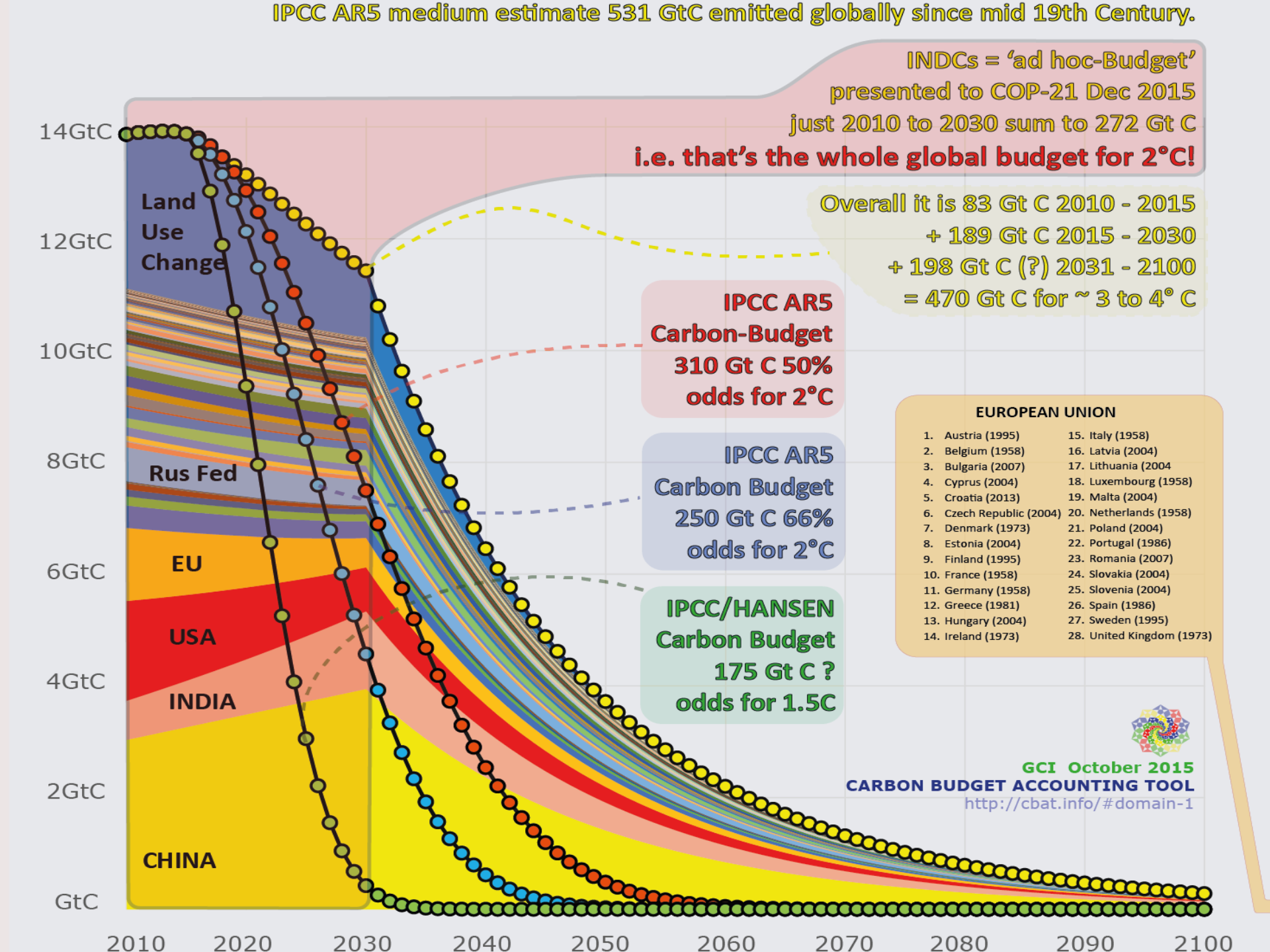
How to deploy CCS in Northern Europe and enable negative CO_2 emissions

The case for CO_2 infrastructure as a public good

Taking the CO2 Back: Making Sweden carbon-negative by 2045
15th June 2017, Riksdagen (Swedish Parliament), Stockholm

Jonas Helseth
Director, Bellona Europa
jonas@bellona.org

@Bellona_EU / @jonashelseth


IPCC AR5 medium estimate 531 GtC emitted globally since mid 19th Century.
INDCs = 'ad hoc-Budget'
presented to COP-21 Dec 2015
just 2010 to 2030 sum to 272 Gt C
i.e. that's the whole global budget for 2°C!
Overall it is 83 Gt C 2010 - 2015
+ 189 Gt C 2015 - 2030
+ 198 Gt C (?) 2031 - 2100
= 470 Gt C for ~ 3 to 4° C
IPCC AR5
Carbon-Budget
310 Gt C 50%
odds for 2°C
IPCC AR5
Carbon Budget
250 Gt C 66%
odds for 2°C
IPCC/HANSEN
Carbon Budget
175 Gt C ?
odds for 1.5C
14GtC
12GtC
10GtC
8GtC
6GtC
4GtC
2GtC
GtC
Land Use Change
Rus Fed
EU
USA
INDIA
CHINA
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
EUROPEAN UNION
1. Austria (1995)
2. Belgium (1958)
3. Bulgaria (2007)
4. Cyprus (2004)
5. Croatia (2013)
6. Czech Republic (2004)
7. Denmark (1973)
8. Estonia (2004)
9. Finland (1995)
10. France (1958)
11. Germany (1958)
12. Greece (1981)
13. Hungary (2004)
14. Ireland (1973)
15. Italy (1958)
16. Latvia (2004)
17. Lithuania (2004
18. Luxembourg (1958)
19. Malta (2004)
20. Netherlands (1958)
21. Poland (2004)
22. Portugal (1986)
23. Romania (2007)
24. Slovakia (2004)
25. Slovenia (2004)
26. Spain (1986)
27. Sweden (1995)
28. United Kingdom (1973)
GCI October 2015
CARBON BUDGET ACCOUNTING TOOL
http://cbat.info/#domain-1

BELLONA EUROPA brief

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 CO_2 emissions so that average global temperature rise is limited to 2°C.

Because more than half of the CO_2 '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 CO_2 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 CO_2eq concentration by 2100 in the absence of CCS *[CO_2 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 CO_2eq 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).

Carbon-Negative

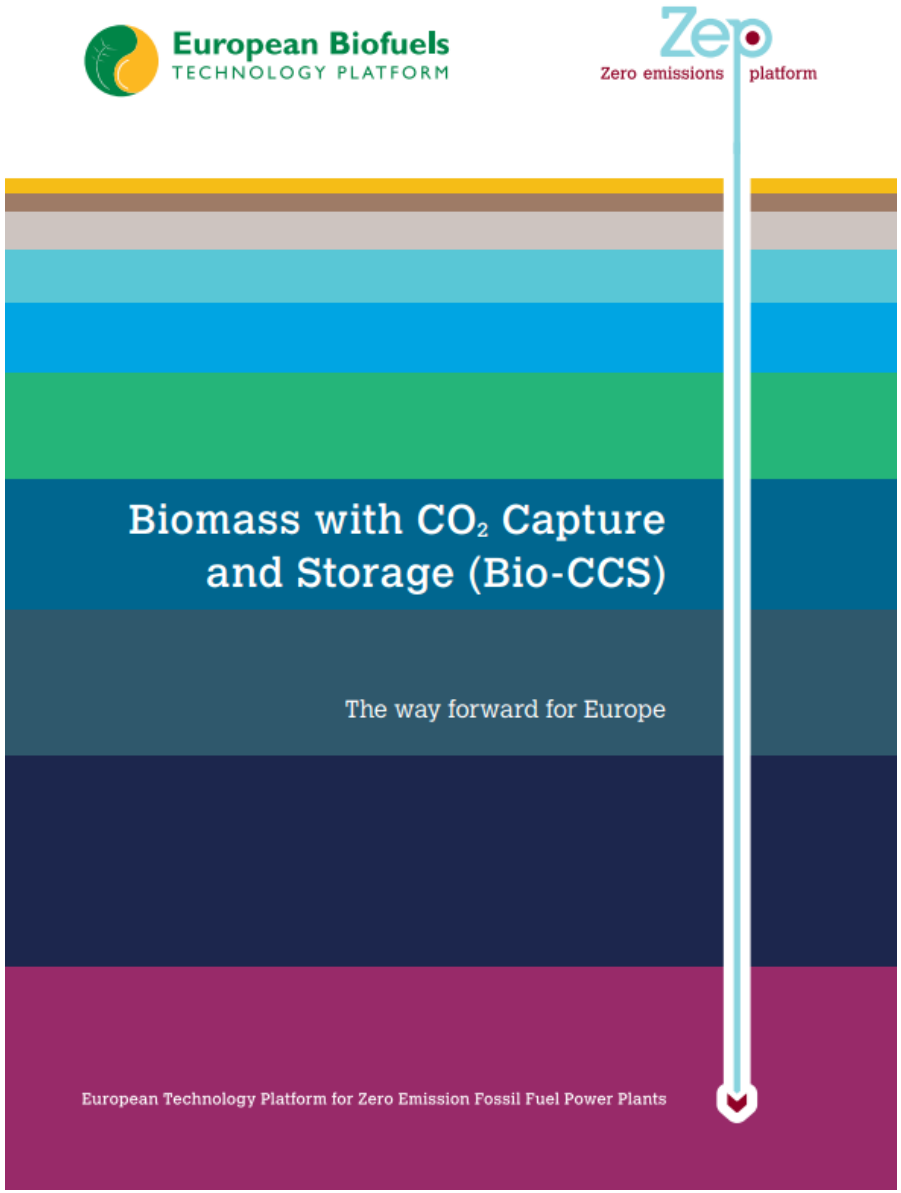
Coal

Bellona and Bio-CCS: Buildng the case in Europe

Following the two first international scientific workshops on Bio-CCS in 2010 (Orleans), 2011 (Cardiff):

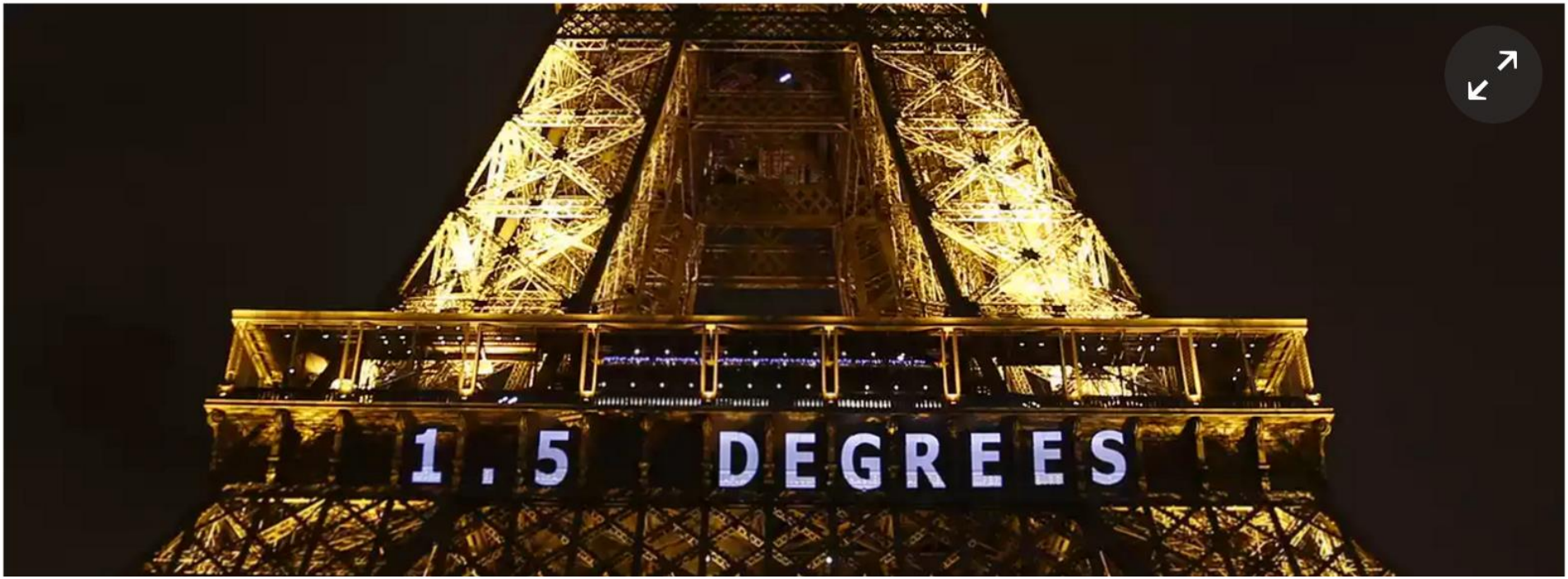
Technical Potential EU:

In Europe, Bio-CCS could remove **800 million tonnes of CO_2 from the atmosphere every year by 2050** using available sustainable biomass. **This is equivalent to over 50% of current emissions from the EU power sector** *(JTF Bio-CCS report, 2012)*



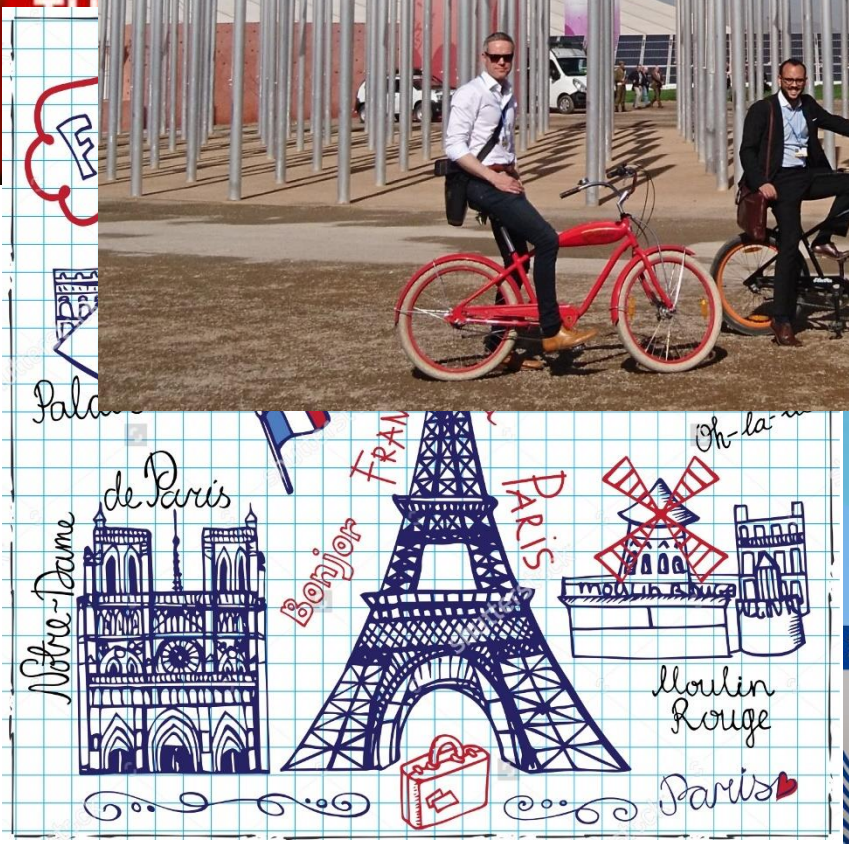
EU says 1.5C global warming target depends on 'negative emissions' technology

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

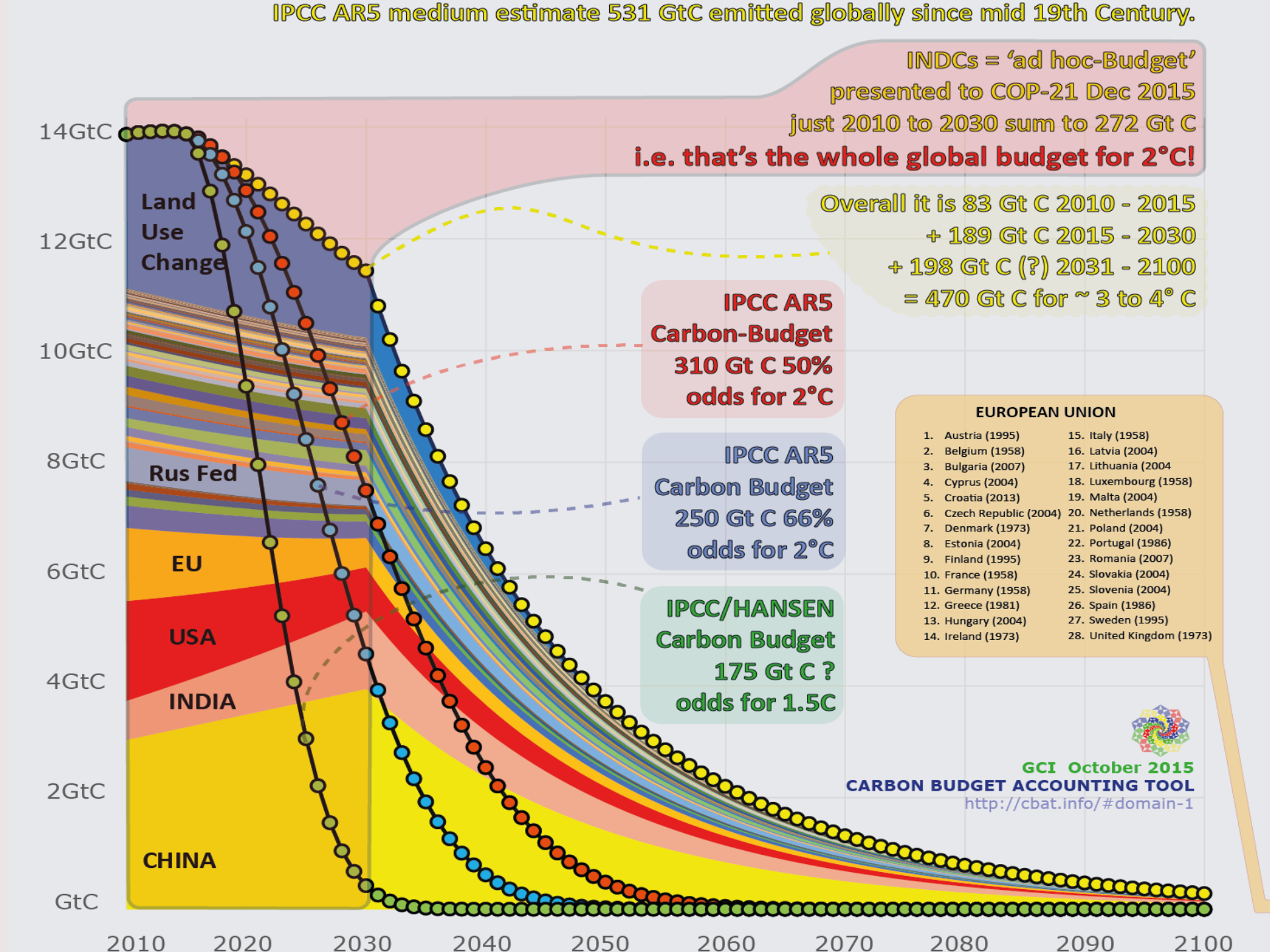


Report on 1.5 degrees
by 2018…

BELLONA
EUROPA



30 YEARS INTO THE FUTURE


IPCC AR5 medium estimate 531 GtC emitted globally since mid 19th Century.
INDCs = 'ad hoc-Budget'
presented to COP-21 Dec 2015
just 2010 to 2030 sum to 272 Gt C
i.e. that's the whole global budget for 2°C!
Overall it is 83 Gt C 2010 - 2015
+ 189 Gt C 2015 - 2030
+ 198 Gt C (?) 2031 - 2100
= 470 Gt C for ~ 3 to 4° C
IPCC AR5
Carbon-Budget
310 Gt C 50%
odds for 2°C
IPCC AR5
Carbon Budget
250 Gt C 66%
odds for 2°C
IPCC/HANSEN
Carbon Budget
175 Gt C ?
odds for 1.5C
14GtC
12GtC
10GtC
8GtC
6GtC
4GtC
2GtC
GtC
Land Use Change
Rus Fed
EU
USA
INDIA
CHINA
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
EUROPEAN UNION
1. Austria (1995)
2. Belgium (1958)
3. Bulgaria (2007)
4. Cyprus (2004)
5. Croatia (2013)
6. Czech Republic (2004)
7. Denmark (1973)
8. Estonia (2004)
9. Finland (1995)
10. France (1958)
11. Germany (1958)
12. Greece (1981)
13. Hungary (2004)
14. Ireland (1973)
15. Italy (1958)
16. Latvia (2004)
17. Lithuania (2004
18. Luxembourg (1958)
19. Malta (2004)
20. Netherlands (1958)
21. Poland (2004)
22. Portugal (1986)
23. Romania (2007)
24. Slovakia (2004)
25. Slovenia (2004)
26. Spain (1986)
27. Sweden (1995)
28. United Kingdom (1973)
GCI October 2015
CARBON BUDGET ACCOUNTING TOOL
http://cbat.info/#domain-1

BELLONA

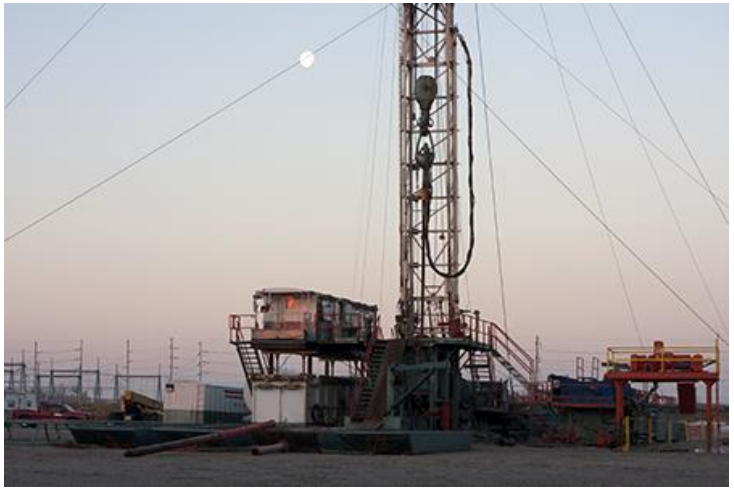
SEEING

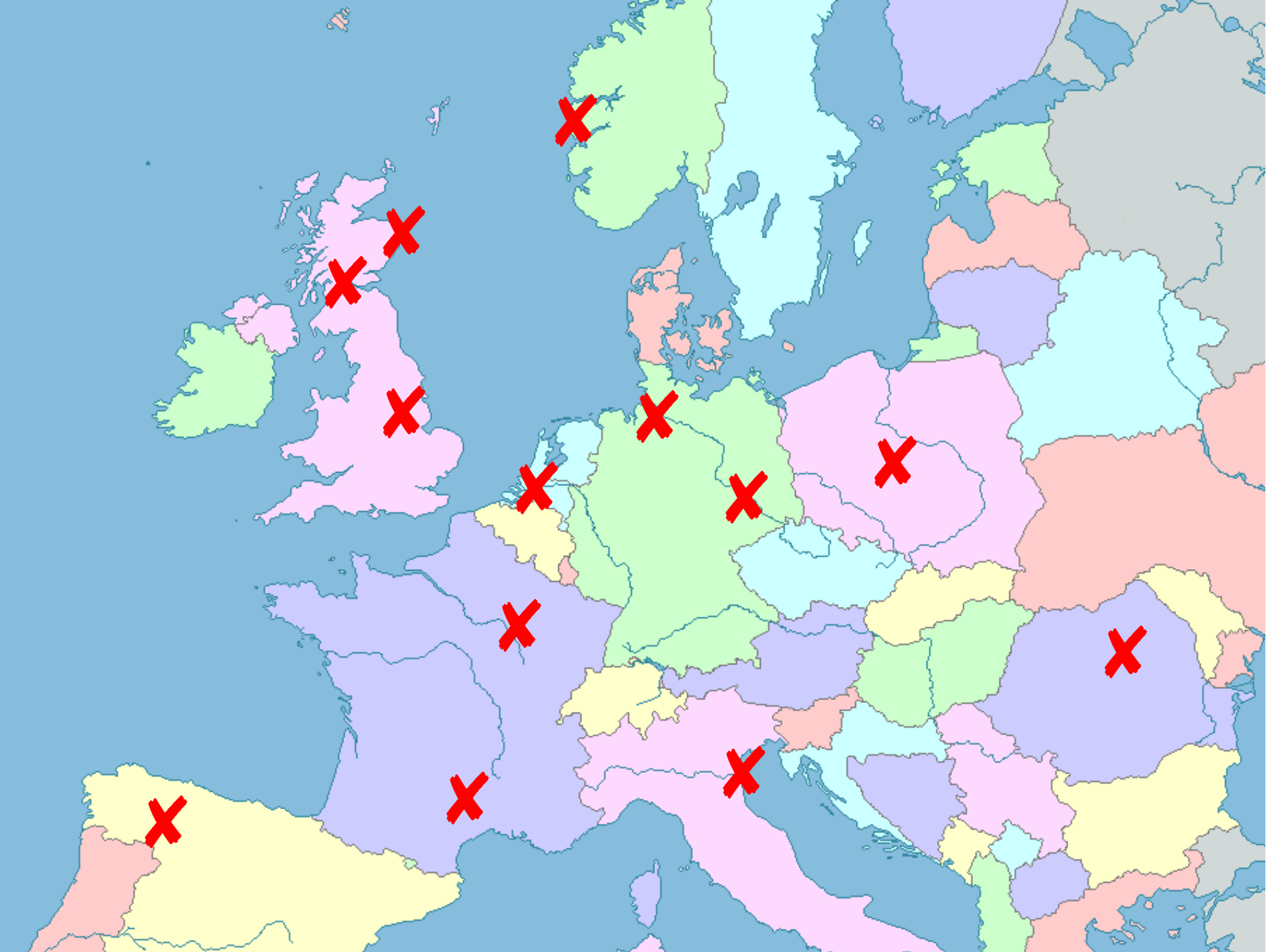
iS

BELIEVING

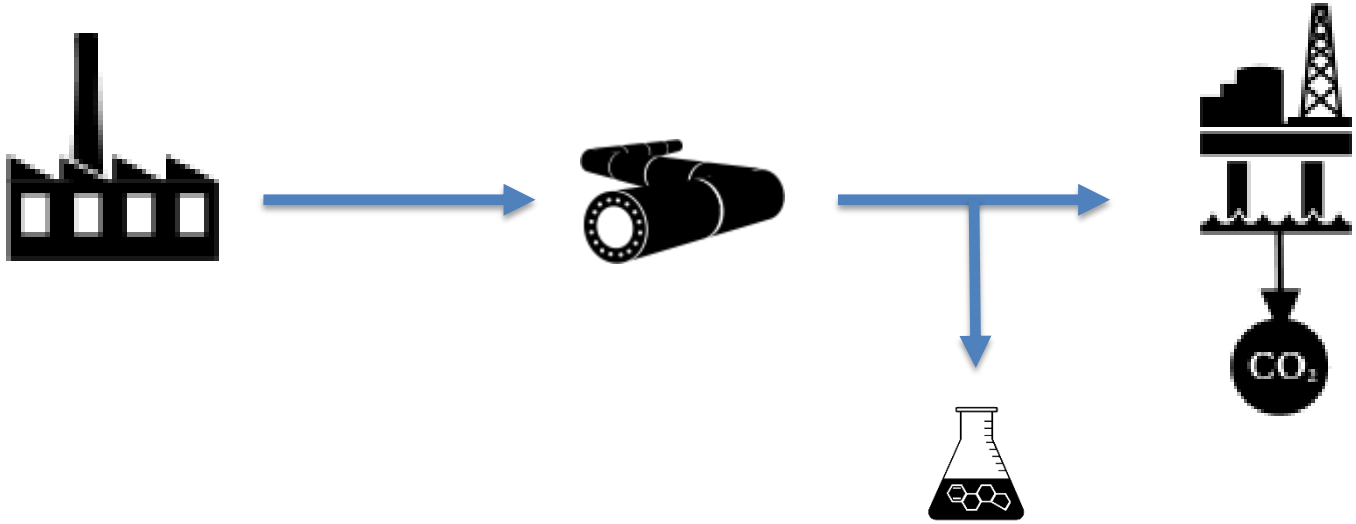
ADM bioethanol production in Decatur, Illinois with CCS

1 million tonnes CO_2 per year captured and permanently stored

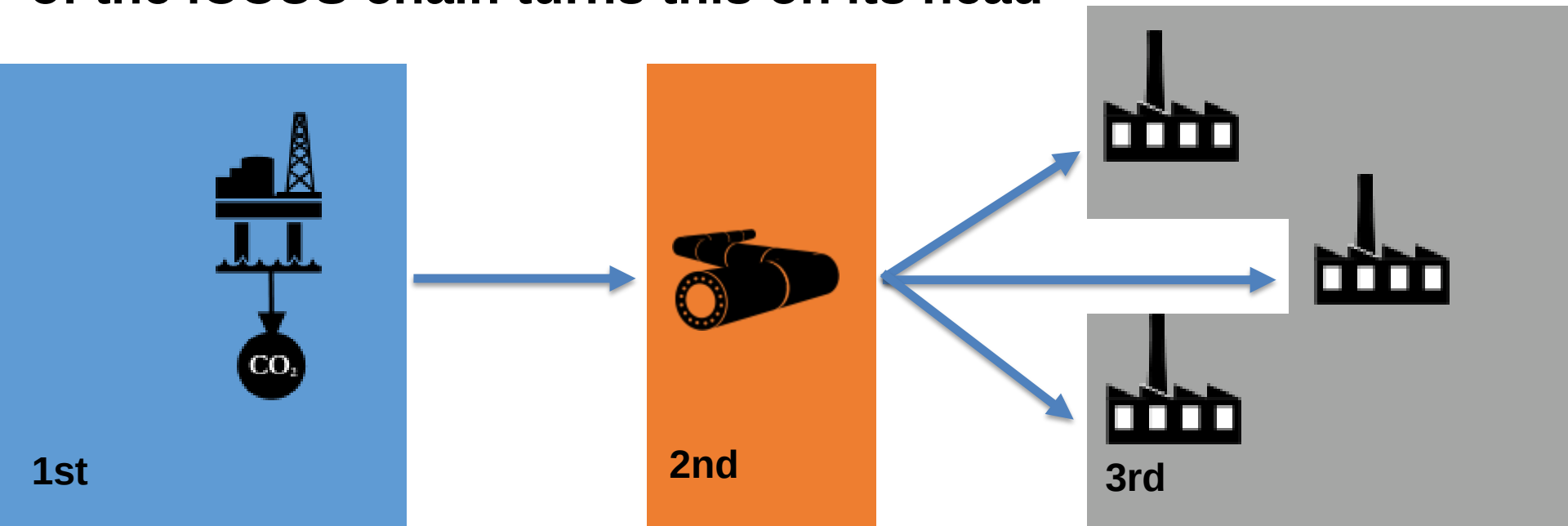


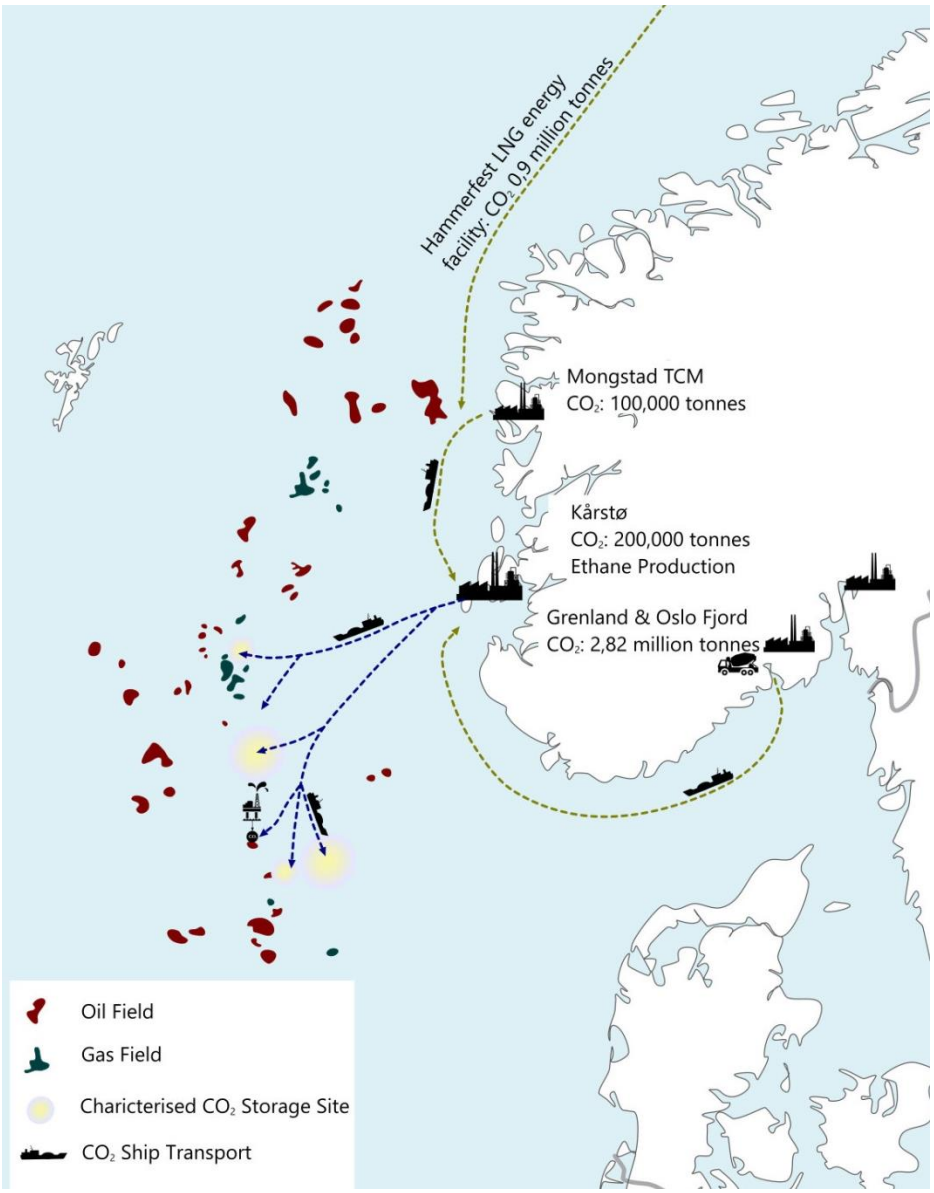


What is Industrial Carbon Capture (Use) & Storage?



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





Bellona March 2015: 6 steps to a CO_2 economy in Norway

1. Set up a **market maker to buy CO_2**
2. Capturing CO_2 from existing sources
3. Transporting and using CO_2 for developing commercially profitable CO_2 storage
4. The role of EOR
5. **Develop hubs**
6. Contribute nationally and internationally

Annual investment to characterise and develop EU storage industry

BELLONA
EUROPA

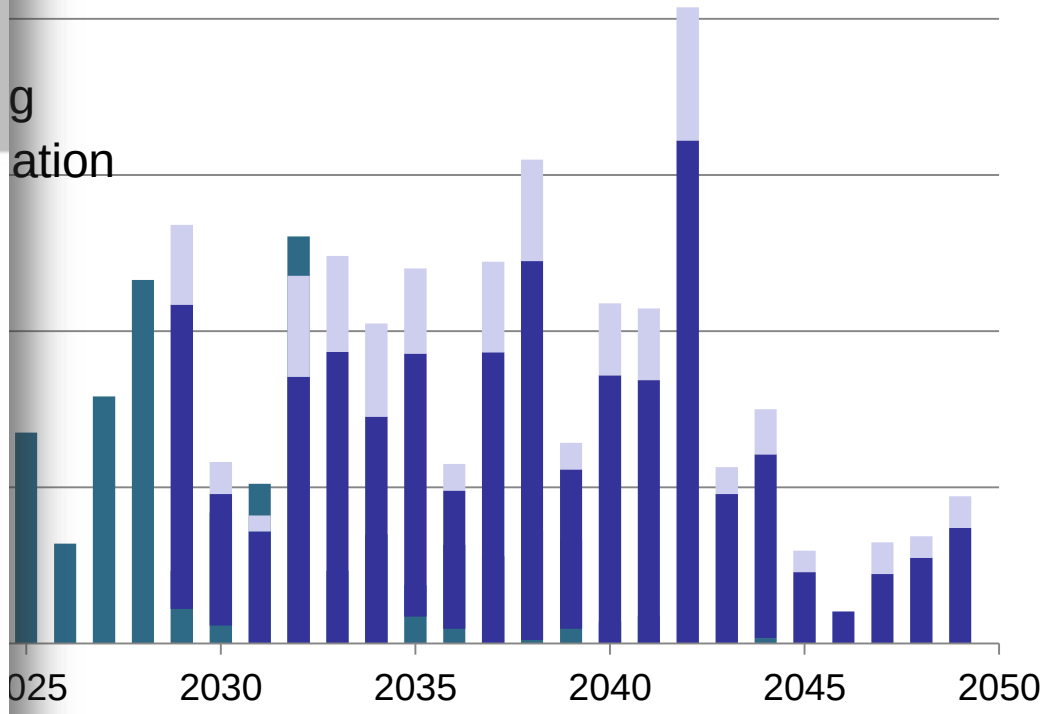
Bellona Europa
Rue d'Egmont 15
1000 Brussels
europe@bellona.org
+32 (0)2 648 31 22
www.bellona.org

Scaling the CO_2 storage industry: A study and a tool

A study of the CO_2 storage industry in Europe to 2050 – and a tool to measure its feasibility, the requirements and the bottlenecks.

November 2014

EU Energy Roadmap, Annex 1, CO_2 capture estimates



Press Release: Norway breaks vicious cycle of inaction on CCS deployment with concrete plans for industry

Today marks a historic milestone for the deployment of Carbon Capture and Storage (CCS) technology in the EU. Thanks t
Bellona's consistent efforts the Norwegian Ministry for Petroleum and Energy today, 30 September 2016, confirmed the
Norwegian government's decision to move forward with the country's three CO2 capture projects from the feasibility study

Published on September 30, 2016 by **Bellona Europa**

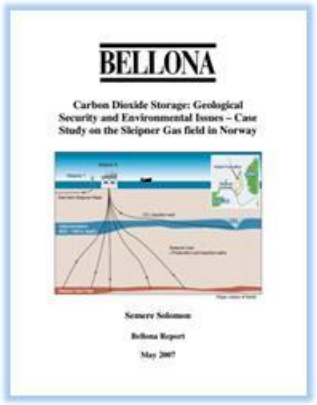
The capture projects represent three different industries: Yara, the world's largest ammonia production company, Norcem, Norway's sole cement producer, and Oslo's waste management and energy recovery CCS project Klemetsrud. This will thus add immense value for the development of CO_2 capture technologies in Norway and throughout the EU.

ona.org/.../2016-09-why-deep-decarbonisation-of-fertiliser-manufacture-...

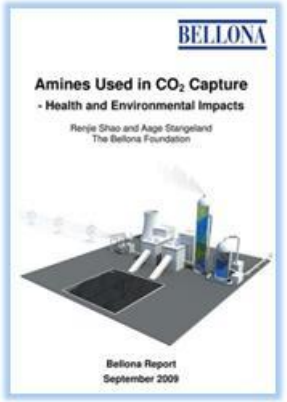
Related posts

- Why deeply decarbonising cement needs CCS
- Why deeply decarbonising fertiliser manufacture needs CCS
- Why tackling waste incineration emissions needs CCS
- Press Release: Norway breaks vicious cycle of inaction on CCS deployment with concrete plans for industry

Bellona & CCS


BELLONA
Carbon Dioxide Storage: Geological Security and Environmental Issues – Case Study on the Sleipner Gas field in Norway
Semere Solomon
Bellona Report
May 2007


BELLONA
EUROPA
MANUFACTURING OUR FUTURE: INDUSTRIES, EUROPEAN REGIONS AND CLIMATE ACTION
CO_2 Networks for the Ruhr, Rotterdam, Antwerp & the greater Oslo Fjord


BELLONA
Amines Used in CO_2 Capture
- Health and Environmental Impacts
Renjie Shao and Aage Stangeland
The Bellona Foundation
Bellona Report
September 2009


WHY CCS NOW
BELLONA


BEST
INSURING ENERGY INDEPENDENCE
A CCS ROADMAP FOR POLAND


ENVIRONMENTAL LAW SERVICE
BEST
CCS READINESS AT SOSTANJ: TICKING BOXES OR PREPARING FOR THE FUTURE?
BELLONA


BELLONA
Working Paper
DRIVING CO_2 CAPTURE AND STORAGE IN THE EU: NEW POLICIES, NEW PERSPECTIVES
BEST

Thank you!

BELLONA EUROPA

Jonas M. Helseth

www.Bellona.org

jonas@bellona.org

@Bellona_EU
@jonashelseth