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A Workflow for Regional Exploration of CO_2 Storage Sites in Saline Aquifers

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Video

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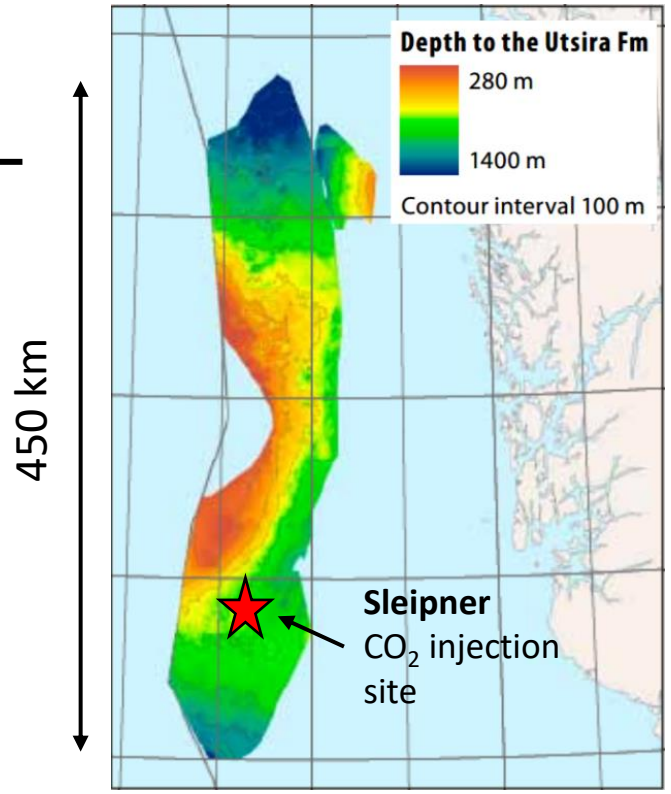
Rationale – Regional Variability

- ✓ Potential reservoir for upscaled CO_2 storage
- ✓ High theoretical storage volumes
- X Lack of studies addressing seal and overburden
- X High regional stratigraphic variability

Reference	Year	Area	Scenario	Resource, Gt
Holloway, 1996	1996	Full Utsira	Total Capacity	50.4
			In traps	1.0
Boe et al., 2002	2002	Full Utsira	Total Capacity	42.4
			In traps	0.8
Chadwick et al., 2008	2008	Full Utsira	In traps	0.3
Lindeberg et al., 2009	2009	Full Utsira	With water production	20-60
Thibeau & Mucha, 2011	2011	Full Utsira	Pressure limited	4.2
Halland et al., 2011	2012	Utsira & Skade	Total capacity	15.8
Pham et al., 2013	2013	Sector model, Utsira & Skade		0.17
Andersen et al., 2014	2014	Full Utsira	In traps	1.1
			Migration limited	2.2
Ministry of Petroleum Energy, 2016	2016	Local structure	Migration limited	0.015-0.018
Gasda et al., 2017	2017	Full Utsira	Pressure limited	2.4-8.3
		South Utsira	Pressure limited	5.0
Furre et al., 2017	2017	Sleipner operations		0.017
Thibeau et al., 2018	2018	Full Utsira	Total Capacity	1-60

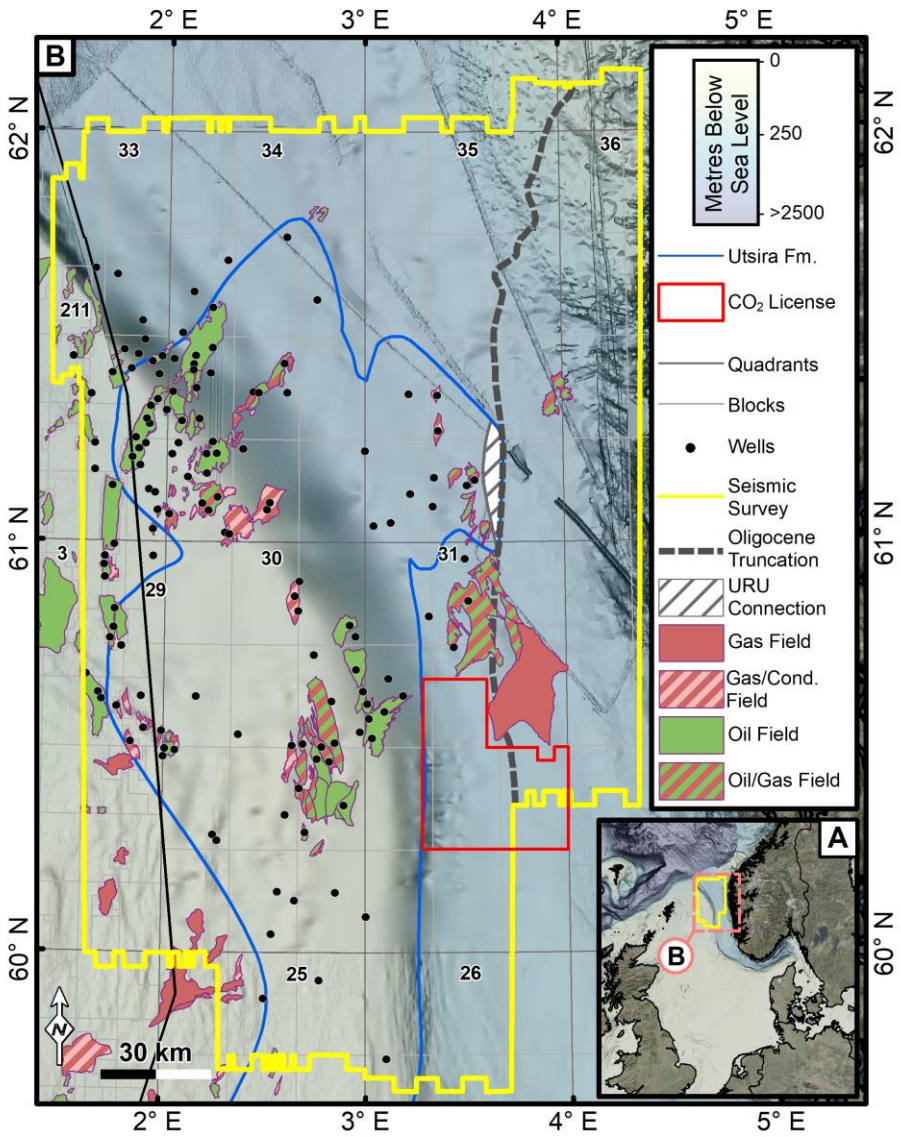
Adapted from Thibeau et al., 2018



Halland et al., 2011

Video

Dataset



1. Broadseis™ Seismic Survey

Complete 3D seismic coverage of the Northern North Sea (37,500km²) owned and provided by CGG.

2. FWI Velocity Cube

Owned and provided by CGG.

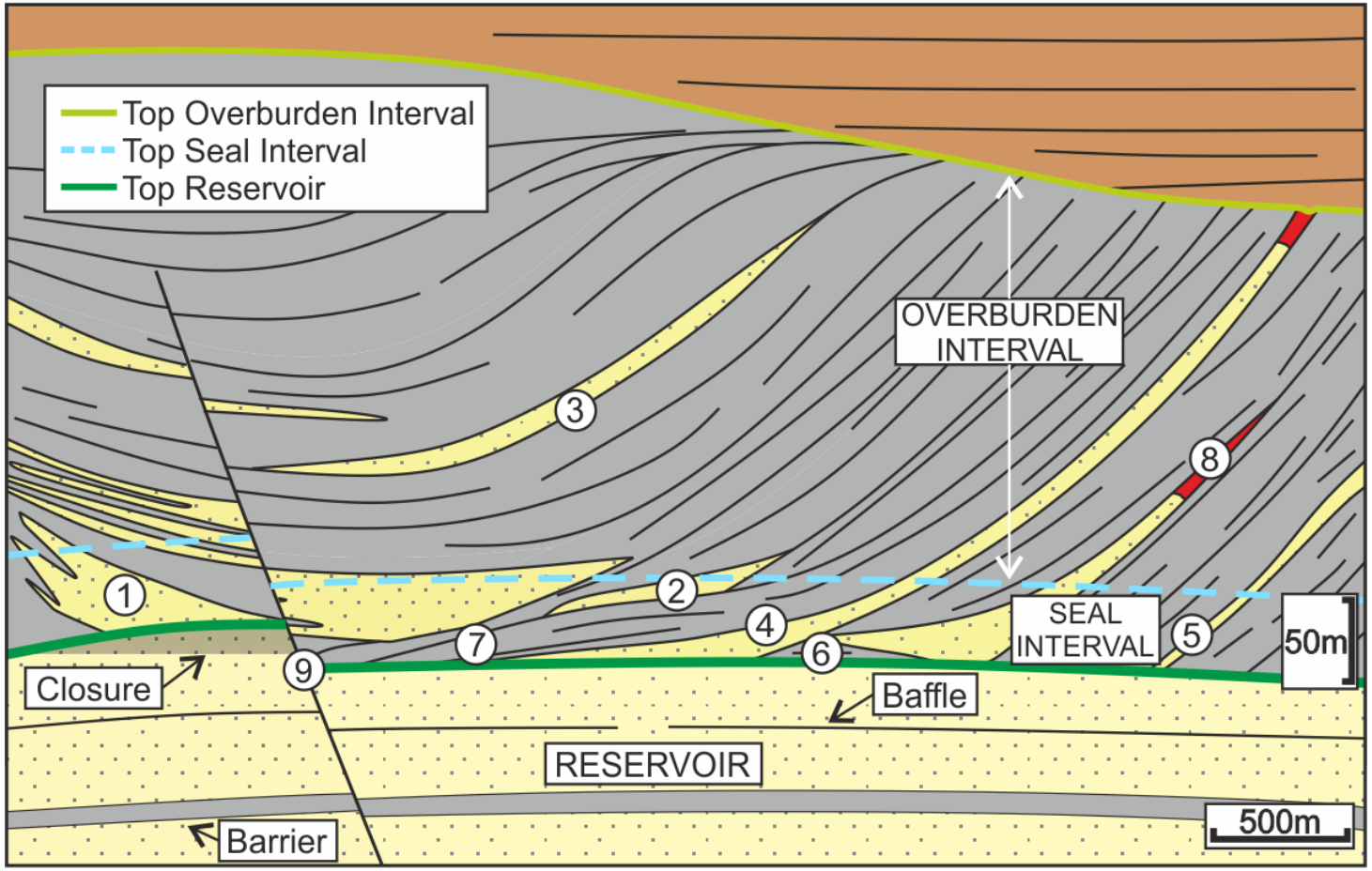
3. 141 Exploration Wells

4. Interpreted Lithology Column

Provided by TGS.

Video

Elements Analysed for Storage Site Identification



Seal and overburden bypass scenarios

1. Connected Seal Interval sandstone
2. Unconnected Seal & Overburden Int. sandst.
3. Unconnected Overburden Int. sandst.
4. Connected Seal & Overburden Int. sandst.
5. Reservoir-to-foreset connection
6. Spatially-limited Seal Int. mudstone baffle
7. Seal Int. mudstone barrier/baffle
8. Trapped gas within clinothem
9. Open fault/ fault juxtaposes sands

Seal & Overburden Characteristics

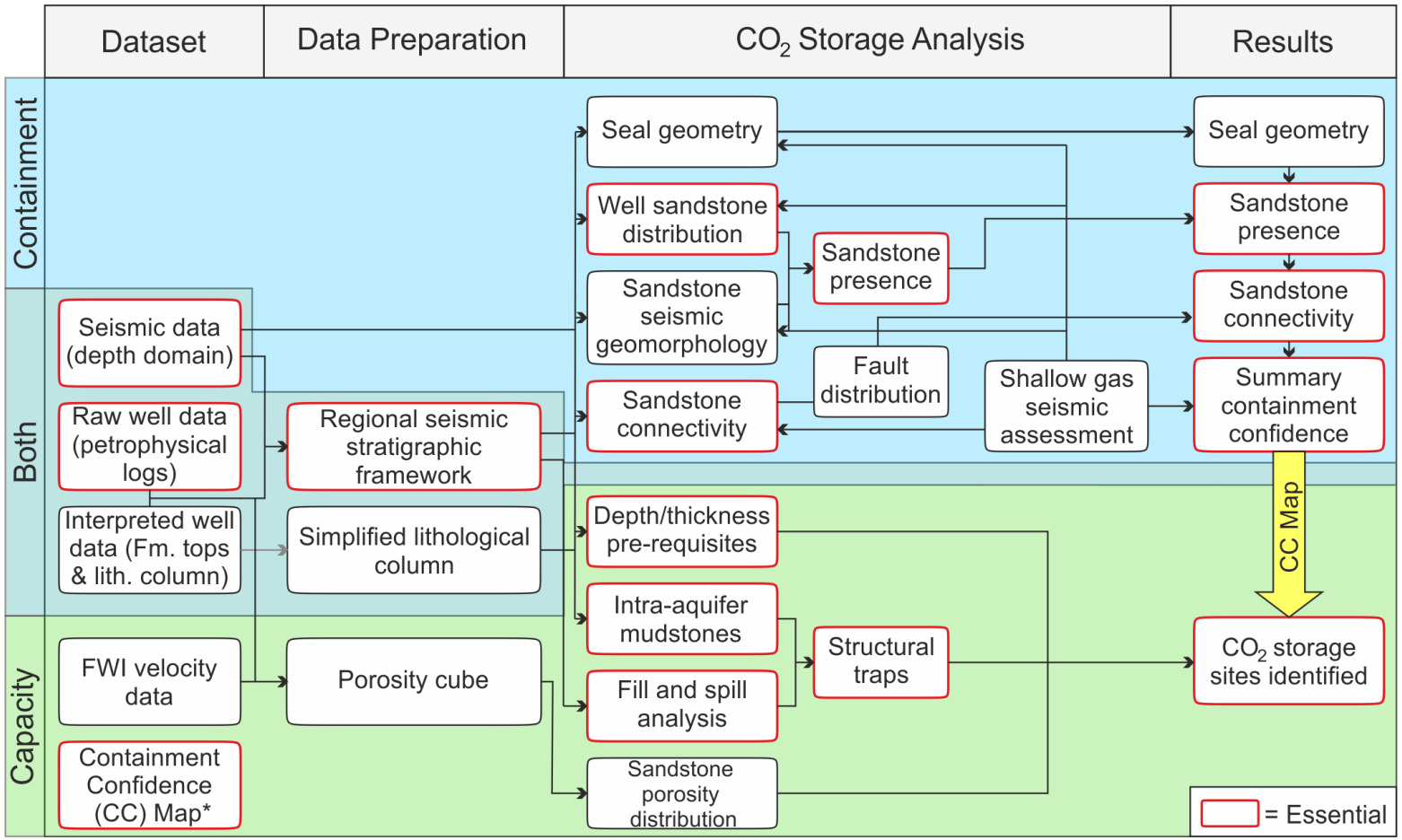
- Seal and Overburden Intervals
- Minimum seal interval thickness
- Seal bypass systems
- overburden migration paths

Reservoir Characteristics

- Porosity distribution
- Intra-aquifer baffles vs barriers
- Structural closures

Video

Workflow



CONTAINMENT

Seal & Overburden Characteristics

- Seal geometry
- Sandstone presence
- Sandstone connectivity

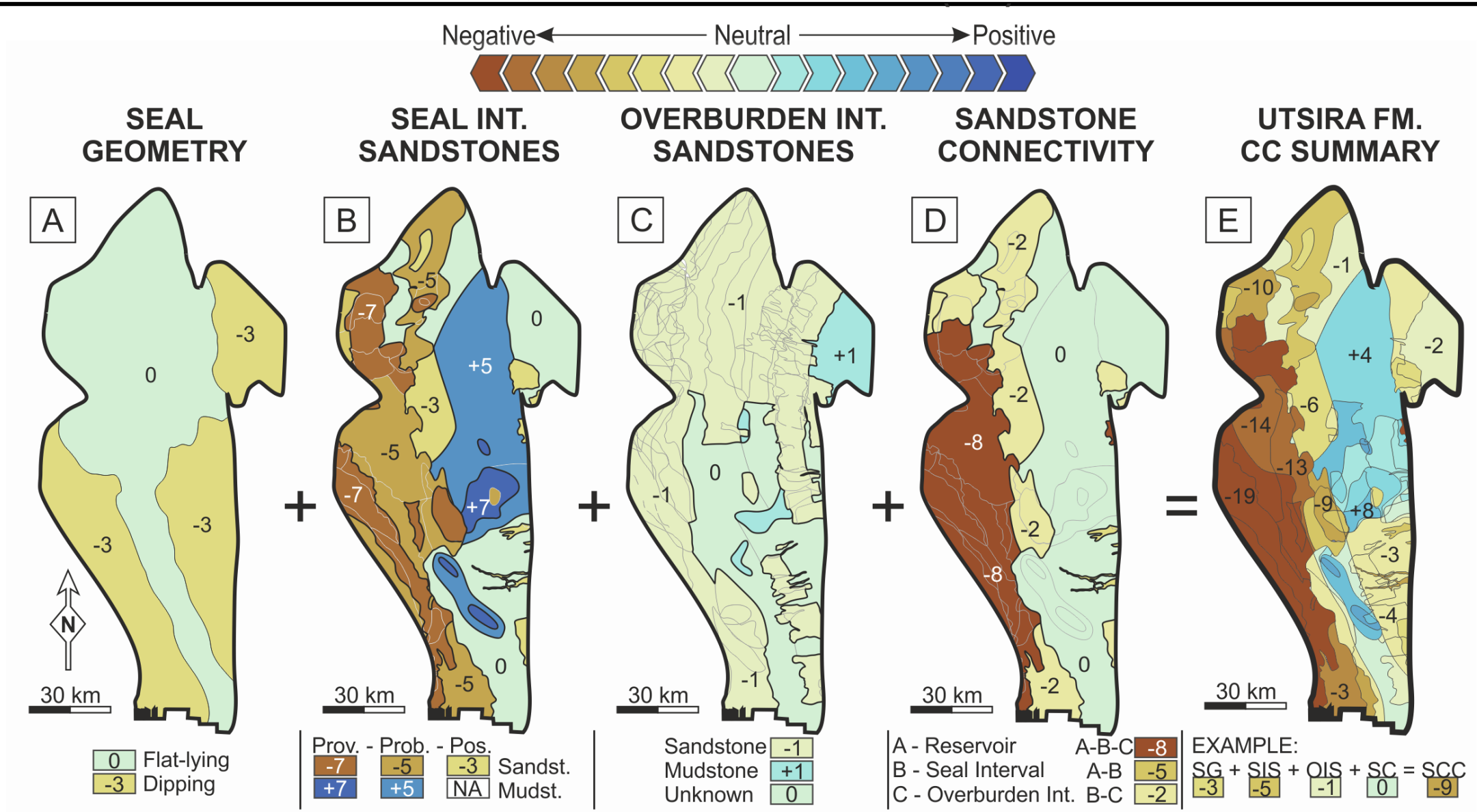
CAPACITY

Reservoir Characteristics

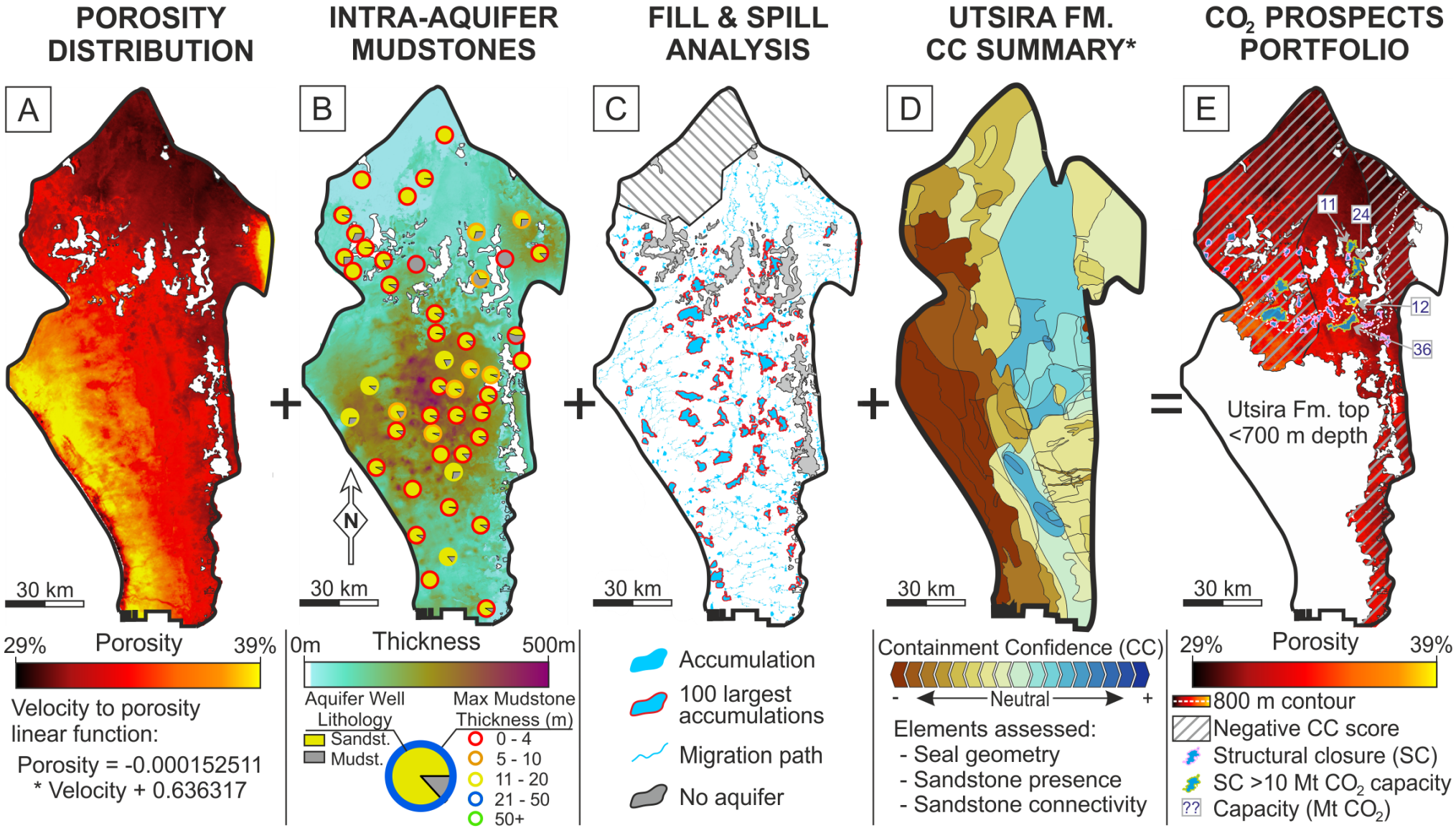
- Porosity
- Intra-aquifer mudstones
- Structural closures (Fill & Spill)

Video

Seal & Overburden (Containment Confidence)



Reservoir (Capacity)



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Video