

The background of the slide is a photograph of a construction site. In the foreground, several vertical steel reinforcement bars (rebar) are visible. A blue hard hat is hanging from one of the rebar. In the background, a yellow hard hat is also visible, hanging from another rebar. The scene is slightly out of focus, emphasizing the text overlay.

# *Cement in a Changing Climate – Implementing Solutions and a European CO<sub>2</sub> Network*

ECRA/CEMCAP/CLEANKER Workshop  
17<sup>th</sup> October 2018, Brussels



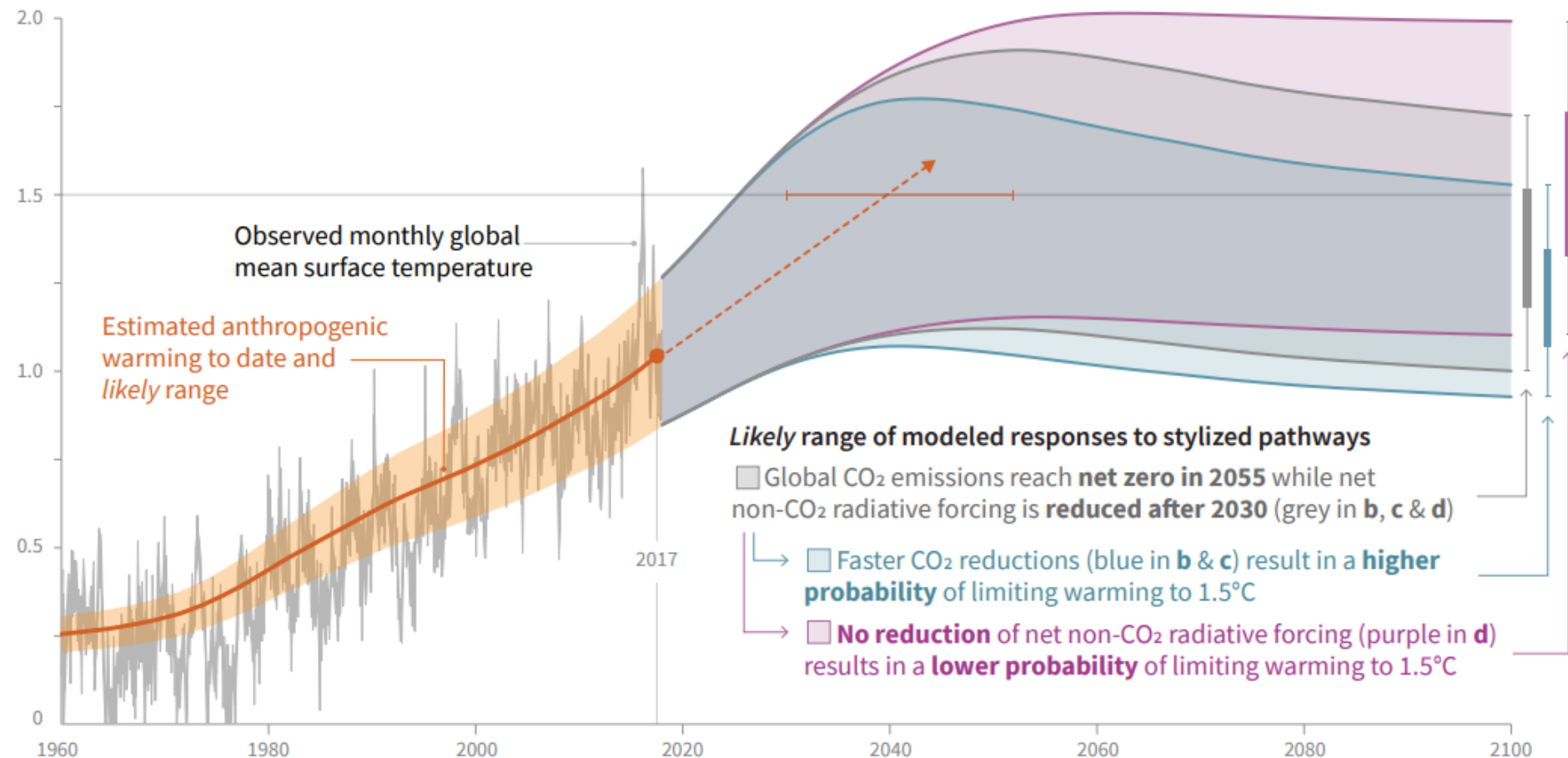
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# Establishing a European CO<sub>2</sub> Network

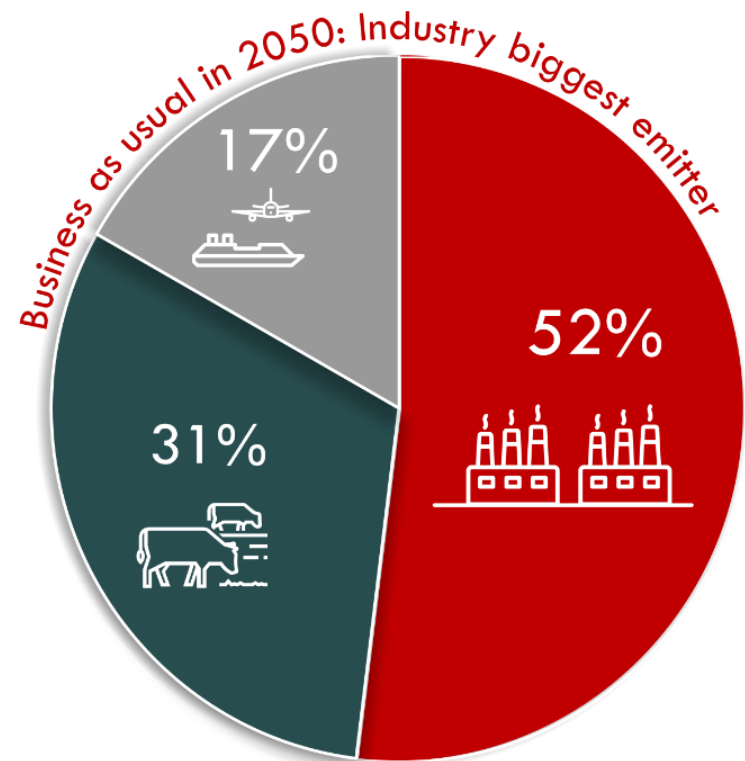
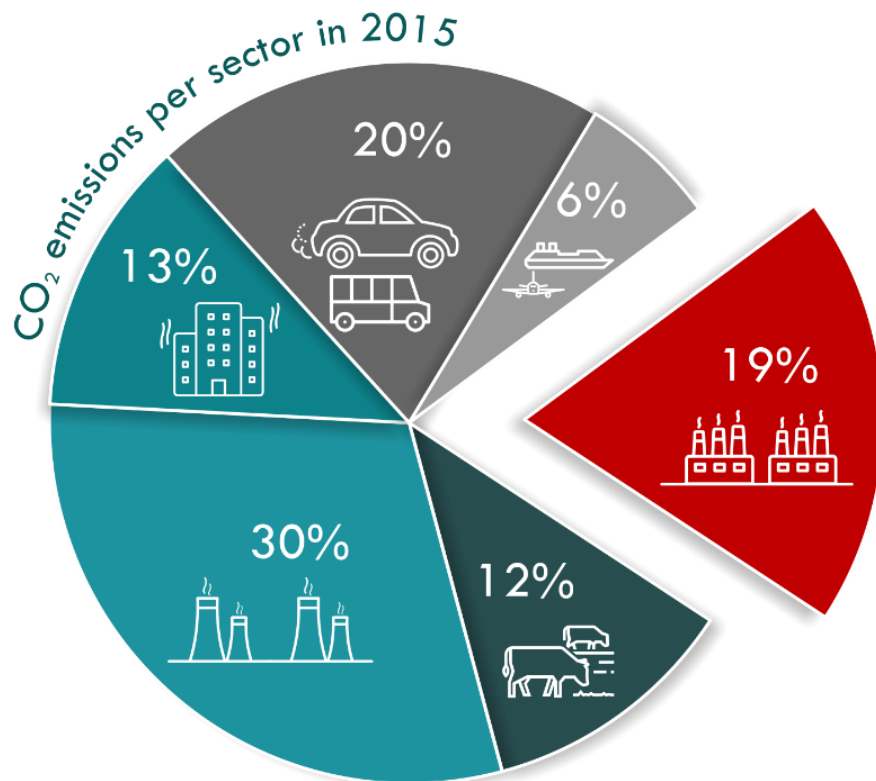


# WHERE ARE WE NOW: IPPC, 1.5°C (2018)

Global warming relative to 1850-1900 (°C)



# INDUSTRY EMISSION SHARE

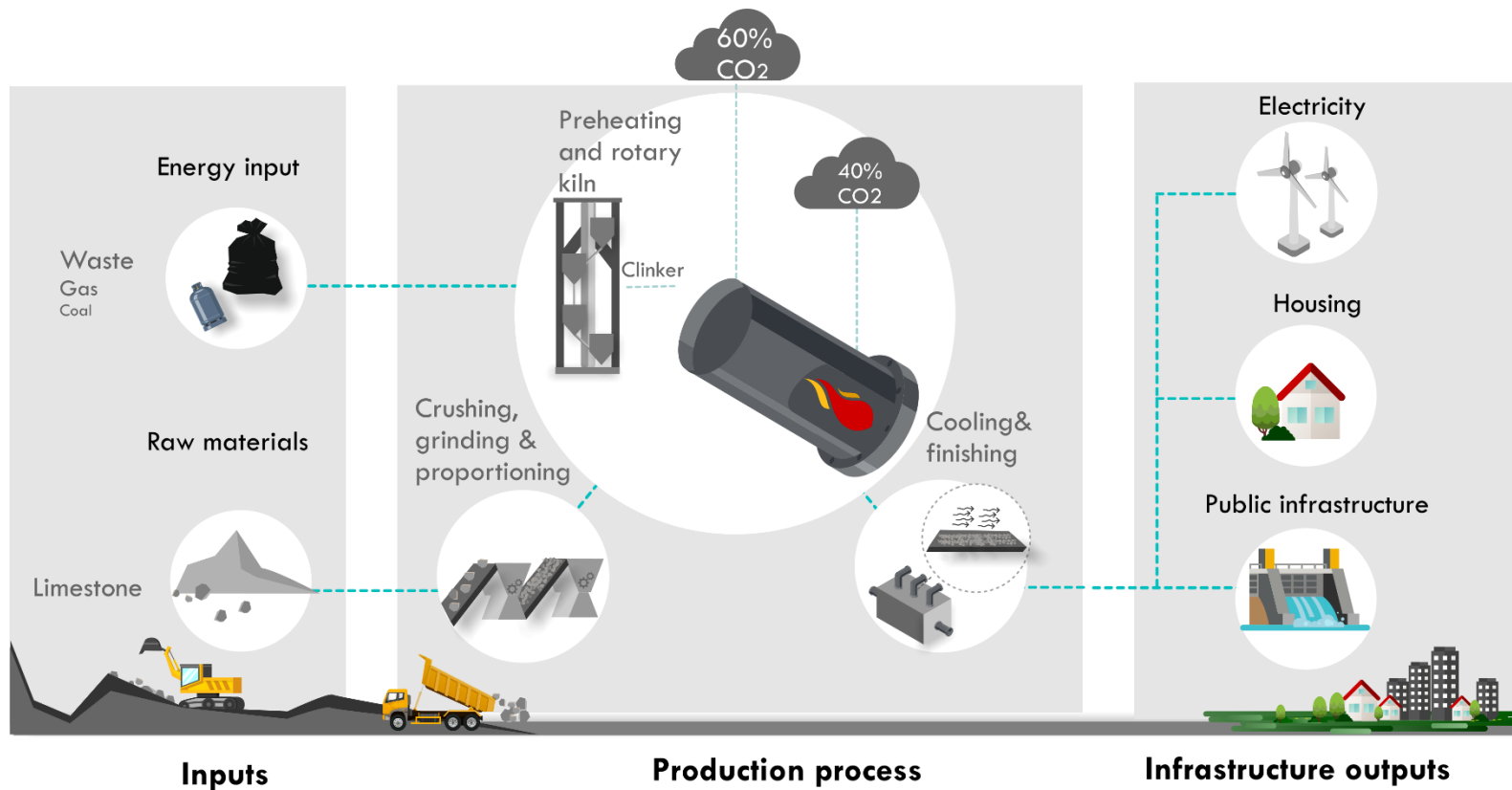


# MANY OPTIONS – ANY SOLUTIONS FOR CEMENT?





# WHERE CEMENT EMITS



# WHAT ARE THE DECARBONISATION SOLUTIONS FOR CEMENT

Efficiency – Lower resource and energy input

Electrification – 40% max. CO<sub>2</sub> abatement + 132TWh renewable energy

Change of Chemistry – No more Portland but other cementitious products

## Carbon Capture

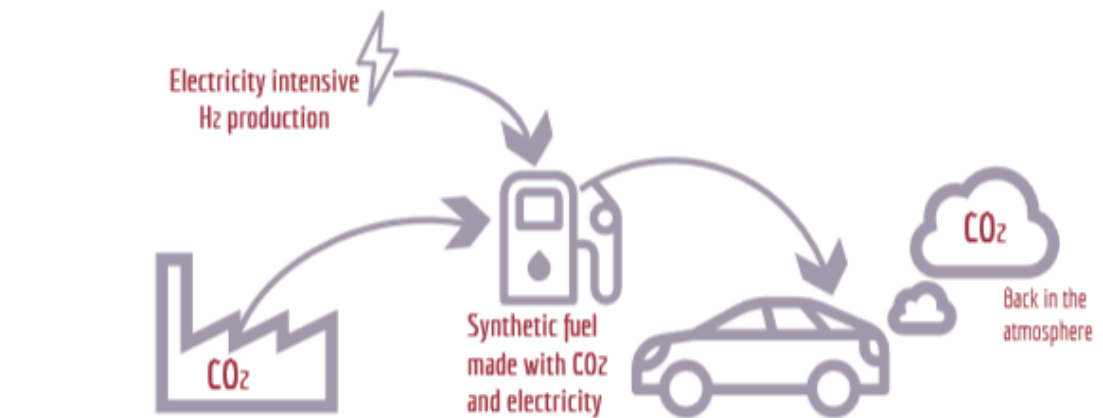
CCUS – Carbon Capture Use & Storage

CCS – Carbon Capture Storage

# CCU VS CLIMATE

Resource Intensive

Rapidly Re-Emitted



Emission Savings are in the Fuel, not the CO<sub>2</sub> Source



# CCU FUELS AIM TO KEEP ICE ALIVE



The advertisement features a blue Audi A5 Sportback g-tron driving on a road, with a house visible on the left. The background is a bright blue sky with white clouds. The Audi logo is prominently displayed on the right side of the car.

## Tanken Sie Rückenwind.

Der Audi A5 Sportback g-tron\*. 80 % weniger CO<sub>2</sub>-Emissionen mit Audi e-gas auch aus Windenergie.\*\*

[audi.de/neu-angetrieben](http://audi.de/neu-angetrieben)



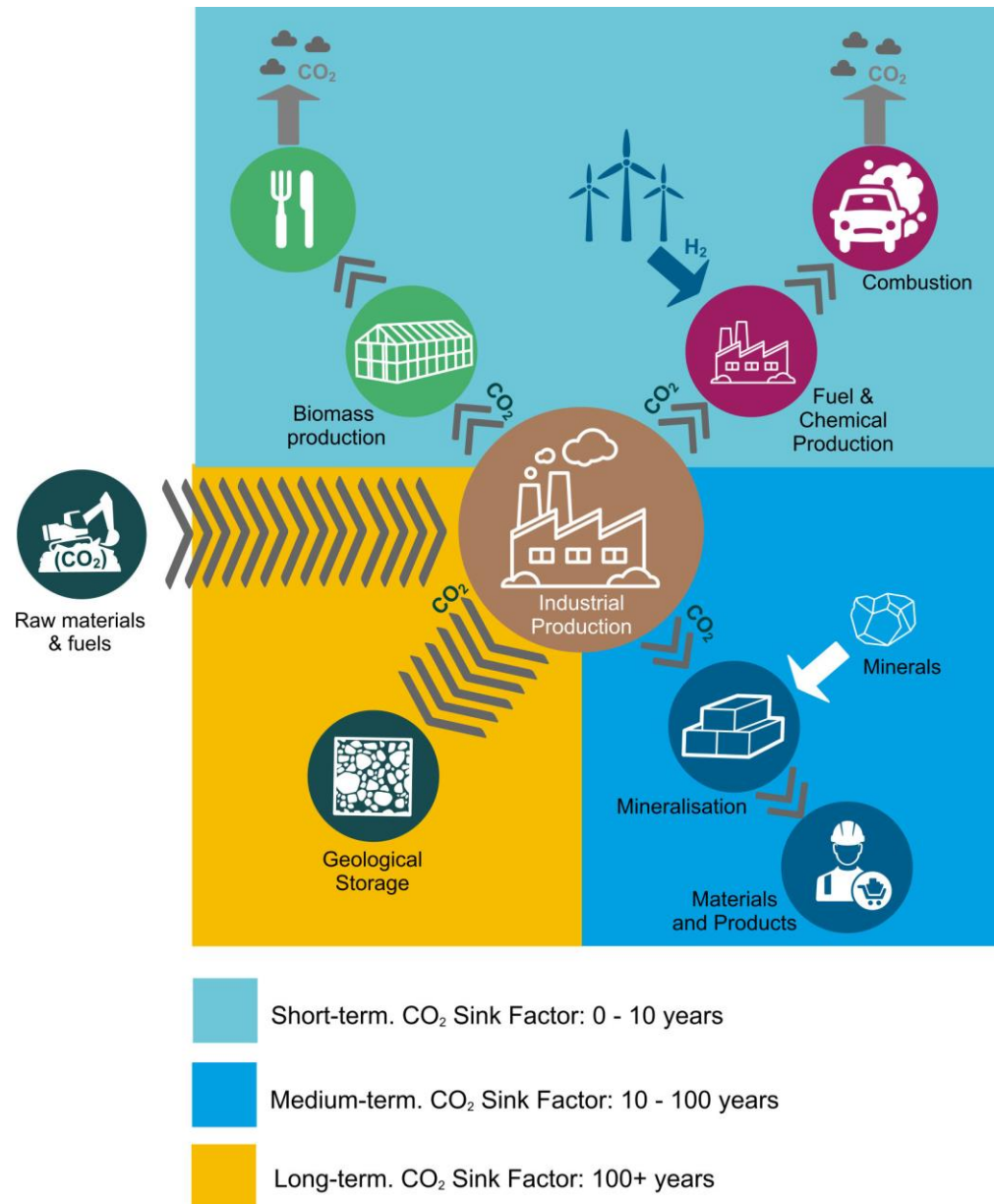
\* Kraftstoffverbrauch kombiniert: Benzin 6,3–5,6 l/100 km; CNG 4,2–3,8 kg/100 km; CO<sub>2</sub>-Emissionen kombiniert: Benzin 143–126 g/km; CNG 114–102 g/km. Angaben zu Kraftstoffverbrauch und CO<sub>2</sub>-Emissionen bei Spannbreiten in Abhängigkeit vom verwendeten Reifen-/Radersatz.

\*\* Im reinen Gasbetrieb (CNG) in einer Well-to-Wheel-Betrachtung (Umweltbilanz, die die Kraftstoffproduktion und den Fahrbetrieb des Fahrzeugs mit einschließt) im Vergleich zum Audi A5 Sportback 2.0 TFSI mit 140 kW (Kraftstoffverbrauch Benzin kombiniert: 5,9–5,5 l/100 km, CO<sub>2</sub>-Emissionen kombiniert: 133–124 g/km). Als g-tron Kunde tanken Sie wie gewohnt an einer beliebigen CNG-Tankstelle. Die AUDI AG stellt sicher, dass die auf Basis der gesetzlichen Normen zur Verbrauchs- und Emissionsmessung nach NEFZ/WLTP sowie regelmäßig von Audi erhobener statistischer Daten zur jährlichen Fahrleistung der im Zeitraum 7. März 2017–31. Mai 2018 bestellten Audi g-tron Fahrzeuge errechneten Gas Mengen durch Audi e-gas ersetzt werden – für 3 Jahre ab der Erstzulassung als Neufahrzeug. Das Audi e-gas wird in das europäische Erdgasnetz eingespeist und verdrängt somit fossiles Erdgas. Der ebenfalls auf dieser Grundlage ermittelte Umfang der CO<sub>2</sub>-Einsparung kann im tatsächlichen Fahrbetrieb geringer ausfallen. Mehr unter [audi.de/g-tron](http://audi.de/g-tron)

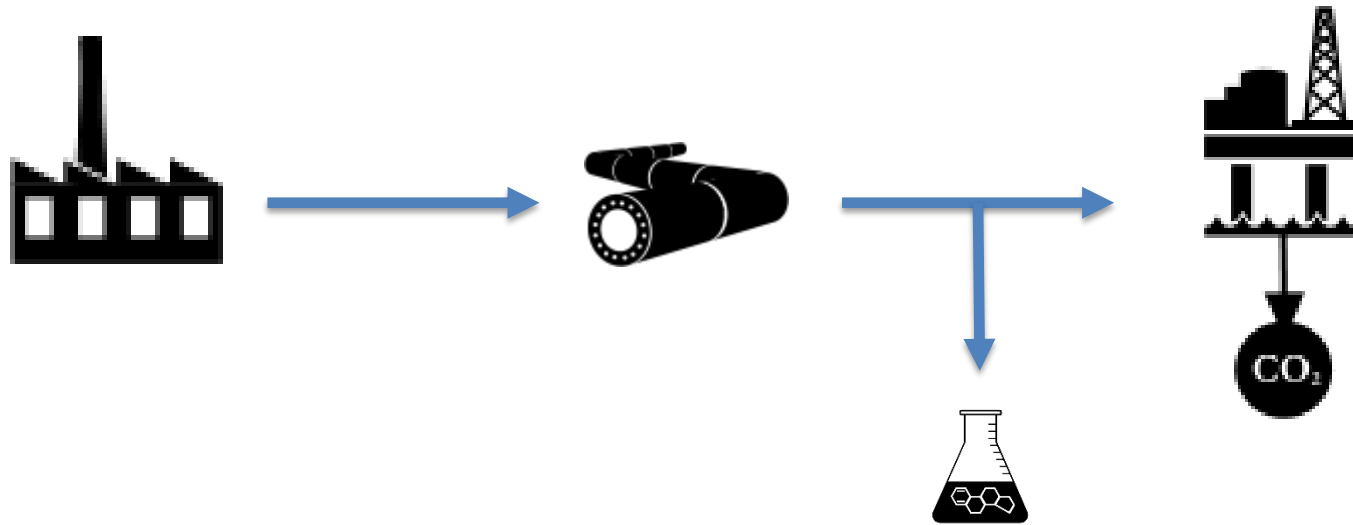
Audi Vorsprung durch Technik

CC – U? – S!

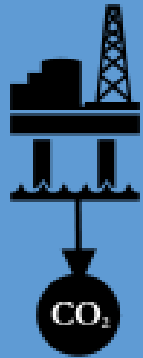
Keep the S  
In  
CCUS



# The CC(U)S value chain...



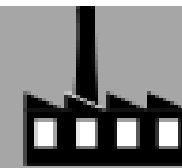
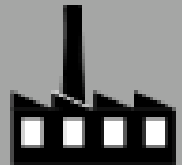
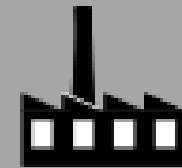
Reviewing the investment and delivery profile of each part of the CCUS chain turns this on its head



1st 10/25/2018



2nd



3rd

# Nordics & ‘Northern Lights’

It's the first full-industry-scale shared CO<sub>2</sub> network in the world with two industry capture projects and opportunities to expand.

**Sweden** seeks to become carbon neutral by 2045 and may choose to cooperate with Norway on CCS for its own industry.

•  
**Offshore Storage**

- Fortum Waste Incinera
- Norcem Cement Plant

# Europe's biggest emitting regions in need for CO2 transport and storage

**Port of Rotterdam** set  
to become region's  
Gateway for CO2  
storage.

20% of Dutch Emissions  
in Rotterdam.



**Eemshaven**

Magnum Project: hydrogen  
production with CCS

**Rotterdam**

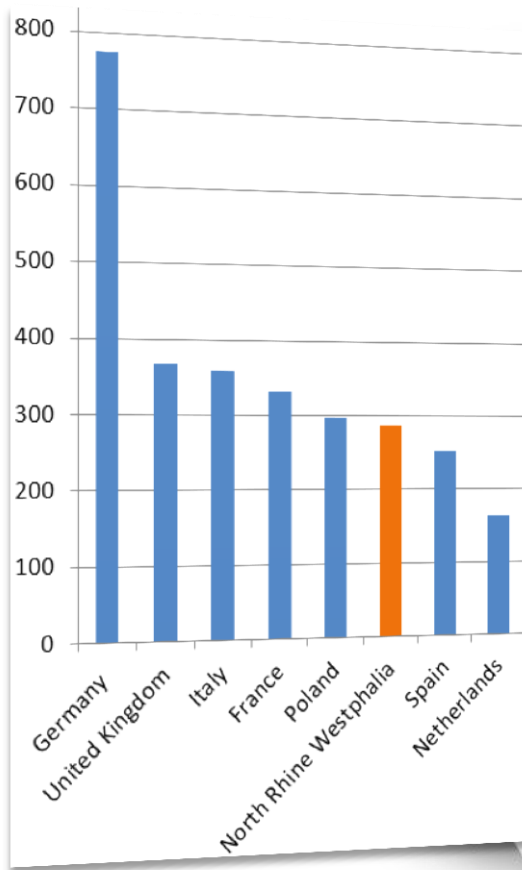
**Chemelot**

Port of  
Antwerp

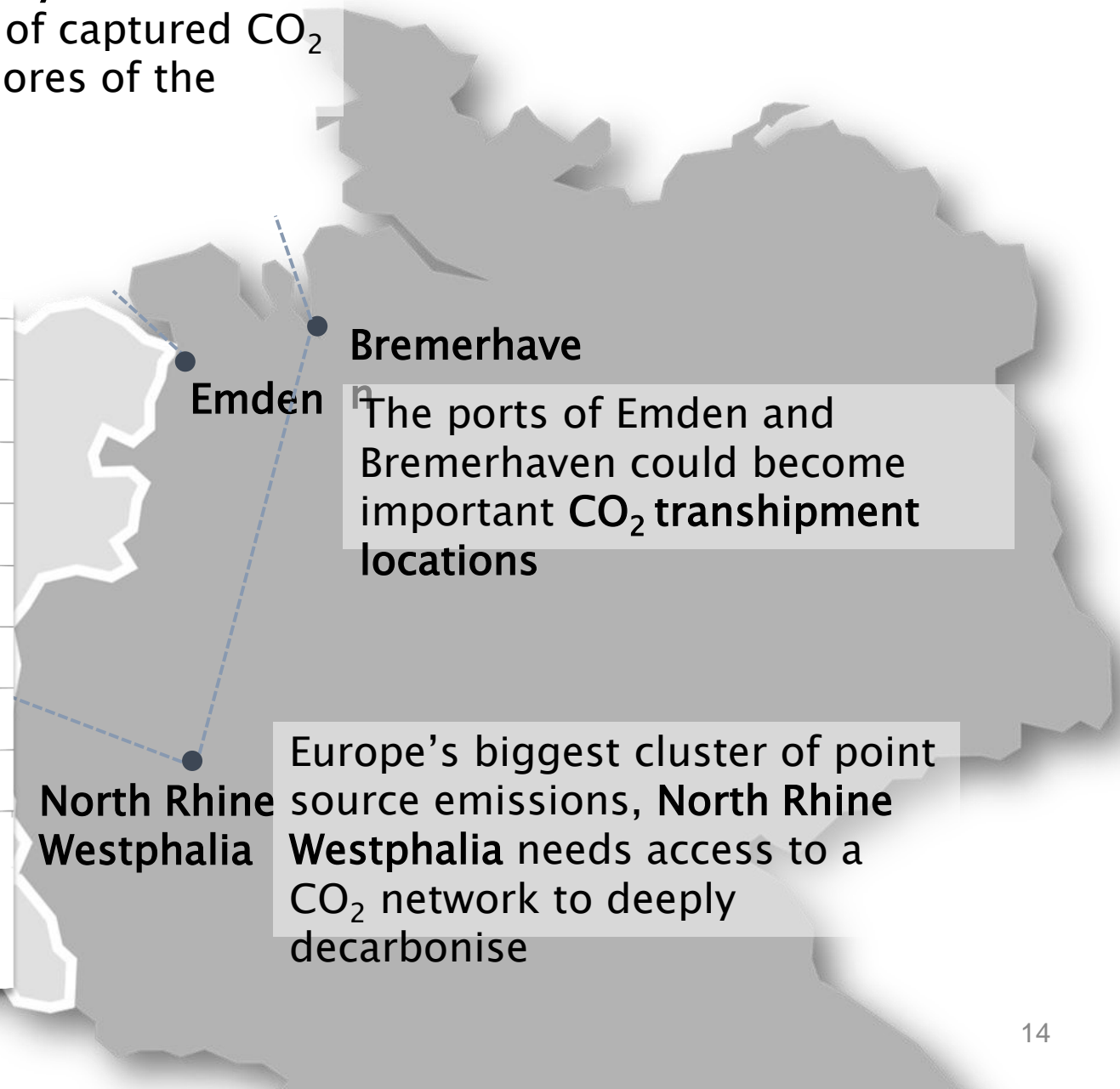
Limburg  
industrial  
area

Expansion to adjacent  
industry clusters

Germany's **waterways** allow for a flexible transport of captured CO<sub>2</sub> to Hubs on the shores of the North Sea.



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# SHARING MEANS SAVING MONEY

## Netherlands Transport & Storage

<i>Abatement Scenarios</i>	Low	Mid	Mid Newbuilt	High
CO2 abated (Mt)	476	654	654	964
Mothballing*	133	216	120	474
Injection	1 499	2 740	4 154	3 382
Offshore Transport	740	764	764	1 404
Onshore Transport	366	366	366	376
Onshore compression (20 bar to HP)	1 490	2 072	2 072	3 072
Total Cost	4 229	6 158	7 477	8 707
€/tCO2	8,9	9,4	11	9,0
*costs during transition period of infrastructure before being re-used for CO2 transport				

**4.1 - 4.2 billion Euro**

**8.0 - 9.5 billion Euro**

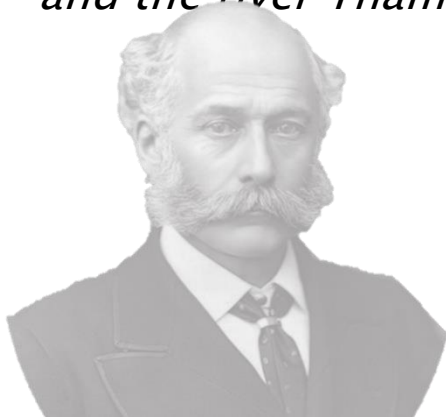
**CO2 Transport & Storage for 60 MtCO<sub>2</sub> per year** from the German industry via pipeline or ship for offshore storage.

**Nord Stream 2** to import additional 55 billion m<sup>3</sup> of gas, the equivalent of **106 MtCO<sub>2</sub>/year**, ignoring further GHG emissions from flaring and leakage.



# CO<sub>2</sub> NETWORK AS A PUBLIC GOOD

*In the early 19<sup>th</sup> century, London planned to expand its sewage system, yet faced widespread public opposition. Particularly wealthier people, living uphill, did not see why a general sewage system was needed and hence did not want to pay to improve the property of private individuals 'downhill'. In fact, sewage was not seen as a public good, and so the government initially considered it improper to use public money. It took several cholera epidemics, thousands of deaths, and the 'Great Stink' of 1858 for London to finally modernize and upgrade its sewage system, at last stopping the unchecked dumping of human waste into the city and the river Thames.*



***“[The principle] was of diverting the cause of the mischief to a locality where it can do no mischief.”***

Sir Joseph Bazalgette, Civil Engineer

# JOINING THE LINKS TO A EUROPEAN CO2 NETWORK

Cement pioneers deep  
decarbonisation of  
process industry

Clusters allow for lower  
cost and greater access  
to small(er) plants

Regional/European focus  
opens up new channels  
of cooperation and  
financing



# EVERYBODY WINS

CCS provides a feasible path for *industry* to deeply decarbonise. It protects already made investments and existing assets, from which value is currently realised, and where growing value and products need to be generated in the future.

With CCS as a corner stone of a *Just Transition* for industries, *labour unions* ensure that jobs in heavy industry and dependent sectors remain in Europe even under increasingly strict climate obligations. It safeguards the welfare of Europe's workers.

*Governments* at a local and national level are able to fulfil their obligations under binding international targets and towards their constituents by protecting their health, their jobs, and the environment and climate.

By supporting a shared CO<sub>2</sub> network, the *civil society* ensures that no industry emissions are considered 'unavoidable' and forces industry to deeply decarbonise. With no excuses left, industry decarbonisation will not be delayed further.

# WHAT IS NEEDED & WHAT TO DO

**A CO2 network will not simply appear, you need PROJECTS & FINANCE.**

## **Find & Make Allies**

Cooperate with Industry partners, Unions, Policy-Makers (local, national, European)

**Establish policy frameworks and finance instruments that suit your needs**

**Develop and Deploy Projects** Projects of Common Interest; Innovation Fund; Regional & National

Industry-scale demo projects need clear, detailed plans (location, size, costs)

## **Think Strategic**

Develop Projects where they can set you up for the long term

A photograph of a construction site with two hard hats on rebar. One blue hard hat is in the foreground, and one yellow hard hat is in the background. The background shows a large, open space with concrete pillars and a wet floor.

# Thank you!

Jonas M. Helseth

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