

Petroleum System Analysis

To reduce exploration uncertainty, a regional understanding of the petroleum system in the basin is important. Petroleum system analysis helps to understand the regional variation in source rock maturity and hydrocarbon generation.

Geochemistry & basin modelling

A regional petroleum system analysis project has been performed for the entire Dutch offshore to provide a high level overview of the distribution, quality and maturity of source rock intervals and their hydrocarbon generation capacity through time and space (IGI Ltd., 2019).

Results include complete geochemical characterization, maturity and expulsion maps of the main source rocks. These can be used as input for exploration studies in the area.

The study and dataset are publicly available via:
www.ebn.nl/en/exploration-production

Source rock characterization

- The geochemical database consists of >10.000 samples Rock Eval and Vitrinite Reflectance data from over 370 wells across The Netherlands
- The main source rocks have been identified by analyzing the organic richness (average TOC and S₂), the kerogen type (HI value) and maturity (VR) for each stratigraphic group
- An overview of the geochemical characteristics of the most prominent source rocks is provided (figure 2 and 3)
- The Jurassic Posidonia Shale is dominated by a oil-prone, predominantly marine environment of Type II kerogen
- The Carboniferous Limburg Group shales and coals are dominated by gas-prone, terrestrial material typical of Type III kerogen

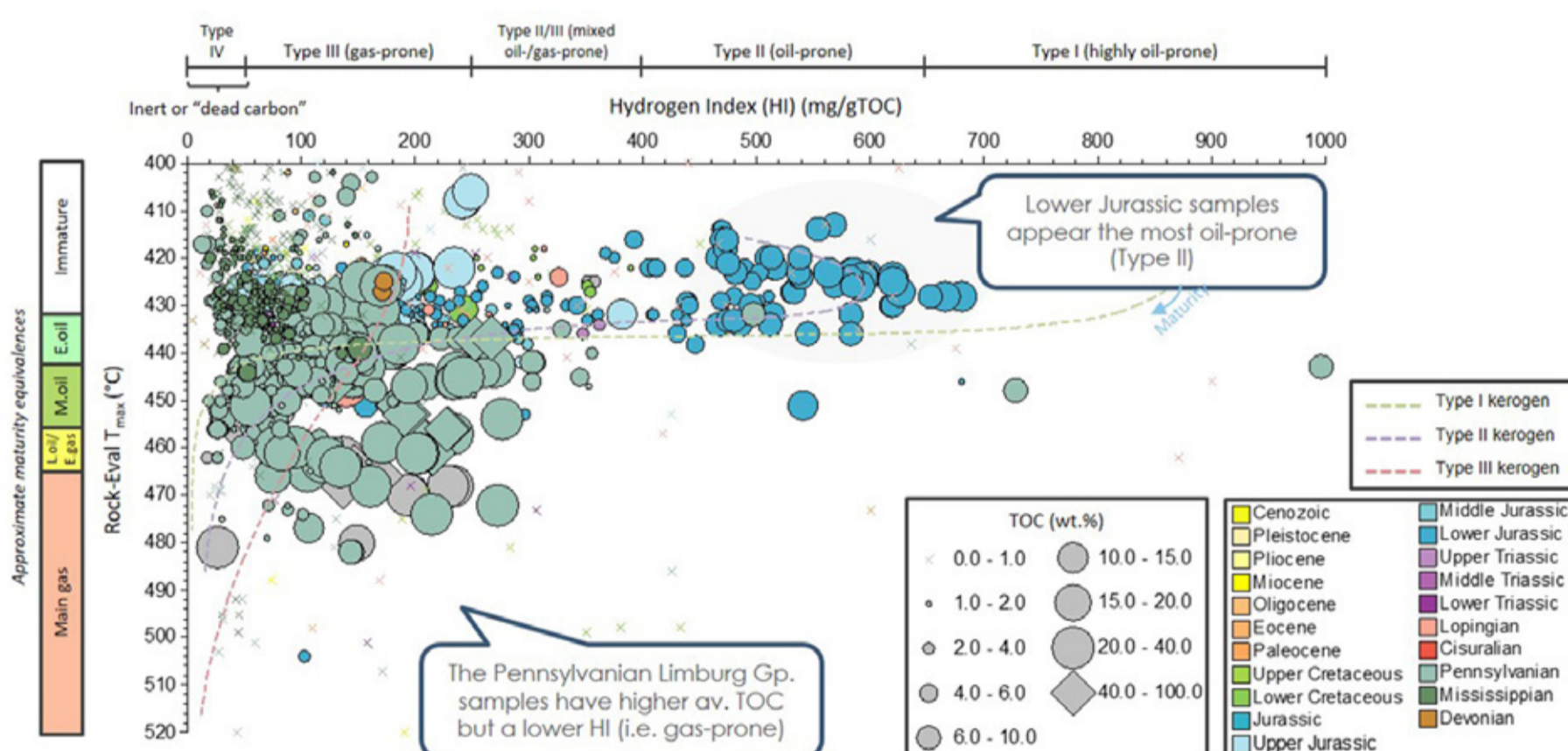


Figure 2. Kerogen types for Dutch offshore samples (colored by chronostratigraphy).

Maturity of main source rocks

1-D models have been constructed, covering all key structural elements, to thermally calibrate the grid based 3D model. Maturity and expulsion maps of the Posidonia Shale and Top and Base Westphalian have been created (figure 4).

Posidonia shale

- The Posidonia source rock is present in the Dutch Central Graben and Broad Fourteens Basin and is generally predicted to be early-oil to mid-oil mature
- A strong correlation to the distribution of known oil fields/discoveries

Westphalian

- The minimum maturity (top Westphalian) is predicted to be mid-oil mature at present day and the predicted maturity of the base Westphalian is mid-late gas mature throughout the area
- Predicted gas maturity shows good agreement with the location of known gas fields/discoveries
- The predicted Limburg Group (Westphalian) gas expulsion during the Cenozoic underlies most known gas fields/discoveries, suggesting relatively recent charge

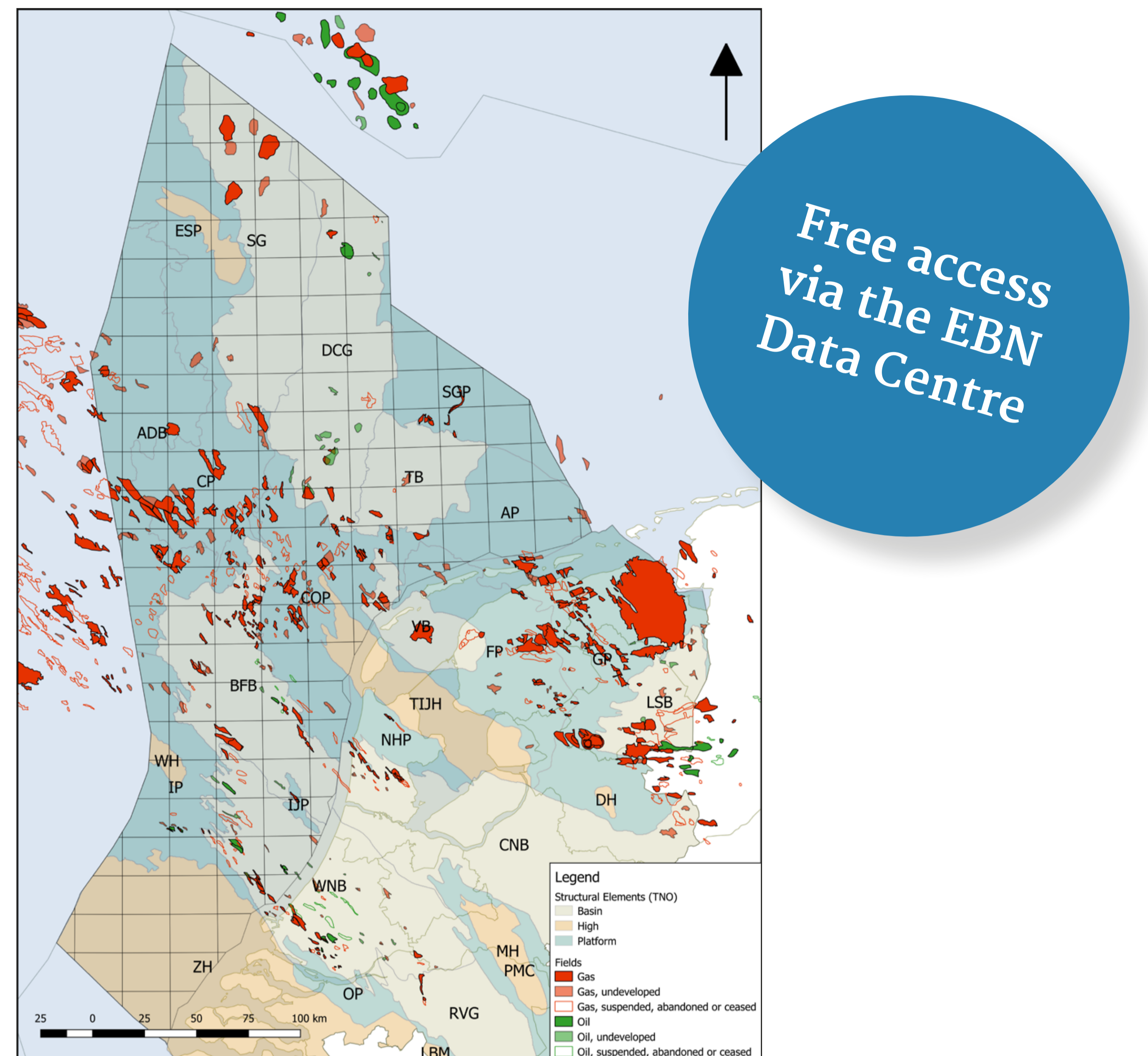


Figure 1. Overview of the study area: Entire Dutch offshore (approximately 57,000 km²).

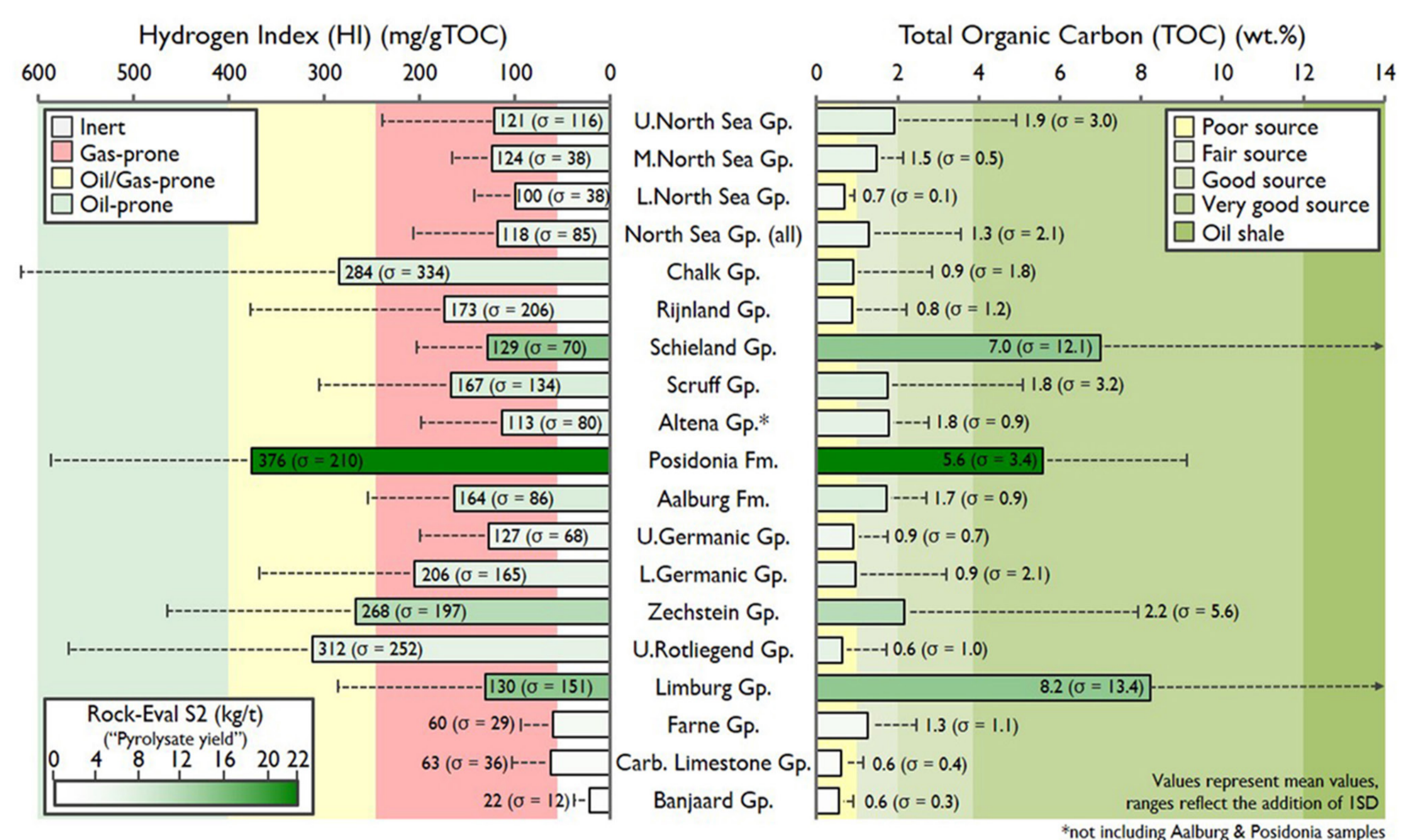


Figure 3. Average TOC, S₂ and HI values for Dutch offshore samples subdivided by formation for key units. The Limburg Group, Posidonia Formation and Aalburg Formation are the main source rocks in the Dutch offshore.

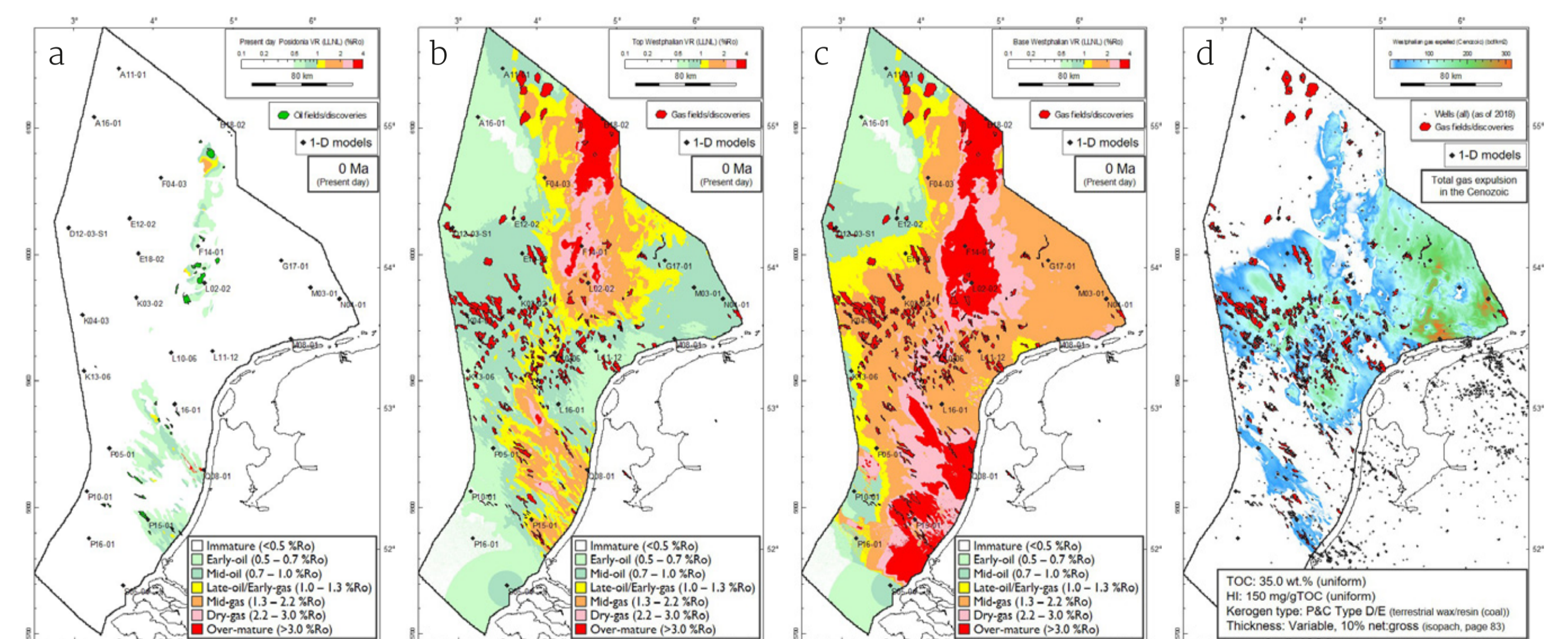


Figure 4. Showing the maturity of the Posidonia Shale (a), the Top (b) and Base (c) Westphalian and the Westphalian gas expulsion during the Cenozoic (d). Note that the Westphalian is very thin, absent or unproven in the northern offshore and therefore the predicted maturity is presented only as a guide.



The full petroleum system analysis study performed by IGI Ltd. is publicly available. Access can be requested via www.ebn.nl/en/exploration-production

For questions contact exploration@ebn.nl