Carbon4PUR

Turning industrial waste gases into valuable polyurethanes

European research collaboration between steel and chemical industry

Frankfurt, 12th June 2018

Dr. Liv Adler,
Covestro Deutschland AG

Carbon4PUR

Turning industrial waste gases (mixed CO/CO_2 streams) into intermediates for polyurethane plastics for rigid foams / building insulation and coatings

Responding to call: H2020-SPIRE-8-2017

Contributing to

- Circular economy
- Industrial symbiosis
- Carbon productivity
- Renewable materials

EC contribution: 7.75 mln. €

Duration: Oct. 2017 – Sept. 2020

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 768919

The Concept of Open Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 768919

Consortium

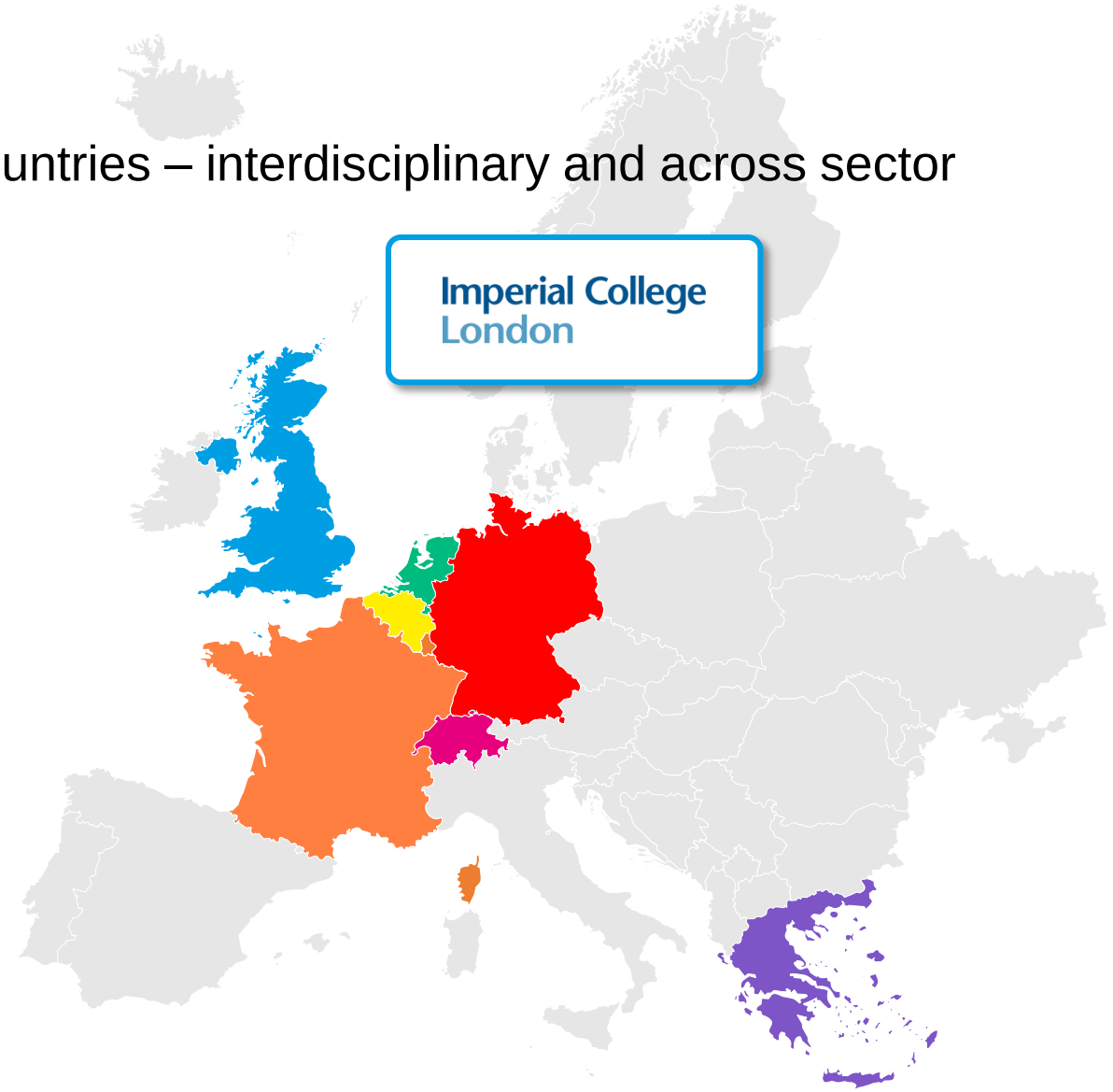
Carbon4PUR

14 Partners from 7 countries – interdisciplinary and across sector

cea
ArcelorMittal
Marseille Fos
Le port euroméditerranéen

RECTICEL
UNIVERSITEIT GENT

Universiteit Leiden
PNO



Imperial College London

covestro
DECHEMA
RWTH AACHEN UNIVERSITY

south pole group

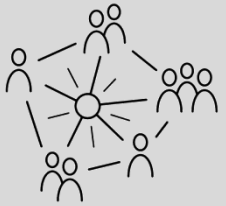
MEGARA RESINS
ANASTASSIOS FANIS S.A.

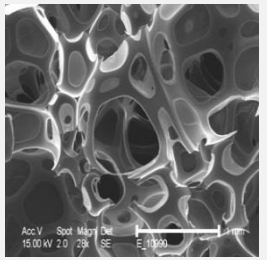
Leading experts teaming up for an excellent consortium

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 768919

Mission

Carbon 4 PUR





Generate value from the entire carbon from the flue gas stream and thus making carbon **productive** and the resulting PUR products more **sustainable**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 768919

Goals

A new **flexible technology** for the **transformation** of carbon derived for the first time from a **CO/CO_2-containing waste** and production of value-added chemicals for **new sustainable polyurethane applications**

Avoiding resource-intense separation of the gas components before the synthesis by developing **a chemo-catalytic process to deal with the complex gas mixture**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 768919

Ambition

Carbon4PUR

CO/CO_2 → BUILDING BLOCKS / INTERMEDIATES → PRODUCTS & APPLICATION

- Take full advantage of **catalysis expertise** and **advanced process technology**
- Small **piloting** of the new process (20t/y)
- **Demonstration** of an adjustable process for on-purpose and on-demand tailor-made production of required products, taking into account all variables at the same time:
  - Steel plant flue gases characteristics
  - Material and process parameters
  - End product market requirements

} Full value chain

- **Adaptable** to products, mostly for existing large-scale markets

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 768919

Methodology

Carbon4PUR

CO/CO_2 → BUILDING BLOCKS / INTERMEDIATES → PRODUCTS & APPLICATION

Steel industry

Steel production

Flue gas treatment

ArcelorMittal

UNIVERSITEIT GENT

Chemical – Polyol industry

Catalyst design

CAT Catalytic Center

cea

covestro

RWTH AACHEN UNIVERSITY

Process design

Upscaling

covestro

RWTH AACHEN UNIVERSITY

Polymer industry

Insulation boards & Coatings

RECTICEL insulation

covestro

MEGARA RESINS

Accompanying

Industrial symbiosis analysis

Marseille Fos

DECHEMA

ArcelorMittal

covestro

LCA and economic analysis

Extended LCA

Universiteit Leiden

Economic evaluation

Societal impacts

south pole

Exploitation – Replication – Dissemination

PNO

RECTICEL insulation

DECHEMA

MEGARA RESINS

Imperial College London

covestro

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 768919

Industrial symbiosis

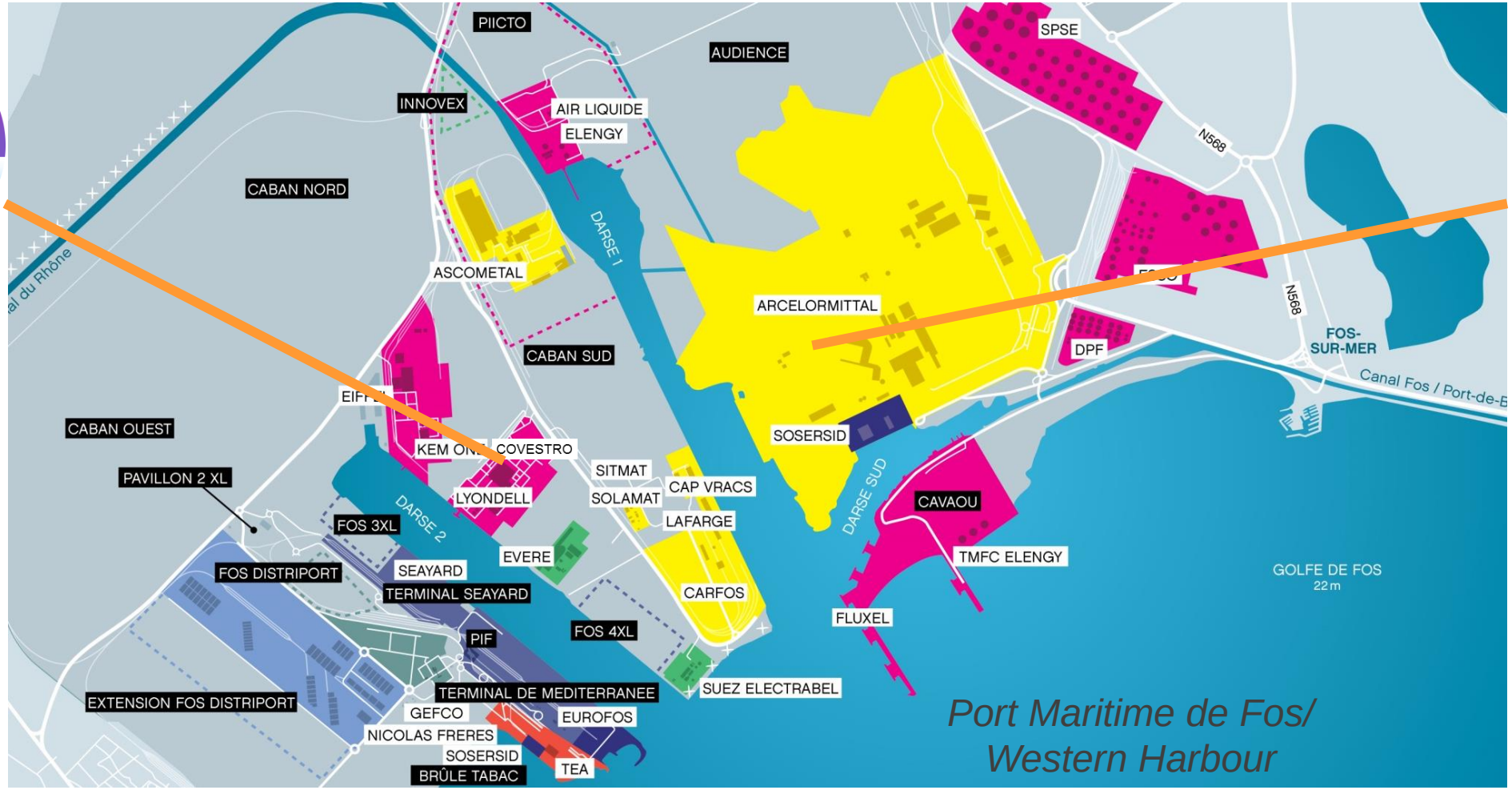
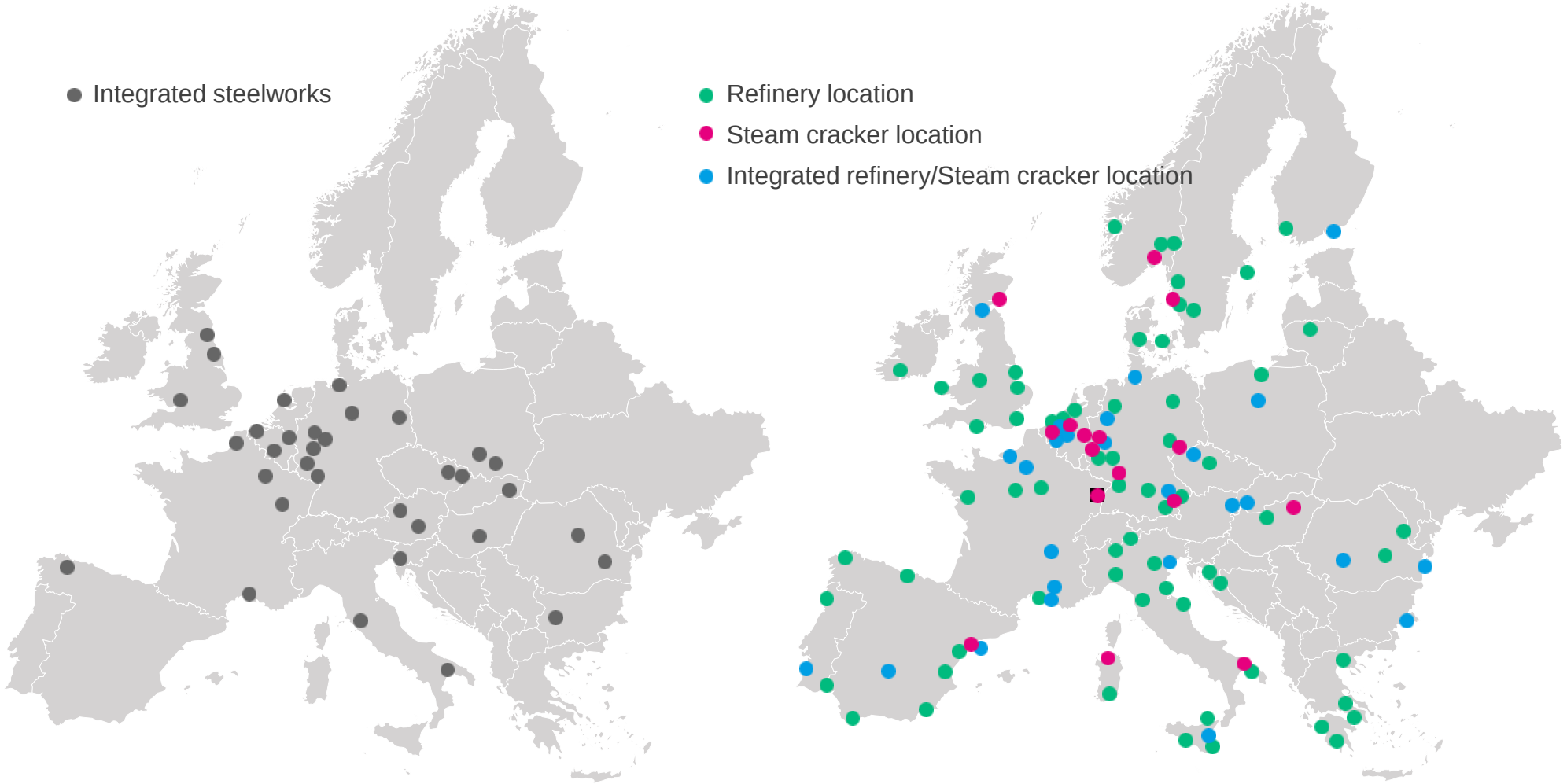


Image-Source:http://www.marseille-port.fr

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 768919

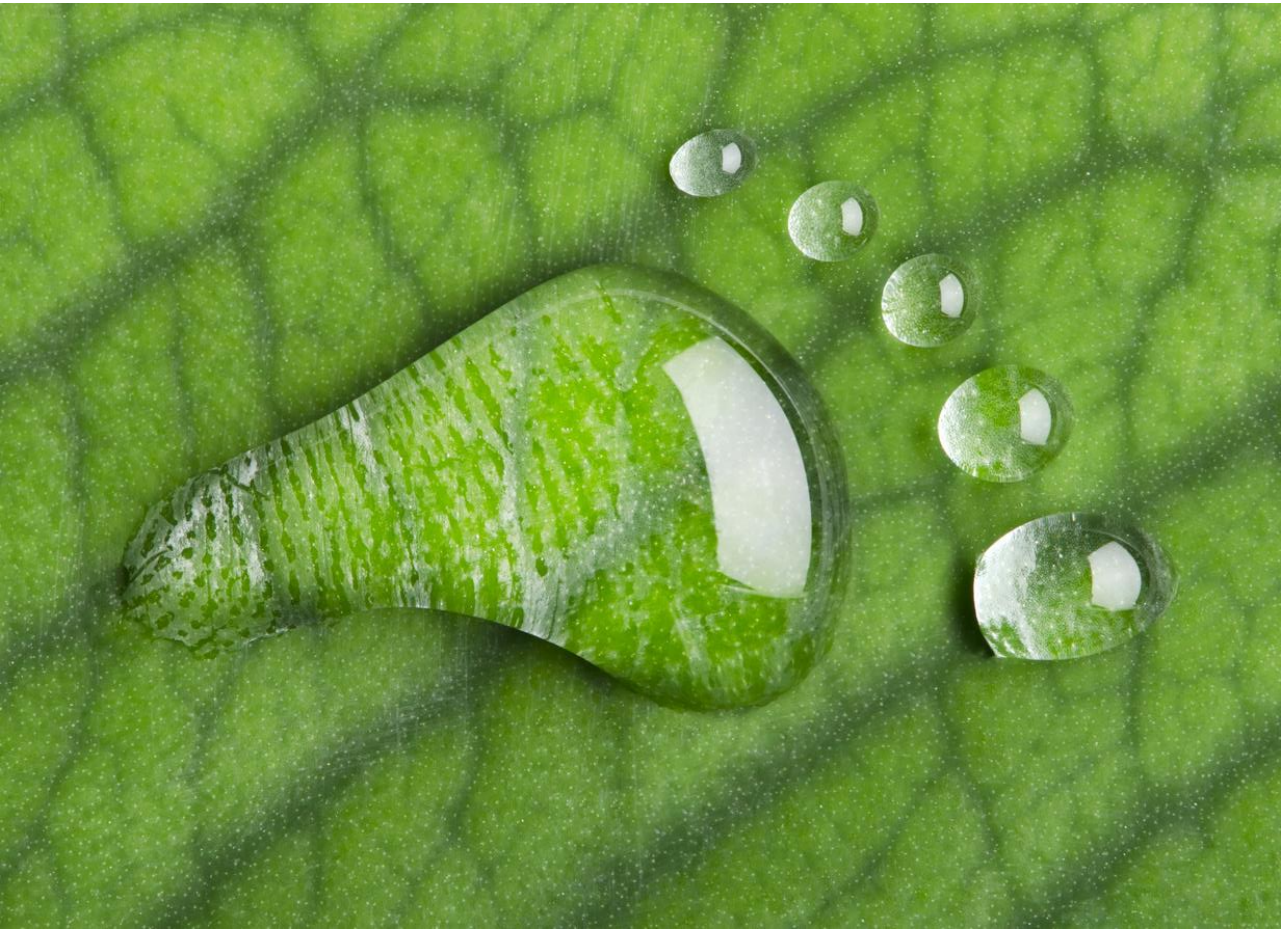
Replication potential

Geographical distribution of integrated steelworks and refineries in Europe



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 768919

Expected impact



- **Green House Gas emissions reduction**
  Reduction of the carbon footprint of PUR intermediates by 20 – 60% CO_2 eq. as compared to today's PUR products manufactured from crude oil thanks to the re-utilisation of CO/CO_2
- **Conservation of resources**
  Reduce up to 15-36 % of petrochemical epoxy compounds and 70 % of process energy compared to conventional chemical processes
- **Strengthen steel and chemical industries**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 768919

Thank you!

Acknowledgement

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 768919.