



# Forest Products: Part of a New Bioeconomy

2018

February 5-8

Fairmont Queen Elizabeth Hotel  
Montreal, Qc, Canada



IEA Bioenergy

*Task42 - Biorefining in a Future BioEconomy*

The IEA Bioenergy Task 42 Perspective for  
Biorefining in a Growing Bioeconomy  
Bert Annevelink



Building for the New  
Pulp and Paper  
Community

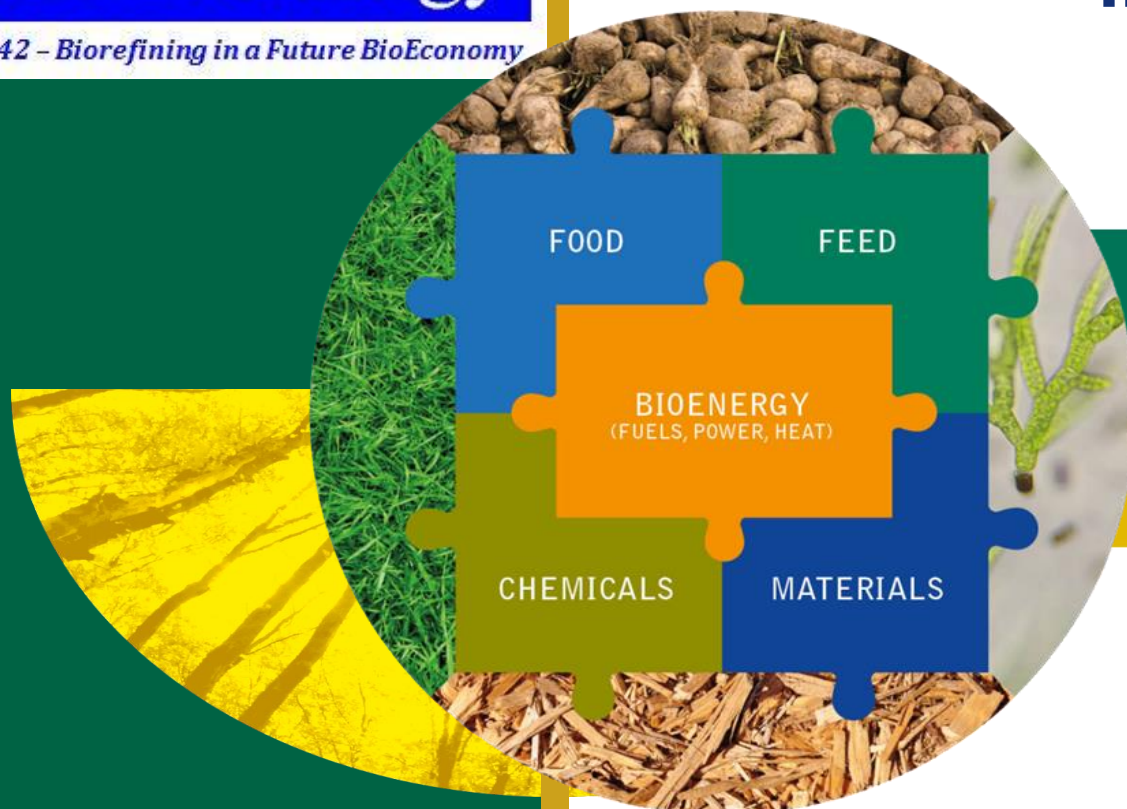


IEA Bioenergy

IEA Bioenergy

Task42 - Biorefining in a Future BioEconomy

# The IEA Bioenergy Task 42 Perspective for Biorefining in a Growing Bioeconomy



**Bert Annevelink**

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Wageningen Food and Biobased Research (WFBR)

BIOFOR International, Montréal, Canada,  
6<sup>th</sup> of February 2018



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# Content

- IEA Bioenergy Task 42 Biorefining in a Future BioEconomy
- Role of Biorefinery in a Circular Bioeconomy
- Information from recent workshops
- Take home messages

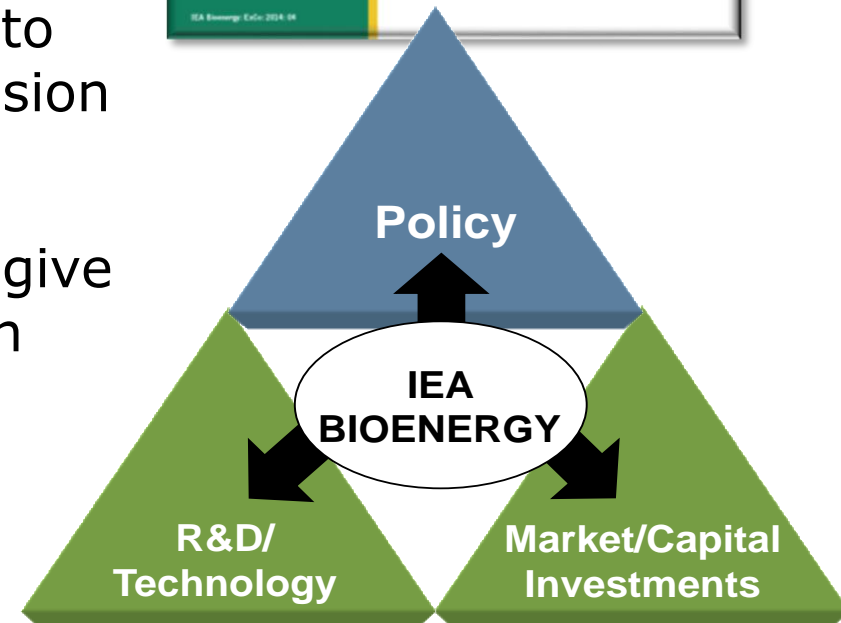
# **IEA Bioenergy Task42 Biorefining in a Future BioEconomy**

# IEA Bioenergy TCP

Technology Collaboration Programme (TCP), functioning within a framework created by IEA

Goal: Facilitate the commercialisation and market deployment of **environmentally sound, socially acceptable and cost-competitive bioenergy systems** and technologies and to advise policy and industrial decision makers accordingly

Key Role: Independent body to give clear and verified information on bioenergy



# IEA Bioenergy: 23 Contracting Parties

## EUROPE:

- Austria
- Belgium
- Croatia
- Denmark
- European Commission
- Finland
- France
- Germany
- Ireland
- Italy
- Netherlands
- Norway
- Sweden
- Switzerland
- United Kingdom

## ASIA/OCEANIA/AFRICA

- Japan
- Korea
- Australia
- New Zealand
- South Africa

## AMERICA'S

- Brazil
- Canada
- United States

### IEA Bioenergy TCP

Budget in 2017:  
1,76 Million US\$

Tasks: 11

Task participation: 98

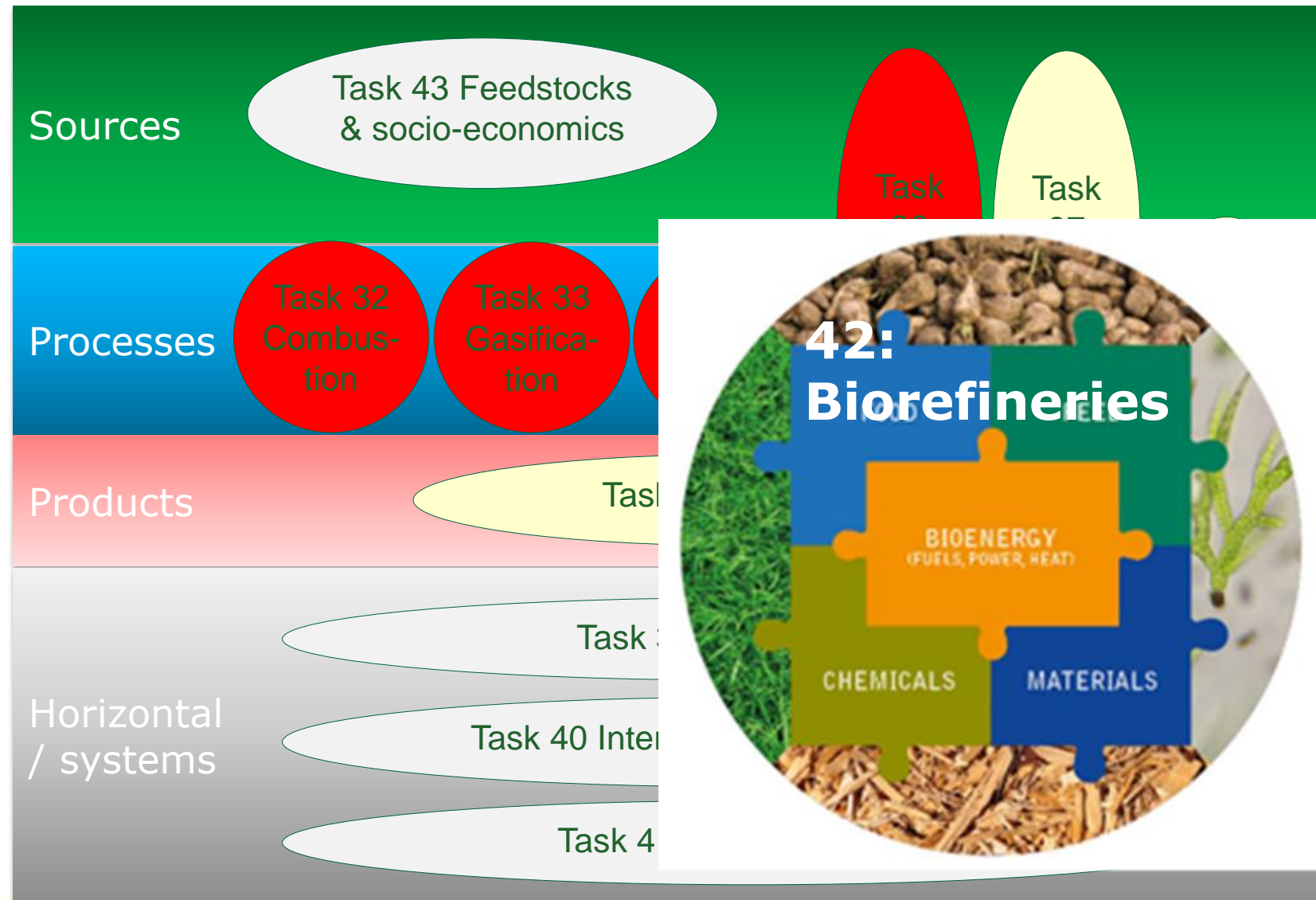
*Direct participation:*  
> 200 persons

**IEA Bioenergy**

*Task42 – Biorefining in a Future BioEconomy*



# Scope IEA



# IEA Bioenergy Task 42

## Vision & Mission

**Vision** Biorefining is the optimal strategy for large-scale sustainable use of biomass in the BioEconomy resulting in cost-competitive co-production of food/feed ingredients, biobased products and bioenergy with optimal socio-economic and environmental impacts, viz.

- > efficient use of resources
- > reduced GHG emissions

**Mission** To facilitate the commercialisation and market deployment of environmentally sound, socially acceptable, and cost-competitive biorefinery systems and technologies, and to advise policy and industrial decision makers





# IEA Bioenergy Task42

## Four WPs 2016 - 2018

**Countries involved:** AT, AUS, CAN, DEN, GER, IRE, IT, NL, US

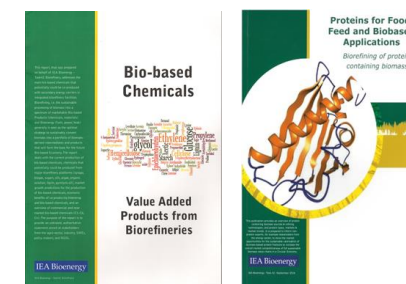
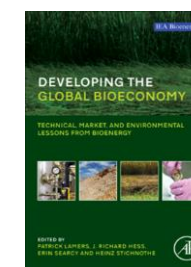
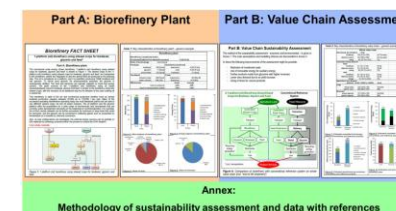
**Scope involve 4 different Activity Areas (AAs)**

- **AA1 - Biorefinery Systems** (AT et al)  
Analysis and assessment of biorefining in the whole value chain
- **AA2 - Product Quality** (GER et al)  
Reporting on related biobased products/bioenergy standardisation, certification and policy activities
- **AA3- Evolving BioEconomy** (IT et al)  
Analysing and advising on perspectives biorefining in a Circular BioEconomy
- **AA4 - Communication, dissemination & training** (NL et al)  
Knowledge exchange, stakeholder involvement, reports & lecturing

# IEA Bioenergy Task42

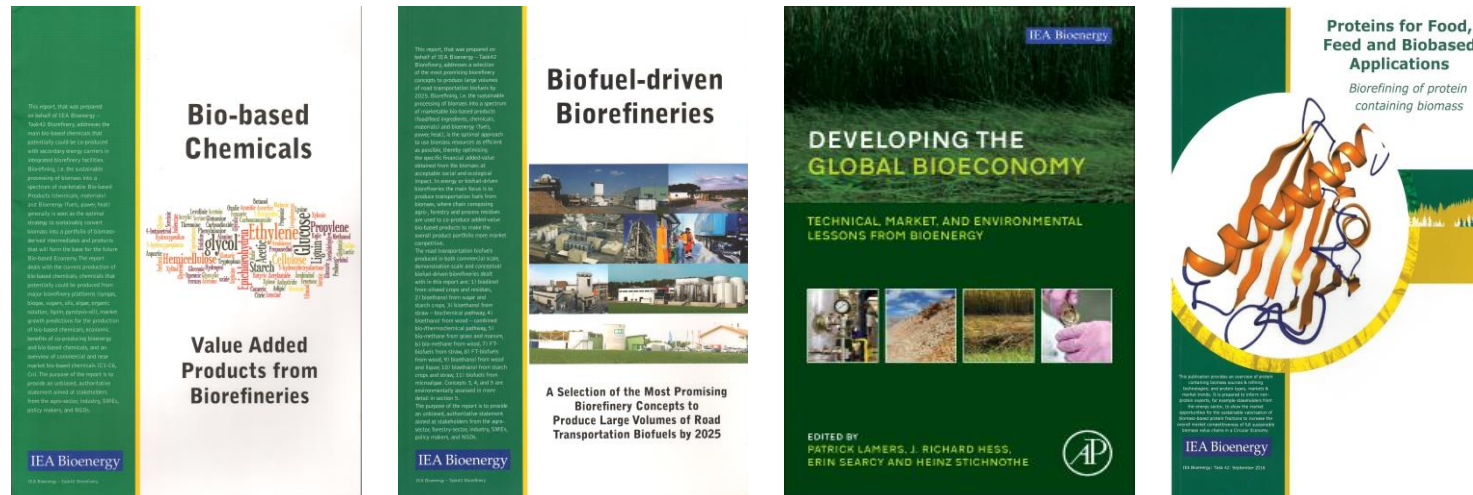
## Deliverables 2016 - 2018

- Biorefinery Expert System (SA) / Factsheets
- Monitoring of international standardisation/certification activities BM-use
- Monitoring international BioEconomy developments
- Joint Tasks Projects (bioenergy supply chains)
- Strategic Reports on
  - Proteins for Food and Non-food (2016)
  - Biobased Fibrous Materials (2017)
  - Biobased Chemicals (2018)
- Updates of National BR Country Reports
- (Thematic) Stakeholder Workshops
- Conference & training contributions
- Biannual newsletters



# IEA Bioenergy Task42 Reports

## Thematic Reports



- Biobased Fibrous Materials (AT) by end 2017
- Update Biobased Chemicals Report by end of 2018

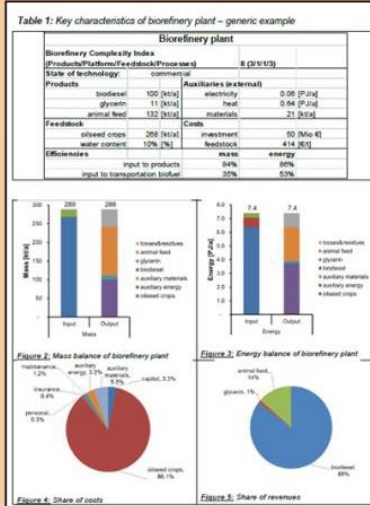
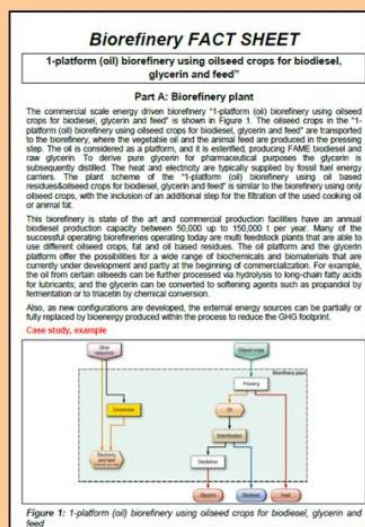
## Country Reports

AT, AUS, CAN, DEN, FRA, GER, IRE, IT, JAP, NL, NZ, TUR, UK, US

# IEA Bioenergy Task42 Classification & factsheets

## Biorefinery definition, classification system and factsheet methodology

### Part A: Biorefinery Plant



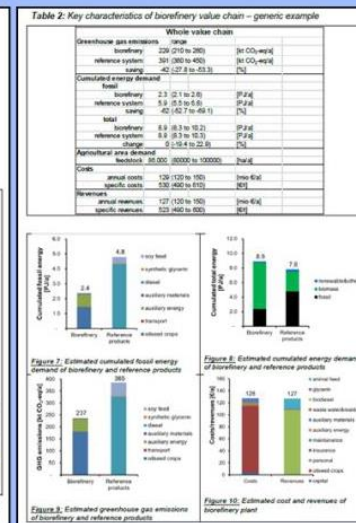
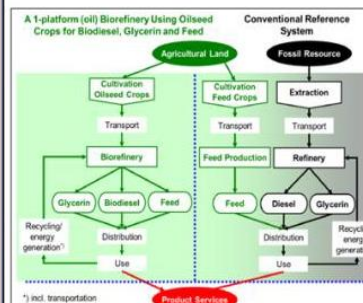
### Part B: Value Chain Assessment

**Part B: Value Chain Sustainability Assessment**

The method of the sustainability assessment - economic and environmental - is given in Annex 1. The main assumptions and modelling choices are documented in Annex 2.

In future the following improvements of the assessment might be possible:

- Reduction of investment costs
- Use of renewable energy for auxiliary energy
- Further products made from glycerine with higher revenues
- Lower area demand due to a yield increase
- Using of straw for various products



### Annex:

## Methodology of sustainability assessment and data with references



# IEA Bioenergy Task42 Dissemination

## Stakeholder Meetings, Excursions & Workshops

- Between 30-40 over last 9 years



## Knowledge & experience transfer

- Lectures at international conferences
- Publications in journals
- Specific thematic workshops
- Specific biorefinery education and training courses



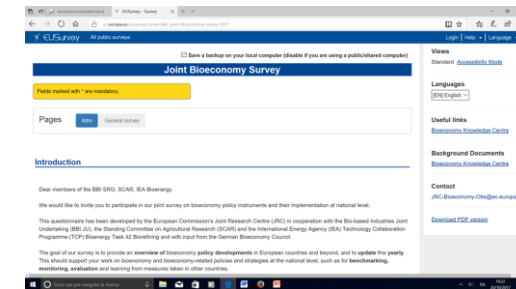
# IEA Bioenergy Task42 BioEconomy Questionnaire

## On-line Joint BioEconomy Survey 2017 JRC-SCAR-BBI-IEA Bioenergy

- Personal info (organisation or coordinated answer)
- National institutions
- National BioEconomy definition/scope
- National BioEconomy policy and strategy
- BioEconomy Infrastructure (funding, register, certification schemes, educational programmes)
- BBI SRG or IEA Bioenergy member
  - Questions for BBI SRG members
  - **Questions for IEA Bioenergy members:**
    - **commercial, flagship and demo/pilot biorefinery plants**
    - **R&D-projects**
    - **stakeholders involved**

Joint Research Centre (JRC)  
EU Science Hub  
Bringing together scientific knowledge for Europe

**ENEA**  
Italian National Agency for New Technologies,  
Energy and Sustainable Economic Development



<https://ec.europa.eu/eusurvey/runner/BKC-joint-bioeconomy-survey-2017>

**Deadline EC countries: 29-10-2017**



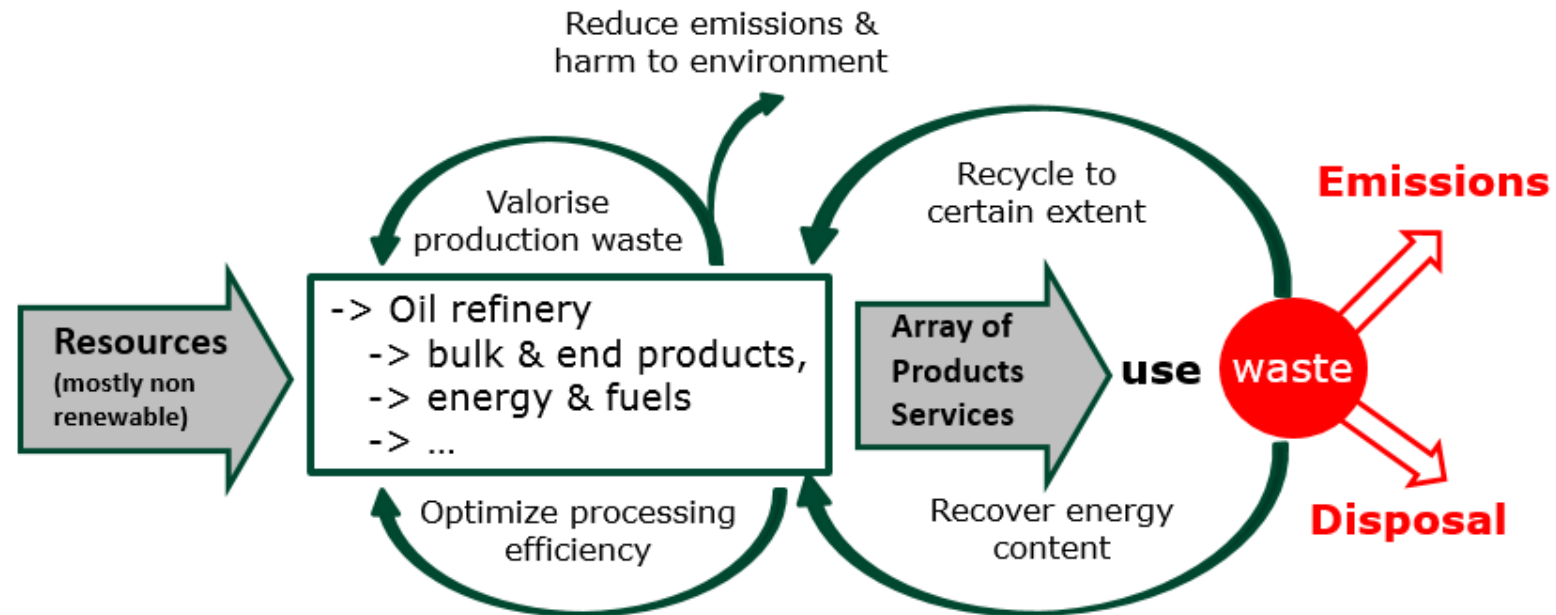
# Role of Biorefinery in a Circular Bioeconomy

# Conventional Economy

Resources  
depletion !

Production system is not sustainable

Global  
Warming !



Reference: TbWResearch, Austria (2017)

# Circular Economy (CE)

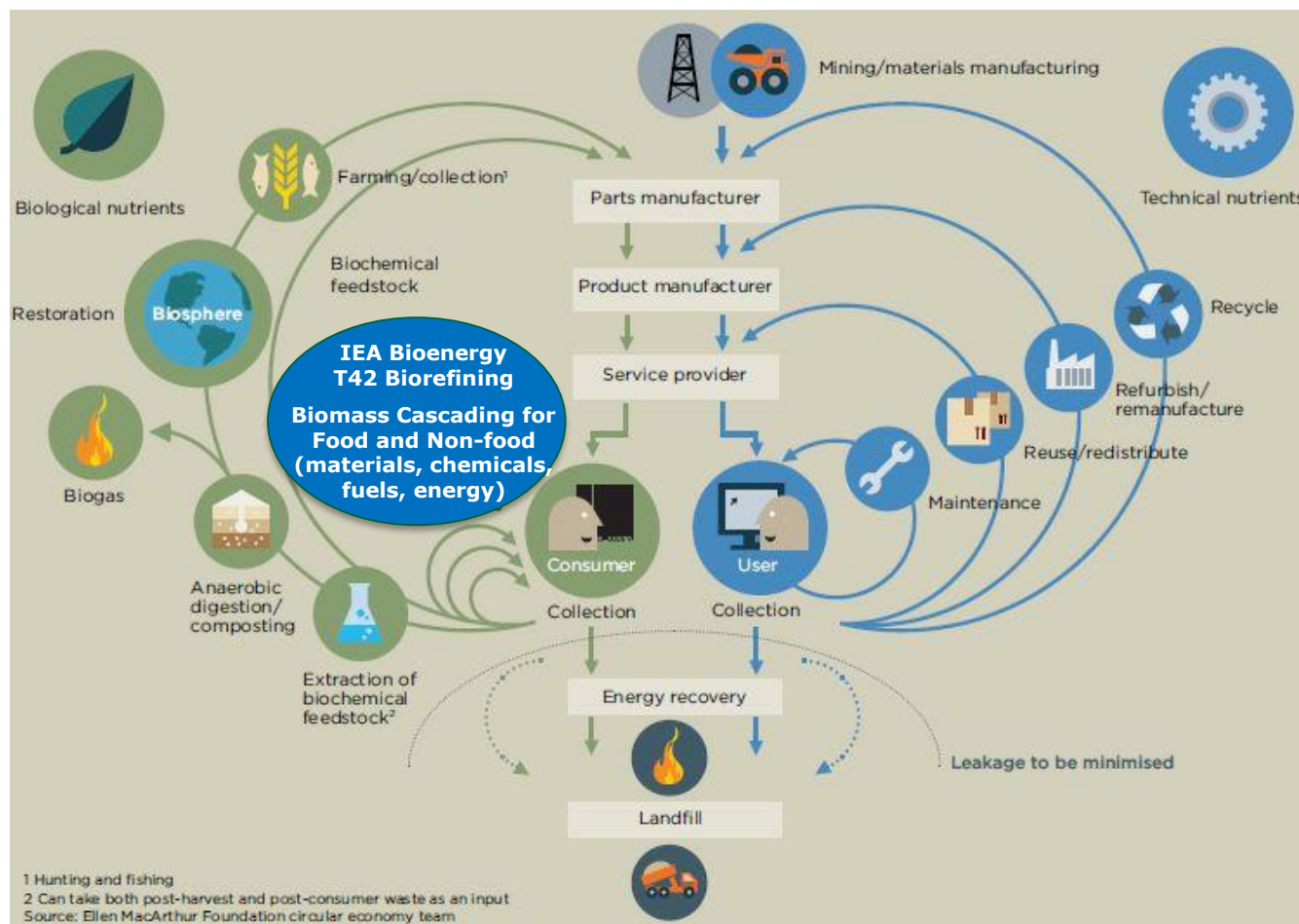
A Circular Economy is an industrial system that is restorative or regenerative by design

It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates use of toxic chemicals (which impair reuse), and aims for the elimination of waste ...

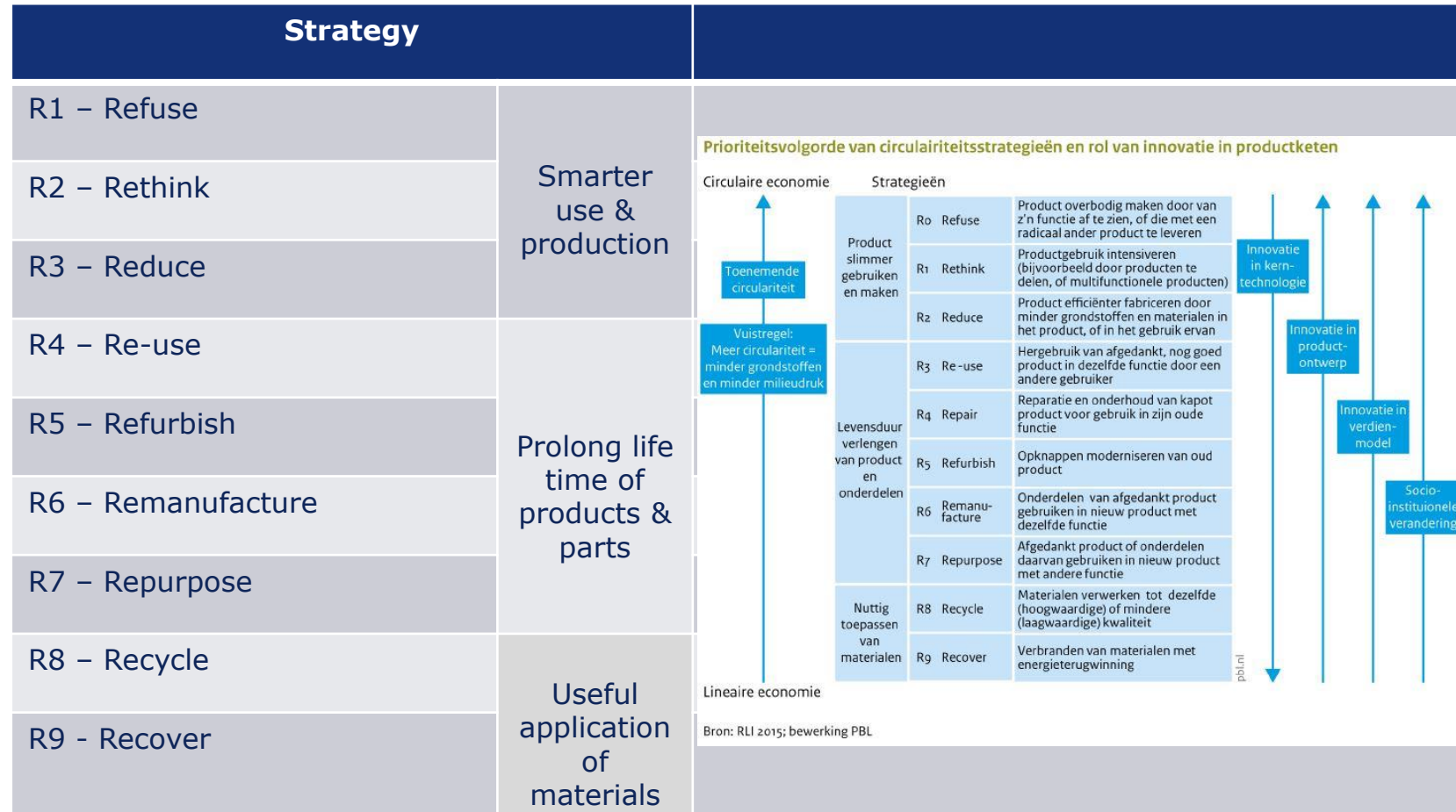
through the superior design of materials, products, systems, and, within this, business models

Reference: Ellen MacArthur Foundation (2012)

# Circular Economy (CE)



# Nine circular strategies



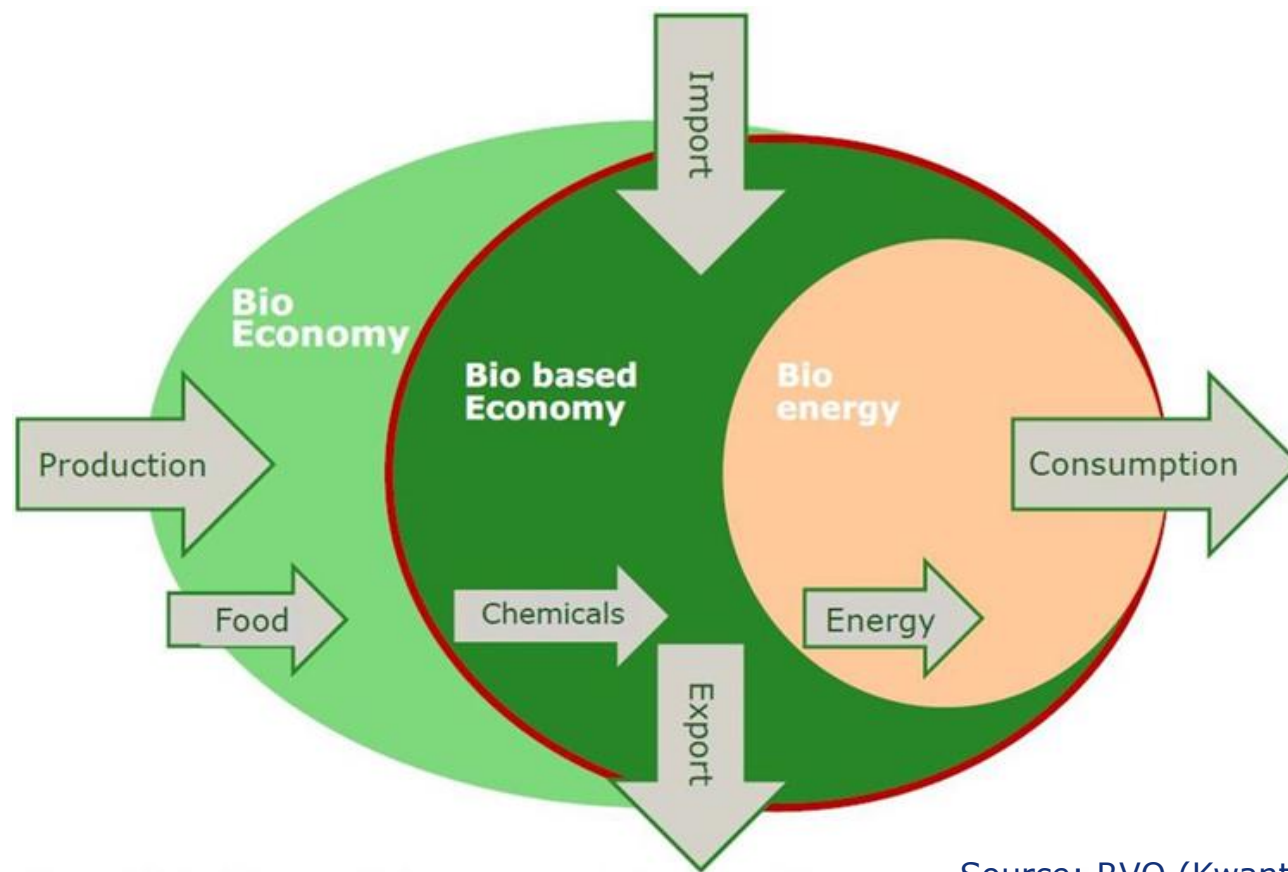
Reference: PBL (2016)

# What is Bioeconomy

- The bioeconomy encompasses the **production of renewable biological resources and their conversion into food, feed, bio-based products and bioenergy** via innovative and efficient technologies
- Feedstocks come from agriculture, forestry, landscape conservation and side streams from food production



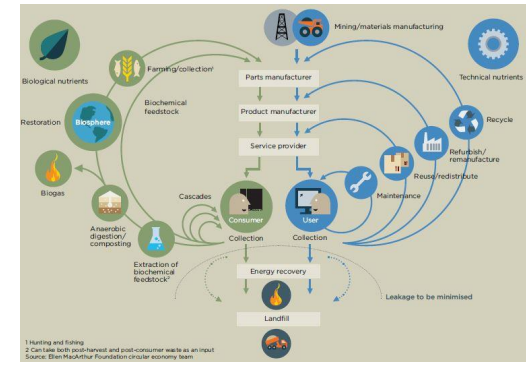
# BioEconomy, Biobased Economy and Bioenergy



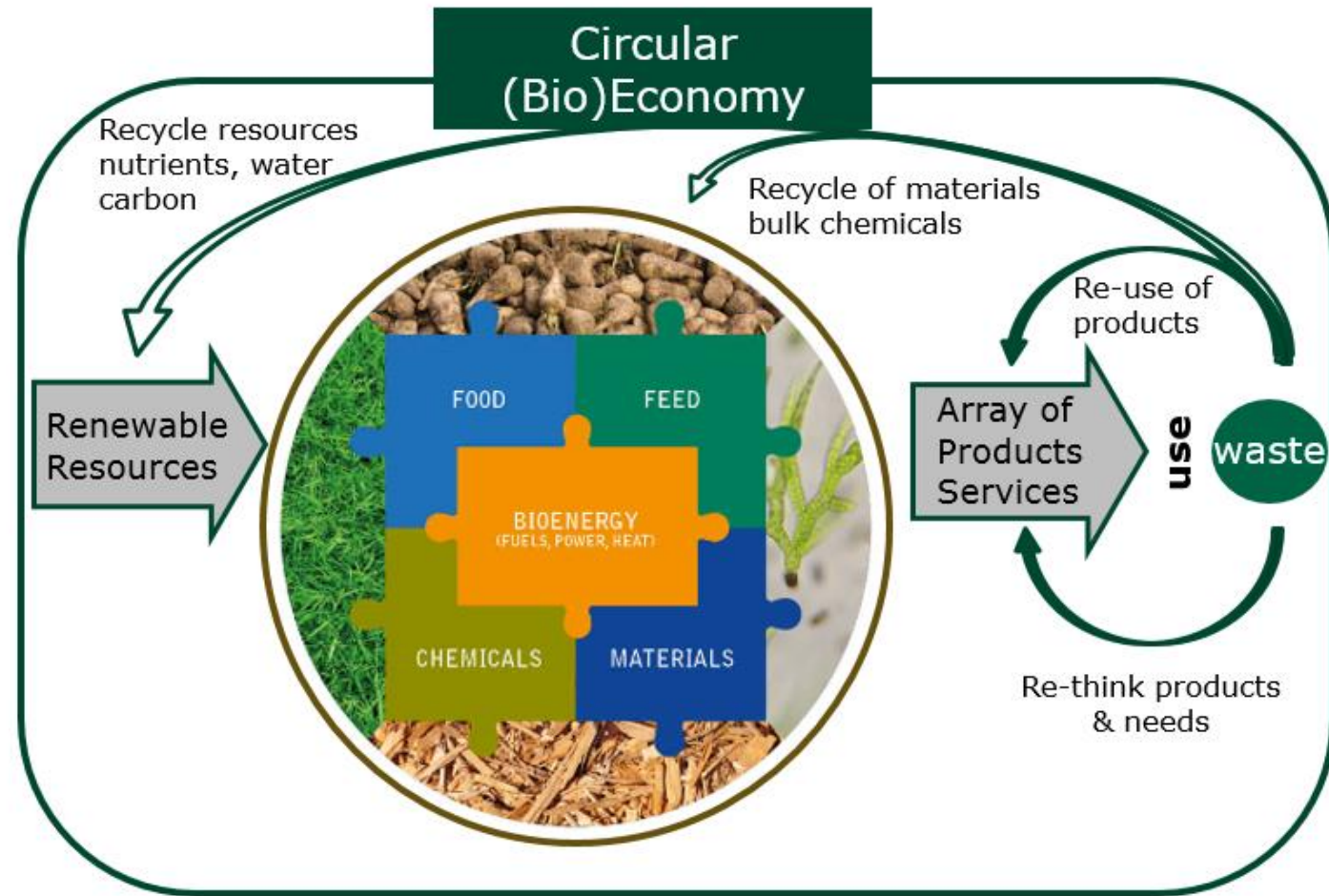
Source: RVO (Kwant)

## Role of bioeconomy in CE

- bioeconomy is circular by nature
- bioeconomy regenerates CO<sub>2</sub> and uses renewable raw materials to make greener everyday products
- bio-based products and materials have the benefit of achieving a more balanced carbon cycle in comparison to fossil alternatives
- supplier of renewable bioenergy (primary sources + side streams)
- supplier of materials that can be well cascaded (wood, fibres)
- circular economy is complementary to the renewable character of the bioeconomy and must facilitate the recycling of carbon after efficient uses



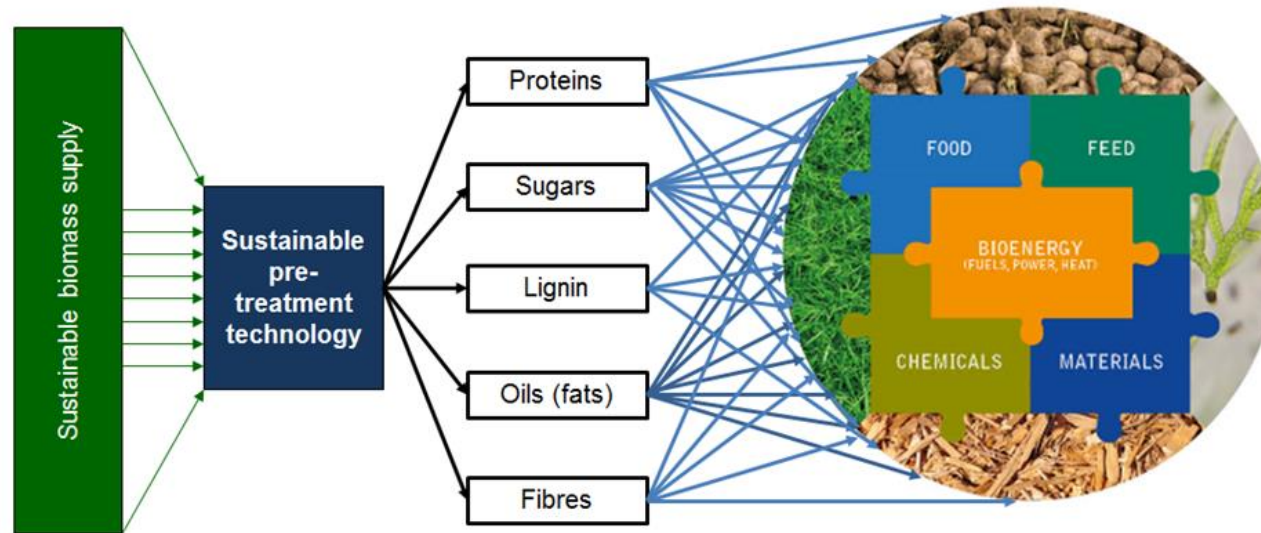
# Biorefinery in the centre of CE



# Biorefining in the CE

## Definition IEA Bioenergy Task42

Sustainable processing of biomass into a portfolio of marketable biobased products (food and feed ingredients, chemicals, materials, fuels, energy, minerals, CO<sub>2</sub>) and bioenergy (fuels, power, heat)







# Biorefining in the CE

## **Energy-based biorefineries**

- Biofuel-based biorefineries
- Biopower-based biorefineries
- Bioheat/cold-based biorefineries
- Biogas-based biorefineries

*Main focus on production secondary energy carriers from biomass; agro and process residues used for production added-value feed or biobased products to optimise full chain sustainability, incl. overall economic performance, reducing necessary financial governmental support*

## **Product-based biorefineries**

- Chemical-based biorefineries
- Material-based biorefineries

*Main focus on production chemicals or materials from biomass; agro and process residues used for feed or energy to optimise full biomass-to-products chain sustainability*



# Bioenergy in the CE

- Bioenergy (power, heat/cold) is and will remain a very important renewable energy source necessary worldwide to meet global GHG emission reduction goals (a.o. use of residues, potential CO<sub>2</sub>-sink combined with CCU/CCS)
- Bioenergy will provide advanced biofuels for aviation, shipping and heavy duty road transport; potentially in combination with RES-hybrids for energy storage
- Bioenergy will be a driver for the realisation of a Bio(based) Economy by
  - global sustainable mobilisation of the required biomass resources
  - the development of required standardisation/certification systems
  - providing (industrial) infrastructure as stepping stone for upgrading to biorefineries

# What are the barriers for a CE?

- current levels of resource pricing; no level-playing field for the bioeconomy
- lack of sufficient incentives due to the insufficient internalization of externalities
- insufficient waste separation at source
- too complicated products with too many materials make recycling more difficult
- insufficient investment in recycling and recovery infrastructure, innovation and technologies

# Role IEA Bioenergy Tasks (1)

- Analyse and disseminate scientifically sound knowledge on global sustainable biomass availability and sourcing options
- Advising on the need for a level-playing policy field for sustainable biomass production and use in a CE
- Develop and promote use of internalization of externalities (CO<sub>2</sub>-price)
- Promote industrial symbiosis for full sustainable biomass use
- Promote biocascading and biorefining as methodologies for optimal sustainable biomass use

## Role IEA Bioenergy Tasks (2)

- Promote advanced biofuels and bioenergy as integral links in sustainable biomass valorisation strategies
- Promote the use of the words biomass residues/co-products rather than wastes to emphasise their role as raw materials
- Contribute to monitoring progress towards a CE (incl. BE, BbE)
- To check the distribution of biomass over consumption (food, energy, etc.), products/materials that have an end-of-life (wear/break-down) and products that can be re-used in existing or new form

# Information from recent workshops

# IEA Bioenergy Task42 has recently (co)organised two workshops

The role that industrial biorefineries can play in a low-carbon economy

*Joint IEA Bioenergy/IEA IETS Workshop,  
Gothenburg, Sweden, 16 May 2017*

The role that bioenergy and biorefining can play in a Circular (BIO)Economy

*Joint IEA Bioenergy, ETIP Bioenergy,  
EERA Bioenergy, EC DG JRC, IRENA, FAO, US DOE  
Workshop, Brussels, Belgium, 27 September 2017*



# IEA Bioenergy Task42

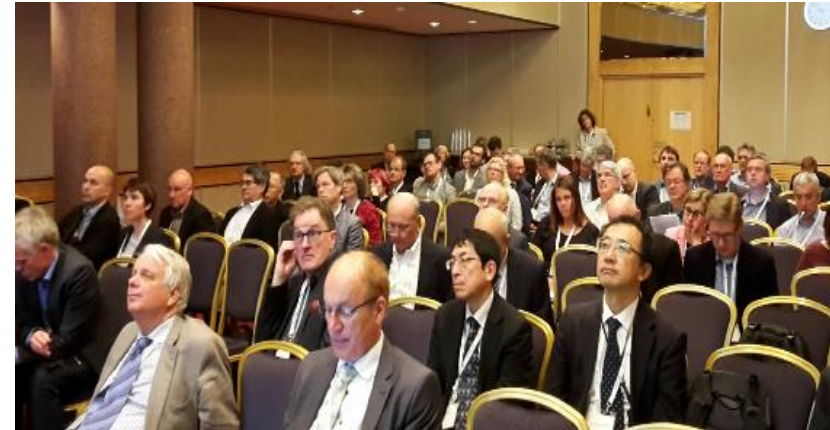
Joint Workshop with IEA-IETS



Industrial  
Technologies  
and Systems

**The role of industrial biorefineries in a low-carbon economy Gothenburg, Sweden, 16 May 2017**

- Strategic biorefinery developments
- How to overcome deployment barriers



2 plenary lecture sessions  
each followed by an interactive workshop  
with all participants

# IEA Bioenergy Task42

## Joint Workshop with IEA-IETS



Industrial  
Technologies  
and Systems

### Interactive workshop focus

- Pulp and paper mills
- Chemical industries
- Food and feed industries
- Petroleum refineries
- Energy utilities



Examples of notes from the different brainstorm groups

### Main deployment barriers

#### *Social*

- Public perception on both BM sustainability and BBPs
- Food habits, throw-away society
- Resistance to change

#### *Technological*

- TRL, complexity BRs, lack of qualified staff, etc.

#### *Economic*

- Large investments, high risks, profitability?
- BR business models, etc.

#### *Markets*

- Conservative industry, need for cooperation
- Opposition and competition, volatile markets

#### *Policy*

- Lack of consistency and LT vision
- Legislation (waste, food safety, etc.)

# IEA Bioenergy Task42

## Joint Workshop with IEA-IETS

### Recommendations on

- Policy
- Business
- Research and education



Examples of notes from the different brainstorm groups



# IEA Bioenergy Task42

## Joint Thematic Workshop on Bioenergy and Biorefining in a Circular (BIO)Economy



Food and Agriculture Organization  
of the United Nations



Task42 – Biorefining in a Future BioEconomy



## Further cooperation

1. Continuation parallel activities and keeping each other actively informed on major achievements (reports, etc.)
2. Organising an annual joint dissemination event on Bioenergy and Biorefining in a Circular BioEconomy: success stories, lessons learned, innovation needs etc.
3. Joint database bioenergy/biorefinery facilities or coupling existing ones.
4. Contact other international organisations (OECD, BIC/BBI, etc.) and assess cooperation opportunities.
5. Identifying (2018) and final (2019 onward) execution of some joint projects





# Take Home Messages

## Take home messages .....

The food/feed/fuel/biobased discussion has to be replaced by a clear vision on sustainable biomass production and biomass use for combined food and non-food applications

*Example: applying flexible biorefineries that are able to produce either food ingredients or non-food/energy products from various feedstocks (depending on actual market demand/ prices) might be a solution to optimise full chain sustainability, incl. guaranteeing a fixed farmers income necessary to make a living*

## Take home messages .....

- We need a good cooperation of international organisations and stakeholders both by the exchange of best-practices and by the execution of joint activities because we need to efficiently solve technical and non-technical deployment barriers
- It is of the utmost importance to accelerate the market implementation of biorefineries in the Circular (Bio)Economy

[www.task42.ieabioenergy.com](http://www.task42.ieabioenergy.com)



Thank you for your  
kind attention

**IEA Bioenergy**

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