



## **Evolution of the lower Rhine-Meuse delta (the Netherlands) in the Early and Middle Holocene: an interplay between fluvial and coastal processes**

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The landscape in the south of the North Sea Basin (Rotterdam, the Netherlands) changed dramatically during the Early and Middle Holocene. 12000 years ago sea-level stood ~57 m lower than today. The Early Holocene landscape, at present buried below 15-20 m of Holocene sediment was a wide Rhine river valley bordered by slightly higher terrain (dune fields on river terraces). 9000 years ago, delta formation set on in the area [1]. 6000 years ago, sea level had risen to within 5 m of the present level [2]. The landscape had evolved into a barrier-lagoon system, initially with many and eventually with only few river outlets [3]. In the back-barrier lagoon, the Rhine-Meuse delta developed [4]. In the study area, river outlets functioned as estuaries and attracted human activities at all these stages of deltaic and coastal landscape development [1-4].

Especially for times of rapid sea-level rise and rapid drowning between 9000 and 6000 years ago, interlinked reconstruction of developments is a challenge. Established modern-analogue based landscape evolution models for coastal and fluvial systems do not apply because the Early Holocene rates of sea-level rise have no modern analogue. We aim to reconstruct the sedimentary architecture of the Early-Middle Holocene base of the Holocene delta in detail, distinguish and map different facies (proximal-

distal, water depth, tidal-fluvial, lithology, palynology, provenance), quantify volumes of sediment (budget analysis), and establish and densify records of groundwater-level and sea-level rise. Hereto a huge amount of data has been made available: >50,000 corings and >50,000 cone penetration tests, detailed offshore seismic data, many dates from  $^{14}\text{C}$  and OSL, and pollen and diatom counts.

Here, we present the development of the lower Rhine-Meuse delta, based on the new data and interlinked coastal and fluvial mapping approach. We will show the influence of the Early-Middle Holocene development on the modern landscape and highlight the differentiating and unifying factors when contrasting Rhine delta evolution 9-6 ka compared to 6-0 ka.

#### References

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