

Concept of bioeconomy in Europe: background, history, current situation

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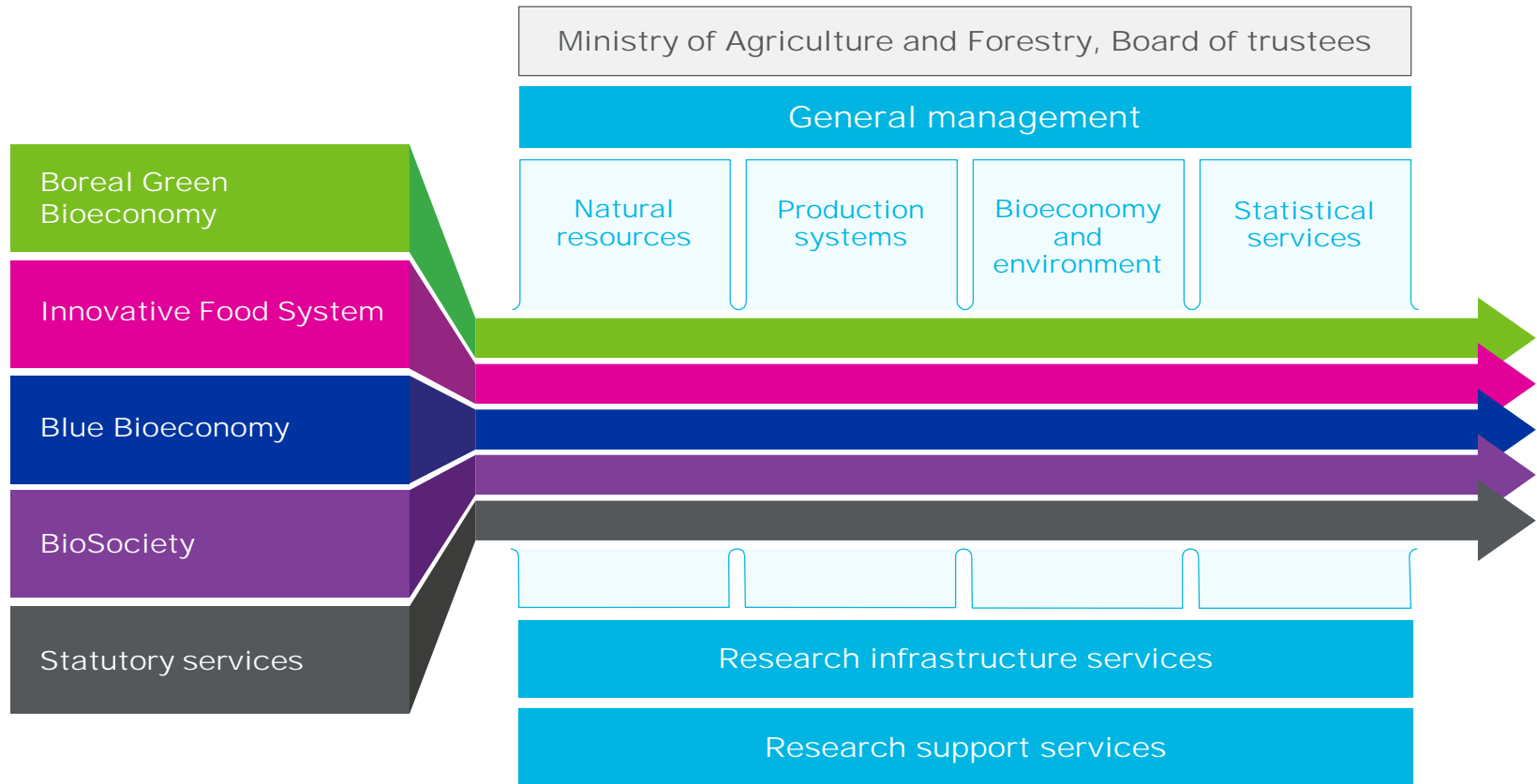
Storyline

- We are Luke
- Bioenergy - First wave of Bioeconomy
- Bio-based products and biorefineries – Second wave of Bioeconomy
- Biosociety – Third wave of Bioeconomy
 - EU's bioeconomy strategy
- Conclusions and the way forward



We are Luke

LUKE Natural Resources Institute Finland



120 M€

Turnover

90 M€

Research & customer portfolio

30 M€

Statutory services

25

Locations in Finland

HQ in Helsinki

Present in 12 campuses with universities, research institutes and polytechnics

1300

Employees

50 research professors
650 researchers

*We are one of the four
Statistical Authorities in Finland.*

Boreal Green Bioeconomy

Head of thematic research programme: **Antti Asikainen**

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Genomics and breeding

- Genomic understanding of key quality parameters of boreal species
- Precision breeding
- Development of breeding methodologies (genomic selection, genome editing)
- Technologies for modern breeding (somatic embryogenesis, automation)

Sustainable biomass production

- Intensification of biomass production
- Forest management concepts
- Abiotic and biotic risk management
- Environmental impacts of forestry

Forest resource supply management

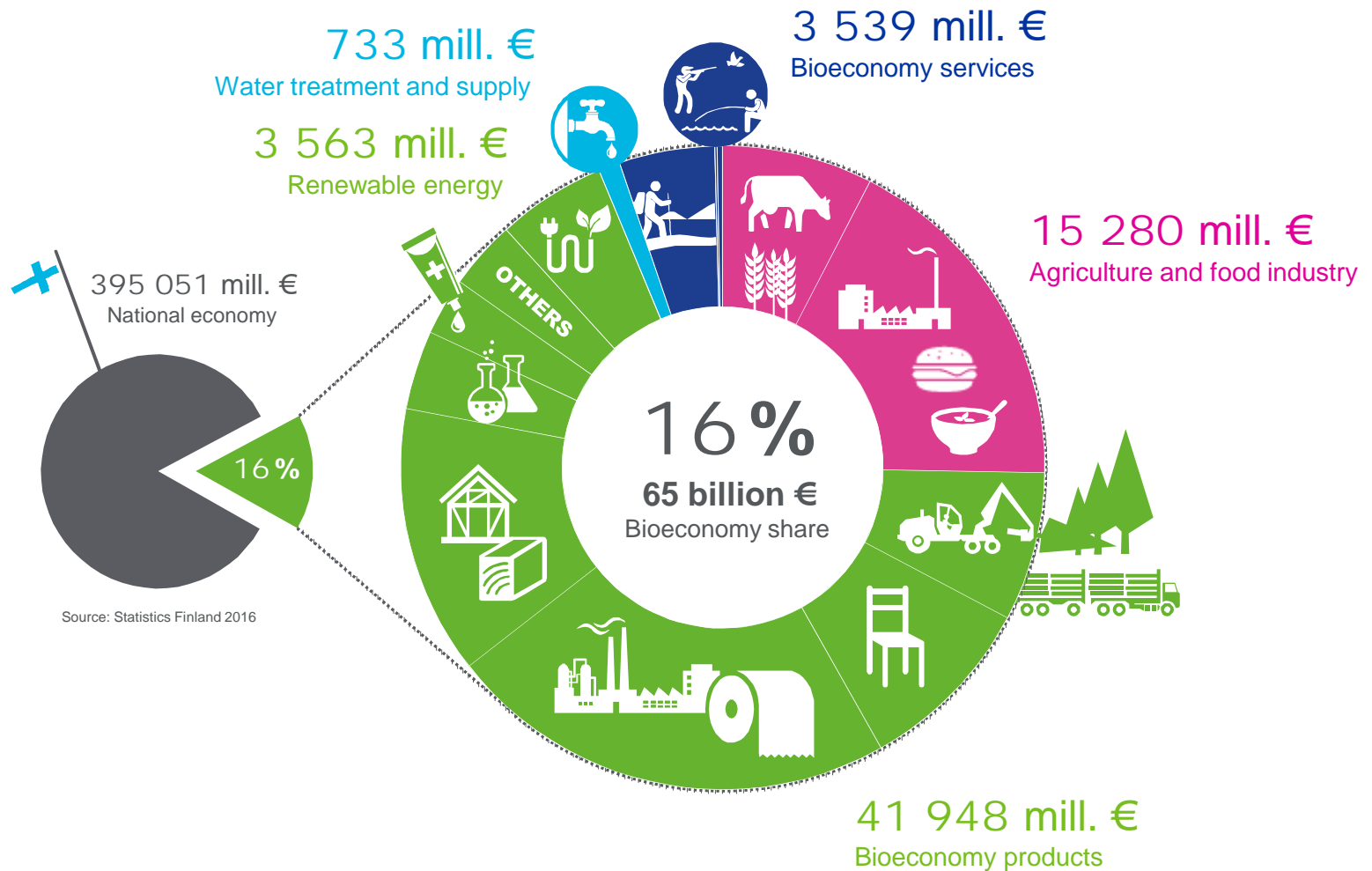
- Regional scenarios and models
- Active, sustainable and climate smart forest and land use planning
- Operational efficiency in wood sourcing and silviculture
- Reduction of adverse impacts of wood harvesting

Value-added bioeconomy products and processes

- Formation and location of structures and compounds of biomass (Biorefinery potential of biomass),,
- Valorisation of secondary streams and by-products, bioenergy
- Wood products, green building and living with wood

Bioeconomy in Finland

1m³ of wood generates 200€ added value

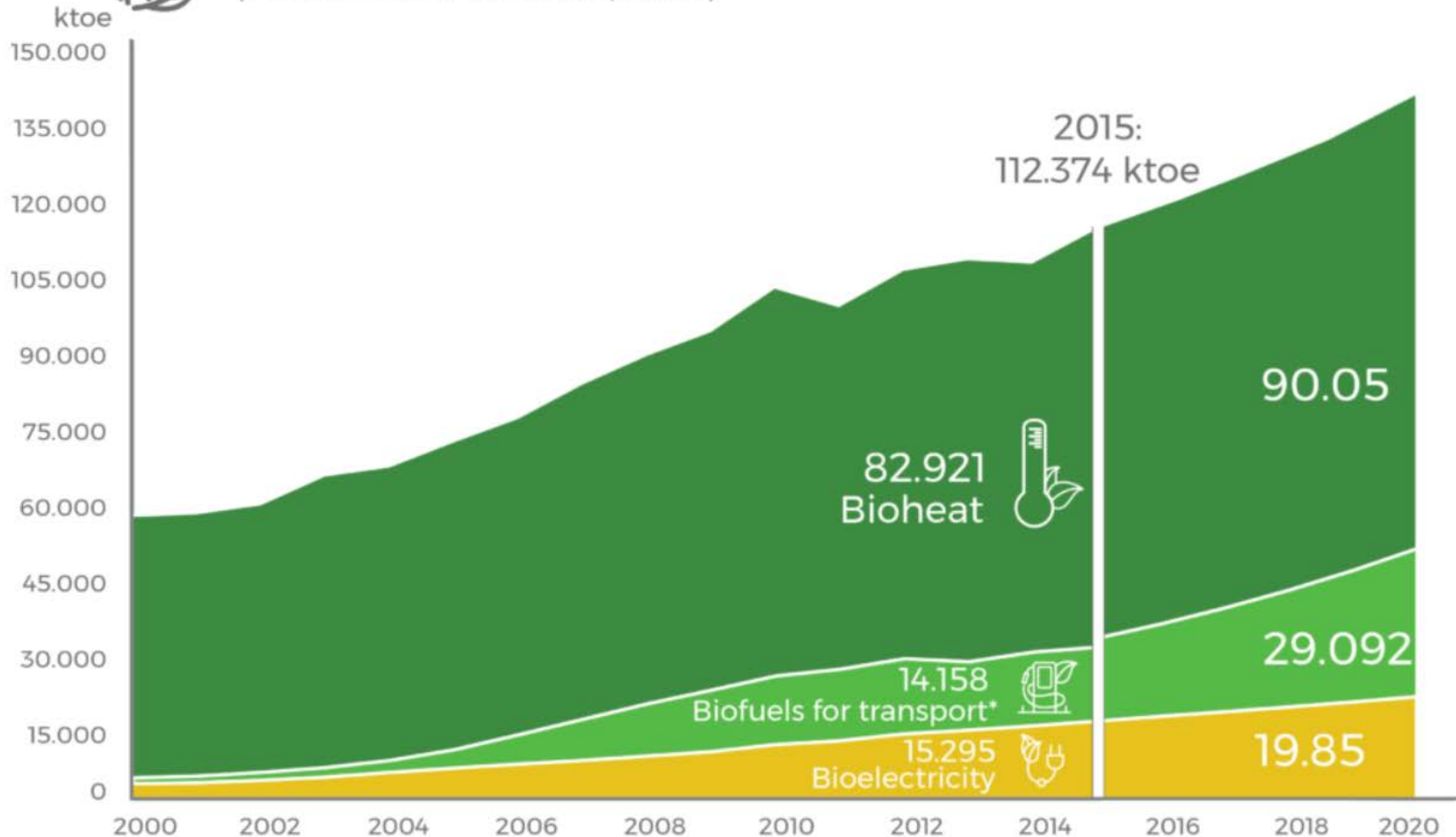


Graphics: Vihreä biotalous – 100-vuotiaan Suomen hyvinvoinnin ja kilpailukyyn perusta.

EU's bioenergy strategy was a success



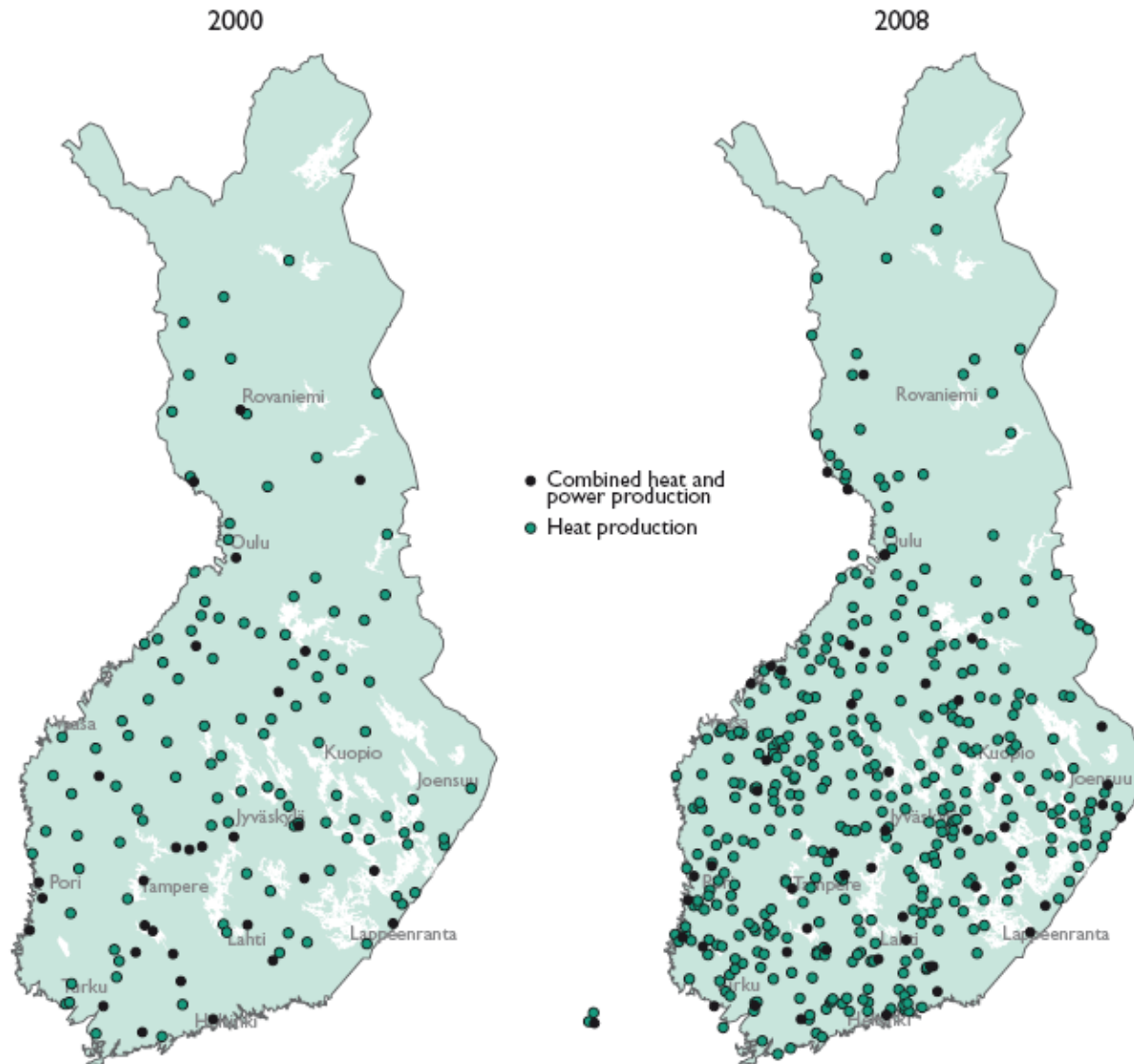
EU-28 gross final energy consumption of bioenergy (From 2000 to 2020, ktoe)



Source: Eurostat, National Renewable Energy Action Plans (NREAPs), AEBIOM's calculations

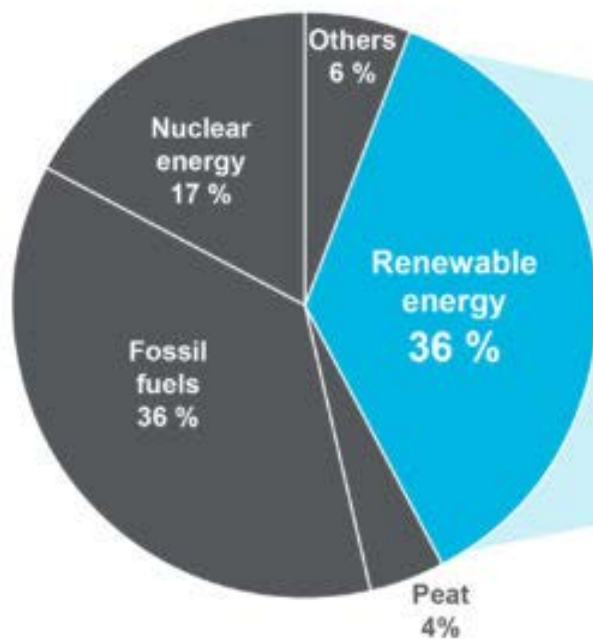
*Target for liquid biofuels for transport includes multiple countings

The biggest growth of heating plants based on wood chips happened in early 2000's in Finland

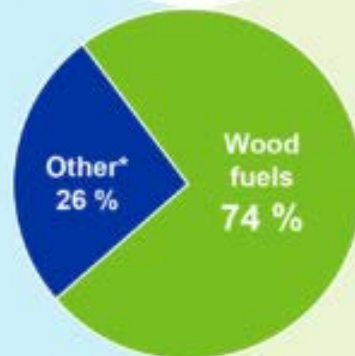


CONSUMPTION OF WOOD FUELS 2017

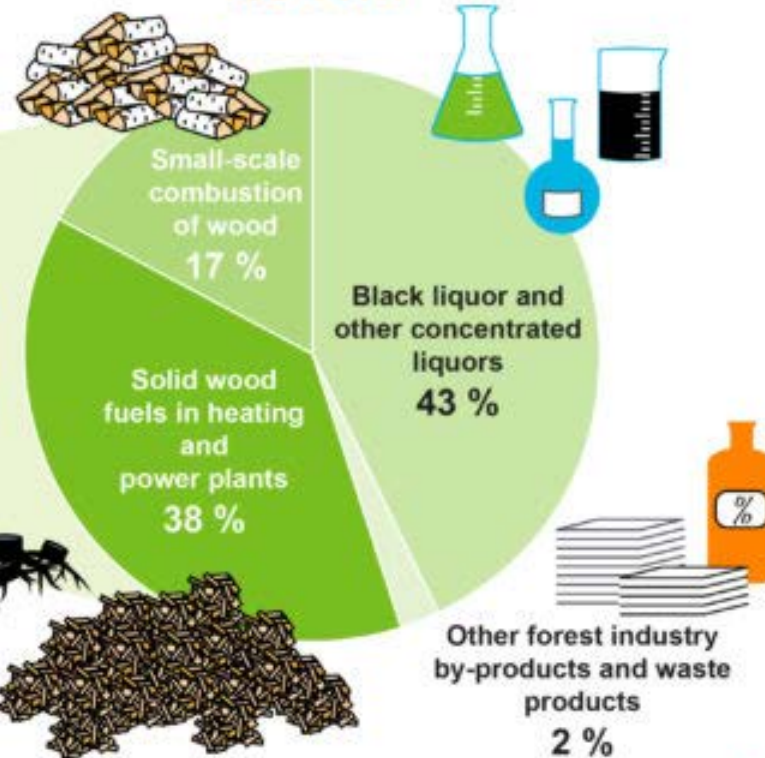
Total energy consumption
377 TWh



Renewable energy
136 TWh



Wood fuels
100 TWh



*Other renewable energy includes wind and hydro power, heat pumps, solar energy and other biofuels.

The data for 2017 are partly preliminary
TWh=terawatt hour

Sources: Statistics Finland, Natural Resources Institute Finland

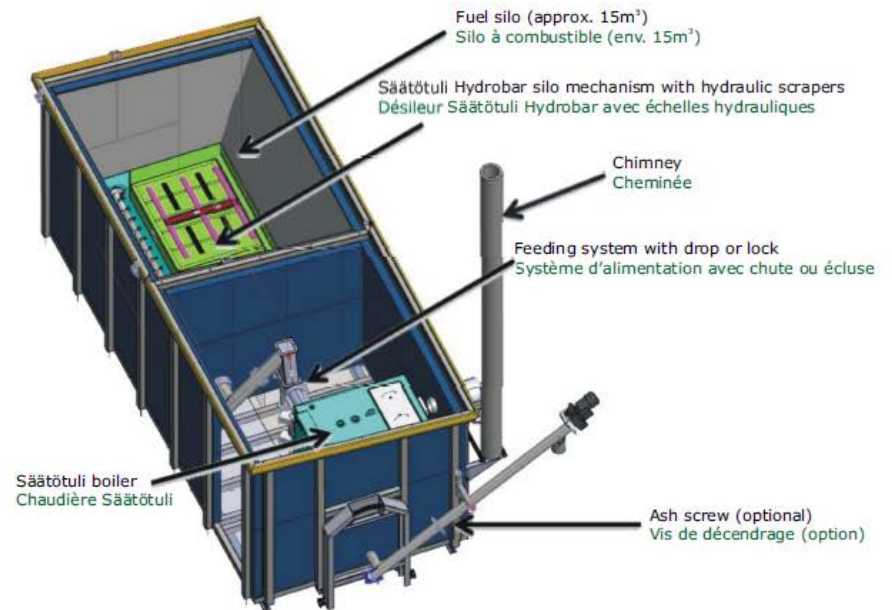
Heat 80-150 kW

Laho_sm...

saatotuli-biocont.pdf ×

80 - 150kW multi-fuel series Gamme 80 - 150kW poly-combustible

Extra-fast delivery:
Livraison extra-rapide:



Electricity 40 kW, heat 225 kW



- Fuel feeding
- Reactor, wood chips are converted into wood gas
- Primary gas cooling and heat recovery
- Gas filtering
- Secondary gas cooling and heat recovery
- Control panel

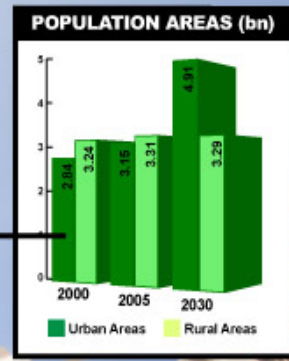
- Automation cabinet
- Gas motor
- Exhaust gas cooling and heat recovery
- Ash removal





THE 2030 PERFECT STORM

WORLD'S POPULATION RISE
 RISE of **33%** from **6bn** to **8bn** PEOPLE
 With more people living in **URBAN AREAS**
 greater demand for

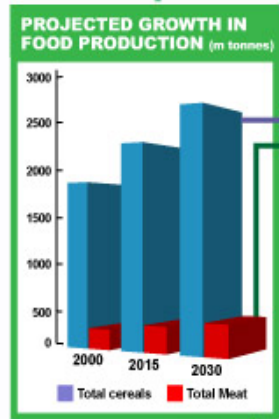


FOOD
 DEMAND will increase **50%**

WATER
 DEMAND will increase **30%**

ENERGY
 DEMAND will increase **50%**

WORLD ENERGY RESERVES
 (billion coal equivalent/years)
NATURAL GAS 63.1 yrs
OIL 42 yrs
COAL 122 yrs



This pressure on resources can finally result in shortages which may

- hamper economic development
- lead to social and geopolitical tensions
- cause irreparable environmental damage
- put food, water and energy security at risk

WATER PRESSURE (litres)

1,000 - 2,000 l to produce **1kg of WHEAT**
10,000 - 13,000 l to produce **1kg of BEET**
190 l to produce **1 driven mile using ethanol**

2030 200,000KM³

DAILY REQUIREMENTS
DRINKING REQUIREMENTS 2 - 4 LITRES
PRODUCE DAILY FOOD REQUIREMENTS 2,000 - 4,000 LITRES

PRODUCTION OF BIOFUEL
US has 90.5 m acres used to grow corn for Ethanol production
 Wants supply of **36 bn gallons by 2022, with 15 bn maize based by 2015**

Carriers and barriers of bioeconomy

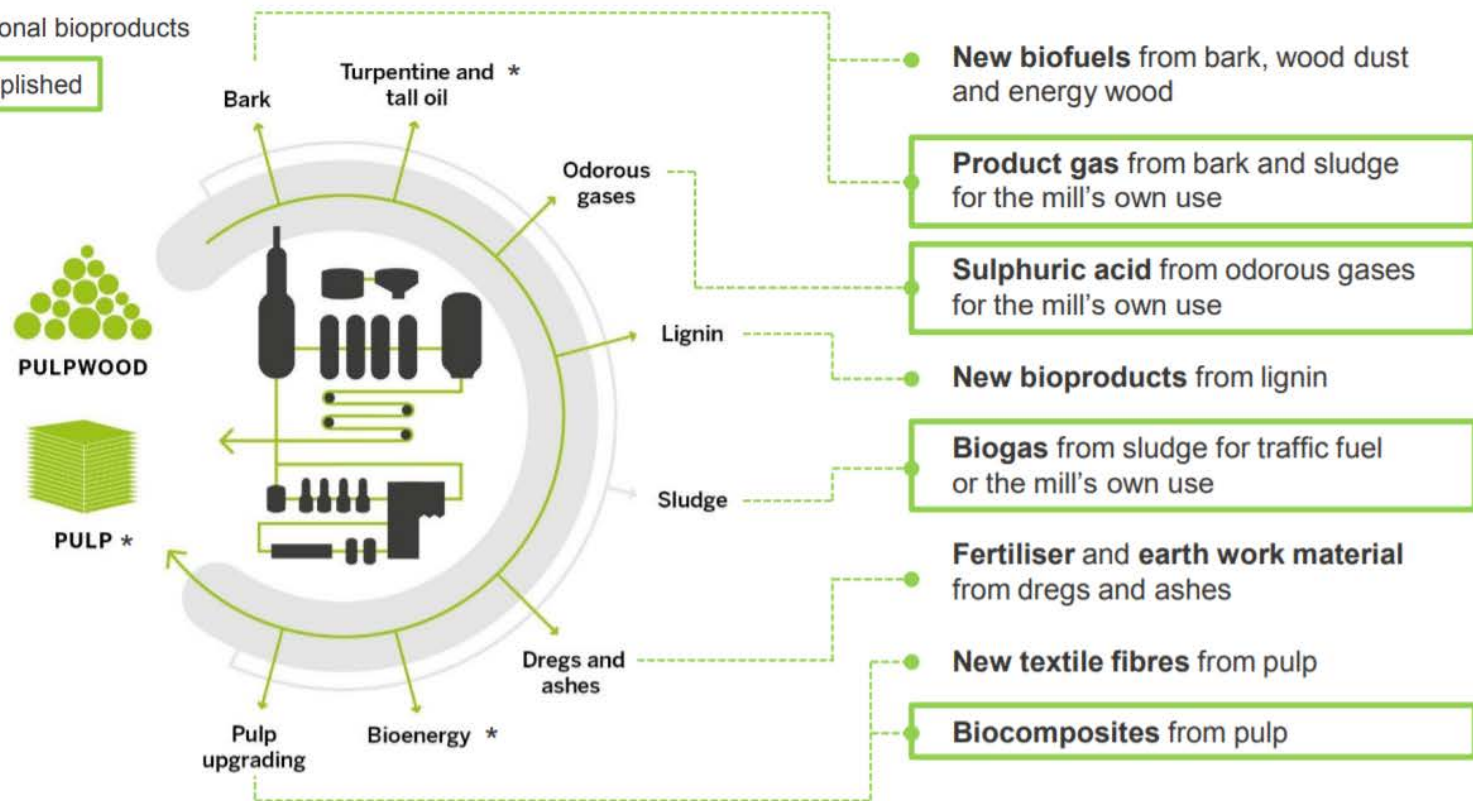
- EU regulation – markets created with policies
- General opinion channelled into market pull and politics
- Fossil raw materials becoming more expensive
- Natural catastrophes
- Guaranteeing resilience – distributed structure
- Protectionism and “infant industries”
- The complexity of the concept
- The size of investments needed – biorefinery is not an ICT start-up
- Hegemony of the forest industry
- Size of the home markets (Finland) and homogenic (business) culture that encourages to avoid risks
- Innovation system playing safe
- Silos, sub-optimisation
- Lack of capital and business skills

Bioproduct mill concept, Metsä group

Bioproduct concept: all side streams 100% utilised

* Traditional bioproducts

Accomplished



EU's bioeconomy strategy

1

STRENGTHEN AND SCALE-UP THE BIO-BASED SECTORS, UNLOCK INVESTMENTS AND MARKETS



Mobilise stakeholders in **development** and **deployment** of **sustainable bio-based solutions**



Launch the **EUR 100 million** Circular Bioeconomy Thematic **Investment Platform**



Analyse enablers and bottlenecks for the deployment of **bio-based innovations**



Promote and develop **standards, labels and market uptake** of **bio-based products**



Facilitate the **development of new sustainable biorefineries**



Develop substitutes to fossil based materials that are **bio-based, recyclable and marine biodegradable**

2

DEPLOY LOCAL BIOECONOMIES RAPIDLY ACROSS EUROPE



Launch a Strategic Deployment Agenda for sustainable food and farming systems, forestry and bio-based products



Launch pilot actions for the development of bioeconomies in rural, coastal and urban areas



Support regions and Member States to develop Bioeconomy Strategies



Promote education, training and skills across the bioeconomy

3

UNDERSTAND THE ECOLOGICAL BOUNDARIES OF THE BIOECONOMY



Enhance **knowledge** on biodiversity and ecosystems



Monitor progress towards a sustainable bioeconomy



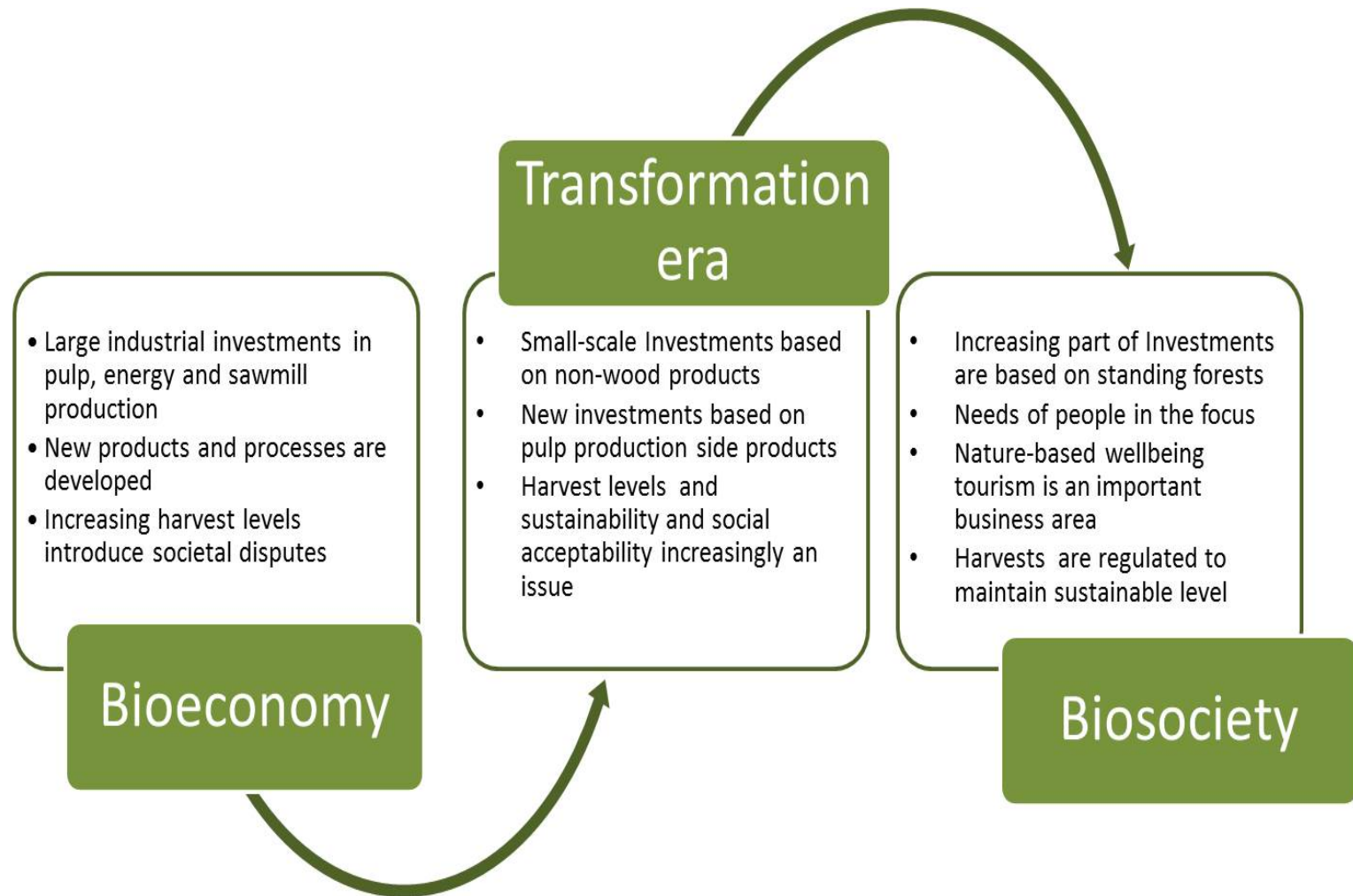
Promote good practices to operate the bioeconomy within **safe ecological limits**



Enhance the **benefits** of biodiversity in **primary production**




From bioeconomy to biosociety



Conclusions and the way forward

- Bioeconomy is an evolving concept in EU
- Emphasis is to generate more value from biomass based products and services
- Replacement of fossil-based resources
- Climate issue is becoming controversial: How much can bioeconomy contribute to the mitigation of climate change
- Risks associated with bio production (storms, insects, droughts etc.)



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