International Scene-setting on Offshore CCS

Tim Dixon

IEAGHG

GoMCarb & SECARB Joint Partnership Meeting

Lamar University, Beaumont, Texas 11-12 Feb 2019

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International Panel

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- Mr Jiro Tanaka, Japan CCS Co.
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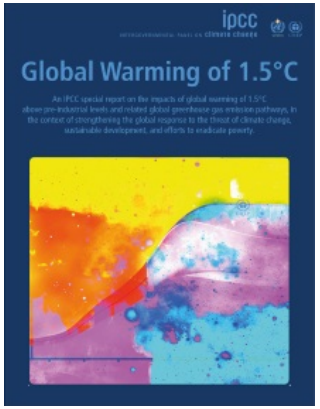
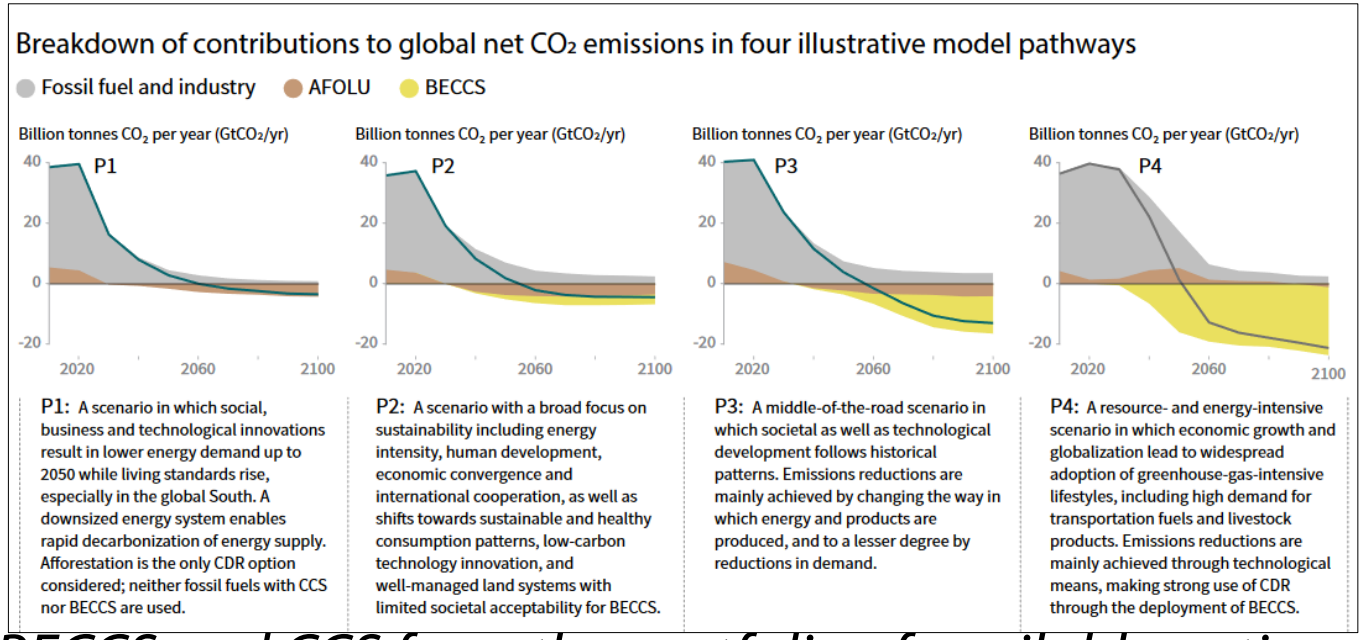
- Professor Andrew Jupiter, University of the West Indies (Trinidad and Tobago)

IPCC 1.5 Special Report

- Impacts and pathways to achieving 1.5C by 2100, in context of increasing global response, sustainable development and poverty (IPCC Oct 2018)

Fig SPM.3b

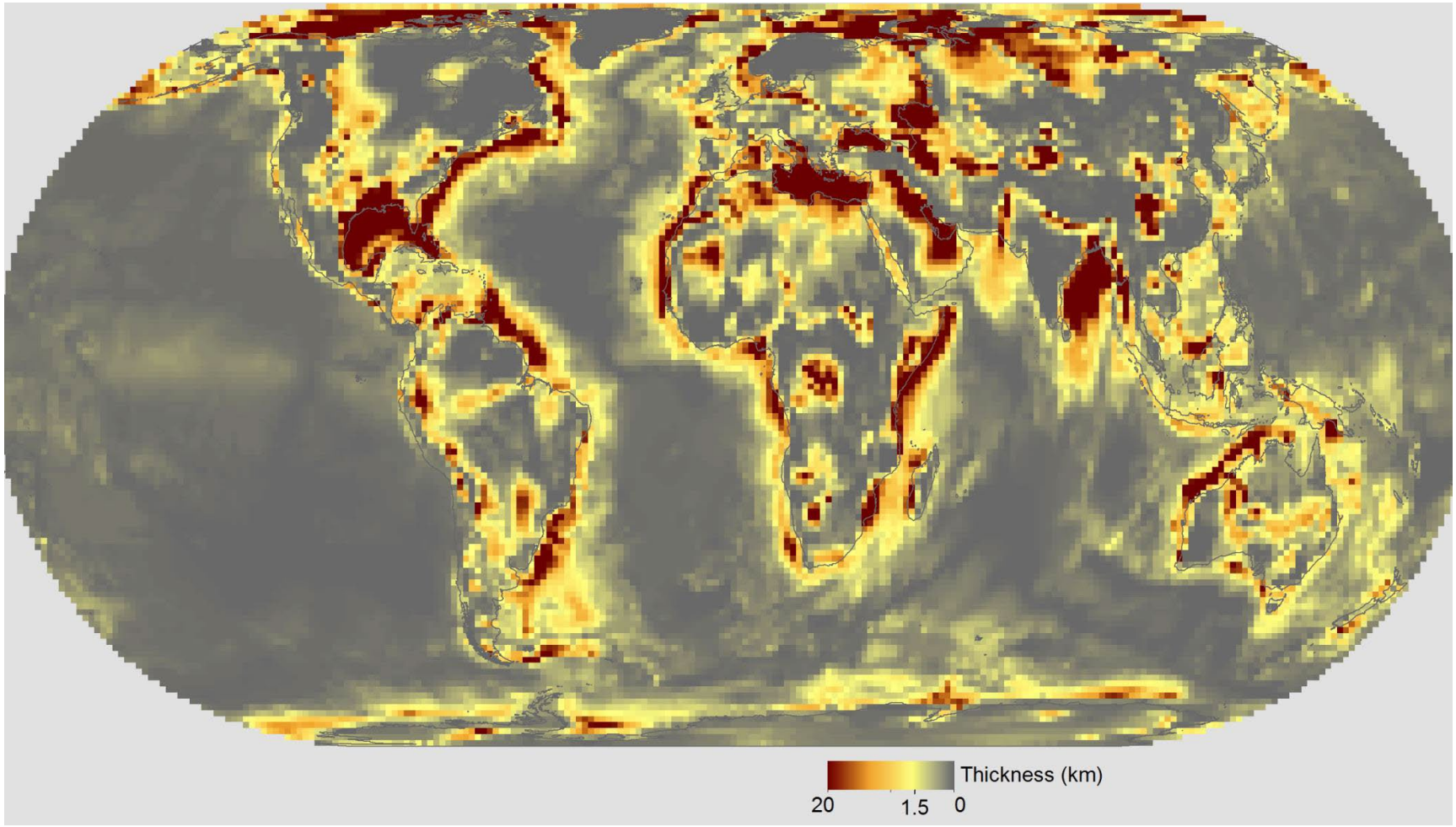




- *"Removing BECCS and CCS from the portfolio of available options significantly raises mitigation costs."* (Chp 4.3)

  - https://www.ipcc.ch/report/sr15/

Offshore potential and who is interested



University of Texas 2016

Countries doing CCS offshore

- Norway
  - Two operation projects since 1997 (Sleipner) and 2008 (Snovit)
  - New work on storage assessment and shipping
- Netherlands – Operational project since 2004 (K12B)
- Brazil – Operational project since 2015 (Lula)
- Japan – Operational project since 2016 (Tomakomai)

What is the London Protocol?

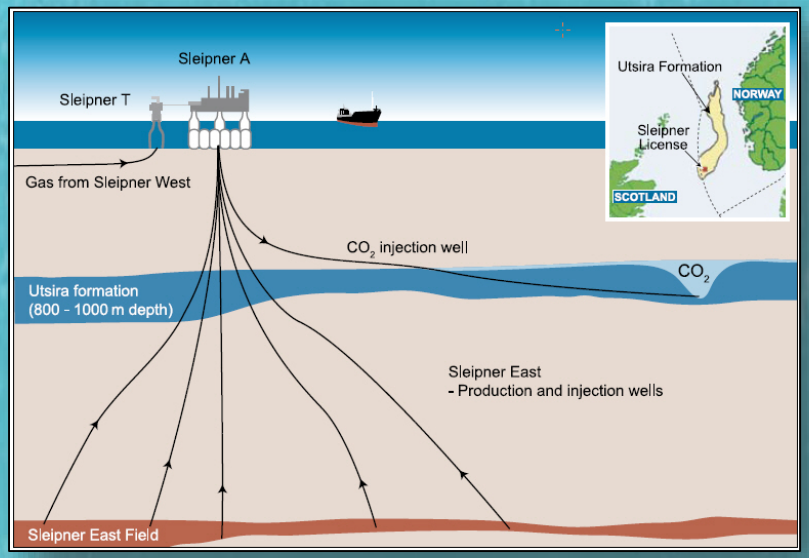
- **A stand-alone treaty relating to the prevention of marine pollution from dumping at sea that has been in force since 2006**

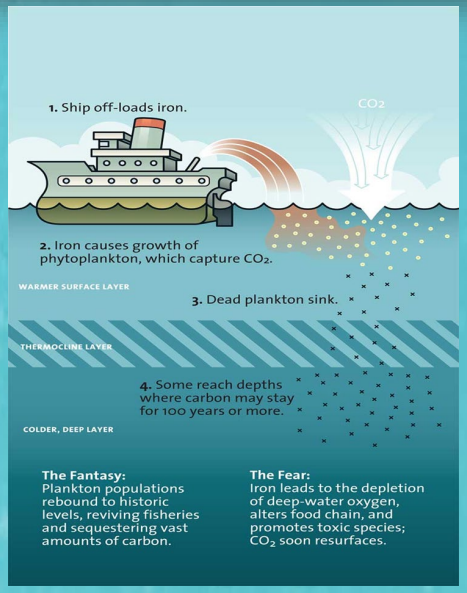
- Provides the precautionary framework needed for parties to effectively prevent pollution of the sea caused by dumping of waste and other matter, incineration, and new activities such as marine geoengineering or carbon capture and storage

- A key pillar of marine environmental protection in an important international regime that includes MARPOL, UNCLOS and Regional Seas Agreements

LONDON PROTOCOL CLIMATE CHANGE AMENDMENTS

- Carbon capture and storage (CCS) in subsea geological formations – 2006 amendment in force
- CCS in transboundary formations 2008 amendment
- Marine geoengineering – 2013 amendment





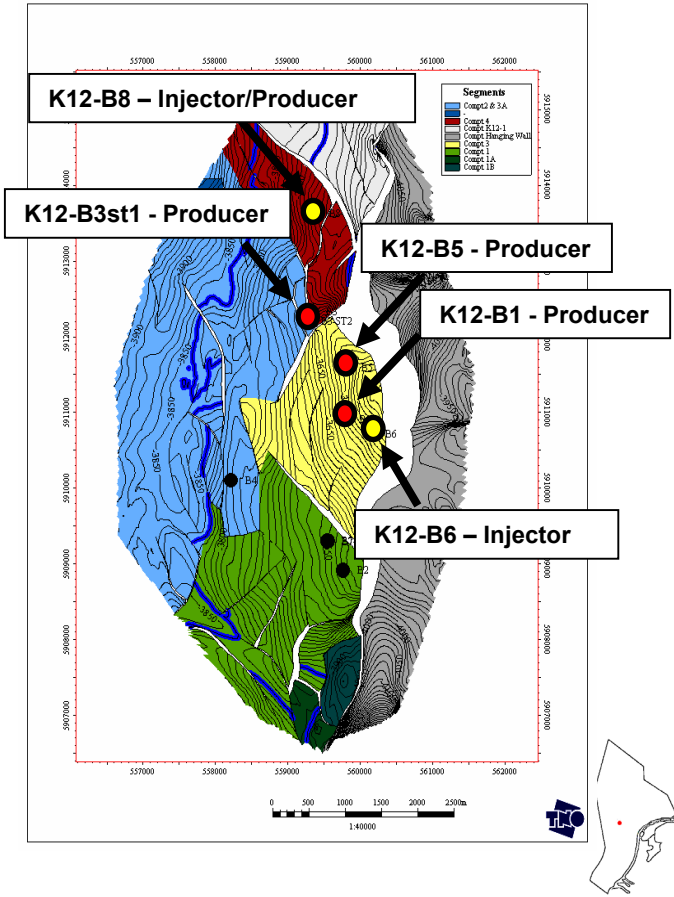
HIGHLIGHTS OF K12-B

- First site in the world where CO_2 is being injected into the same reservoir from which it originated
- First and only operational CO_2 storage project in the Netherlands
- Serves as field laboratory on a fully productive gas platform in the Southern North Sea
- CO_2 injection performed on the mature, still producing natural gas field K12-B
- 12 years of capturing and re-injection of CO_2 without any major incidents

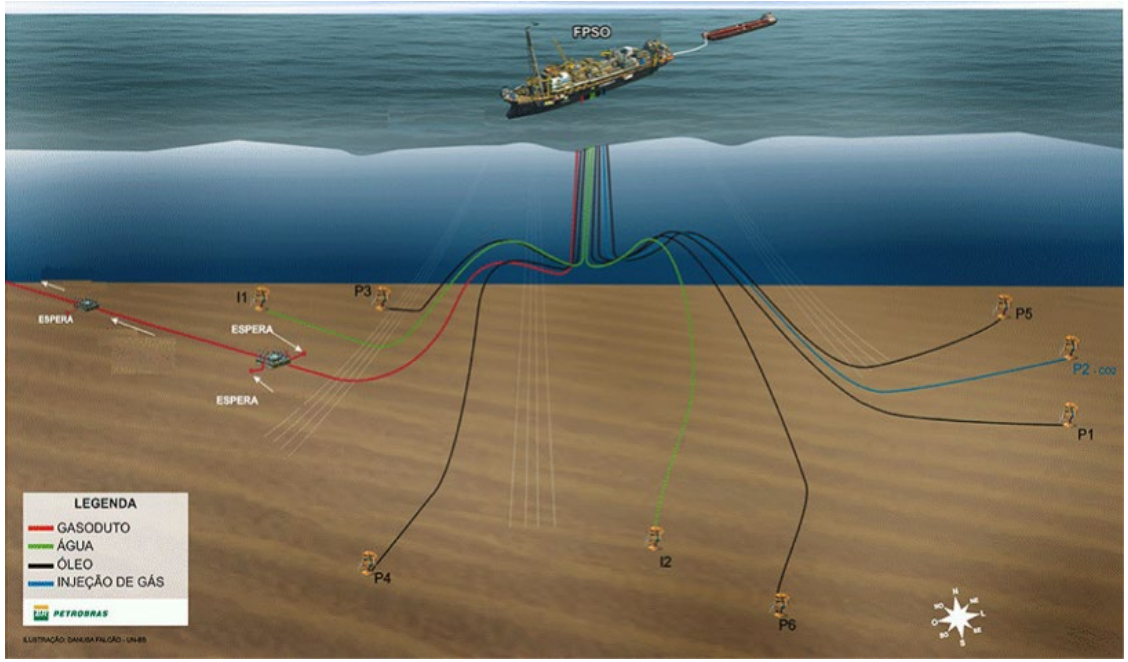
- Long term ongoing scientific research
- Close collaboration between operator and research institutes

CO_2 INJECTION AT K12-B

- All wells were originally developed as natural gas producers
- In 2004 actual CO_2 injection started in single well compartment 4*
  - Investigate injectivity and test the injection facility
  - Investigate the behavior of CO_2 in the well and the reservoir
- Over 10 kt were injected using the K12-B8 well
- Injection continued in 2005 in multi well compartment 3*, additional goals:
  - Investigative well integrity under CO_2 injection conditions*
  - Investigate possibilities for CO_2 EGR
- Over 100 kt and counting….



Brazil

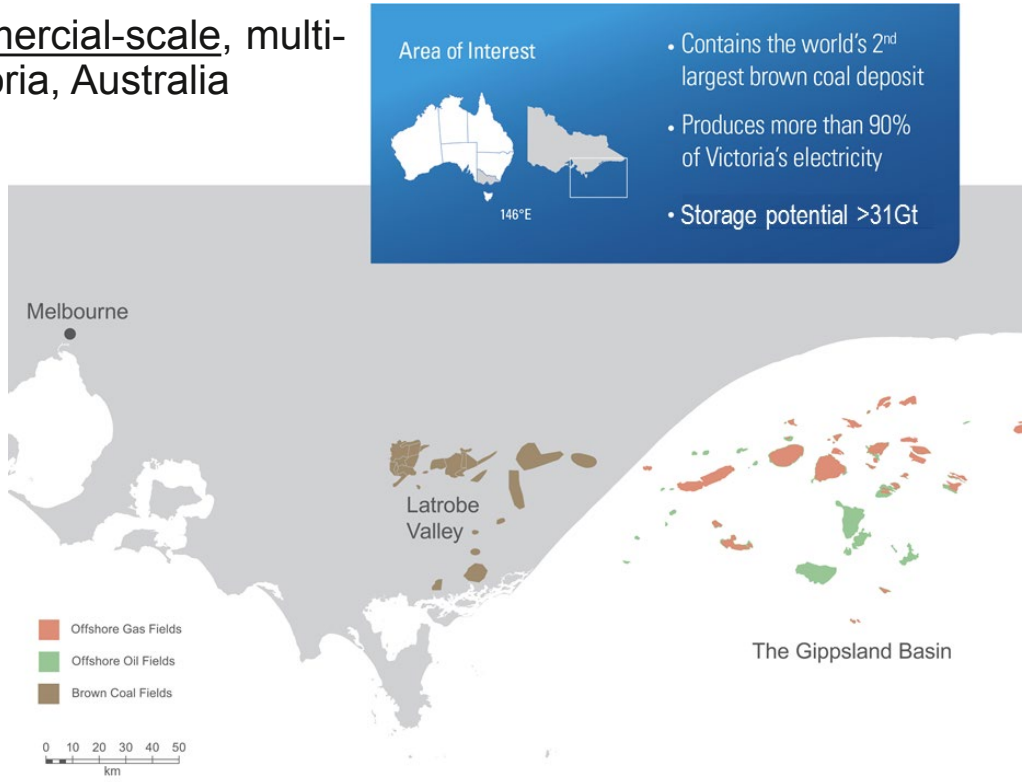


- **Lula, Petrobras, Brazil**
- Offshore gas separation and CO2-EOR
- FPSO
- Deep: 2000m water depth, 3000m beneath seabed
- Over 7Mt CO_2 injected (Dec 2017)

THE CARBONNET PROJECT

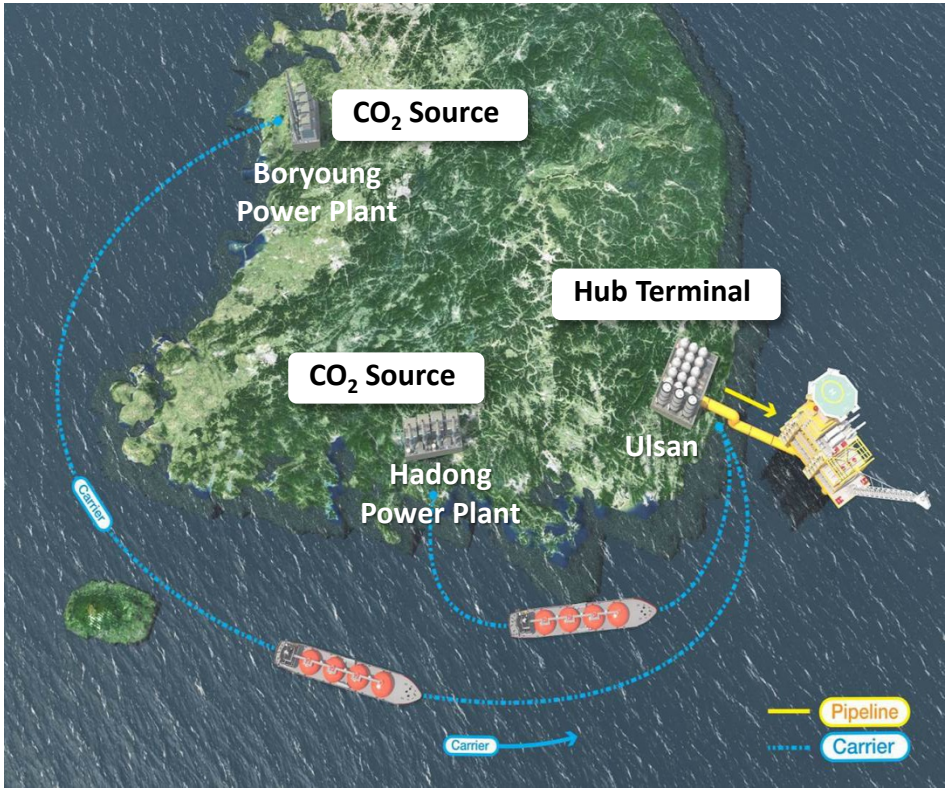
- Investigating the feasibility for a commercial-scale, multi-user CCS network in Gippsland, Victoria, Australia

- Jointly funded by the Australian and Victorian Governments to 2020, also supported by GCCSI
- Governments have made significant research investment to support CarbonNet
- CO2CRC is CarbonNet's lead research organisation
- Working collaboratively with industry to secure customers and investors in a **CCS service**

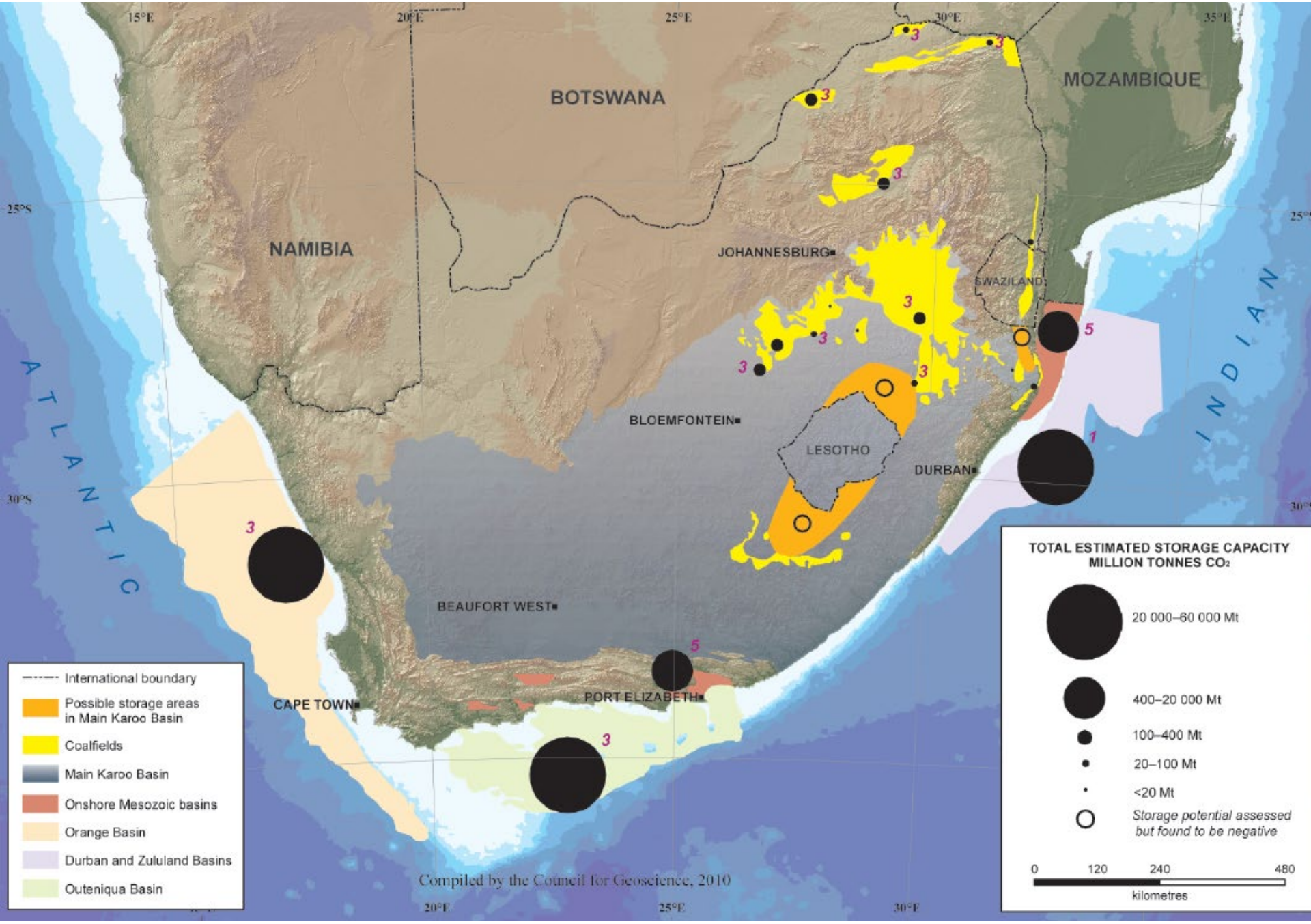


Status of Transportation Assessment

- Major coal-used power plants for large-scale CO_2 source in the western and southern coastal areas: long distance to promising storage sites
- Less public acceptance about CO_2 transportation/storage in land



- Onshore pipeline transportation: expensive cost and less public acceptance
- Ship transportation from CO_2 sources to Hub terminal
- Offshore pipeline transportation from Hub terminal to storage sites


15°E
20°E
25°E
30°E
35°E
25°S
30°S
BOTSWANA
MOZAMBIQUE
NAMIBIA
JOHANNESBURG
SWAZILAND
BLOEMFONTEIN
LESOTHO
DURBAN
BEAUFORT WEST
CAPE TOWN
PORT ELIZABETH
ATLANTIC
INDIAN
International boundary
Possible storage areas in Main Karoo Basin
Coalfields
Main Karoo Basin
Onshore Mesozoic basins
Orange Basin
Durban and Zululand Basins
Outeniqua Basin
TOTAL ESTIMATED STORAGE CAPACITY MILLION TONNES CO2
20 000–60 000 Mt
400–20 000 Mt
100–400 Mt
20–100 Mt
<20 Mt
Storage potential assessed but found to be negative
0
120
240
480
kilometres
Compiled by the Council for Geoscience, 2010

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