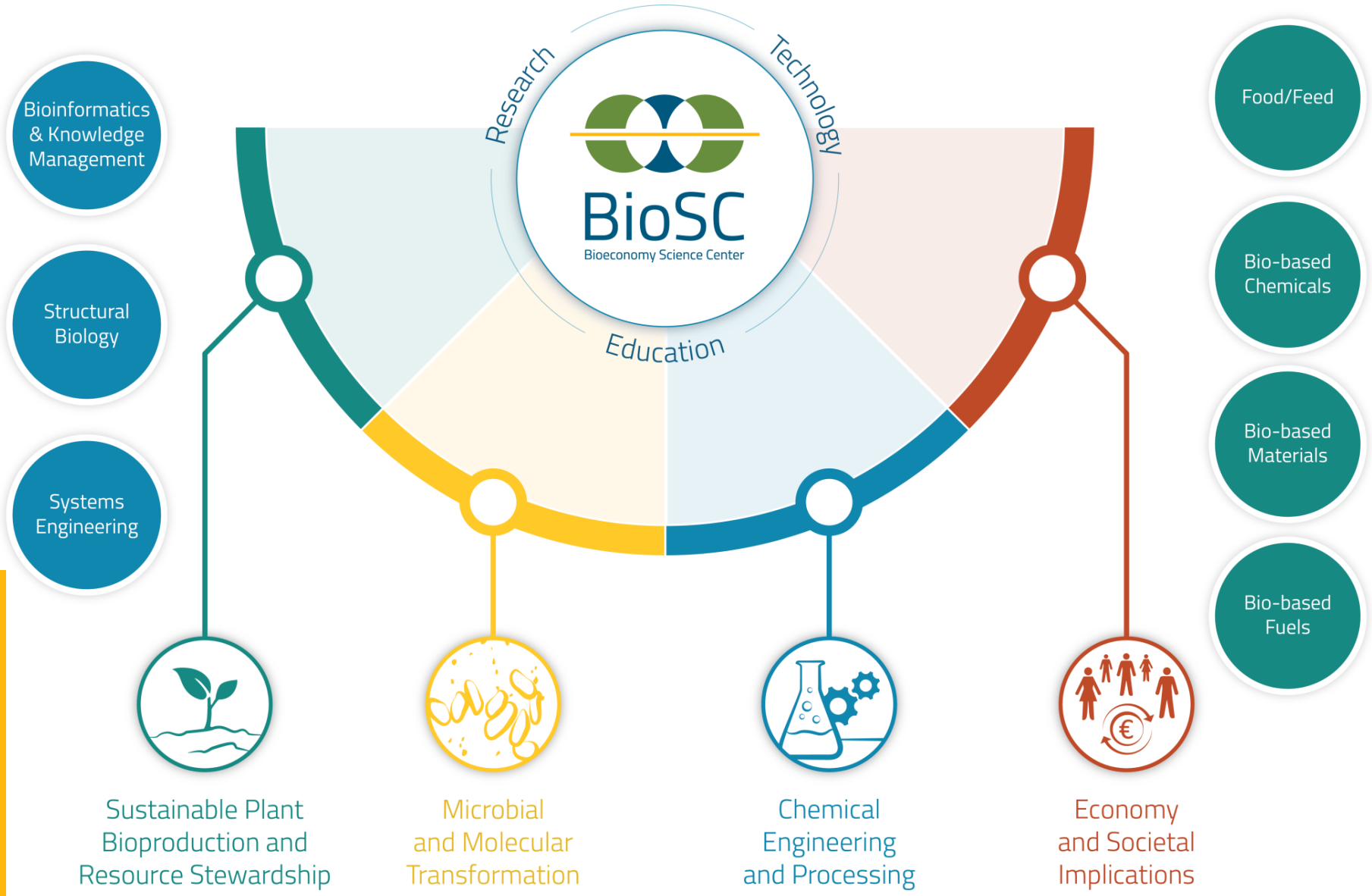
Resources

Research Center BioSC

- Established 2010
- 62 Core Groups, > 1400 staff
- Integration of key disciplines for the provision of biomass, bio-based products and processes, economy
- Vision „Sustainable and integrated bioeconomy“
- Research & education
- Four key research areas, three cross-cutting topics



Competence for Bioeconomy Research



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Sustainable Plant Bioproduction and Resource Stewardship

- Improvement of quality and quantity of biomass
- Improvement of resource use efficiency
- Bio-geo-chemical material cycles and efficient aquisition of nutrients from soils
- Vulnerability and resistence as well as adaptation possibilities of agricultural cropping systems against environmental changes
- Integrative approaches for the evaluation of land use changes

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Microbial and Molecular Transformation

- Methods for the production of bulk and fine chemicals, pharmalogical products, proteins, enzymes, biopolymers from renewable resources.
- Whole cell processes, isolated enzymes and chemical catalysts for effective and efficient transformation of substrates
- Integrative production systems
- New products for the chemical and pharmaceutical industry

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Chemical Engineering of Renewable Resources

Tailor-made Fuels

Low Emission Combustion

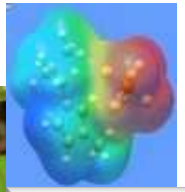
Reaction and Separation Processes

Interacting Product and Process Systems

Reaction Pathways

Bio- and Chemo-Catalysis

Green Solvents



Sustainable Agriculture

Tailored Crops: Composition

Water Technologies

Chemical Engineering:

- principles of material and energy conversion technologies
- systems integration

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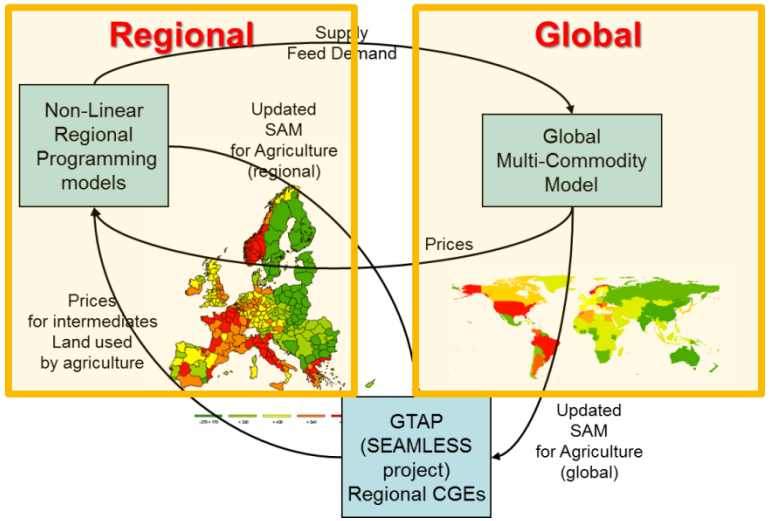
Economy and social implications

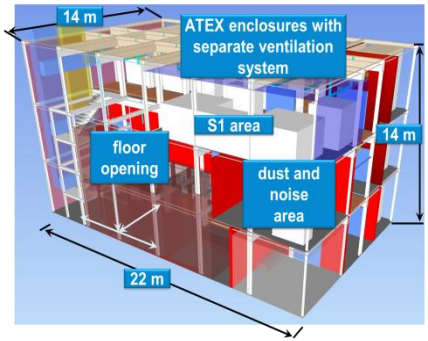
Research Topics:

- Global and regional socioeconomic and economic frameworks and conditions
- Environment and resource economy
- Organisation and management of process and value chains
- Consumer and acceptance



Cooperation in infrastructures

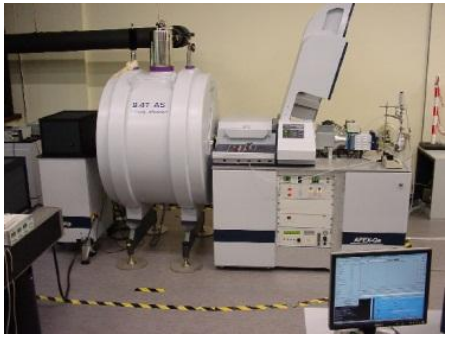
Agricultural experimental sites
(Campus Kleinaltendorf)



Bioraffinery
(NPG²)

Bioinformatics

Phenotyping



Bioanalytics

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Strategic Development of a Bioeconomy Research Infrastructure

- Since 2013 the BioSC is supported by the State of North-Rhine Westphlia on a long term basis
- 10 years funding, 5.8 Mio. €/a
- Instruments to support the integration
- **Research funding**
  - SEED FUND/BOOST FUND
- **Funding of Structural Measures**
  - Strategic Fund
  - Graduate Education Fund

BioSC
Bioeconomy Science Center
NRW-STRATEGIEPROJEKT

Research funding

	SEED FUND	BOOST FUND
Aims	Exploration and development of new, innovative bioeconomy topics	Exploration and further development of innovative and interdisciplinary bioeconomy topics with a high potential for follow-up projects
Application guidelines	Cooperation of at least 2 Gore groups and 2 partner institutions and at least 2 research areas must be adressed	
Funding	Max. 150.000 €/a Max. 12-15 months project duration	Max. 800.000 €/a Max. 24 months project duration

Topics (14 Seed Funds; 11 Boost Fund projects)

- **Biosensorics**
- **Sustainable production of biomass (lignocellulose)**
- **Optimising biomass for specific use**
- **Biocatalysis and expression platforms**
- **High value products (proteins, secondary (plant) metabolites)**
- **Degradation of lignocellulotic biomass** (novel enzymes, optimisation plant)
- **Biorefinery**
- **Waste and resource recovery**
- **Economy, sustainability and innovation in integrated value chains**

Plant Sciences role in Bioeconomy strategy

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Action fields

Securing global nutrition

Sustainable agriculture

Producing healthy and safe foods

Using renewable resources for industry

Developing biomass-based energy carriers

Contribution of plant science

Increase yield

Increase quality

Increase resource use efficiency

Adapt plants to novel utilsation

Optimizing plants bioresources

Overcome bottlenecks in (pre-)breeding (phenotyping, bioinformatics)

Identify novel traits

Improve crop genetic resources

Improve biomass composition

Develop efficient production systems

National Research Strategy BioEconomy 2030

IBG-2: Plant Sciences

Prof.
Uli Schurr,
Director

Prof.
Björn Usadel,
Director

Dr. Andreas Müller
Management

Ecosystem dynamics

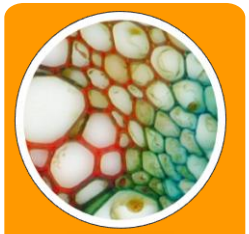
PD Dr. Uwe Rascher

Transport

PD Dr. Heike Schneider

Growth Metabolism

Dr. Shizue Matsubara



Bioinformatic/ Cell walls

Prof. Björn Usadel

Enabling Technology

Dr. Siegfried Jahnke

JPPC
Jülich Plant Phenotyping Centre

Jülich Plant Phenotyping Center

Dr. Fabio Fiorani

IBG-2 Jülich:
Plant sciences for improved resource use efficiency and optimized biomass

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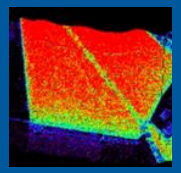
Biomass quality and alternative resources

Selection and screening of novel traits

Identifying novel traits



Next generation infrastructure and technologies

Deutsches Pflanzen Phänotypisierungs-Netzwerk DPPN

Service to plant science community

Associated partners (beyond Helmholtz)

Chemistry and processing

ITMC RWTH Technische Chemie

AVT Aachener Verfahrens-Technik

Breeding and agronomy

universitätbonn INRES

Embrapa

Crop genetic resources

Global Crop Diversity Trust – A Foundation for Food Security

The Global Plant Council

Technology platform

IPK Gatersleben

HelmholtzZentrum münchen – Deutsches Forschungszentrum für Gesundheit und Umwelt