CCS Talks: All you need to know about CO_2 Storage

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CO_2 STORAGE

Today's discussion will focus on:

- What is the role of CO_2 storage in meeting climate change targets?
- Geological storage of CO_2 explained
- Addressing CO_2 storage myths, misconceptions and concerns
- Questions and Answers

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PRESENTERS

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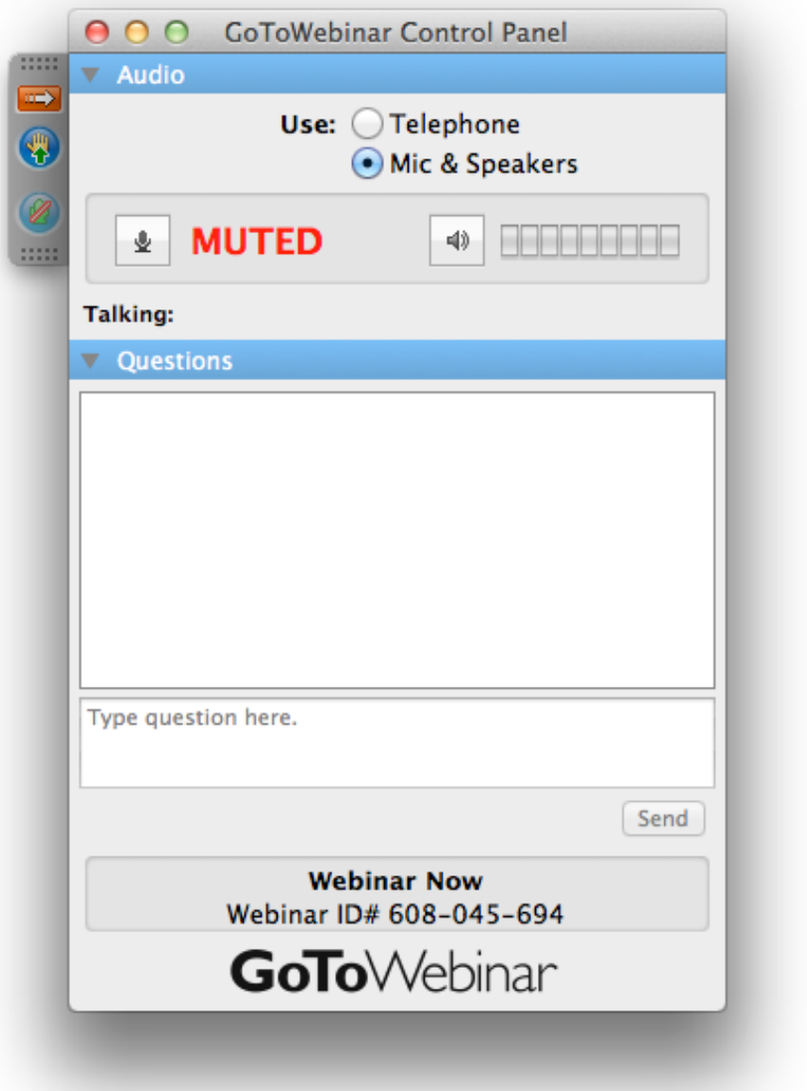
QUESTIONS

- We will collect questions during the presentation.
- Moderator will pose these question to the presenters after the presentation.
- Please submit your questions directly into the GoToWebinar control panel.



SECTION 1

ROLE OF CCS IN MEETING CLIMATE CHANGE TARGETS

MEETING CLIMATE CHANGE TARGETS

- CCS is **vital** to reduce emissions to net-zero by mid-century and achieve global climate change targets.
- CCS technologies are **proven,** have been in operation since 1970s.
- Over **260 Mt of anthropogenic CO_2** has been captured and stored to date.
- CCS is **versatile** in its application; mitigates emissions as well as removing CO_2 from atmosphere.
- Most proposed models require a substantial volume of CO_2 to be captured, transported and stored annually.

THE VITAL ROLE OF CO_2 STORAGE

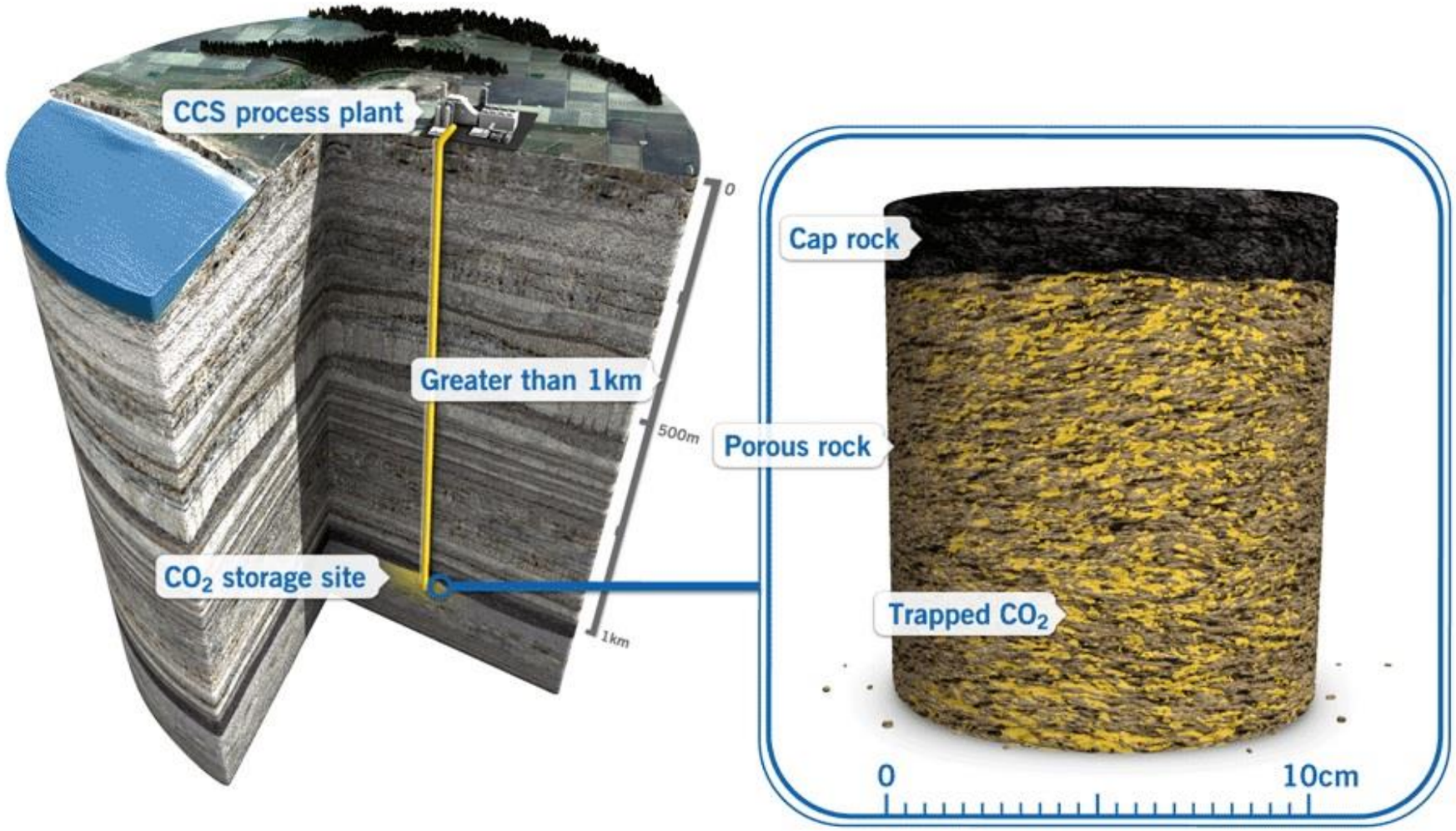
- Multi-gigatonne storage of CO_2 required to reduce emissions.
- The IEA forecasts that **2.3 Gt of CO_2** must be stored each year, by 2060.
- To meet climate targets, the IPCC climate pathways model up to **1,200 Gt of CO_2** cumulatively stored by 2100.
- Means a CCS deployment rate of more than double to that of the growth of the oil industry during the last century.

SECTION 2

WHAT IS CO_2 STORAGE?

CO_2 STORAGE: THREE KEY ELEMENTS

1. **Depth:** > 1 km
2. **Location:**
   - reservoir and containment
   - accessible
3. **Capacity:**
   Space to hold all the planned CO_2



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CO_2 STORAGE – KEY TARGETS

STORAGE ROCKS!

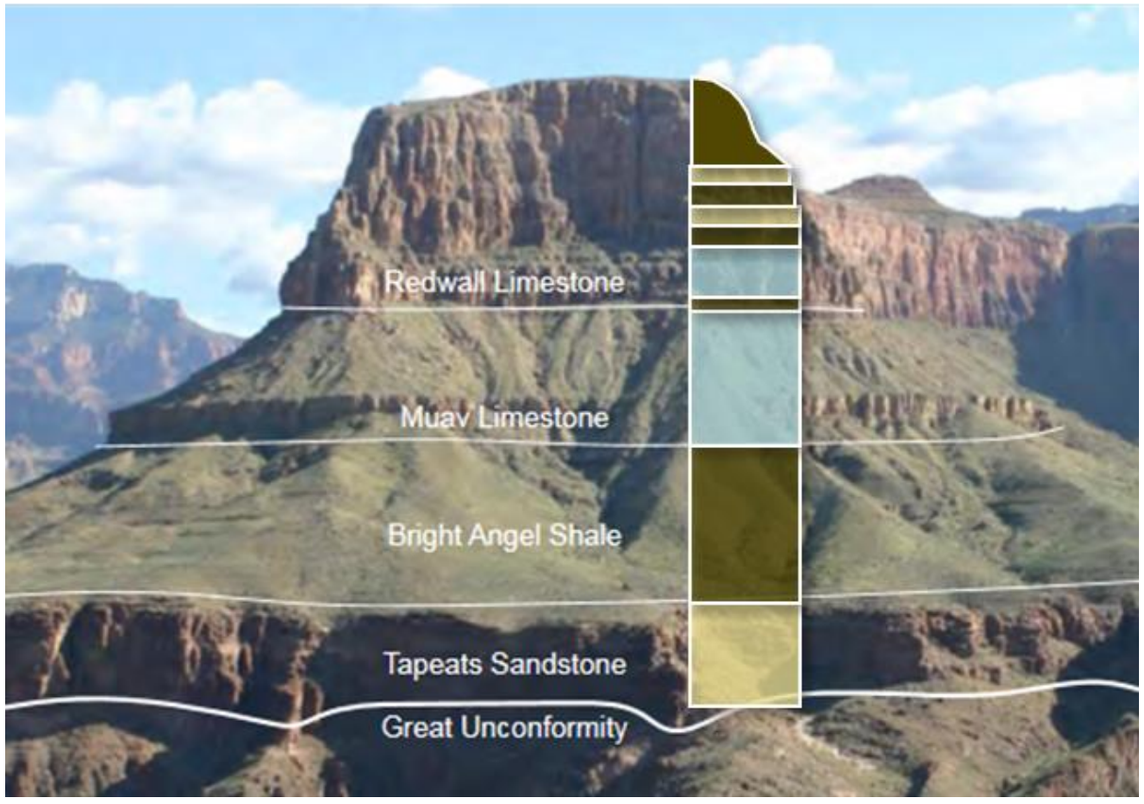


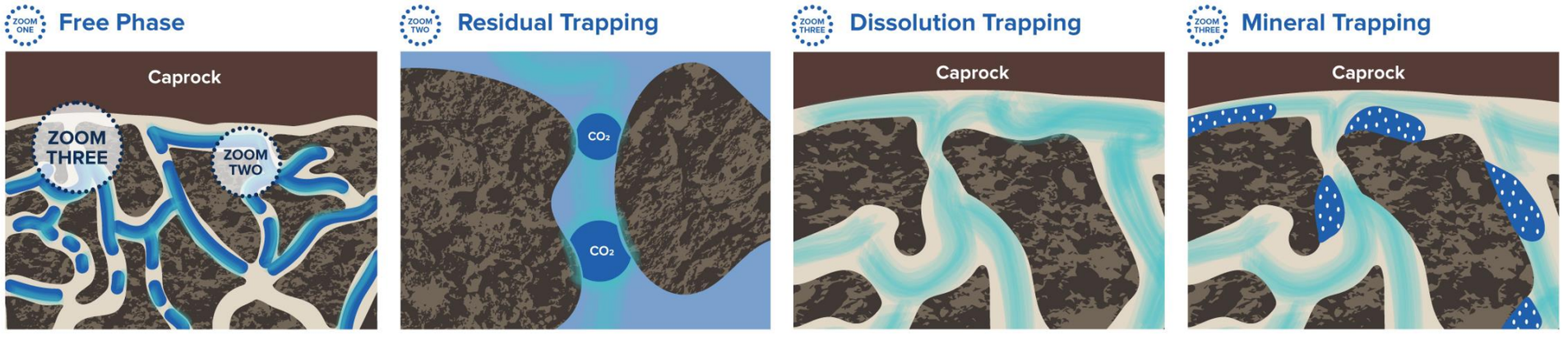
Image courtesy of:

Reservoir

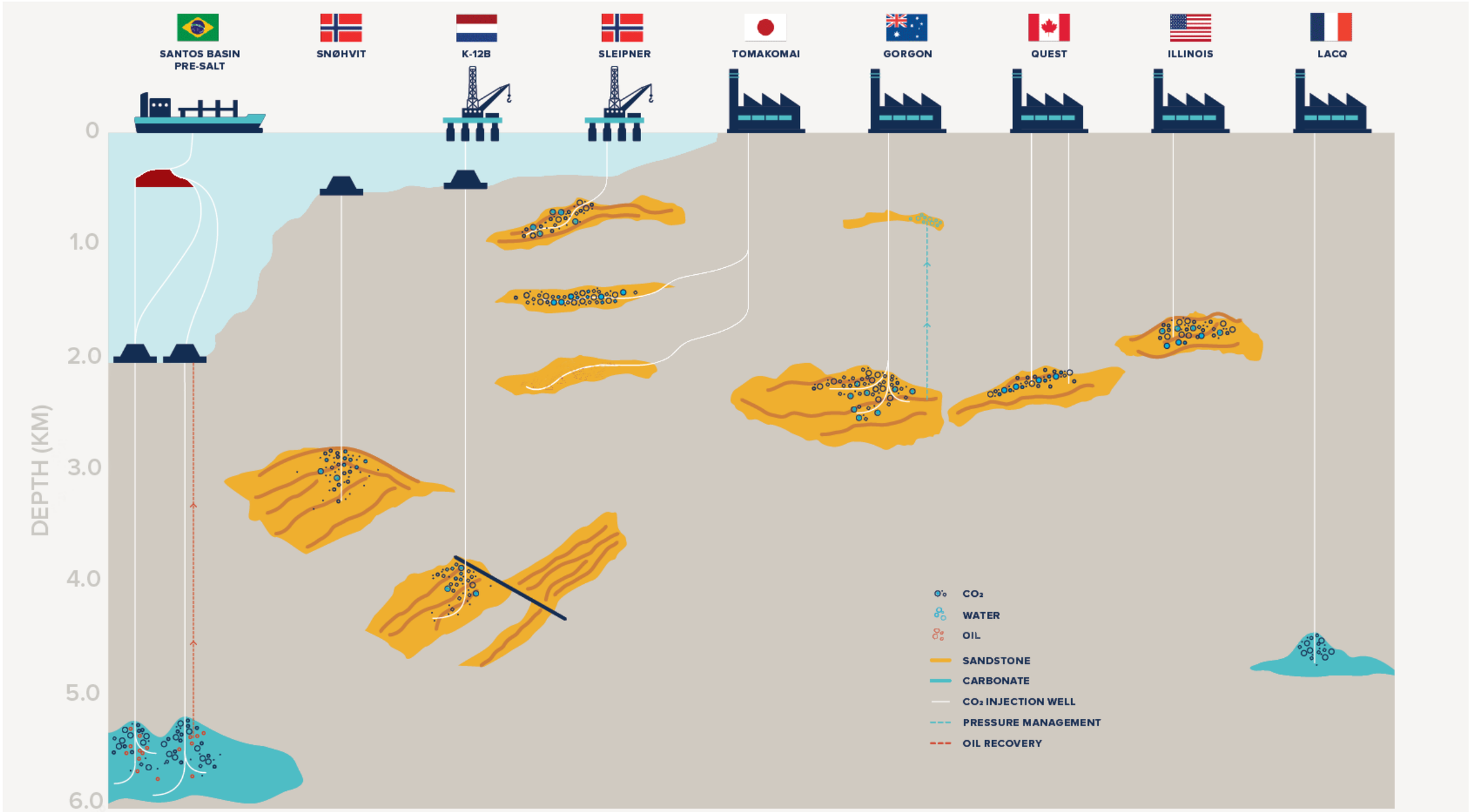
- Sandstones or carbonates
- Porous and permeable
- Contains fluids and gases

Caprock

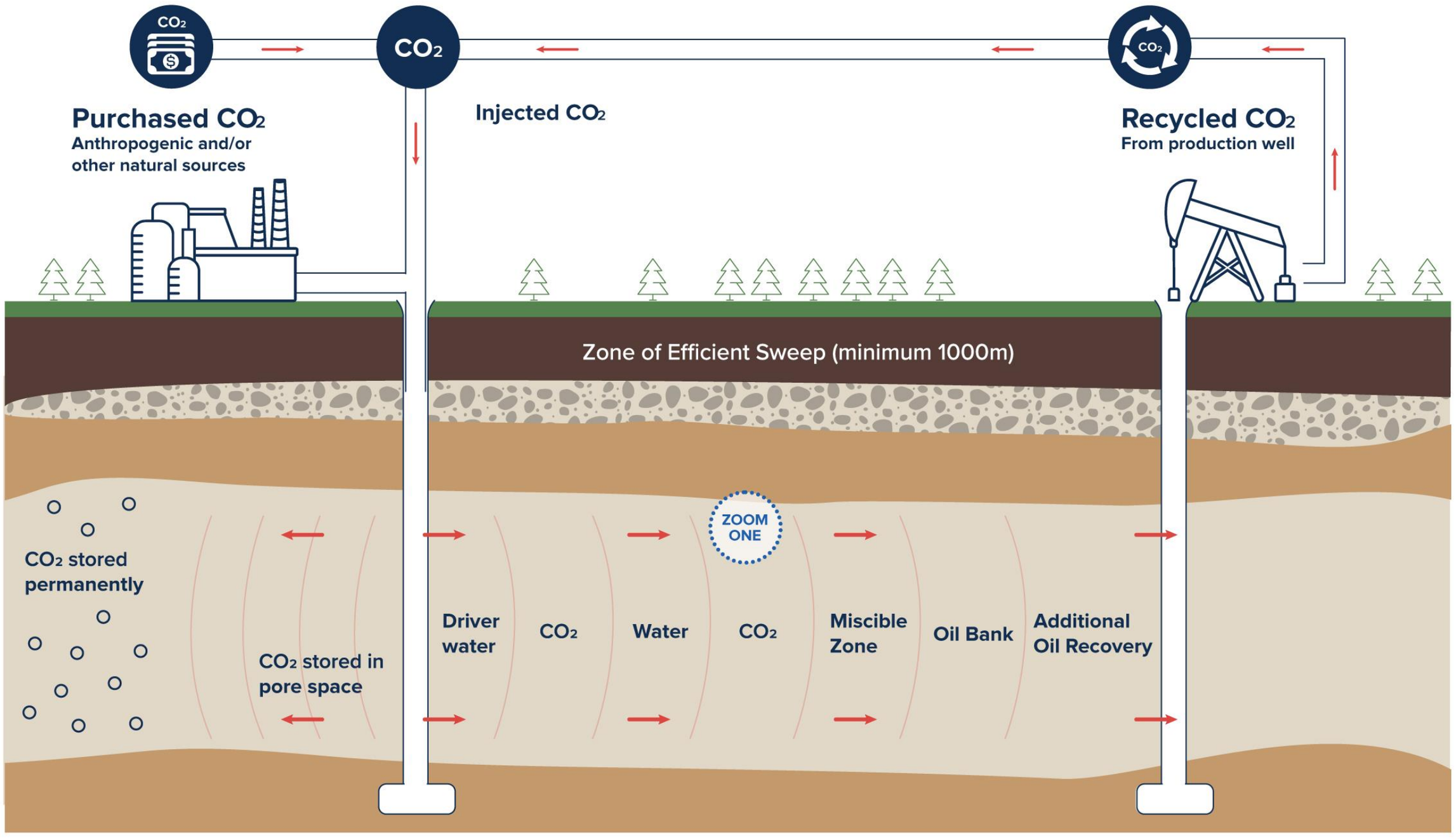
- Mudstone, salt, poor reservoir
- Very low or no permeability
- Barrier to fluid movement



CO_2 STORAGE EXPERIENCE



EOR PERMANENTLY STORES CO_2



SCALING UP CO_2 STORAGE

- Substantial scale up of CO_2 storage is required.
- Rapid exploration and development of thousands of individual storage sites; estimated 30-60 each year until 2050.
- It can be achieved, where there is a business case and supportive policy.
- Many countries recognising the importance of CCS to achieve emissions reduction targets.
- Storage initiatives underway in the US, Norway and the UK, the EU, Australia and Japan.

SECTION 2

MYTH BUSTING

MYTHS, MISCONCEPTIONS & CONCERNS

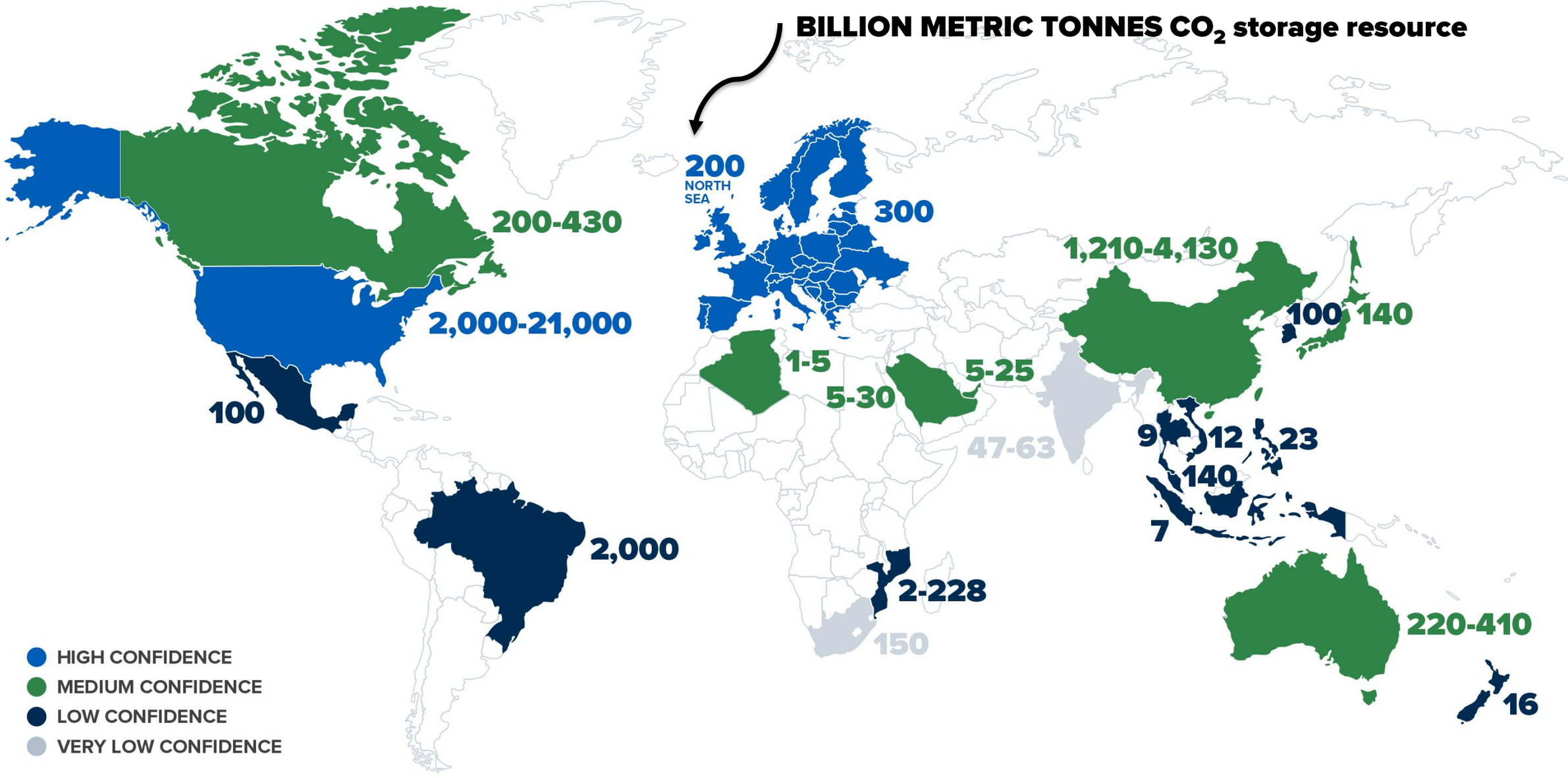
- *"CO_2 storage is not happening... it is an untested/unproven technology"*
- *"There is not enough storage space to store enough CO_2 to make a difference"*
- *"The CO_2 will leak"*
- *"Is there specific regulation in place?"*
- *"Who is responsible for the CO_2 once it is stored underground?"*

CO_2 STORAGE IS PROVEN

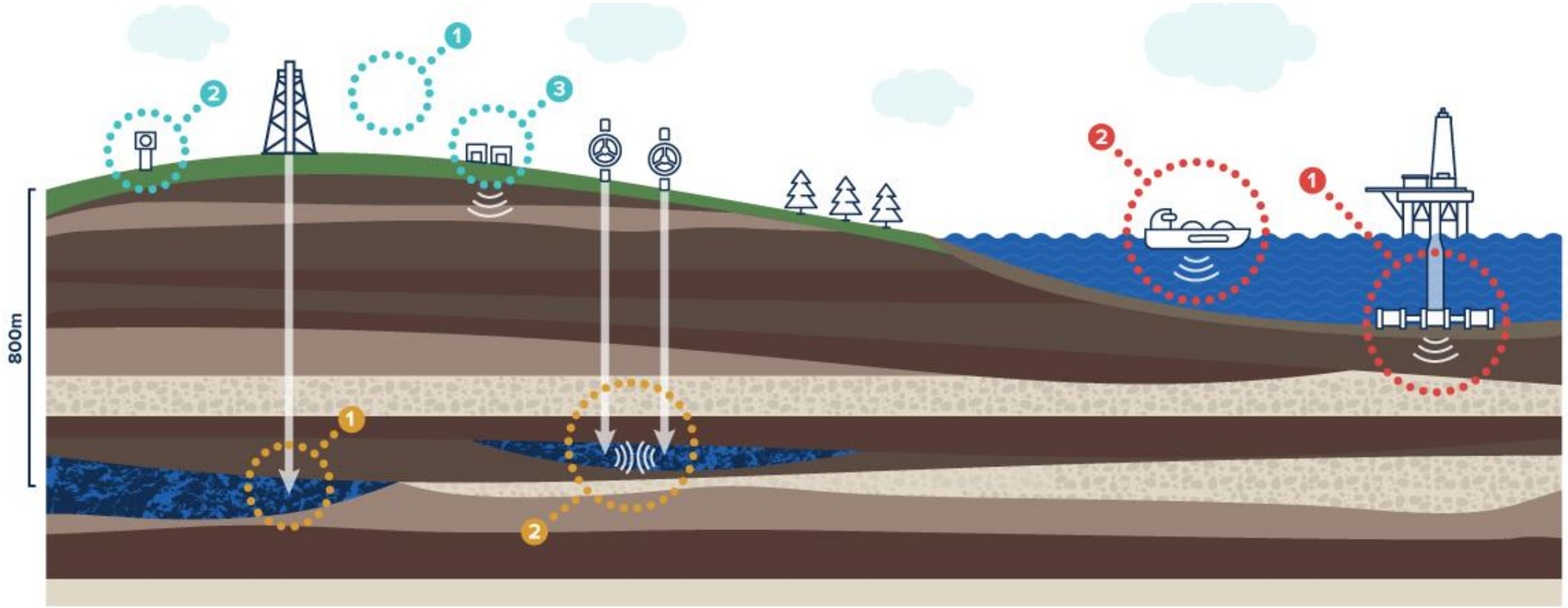
STORAGE IS HAPPENING!

- Over 260 million tonnes of anthropogenic CO_2 has been successfully injected underground
- The process of storing CO_2 in underground rock formations is well-understood, safe and permanent
- Monitoring technologies, refined from hydrocarbon and hydrogeology industries are available

GLOBAL STORAGE RESOURCES



MONITORING TECHNOLOGIES



1 ATMOSPHERE
AIRBORNE EM
AIRBORNE SPECTRAL
SATELLITE INTERFEROMETRY

2 SURFACE
EDDY COVARIANCE
SURFACE GAS FLUX
SOIL GAS CONCENTRATIONS
GROUND WATER CHEMISTRY

2 SURFACE
2D/3D SURFACE SEISMIC
LAND EM/ERT
SURFACE GRAVIMETRY
TILTMETERS

1 SUB-SURFACE
DOWNHOLE FLUID CHEMISTRY
DOWNHOLE PRESSURE
DOWNHOLE TEMPERATURE
GEOPHYSICS LOGS

2 SUB-SURFACE
CROSS-HOLE EM
CROSS-HOLE ERT
CROSS-HOLE SEISMIC
MICROSEISMIC
VERTICAL SEISMIC PROFILING
WELL GRAVIMETRY

1 OFFSHORE
BOOMER/SPARKER PROFILING
BUBBLE STREAM DETECTION
MULTI-ECHO SOUNDINGS
SIDESCAN SONAR

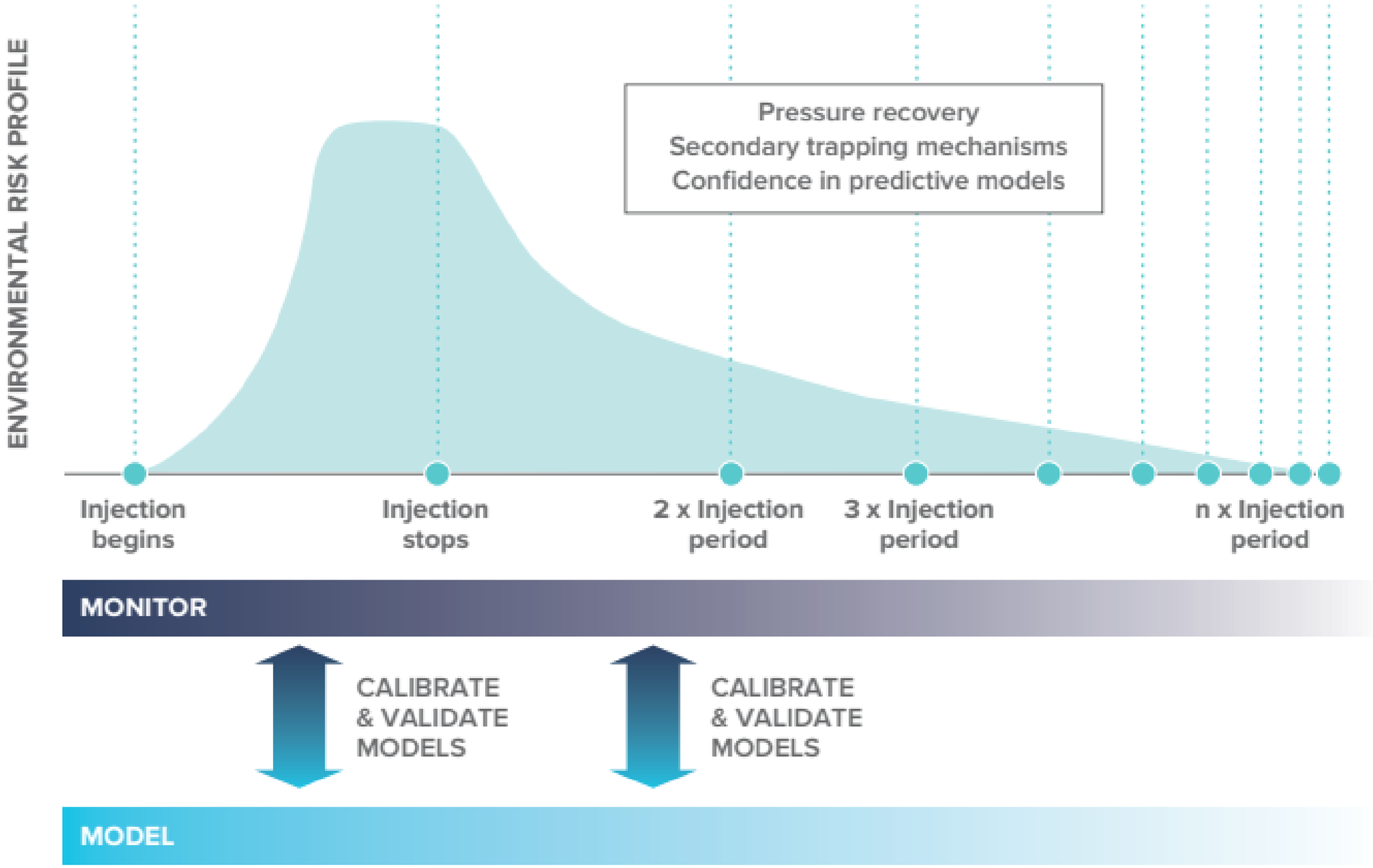
2 OFFSHORE
SEABOTTOM GAS SAMPLING
SEAWATER GEOCHEMISTRY
SEABOTTOM SEISMIC
SEABOTTOM EM

EM ELECTROMAGNETIC ERT ELECTRICAL RESISTANCE TOMOGRAPHY

REGULATION

- Legal and regulatory frameworks are critical for CCS operations
- CCS-specific frameworks are now in place in many jurisdictions worldwide
- Regulatory models not only support deployment, but also ensure environmental protection and public safety
- Clarify rights and responsibilities of operators and relevant authorities
- Manage the novel risks of the CCS process throughout the project lifecycle

STORAGE RISK PROFILE



[1] Model reproduced from Benson, S., Carbon Capture and Storage: Research Pathways, Progress and Potential, GCEP Annual Symposium, Stanford University, 2007.

LIABILITY

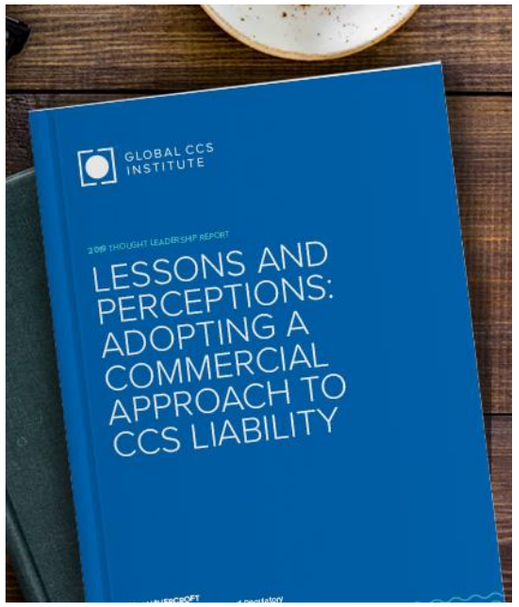
- Apportioning responsibility for CCS activities is a key feature of many of the CCS-specific frameworks
- Many regimes now include well-characterised examples of how to approach liabilities associated with CCS operations
- Frameworks address the novel challenges of CCS to consider liability throughout the project lifecycle
- Host of different forms of liability may be addressed
- Clear allocation of roles for operators and regulators to ensure security of storage

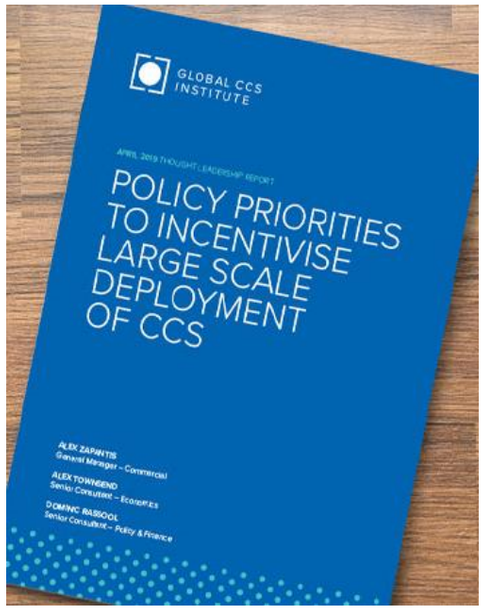
Questions & Answers

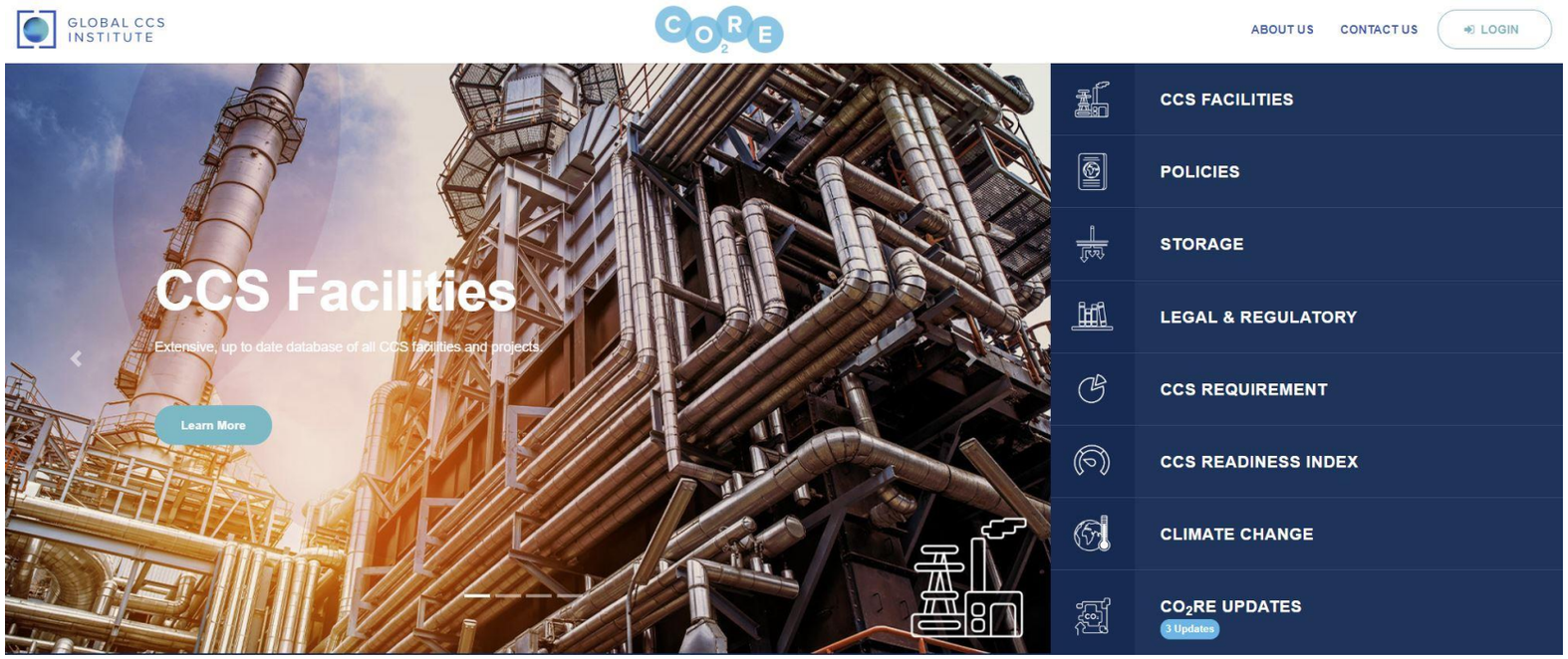
CONCLUSION

- CO_2 Storage is a well-understood, proven, permanent and safe technology.
- Vital to achieving global climate change targets.
- CCS-specific regulatory frameworks in place in many jurisdictions worldwide.
- Responsibility for CCS activities a key feature.

FURTHER RESOURCES







UPCOMING ONLINE EVENTS

28 April: Scaling up the CCS Market to Deliver Net Zero Emissions

13 May: The Value of Carbon Capture and Storage

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