Role of the chemical valorisation of CO_2 toward the transition to climate neutrality and circular economy

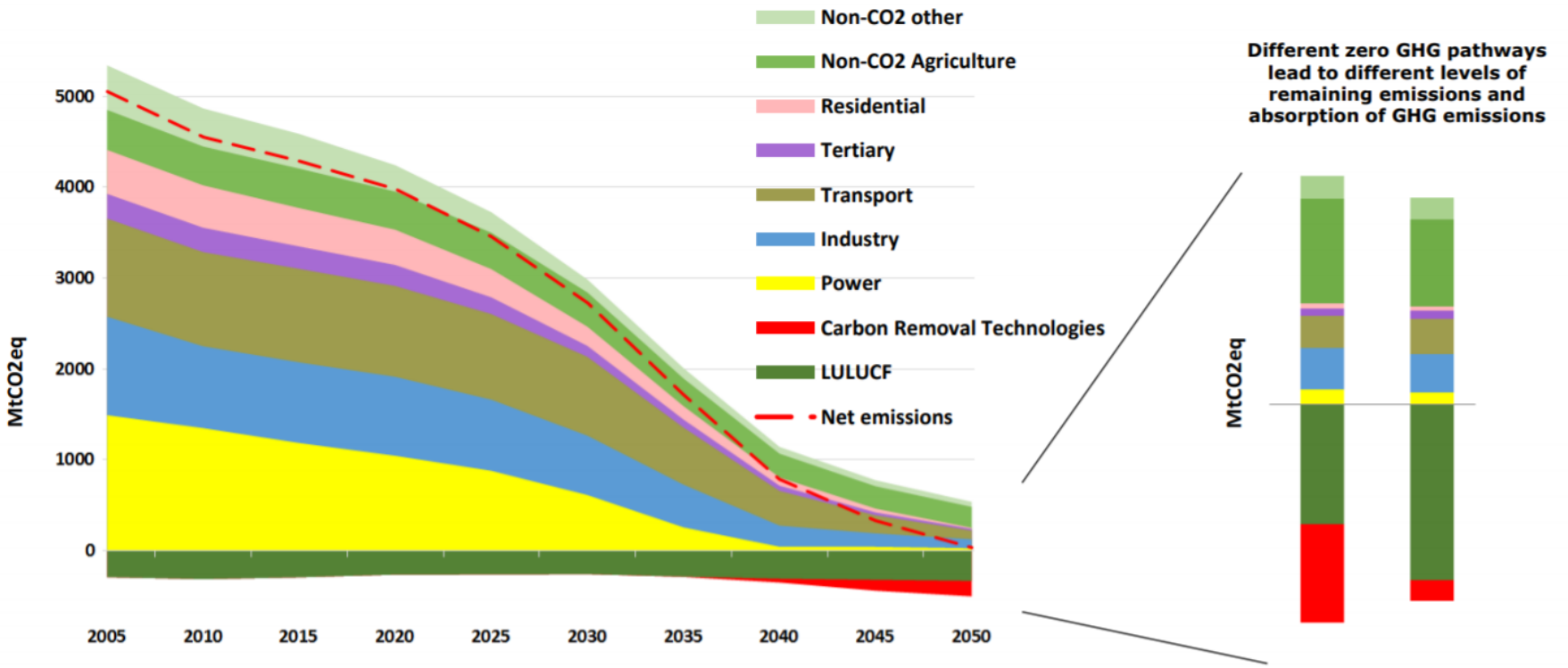
Workshop

22 October 2020

Sophie Wilmet

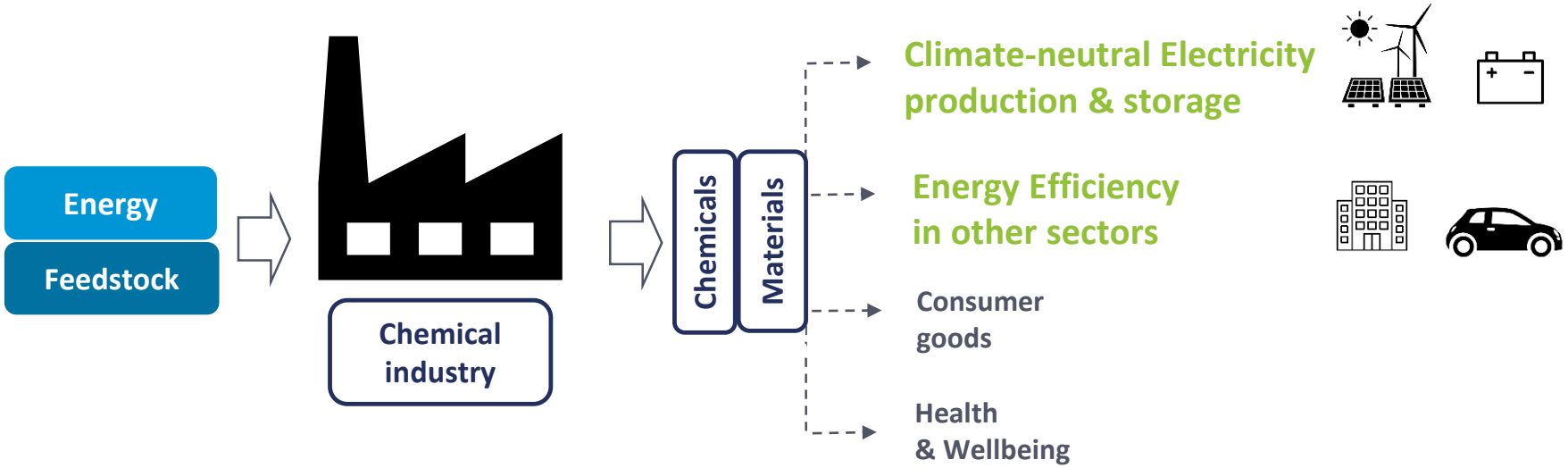
The chemical industry and the transition toward a circular and climate neutral economy

Toward a climate neutral economy

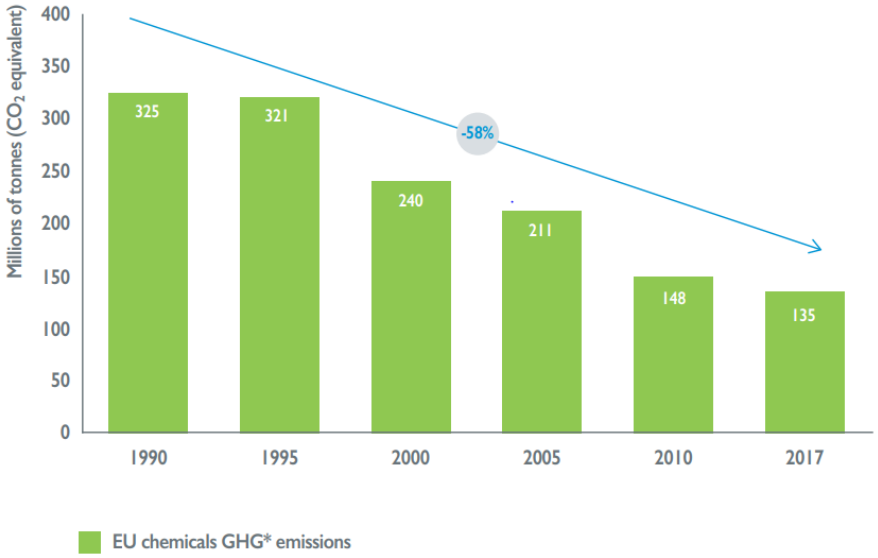


Spurce: A Clean Planet for all - A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy COM(2018)773 & related in depth-analysis

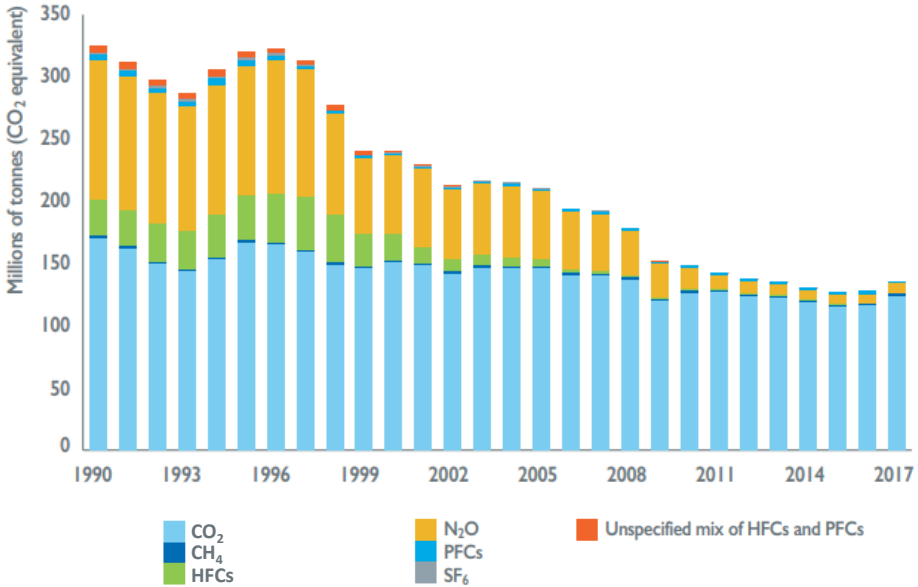
Enabling role of the chemical industry in the transition toward a climate-neutral economy



Total GHG emissions* in the EU-28 chemical industry fall nearly 60% since 1990

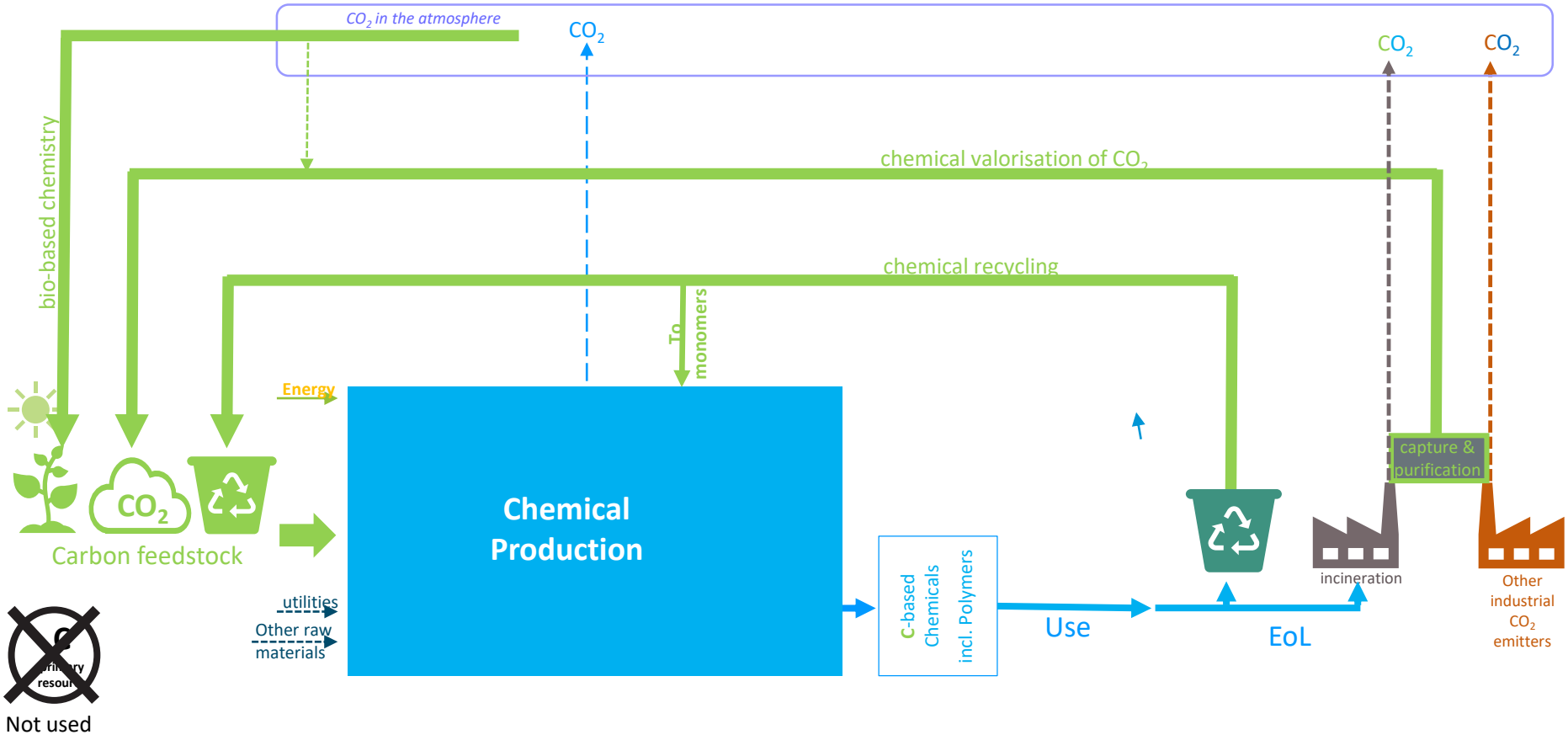


Source: European Environment Agency (EEA)
* Energy (Fuel and Power CO_2) included
Cefic Facts & Figures 2020

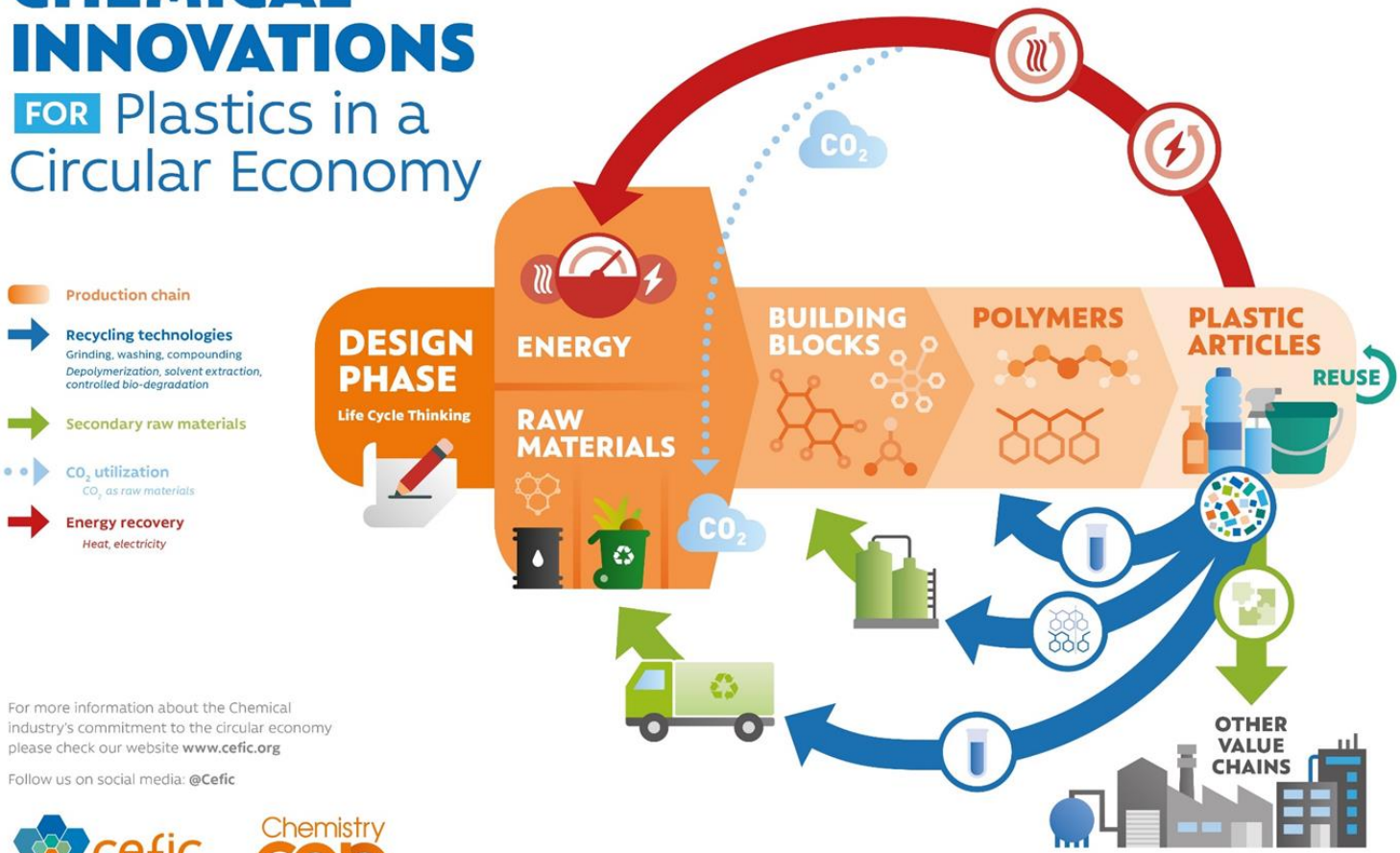


Source: European Environment Agency (EEA)
* Energy (Fuel and Power CO_2) included
Cefic Facts & Figures 2020

Circularity of Carbon



CHEMICAL INNOVATIONS FOR Plastics in a Circular Economy



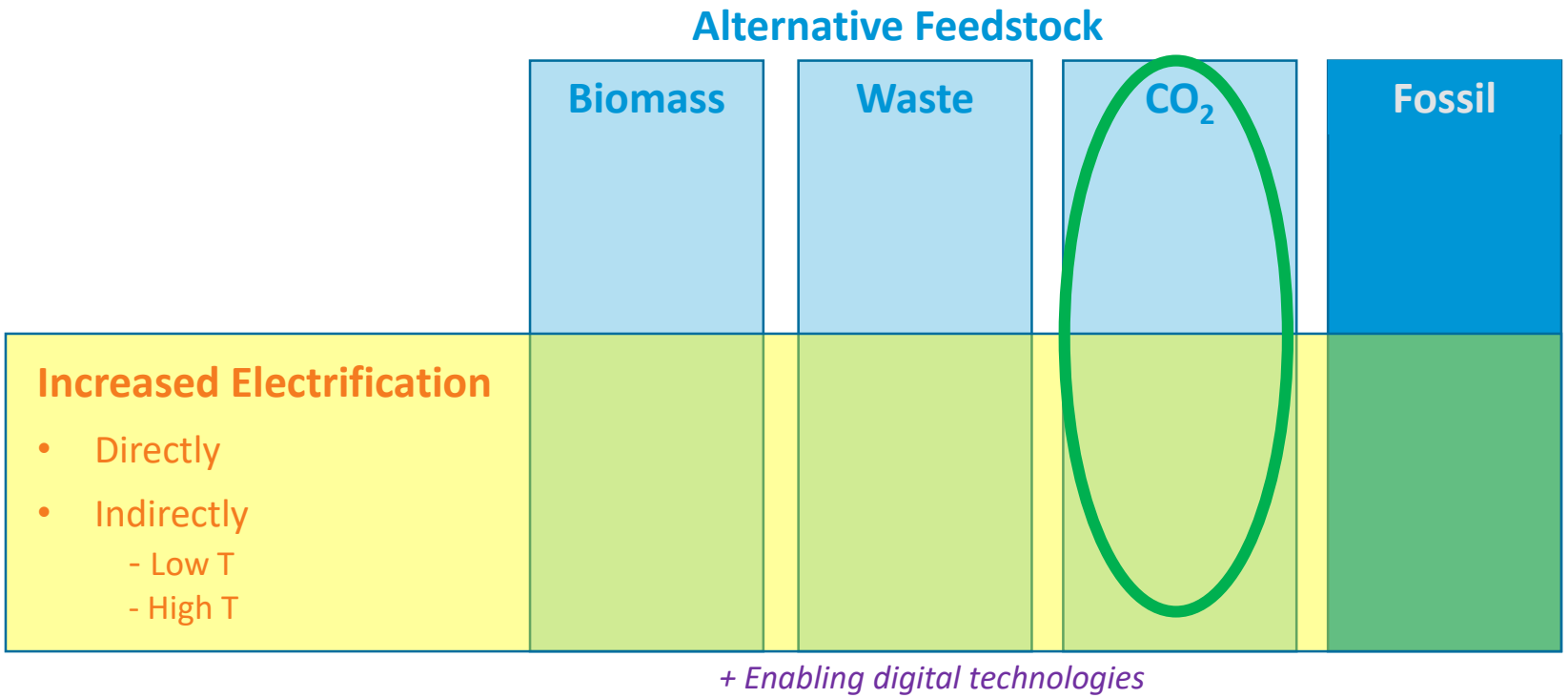
For more information about the Chemical industry's commitment to the circular economy please check our website **www.cefic.org**

Follow us on social media: **@Cefic**

cefic

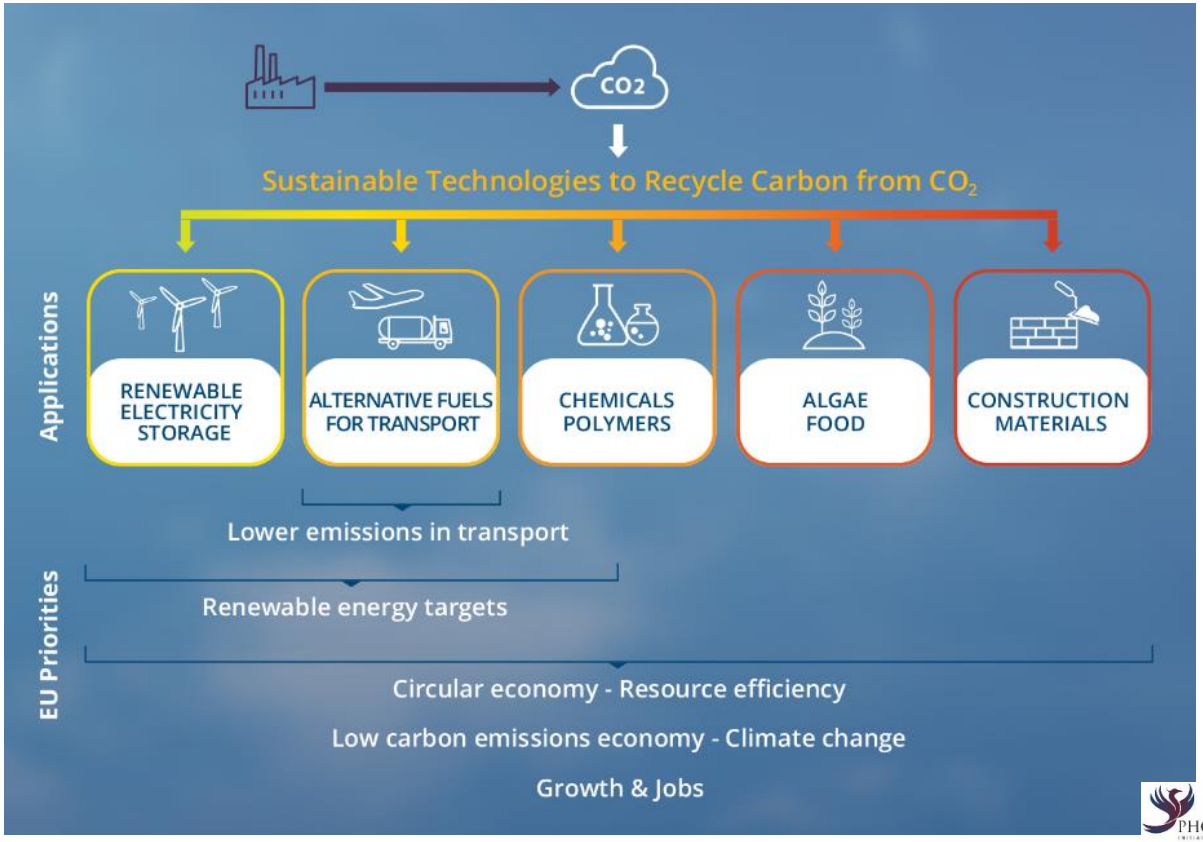
Chemistry can

A mix & combination of technological solutions needed in the chemical sector

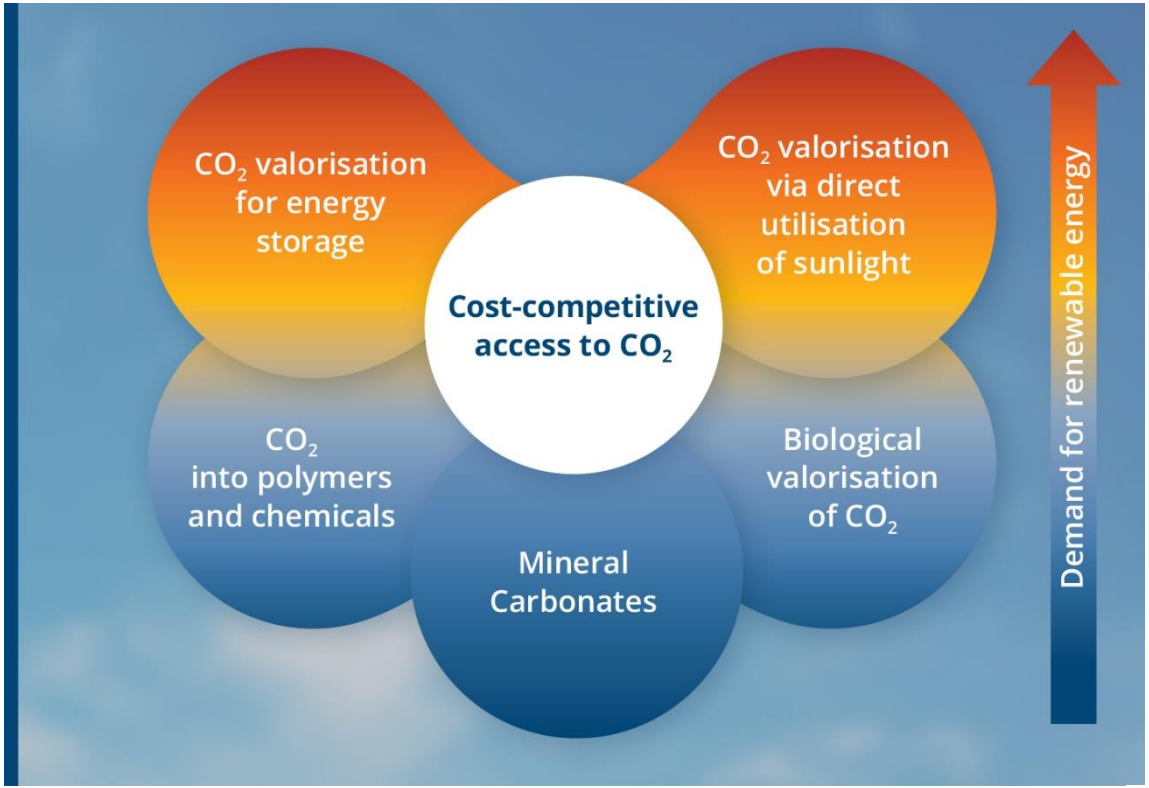


Chemical valorisation of CO_2: applications

Chemical valorisation of CO_2 - Applications

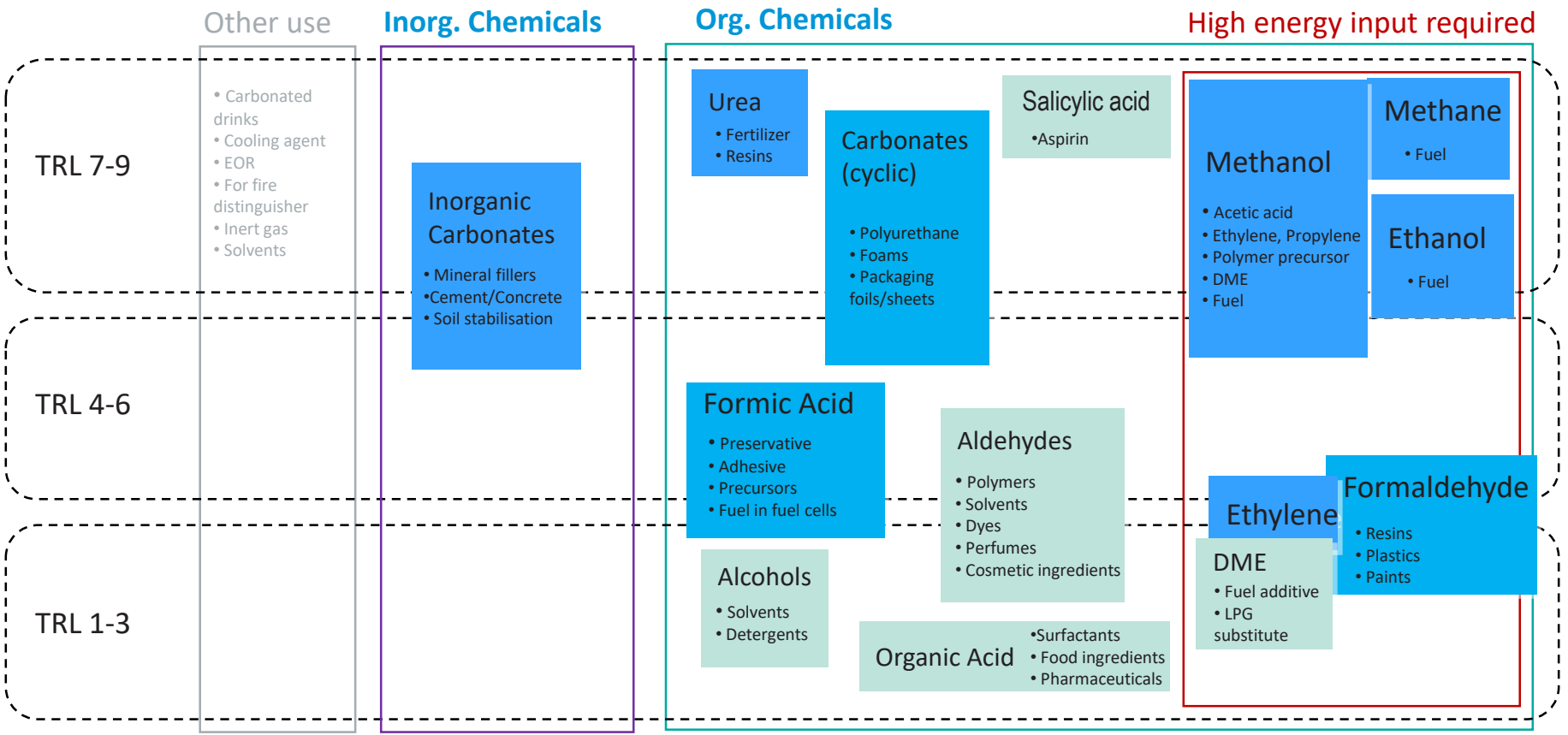


Technology Fields



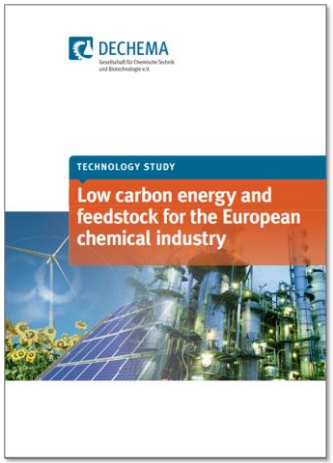
Products from CO_2

Small | Medium | High — Market size



Source: DECHEMA 2019

Low carbon energy and feedstock for the European chemical industry - Dechema study (2017)



Scope

Impact of alternative production routes for the production of:

- Methanol
- Ethylene
- Propylene
- BTX
- Ammonia (urea)
- Chlorine

accounting for ⅔ of the chemical sector's GHG emissions

Technical options*

- **Alternative carbon feedstock**
  - CO_2 (CO)
  - Biomass
- **Low carbon energy supply**
- **Power-to-heat**
- **Energy efficiency**

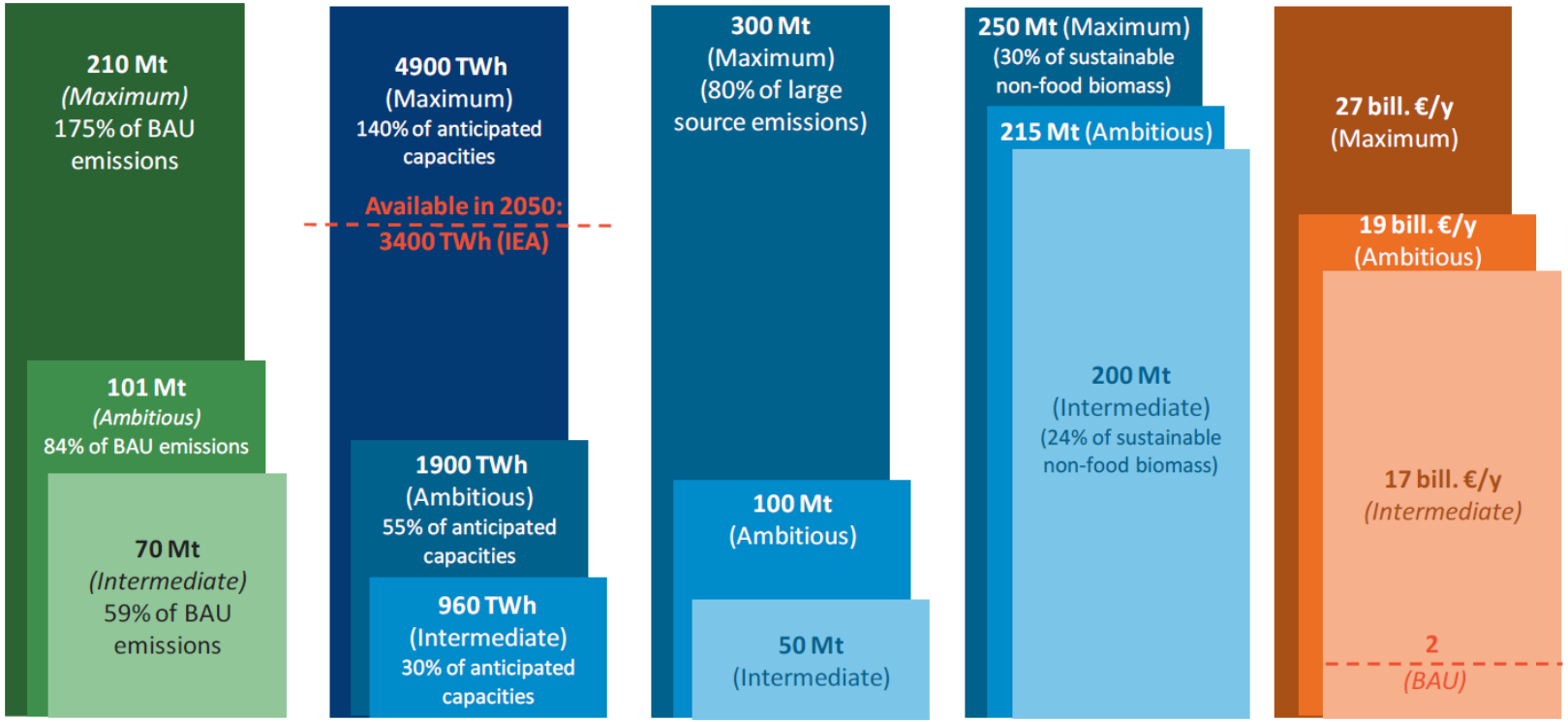
**Technologies considered were at TRL>6 in 2017*

Not included in the quantitative evaluation:
Impact of industrial symbiosis and chemical recycling of waste
Impact of chemical products on GHG savings in other sectors

Objectives: evaluate in various deployment scenario the impact of the technologies considered on:

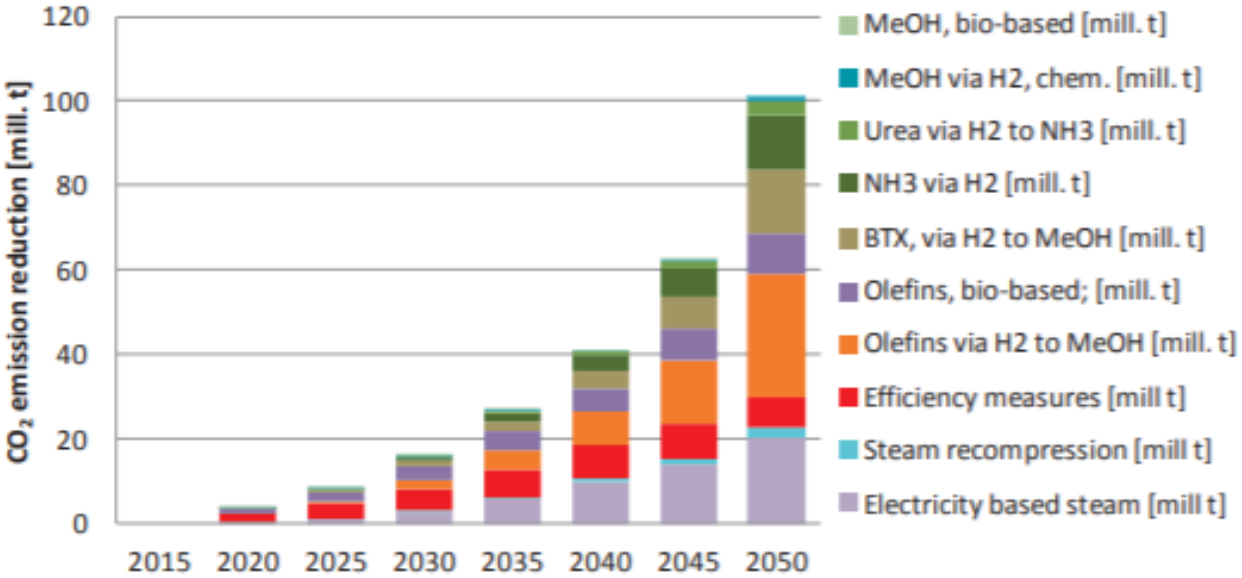
- GHG emissions reduction
- Investment requirements
- Demand for climate neutral electricity
- Demand for alternative feedstock

Dechema study(2017) – Impact for various scenarios



Source: Low carbon energy and feedstock for the European chemical industry, DECHEMA, 2017

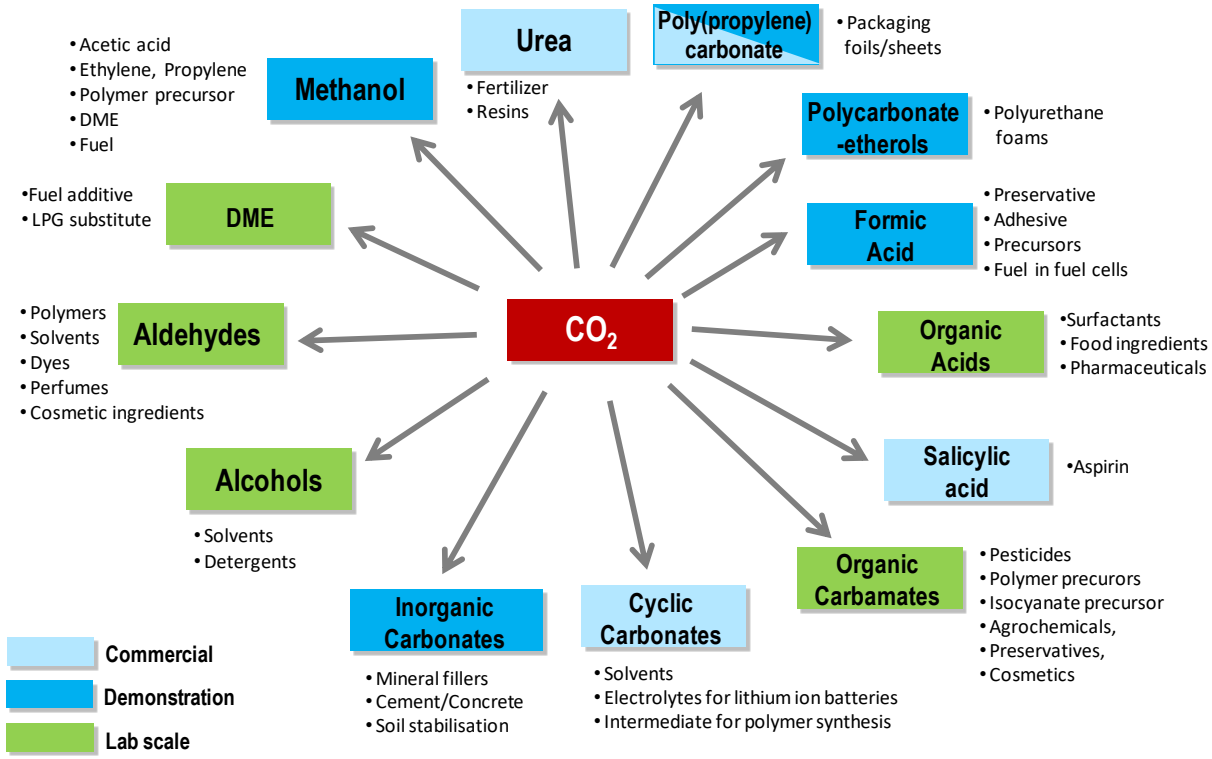
CO_2 emissions reduction potential - Chemicals



45 Mt CO_2 emissions reduction through CO_2-derived production of methanol, olefins, BTX)

R&I priorities for CO_2 valorisation technologies and EU funding landscape

CO_2 derived chemicals



Source: DECHEMA 2017

Major R&I priorities

- More efficient capture and purification technologies, including purification adapted to CO_2 valorisation route
- Robust catalysts for CO_2 to C1 molecules and CO_2 to Cn+1 molecules
- Efficient electrocatalytic processes
- Advanced photo(electro)catalytic systems for the direct utilisation of sunlight
- Advanced catalytic system for direct CO_2 to polymers (existing polymers and new polymeric structures for high performance materials polymers from CO2 with new properties.

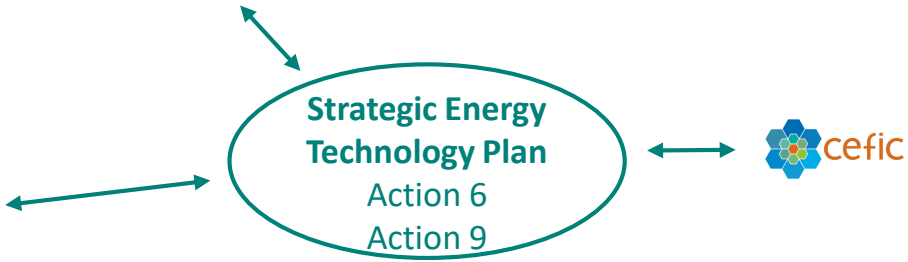
EU funding landscape

Innovation Fund - methodologies ⇦ cefic

Life Programme - work Programme 2021-2024 consultation ⇦ cefic

Horizon 2020 Green Deal Call - 2020

Horizon Europe - 1st call in 2021 ⇦ SPIRE SUSCHEM cefic



Definition of R&I priorities

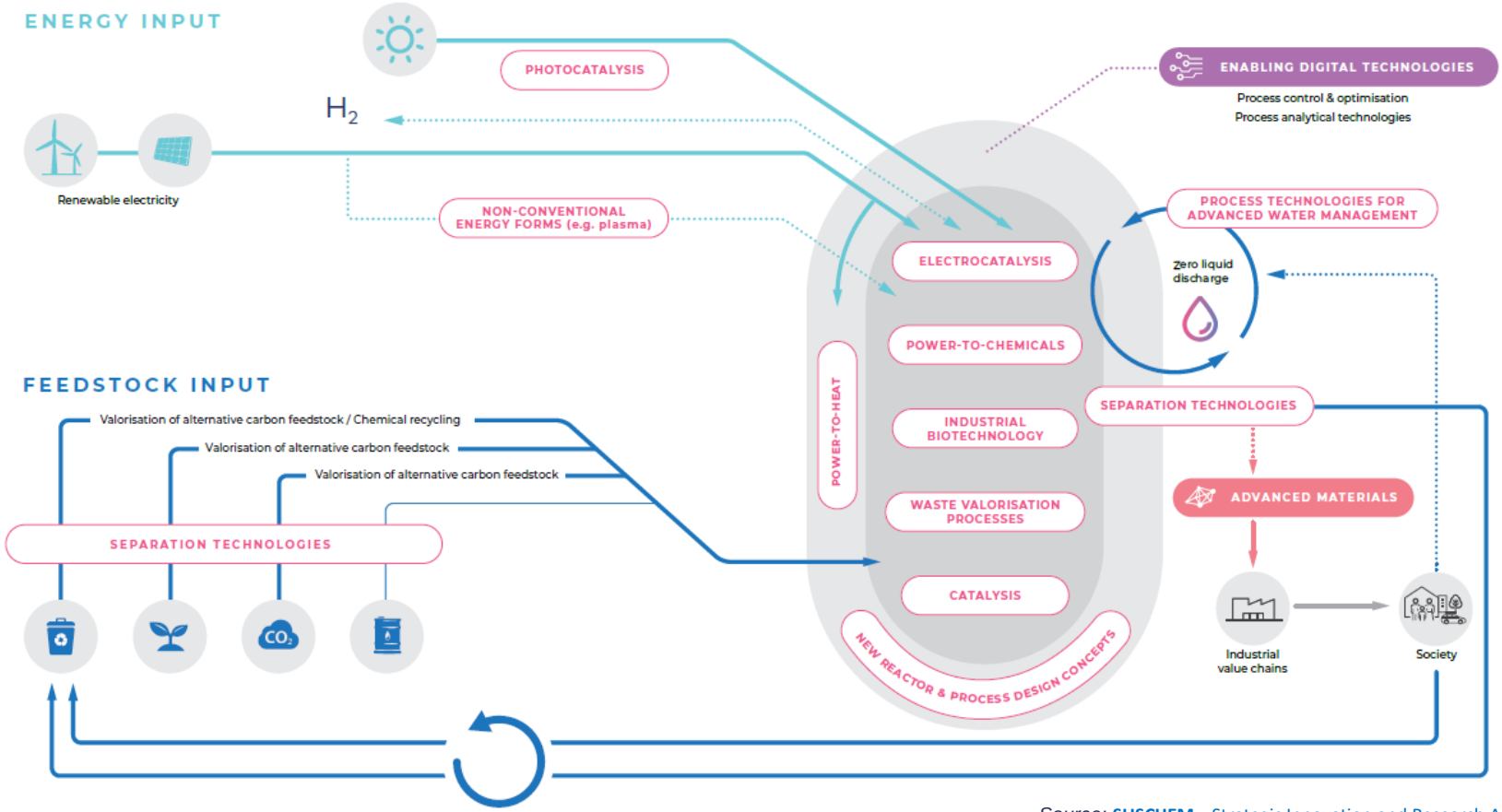
Multi-stakeholders ETP

Cefic Members

Processes4Planet PPP

Members of A.SPIRE

Advanced Processes for energy transition & circular economy



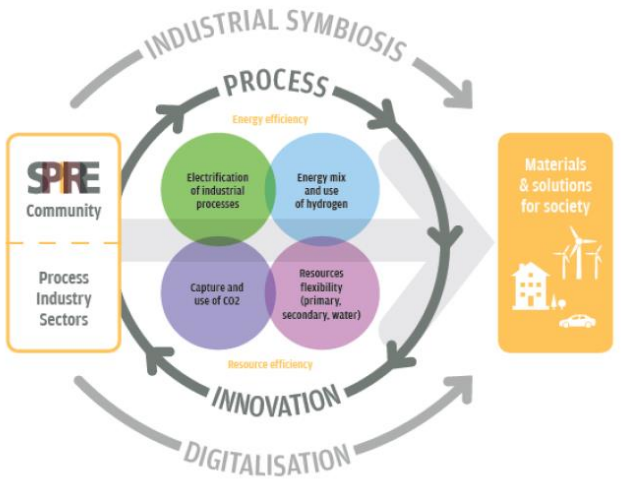
Source: **SUSCHEM** – Strategic Innovation and Research Agenda, 2019

4 technological drivers

Electrification
Energy mix and H_2
Capture and Use of CO/CO_2
Resources flexibility

2 transversal topics

Digitalisation
Industrial symbiosis

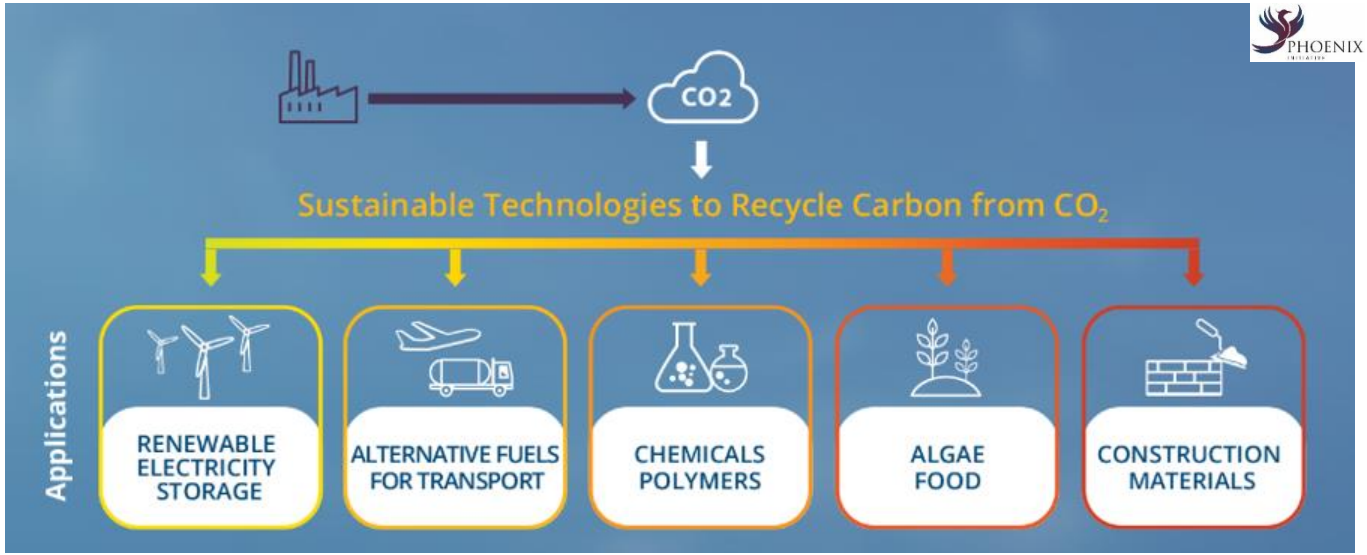


SPIRE VISION 2050

An integrated and digital European process industry fostering a well below 2 degrees planet and a fully circular economy

Critical evaluation on the environmental impact

Impact of chemical valorisation of CO_2



Broad range of applications

Broad range of technologies – Various energy needs /sources

Common understanding of how to evaluate the impact is essential

Regulatory framework

Financial support for technology development and deployment

Evaluation of the impact of CO_2 valorisation

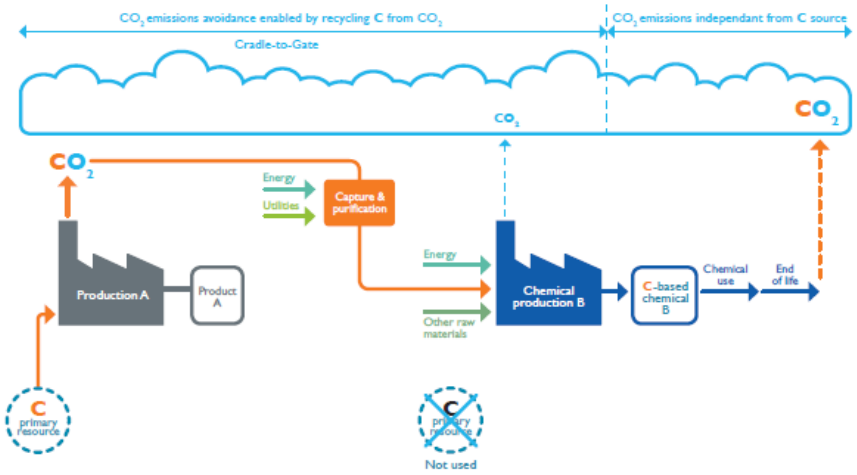
DG ENER DG CLIMA DG GROW DG ENVI DG RTD

Various studies on CO_2 valorisation

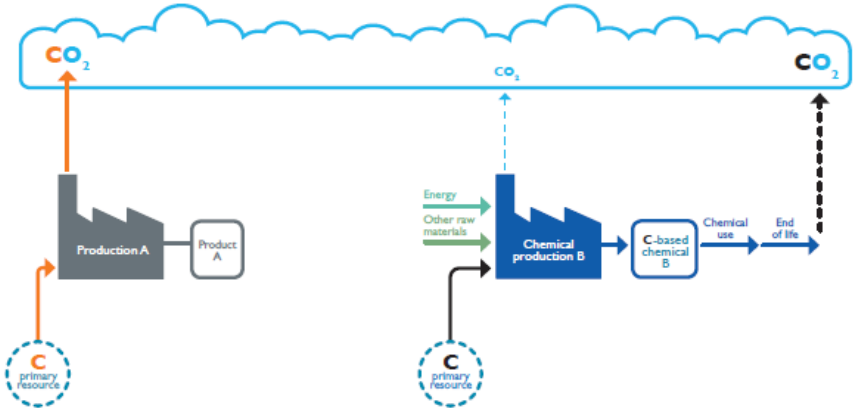
No common understanding of

how to evaluate the impact

(1) CO_2-based production of chemical product B

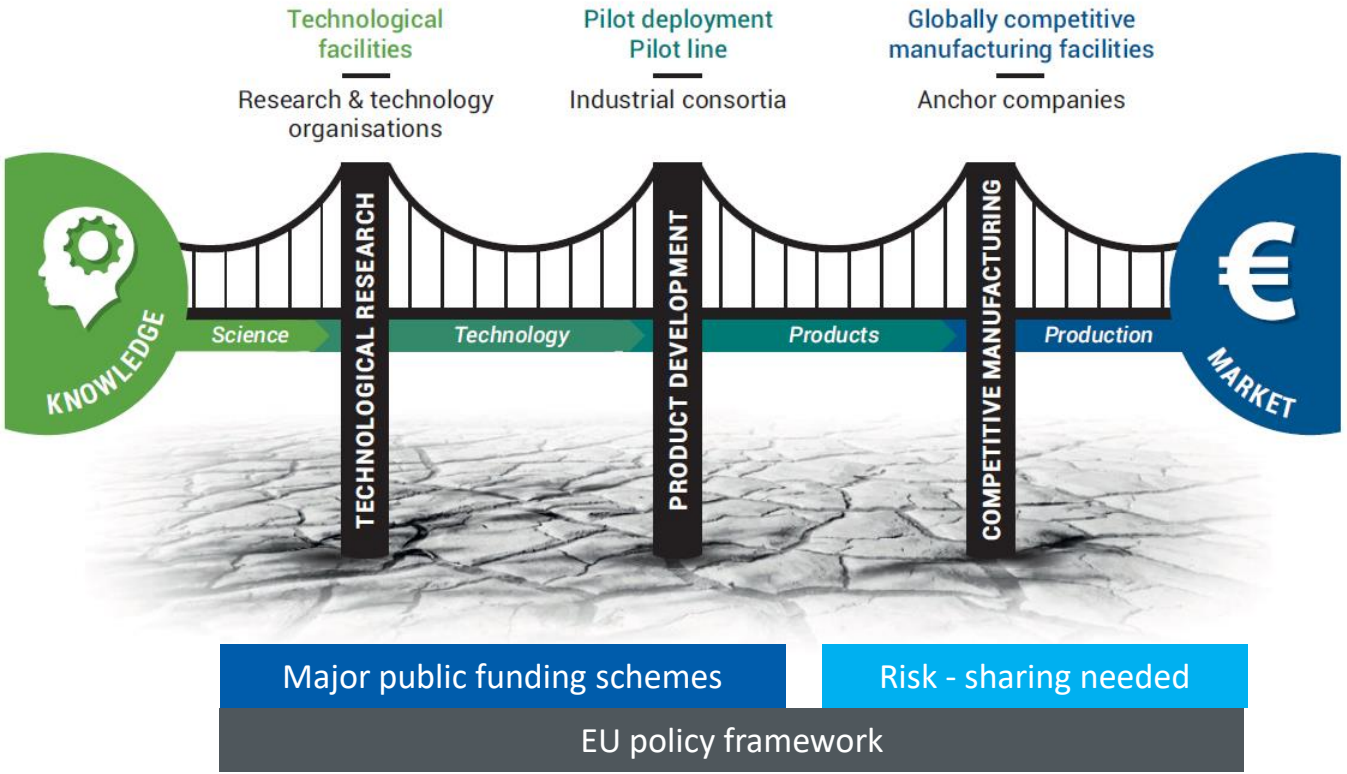


(2) Conventional production of chemical product B



Major non-technical challenges to be addressed

Enabling development and deployment in Europe



Source: High Level Group on Key Enabling Technologies
Final report « KETs: Time to Act » - 24 June 2015
http://ec.europa.eu/growth/industry/key-enabling-technologies/european-strategy/high-level-group/index_en.htm

Major challenges

- Time for one (or two) investment cycle(s) in the chemical industry by 2050
- **Technology** development and demonstration needed by 2030
- Global **competitiveness** of the European chemical industry (huge investments required for the transition and higher cost of climate neutral products)
- High demand for **climate neutral electricity**

➡ **An appropriate policy framework required:**

- **Risk-sharing measures**
- **Infrastructures**
- **Regulation**
- \+ **Skills**

What is needed to succeed

- **A clear terminology**
- **Dedicated guidelines enabling a common understanding of how to evaluate the environmental impacts of CO_2 valorisation technologies**. Such guidelines:
- **An appropriate policy framework** ensuring that existing and future policies **adequately recognise CO_2 valorisation technologies** taking into account the abovementioned guidelines.
- **The recognition** in the Emissions Trading System (ETS) Monitoring and reporting regulation (MRR) (and any future regulation in this area) based on carbon accounting principle of **CO_2 emission avoidance resulting from the utilisation of CO_2 as alternative carbon feedstock.**
- **Risk-sharing measures through appropriate financial instruments** such as the Innovation Fund and Important Projects of Common European Interest (IPCEI). Appropriate funding for technology development along the value chains at all Technology Readiness Levels (TRLs) in Europe at EU and national level will be key, in particular Horizon Europe.

Not to be shown - Just as notes of the previous slide

To define business opportunities for the European industry in the context of global competition, it is essential for Europe to develop:

- **Dedicated guidelines enabling a common understanding of how to evaluate the environmental impacts of CO_2 valorisation technologies**. Such guidelines:
  - are essential to the design of an appropriate policy framework and the evaluation of project proposals, and
  - would avoid the utilisation of non-relevant indicators such as carbon retention time of carbon in CO_2-derived chemicals (see annex);
- **A clear terminology** to avoid confusion created for instance by acronyms such as CCU and CCUS (see annex);
- **An appropriate policy framework** ensuring that existing and future policies **adequately recognise CO_2 valorisation technologies** taking into account the abovementioned guidelines.
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Thank you

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