

Challenges in designing a wind farm on an eroding beach

Authors: Bas van Leeuwen¹, Marius Sokolewicz², Anne de Beer³, Arjen Luijendijk³, Yorick Broekema³, Jelmer IJntema², Dirk Jan Peters²

¹ Svašek Hydraulics, Rotterdam, The Netherlands

² Haskoning, Amersfoort, The Netherlands

³ Deltares, Delft, The Netherlands

Abstract

In 2021, a new wind farm with twelve 6.2 MW turbines was built on the beach of Maasvlakte-2, the seaward extension of the Port of Rotterdam. The sandy beach and dunes are part of the flood defence of the port with a 1 in 10 000 years safety standard. This highly erosive beach is maintained by means of regular, biennial nourishments. The wind turbines with a hub height of 103 m have a monopile foundation with a diameter of 5 m and are located close to the waterline. Both the naturally varying beach profile and the local erosion caused by monopiles were a concern regarding the flood safety of the Port during the initial design phases, while also posing a challenge for the design and construction. The multi-scale beach phenomena were extensively studied with numerical and physical models, and using volumetric and statistical analyses. Four years after completion, the predicted and actual beach variation can be compared and conclusions can be drawn.

Keywords

coastal engineering/erosion/hydraulics and hydrodynamics/numerical modelling/renewable energy/UN SDG 7: Affordable and clean energy.

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