# **Screening of Future Carbon Storage Sites**



#### Screening & Prospect Evaluation

- Risk & Resource predictions
- Simple assumptions
- Probabilistic approach

#### Focus on Specific Assets

- Reservoir Engineering
- 3D models
- Dynamic modelling

#### Field Development

- Drilling
- Injection tests
- Monitoring









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### Where to look for Carbon Storage Sites

Onshore versus offshore



#### ONSHORE

PROS

- Proximity to emissions
- Operations simpler



#### OFFSHORE

- Larger areas
- Less sensitive to environment

#### CONS

- Limited area
  - Urban centers
  - Nature reserves & drinking water
  - Old legacy wells
- Limited social acceptance

- Higher distance to emissions
- Operations more complex

# Where to look for Carbon Storage Sites

#### Oil & gas basins?

#### PROS

- Good knowledge of geology
  - Stratigraphy
  - Reservoirs & Seals
  - Pressure & Temperature
- Potential reuse of transport infrastructure
- CONS
- Competition of operating space
  - Concessions & Legislation
  - Surface installations
  - Subsurface interactions
- Legacy wells
  - Possible weak points
- Competing fluids



# Where to look for Carbon Storage Sites

#### Structured versus unstructured?



- PROS
- Easy to map
  - Focussed CO2 flow
  - Higher CO2 saturations
- CONS Limited area
  - Limited storage capacity



Much larger areas

PROS

CONS

- Much larger storage capacity
- Unfocussed CO2 flow
  - Control on containment



- Mapping of structure
- Estimation of pore space
- PVT & Seal

- How much could the trap contain?
  - Theoretical storage capacity
  - Effective storage capacity



[Mt] 182.07

250

PS0 186 P90 226

297

Theoretical CO2 mass

150

P10 135

42



- How much could the trap contain?
  - Theoretical storage capacity
  - Effective storage capacity
- What is the phase and density of CO2?
  - Pressure & temperature uncertainty
  - CO2 PVT model

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  - Pressure versus leak-off pressure
  - Buoyancy versus seal capacity







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- What happens in case of over-injection?
  - Leak and spill volumes & masses

#### Top leak into upper stratigraphy







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- What happens in case of over-injection?
  - Leak and spill volumes & masses
  - Containment risk

#### Top leak into upper stratigraphy







- Mapping of (simple) structure
- Estimation of pore space
- What is the assessment unit?
  - Few geological boundaries
  - A prospect is an injection well and the associated plume
  - Concession boundaries







- What is theoretical storage capacity?
- What is the maximum amount which could effectively fit into one concession?
  - Effective storage capacity
  - Location of injection plume







• Plume modelling



- What is theoretical storage capacity?
- What is the maximum amount which could effectively fit into one concession?
  - Effective storage capacity
  - Location of injection plume



- Increasing likelihood of non-containment with increasing injection amount
- Is lateral outflow mass acceptable?









- What is theoretical storage capacity?
- What is the maximum amount which could effectively fit into one concession?
  - Effective storage capacity
  - Location of injection plume
- Do 50-100-150 Mt fit into one concession?
  - Increasing likelihood of non-containment with increasing injection amount
  - Is lateral outflow mass acceptable?
- What does a 100 Mt plume look like?
  - Is more than one block needed?
  - Which blocks?





#### PROS

• Only one well

• Well-known stratigraphy

- CONS
- Only one well

• Shallow

• What to do with the gas in place?

# Zulu Øst Gas Discovery

### Zulu Øst Gas Discovery

• Small gas discovery east of major oil fields





- Only one well
- Well-known stratigraphy
- Two reservoir layers
  - Upper reservoir has proven seal
  - Lower reservoir has more pore space
  - Lower store layer with upper buffer layer

#### CONS

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Coskun & Huuse, 2022 MANCHESTER 1824

The University of Manchester

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### Conclusions



- Screening is not about getting it precisely right
- It is about testing scenarios and ranking assets



- We want to select the best assets for focus & development
- Time will tell how good we are at screening...



#### Screening & Prospect Evaluation



#### Focus on Specific Assets

#### **Field Development**







# Conclusions

- At ArianeLogiX we build standard workflows and tools for Carbon Storage screening
- Currently cooperating with supermajors, national authorities and academia across Europe, United States and Australia

#### Screening & Prospect Evaluation



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