CASEE
Central and South Eastern Europe

BOKU
University of Natural Resources and Life Sciences, Vienna

**6th CASEE Conference**
**Latest Trends in Bioeconomy in Danube Region**
24-26 May 2015, Nitra, SK

# Current Trends in the Development of Regional Bioeconomy Strategies – Do Universities Play a Role?

**Josef Glössl**
Vice Rector for Research and International Research Collaboration
University of Natural Resources and Life Sciences, Vienna, Austria
**www.boku.ac.at**

# Overview

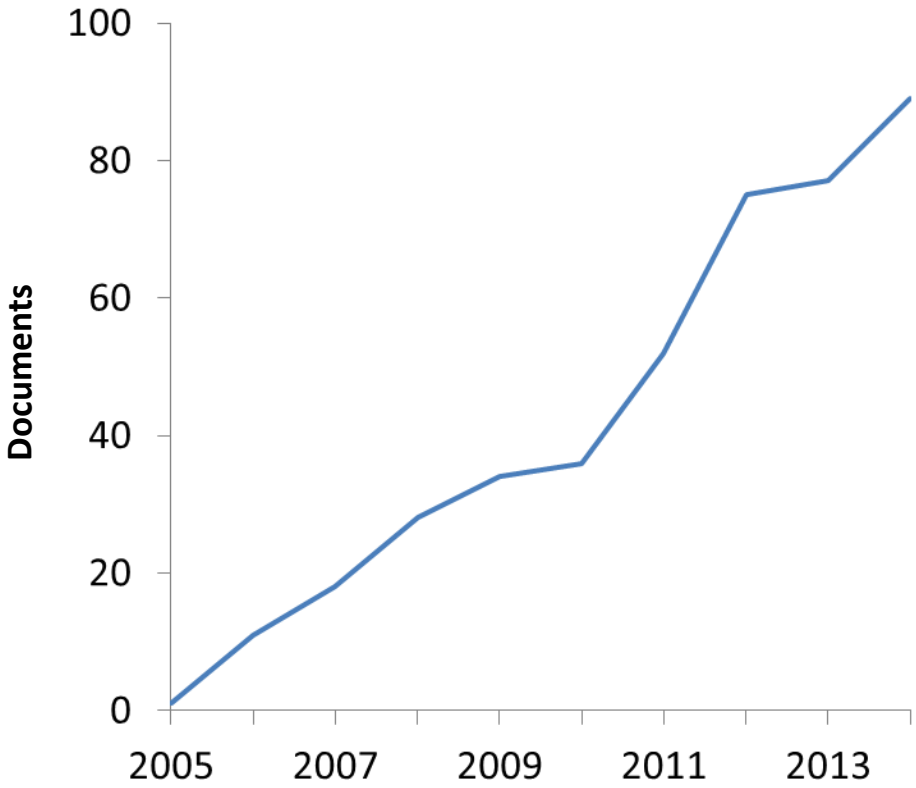
University of Natural Resources and Life Sciences, Vienna

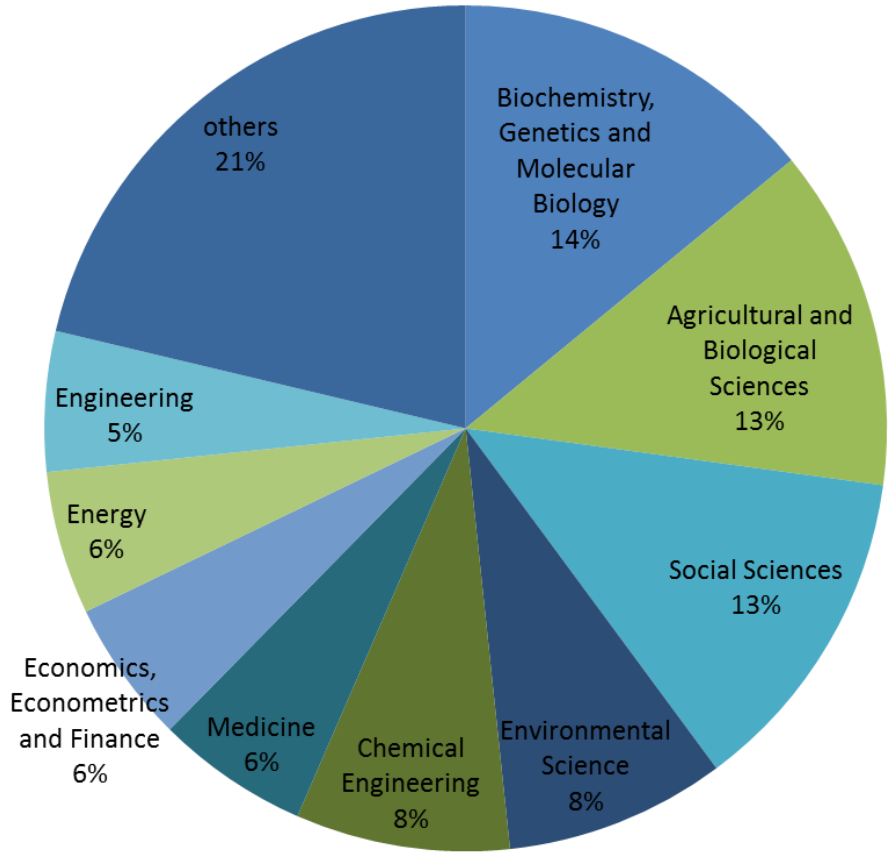
- Introduction
- Definitions of Bioeconomy
- The Bioeconomy in the EU
- National Bioeconomy Strategies
  - Europe and worldwide (Examples, Comparisons)
- The Role of Universities
  - Education in Bioeconomy
  - Research and Technology Transfer
  - Engagement in Policy Development

# Trend in using the term „Bioeconomy“ or „Bio-economy“

University of Natural Resources and Life Sciences, Vienna

Documents containing the term “bioeconomy” or “bio-economy” in title, keywords or abstract

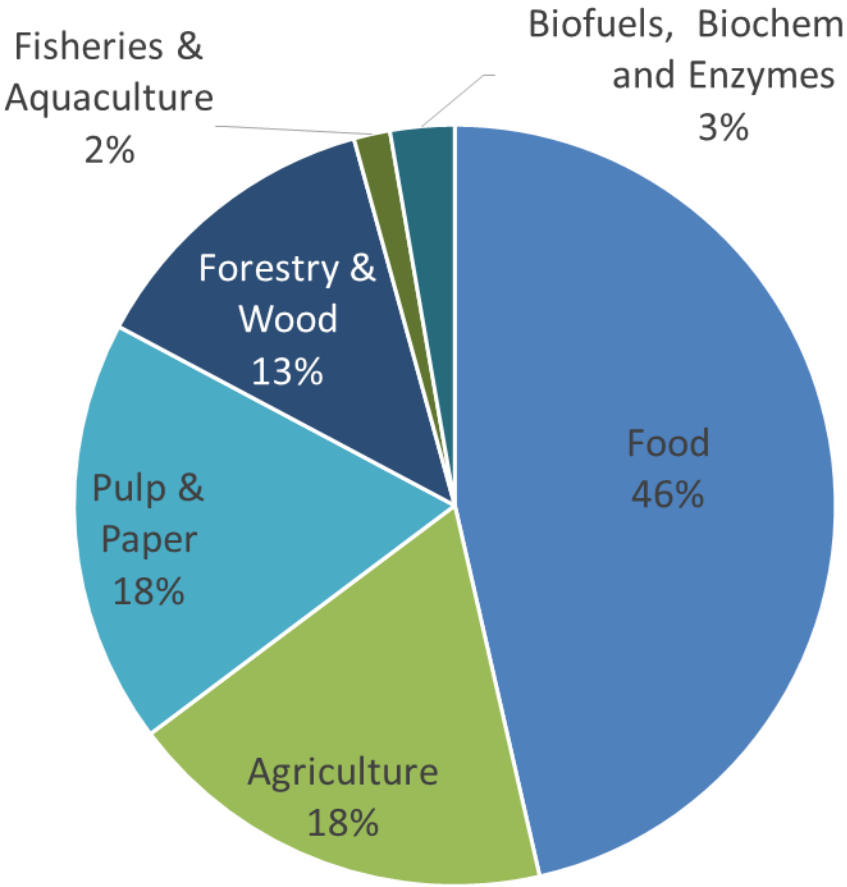


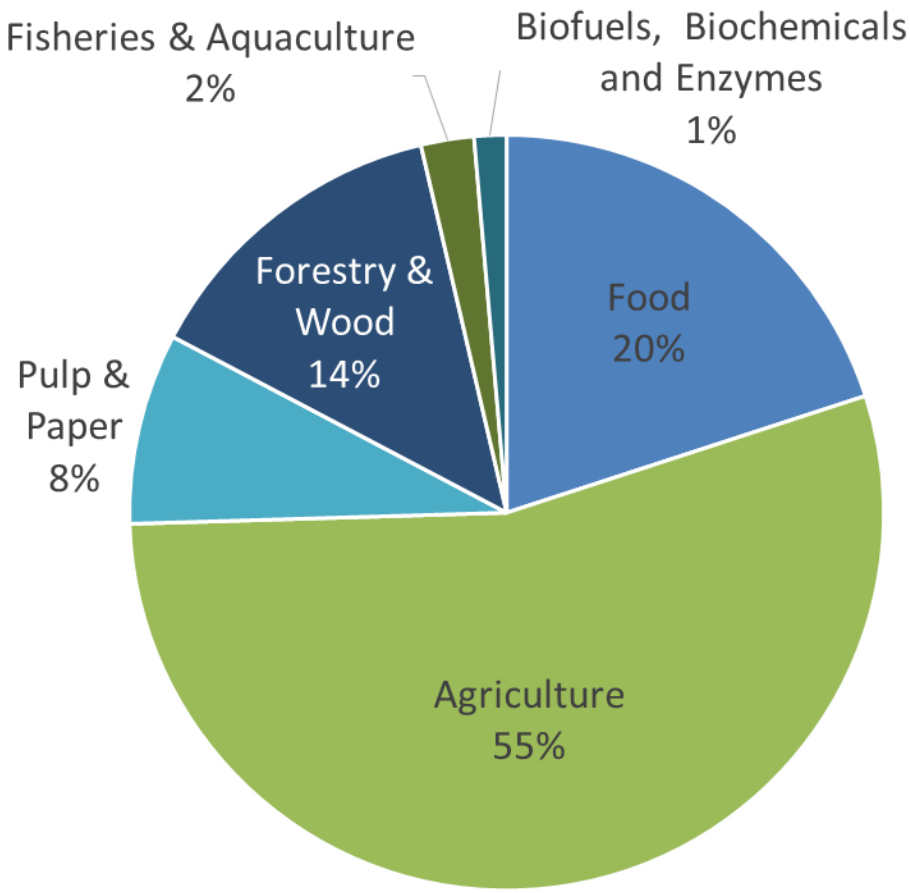

Source: www.scopus.com

# The Bioeconomy in the EU – turnover and employment

University of Natural Resources and Life Sciences, Vienna




2.1 billion €/a turnover (17% of GDP)




22 million employees (9% of workforce)

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# The bioeconomy in the EU – Definition and sectors

University of Natural Resources and Life Sciences, Vienna

**2005: KBBE – Knowledge Based Bio-Economy**
**2012: Bioeconomy Strategy and Action Plan**

AUTHORS

**Leading Body**

- Directorate-General for Science, Research and Innovation

**Contributions**

- DG Agriculture and Rural Development
- DG Maritime Affairs and Fisheries
- DG Environment
- DG Enterprise and Industry


DEFINITION EU 2012

The **bioeconomy** encompasses the production of renewable biological resources and their conversion into food, feed, bio-based products and bioenergy. It includes:

- agriculture,
- forestry,
- fisheries,
- food,
- pulp and paper industries
- parts of chemical, biotechnological and energy industries

# EU Bioeconomy Strategy and Action Plan- Innovating for Sustainable Growth (2012)

University of Natural Resources and Life Sciences, Vienna

**Contributes to objectives of Europe 2020 flagship initiatives e.g. "Innovation Union" and "A Resource Efficient Europe"**




## STRATEGY

**Tackling societal challenges**

- Ensuring food security
- Managing natural resources sustainably
- Reducing dependence on non-renewable resources
- Mitigating and adapting to climate change
- Creating jobs and maintaining European competitiveness

**Developing a coherent bioeconomy**

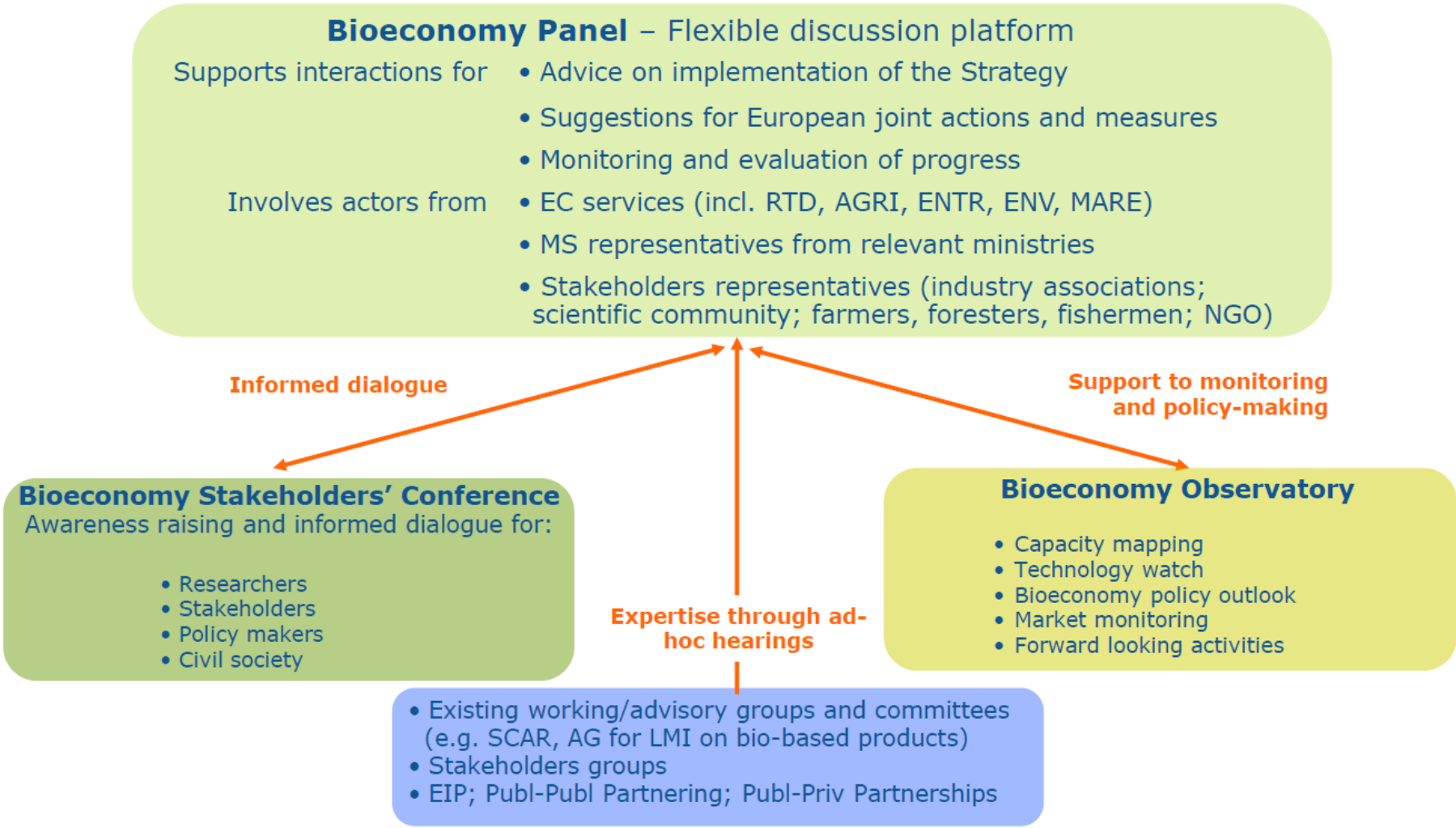
- Investment in knowledge, innovation and skills
- Participative governance and informed dialogue with society
- New infrastructures and instruments

## ACTION PLAN

- Investments in research, innovation and skills
- Reinforced policy interaction and stakeholder engagement
- Enhancement of markets and competitiveness in bioeconomy

# The Bioeconomy in the EU – Policy interactions

University of Natural Resources and Life Sciences, Vienna



# The Bioeconomy in the EU – Bioeconomy Panel

University of Natural Resources and Life Sciences, Vienna

"Create a Bioeconomy Panel that will contribute to enhancing **synergies and coherence between policies, initiatives and economic sectors** related to the bioeconomy at EU level, linking with existing mechanisms (by 2012).." Bioeconomy Action Plan, 2012

## Bioeconomy Panel

- support the interactions between different policy areas and sectors
- 30 members from business and producers, policy-makers and public administrations, scientists and researchers, and civil society organisations
- advice on implementation of the strategy
- 2 **issues papers**, one on **biomass supply** and one on **market-making in the bioeconomy** published in the report "Where next for the European bioeconomy?"

# The Bioeconomy in the EU – Bioeconomy Observatory

University of Natural Resources and Life Sciences, Vienna

"Establish a Bioeconomy Observatory in close collaboration with existing information systems that allows the Commission to regularly **assess the progress and impact of the bioeconomy** and **develop forward-looking and modelling tools** (by 2012). Review progress and update the Strategy at mid-term." Bioeconomy Action Plan, 2012

## 3 PILLARS: RESEARCH, POLICY AND MARKTETS


- Quantitative data on R&I public and private investments in the bioeconomy, at EU and at national level (Eurostat STI data)
- Qualitative information on development of research related to the bioeconomy (CORDIS database)


- Qualitative policy information will be collected on policy initiatives related to the bioeconomy ("policy watch")
  -> **information from member states welcome**


- Data, indicators, models and forward-looking analyses will represent the "core business" of the Bioeconomy Observatory
- reliable quantitative data on biomass used (input) and biobased products (output)

# EU – Stakeholder conferences

University of Natural Resources and Life Sciences, Vienna

**Stakeholder conferences are foreseen within the Action Plan to engage with civil society and promote informed public debates on the development of an EU bioeconomy, associated research and innovation activities and the societal implications.**

## CONFERENCES

**2012 – Copenhagen: Bioeconomy in Action**

Framework conditions required to implement the EC bioeconomy strategy and how best to create partnerships across Europe.

**2013 – Dublin: "Bioeconomy in the EU: achievements and directions for the future".**

Report on achievements - at EU, national, regional and local levels - with respect to the Action Plan and debate future prospects and opportunities for the EU Bioeconomy

**2014 - Torino: "From sectors to system, from concept to reality"**

How to integrate the concept of the Bioeconomy into European policies, fostering stronger policy coordination in a top-down approach at national, regional and local level

# Selected key messages from the BioEconomy Stakeholders Conference 2014 in Torino

University of Natural Resources and Life Sciences, Vienna

- Title "From sectors to system, from concept to reality"
  - Summary conclusions from session *"Human capital: getting the right people with the right skills for the rights jobs"*:
    - Bioeconomy implementation requires education to
      - Provide educated society able to discuss new developments on a basis of knowledge
      - Valorize knowledge from disciplinary excellence
      - Integrate knowledge and form networks for a joint target (= implementing a sustainable Bioeconomy)
      - attract and generate entrepreneurship to make Bioeconomy real

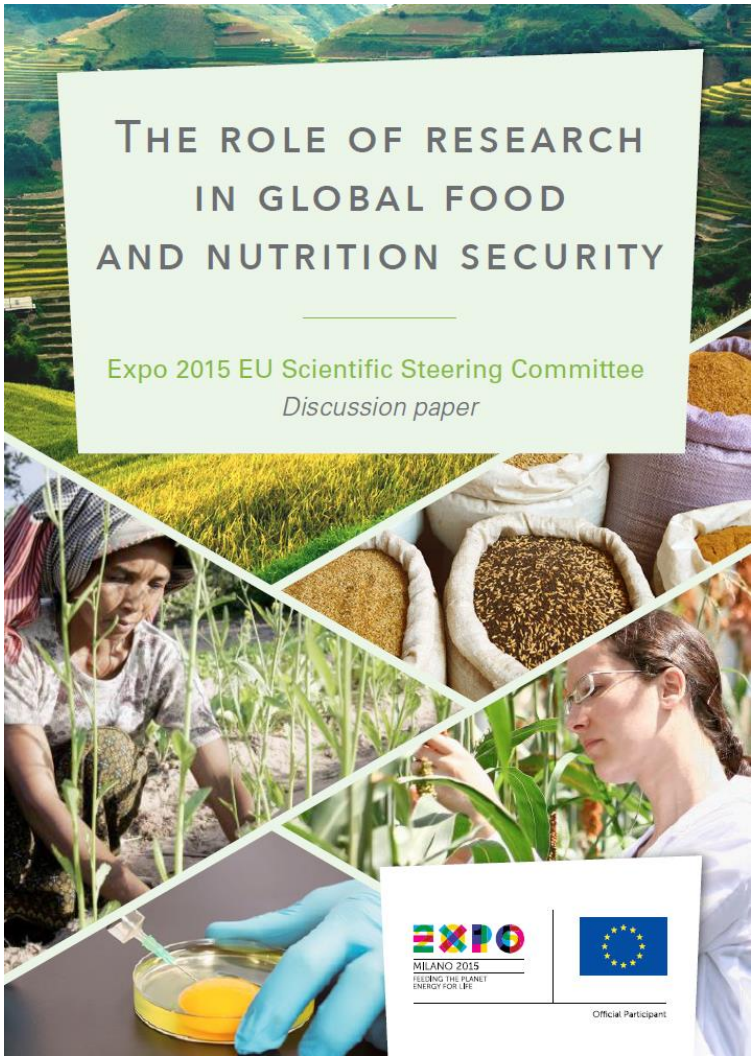
# EXPO 2015 – The role of research in global food and nutrition security

University of Natural Resources and Life Sciences, Vienna

## RESEARCH CHALLENGES

- Improve public health through nutrition – healthy and sustainable consumption
- Increase food safety and quality
- Reduce losses and waste – more efficient food chain
- Manage the land for all ecosystem services – sustainable rural development
- Increase agricultural outputs sustainably – sustainable intensification
- Understand food markets in an increasingly globalised food system
- Increase equity in the food system

The consultation will remain open for contributions until the 1st Sept. 2015



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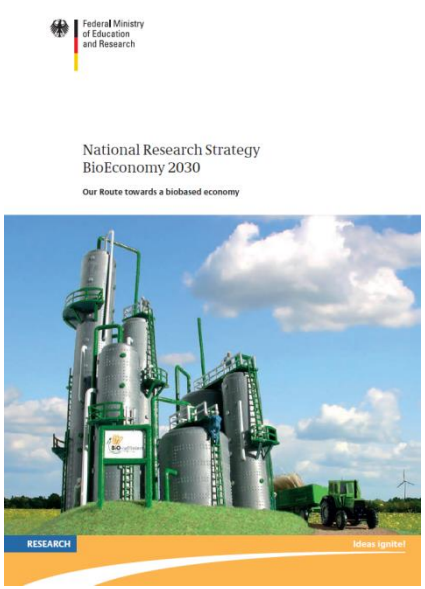
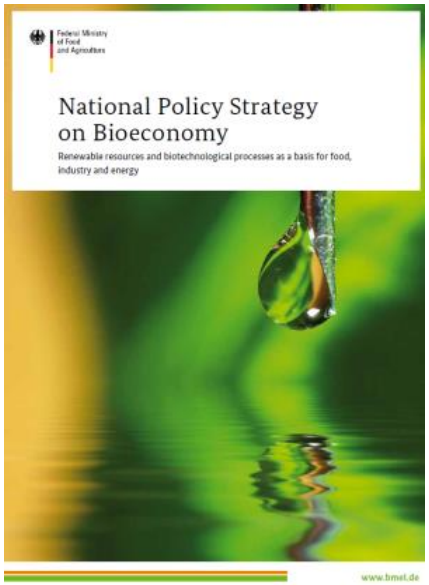
# Germany

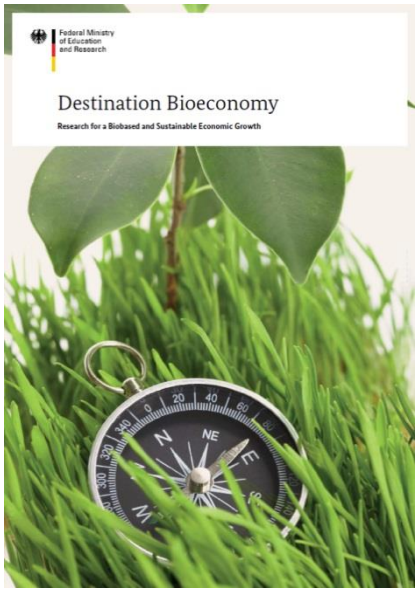
University of Natural Resources and Life Sciences, Vienna

## DOCUMENTS

**2010**
National Research Strategy BioEconomy 2030
**2014**
National Policy Strategy on Bioeconomy
**2014**
Destination Bioeconomy




## AUTHOR

Federal Ministry of Education and Research (BMBF) in collaboration with the Federal Ministry for Food and Agriculture (BMEL), of Economics and Energy (BMWi), for Economic Cooperation and Development (BMZ), for the Environment, Nature Conservation and Nuclear Safety (BMUB), of the Interior (BMI) and the Foreign Office (AA)

# Germany

University of Natural Resources and Life Sciences, Vienna

## DEFINITION

**"Bioeconomy is the knowledge-based production and use of biological resources to provide products, processes and services in all economic sectors within the frame of a sustainable economic system." German Bioeconomy Council**

## SECTORS

agriculture, forestry, horticulture, fisheries and aquaculture, plant and animal breeding, the food and beverage industries, as well as the wood, paper, leather, textile, chemicals and pharmaceutical industries, and aspects of the energy sector

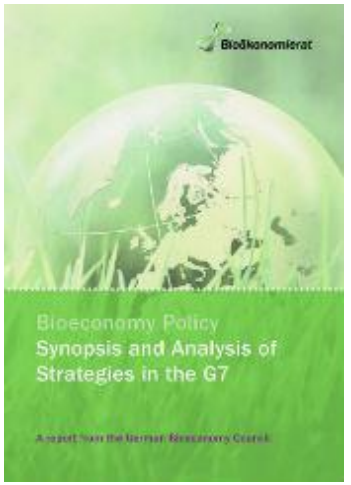
## STRATEGIC GOALS

- become a dynamic research and innovation centre for bio based products, energy, processes and services.
- meet the responsibilities for global nutrition, was well for the protection of the climate, resources, and the environment

# German Bioeconomy Council

University of Natural Resources and Life Sciences, Vienna

- established in 2009 as independent advisory body to the German Federal Government
- 17 members representing the economy, science and society
- 4 working groups on
  - Communication/Public Relations
  - Competition
  - Nutrition and Health
  - Resources, Environment and Nature




**Bioeconomy Policy - Synopsis and Analysis of Strategies in the G7 (15.1.2015)**

**Bioeconomy Council Recommendations**

- Combine disciplines, improve parameters, seek out international partnership
- Priorities in Bioeconomic Research
- Sustainable Use of Bioenergy
- Future Development of Mechanisms for the Support of public and private Research
- Internationalisation of Bioeconomy Research in Germany
- Requirements for a Bioinformatics Infrastructure in Germany for future Research
- The Future of the Food, Nutrition, and Health Sector

# The Finnish bioeconomy strategy – Sustainable growth from bioeconomy

University of Natural Resources and Life Sciences, Vienna

## DEFINITION

**"Bioeconomy refers to an economy that relies on renewable natural resources to produce food, energy, products and services. The bioeconomy will reduce our dependence on fossil natural resources, prevent biodiversity loss and create new economic growth and jobs in line with the principles of sustainable development."**

## AUTHORS

- **Ministries:** Prime Minister's Office, the Ministry of Agriculture and Forestry, the Ministry of the Environment, the Ministry of Education and Culture, the Ministry of Social Affairs and Health, the Ministry of Finance
- **Research institutions:** VTT Technical Research Centre of Finland and the Finnish Innovation Fund Sitra
- **Stakeholder integration:** five consultation workshops, three regional bioeconomy forums and sectoral consultations

# The Finnish bioeconomy strategy – sectors and strategic goals

University of Natural Resources and Life Sciences, Vienna

SECTORS

**Primary production and refining sectors and end product markets:**

- food, bioeconomy products, renewable energy, water treatment and distribution, bioeconomy services

STRATEGIC GOALS

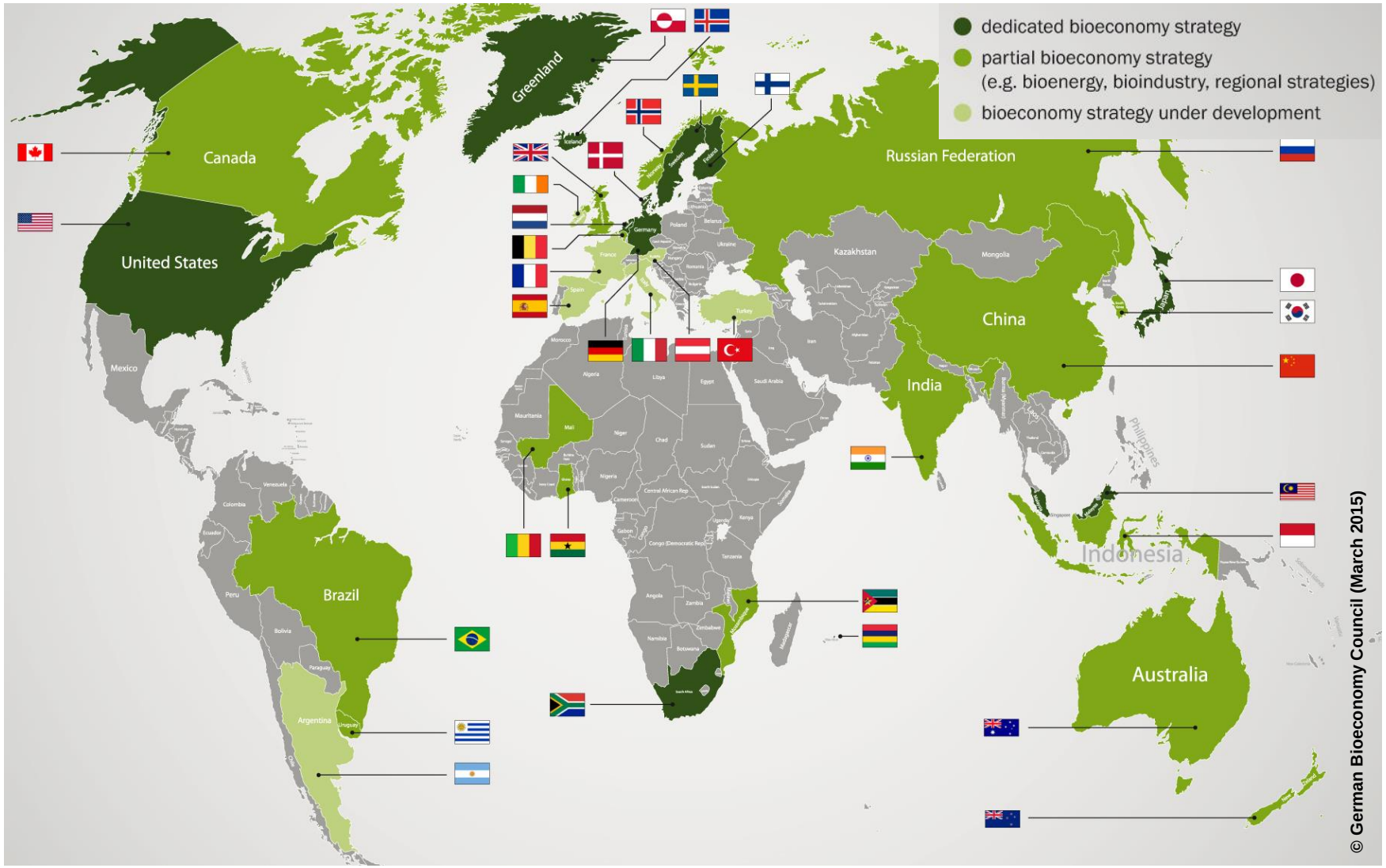
1. **COMPETITIVE OPERATING ENVIRONMENT FOR BIOECONOMY**
   A competitive operating environment will be created for bioeconomy growth
2. **NEW BUSINESS FROM BIOECONOMY**
   New business will be generated in bioeconomy by means of risk financing, bold experiments and crossing of sectoral boundaries
3. **A STRONG BIOECONOMY COMPETENCE BASE**
   The bioeconomy competence base will be upgraded by developing education, training and research
4. **ACCESSIBILITY AND SUSTAINABILITY OF BIOMASSES**
   Availability of biomasses, well-functioning raw material markets and sustainability of the use of biomass will be secured

Implementation and monitoring

Sustainable bioeconomy solutions are the foundation of well-being and competitiveness in Finland

# The global context (I) – International bioeconomy strategies

University of Natural Resources and Life Sciences, Vienna



# Bioeconomy strategies

University of Natural Resources and Life Sciences, Vienna

| | |
|---|---|
| EU | EU Bioeconomy Strategy and Action Plan- Innovating for Sustainable Growth (2012) |
| OECD | The bioeconomy to 2030 – Designing a policy agenda (2009) |
| Brazil | Brazil's National Biodiesel Program (2004), Biotechnology Development Policy (2007) |
| Canada | Blueprint beyond Moose and Mountains (2011), Growing Forward 2 (2013) |
| China | Development Plan for the Bio-Industry |
| Denmark | Agreement on Green Growth (2009) |
| Finland | Finnish Bioeconomy Strategy – Sustainable Growth from Bioeconomy (2014) |
| Germany | National Research Strategy BioEconomy 2030 (2011) ,<br>National Policy Strategy on Bioeconomy (2014), Destination Bioeconomy (2014) |
| Great Britain | UK Bioenergy Strategy (2011),<br>A UK Strategy for Agricultural Technologies (2014) |
| India | National Biotechnology Development Strategy (2014) |
| Japan | Biomass Industrialization Strategy (2013), Biomass Utilization Plan (2009) |
| Malaysia | Bioeconomy Initiative and National Biomass Strategy 2020 (2011) |
| Russia | Bioindustry and Bioresources – BioTech 2030 (2012) |
| South Africa | South Africa – the Bioeconomy Strategy (2013) |
| Sweden | Research and Innovation Strategy for Bio-based Economy (2011) |
| USA | National Bioeconomy Blueprint (2012) |

# USA National bioeconomy Blueprint (2012) Definition and sectors

University of Natural Resources and Life Sciences, Vienna

## DEFINITION

**The bioeconomy stands for "economic activity that is fueled by research and innovation in the biological sciences".**

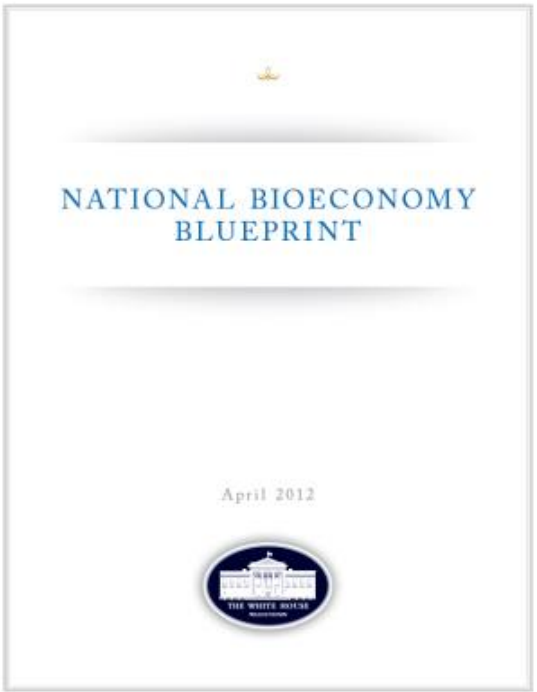
## AUTHORS

**Leading Body**

- White House

**Contributions**

- Department for Agriculture
- State research agencies under the Departments for Agriculture, Economic Affairs, Defense, Energy, National Security, the Interior, Environmental Protection and Health



# USA National bioeconomy Blueprint (2012) technologies and strategic goals

University of Natural Resources and Life Sciences, Vienna

## SECTORS & TECHNOLOGIES

- **sectors**
  biomedical sector, agricultural sector (agriculture, forestry, fishing, and hunting), biotechnology (health, agriculture, and industrial)
- **foundational technologies**
  genetic engineering, DNA sequencing, and automated high-throughput manipulations of biomolecules
- **emerging technologies**
  synthetic biology, proteomics and bioinformatics

## STRATEGIC GOALS

- Support R&D investments
- Facilitate the transition of bioinventions from research lab to market
- Develop and reform regulations to reduce barriers
- Update training programs and align academic institution incentives with student training for national workforce needs
- Identify and support opportunities for the development of public-private

# South Africa – The Bio-economy Strategy (2013)

University of Natural Resources and Life Sciences, Vienna

**National Biotechnology Strategy (2001)**

- commercialisation of technologies that were closer to the market

**Bio-economy Strategy (2013)**

- include disciplines such as information technology, social sciences and engineering
- link biotechnology with agriculture, health and industry sectors

## DEFINITION

**"Bio-economy refers to activities that make use of bioinnovations, based on biological sources, materials and processes to generate sustainable economic, social and environmental development. "**


## AUTHORS

**Department of Science and Technology** with contributions of Departments of Trade and Industry, Health, Agriculture, Forestry and Fisheries, and Environmental Affairs

# South Africa – The Bio-economy Strategy (2013)

University of Natural Resources and Life Sciences, Vienna

## STRATEGIC GOALS

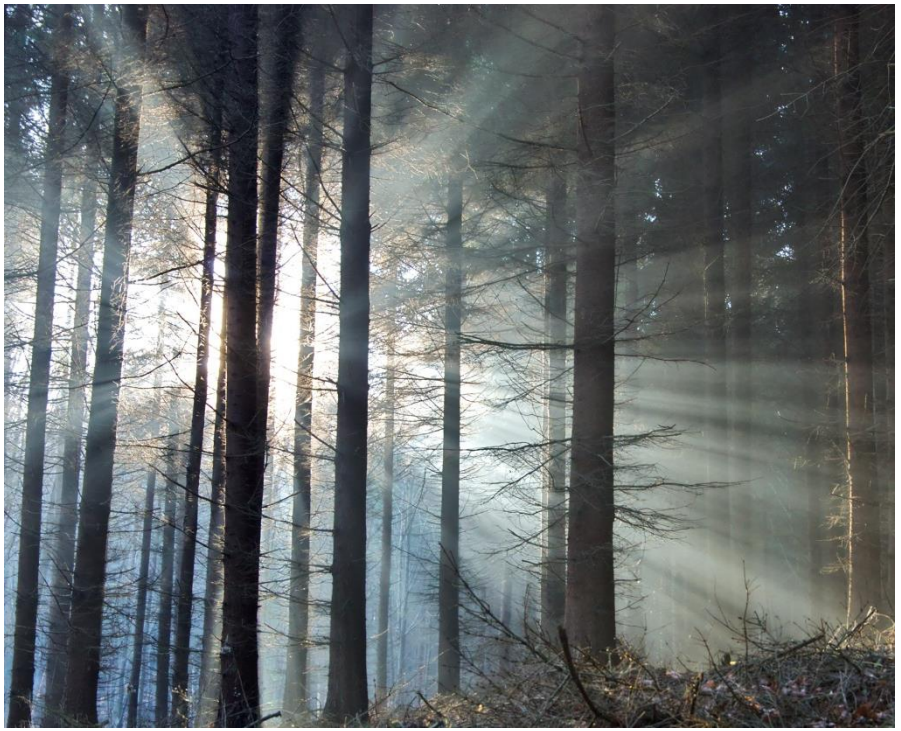
| Agricultural sector | Health sector | Industrial and environmental sector |
|---|---|---|
| • strengthen agricultural biosciences innovation to ensure food security, enhance nutrition and improve health<br>• create jobs through the expansion and intensification of sustainable agricultural production and processing | • strengthen research, development and innovation capabilities to manufacture active pharmaceutical ingredients,vaccines, biopharmaceuticals,<br>• reduce child mortality, improve maternal health and reduce the burden of HIV, malaria and other diseases. | • support research, development and innovation in biological processes for the production of goods and services<br>• enhance water and waste-management practices to support a green economy |

# Differences in bioeconomy strategies

University of Natural Resources and Life Sciences, Vienna

## AIMS

- sustainable raw materials supply
- innovation and economic growth
- ecological transformation of the economy



## PERSPECTIVES

**Sectoral approach**

- Biomass and bioenergy (Brazil, India, Indonesia, Japan, …)
- Biotechnology (USA, Russia, OECD, …) Health biotechnology is included in the USA, Russia, South Africa) and excluded in the EU

**Holistic bioeconomy strategies**
(EU, Germany, Finland, South Africa, …)

## INITIATIVE

**Government**
(EU, USA, Germany, Japan, South Africa)
**Industry** (Canada, Italy, France)

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# Initiatives in Austria towards an Austrian Bioeconomy Strategy (I)

University of Natural Resources and Life Sciences, Vienna

**February 2013**
Dr. Christian Patermann highlights the importance of formulating national bioeconomy strategies at the public event "Science meets Business“ (organized by BOKU )

**November 2013**
BIOS Science Austria and ÖVAF present their Bioeconomy Policy Paper

**November 2013**
The Austrian governement acknowledges the importance of bioeconomy in its working programme

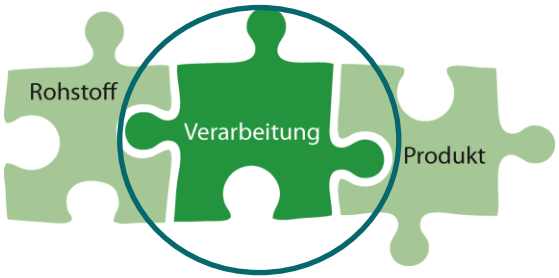
**September 2014**
Cooperation of BIOS/ÖVAF/ÖSF with interministerial RTI-Working Group 2 to work an a bioeconomy position paper for the RTI-Task Force

**October 2014**
Austrian Ministry for Transport, Innovation and Technology (BMVIT) presents its RTI-Strategy for Bio-based Industries (Ganglberger et Sturm 2014)

# Initiatives in Austria towards an Austrian Bioeconomy Strategy (II) – RTI Strategy for biobased industries in Austria

University of Natural Resources and Life Sciences, Vienna

- Development paths for
  - Feedstock
  - Processes
  - Products




- Recommendations
  - Integrated concepts
  - Economic and ecological assessments
  - Networking and cooperation
  - Targeted research support measures
  - Demand-side management

# Initiatives in Austria towards an Austrian Bioeconomy Strategy (III) – Coordination with existing national policies

University of Natural Resources and Life Sciences, Vienna

| | |
|---|---|
| 2010 - April | Austrian Energy Strategy |
| 2010 - June | Austrian Strategy for Sustainable Development |
| 2011 - March | Strategy of the Austrian Federal Government for Research, Technology and Innovation (RTI Strategy) - "Becoming an Innovation Leader" |
| 2011 - July | Eco-Electricity Act 2012 |
| 2011 - November | Climate Protection Law |
| 2012 - January | Action Plan for Increasing the Efficiency of Resources |
| 2012 - May | Austrian Strategy on Climate Change Adaptation |
| 2012 | Austrian Mineral Resources Plan |
| 2014 - July | Energy Efficiency Act → Reduce energy consumption by 20% up to 2020 |

# Initiatives in Austria towards an Austrian Bioeconomy Strategy (IV) – The way forward ...

University of Natural Resources and Life Sciences, Vienna

Goal: Development of a national bioeconomy strategy

The way forward .....

- Designing and „streamling“ the stakeholder process
- Utilization of Austrian key competences
- Networking across sectors and value chains
- Embedding in the European context

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# Dedicated „Bioeconomy“ Curricula

University of Natural Resources and Life Sciences, Vienna

## University of Hohenheim, Germany:

- **Master’s programme Bioeconomy**
  - The students examine the entire value chain of biobased products. This includes:
    - the production of raw materials for biobased products in agricultural economic systems in various climate regions and social contexts;
    - the properties and procurement logistics of biological resources;
    - the biotechnological and industrial processes used to convert these resources into (new) biobased products; and
    - the marketing and consumption of these products.

# Dedicated „Bioeconomy“ Curricula

University of Natural Resources and Life Sciences, Vienna

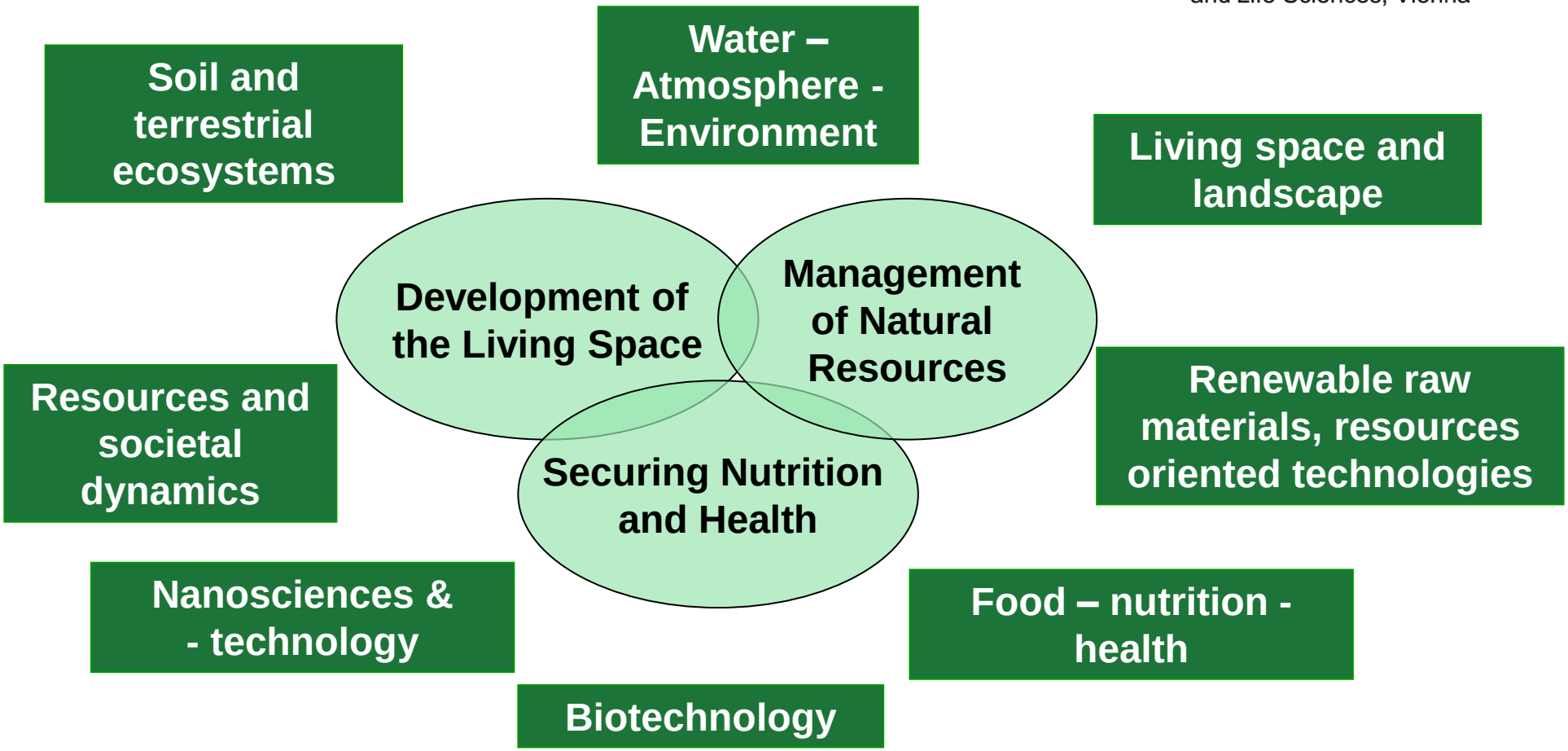
## The University of Edinburgh - Graduate School of Social and Political Science:

- **Masters in Management of Bioeconomy, Innovation and Governance (MSc BIG)**
  - The MSc BIG programme responds to the central challenges of the bioeconomy:
    - Developing sustainable innovation in a responsible manner
    - Identifying and exploiting value throughout innovation ecosystems
    - Bringing new technologies to existing and emerging markets
  - Objective is to enable graduates to excel in strategic and critical thinking that brings globally contextualised solutions to practical problems relating to:
    - innovation and firm strategy;
    - policy and regulation;
    - collaborative R&D models
    - governance and intellectual property

# BOKU University – Themes & Competences

## Interlinking Natural Sciences, Technology & Socio-Economics („Three-Pillars Concept“)

**Universität für Bodenkultur Wien**
University of Natural Resources and Life Sciences, Vienna



# BOKU Bachelor Programs

**Universität für Bodenkultur Wien**
University of Natural Resources
and Life Sciences, Vienna

- Forestry
- Wood and Fibre Technology
- Environment and Bio Resources Management
- Environmental Engineering
- Food Sciences and Biotechnology
- Agricultural Sciences
- Landscape Architecture and Planning
- Equine Sciences

Further information: www.boku4you.at : www.boku4you.at

# BOKU Master Programs

**Universität für Bodenkultur Wien**
University of Natural Resources
and Life Sciences, Vienna

Agricultural and Food Economics (H 457)

Alpine Natural Hazards / Watershed Regulation (477)

Biotechnology (H 418)

Crop Sciences (455)

Environment and Bio-Resources Management (H 427)

Environmental Engineering (H 431)

Food Science and Technology (H 417)

Forestry Science (H 425)

Landscape Architecture and Planning (H 419)

Livestock Sciences (456)

Organic Agricultural Systems and Agroecology (H500)

Phytomedicine (H 422)

Wildlife Ecology and Wildlife Management (H 423)

Wood Technology and Management (H 426)

Further information : www.boku4you.at

# BOKU Master Programs - International

**Universität für Bodenkultur Wien**
University of Natural Resources
and Life Sciences, Vienna

- Animal Breeding and Genetics
- Applied Limnology – Wetland Management
- Environmental Sciences – Soil, Water and Biodiversity
- European Forestry
- Horticultural Sciences
- Material and thermal utilization of renewable raw materials
- Mountain Forestry
- Natural Resources Management and Ecological Engineering
- Organic Agricultural Systems and Agroecology
- Safety in the Food Chain
- Sustainability in Agriculture, Food Production and Food Technology in the Danube Region
- Viticulture, Oenology and Wine Economy
- Water Management and Environmental Engineering

Further information : www.boku4you.at

www.ica-casee.eu

# International Joint Degree Programme
# Danube AgriFood Master

## Sustainability in Agriculture
## Food Production and Food Technology
## in the Danube Region

CASEE
Central and South Eastern Europe

# Why ICA-CASEE Joint Master Program?

Universität für Bodenkultur Wien
University of Natural Resources and Life Sciences, Vienna

- Enormous challenges for **university development** at present
  - Bologna process
  - Excellence in research, education and university management (increasing competition between higher education institutions!)
- Specific challenges for **life science universities** to develop the basis for the future development of mankind
  - Food and water security, environmental protection
  - Sustainable use of natural resources (soil, bioresources, water,..)
  - Development of high-end technological methods in biotechnology (biorefinery, renewable energy,....)
  - Landscape development; town- and country planning
  - And many more.....

Association for European Life Science Universities

Universität für Bodenkultur Wien
University of Natural Resources and Life Sciences, Vienna

# ICA Edu Colloquium at BOKU Vienna:
# „Educating Life Science Graduates Fit for Europe"

**15 /16 April 2015**

**Chair:** Barbara Hinterstoisser, BOKU

Discussion of specific challenges in preparing our life science graduates for careers in Europe and internationally:

**Impulse Panel "Challenges of the Bio-economy for Graduates"**

**Workshops:**

(1) challenges of the intercultural classroom
(2) tools for enhancing the learning experience,
(3) bridging education and practice,
(4) innovation in curriculum development and delivery

**General Goal:** To contribute to the development of the European HE Area

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- National Bioeconomy Strategies
  - Europe and worldwide (Examples, Comparisons)
- **The Role of Universities**
  - Education in Bioeconomy
  - **Research and Technology Transfer: Examples from BOKU**
  - Engagement in Policy Development

# Research at BOKU: Biorefineries for a resource efficient, low-carbon bioeconomy

University of Natural Resources and Life Sciences, Vienna

**Techno-economic assessment using spatially explicit optimization models**

- optimal locations considering the competition for biomass with other sectors
- the economic feasibility of green biorefinery concepts

**Key findings**

- cascade utilization in biorefineries allows for the economic utilization of grassland biomass
- feedstock costs, product prices and yields are the main uncertainties for the economic feasiblity
- current policy support schemes in Austria (and the EU) target primarily the energetic utilization of biomass (e.g. feed-in tariffs)

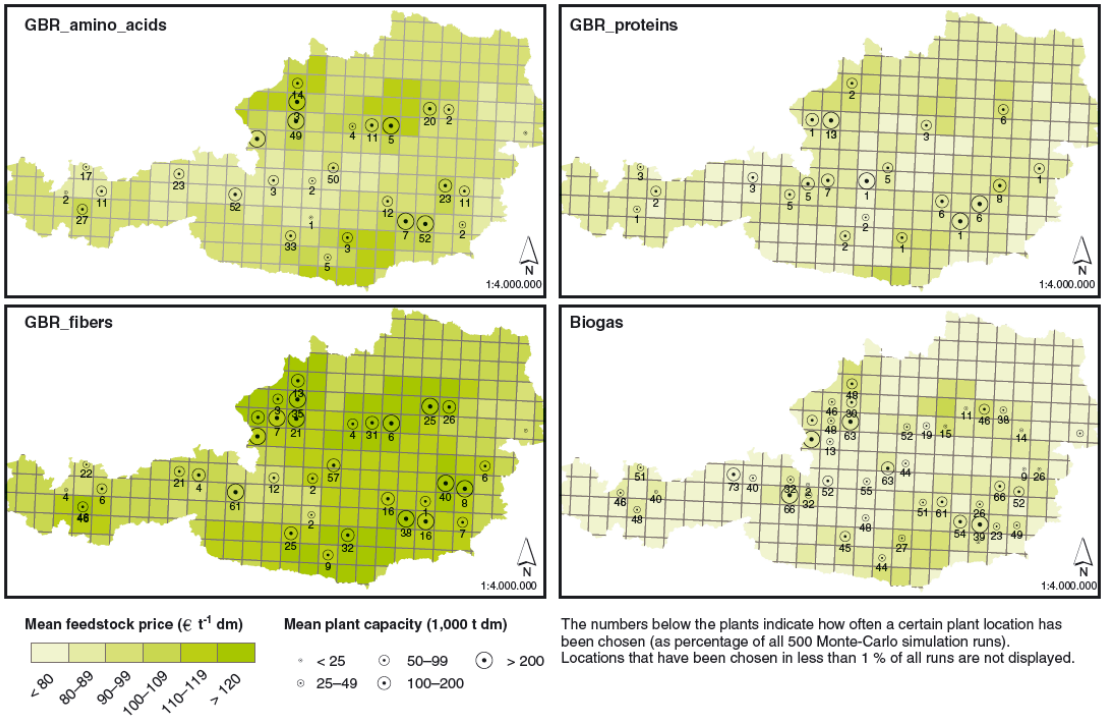



**Figure: Selected locations, capacities and the effect on regional feedstock prices of different green biorefinery concepts**

Biofpr Biofuels Bioproducts & Biorefining

Stefan Höltinger, Johannes Schmidt, Martin Schönhart and Erwin Schmid (2014). A spatially explicit techno-economic assessment of green biorefinery concepts. Biofuels, Bioproducts and Biorefing. 8:325–341.

# Research at BOKU:
# Christian-Doppler Research Laboratory for Innovative Bran Biorefinery (CEREVAL)

**Wolfgang Kneifel, BOKU**

**Christian Doppler Research Laboratory for Innovative Bran Biorefinery**
**Department of Food Science and Technology**
**University of Natural Resources and Life Sciences Vienna**

# The Christian Doppler Research Association...

**„...promotes the cooperation between science and business. Specifically, this takes place in specially established research units with fixed terms, in which application-oriented basic research is pursued.**

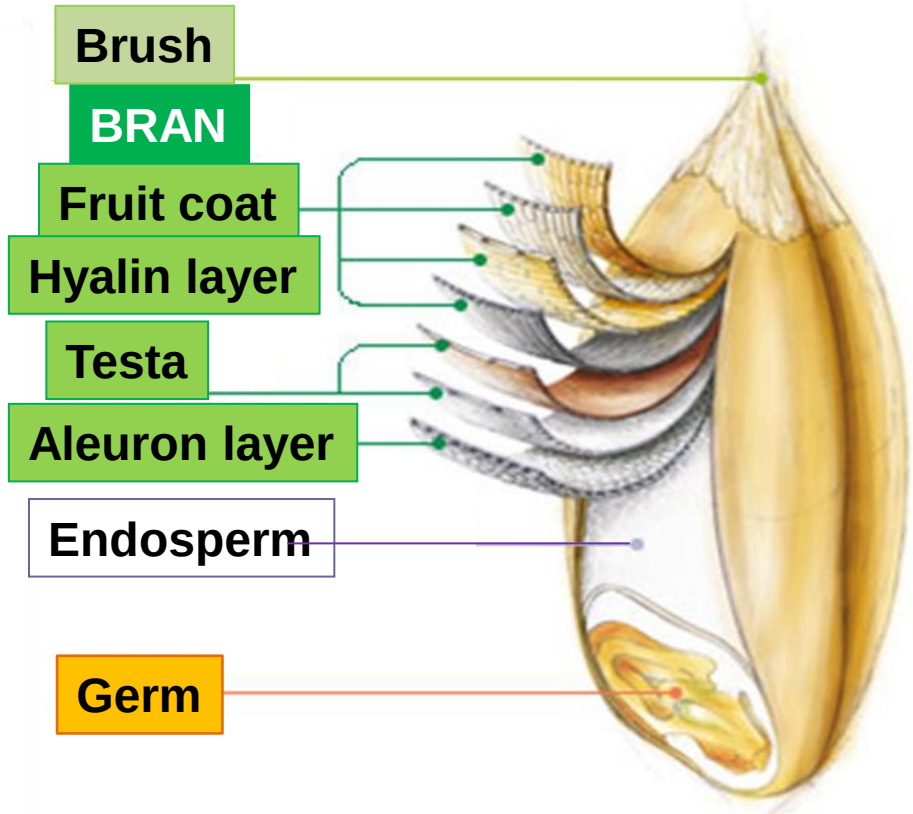
**„...Under the direction of highly qualified scientists, research groups work in close contact with the commercial partners on innovative responses to business-related research issues."**

***industrial partnership + international evaluation + 7 years concept + continuous assessment of output + 50:50 percentage funding + ´responsible science´***

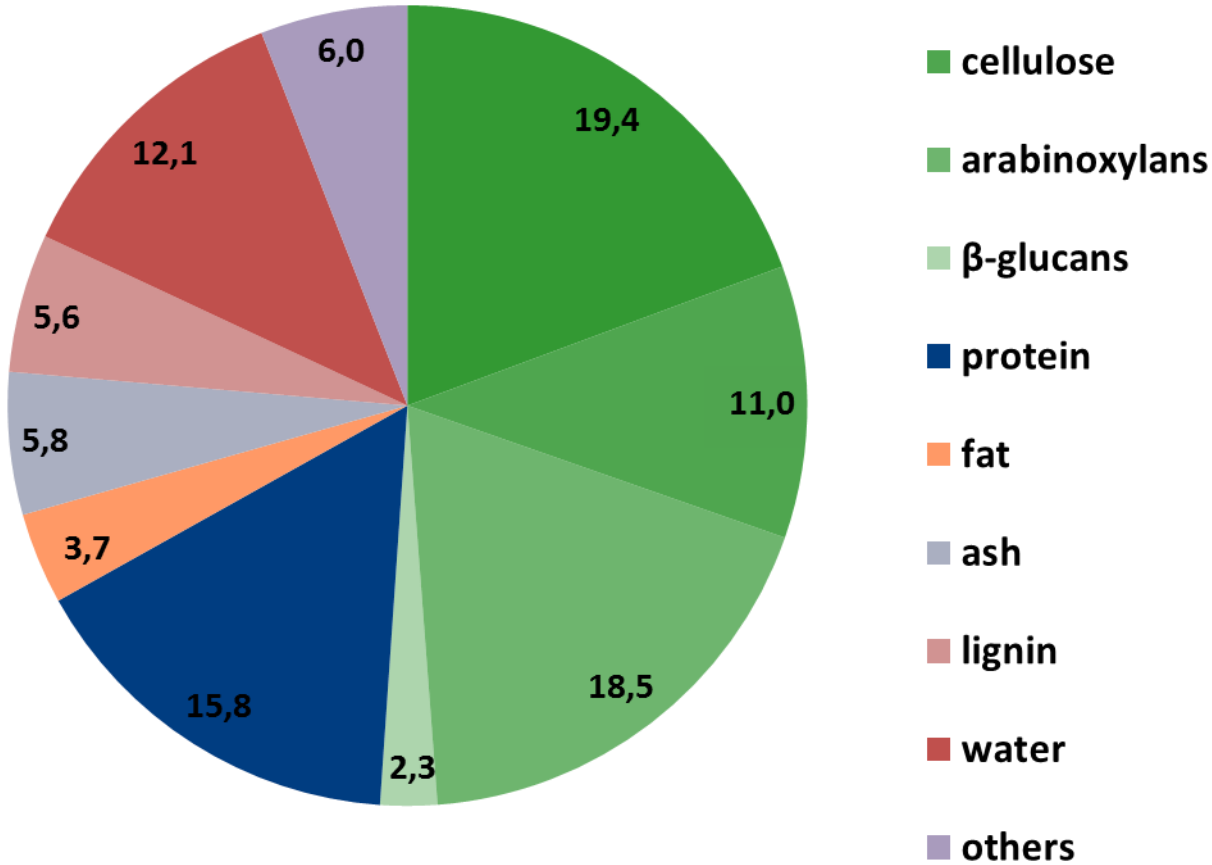
*Further information:* ***www.cdg.ac.at***

# What is Wheat Bran?

- comprises about 20% of the milled wheat kernel
- is composed of different cellular layers (seed coat, fruit coat, hyalin layer, aleuron layer).



# The Value of Wheat Bran



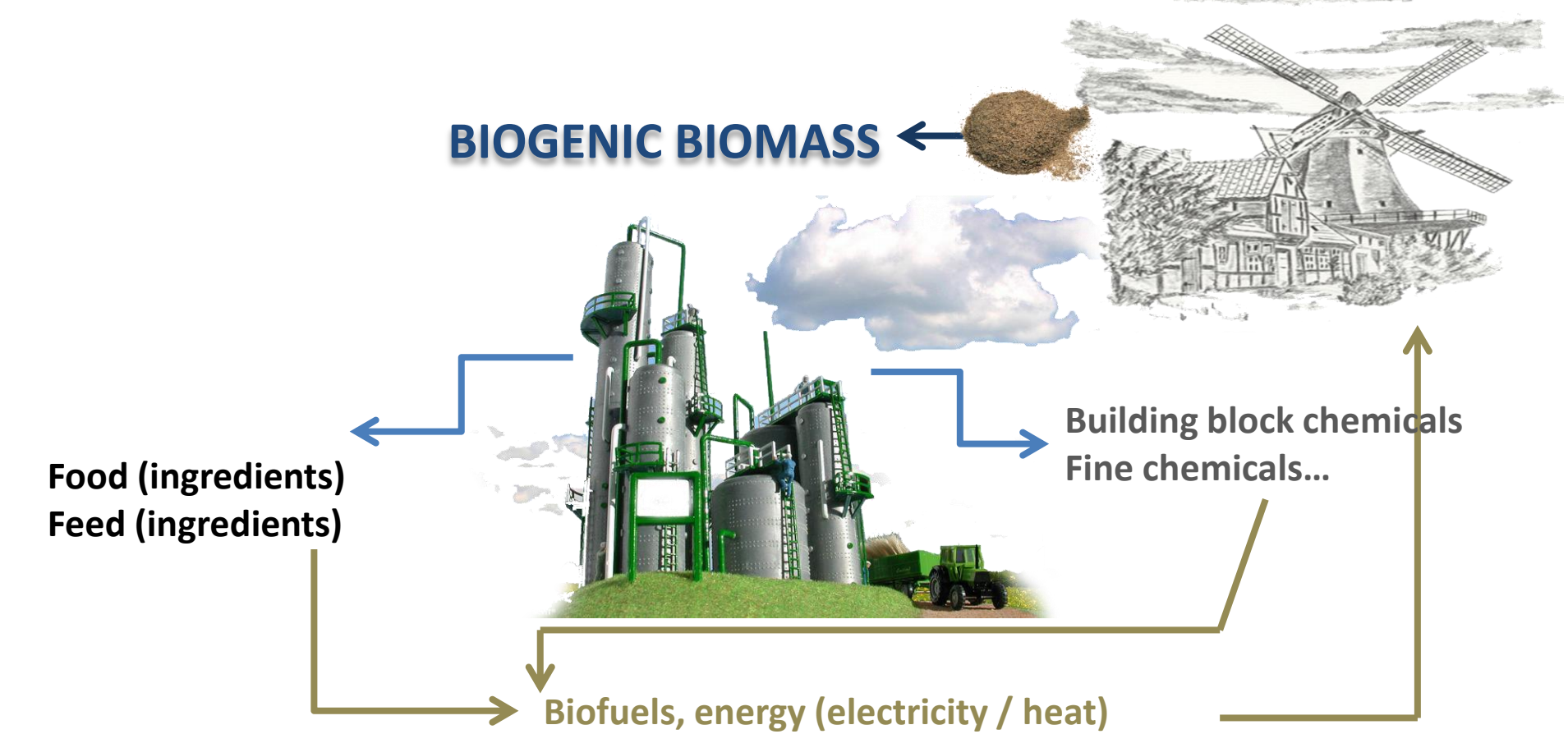
~ 10.5 mio. tons per year

~ 150 mio. tons per year

Major producers:

# Biorefinery: General Aims

## ...substantially and energetically complete utilization of biomass




**(BIO)CHEMISTRY + BIOTECHNOLOGY + PROCESS ENGINEERING + AGRICULTURAL SCIENCE + NUTRITION SCIENCE + MICROBIOLOGY + FOOD & FEED SAFETY + MARKET RESEARCH …**

# The Cascade Principle


DIRECT

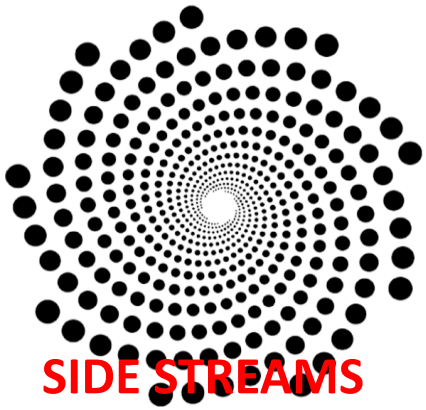
MECHANICAL/THERMAL MODIFICATION

MILD PRE-TREATMENT (THERMAL, ENZYMATIC...)

THERMAL PRETREATMENT (Hydrothermal, Steam explosion, Organosolv...)

SEPARATION PROCESSES

FRACTIONATION PURIFICATION



SIDE STREAMS


# Wheat Bran - Avenues of Utilization




PLATFORM CHEMICALS
& BUILDING BLOCKS

NON-FOOD, FUEL & ENERGY

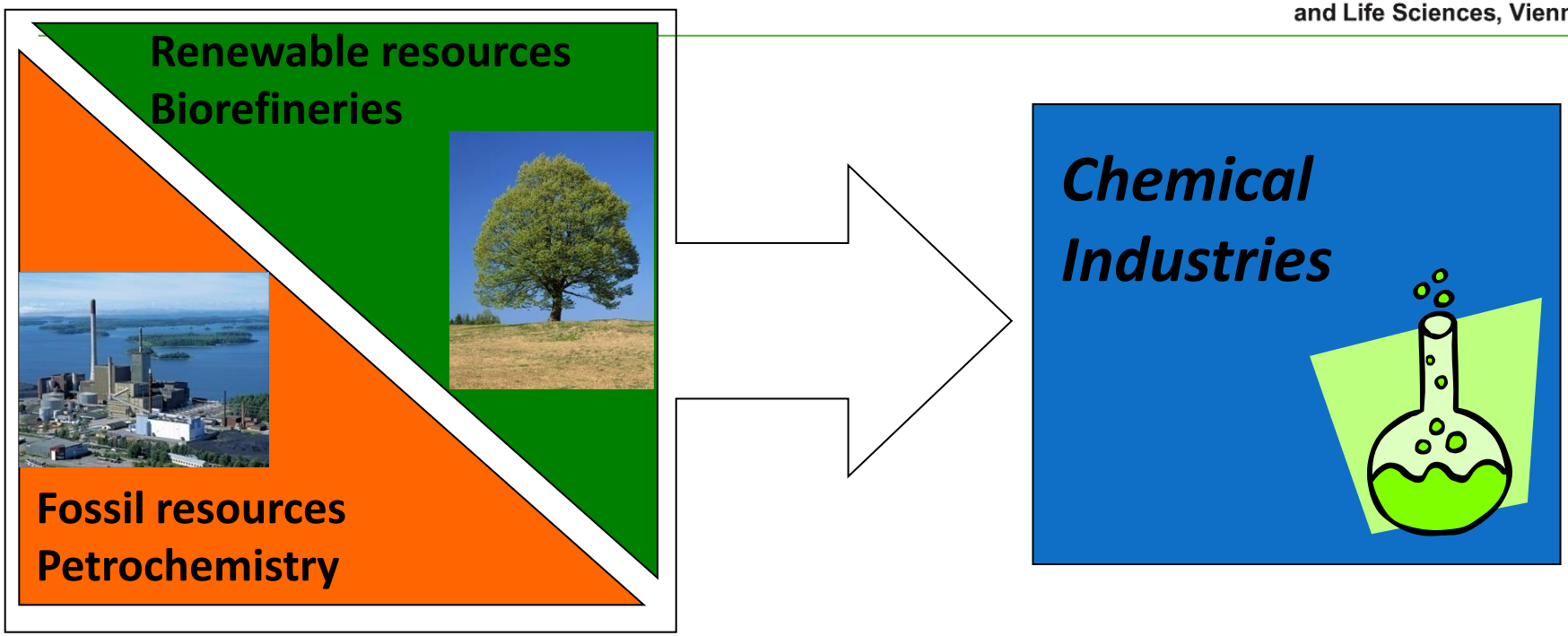
# The chemical basis of „bioeconomies“

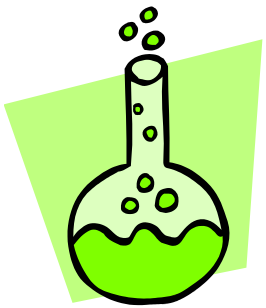
By courtesy of Prof. Thomas Rosenau, BOKU

# Looking into the (far) future

## The basis of the chemical industries, present and future

University of Natural Resources and Life Sciences, Vienna



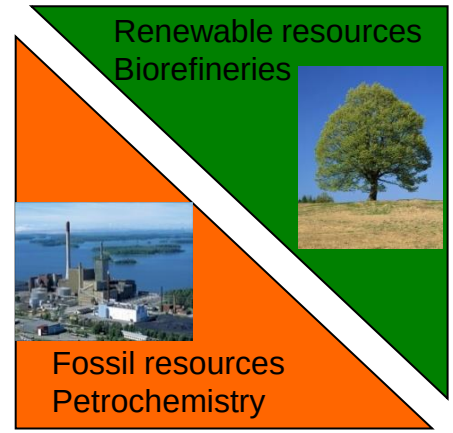
In (far) future, fossil resources WILL be used up.
If mankind is not to fall back into a rudimental, pre-industrial state, the whole production and all flows of the chemical industries will have to be changed from a ***petrochemical basis*** to a ***renewable basis***.
This requires long-term efforts and fundamental research.

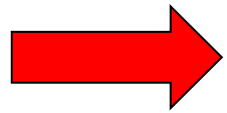
# Energetic *vs.* chemical utilization

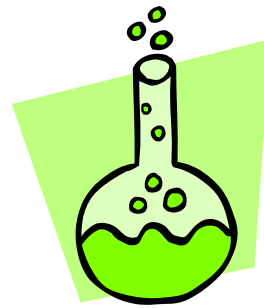
## "Use as matter": chemicals, materials, food, feed

University of Natural Resources and Life Sciences, Vienna

We need "**CARBON**" to produce materials and chemicals.
We don't necessarily need "**CARBON**" for energy production (there are other and better alternatives) !



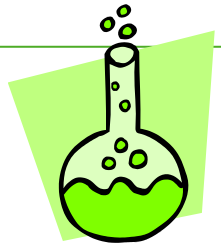





# How green ~~can~~ must & will chemistry get ?

## In evitable general future developments

University of Natural Resources and Life Sciences, Vienna



Material / chemical utilization

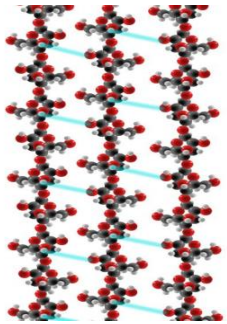
Energetic utilization

Food / feed if possible

Energy / chemicals from food-/feedstock

Cascade utilization

Direct (one-step) utilization



Better use of nature´s ingenuity in synthesis and material production

Extensive breakdown of renewables „green-to-oil“

$CO$, $H_2$, $CH_4$, $C_2H_5OH$

# The Global Challenges University Alliance

Initiated by Prof. Johan Schnürer,
Pro Vice-Chancellor external research collaboration, Swedish University of Agricultural Sciences (SLU)

## Goal:

**Research and Education of the Future Leaders of a Sustainable Bioeconomy**

# The Global Challenges University Alliance

## Co-operation with 4-5 selected leading universities per continent

**(cultural and climate zone diversity)**

**Highest Quality**
**Asia, Oceania, North America, South America, Africa, Europe**

## Stepwise development of network to Alliance through:

- **Thematic Workshops (research) with 6-12 participating universities**

- **Meetings with university leaders (11 universities so far)**

- **Global Challenges Summer Schools (PhD students/MSc students)**

# Global Challenges University Alliance Workshops

**Biofuels and Biorefineries**, September 26-28, 2012
(Cornell University, University of Tokyo, China Agricultural University, National University of Singapore, University of Pretoria, Makerere University, SLU)

**The Future of Food – Security, Quality and Safety**, May 22-24, 2013
(Cornell University, University of Tokyo, China Agricultural University, University of Sao Paolo, University of Ougaddogou, Addis Ababa University, Makerere University, Chulalongkorn University, Bogor Agricultural University, University of Queensland, University of British Colombia, Wageningen University, and SLU)

**Environmental Monitoring of Invasive Species**, September 3-5, 2013
(Cornell, Tokyo, Chulalongkorn, Wageningen, Pretoria, Nicaragua, SLU)

**Green and Sustainable Cities – The Role of Landscape Architecture** , March 12-14, 2014
(Melbourne, Guelph, Tokyo, Putra Malaysia, Lincoln NZ, UNA, St Petersburg, Chulalongkorn, Makerere, Cornell)

**Forestry for the Future**, June 25-27, 2014
(Tokyo, Melbourne, Murdoch(Australia), BOKU(Austria), Florence, University of British Colombia, Putra Malaysia, Makerere, SLU)

**Aquaculture – Providing Food for the Future**, October 22-24, 2014
BOKU, Lilongwe (Malawi), Makerere University, Queensland, Putra Malaysia, Sao Paolo, Stirling (UK), Wageningen, SLU

**Why Wildlife – Global Opportunities and Challenges**, April 2015
Melbourne, BOKU, Sao Paolo, Bolognas, Putra Malaysia, Wageningen, Lincoln, Porto, Pretoria, Sokoine Makarere, UC Davis, SLU

**Agriculture without Antibiotics**, December 2015?

Universität für Bodenkultur Wien
University of Natural Resources and Life Sciences, Vienna

SLU

Global Challenges University Alliance

BOKU

Universität für Bodenkultur Wien
University of Natural Resources and Life Sciences, Vienna

# Some Expected Benefits

## University Management:

**Strategic support and funding**

- Institutional benchmarking
- Enhanced internationalization
- Global network for large research programs
- Collective Dialogue EU, UN, ASEAN, OECD, etc

## Researchers:

**Scientific expertise**

- New projects (bilateral – multilateral–global)
- New interdisciplinary insights

## Students (PhD/MSc):

**Curiosity/Creativity:**

- Enhanced awareness of global challenges
- Lifelong global network of colleagues early in careers in academia, business, government,….

# *The Global Challenges University Alliance 2016?*

Global Challenges University Alliance

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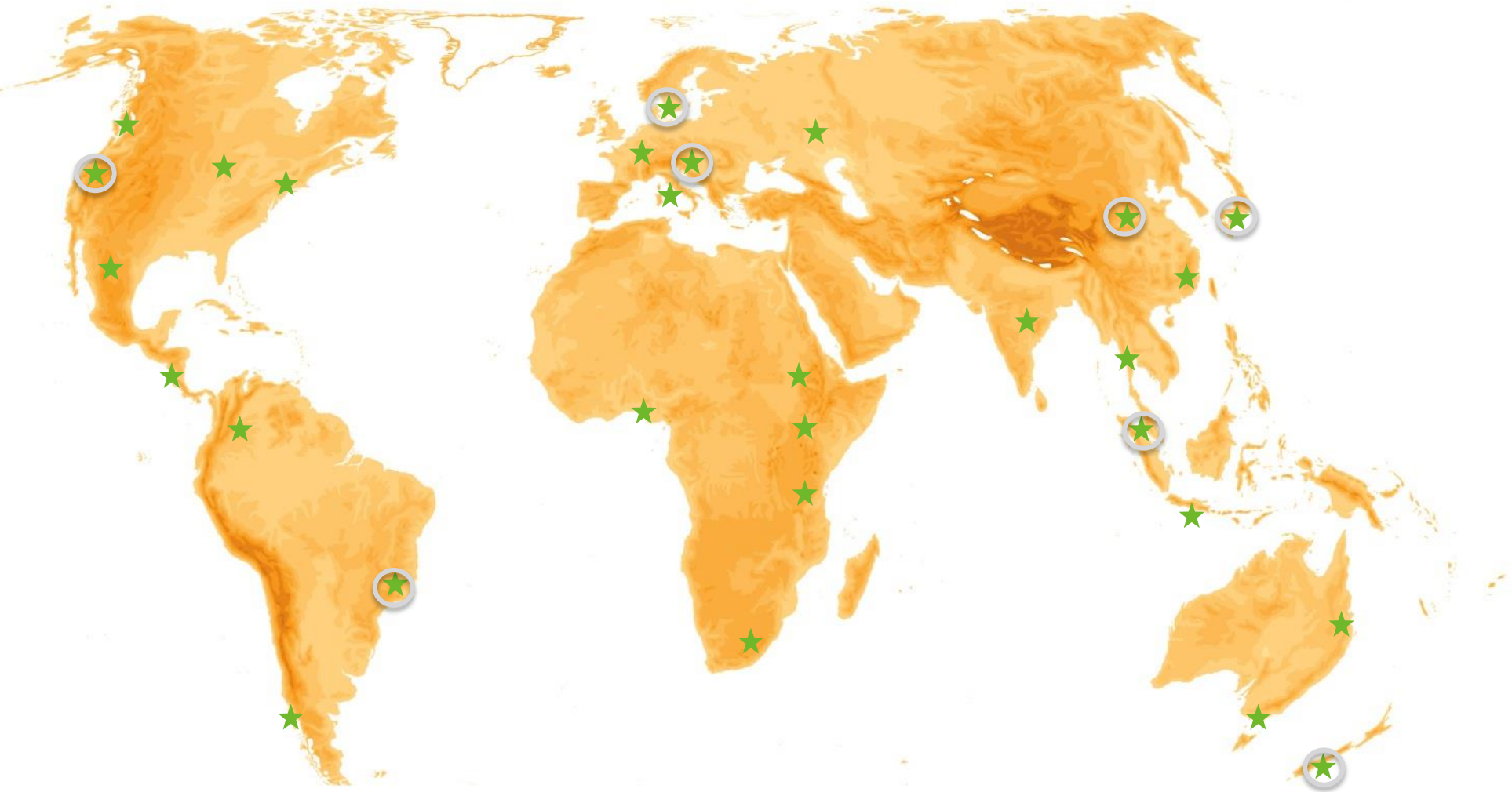

## *The 25 Global Challenges Universities*

***(Both committed, interested and possible universities indicated)***

# Some Conclusions

University of Natural Resources and Life Sciences, Vienna

**Multiple roles of Universities in the development of European Bioeconomies !**

**→ requires new science policies and important new skills, fostering:**

- Integrated approaches of research, education and co-operation Academia – Industry and across sectors →→ innovation processes
- Complementary partnerships between universities, research centres, …
  - joint curricula
  - Inter- and multidsiciplinary approaches
  - …..
- Knowledge and technology transfer

- Development of sustainability as a big chance for economic development:
- **→ Multidisciplinary integration of traditional approaches with high-end (bio)technologies is a key issue in the development of a European Bioeconomy**
- **Public awareness, communication science – society**

CASEE
Central and South Eastern Europe

BOKU
University of Natural Resources and Life Sciences, Vienna

# 6th CASEE Conference
# Latest Trends in Bioeconomy in Danube Region

24-26 May 2015, Nitra, SK

## THANKS FOR YOUR ATTENTION!

**Josef Glössl**
Vice Rector for Research and International Research Collaboration
University of Natural Resources and Life Sciences, Vienna, Austria

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