Evaluation of the CO2-storage potential in depleted gas fields of the West Netherlands Basin
Case study P18 gas field

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Evaluation of the CO_2-storage potential in depleted gas fields of the West Netherlands Basin: Case study P18 gas field

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Introduction

Carbon Capture and Sequestration (CCS) is expected to become a serious CO_2-emission reduction technology in the Netherlands. This study aims to evaluate the CO_2-storage potential of depleted gas reservoirs in the West Netherlands Basin (WNB) based on geological boundary conditions.

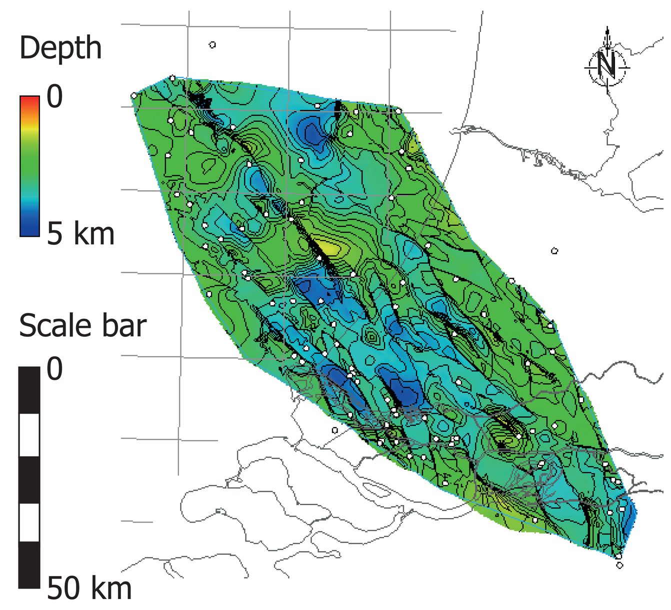


Fig. 1 Base of the Main Buntsandstein Subgroup (MBS) in the WNB.

Basin-scale evaluation

The identification of suitable reservoirs for CO_2 storage is based on predefined geological boundary conditions, such as trap type, reservoir architecture and capacity, seal quality, and depth. Depleted gas fields inherently meet most criteria and their depth is derived from a basin-scale structural model (Fig. 1).

P18

The nearly-depleted P18 gas field is located 20 km NW of the E.ON MPP3 power station (Fig. 2) and comprises fluvial and aeolian deposits of the Triassic Main Buntsandstein Subgroup (MBS) in several fault-bounded compartments (Fig. 2A and 3) whose juxtaposition locally inhibits connectivity.

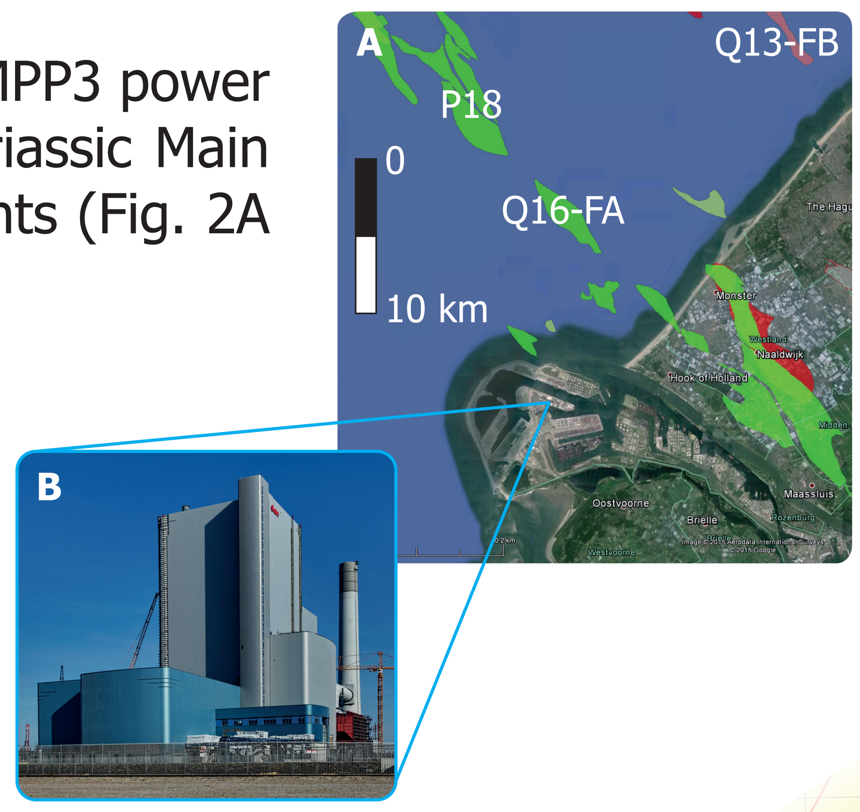


Fig. 2 A) Overlay of oil and gas fields on Google Earth image (north is up). **B)** E.ON MPP3 power plant.

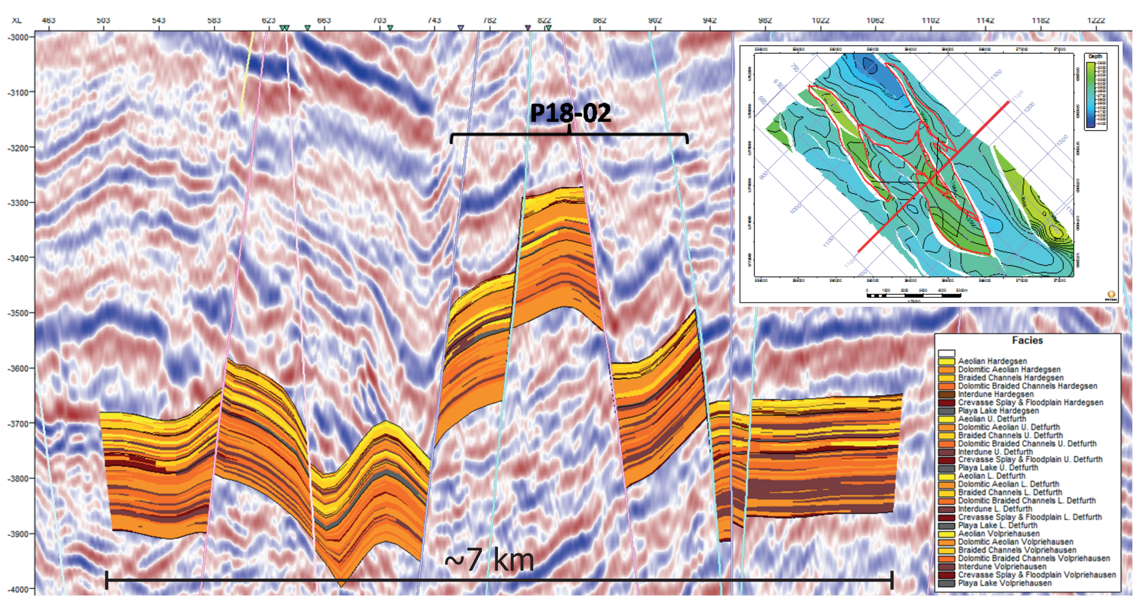


Fig. 3 Seismic inline through the P18 field (NE-SW; inset top right) showing interpreted faults and the facies model of the reservoir interval. Note that juxtaposition may isolate fault-bounded compartments.

The reservoir meets the criteria for carbon sequestration with a production-derived capacity of ~40 Mt CO_2. Monte-Carlo simulations of the reservoir model capacity average ~33 Mt CO_2 (Fig. 4) and identify bulk rock volume (BRV) and geological heterogeneities as the main uncertainties.

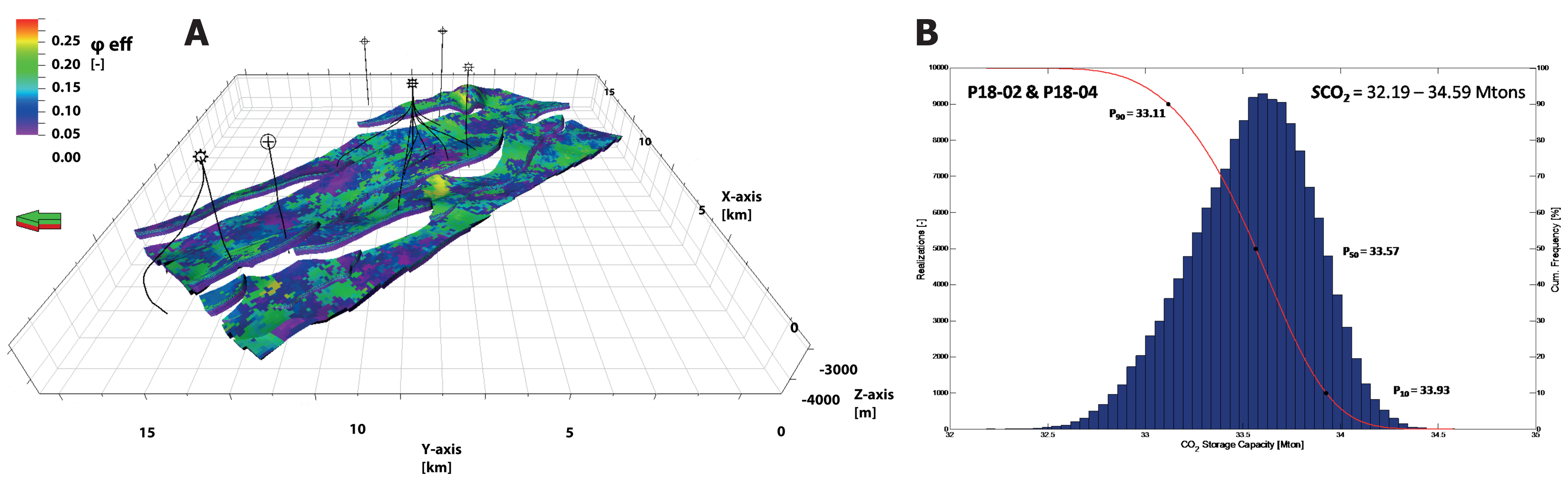
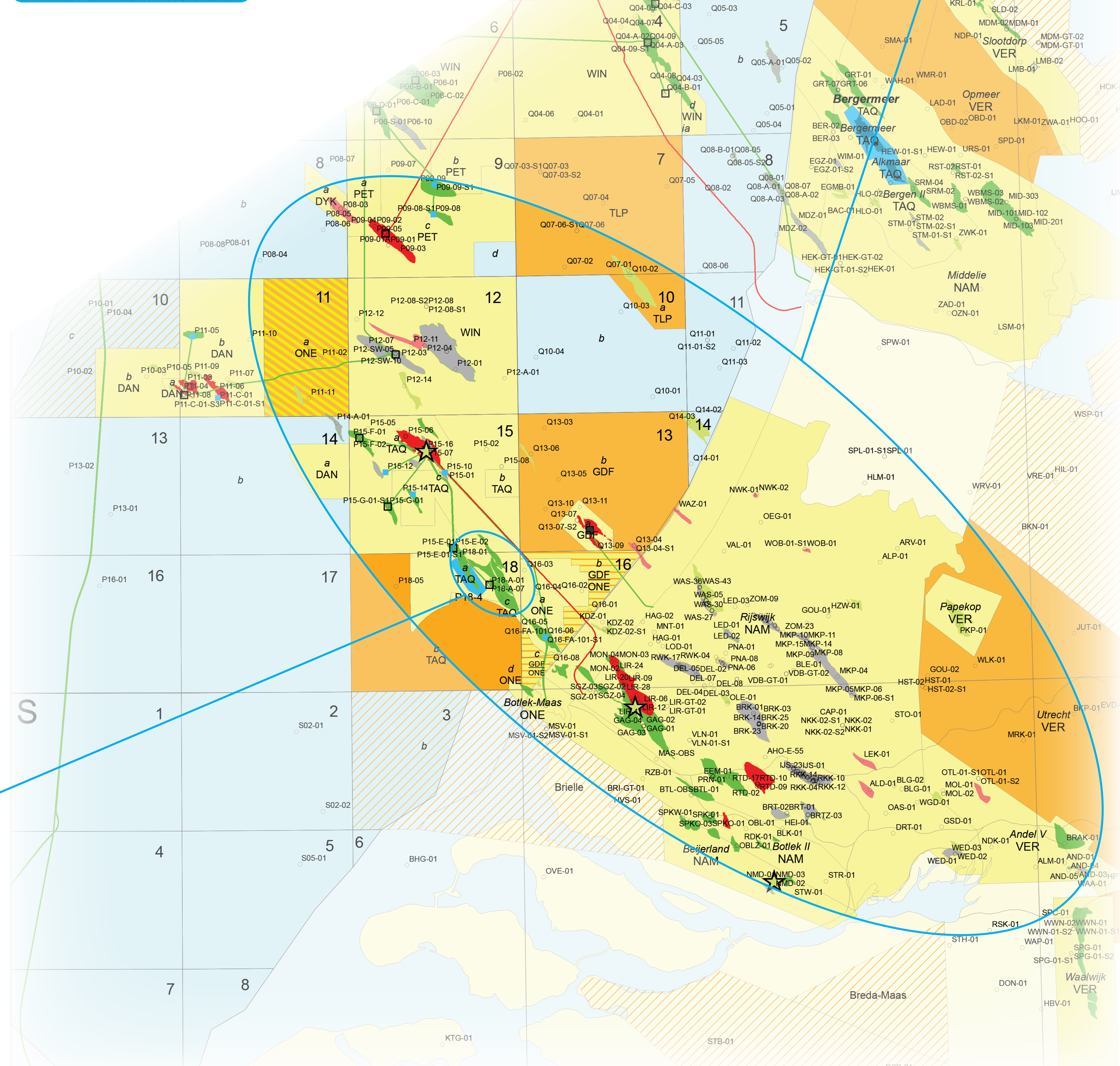


Fig 4 A) Static reservoir model of the effective porosity distribution in the P18 field. **B)** Results of Monte-Carlo simulatons of the modelled reservoir capacity.



Oil and gas map of the Netherlands (modified from TNO Geological Survey of the Netherlands 2015, 2nd edn.). Producing gas fields in green, depleted gas fields in grey with green edge.

Conclusions

- Depleted gas reservoirs may have CO_2-storage potential
- The P18 offshore field is geographically and geologically suitable for carbon sequestration
- Several compartments add to a capacity of 33 - 40 Mt CO_2
- The main uncertainties are in BRV and geological heterogeneities

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