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Listen to the ocean

CO_2 Capture and Storage impacts on marine systems:

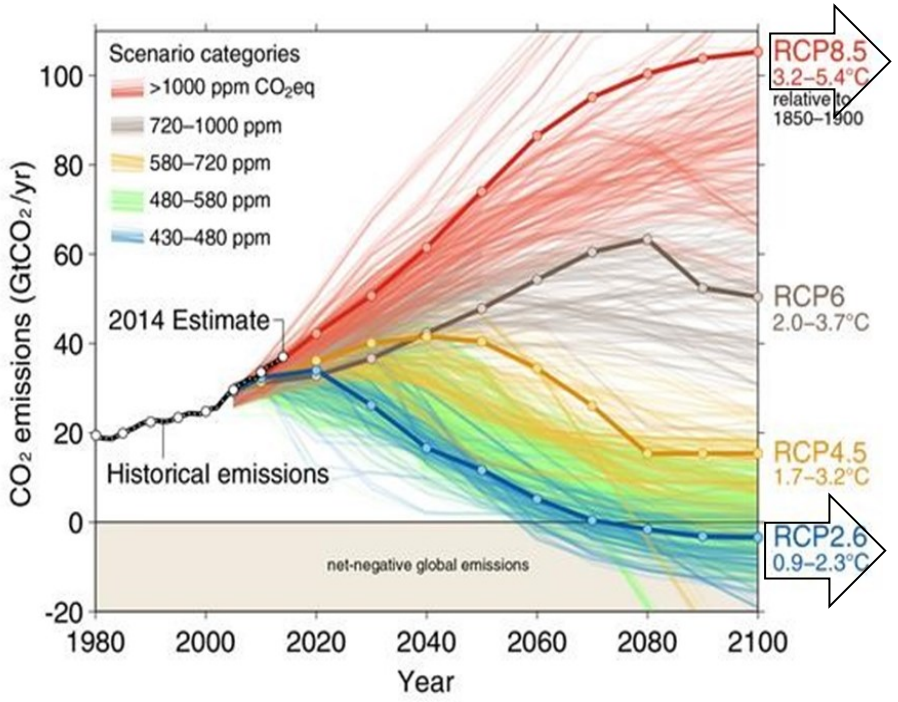
Are local impacts good return for global mitigation?

(the point of view of a marine ecologist)

Ana M Queirós, Nicola Beaumont, Jerry C Blackford, Vivian Scott and Steve Widdicombe

S12. ICES-PICES-IOC , Effects of Climate Change on the World's Oceans, 23rd-27th of March 2015, Santos Brazil

2°C and the need for global decarbonisation



Where we are heading

UNFCCC 2° C target

Representative Concentration Pathways, IPCC AR5

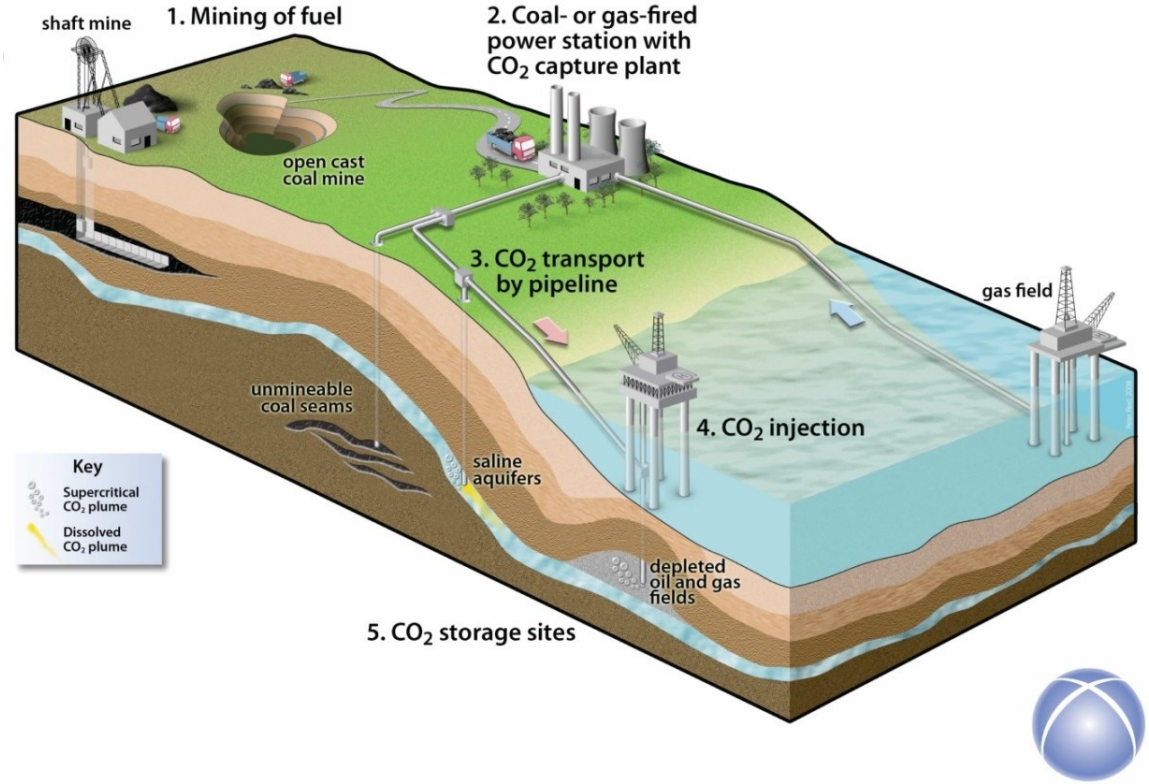
Sources: Fuss et al 2014; Global Carbon Budget 2014

Country	Change in carbon intensity 2012-2013
World	-1.2%
G7	-0.2%
E7	-1.7%
Australia	-7.2%
UK	-4.8%
Italy	-4.1%
China	-4.0%
South Africa	-3.0%
EU	-2.5%
Canada	-2.5%
South Korea	-2.4%
Japan	-2.3%
Argentina	-1.2%
Saudi Arabia	-1.0%
Turkey	-0.7%
Russia	-0.7%
Mexico	-0.3%
Indonesia	-0.1%
France	0.3%
US	0.6%
India	0.9%
Germany	2.9%
Brazil	5.5%

Low Carbon Economy Index

Source: Pwc 2014

What is CO_2 Capture and Storage (CCS)?



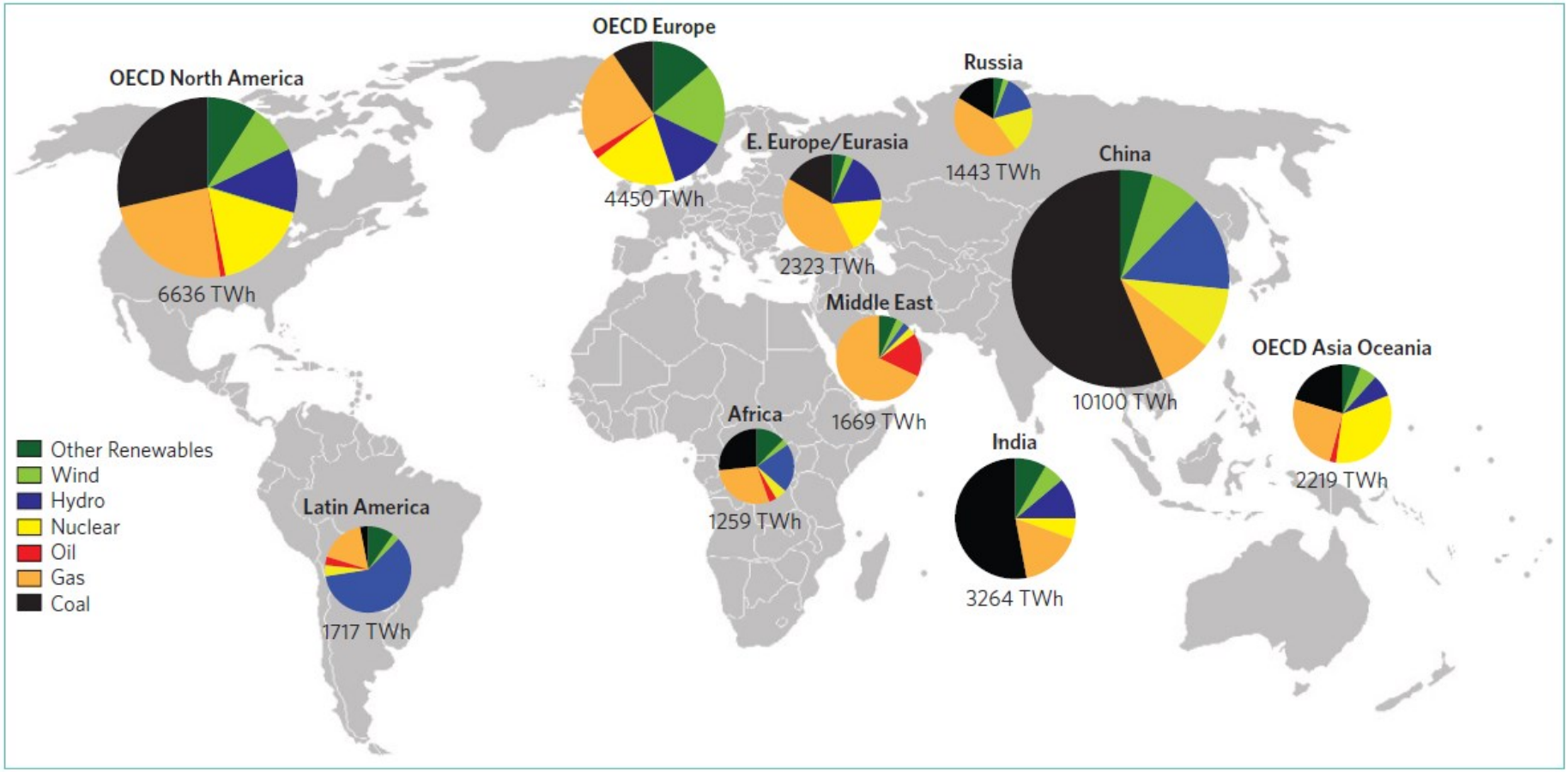
Saskatchewan coal. 1M tonnes CO2/vr

Sleipner oil field CCS .0.9M tonnes CO2/yr

Negative emissions via Bioenergy and CCS (BECS) –most widely selected by IAMS aimed at 2°C
Global decarbonisation 5-6% year : CCS in 5-40% of global power generation by 2050, including coal & gas

Sources: Scott et al Nature Clim Change 2012, Fuss et al. 2014 Nature Climate Change,Loftus et al. 2015 Wires Clim Change 6:93-112l

Why CCS?



Global electricity sources by 2035

Source: Scott et al 2012 Nature ClimChange.

Risk assessment

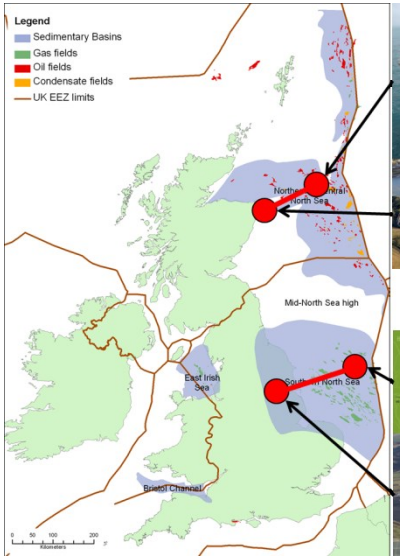
Source: QICS, Jerry Blackford

London Convention amendment

1972 Global agreement regulating disposal of wastes and other matter at sea

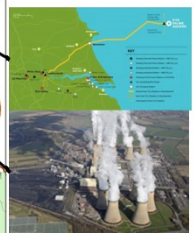
2006 (2012) amendment now allows CO_2 streams from CO_2 capture processes for sequestration

Offshore storage requirements now produced for the NE Atlantic through OSPAR into EU directive



UK CCS competition
Two applicants for funding

Peterhead-Goldeneye
(Shell)
Gas fired
Depleted gas reservoir
10 MT

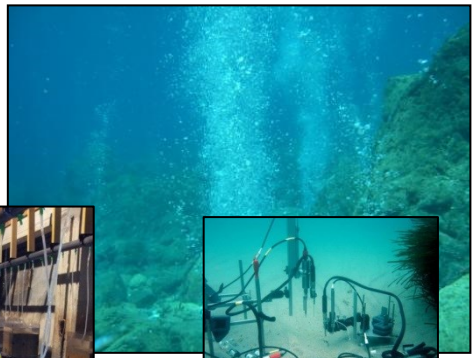


White Rose
(Alstrom, Drax, BOC, National Grid)
Coal fired
Saline aquifer
2MT/A

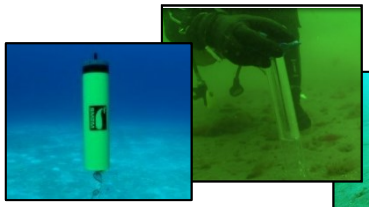
INTERNATIONAL MARITIME ORGANIZATION

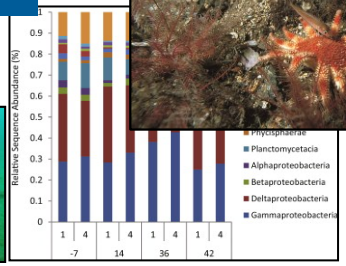
Empirical research: local impacts of leakage

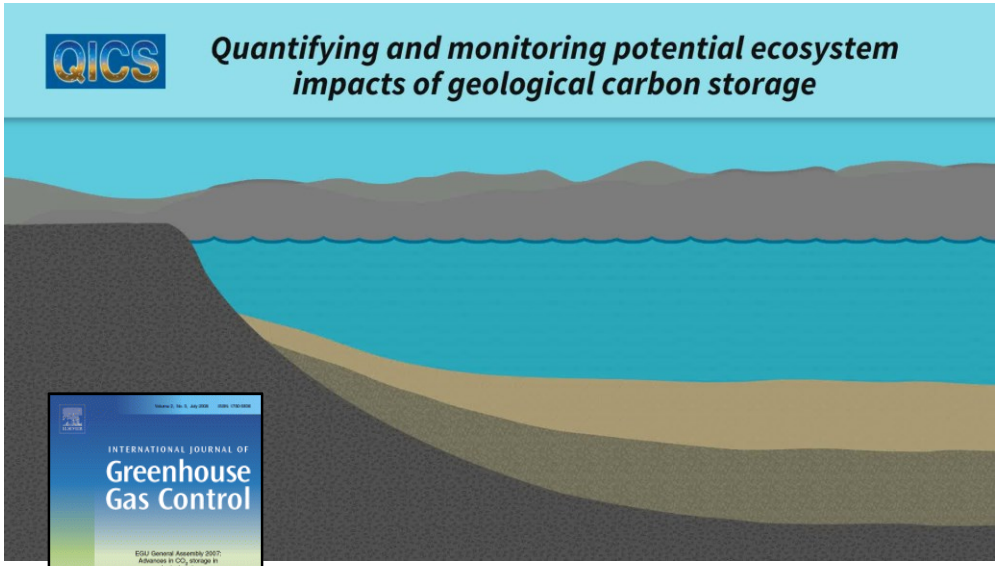
ECO2 Sub-seabed CO_2 Storage: Impact on Marine Ecosystems



QICS Quantifying and Monitoring Potential Ecosystem Impacts of Geological Carbon Storage







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Empirical research: local impacts of leakage

Laboratory based studies:

variable effects of CO_2

species, habitat, dose and exposure time

CO_2 but almost no hypoxia and/or salinity

ECO2: hypoxic brines far more harmful than CO_2

Vent based studies and QICS:

small effects

comparable to natural spatial / temporal variability

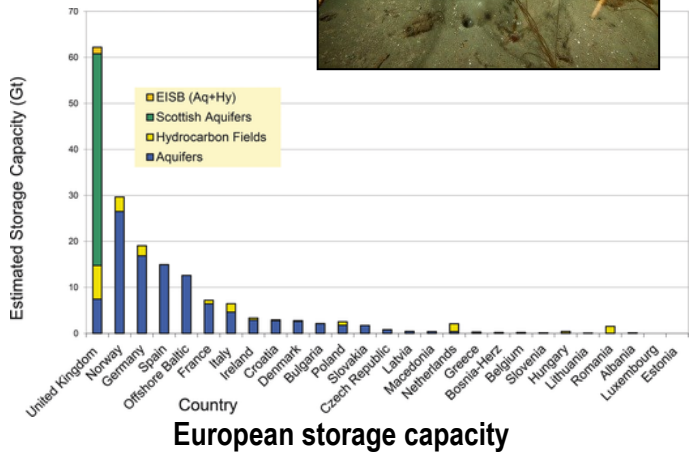
no investigation of hypoxia and salinity

Local focus

Realistic leak scenarios?

Little/no integration of evidence

Socio-economic focus: global human benefits



European storage capacity

Source: Stewart et al. 2014 Greenhouse Gas Sci Tech

Aims

1: integrate experimental local CCS impacts evidence from simulated leakage scenarios in marine systems

2: compare local impacts with global benefits for marine systems derived from CCS as an emissions curbing strategy

The work presented is ongoing and unpublished, so sensitive material has been removed, sorry.

However if you are interested in our work and would like to have some more information please do get in touch with Ana on anqu@pml.ac.uk.

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QICS
Quantifying and Monitoring Potential Ecosystem Impacts of Geological Carbon Storage

www.bgs.ac.uk/qics

ECO2
Sub-seabed CO_2 Storage: Impact on Marine Ecosystems

www.eco2-project.eu

Contact: Ana M Queirós, anqu@pml.ac.uk