



PhD Excursion UK 2014.03.23-25

CCS Landscape in the Netherlands

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Agenda

- CATO
- CCS in the Netherlands

Climate Change

- Our climate is changing



Why CCS?

- Large capacity
- Short term availability
- Expensive, but relatively cheap:
 - CCS: ~ 60€/ton-CO₂
 - Wind on Sea: ~ 260€/ton-CO₂ (SDE+)
 - Solar-PV: ~ 235€/ton-CO₂ (SDE+)
- Buy time and “save” money for renewables

Why CCS in the Netherlands?

- Availability (clustered) large CO₂ point sources
- Large storage capacity
 - 1500 Mt in gas fields, excl. Slochteren and aquifers
- Relatively short transport distances
- Extensive knowledge of gas and CCS
 - technology, infrastructure etc.
- Strong academic tradition (since 1990)
- Serious Industry commitment

CATO2 in a glance

- CATO = CCS + Transport
- National CCS Program
- Applied and scientific research
 - 40 PhDs
- Goals:
 - knowledge network for CCS
 - integrated development of CCS in The Netherlands
 - innovation for new CCS generations
- Budget: >60 M€ (30 M€ government)
- Coordination: TNO
- 2009-2014 (CATO1 from 2004-2008)
- 35 partners from industry, SME, university, NGO



university of
 groningen

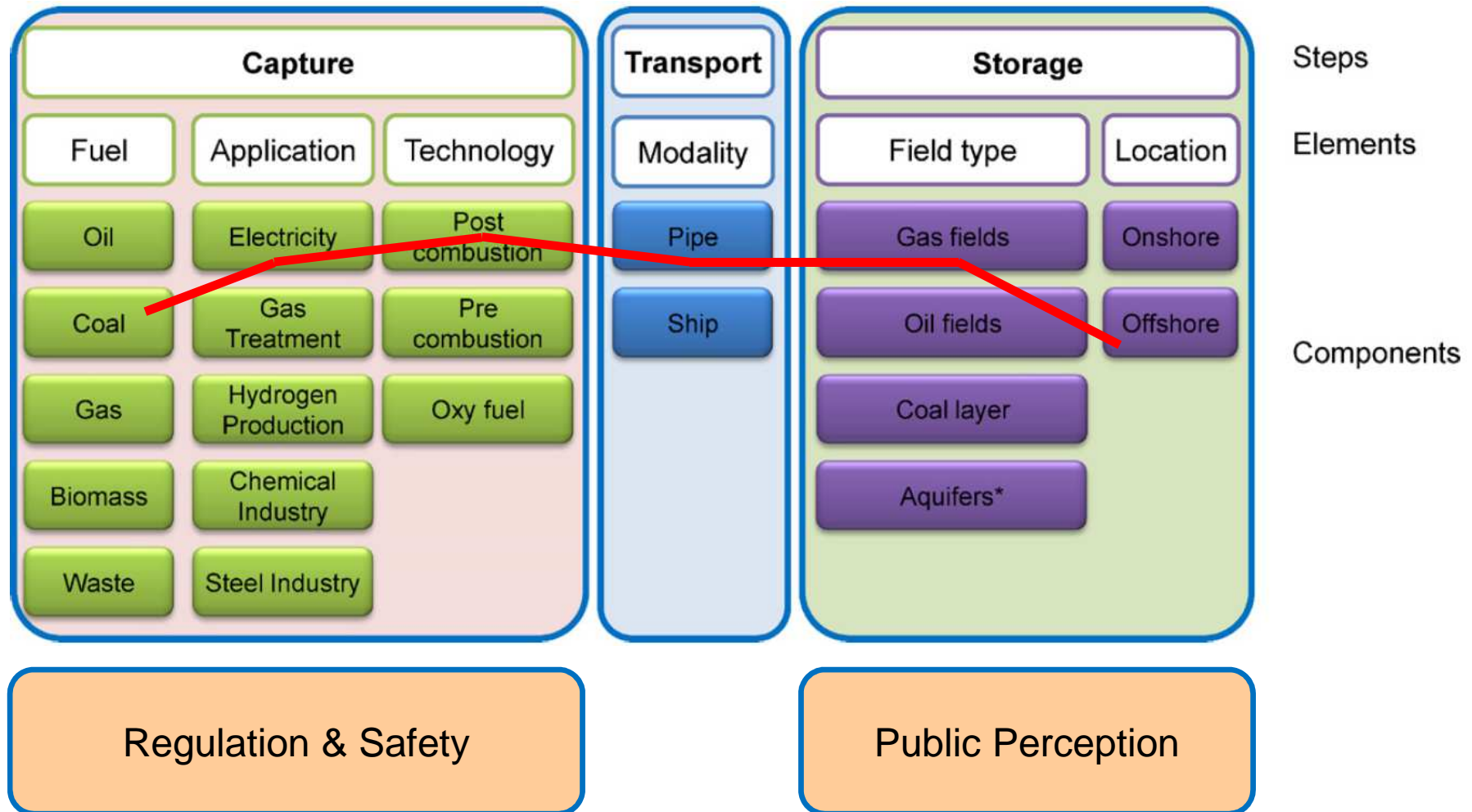
UNIVERSITEIT TWENTE.









Universiteit Utrecht



CCS/CATO: CO2 Afvang Transport & Opslag

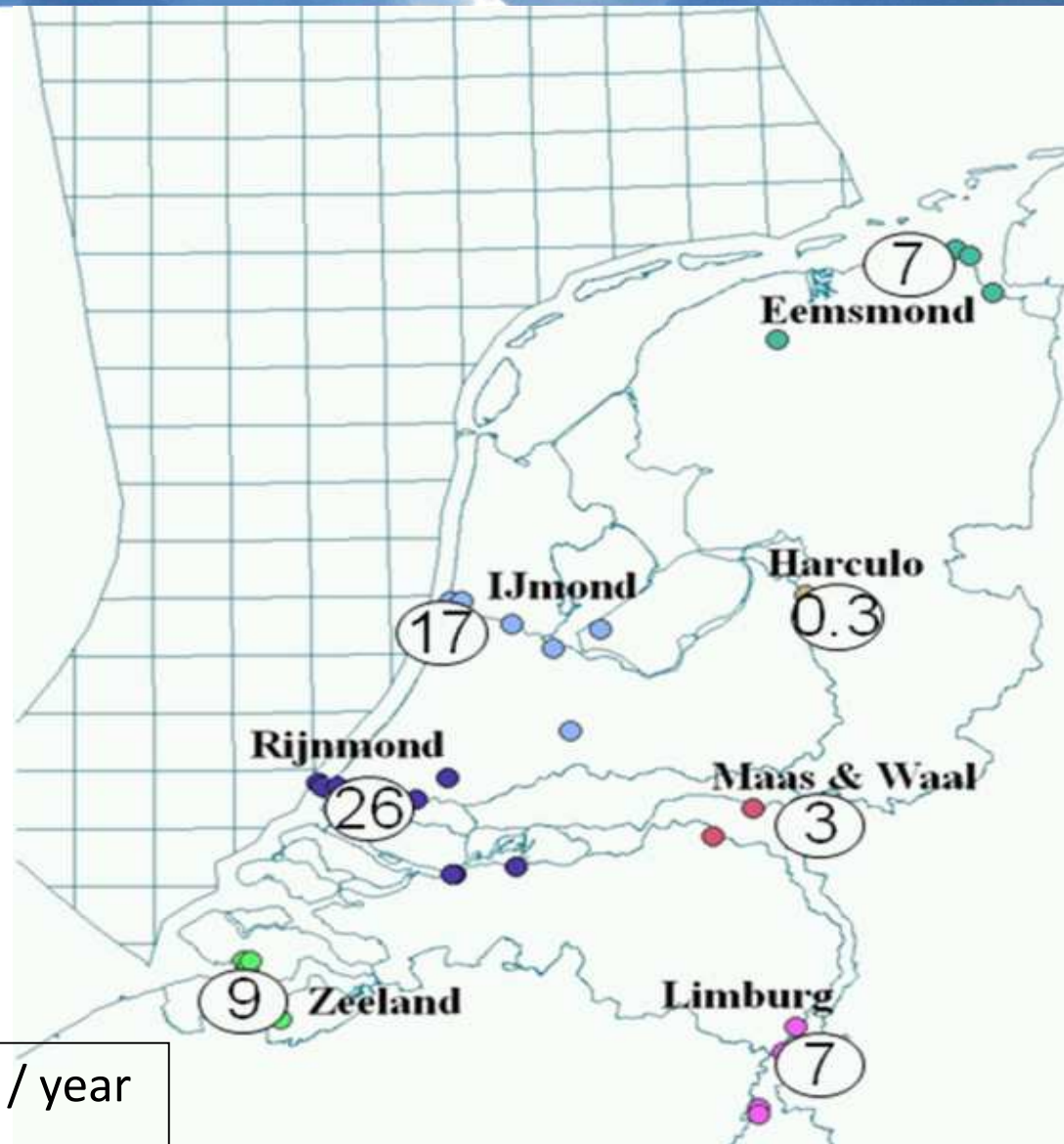


	SP	Sub-Programs
	0	Coordination
	1	Capture
	2	Transport
	3	Storage
	4	Regulation
	5	Public perception

Large CO₂ point sources in the Netherlands

24 power plants

16 industrial sources



Unit: Mton CO₂ / year

Source: Machteld vd Broek, UU

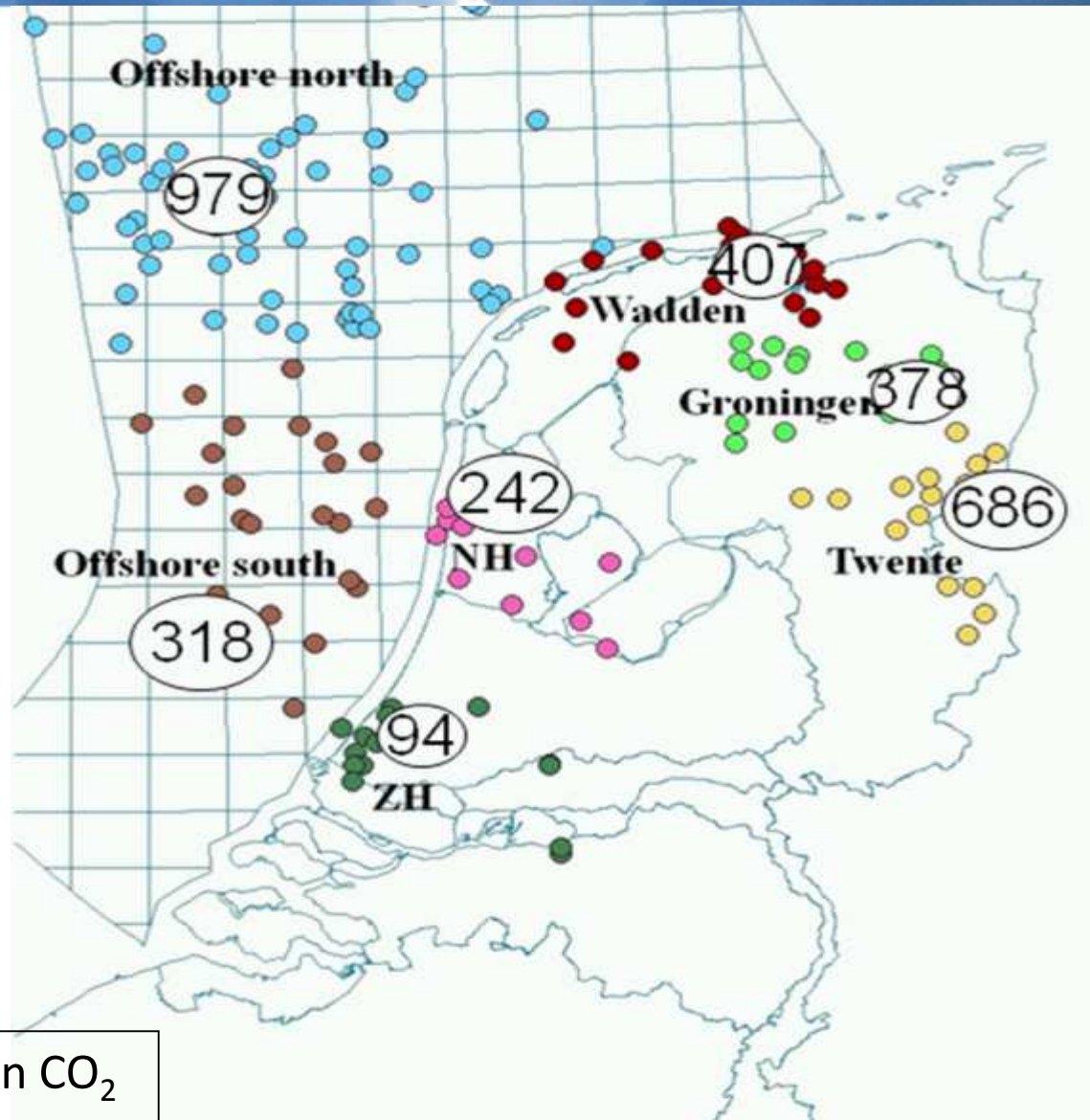
Potential CO₂ Storage Locations

35 aquifers (> 2 Mt)

5 oil fields

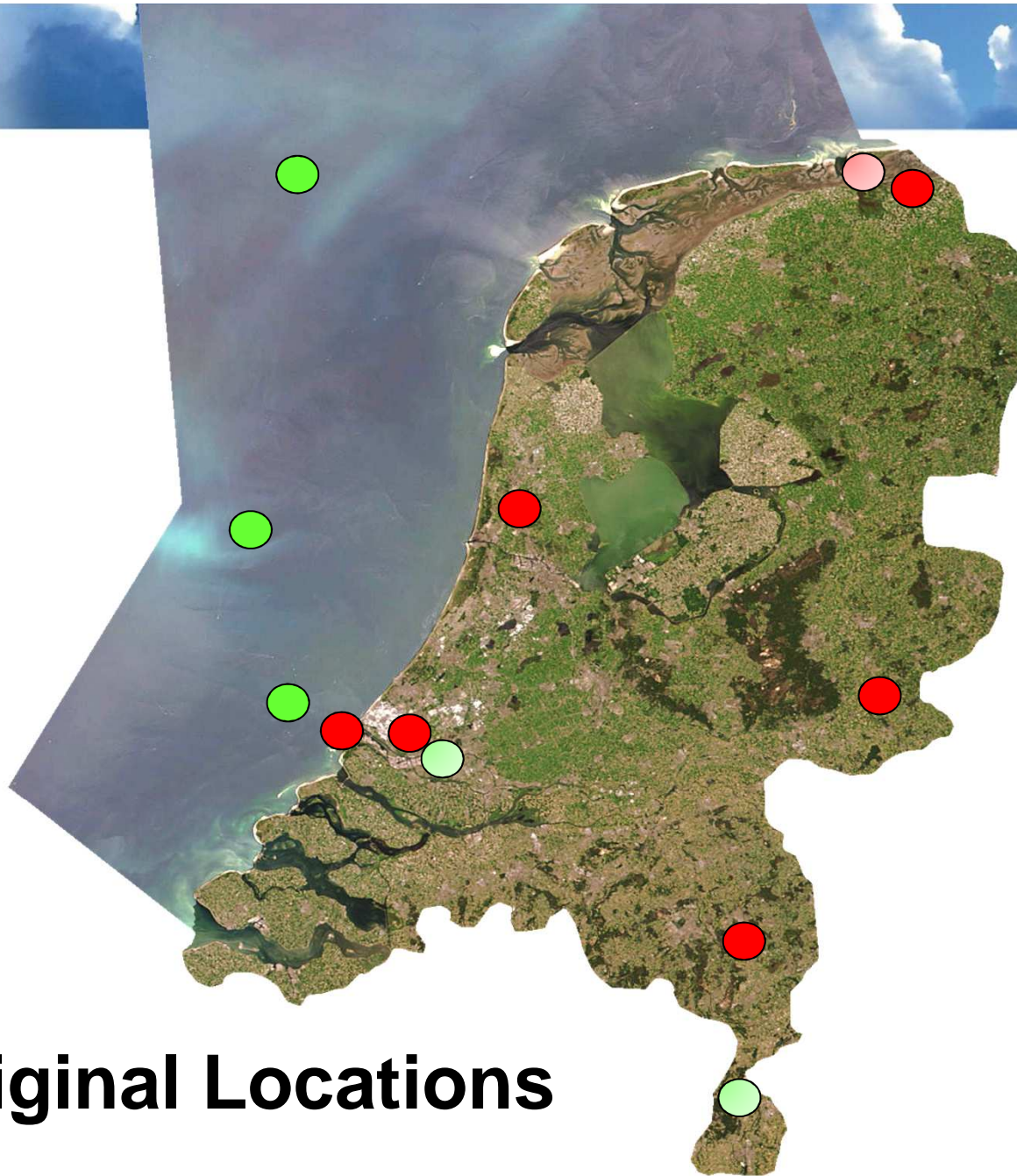
131 gas fields (> 4 Mt)

Total 3 Gton (excl. Groningen)



Unit: Mton CO₂

Source: Machteld vd Broek, UU



Original Locations

de Volkskrant

Nieuws **Opinie** Cultuur Opmerkelijk Video Service Webwinkel

Binnenland **Buitenland** Economie Sport Kunst Wetenschap Internet

Barendrecht gaat in verzet tegen CO2-opslag

ANP op 18 november '09, 17:25, bijgewerkt 19 november '09, 11:46



Barendrecht protesteert tegen CO2-opslag (RTVRijnmond)

vk.nl/groen BARENDRECHT - De gemeente Barendrecht legt zich er niet bij neer dat in de gemeente een proef komt met de opslag van het broeikasgas CO2.

- [Barendrecht krijgt CO2-opslag](#)

DOSSIER ▾

BEKIJK ▾



Nog geen besluit over CO2-opslag

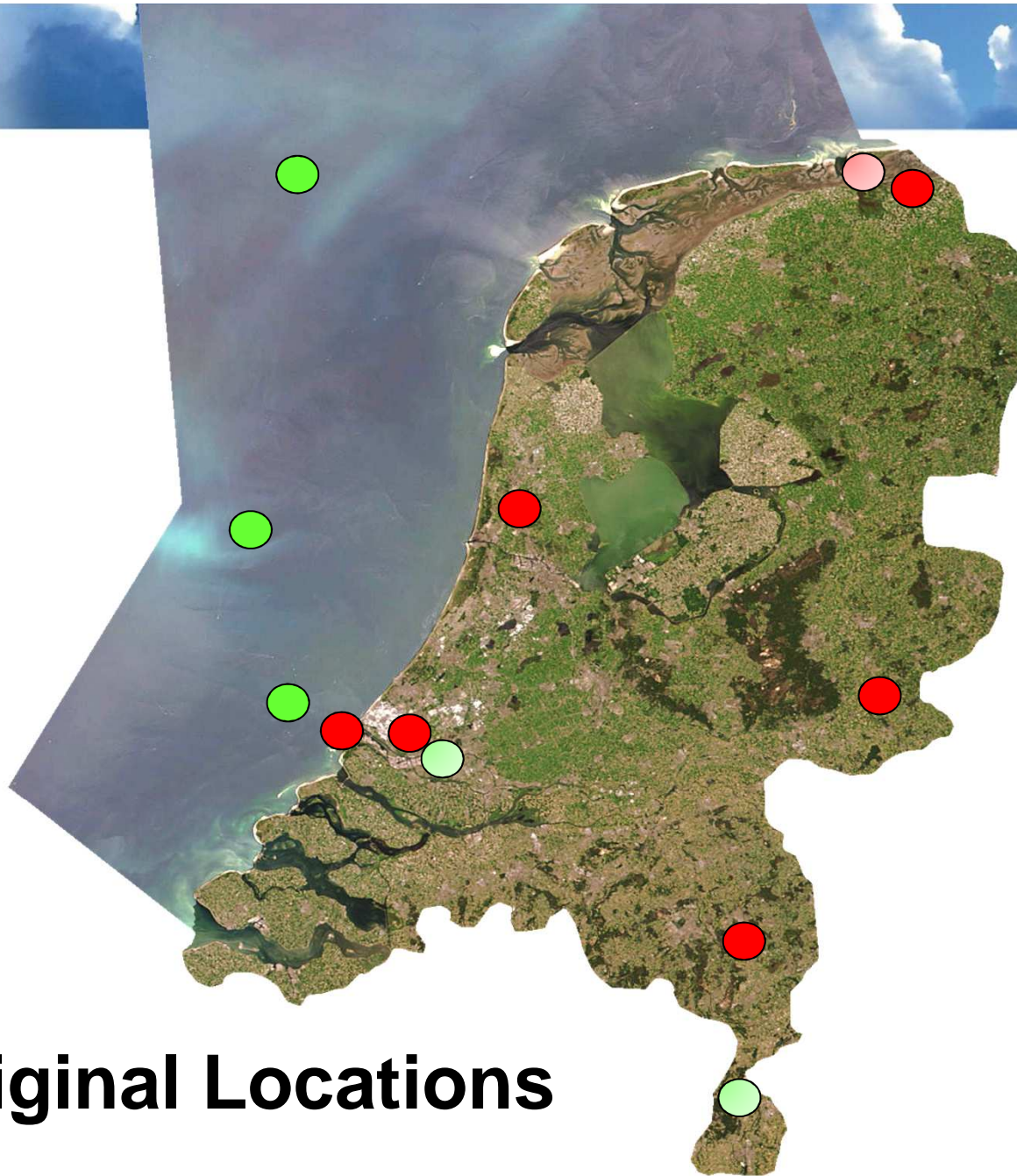
Barendrecht krijgt donderdag nog geen duidelijkheid over het project...



India belooft CO2-uitstoot te verminderen

India heeft donderdag gezegd in 2020 de uitstoot van broeikasgassen...

BINNENLAND ▾



Original Locations

Post Combustion Capture

CATO Pilot at E.ON Maasvlakte



Pre-Combustion Capture



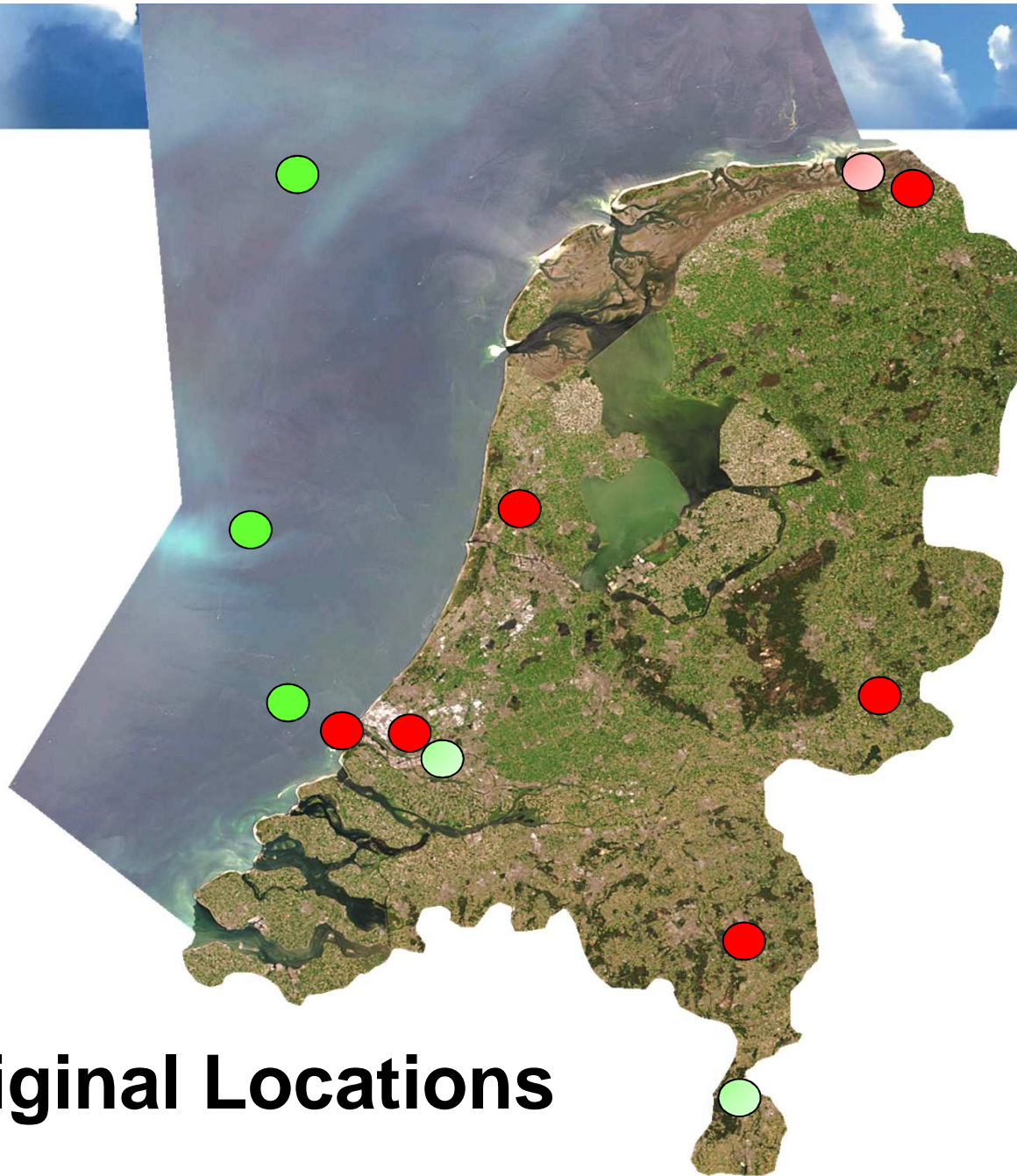
Pd/alloy membranes



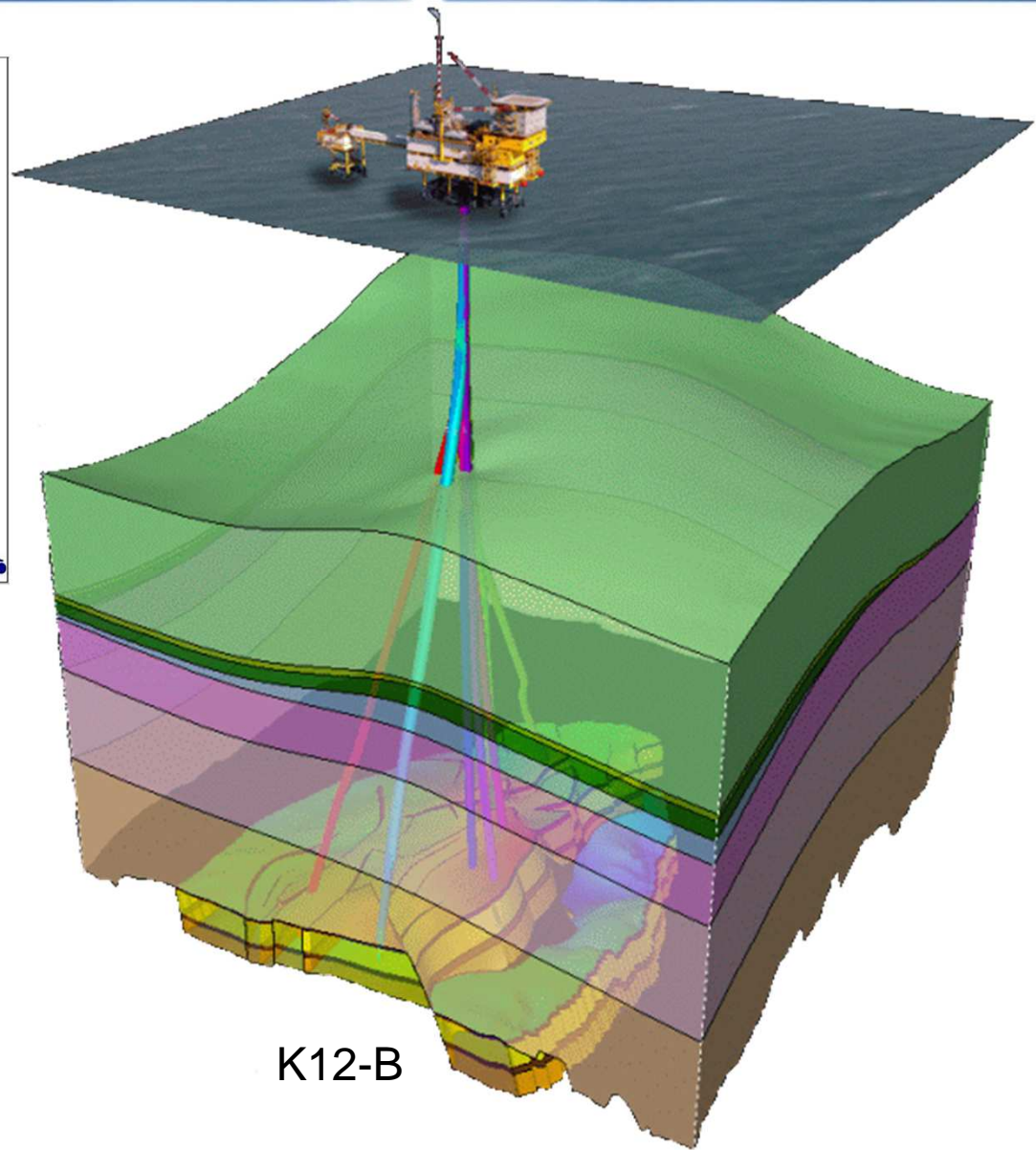
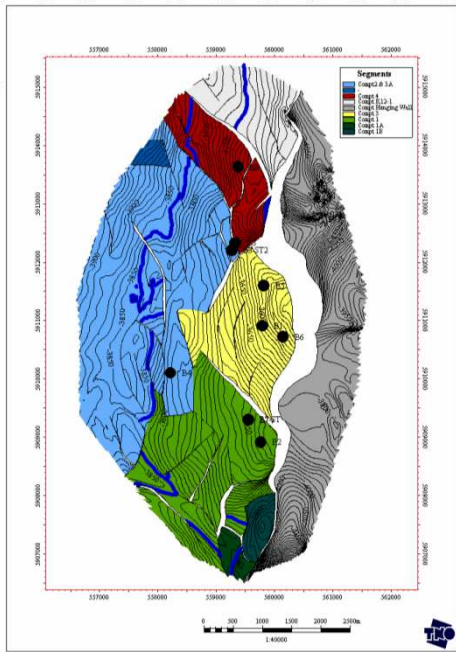
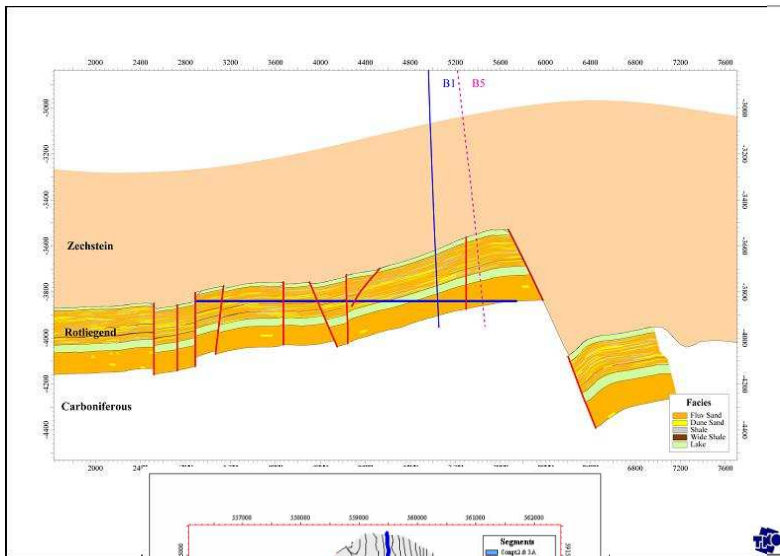
Sorption Enhanced Water Gas Shift



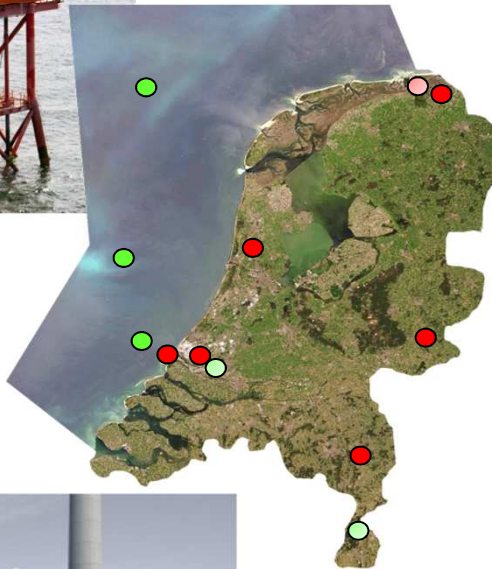
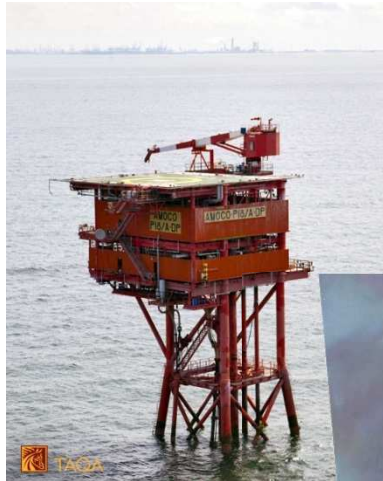
Buggenum pilot plant



Original Locations



K12-B



ROAD-project:

- EON, GdF-Suez & TAQA
- Whole CCS chain
- ~1.1 Mton/year
- www.road2020.nl
- EERP funding
- Financial gap

Future of CCS in the Netherlands?

- ROAD project?
- CATO3
 - Ship transport
 - K12-b storage pilot: CO2 tracers
 - CO2 (re)Use?
 - Collaboration with UK?