

# A low-carbon future for EU industry:

Examples and link with design of  
Innovation Fund

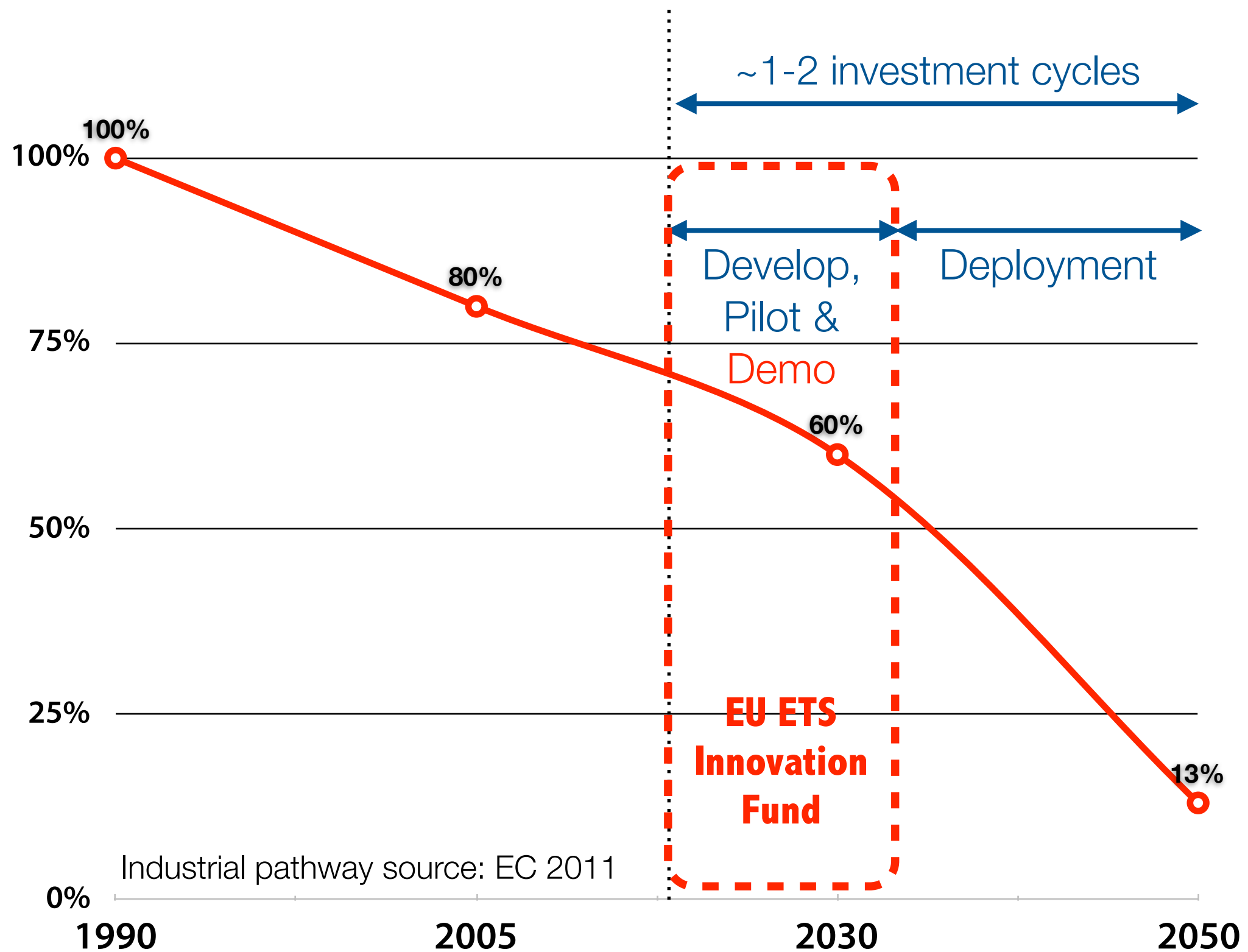


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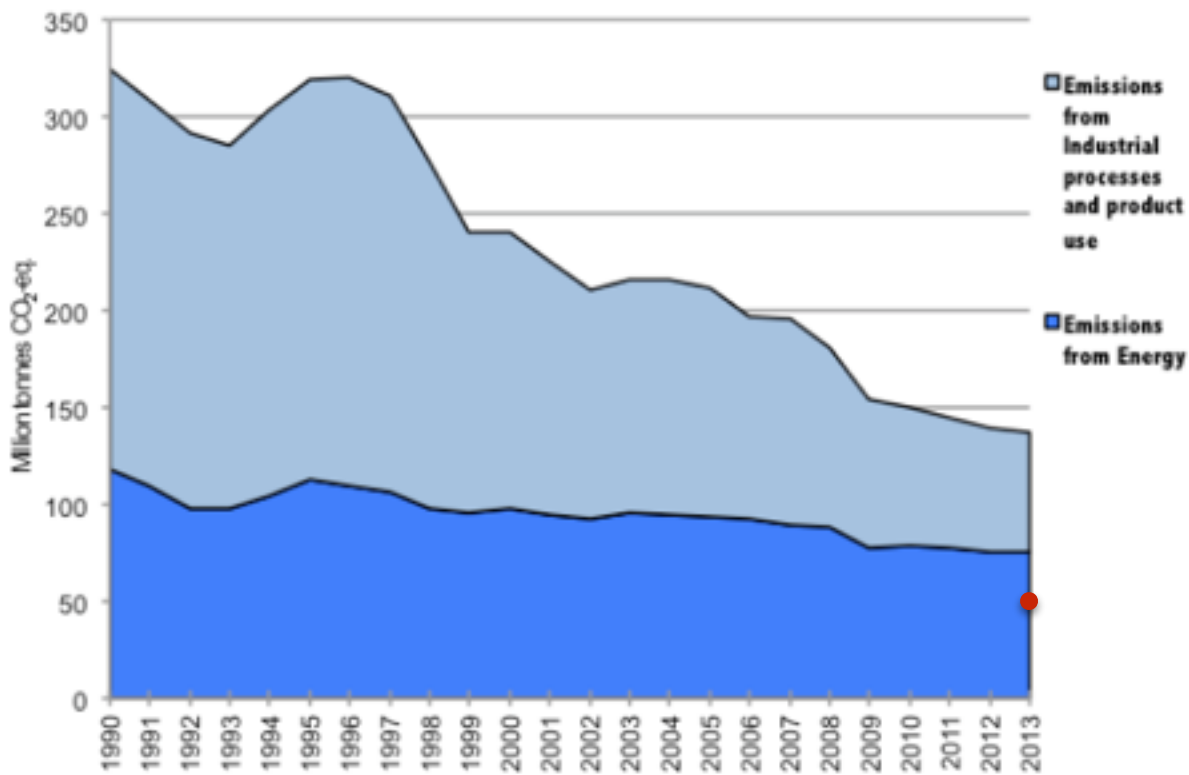
**2050 decarbonisation trajectory  
for industry  
and current status of emissions**

# Industrial decarbonisation



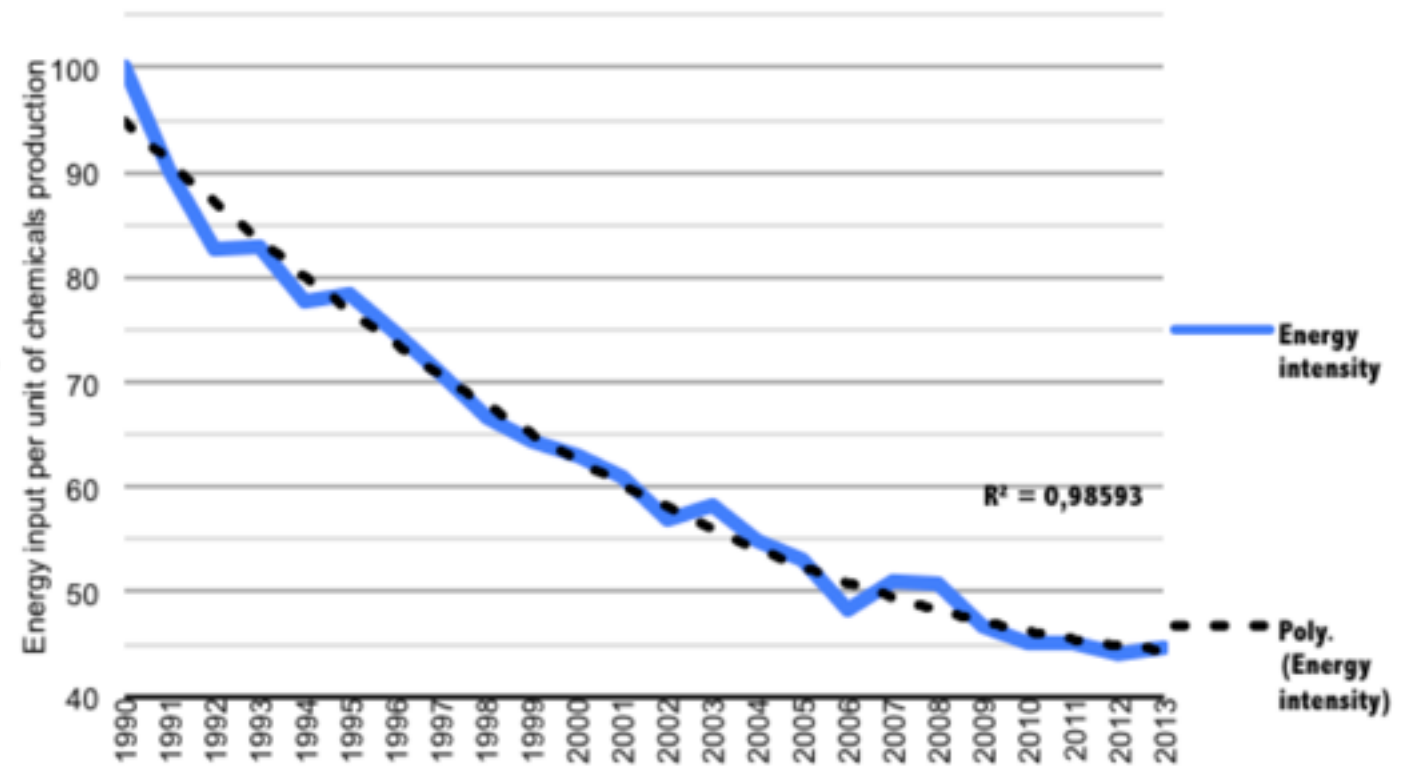
# Chemicals industry

### Emissions from EU Chemical industry



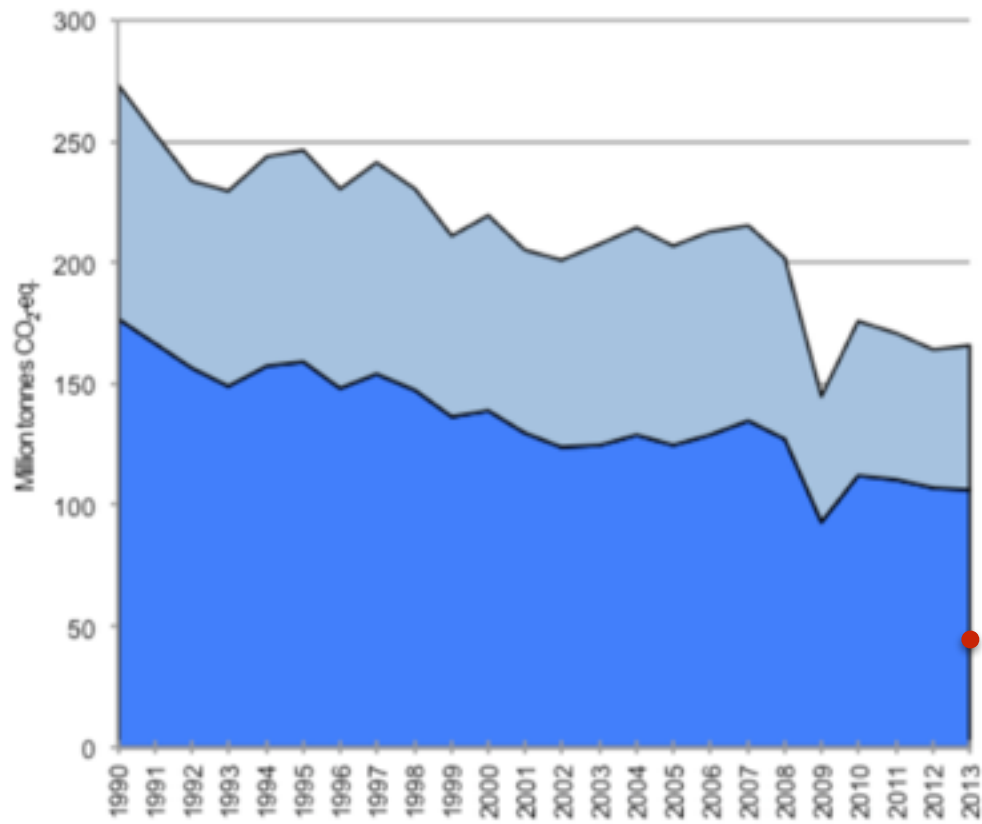
● 80% reduction ref. 1990

### Energy intensity in EU Chemicals production



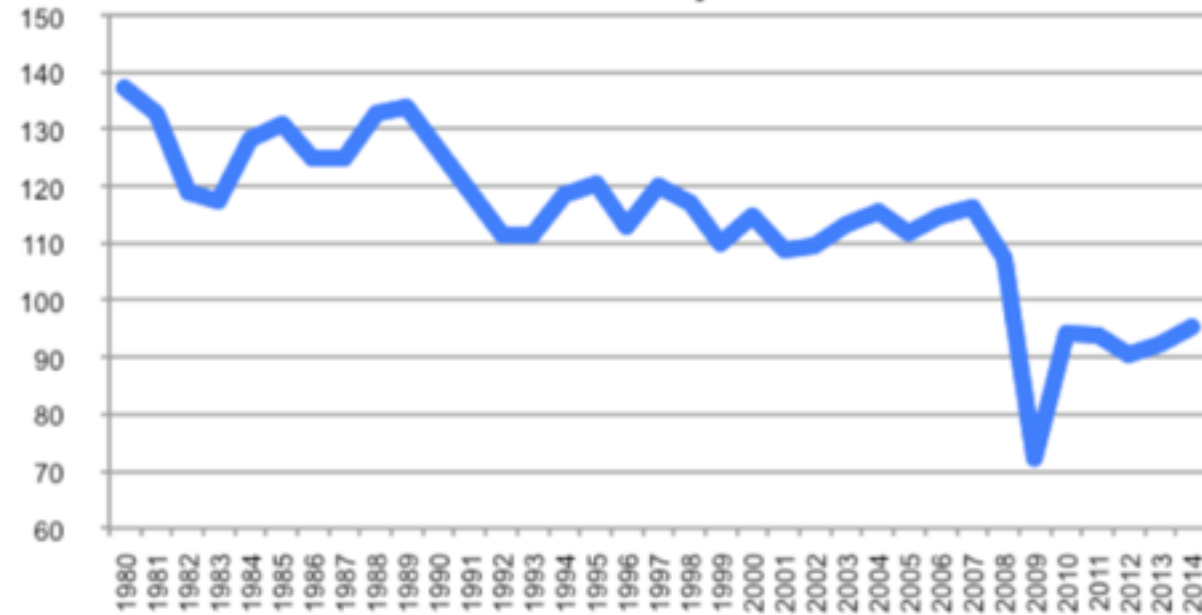
# Steel industry

### Emissions from EU Steel industry



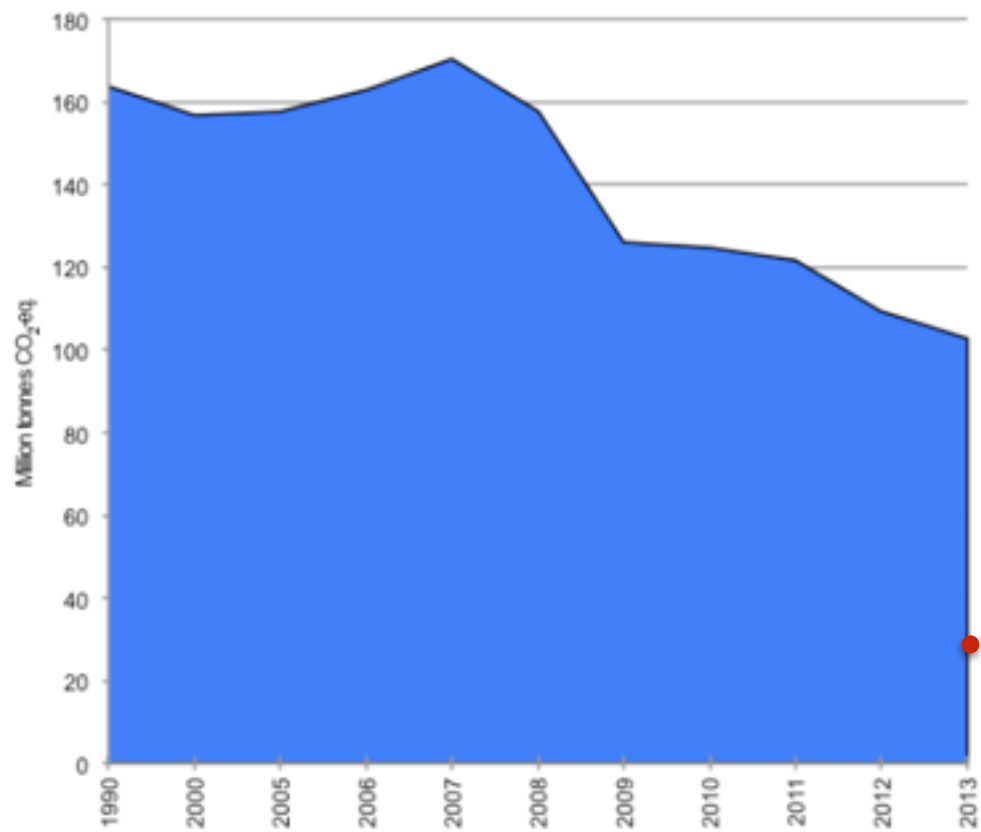
● 80% reduction ref. 1990

### EU Blast furnace iron production

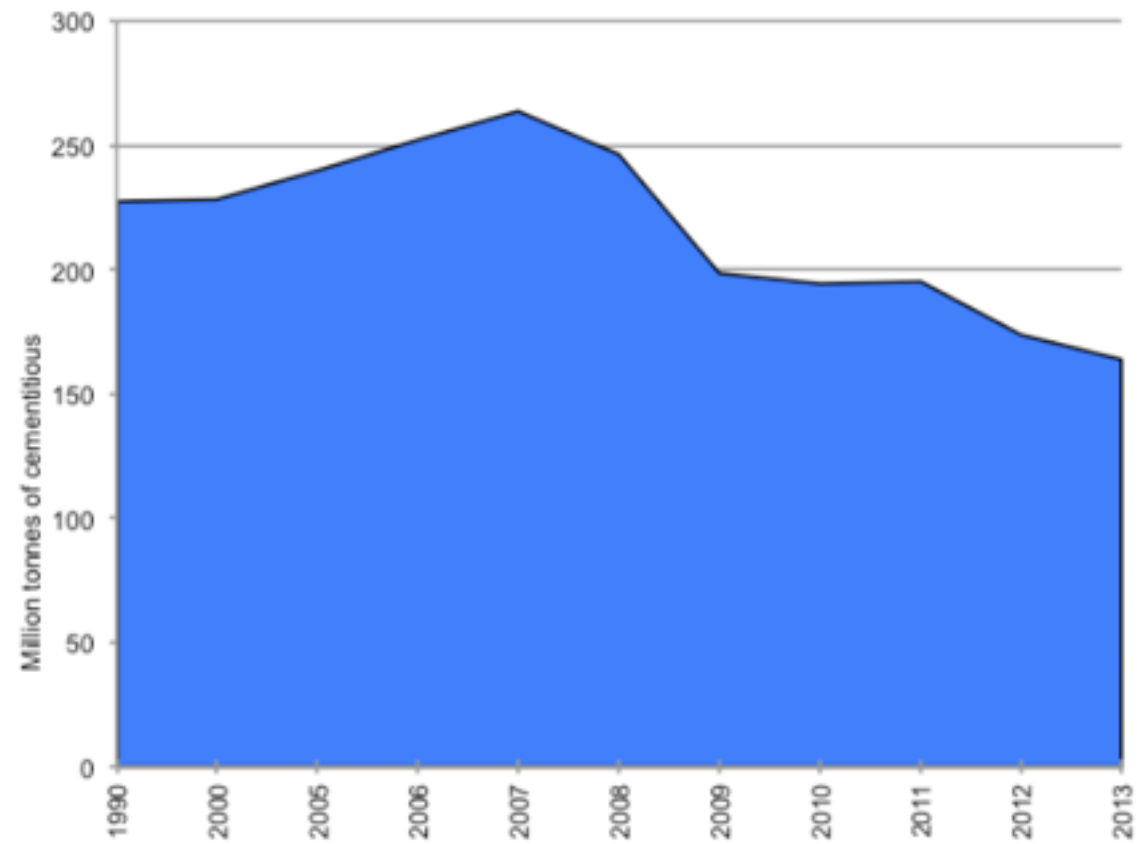


# Cement industry

**Emissions from EU Cement industry**



**EU production volume of cementitious**



● 80% reduction ref. 1990

# **2050 decarbonisation strategies & examples**

# Steel industry

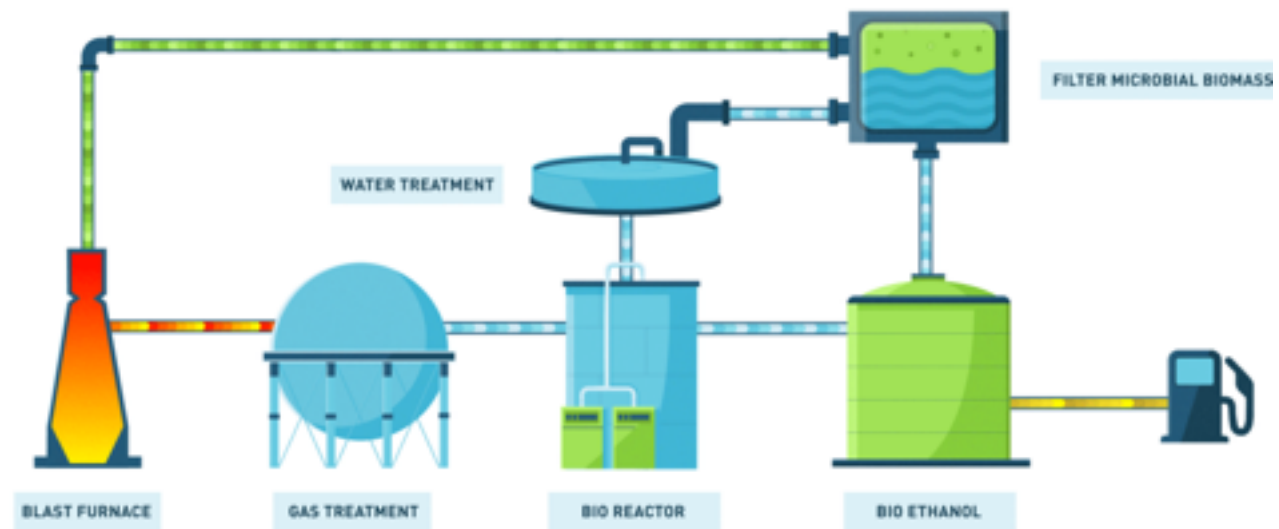
- Multi-purpose integrated steel plant: producing steel, cement, concrete aggregates (CCUS), high value chemicals (CCU) and/or electricity
- Higher levels of Re- and up-cycling steel through electric arc furnaces
- CCS with other operational co-benefits
- (renewable) Hydrogen steelmaking
- Product and business model changes: specialisation, product-service hybrid, leasing, ...



# Examples



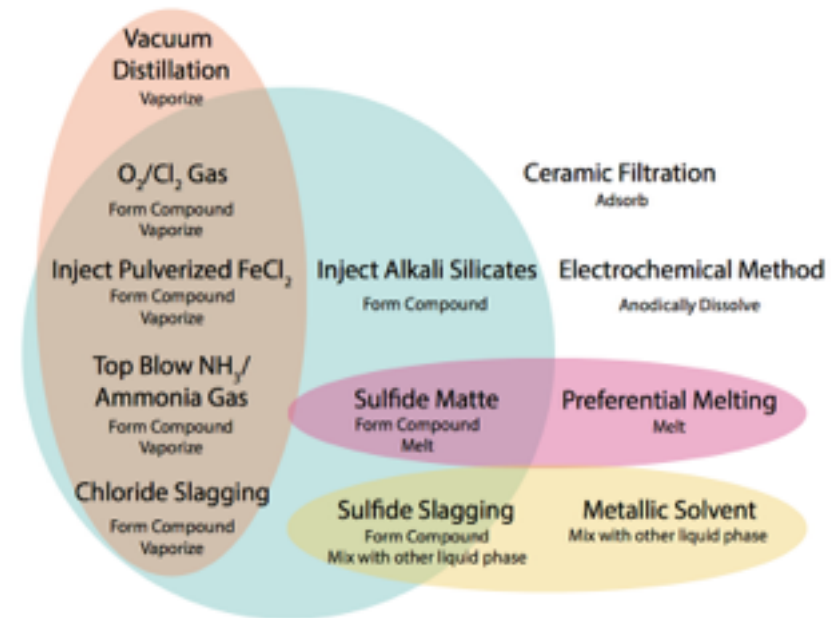
**Hlsarna (ULCOS/Tata)**



**Steelanol (CCU) (ArcelorMittal)**



**steel slag + CO<sub>2</sub> → concrete (CCUS Blue planet/Carbocrete)**



**Re/upcycling steel technologies** (source Allwood 2016)

**Hydrogen based steel production (SSAB, Voestalpine)**

# Chemical industry

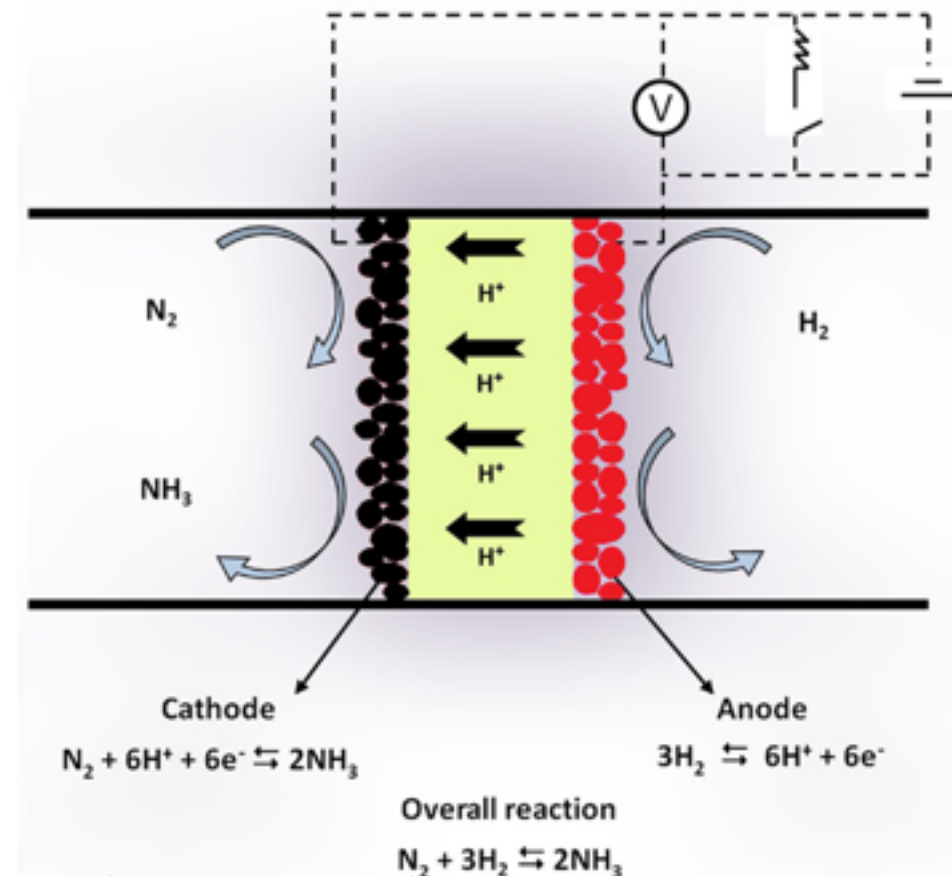
- Bio-based chemistry (intra-EU supply chain) gradually replacing petrochemicals (processes and products)
- Higher level of re/up-cycling (plastics)
- Further (renewables based) electrification of processes (e.g. H<sub>2</sub>, NH<sub>3</sub>)
- Product and business model changes (e.g. chemical services, leasing of chemicals)

# Examples



- €3.7 billion investments in bio-based innovation from 2014-2020
- Deliver bio-based products that are comparable and/or superior to fossil-based products in terms of price, performance, availability and environmental benefits.
- on average **reduce CO2 emissions by at least 50%** compared to their fossil alternatives.

**from: Horizon 2020, NER300**



Source: <http://www.frontiersin.org>

## Solid State Ammonium Synthesis

**Utilisation of CO(2)  
from other industries  
e.g. steel industry**

# Cement industry

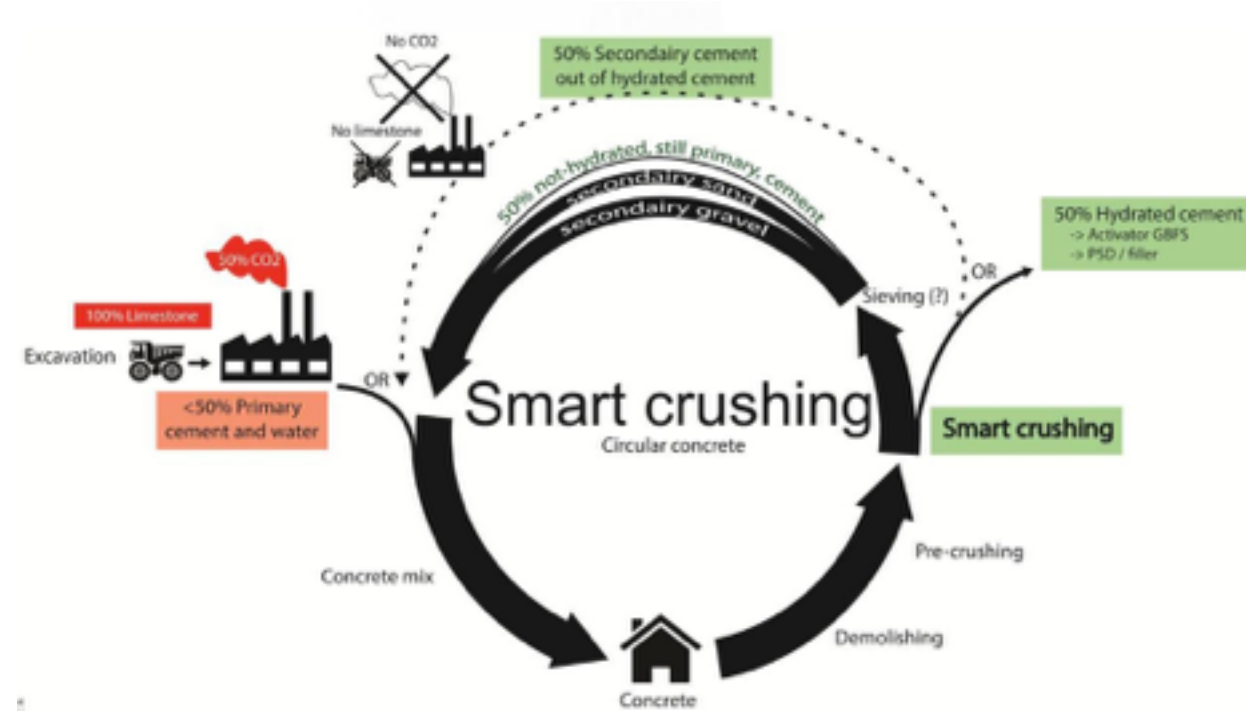
- Modernisation and efficiency gains (site + sector level)
- More clinker substitution (alternatives beyond BF slag and fly ash)
- CCS, but with co-benefits to clinker production process
- Alternative concrete formulas (physical/chemical)
- Concrete and cement re/up-cycling



# Examples



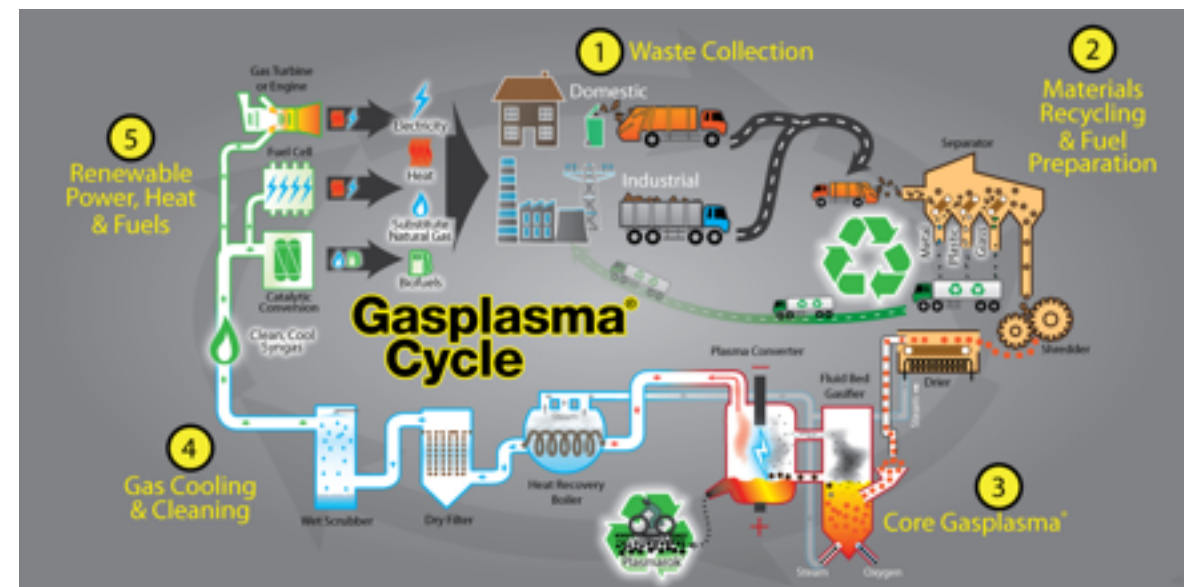
**Aether© cement (partial clinker replacement)**



**re/up-cycle concrete to cement**



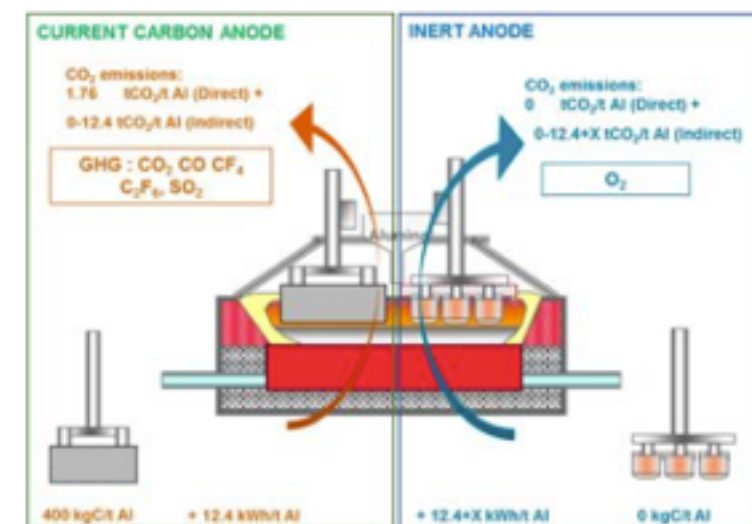
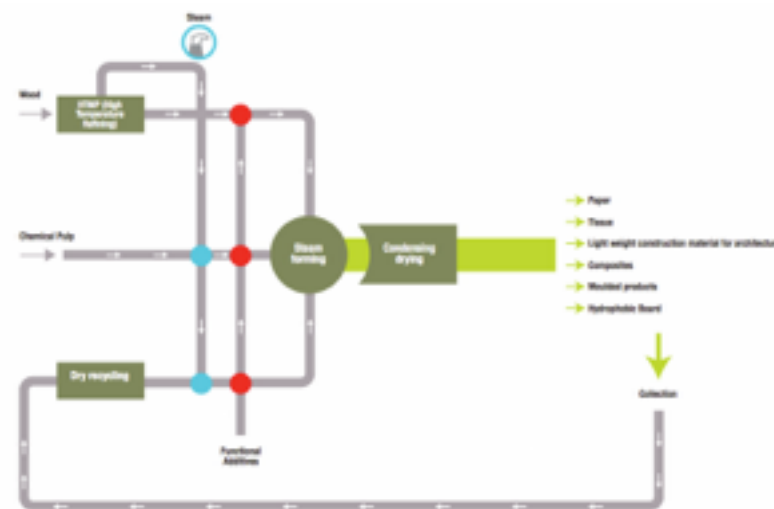
**Calcium looping CCS**



**Landfill-mining; plasmarok**

# Examples in other industries

- Aluminium: Advanced Green Aluminium Anode (AGRAL H2020), process demand response, selective recycling technologies
- Paper: Deep Eutectic solvents (pulping), waterless paper production, supercritical CO<sub>2</sub>, process electrification
- Ceramics: microwave assisted heating/gas-firing



**Designing the Innovation Fund  
as part of  
a low-carbon investment  
and industrialisation strategy**

# Parameters for selection of projects

CO<sub>2</sub> abatement potential (e.g. using EU ETS benchmarks as a reference and CAPEX+OPEX per tonne)

## **But other criteria essential in evaluation:**

- higher productivity
- higher value added products
- better economic/process resilience (wider range of input materials, resource efficiency more diverse outputs)
- specialisation (new markets)
- efficient integration of different processes (incl. IT tech. I4.0)

**Lowers risk of ‘white elephants’ and higher deployment/  
commercialisation rates of technology**



# Innovation Fund: a one stop shop?

- Innovation Fund a (project) finance toolbox
- (most) projects with high technology/construction risk will need (part) grant based finance (e.g. linked to TRL)
- Results based finance but milestone based (not 100% ex post)
- I.F. can enable/provide next layers of finance (equity, mezzanine, senior & minor debt, guarantees)
- Expand I.F. with participation of National Promotional Banks (NPBs) and private investors and use of 'EU guarantee': i.e. Investment Platform
- Projects could in principle be fully financed through I.F. (combination of finance tools, a one stop shop)
- Lean but professional management structure/administration of fund (see also Business Europe position paper 'Making innovation fund fit-for-purpose')

# EU and national industrial strategies

**Essential that I.F. becomes part of broader EU and national industrial (isation) strategy**

## **At National/Member State level:**

- R&D support
- industrial infrastructure support, zone planning (promoting industrial symbiosis)
- Tax breaks for low-carbon investments
- public procurement
- enhanced role of national promotional banks

## **At EU level:**

- mission oriented industrial policy: linking H2020, EFSI, I.F. ...
- procurement of low-carbon products under EU funds
- flexibility for Member States under SGP/macro-economic imbalance/Eurostat ESA2010
- State Aid rules flexibility/transparency
- protection against dumping

# **Decarbonising Europe's energy intensive industries**

## **The Final Frontier**

**Tomas Wyns & Matilda Axelson**

**Institute for European Studies  
Vrije Universiteit Brussel**

*“The EU finds itself at an important moment in the history of its industrial development.*

*Ongoing and future process, product and business model innovations, will make deep emission reductions possible over the next decades.*

*But public policy needs to play a catalysing role.”*