

Market Makers for CCS deployment

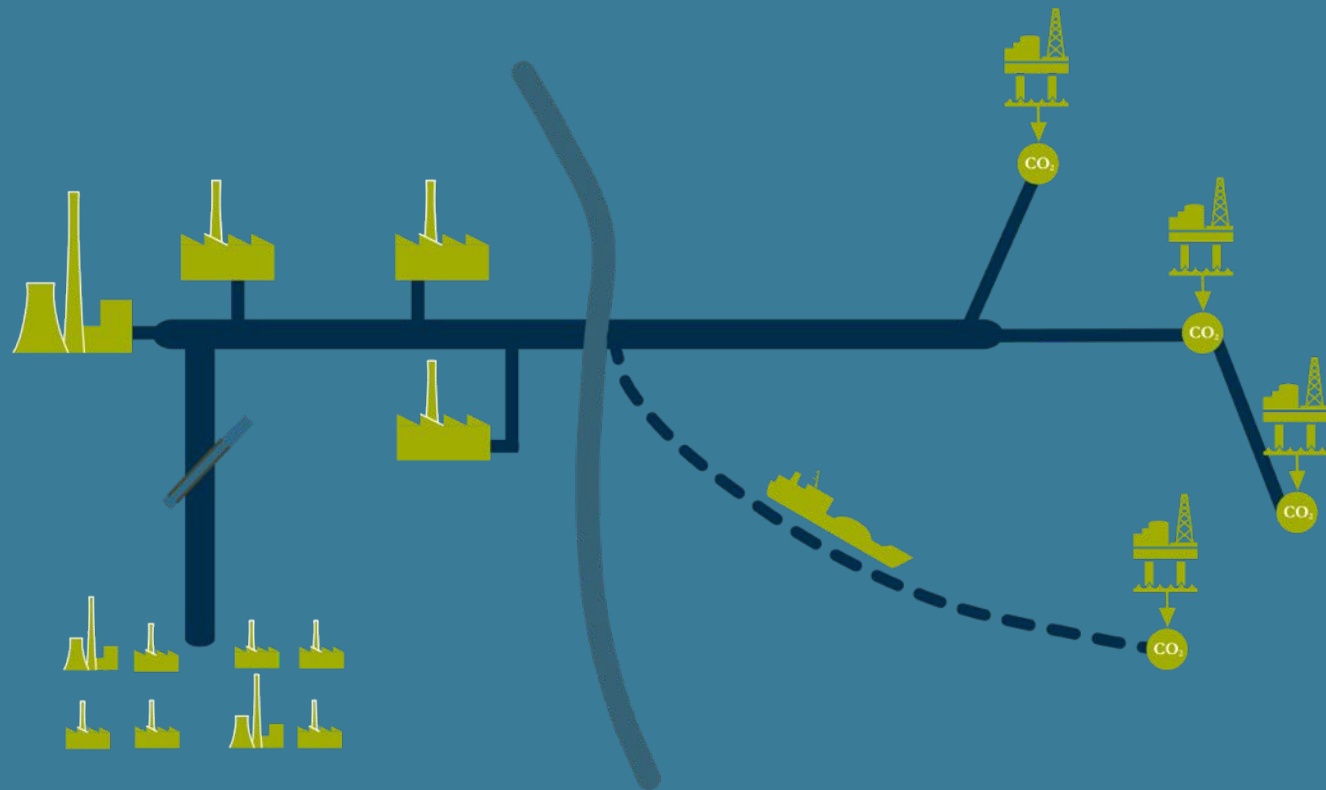
BELLONA
E U R O P A

Jonas M. Helseth
Director
Bellona Europa

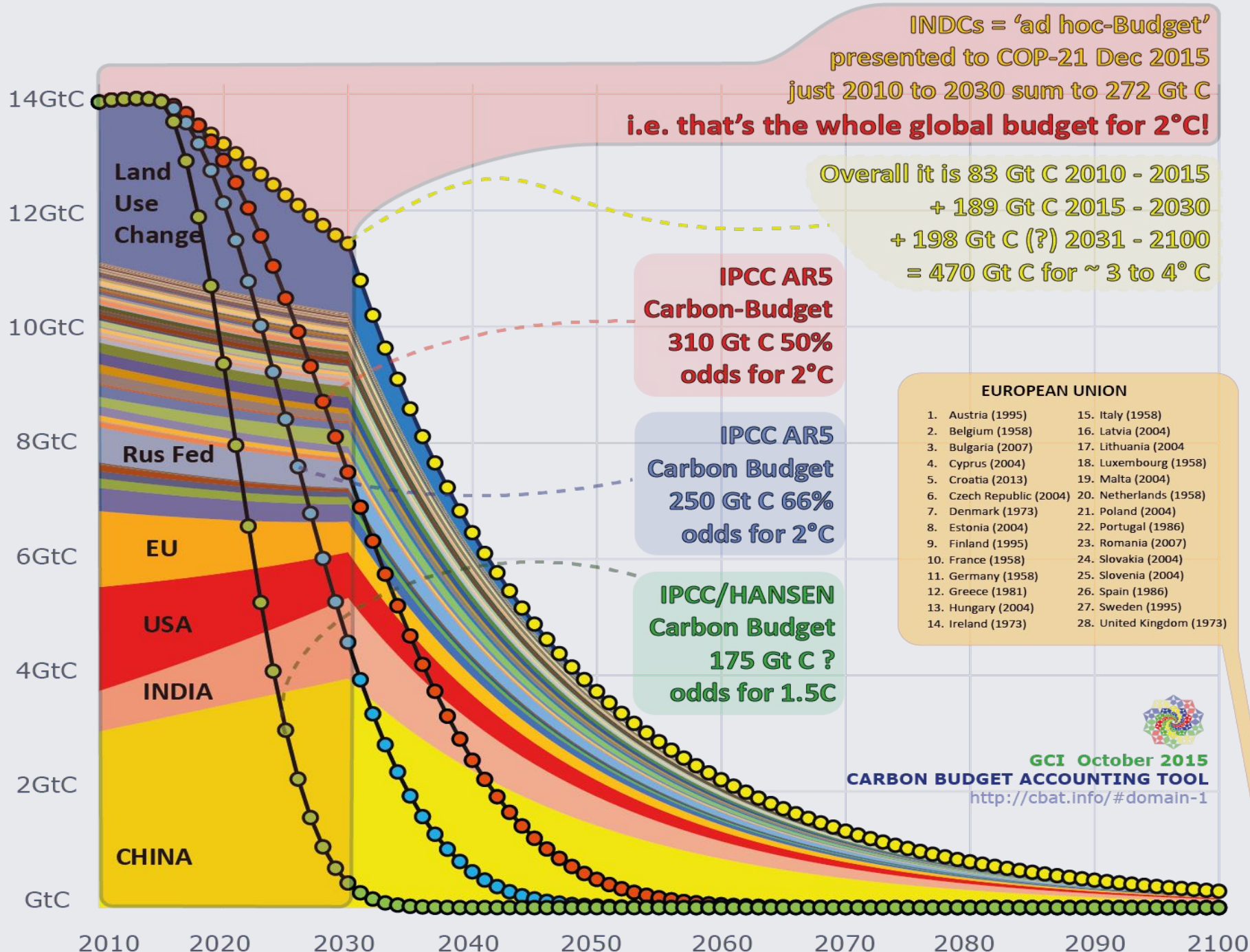
jonas@bellona.org

CO₂GeoNet
Venice, 09.05.2016

@Bellona_EU
@jonashelseth



IPCC AR5 medium estimate 531 GtC emitted globally since mid 19th Century.



30 YEARS INTO THE FUTURE



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“Delayed mitigation further increases the dependence on the full availability of mitigation options, especially on CDR technologies such as BECCS”

“BECCS is markedly different than fossil CCS because it not only reduces CO₂ emissions by storing C in long-term geological sinks, but it continually sequesters CO₂ from the air through regeneration of the biomass resource feedstock”



“Many models cannot reach about 450 ppm CO₂eq concentration by 2100 in the absence of CCS”

“Many models could not achieve atmospheric concentration levels of about 450 ppm CO₂eq by 2100 if additional mitigation is considerably delayed or under limited availability of key technologies, such as bioenergy, CCS, and their combination (BECCS).”

IPCC 5th CLIMATE ASSESSMENT REPORT: AN UNEQUIVOCAL CALL FOR ACTION ON (BIO-)CCS

The latest report of the Intergovernmental Panel on Climate Change (IPCC 5AR, 2014) issued a stark warning: to stand a reasonable chance of avoiding disastrous climate change, we have to remain within a 'safe' level of CO₂ emissions so that average global temperature rise is limited to 2°C.

Because more than half of the CO₂ 'budget' that allows us to remain within this threshold has already been used and current rates will exhaust the remainder within 25 years, the **IPCC's scenarios now rely on negative emissions to keep temperature rise below 2°C.**

Negative emissions are achieved when excess CO₂ is removed from the atmosphere. This is attainable through the combination of Carbon Capture and Storage (CCS) and sustainable biomass used for energy or products, so-called Bio-CCS or BECCS. **The message from the IPCC cannot be misunderstood: Bio-CCS is going to be a critical safeguard against disastrous climate change.**

Rejecting any role for Bio-CCS will: Drastically increase decarbonisation costs; preclude reaching the 2°C / 450 ppm target this century; likely result in missing our only chance to deal with runaway climate change; alienate potential allies from industrial sectors needed for deep decarbonisation; and increase the political barriers to transformational change.

This brief summarises the case for action on CCS and Bio-CCS as laid out in the IPCC 5AR.

2°C scenario lost without (Bio-)CCS

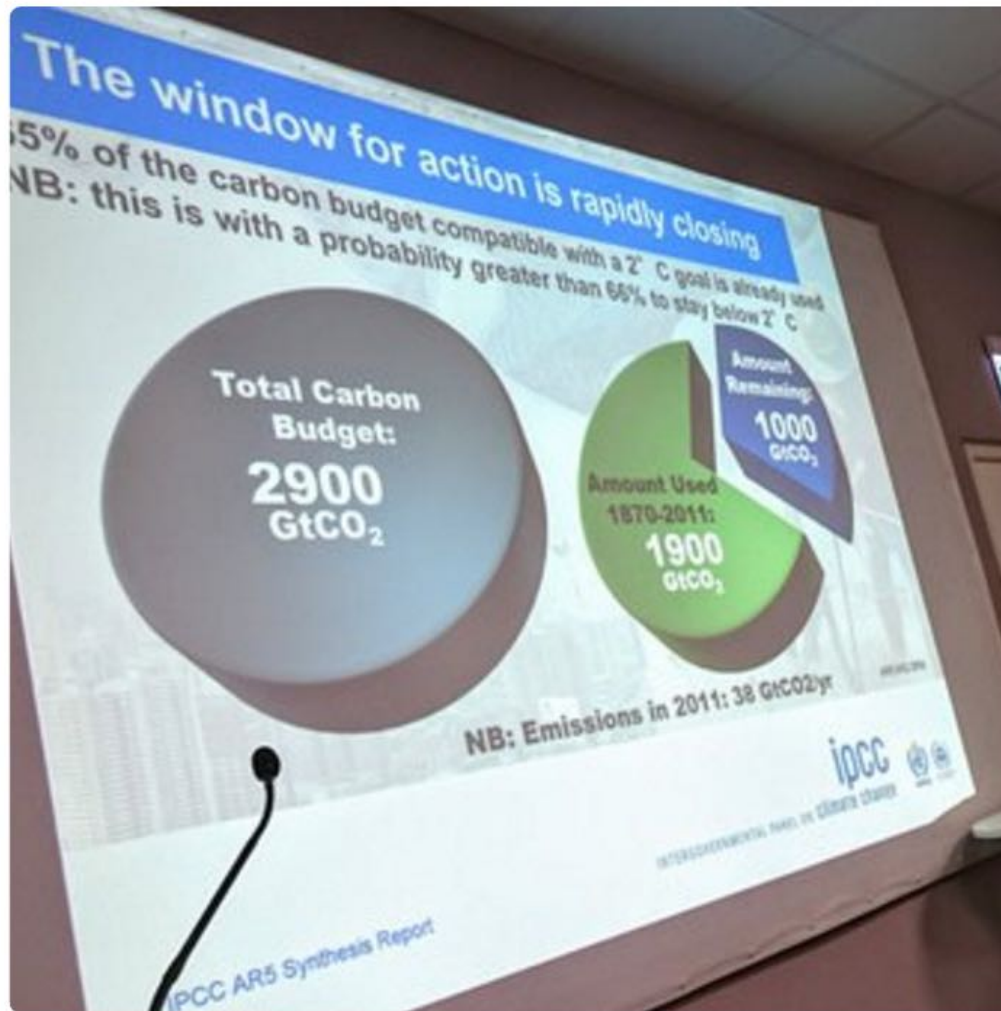
"Many models cannot reach about 450 ppm CO₂eq concentration by 2100 in the absence of CCS [CO₂ Capture & Storage], resulting in a low number of scenarios for the right panel" (IPCC, 2014).

"Many models could not achieve atmospheric concentration levels of about 450 ppm CO₂eq by 2100 if additional mitigation is considerably delayed or under limited availability of key technologies, such as bioenergy, CCS, and their combination (BECCS)" (IPCC, 2014).

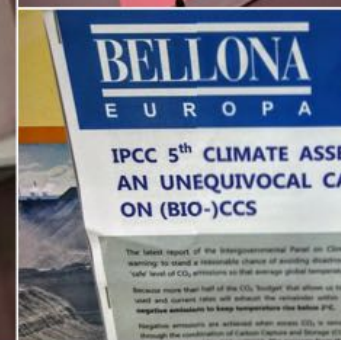
lo CCS ≈ 2 x cost to 50ppm / 2 degree target

	Increase in total discounted mitigation costs in scenarios with limited availability of technologies			
mitage t on in ized ption rate]	[% increase in total discounted mitigation costs (2015–2100) relative to default technology assumptions]			
2100	No CCS	Nuclear phase out	Limited Solar/Wind	Limited Bioenergy
5 (.14)	138 (29–297) [N: 4]	7 (4–18) [N: 8]	6 (2–29) [N: 8]	64 (44–78) [N: 8]
5 (.13)	N/A	N/A	N/A	N/A
4 (.09)	39 (18–78) [N: 11]	13 (2–23) [N: 10]	8 (5–15) [N: 10]	18 (4–66) [N: 12]
3 (.05)	N/A	N/A	N/A	N/A

Thanks @JPvanYpersele & @HeleendeConinck for highlighting @IPCC_CH's urgent call for action on #CCS #BECCS at #COP21



- IPCC is clear, but ignored**
- Two degrees only risk-effective if Bio-CCS is deployed
 - Result is now over a year old, but no action has been taken
 - More attention and R&D going into pre-engineering for Bio-CCS
 - Bio-CCS risks combining the political and economic risks of biomass and CCS
 - What happened to CCS does not bode well for Bio-CCS - missing the two-degrees scenario



Jonas M.
@jonashelseth
Director of Bellona
Tweets both in p
capacity; RT ≠ e










EU says 1.5C global warming target depends on 'negative emissions' technology

EU climate chief says that aspirational 1.5C target was put into Paris climate deal at insistence of 'most exposed countries' and will require new strategies



TAKE YOUR PICK

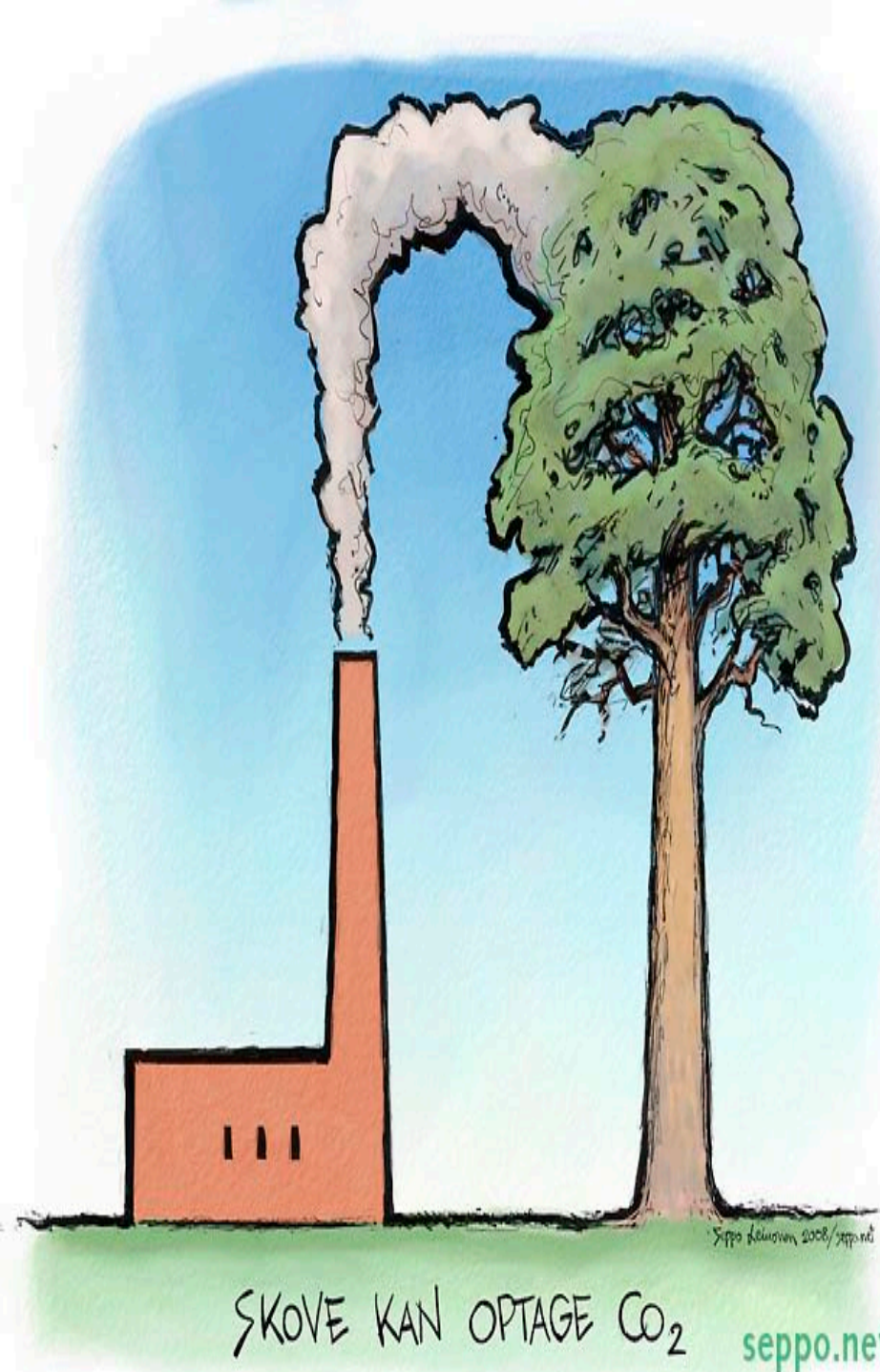
A plethora of schemes have been proposed to extract carbon dioxide from the atmosphere. Here are nine, some more speculative than others.

TECHNIQUE	HOW IT WORKS
 Bioenergy with carbon capture and storage (BECCS)	Crops grown for the purpose are burnt in power stations (providing energy), and the resulting CO ₂ is captured for secure long-term storage.
 Afforestation and reforestation	Large-scale tree plantations increase natural storage of carbon in biomass and forest soil.
 'Blue carbon' habitat restoration	The recovery of degraded or over-exploited coastal ecosystems that have a high potential for carbon storage, such as saltmarshes and mangroves.
 Biochar	Carbon from partly burnt biomass is added to soil, with potential for agricultural benefits.
 Enhanced ocean productivity	Marine photosynthesis and CO ₂ drawdown from the atmosphere is increased, either by adding nutrients to promote phytoplankton growth in the open ocean or through seaweed cultivation in shallow seas.
 Enhanced weathering (using silicate rock)	Crushed olivine or other silicate rocks are added to soil surfaces or the ocean for chemical absorption of CO ₂ . (Could help to reduce ocean acidification.)
 Direct air capture (DAC)	Chemicals (or possibly low temperatures) are used to extract CO ₂ from ambient air. Safe CO ₂ transport and storage are subsequently required.
 Cloud treatment to increase alkalinity	Alkaline rain resulting from cloud treatments reacts with, and removes, atmospheric CO ₂ .
 Building with biomass	A massive increase in the use of biomass (straw and timber) as a building material removes carbon for decades or centuries.

Klemetsrud waste incinerator (Oslo, Norway) will capture around 300,000 tonnes CO₂ annually. This is equivalent to 1,000 km² of forest...or planting approx. ½ of Luxembourg with forest.

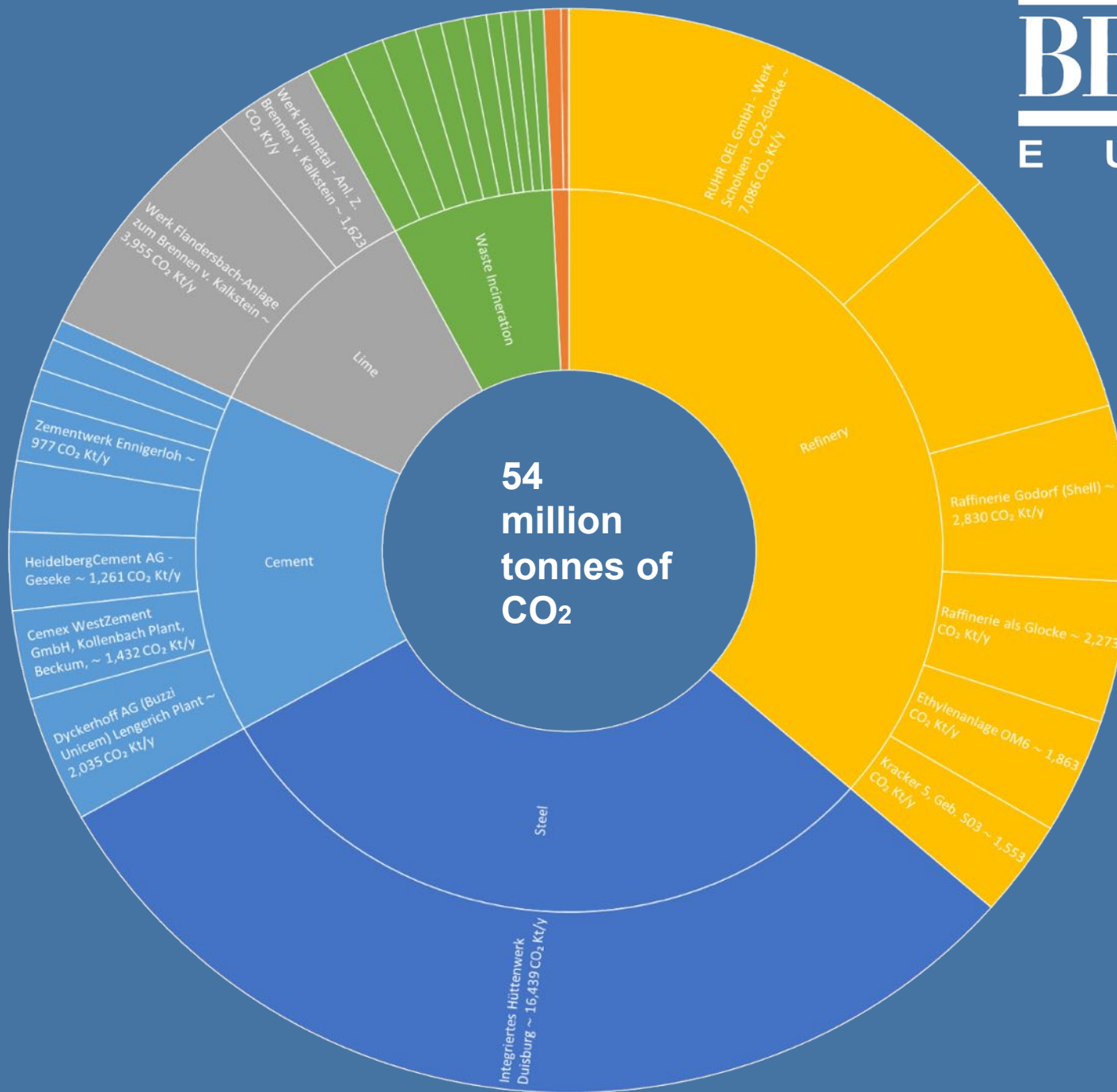
Total EU emissions from waste incineration is about 9m tonnes of CO₂. This is equivalent to 30,000 km² of forest...or to planting the total area of Belgium with forest – *just for EU waste incineration.*

Monni et al. (2006) estimated that incinerator emissions would grow to 80–230 MtCO₂-eq/yr by 2050 (not including fossil fuel offsets due to energy recovery).



SKOVE KAN OPTAGE CO₂

seppo.net



- **Ruhr Area, Germany**
- German industrial emissions are larger than Portugal's overall emissions, and make up ~1/4 of Germany's CO₂ emissions
- CCS?
...or shut it down.

- Every new (unabated) emission source is a lock-in we can't afford
- ...or a huge societal bankruptcy (Stranded Assets!)
- Are we waiting for a chance to say 'I told you so', or are we going to make this happen?

bellona.org/news/ccs/2013-07-press-release-well-timed-new-report-s

Carbon capture and storage

PRESS RELEASE: Well-timed new report shows CCS industry with the Union's climate ambitions

The Zero Emissions Platform (ZEP) – an EU Technology Platform consisting of and of which Bellona is a founding member – has released a new report on the

Published on July 1, 2013 by [Bellona](#)

The report, which was published by the Platform today¹, shows that direct emissions from EU industries in 2010 accounted for 25 % of total EU CO₂ emissions, and that energy efficiency measures will not be sufficient to reduce those emissions significantly. CCS continues to stand out as the only technology available to deliver deep emission cuts; a failure to deploy CCS in those sectors would therefore undermine the EU's ability to meet its own long-term climate ambitions while retaining a strong industrial base.

Bellona led the work on the report

The industries covered in the report are steel, cement, refineries and chemicals. Bellona has for more than a year led ZEP's work



Bloomberg ▼

Germany Vows Help for Battered Steelmakers Ahead of Carbon Bill

Germany Vows Help for Battered Steelmakers Ahead of Carbon Bill

by **Brian Parkin**
[bparkx](#)

April 29, 2016 – 4:12 PM CEST



- ▶ Germany seeks exemptions for steel industry in ETS reform
- ▶ German steelers face EU1 billion bill p.a. for CO₂ permits

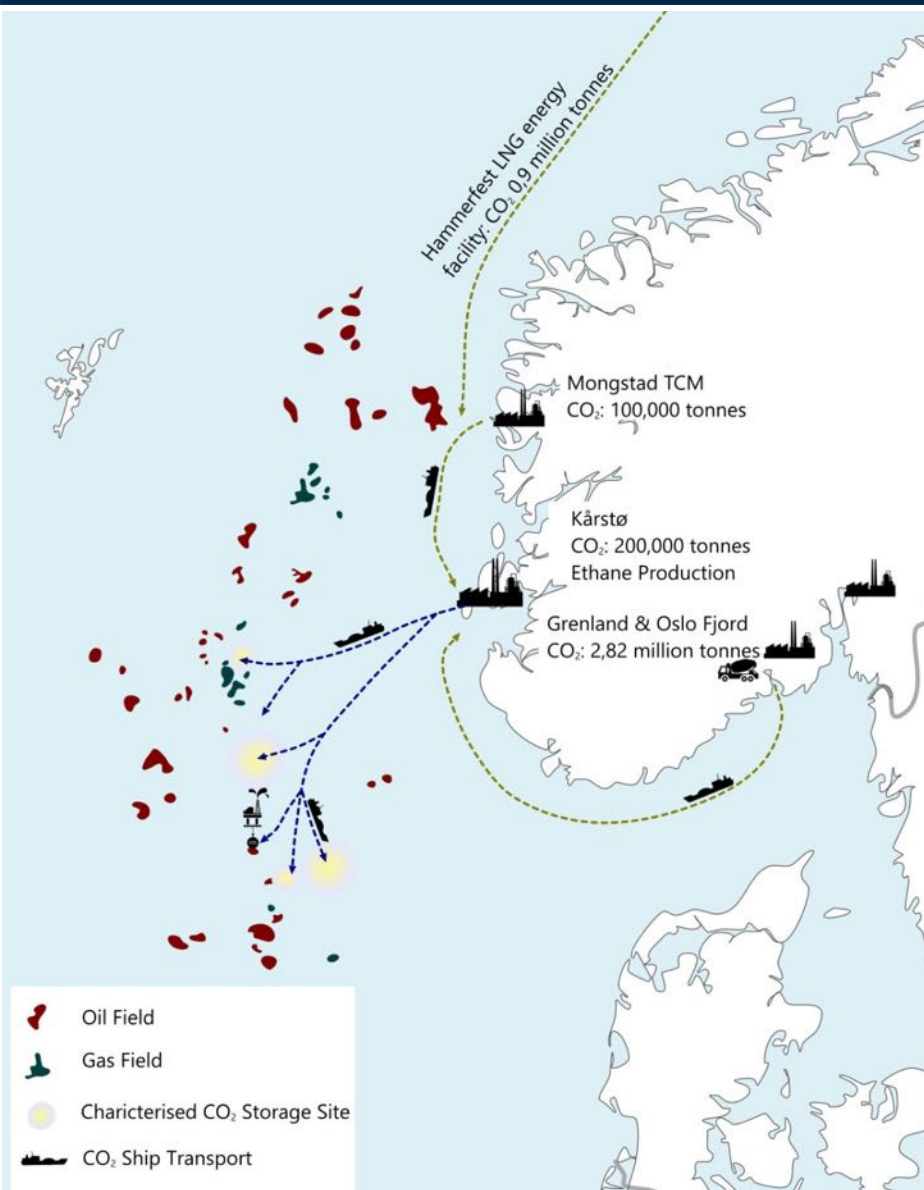


Germany's ruling coalition is backing calls from steel producers like Thyssenkrupp AG and Salzgitter AG to shield them from financial risks from the European Union's revamp of the emissions trading system



We urgently need to *enable* a discussion





Bellona March 2015: 6 steps to a CO₂ economy in Norway

1. Set up a market maker to buy CO₂
2. Capturing CO₂ from existing sources
3. Transporting and using CO₂ for developing commercially profitable CO₂ storage
4. The role of EOR
5. **Develop hubs**
6. Contribute nationally and internationally

The EU / European Commission's role

BELLONA



Miguel Arias Cañete

@MAC_europa

Follow

#CCS is a reality, also in the Emirates.
Visiting the first commercial CCS project in
the Gulf region @Masdar



RETWEETS

18

FAVORITES

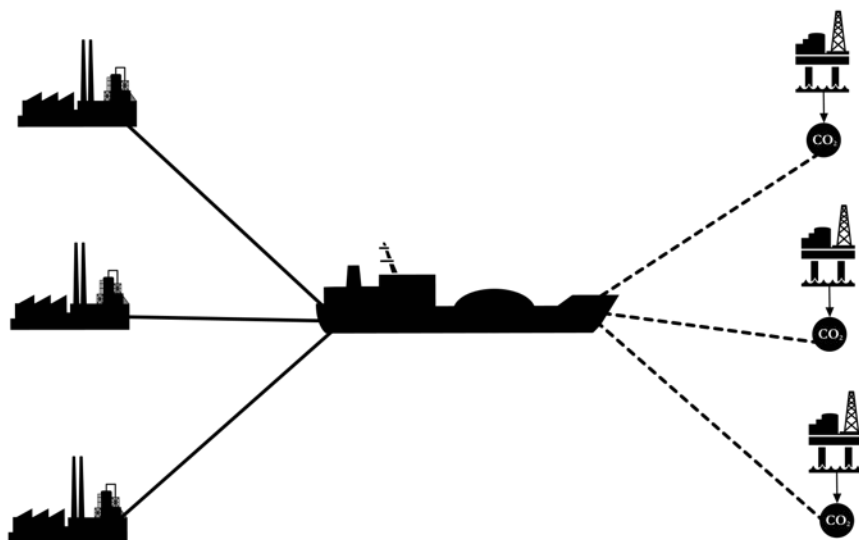
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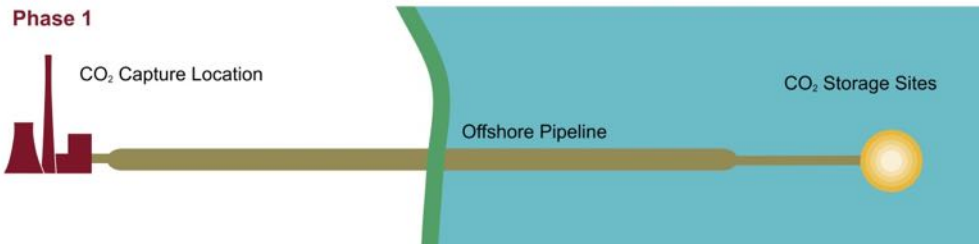
We need an
executable
PLAN for EU
CCS at scale!
...but it has to fit
with(in) existing
EU initiatives



- Continuing solely with **point to point demonstration projects** will not provide **sufficient bankable storage** capacity at the rate needed

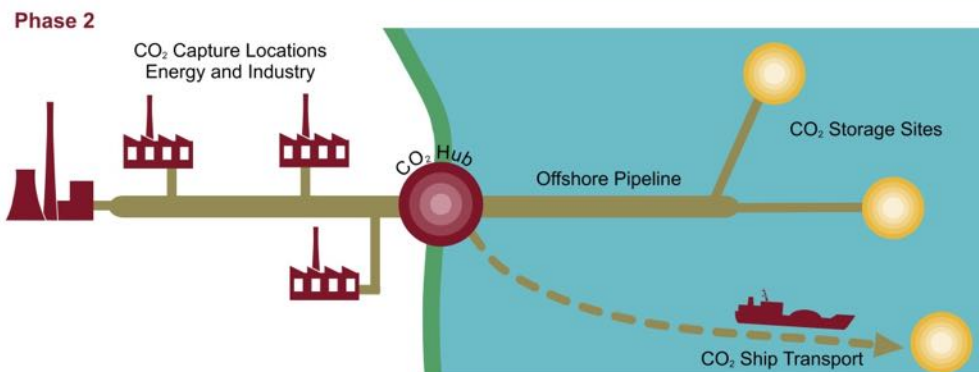


- Strategic and Targeted development of CO₂ storage capacity is key to the future of CCS
- Projects must be rated highly on storage and infrastructure provided



Phase 1

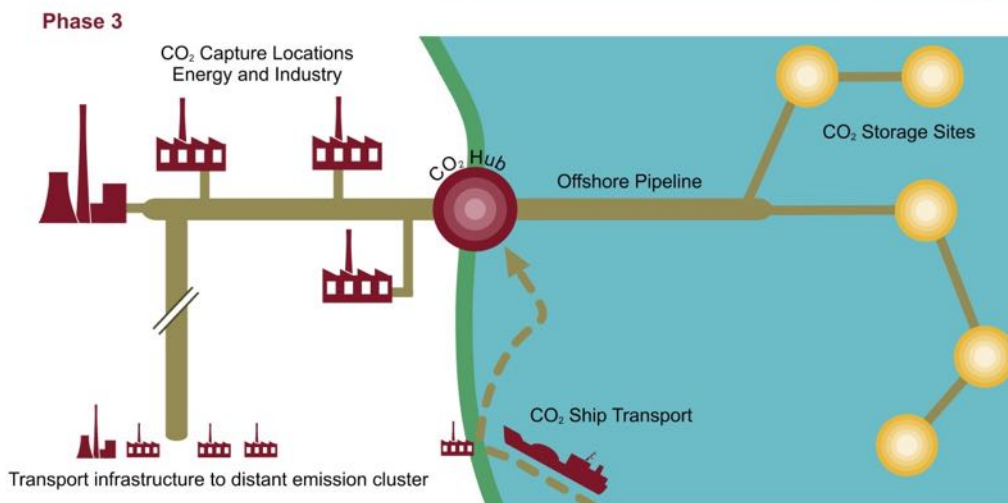
Deliver **existing** single source/ sink CCS demonstration projects in **prime locations** which can be expanded into **strategic European CO₂ hubs**;



Phase 2

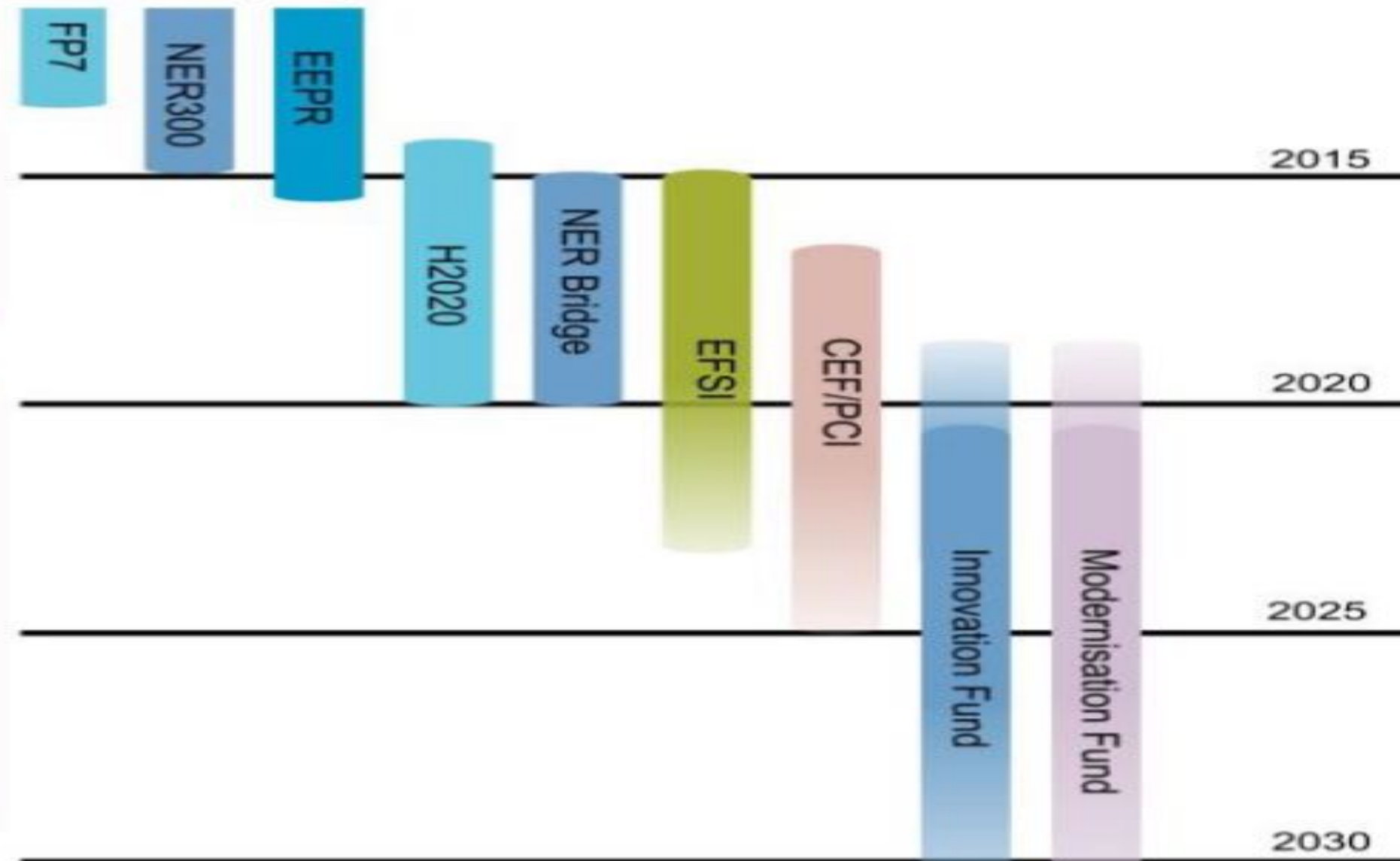
Start sourcing CO₂ from nearby emitters to create CCS hubs, i.e. clustering additional CCS projects near the ground-breaking CO₂ transport infrastructure.

Ensure that the storage capacity identified and is appraised well in advance of its need, driven by hub expansion;



Phase 3

Expand the hub over a **wider region** and **potentially across neighbouring countries**.



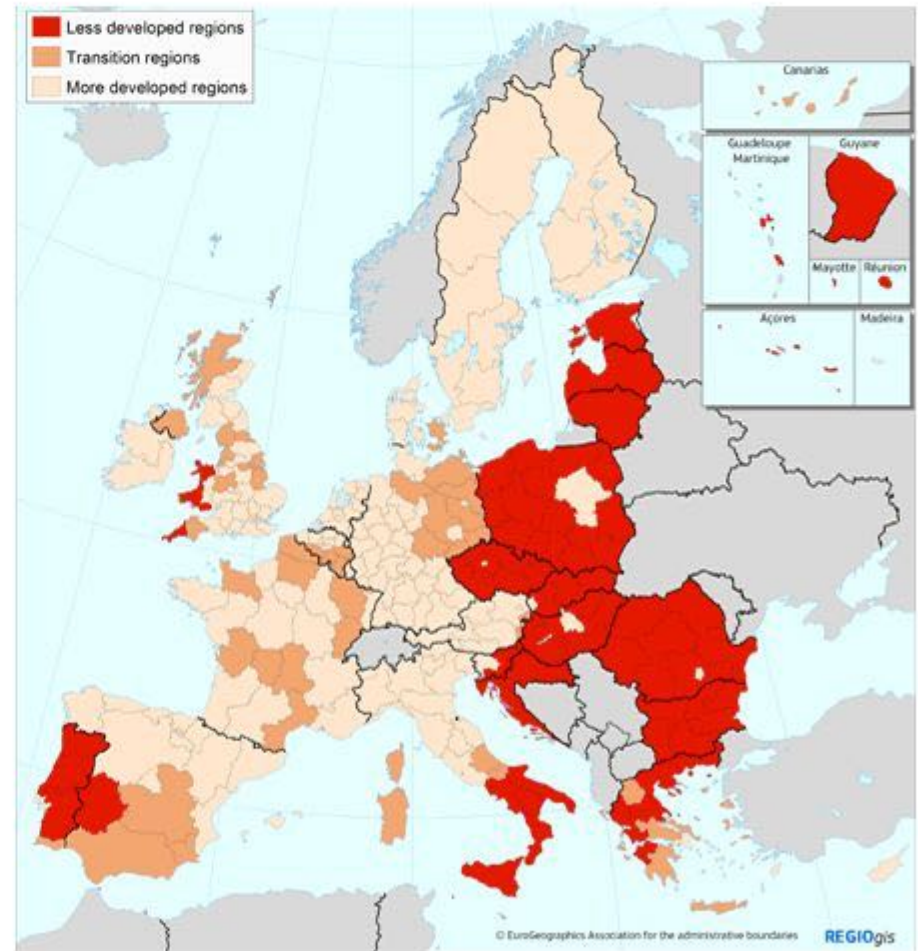
Cohesion Policy 2014-2020

Investment policy supporting Europe 2020: growth, jobs, quality of life and sustainable development

- European Regional Development Fund (ERDF)
- European Social Fund (ESF)
- Cohesion Fund (CF)

**Total: Around € 322
billion of EU funds,
concentrated in less
developed regions**

The map shows eligibility simulation for the ERDF and the ESF. Approximate overall amount and classification of regions based on political agreement on EU Multiannual Financial Framework reached between EP and Council June 2013.



Public *support* for CCS – ETUC / Societal Case



The voice of 60 million
workers in Europe

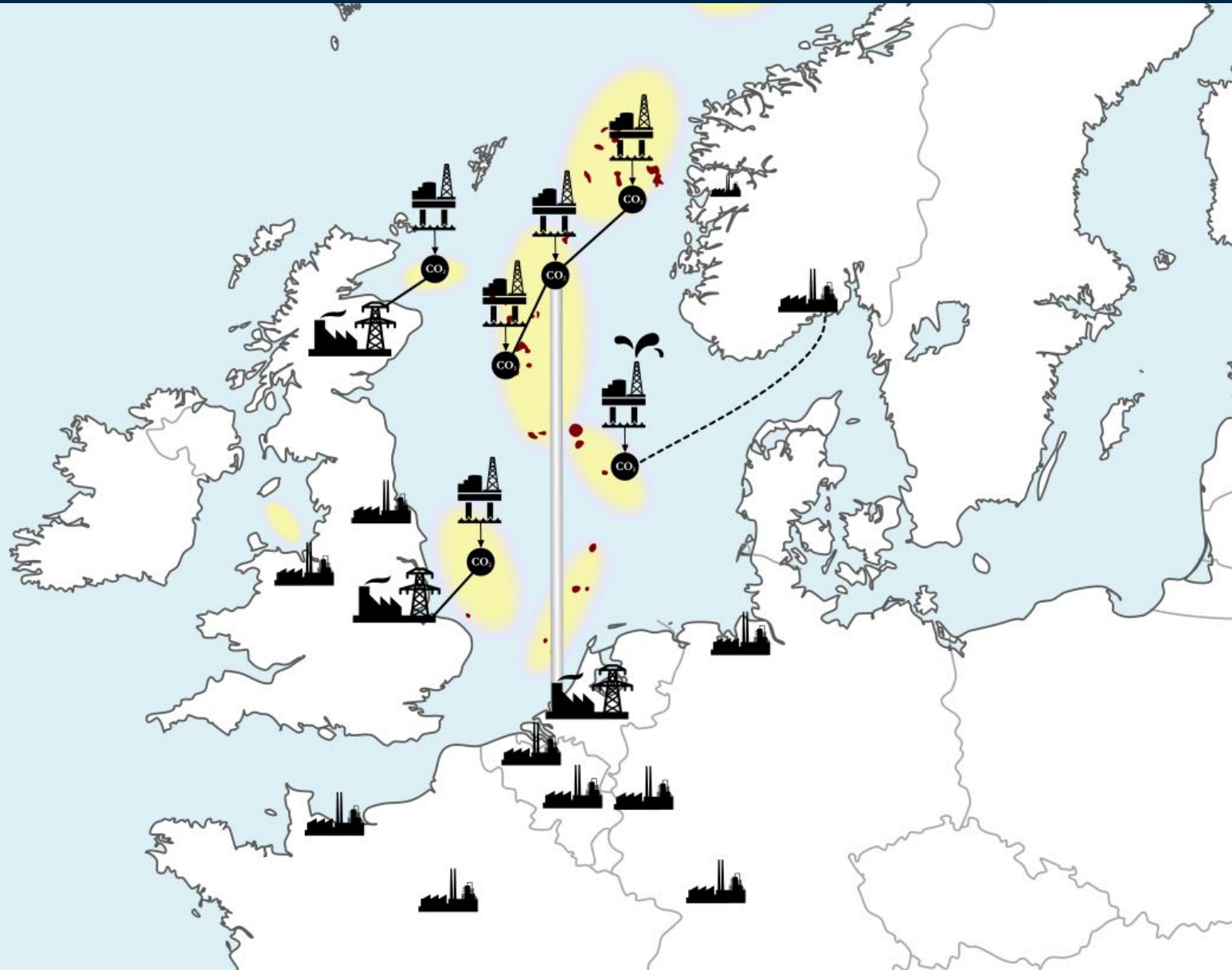
Tees Valley
Unlimited



- Industrial capture at three large industrial sites
 - Ammonia, Steam Methane Reformer, Blast Furnace
- Additional, smaller, and future sources of CO₂



PROCESS INDUSTRY CARBON CAPTURE & STORAGE INITIATIVE





Annual investment to characterise and develop EU storage industry

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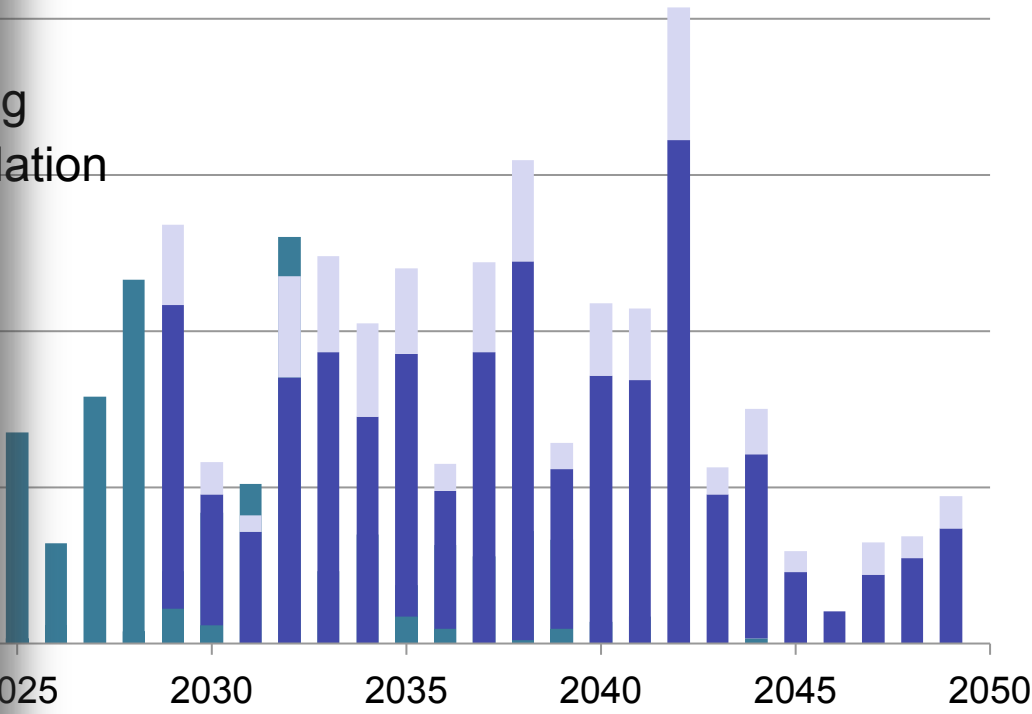
Scaling the CO₂ storage industry: A study and a tool

A study of the CO₂ storage industry in Europe to 2050 – and a tool to measure its feasibility, the requirements and the bottlenecks.

November 2014

Keith Whiskey - keith@bellona.org

EU Energy Roadmap, Annex 1, CO₂ capture estimates



WE NEED YOU!



...so **thanks for still being here!**

...and thanks
for your
attention!



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