# Model Demonstrator Region Chemelot
# Trilateral Strategy Innovation Table


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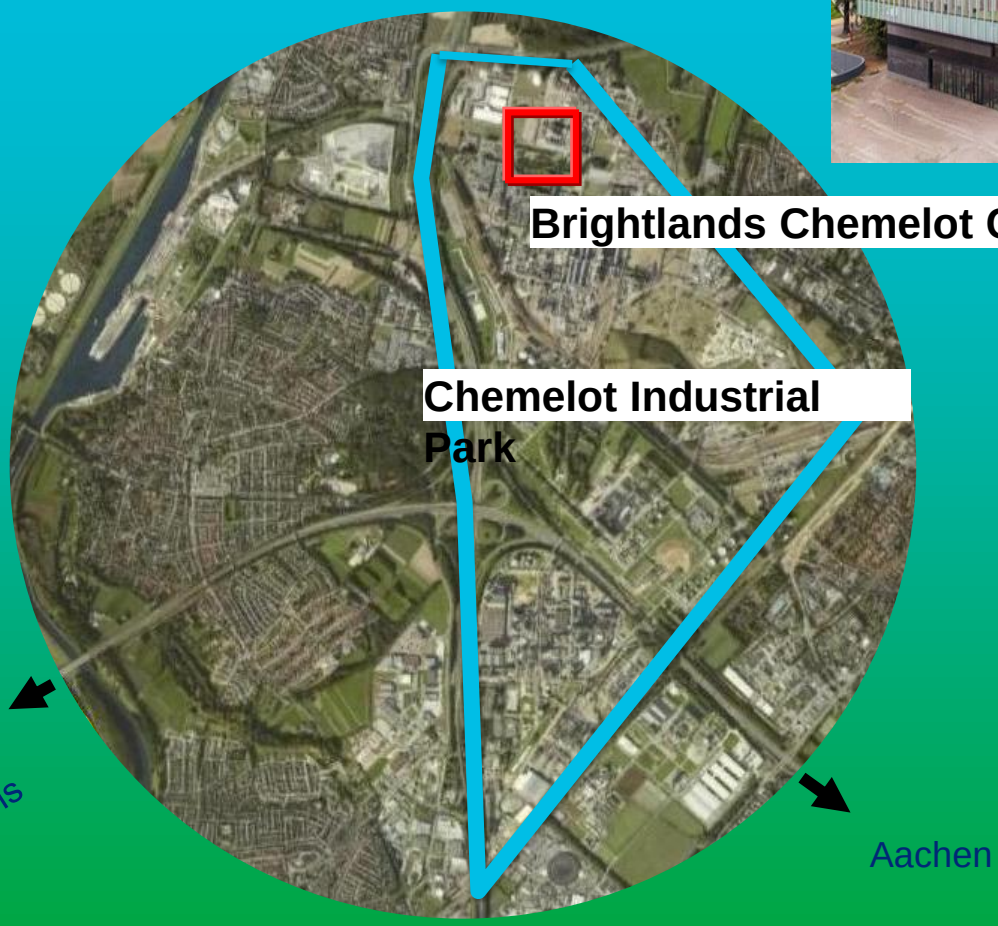
Brightlands Chemelot Campus

Brussels 27.09.2018

# Brightlands Chemelot Campus & Chemelot




provincie limburg

# Chemelot Industrial Park & Brightlands Chemelot Campus

## Missionplan Climate-Neutral Site in 2050 !

Brightlands
Knowledge crossing borders

chemelot
The chemical innovation community

Ca. 1900 employees, 750 students
20 ha R&D and scale-up infra
Ca. 80 innovation related organisations

- Ca. 6000 employees
- 800 ha, 60 large scale plants
- 80 companies

# STEPPING STONE
# Trilateral Region Chemical Industry


Brightlands
Chemelot Campus

# Trilateral Strategy for the Chemical Industry

➔ **Commissioned by**

The Netherlands, the Flemish Region, Federal State of North Rhine Westphalia

➔ **Transition Mission**

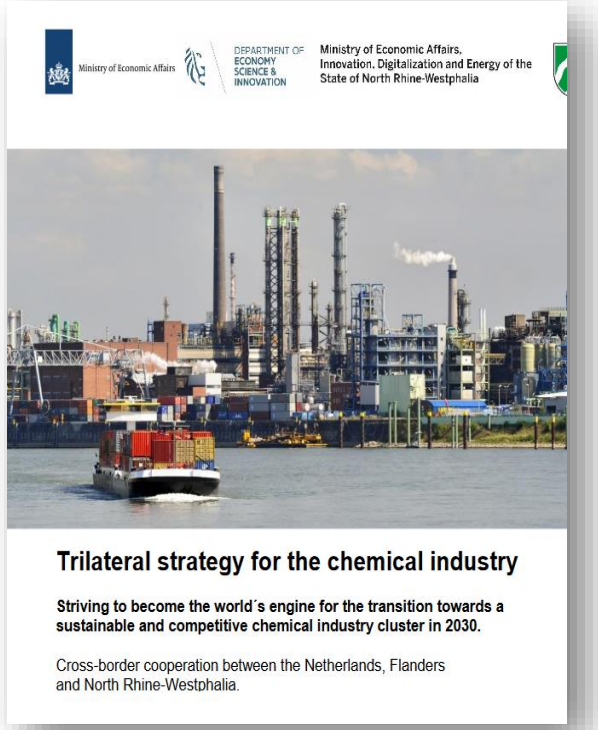
A sustainable &T competitive chemical industry cluster by 2050

➔ **Three tables**:

Innovation- Energy- Infrastructure

➔ **Innovation table;**

Chaired by Brightlands Chemelot Campus



# Trilateral Region Chemical Industry
# The Largest  Chemical Cluster in the World !

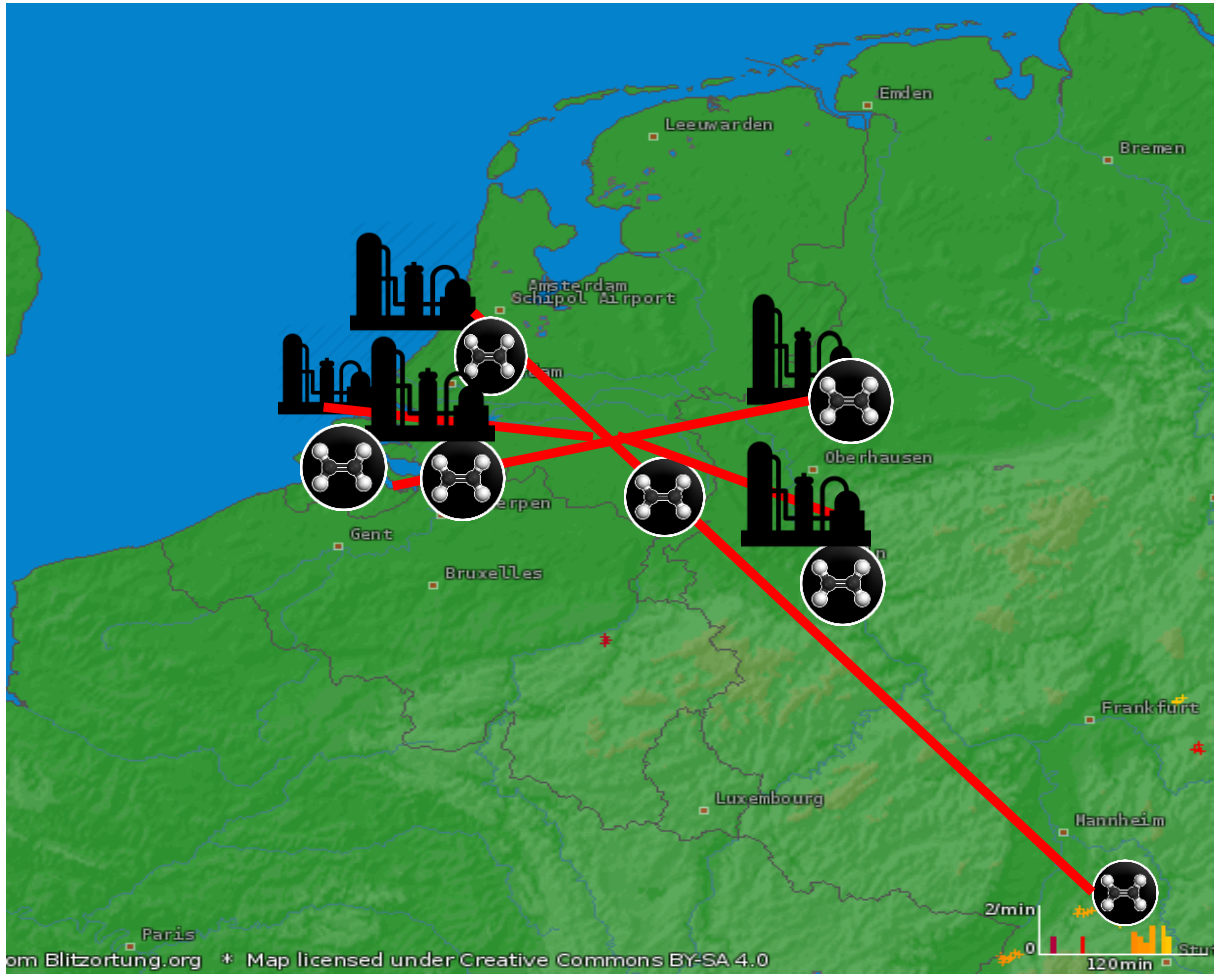
**INTERCONNECTED**

- 220b€ of turnover

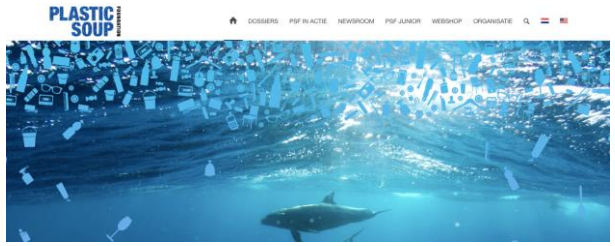
- 12% of the GDP

- 40% of the European turnover

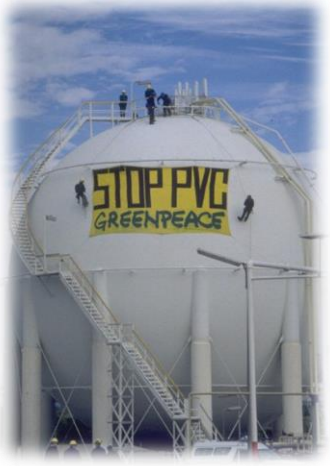
- 240.000 jobs



# The chemical industry in the trilateral region: Challenges








# Chemical Industry
# Transformation – Game changers

Footprint transition


Digital transition

Driver: society

Driver: technology

# Climate policies: an opportunity

- *All* processes *everywhere* will require redesign
- Breakthrough technology is key to future competitiveness
- *2030 is tomorrow, 2050 the day after*

# Three seemingly different government programs…

| NRW | FL | NL |
|---|---|---|
| <u>Frame of German research policy</u><br>• German Program of Resource Efficiency Progress II (2016)<br>• Plan for Climate Protecting 2050 (2016)<br>• 6th Energy Research Program (2016)<br>• Sustainability Strategy (2002)<br>• The new High-tech Strategy(2014)<br>• Research for Sustainable Development (FONA3, 2015)<br><br><u>German public funding programs</u><br>• Chemical Processes and Material Usage (2010 – 2016)<br>• CO2Plus – Broadening the Feedstock Basis (2016 – 2019)<br>• CO2Mi n –Pilot project Carbonatisation (2017 – 2020)<br>• Kopernikus Project P2X (2016)<br>• Carbon2Chem (since 2016)<br>• Ways to industrial usage (Carbonisation, Photocatalysis, Biotechnology and other innovative catalytic processes) – in preparation<br>• PHOENIX – Initiative | <u>Innovation programs</u><br>• Renewable Chemicals: Using nature's power<br>• Process Intensification & Optimization: Faster, smaller, better<br>• Side stream Valorization: Waste becomes resource<br>• Advanced Sustainable Products: Clean and green<br><br><u>Strategic topics</u><br>• Development of bio-aromatics from lignin origin<br>• Carbon capture and utilization (CCU)<br>• Sugar as a resource for bio based chemicals<br>• Industry 4.0 in chemical and plastics production | <u>Lower TRL-levels</u><br>• $CO/CO_2$ conversion to chemicals<br>• Novel energy carriers for sustainable energy ($H_2$, ammonia)<br>• Bio refinery of various sorts of biomass<br>• Bio solar technologies for chemicals<br>• Electrochemical conversion for materials/chemicals<br>• Algae as source of chemicals<br>• $CH_4$ decarburization<br>• Chemical recycling of polymers<br>• Smart materials providing solutions for other sectors<br>• Nanotechnologies / process efficiency<br><br><u>Higher TRL-levels / implementation</u><br>• Circular heat/heat pump technology<br>• Smart industry/digitization/censoring<br>• Process intensification<br>• $CO_2$ capture/storage<br>• Bio-methanol/Bio-ethanol/Bio-ethylene<br>• Gasification of waste<br>• Bio based chemicals/plastics from sugar<br>• Waste/sewage water to chemicals<br>• Mechanical polymer recycling<br>• Light materials for automotive/air transport/other applications<br>• Algae for fatty acids<br>• Manure to biogas |

# …that cover the same challenges

| NRW | FL | NL |
| --- | --- | --- |
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CCU

Recycling

CCS

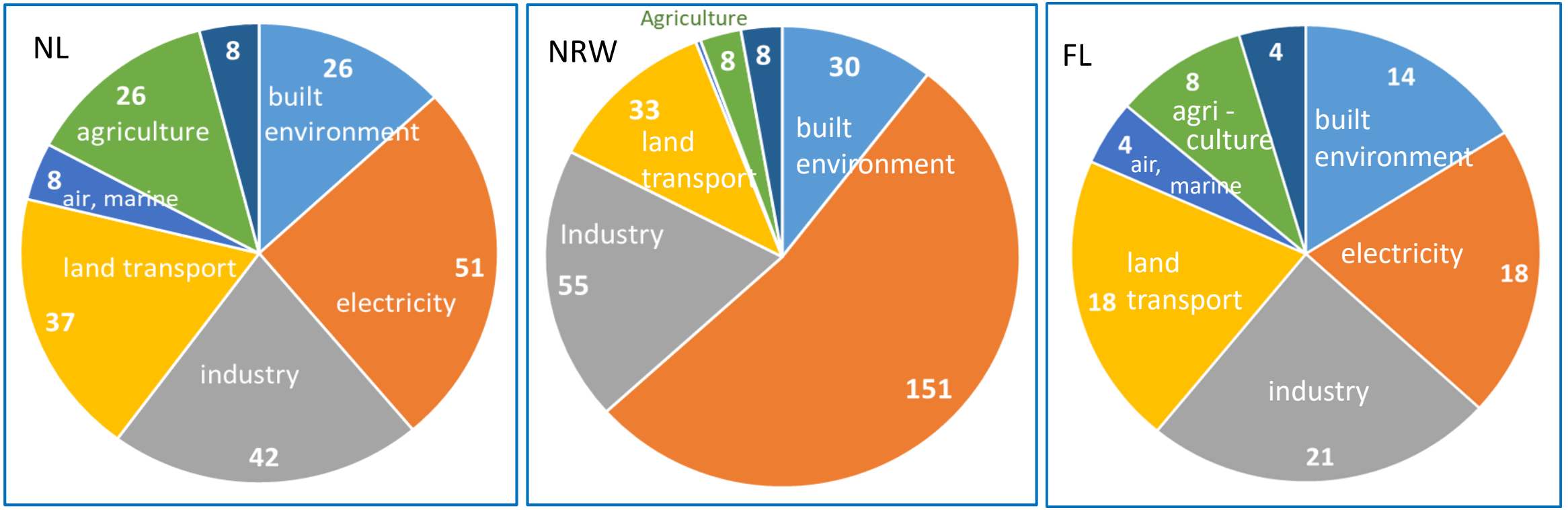
Electrification

Power-to-X

Industry 4.0

Bioaromatics

# Climate Policies: all of us will be asked to take our share




**NL:** **195 Mt $CO_2$-eq**

| | |
|---|---|
| Refineries | 11 Mt |
| Chemical industry | 22 Mt |

**NRW:** **285 Mt $CO_2$-eq**

| | |
|---|---|
| Refineries | 7 Mt |
| Chemical industry | 16 Mt |

**FL:** **87 Mt $CO_2$-eq**

| | |
|---|---|
| Refineries | 5 Mt |
| Chemical industry | 10 Mt |

# Industry themes: cover >80% of our total emissions

| Source | Use | Trilateral Impact |
|---|---|---|
| High-Temperature heating >400 ◦C | Combustion of fossil fuel for steam cracking, refining | **20-35** Mtpa $CO_{2\text{-eq}}$ |
| Hydrogen production | Steam reforming, ammonia, hydrogenation | **10** Mtpa $CO_{2\text{-eq}}$ |
| Low-temperature heat waste | Cracker of the future | **10-15** Mtpa $CO_{2\text{-eq}}$ |
| Grey electricity use | Electrolysis, electrical equipment | **20** Mtpa $CO_{2\text{-eq}}$ |
| Plastic waste | Waste incineration | **6** Mtpa $CO_{2\text{-eq}}$ plastic soup |

Report

# Trilateral Innovation Workshop

Friday, April 13, 2018

- Ca. 80 participants
- Highly interactive workshops
- Industry driven !
- Clusters of interest identified

**A shared Trilateral Region agenda for competitiveness through innovation**

# SUPRAREGIONAL INNOVATION THEMES

**Themes** that align National Programs Innovation Roadmaps

**Themes** that bind industry, knowledge institutes and government

**Themes** that create a competitive and sustainable industry in the trilateral region

# Outcome

What

| Trilateral Region Agenda Themes | ENABLING TOPICS | Next step Workshop dates |
|---|---|---|
| 1. $CO_2$ as a feedstock source (CCU) | Start-ups & Scale ups<br>Demo- and pilot plants<br>Funding & Innovation Hurdles | 3 Jul |
| 2. Electrification in high-T cracking | | 3 Jul |
| 3. Electrochemical conversion | | 20 Sep |
| 4. Carbon circularity in products | | 20 Sep |
| 5. Hydrogen of the future | | 2 Oct |
| 6. Biomass as a feedstock | | 2 Oct |
| 7. Industry 4.0 for digital transformation | | 11 Oct |

# TRILATERAL REGION AGENDA

Next Step Innovation Workshop

## ' CO2 as a Feedstock Source’

The CCU Innovation in cooperation with DG Grow / led by Ecofys

Three topics emerged from the discussion on CCU:

1. Carbon capture technology
2. Catalyst for transforming non-pure CO2
3. New products directly from CO2

Next Step: Roadmap & Plan of Action

# CCU- PILOT

Interreg

EUROPESE UNIE

Vlaanderen-Nederland

Europees Fonds voor Regionale Ontwikkeling

Governmental support

Project EnOp

BrightLands

Knowledge crossing borders

TNO innovation for life

UHASSELT

TU/e Technische Universiteit Eindhoven University of Technology

UNIVERSITEIT GENT

KU LEUVEN

Universiteit Antwerpen

THOMAS MORE

RWTH AACHEN UNIVERSITY

vito vision on technology

DIFFER Dutch Institute for Fundamental Energy Research

# TRILATERAL STRATEGY INNOVATION TABLE

PROPOSTION TOWARDS EUROPE:

- CONSORTIA ON KET’s
- MISSION DRIVEN ROADMAPS

Thank you for your attention

For more information:

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