



Carbon4PUR

Turning industrial waste gases into valuable polyurethanes

European research collaboration between
steel and chemical industry

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Challenge: Saving our fossil resources

Use of carbon in the most productive way



- Chemical industry depends on the element carbon
- Current carbon source:
fossil raw materials, such as oil
- 4% – 6% of global output is used for plastics production
- Oil reserves are finite

Reduce CO₂ emissions

Use CO/CO₂ instead of oil



- CO₂ gaining importance as alternative carbon source
- CO₂ supply is virtually unlimited, global availability
- Using CO₂ is technically very demanding, however
- Use of CO₂ for the production of polyols – key precursor for numerous plastics and coatings

Carbon4PUR



Turning industrial waste gases (mixed CO/CO₂ 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



Consortium

14 Partners from 7 countries – interdisciplinary and across sector



Leading experts teaming up for an excellent consortium



Collaboration Open Innovation



Carbon4PUR



Mission



Generate value from the entire carbon from CO/CO₂-containing waste streams
Making carbon productive and the resulting PUR products more sustainable

CO/CO₂

BUILDING BLOCKS / INTERMEDIATES

PRODUCTS & APPLICATION



- **Demonstration** taking into account all variables at the same time:
 - Steel plant flue gases characteristics
 - Material and process parameters
 - End product market requirements
- Small **piloting** of the new process (20t/y)
- **Adaptable** to products for existing large-scale markets



Full value chain

Methodology

CO/CO₂

BUILDING BLOCKS / INTERMEDIATES

PRODUCTS & APPLICATION

Steel industry

Steel production

Flue gas treatment



ArcelorMittal

UNIVERSITEIT GENT

Chemical – Polyol industry

Catalyst design

Process design

Upscaling



CCT
Catalytic Center
cea

covestro

RWTH AACHEN
UNIVERSITY

covestro

RWTH AACHEN
UNIVERSITY

Polymer industry

Insulation boards & Coatings



RECTICEL
insulation

covestro

MEGARA RESINS[®]
ANASTASSIOS PARISS S.A.

Accompanying

Industrial symbiosis analysis

Marseille Fos
Le port méditerranéen

DECHEMA

ArcelorMittal

covestro

LCA and economic analysis

Extended LCA

Universiteit Leiden

Economic evaluation

TU/e

Societal impacts

south pole

Exploitation – Replication – Dissemination

PNO

RECTICEL
insulation
DECHEMA

MEGARA RESINS[®]
ANASTASSIOS PARISS S.A.
Imperial College
London

covestro



Expectations and added value



Thermal insulation solutions for building renovations and new construction make a significant contribution to a low-carbon society

We estimate that in 2017, the **CO₂ emissions avoided by our insulation solutions total over 30 times our carbon impact throughout the value chain**

Carbon4PUR :

- Evaluation of **CO/CO₂-based polyols** on lab- and semi-industrial scale into innovative high-performance, durable, thermal insulation boards made from rigid closed cell PUR for the construction sector
- CO/CO₂-based polyols that are **able to substitute conventional polyols** resulting in rigid foams with the same or even superior quality (e.g. fire behaviour) compared to advanced standards
- With CO/CO₂-based polyols, **carbon footprint can be reduced** compared to today's polyurethane products manufactured from crude oil due to the re-utilisation of anthropogenic CO and CO₂
- Consequently also a **lower carbon footprint** compared to the current PU insulation panels is expected
- It is estimated that **by 2029 about 25% of our total rigid foam polyol consumption will be substituted**



Industrial symbiosis

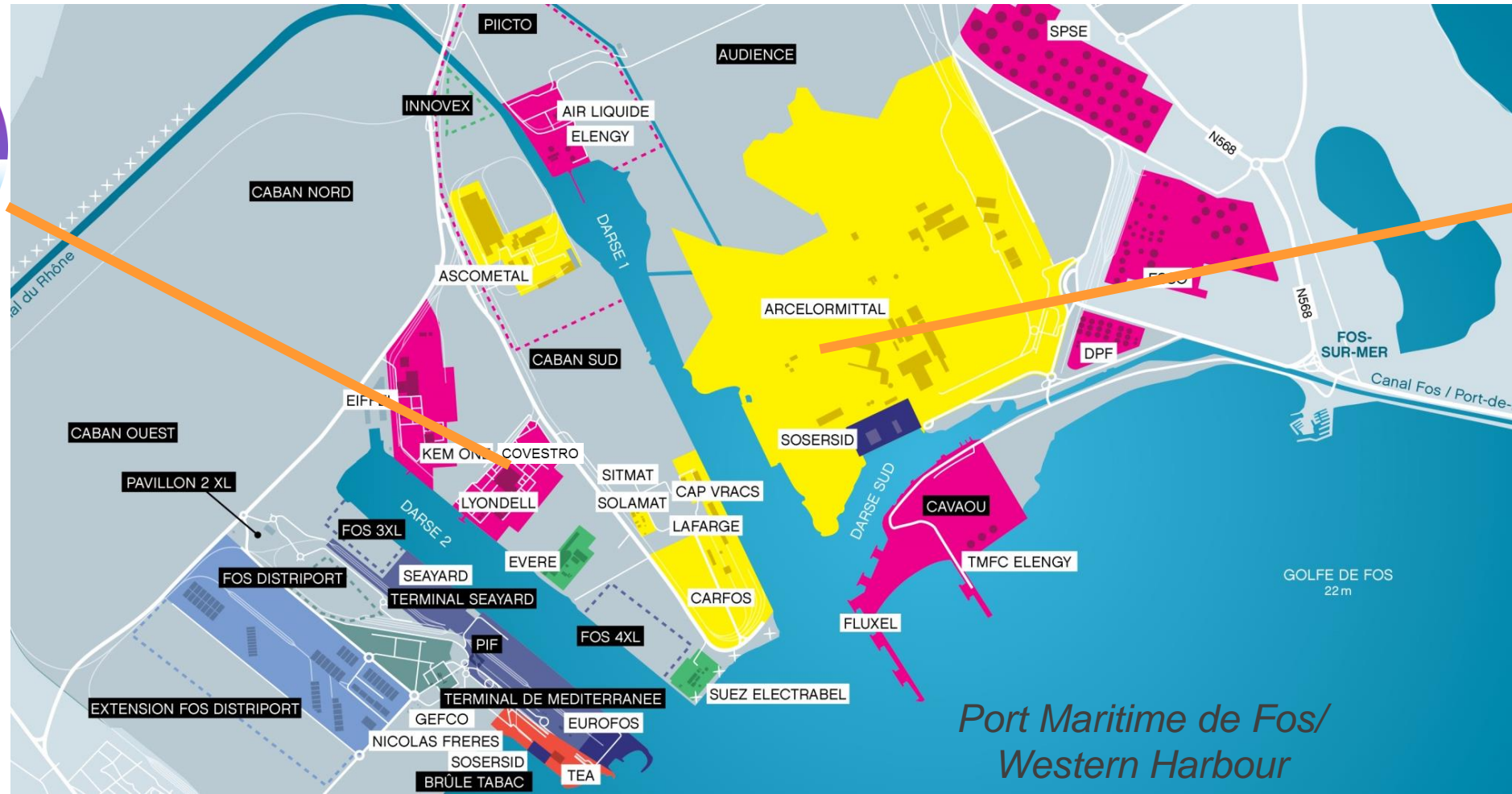
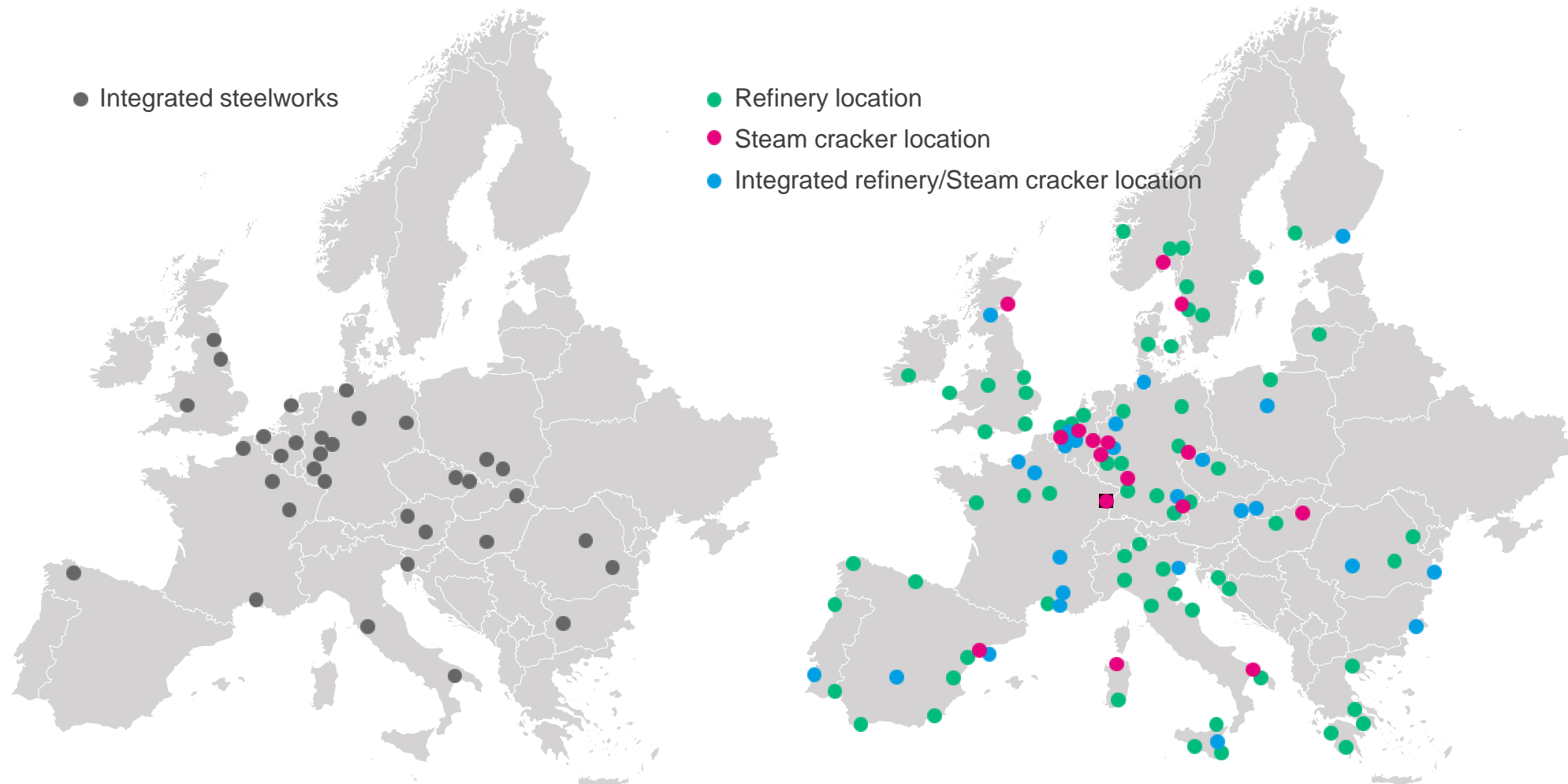


Image-Source: <http://www.marseille-port.fr>



Replication potential

Geographical distribution of integrated steelworks and refineries in Europe



Thank you!



How to get involved...



Website www.carbon4pur.eu

Follow [@carbon4pur](https://twitter.com/carbon4pur) on twitter

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Stakeholder analysis

Stakeholder-Event: 20th March 2019 in Marseille, France

Disclaimer

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