

# CO<sub>2</sub> STORAGE IN AUSTRALIA

POTENTIAL, PROSPECTS AND PERMITS

CHRISTOPHER CONSOLI

SENIOR CONSULTANT

GLOBAL CCS INSTITUTE

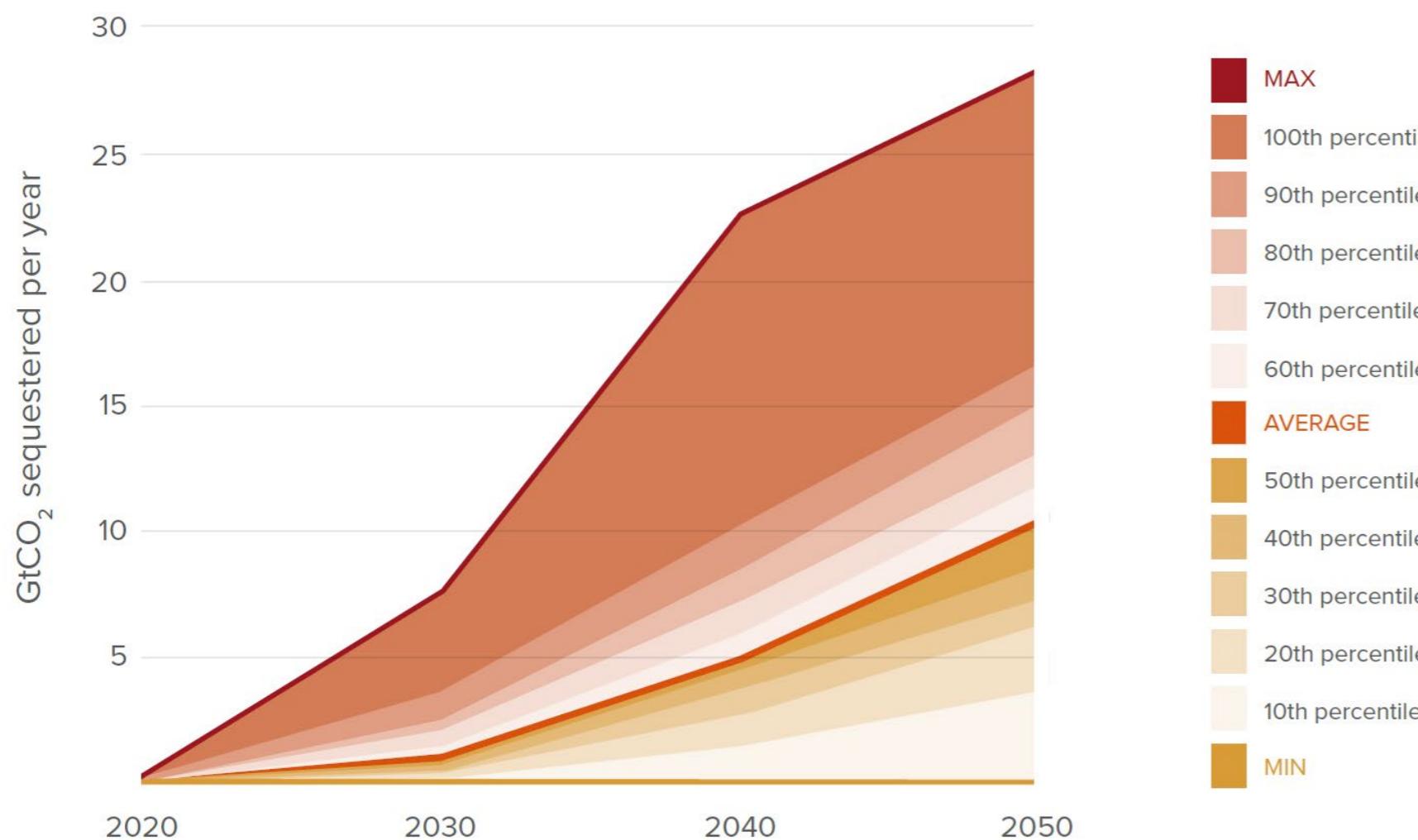
FEBRUARY 2022



# STORAGE IS KEY

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SCENARIO PATHWAYS MODEL 348GT TO 1,218GT CO<sub>2</sub> TO BE STORED THIS CENTURY

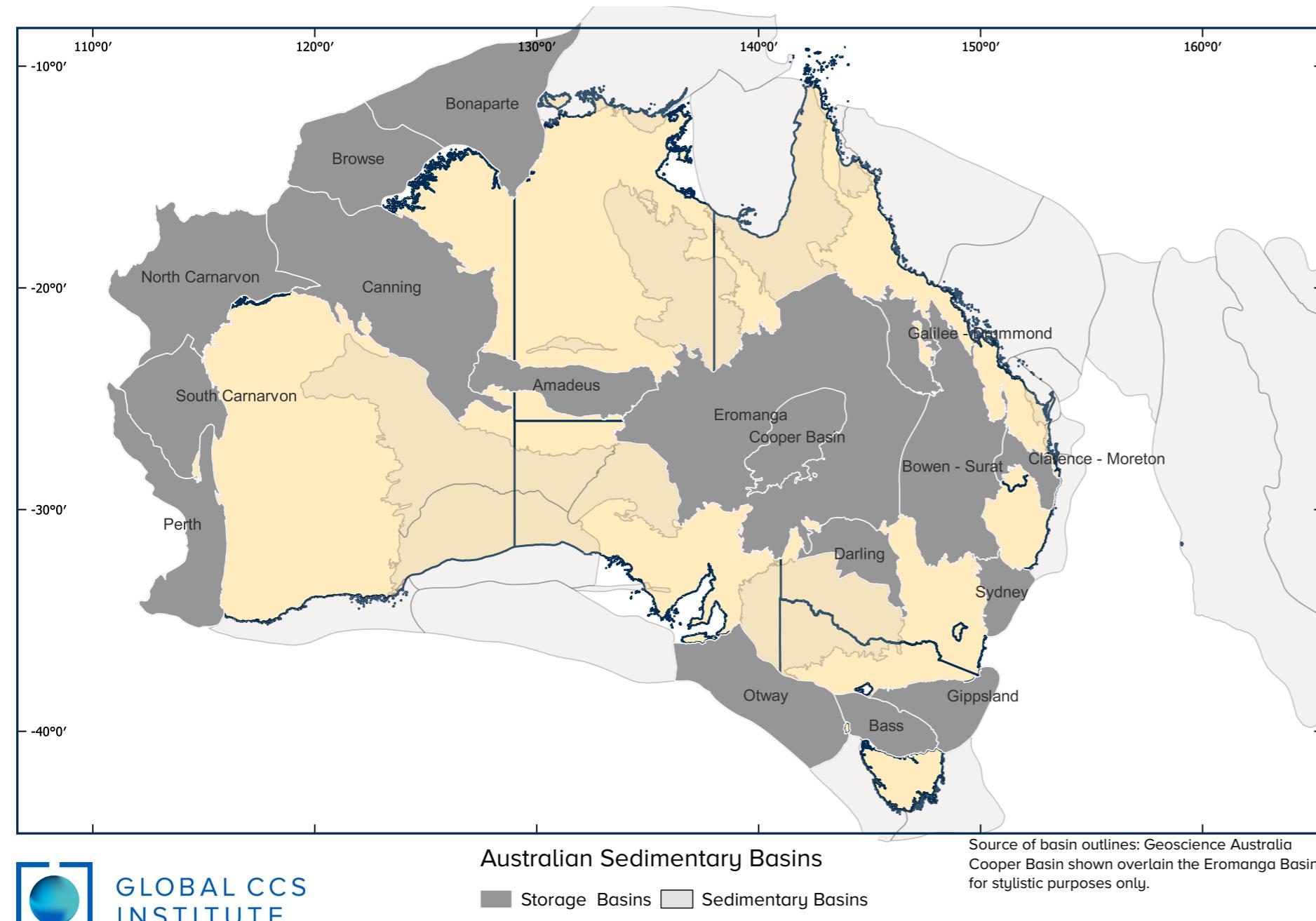


## Global status of CCS: 2021 - Conclusions

-  Define the role of CCS in meeting national emissions reduction targets and communicate this to industry and the public
-  Create a long-term, high value on the storage of CO<sub>2</sub>.
-  Support the identification and appraisal of geological storage resources.
-  Develop specific CCS laws and regulations that include the transfer of liability to the government subject to acceptable performance and behaviour of the stored CO<sub>2</sub>.
-  Identify opportunities for CCS hubs and facilitate their establishment.
-  Provide capital grants, low-cost finance and/or guarantees to reduce the cost of capital for CCS investments.

# AUSTRALIAN STORAGE BASINS

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## Global CCS Institute's Storage Assessment Tool

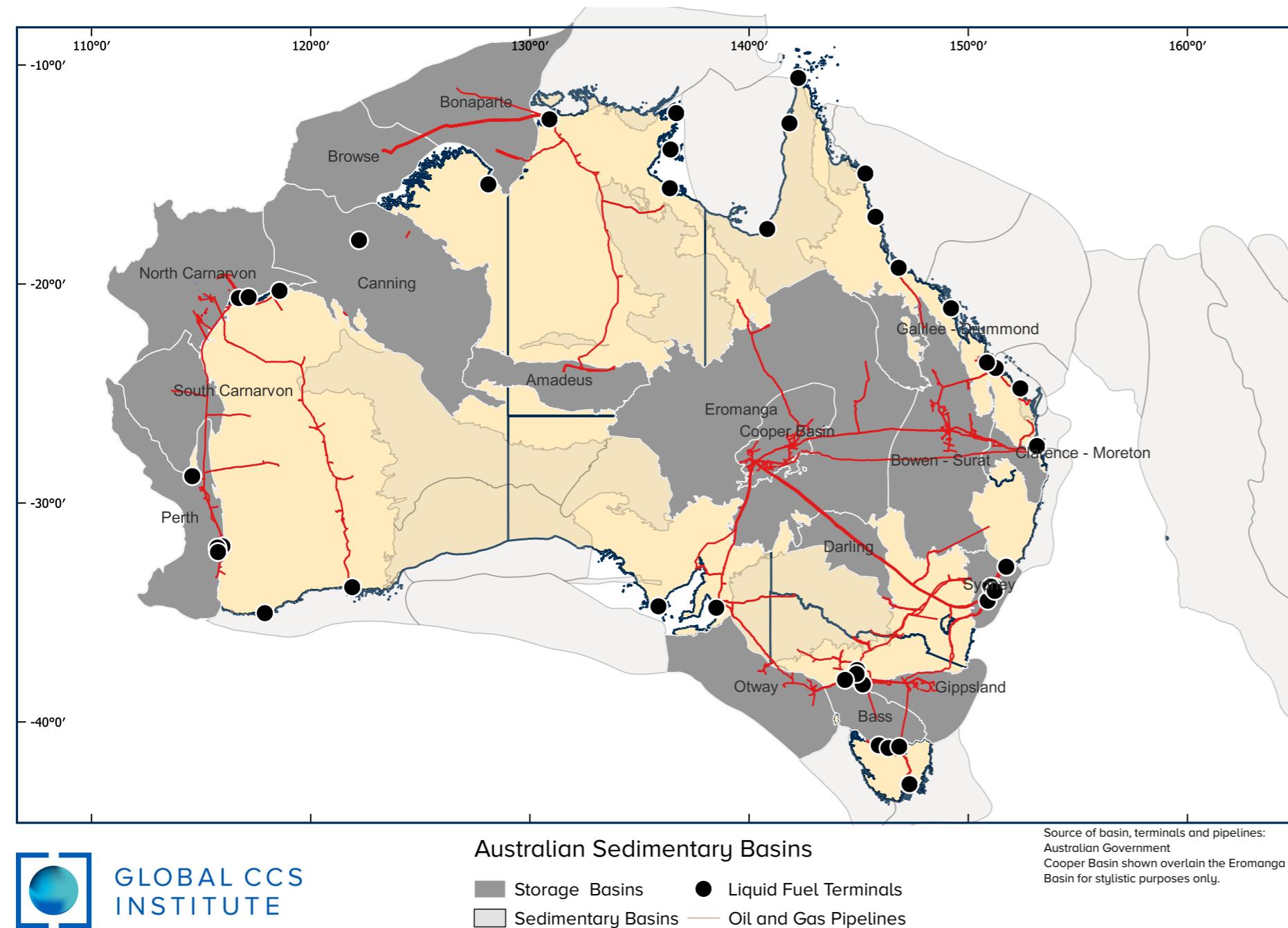
- Criteria-based system
- 70 Criteria

## Outputs

- Ranks Basin
- Qualifies basins as Highly-Suitable to Unlikely

# AUSTRALIAN STORAGE BASINS

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## Global CCS Institute's Storage Assessment Tool

- Criteria-based system
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## Outputs

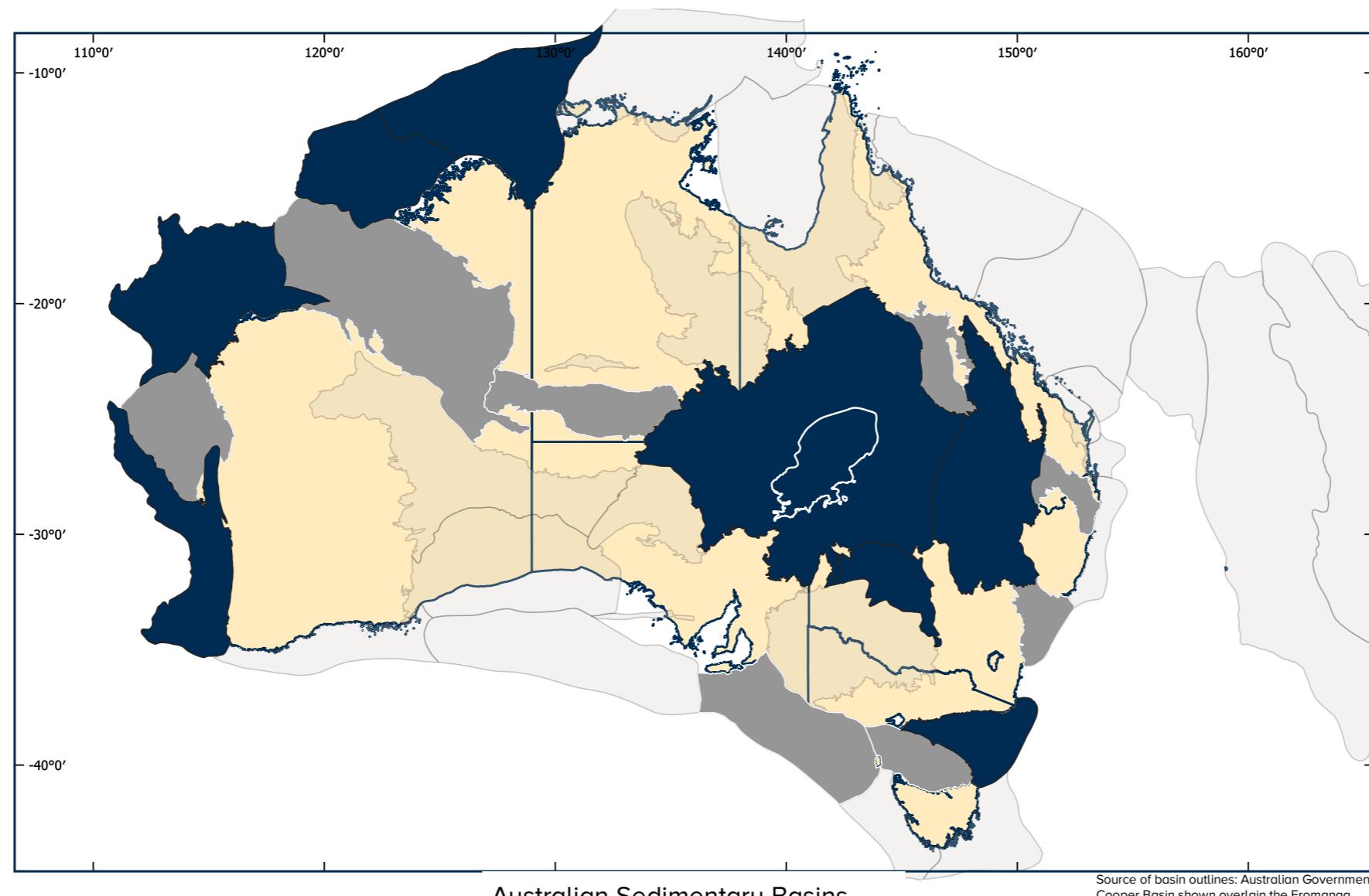
- Ranks Basin
- Qualifies basins as Highly-Suitable to Unlikely

## International Import?

# STORAGE PROJECTS IN AUSTRALIA

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## STAGES: EXPLORATION, APPRAISAL, CONSTRUCTION, INJECTION



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### Australian Sedimentary Basins

■ Active Studies   ■ Sedimentary Basins  
■ Storage Basins

# INJECTION RATES ARE HIGH

## Northern Carnarvon Basin (Chevron)

- 3-4 million tonnes per annum (MTPA)

## Surat Basin (Garnett et al 2013):

- 0.2 to 2.4 MTPA CO<sub>2</sub> across the 4 areas

## Gippsland Basin (CarbonNet)

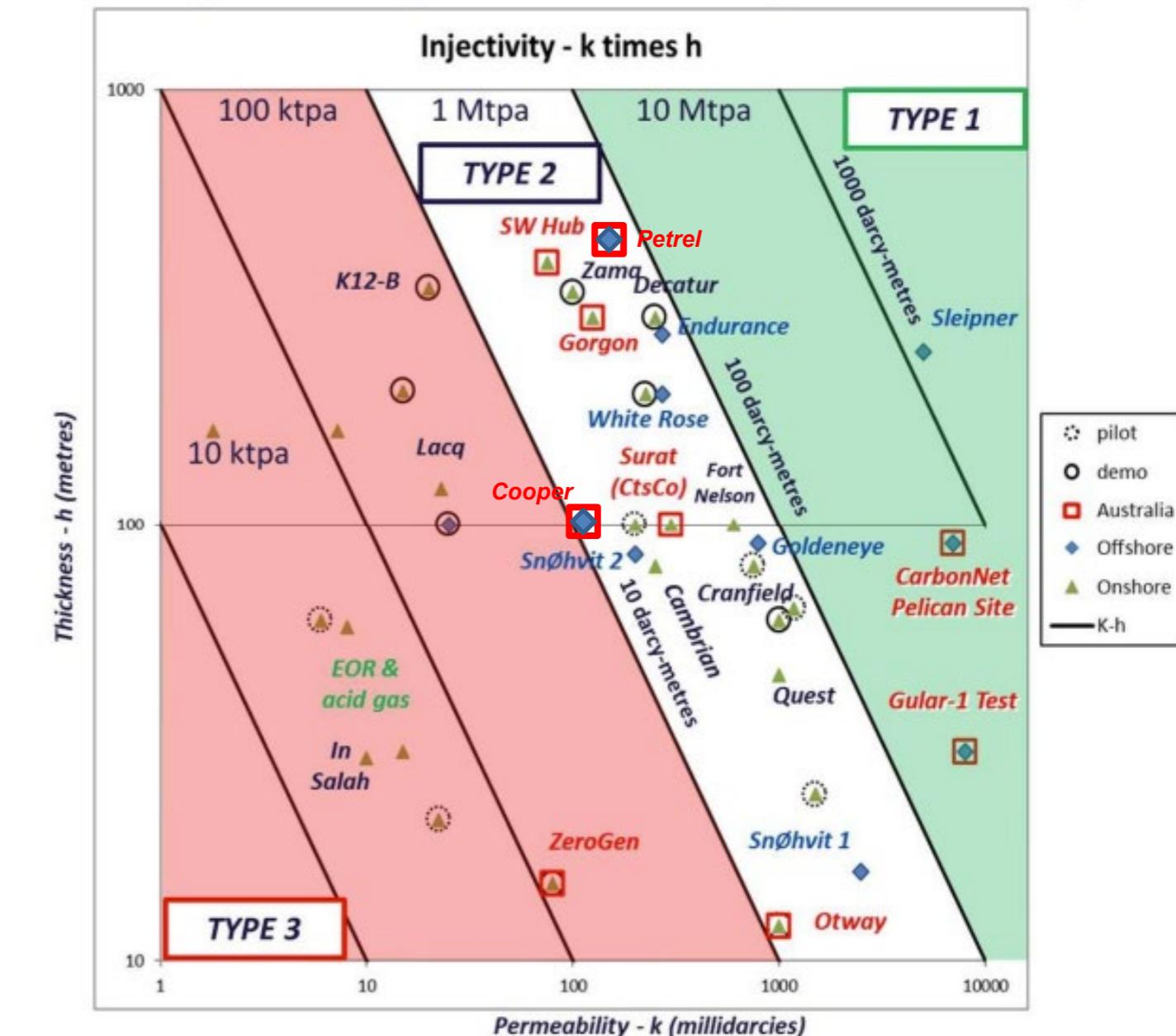
- 10 MTPA CO<sub>2</sub> based on an appraisal well at the Pelican Storage Site

## Cooper Basin (Santos)

- 20 MTPA CO<sub>2</sub> based on well data and oil production data at the Moomba Site

## Bonaparte Basin (Clennell et al. (2017); GA, CSIRO, Shell, ENI

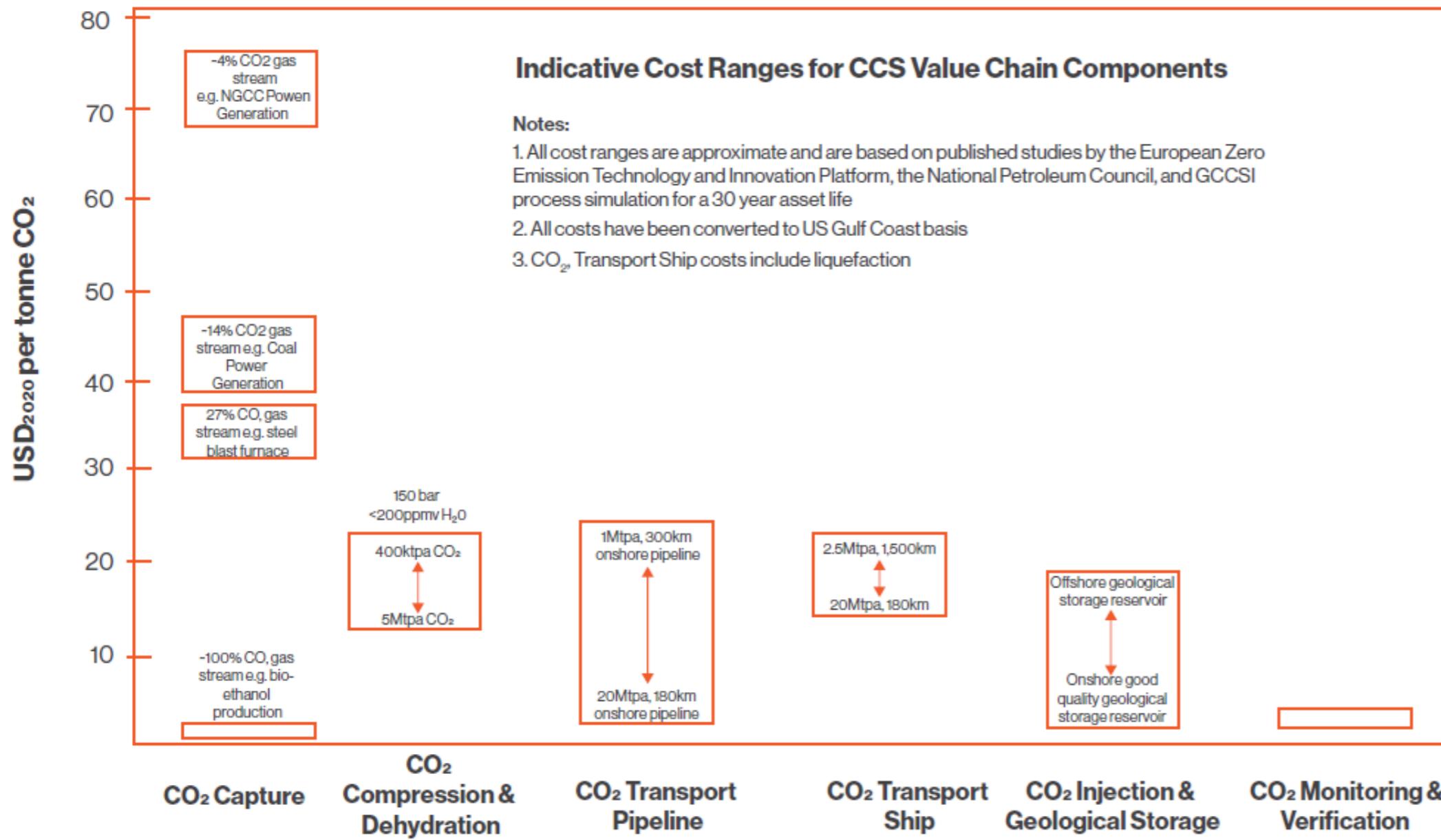
- 2.0 - 7.5 MTPA CO<sub>2</sub> based on limited data and a dynamic



Injection rates globally with examples with Australian examples shown in Red Boxes, courtesy of Nick Hoffman, CarbonNet

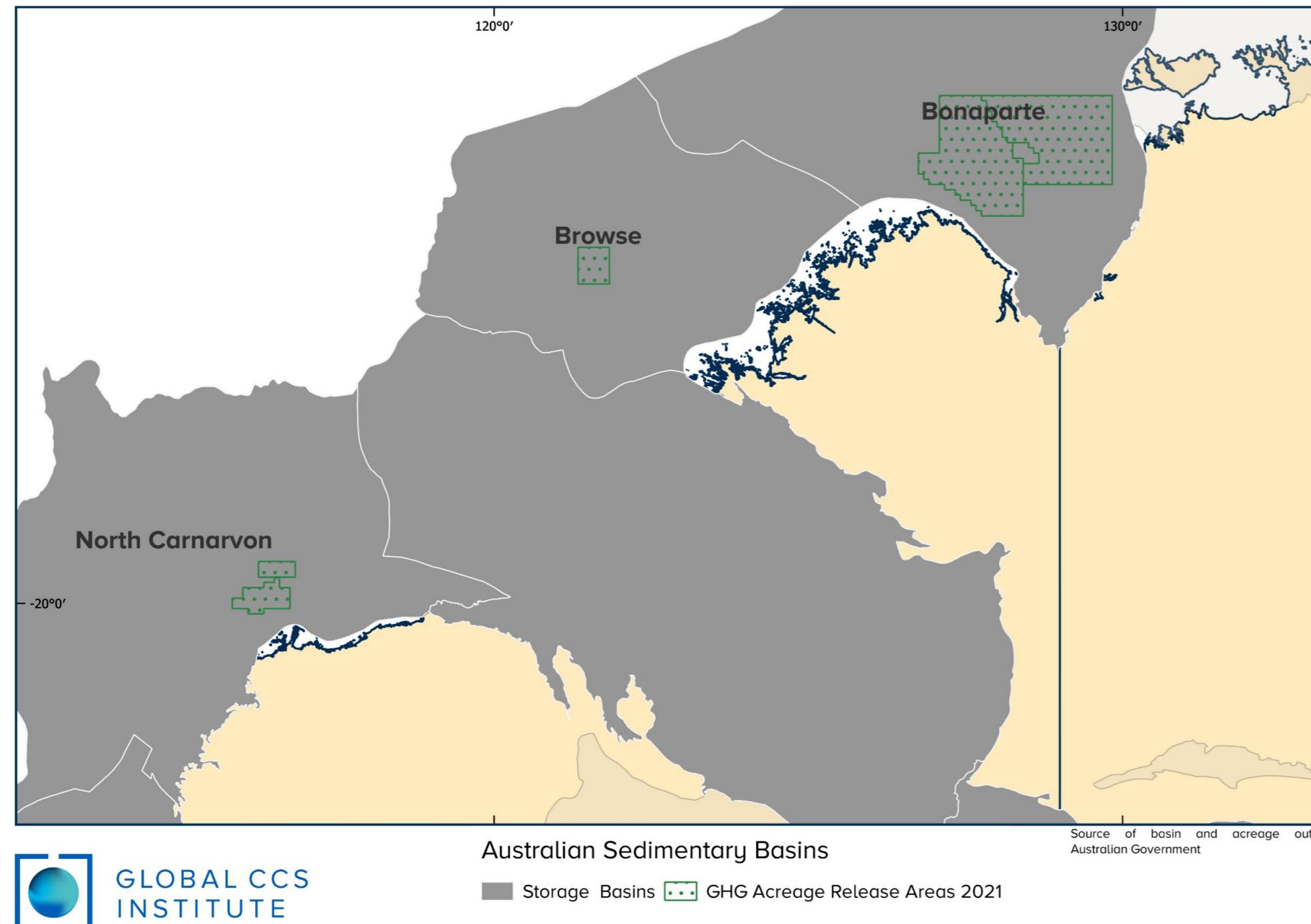
# COST OF TRANSPORT AND STORAGE

- Capture and transport are dependent on scale and concentration
- Storage is dependent on location, injection rate and plume footprint?



Australia is currently ranking at the high end for offshore (due to distances) and comparable for onshore

# 2021 ACREAGE RELEASE



## 2021 Acreage Release

- Five offshore areas are available
- Geoscience Australia holds a wealth of information

## Key aspects in the successful work programme

- Injectivity
- Quality and extent of reservoir and seal
- Capacity
- Containment
- Monitoring

## Submission

- National Offshore Petroleum Titles Administrator
- Work program bds accepted between 4 – 10 March 2022
- Competitive Process
  - Work Programme

# 2021 ACREAGE RELEASE

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## Current Permits held by

- CarbonNet Gippsland Basin, Victoria– Declaration of Storage
- CTSCo Surat Basin, Queensland
- Santos Cooper Basin, potentially under an existing licence

## Bonaparte

- 32 – 88 GtCO<sub>2</sub> (Carbon Storage Taskforce 2009)
- Overlies the Petrel and Tern Fields
- Highly-suitable reservoir seals, unproven (moderate confidence)

## Browse

- 7.0 – 16.3 GtCO<sub>2</sub> (Carbon Storage Taskforce 2009)
- Overlies Woodside Browse FLNG (Brecknock-Calliance Fields) currently under development
- Permits not within suitable areas (from previous studies)

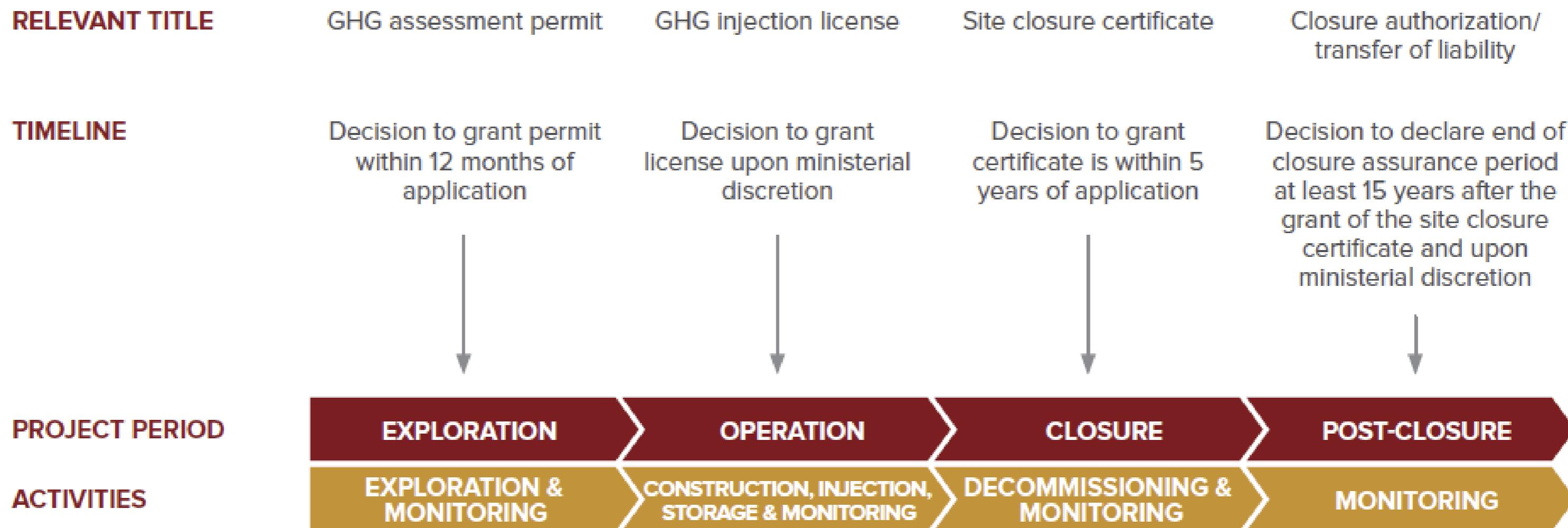
## Northern Carnarvon

- 25.5 – 89.3 GtCO<sub>2</sub> (Carbon Storage Taskforce, 2009)
- Stacked reservoir-seal pairs
- Located within oil and gas fields
- North of Gorgon

# PERMITTING THROUGHOUT THE PROJECT LIFECYCLE

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## Australian Commonwealth regime



# ACREAGE RELEASE -AUSTRALIA

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## ACCESS AND RIGHTS TO THE SUBSURFACE



- The Australian Commonwealth government retains sovereign rights over the waters beyond the coastal waters of the States:
  - Australia's exclusive economic zone and continental shelf
  - For the purpose of exploring for and exploiting natural resources.
- **Exploration or injection activities are prohibited in offshore Commonwealth waters, without first obtaining the relevant titles established under the OPGGSA.**
- **Release of acreage, within the Commonwealth's offshore waters, is the starting point for the site selection process.**
- **Nomination of areas from interested parties, including private companies and State and Territory governments:**
  - Sites are subsequently shortlisted as potential sites for GHG exploration
  - Geoscience Australia then prepares geological data
  - Consideration of any potential conflicts.
- **To date, there have been three greenhouse gas storage acreage release processes.**

# EXPLORATION –AUSTRALIA (COMMONWEALTH)

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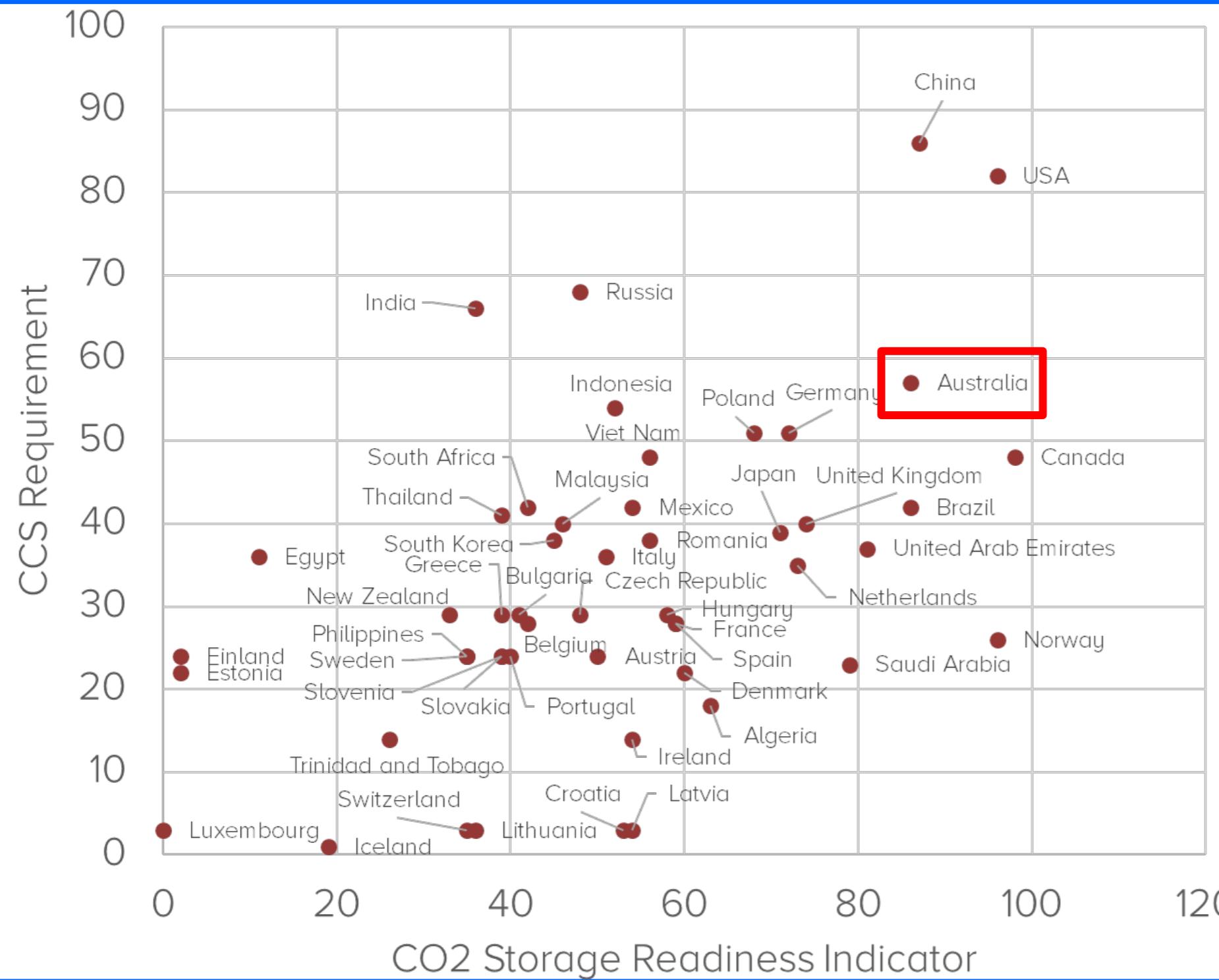
- To explore for a potential GHG storage formation, an application must first be made to the Minister for a GHG assessment permit.
- A GHG Assessment Permit enables a holder to undertake exploration activities for identifying potential storage sites:
  - Granted through a competitive tender process
  - Application is to be made to Minister based on either work or cash-bid
  - Rights to appraise a formation, under the permit, include the right to inject and store CO<sub>2</sub>
  - Duration of 6 years, with the possibility of renewing the permit for a further 3 years.
- **Additional approvals are also required:**
  - An applicant is required to obtain approval from the Minister to undertake a key "GHG operation".
  - To ensure full consideration is given to the impact upon petroleum exploration and production activities and that there is no "significant risk of significant adverse impacts"
  - Environmental environment plan to be approved prior to undertaking a GHG activity.
- **Applicant may apply for a GHG holding lease to retain an area, which has been the subject of an assessment permit until they are able to commence injection and storage activities.**

# INJECTION LICENCE – AUSTRALIAN OFFSHORE REGIME

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- **Injection and storage activities are to be carried out under a GHG injection licence:**
  - Authorises permanent storage of CO<sub>2</sub>
  - Granted in relation to storage formations which have been "declared" by the Minister as an identified GHG storage formation.
- **A licence application must contain information relating to the applicant's proposed activities, as well as their technical and financial resources.**
- **Three plans are to be submitted and approved as part of the approvals process:**
  - Site plan
  - Decommissioning plan
  - Environmental plan.
- **In granting a licence, the Minister must be satisfied that there will be no "significant risk of a significant adverse impact" on certain petroleum titles.**
- **The information to be specified in the licence, includes details of:**
  - GHG substance to be injected and its origins
  - The proposed period of injection
  - Volume of GHG substance to be injected.
- **Term of the licence is indefinite; however, injection must occur within 5 years.**

# CO<sub>2</sub> STORAGE “READINESS”



## CRITERIA

- Geology
- Storage Potential
- Knowledge and Data
- Maturity
- Accessibility
- Injection and Storage

De-risking storage sites is one of the key drivers to the deployment of carbon capture and storage projects.  
(policy and regulations being the other)

# AUSTRALIAN STORAGE OVERVIEW

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## **Highly-suitable or suitable storage basins in each state and territory (apart from ACT/NSW)**

- The large offshore basins off Victoria, northern and central WA and the NT provide a significant opportunity for multiple large-scale CCS facilities
- Multiple storage basins are also present inland from the central and southern Qld, as well as in central Australia (Qld and SA)
- Limited opportunities are present in southern Western Australia and New South Wales

## **Basins likely host 1000's of years of CO2 injection and storage, with low-moderate confidence in estimates**

- Conclusion based on broad-scale studies between 2008-2015
- The potential storage areas (next slides) have moderate-high confidence in estimates.

## **The proven viability of storage reservoirs and individual sites for storage is unknown across most of Australia**

- A national site-scale, a storage-focussed programme is required

## **A strong regulatory framework and acreage release available**

# GLOBAL STATUS OF CCS

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