



Identification and evaluation of CCS sweet spots in the West Netherlands Basin

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Carbon capture and sequestration (CCS) is expected to become a serious CO₂-emission reduction technology in the Netherlands. The industry- and government-supported national research programme *CATO-2* is tasked to investigate the opportunities and feasibility of CCS projects, both onshore and offshore in the Dutch territory. An example of such opportunities are the deep aquifers and (soon-to-be) depleted gas reservoirs in the mature West Netherlands Basin (WNB), conveniently situated near CO₂-emitting sources in the Rotterdam industrial area and a future >1,000MW coal-fired power station.

This study aims to define, identify, evaluate and compare potential CO₂-storage reservoirs within the WNB, focusing on Triassic and Lower Cretaceous intervals. The identification of *sweet spots* for CO₂ storage is based on pre-defined geological boundary conditions, including trap type, geological and petrophysical reservoir architecture, top-seal and fault-seal quality, CO₂-storage capacity and reservoir depth, contributing to a cost-efficient reservoir (re)development at low environmental impact. These criteria are applied to a basin-scale structural model, constructed from a representative selection of public well and seismic data, in combination with a literature study on the lithology and petrophysical properties of the targeted stratigraphic intervals. Next, high-resolution 3D static reservoir models are constructed for identified *sweet spots*. The models are based on the analysis and correlation of comprehensive subsurface datasets, which allow for an accurate time-to-depth conversion, and reconstruction of the structural architecture and reservoir facies distribution. The models are populated with known petrophysical properties from the targeted stratigraphic intervals in the same area. These serve as a basis for subsequent dynamic flow modelling, CO₂-storage capacity recalculation and overburden studies. The various uncertainties in e.g. structural architecture, facies distribution and petrophysical properties are quantified and their effects are evaluated. In addition, calculated CO₂-storage capacity is compared with conventional estimates, which are based on anisotropic averaging of petrophysical properties without considering heterogeneity in the facies architecture.

In this study, the CO₂-storage potential is presented of *Buntsandstein* (Lower Triassic) fluvial sandstone in the depleted P18 offshore gas field and *Vlieland Sandstone* (Lower Cretaceous) shallow marine, coastal and fluvial reservoirs. Not only are the results important for selection of locations for future CCS projects, but they also serve to assess the proposed workflow, showing that reservoir structure, facies architecture and petrophysical properties play a major role in calculating storage potential. Furthermore, the conventional approach to calculating CO₂-storage capacity from average petrophysical values is found to significantly overestimate injectable volumes when compared to the results of this study. This emphasises the need for an accurate facies distribution model in estimating the CO₂-storage potential.