

Potential of the Scheldt basin in a biobased Economy



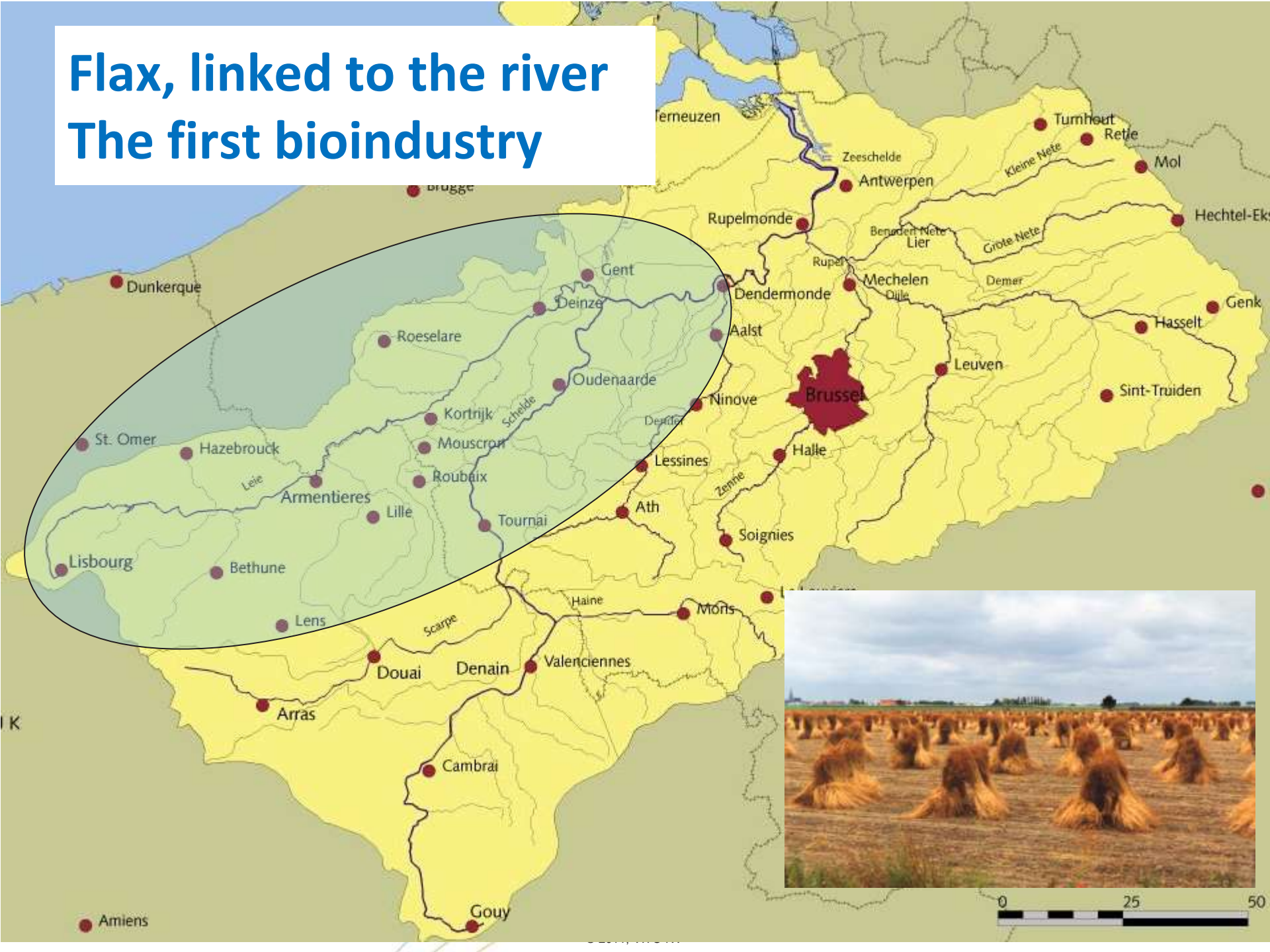
Willem D'Hooghe, Cinbios & FlandersBio
Willem Sederel, Biobased Delta
Ludo Diels, University Antwerp, Vito-Mol



De Schelde in 2050
Antwerp, 8 May 2014

Flax, linked to the river

The first bioindustry



Flax, biobased economy since 13th century



Pretreatment of flax in Leie river



Lakenhalle in leper since 1304

Flax and linen: most important industrial activity leading to wealth of Flanders

Flax, basis for new developments in Flanders

Unilin produces since 1960 Flax hard boards, since 1990 laminate



Vyncke started with steam boilers for flax industry



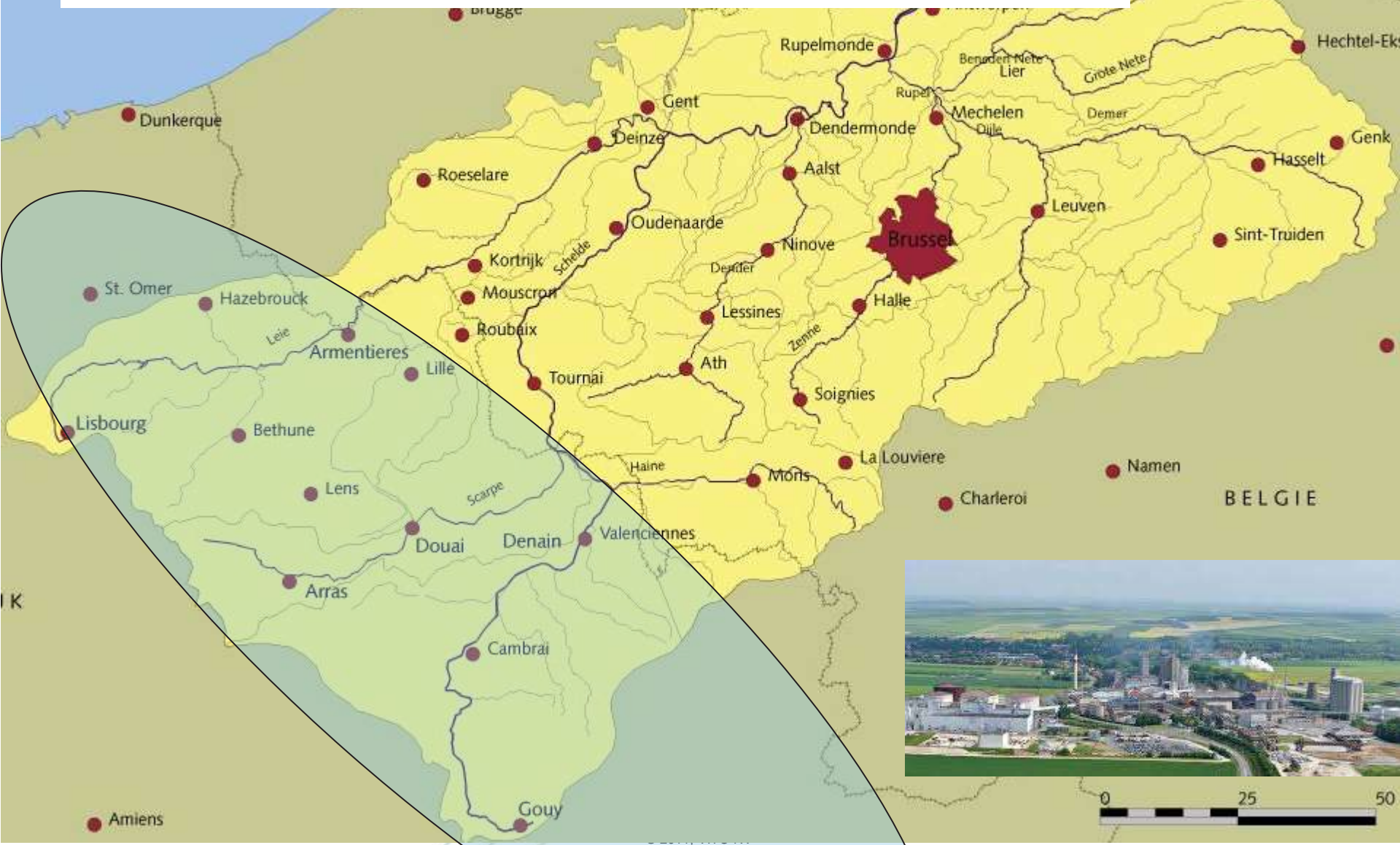
Beaulieu started with carpet textiles based on flax



Picanol produces weaving looms



The river Scheldt originates from North France, nowadays center of bioindustry



North France: top region in agro-based industry

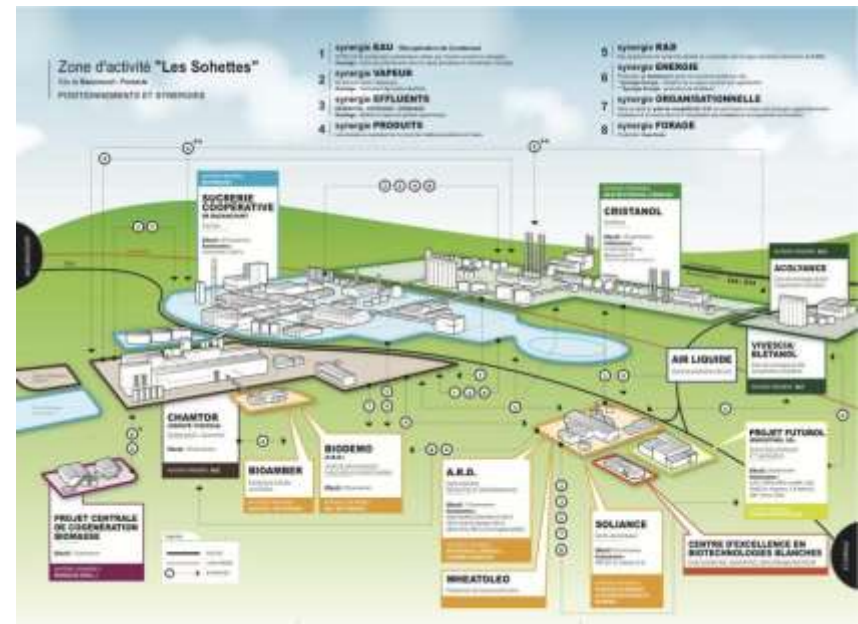
Roquette, Lestrem

- » Starch chemistry



Pomacle Bazancourt biorefinery

- » Sugar beet, wheat,



Linked with Walloon region with agro innovation

Valbiom



- » Forest based biomass
- » Agro-based biomass
- » Agro-residues

220 ha hemp plantations to feed new feedstock needs



Antwerp, port & chemistry cluster + fine chemicals (Kempen)



Port of Antwerp, second largest petrochemical site

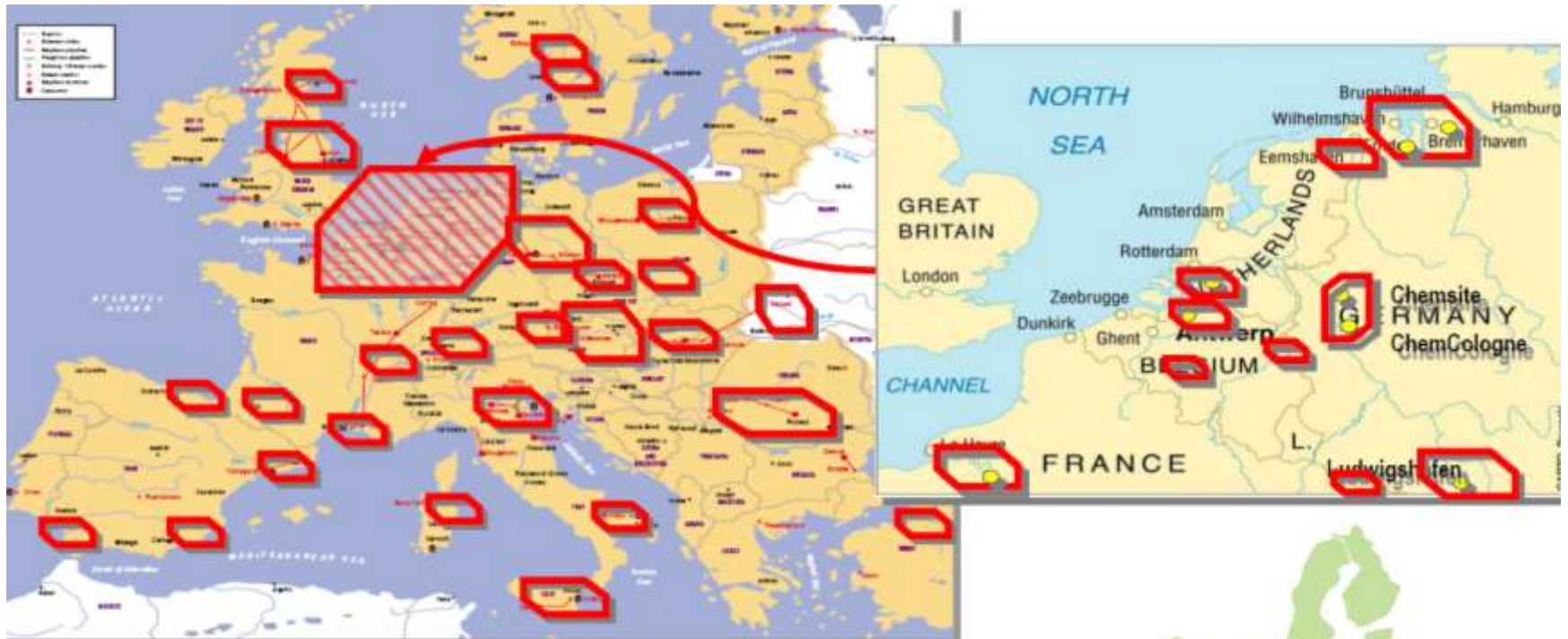
Biggest petrochemical center of Europe

Strongly linked with the German chemistry cluster

Several lead plants



Antwerp, central in the ARRR megacenter



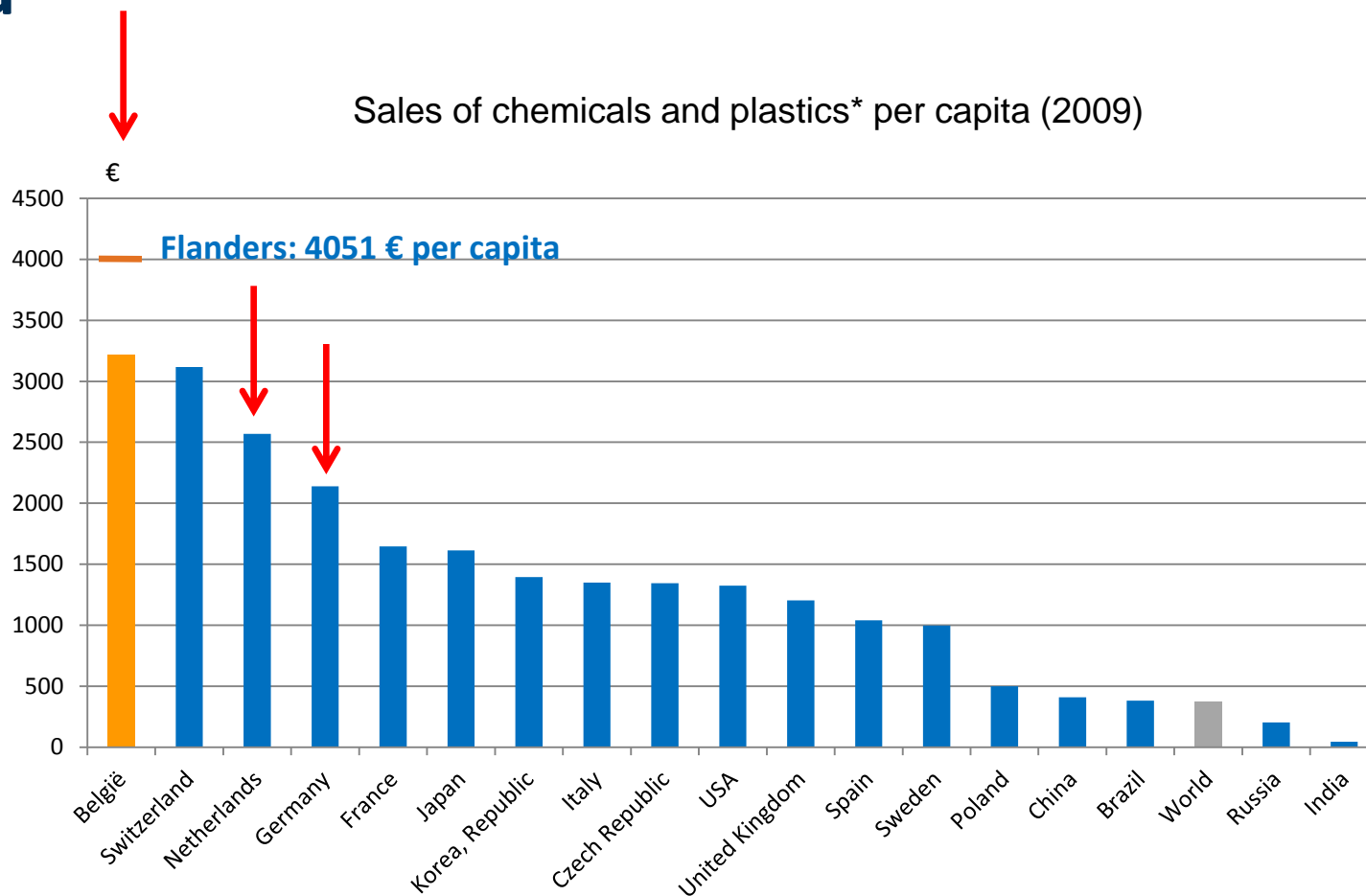
Mega-cluster: NL-NRW-FI
BIG-C: Bio Innovation Growth
Mega Cluster



Mega clusters chemical industry in the world



Flanders with the highest chemical sales per capita



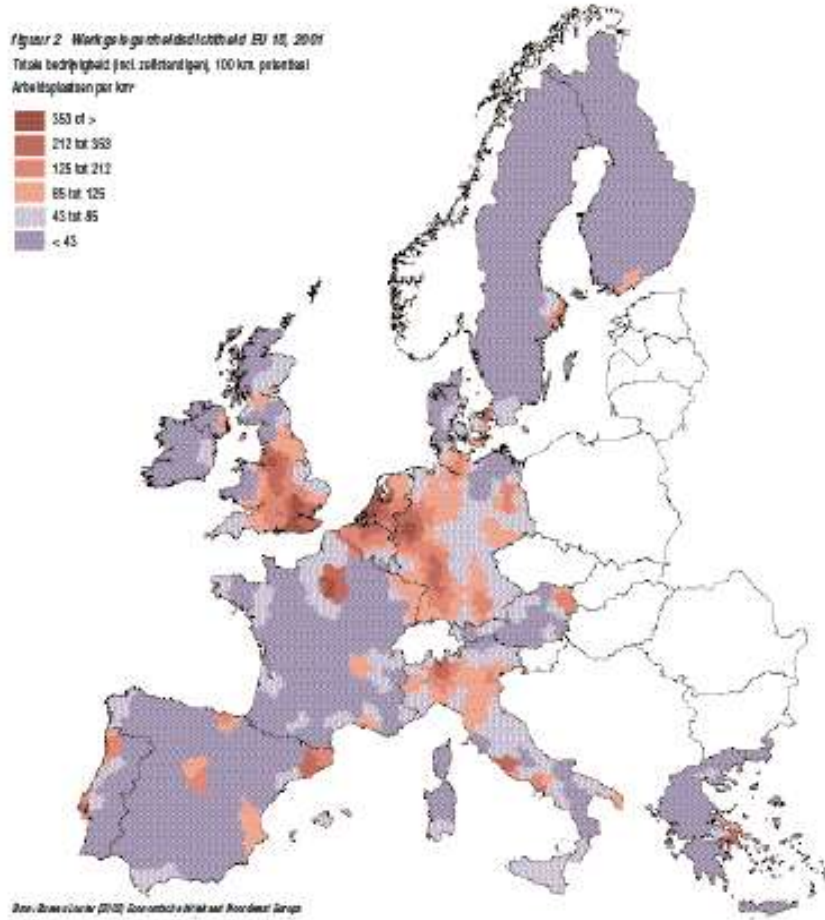
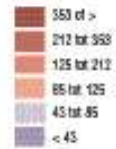
Source: Feri Q12010, NIS
2009 Figures

* exclusive life sciences

Antwerp: center of logistics

Jobs (Rhine Corridor)

Figuur 2: Werkgelegenheid in de regio van de EU 15, 2001
 Totale bedrijvigheid (incl. zelfstandigen), 100 km. pixelsaal
 Arbeidsplaatsen per km²

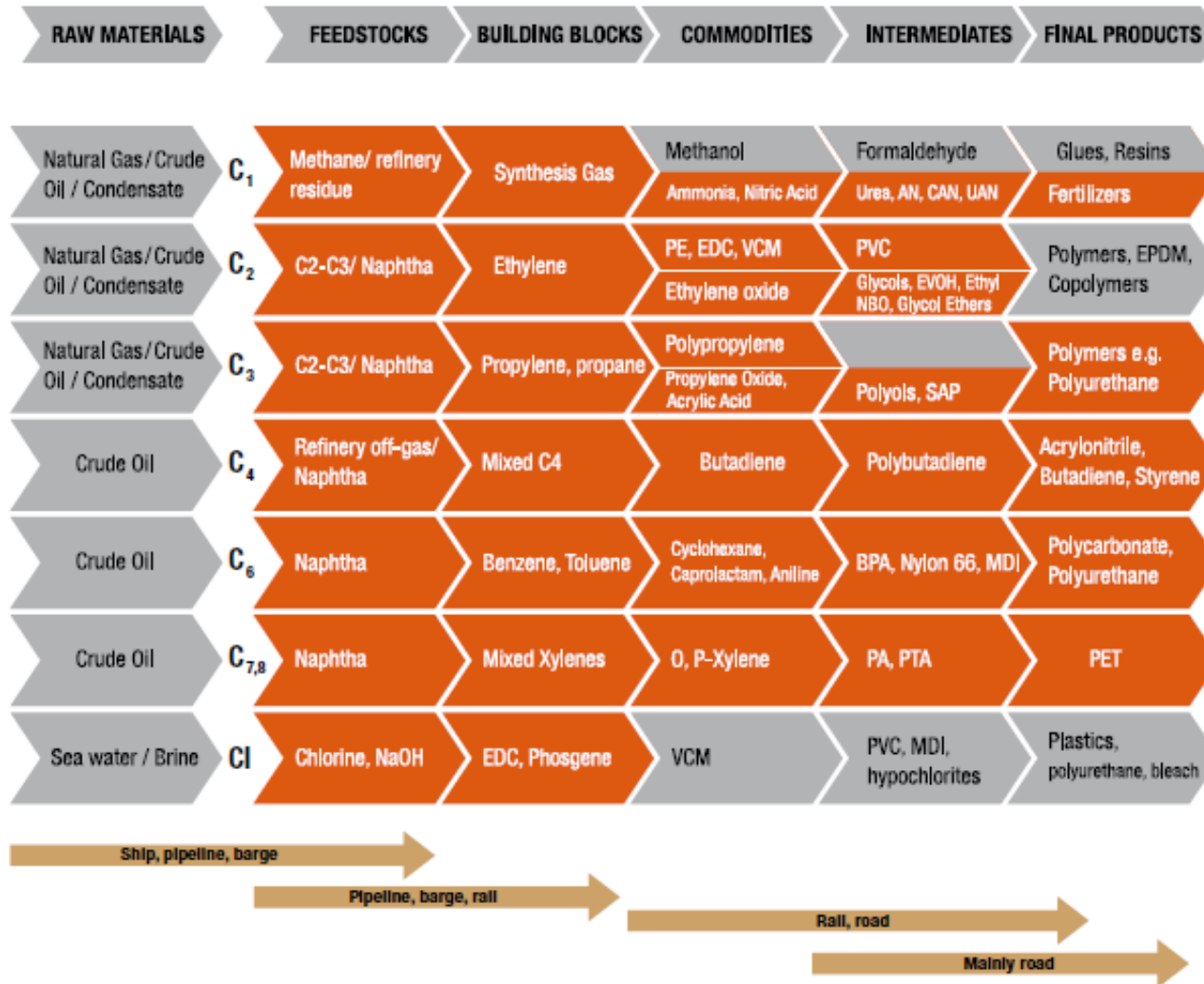


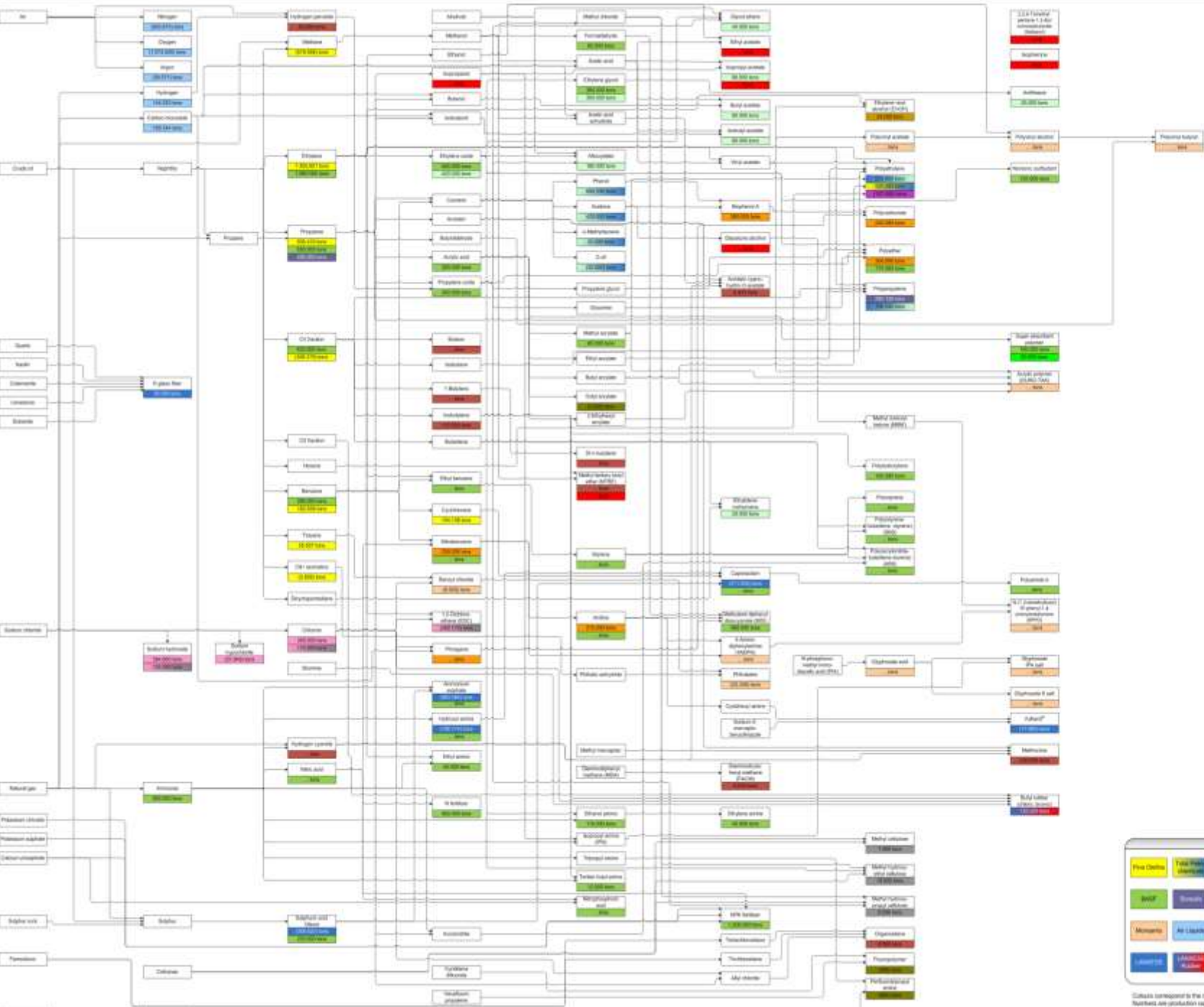
Bron: Bureau Vlerick (2002) Economische Atlas van Noordwest-Europa

- Steam cracker
- Olefins consumer(s)
- ★ Refinery
- ★ Refinery + olefins producer
- RAPL (crude oil)
- PALL (naphtha)
- Industrial gases pipeline
- Ethylene pipeline
- Propylene pipeline



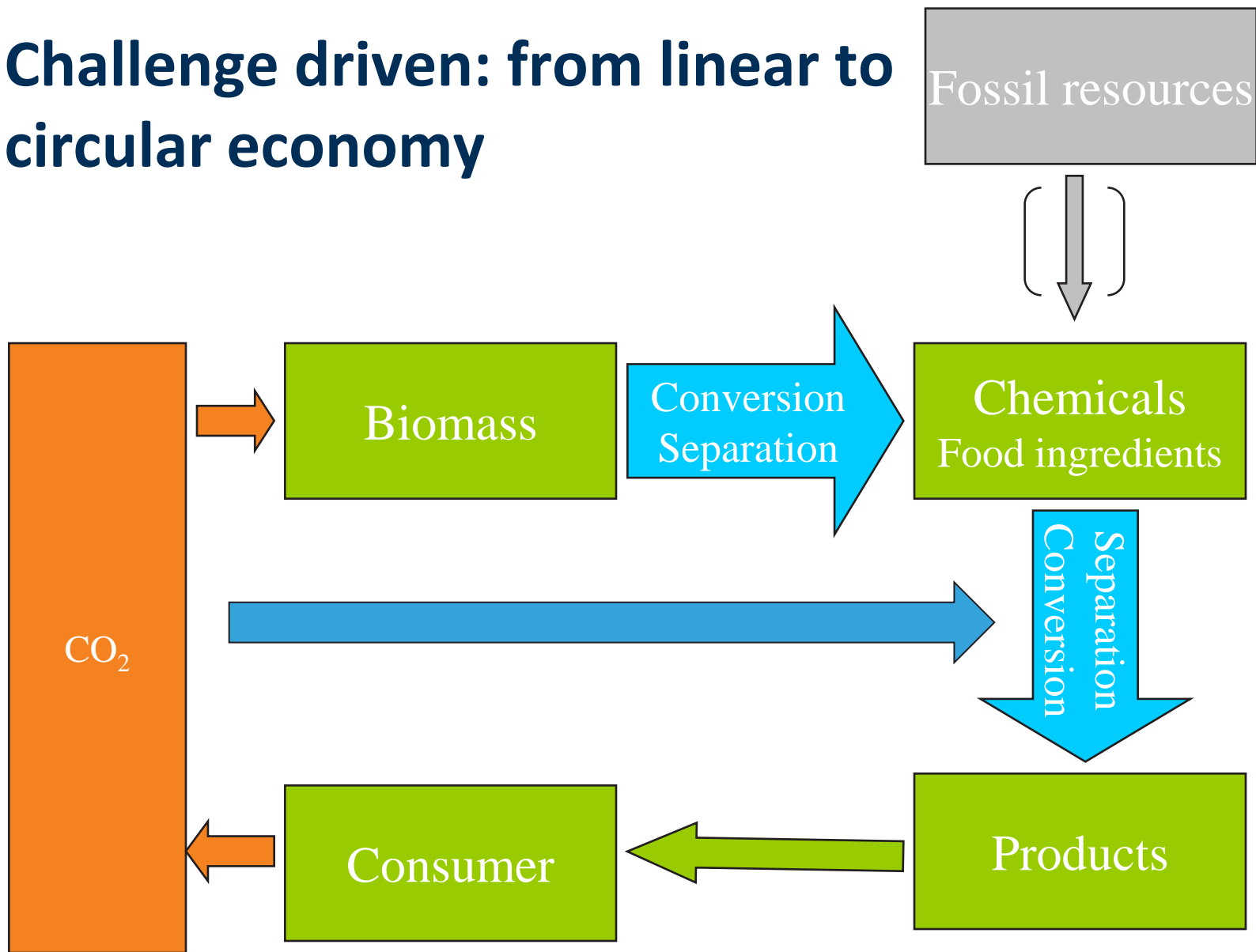
Value chain of chemicals





Colors correspond to the chemical production plants. Numbers are production capacities in metric tons per year (in parentheses, produced volumes in cubic tons of the year 2012).

Challenge driven: from linear to circular economy

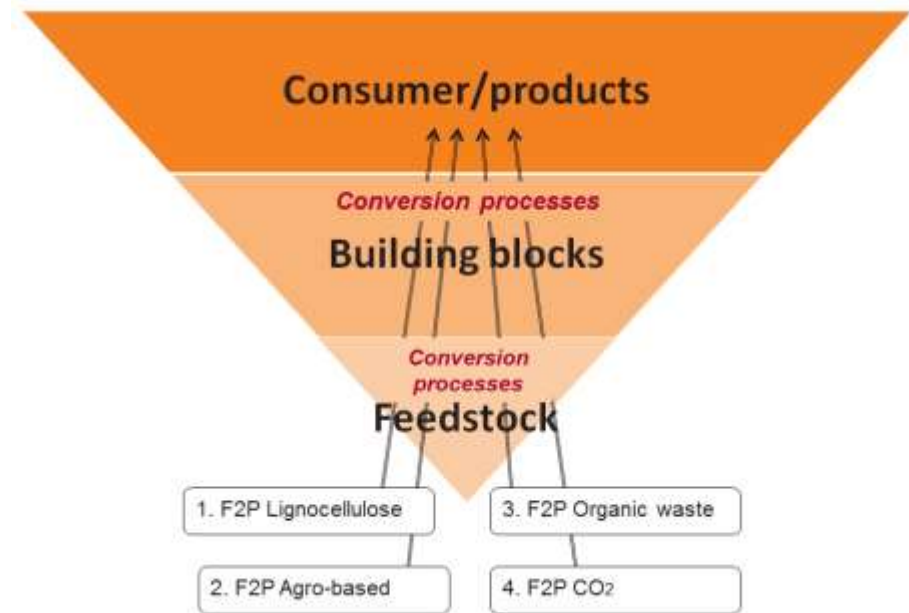


Smart specialisation: circular value chains

Biobased Feedstock

1. Woody Biomass
2. Agricultural Biomass
3. Municipal Waste
4. Industrial Side Streams
incl. CO/CO₂

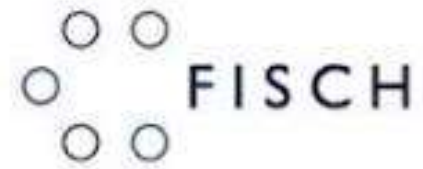
4 Biobased Value Chains



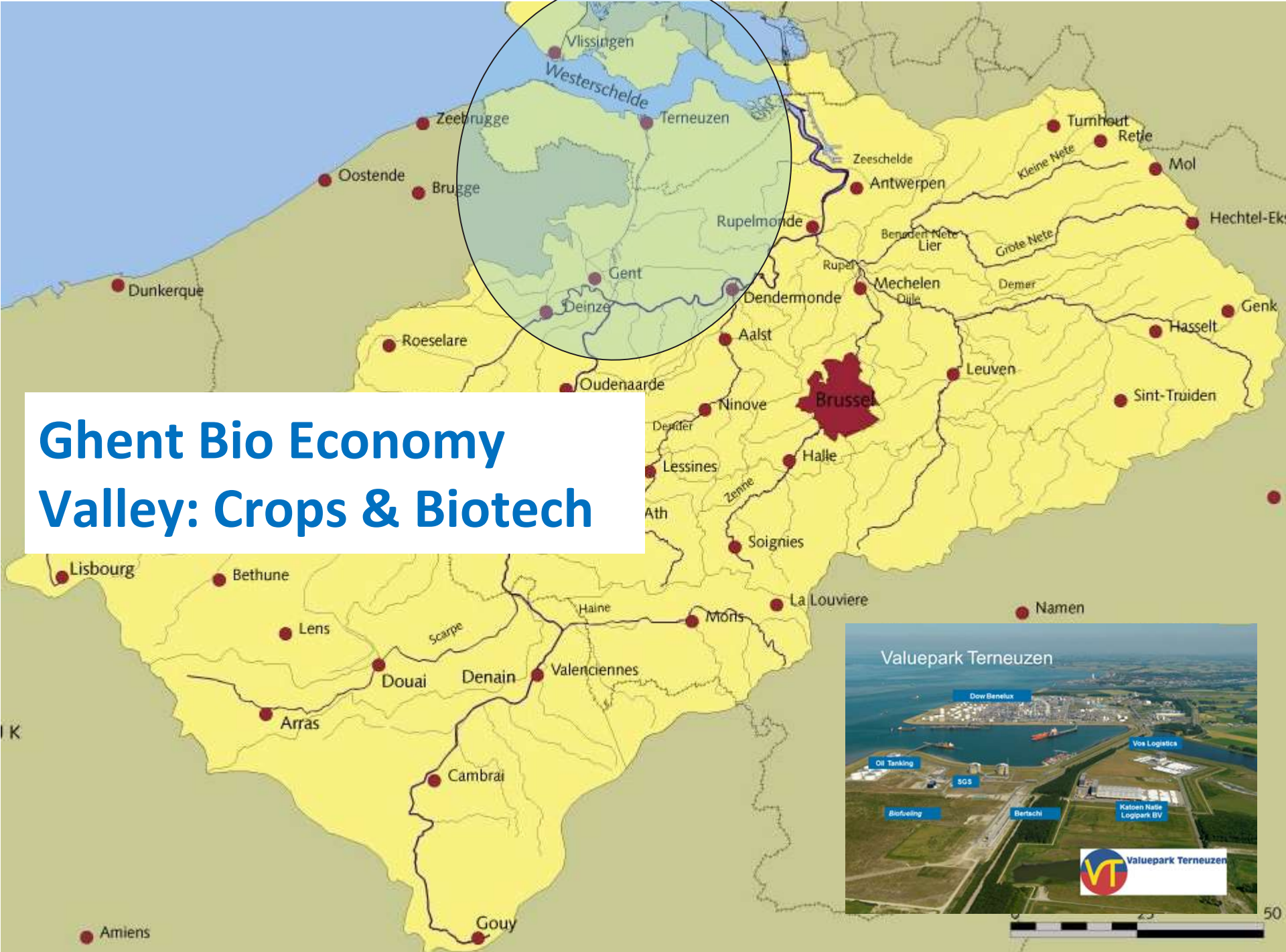
Antwerp: focus on CO₂, bio-based aromatics, ...

Flanders Innovation hub for Sustainable Chemistry

- » Develops the chemical industry into **smart specialisation**
 - » Renewable feedstocks
 - » Process intensification
 - » ...
- » **Biomass pretreatment:** collaboration with Cinbios, Ghent Bio Economy Valley, FlandersBio
- » **New chemical building blocks:** collaboration with BlueChem (Antwerp)
- » **New materials, polymers:** collaboration with Flanders Plastic Vision, Centexbel



Ghent Bio Economy Valley: Crops & Biotech



Gent: Largest Cluster in AgroBio in Europe



Syngenta

Bio-Accelerator I&II

VIB

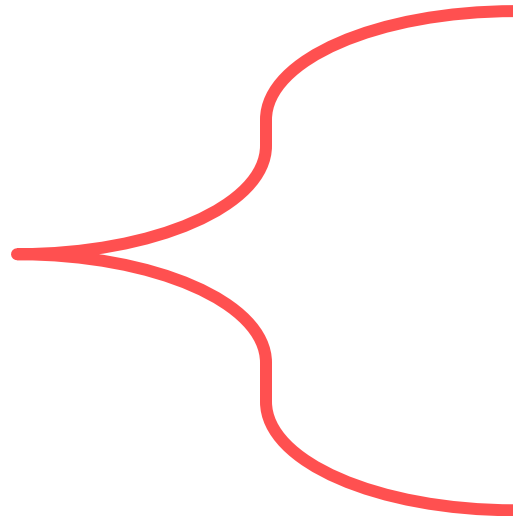
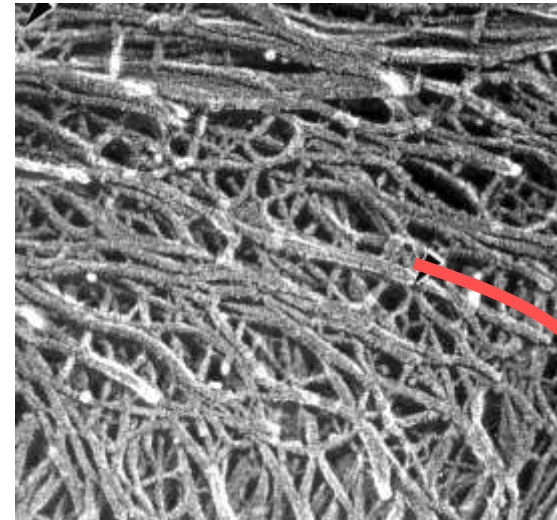
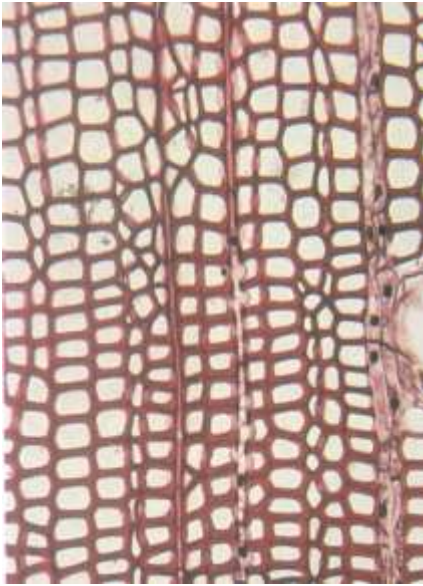
Bayer Crop Science

Bio-Incubators

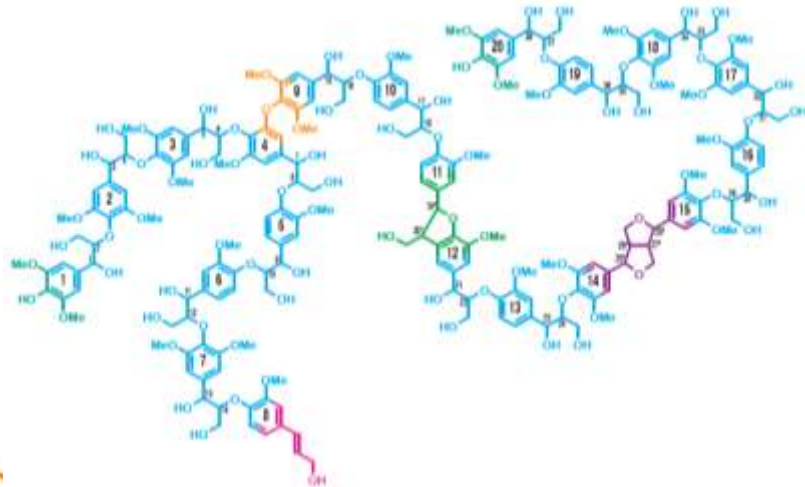


<< 20 km

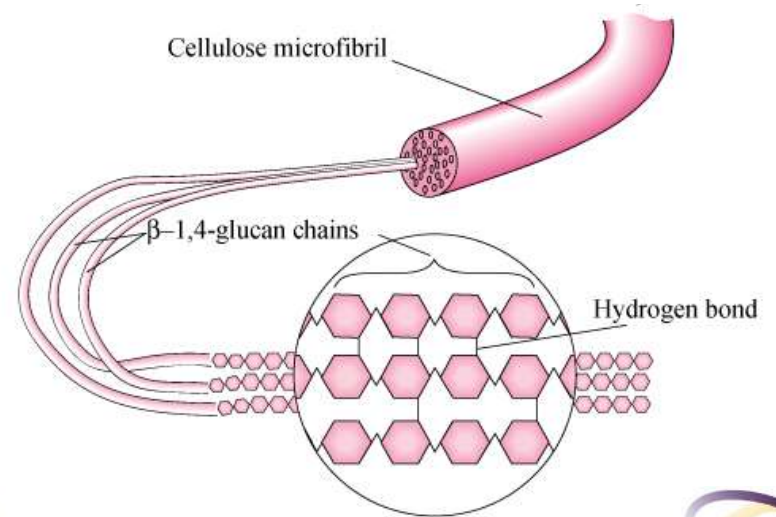
VIB research on poplar: Lignocellulose to fermentable sugars



Wood = 75% sugar



Lignin polymer



Polymerised glucose



Poplar as a future biorefinery crop

- » Dry biomass from the plant = 75% sugar
- » Fast growth
- » Perennial
- » Low energy-input
- » High CO₂ reduction
- » Easy to breed
- » Can grow on marginal land
- » No competition with food chain



Ghent Bioenergy Valley

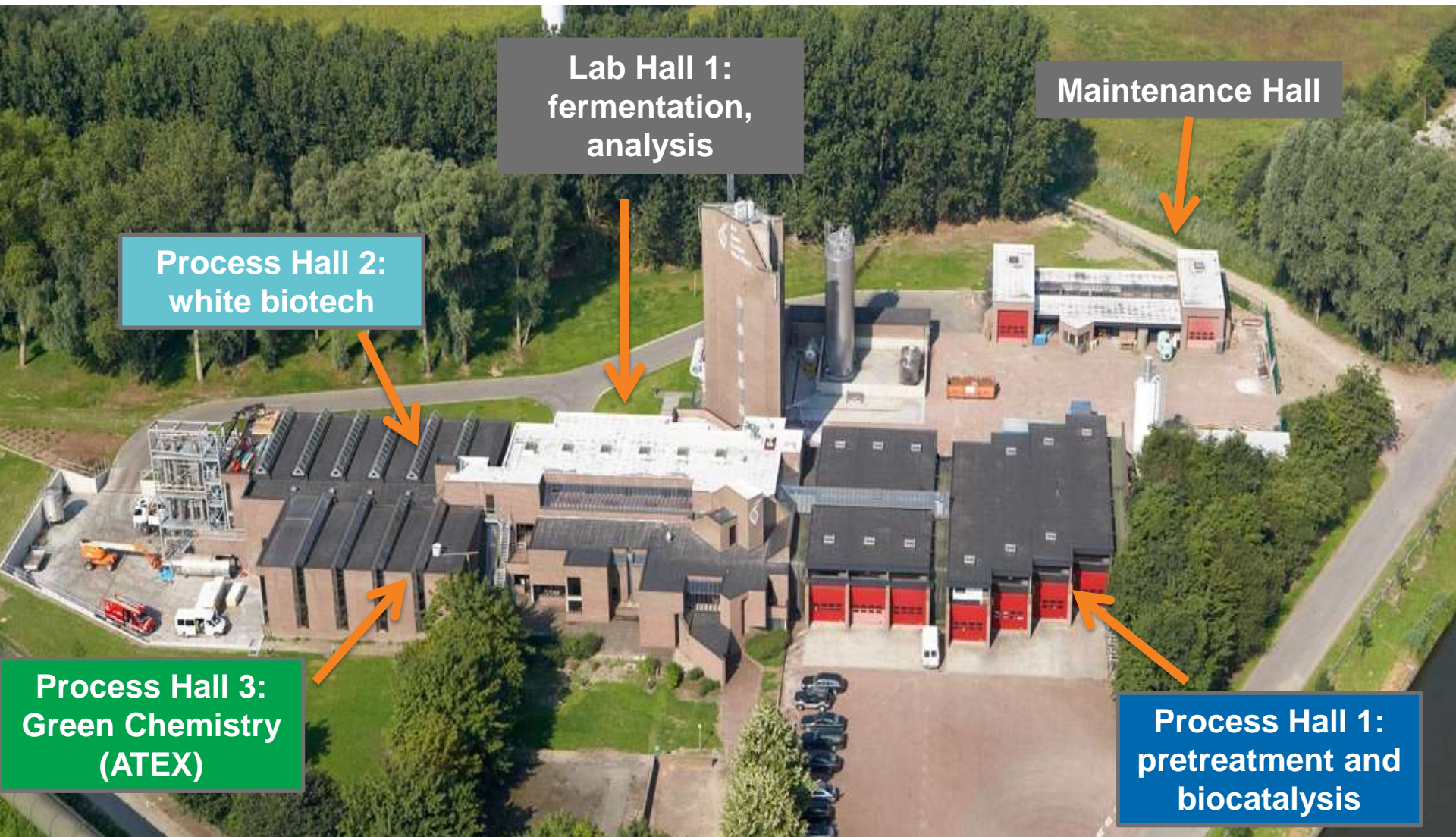


> 500 million Euro investments from 2007 - 2012

09/00/2014
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Bio Base Europe Pilot Plant - Ghent



Lab Hall 1:
fermentation,
analysis

Maintenance Hall

Process Hall 2:
white biotech

Process Hall 3:
Green Chemistry
(ATEX)

Process Hall 1:
pretreatment and
biocatalysis

VISIONS industrial collective research project FlandersBio, GBEV and essenscia

2nd generation technology development for lignocellulosic side streams

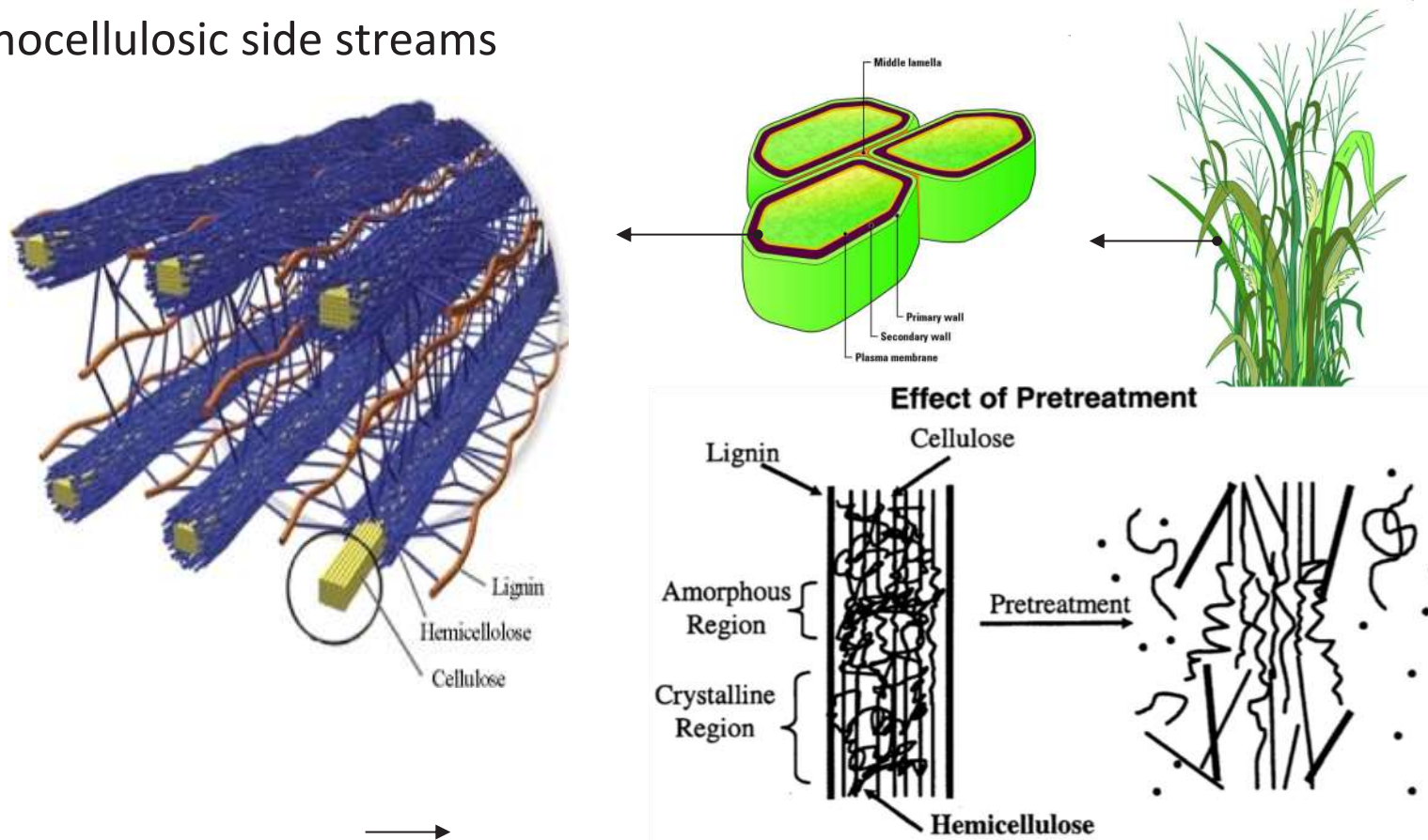


Fig. 1. Schematic of goals of pretreatment on lignocellulosic material (adapted from Hsu et al., 1980).

Bio Base Europe Training Centre - Terneuzen

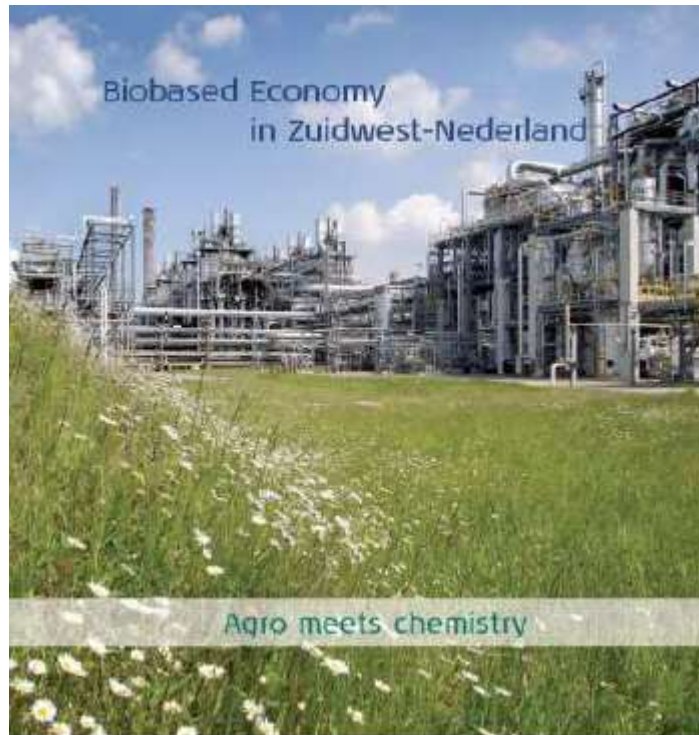
- » Unique training and information centre for the education of future processing in biotech industry, including chemical industry



Biobased Delta: agro meets chemistry



Biobased Delta Anno 2014: Agro meets chemistry





1. BioBase Europe Pilot Plant Gent en Trainingscentrum Terneuzen
2. Kanaalzone / Biopark Terneuzen
3. Sloegebied Vlissingen
4. Agrarisch Innovatie- en Kenniscentrum Rusthoeve (Biobased Garden)
5. Green Chemistry Campus, Bergen op Zoom
6. Agro & Foodcluster Nieuw Prinsenland, Dinteloord
7. Industriegebied Moerdijk
8. Algen, Zee & Land

Legenda:

- Groen = groene grondstoffen
- Blauw = sluiten kringlopen
- Rood = groene bouwstenen

Focus 1: New crops and feedstock

Core: valorisation of agro residues

- » Room for new crops, seeding and harvesting techniques
- » Proefboerderij De Rusthoeve (Colijnsplaat)
- » Industrial symbiosis around Suikerfabriek Dinteloord
- » Diverse (SME) cluster projects on valorisation, including **algae** and **seaweeds**

Top locations:

- » Bevelanden Rusthoeve, Dinteloord Nieuw Prinsenland en Westland (greenhouses)



Focus 2: Green building blocks

Core: bioaromatics

- » Shared research programm TNO, VITO & Green Chemistry Campus
- » Anticipate on growing scarcity of aromatics
- » Initial focus on technology development
- » Interest from Germany, France, Finland, Sweden

Core: natural fibres

- » Flax, hemp, bio-composites

Toplocations:

- » Green Chemistry Campus (sugar-based)
- » Blue Gate Antwerp (lignine-based)



Renewable feedstock:

- Biomass (1st generation)
- Lignocellulose (2nd generation)
- Waste (e.g. agro food residues)
- Algae & seaweed (3rd generation)
- CO₂ & H₂O (4rd generation)

Focus 3: Sustainable process industry

Core: Smart Delta Resources (short term)

- » High concentration process industry
- » Depending on high European energy- & feestock prices
- » Degrading concurrence position

Smart specialisation: links between energy and resources (long term)

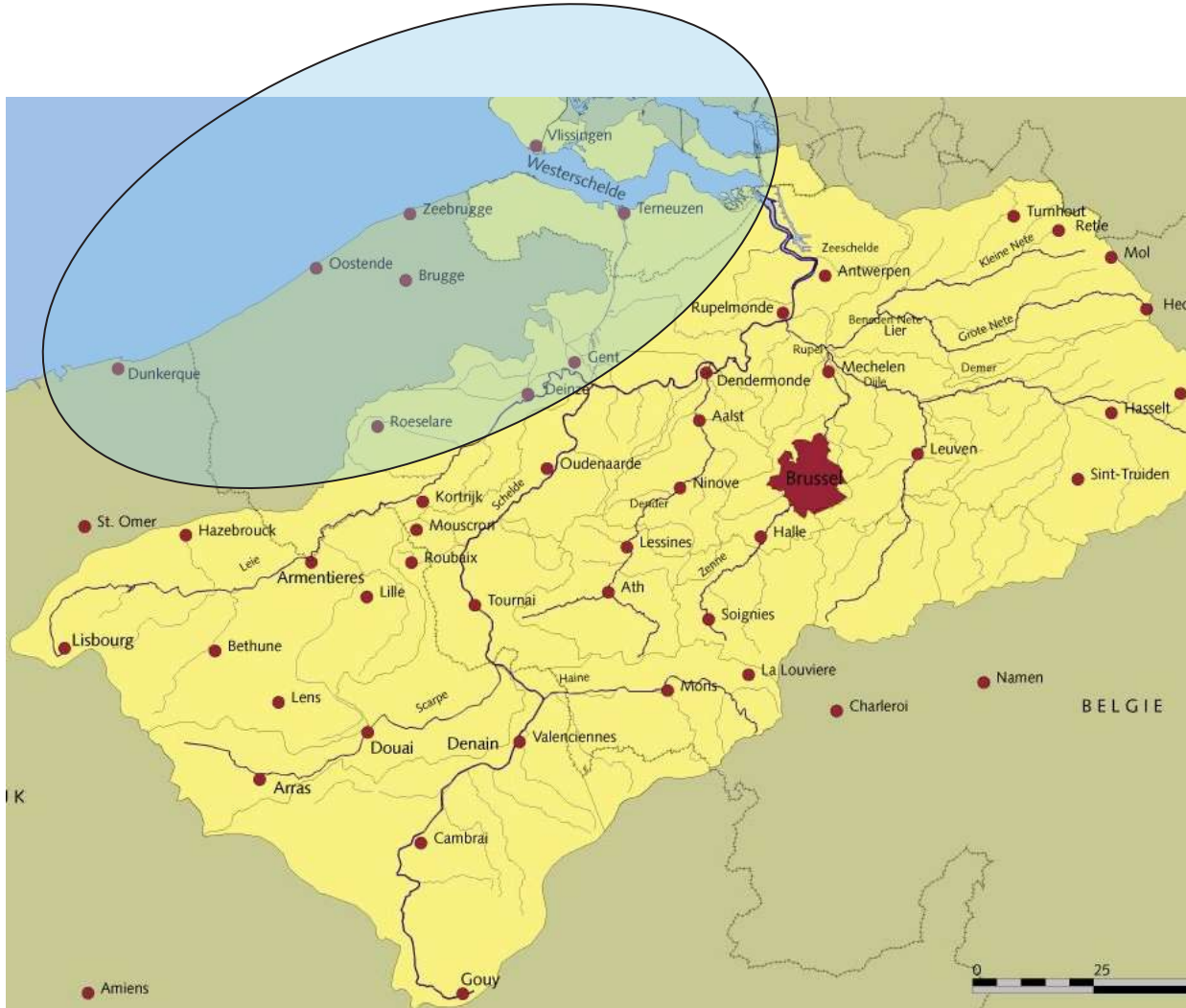
- » Sloegebied, Kanaalzone & Moerdijk
- » BIG-C: VL –NL - NRW regiocluster
 - » Energie & resource efficiency (C1 chemie)



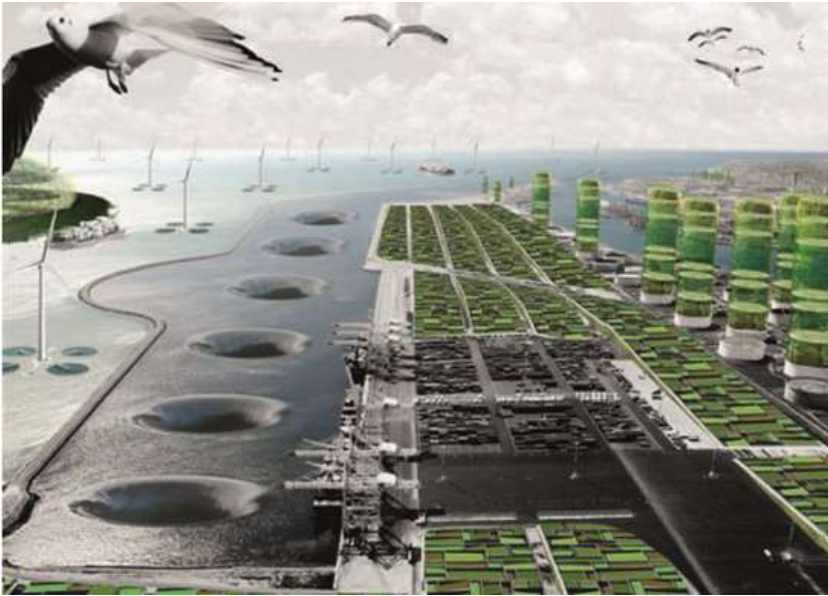
North Sea & Delta: strong in water construction



Future: biomass cultivation in Delta & North Sea



In 2050 the Scheldt basis will be part of a combined and integrated agro-chemical and logistic complex transformed into green and sustainable



Thank you

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