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Soil-Structure Interaction for Non-Slender, Large-Diameter Offshore Monopiles: Vol 1

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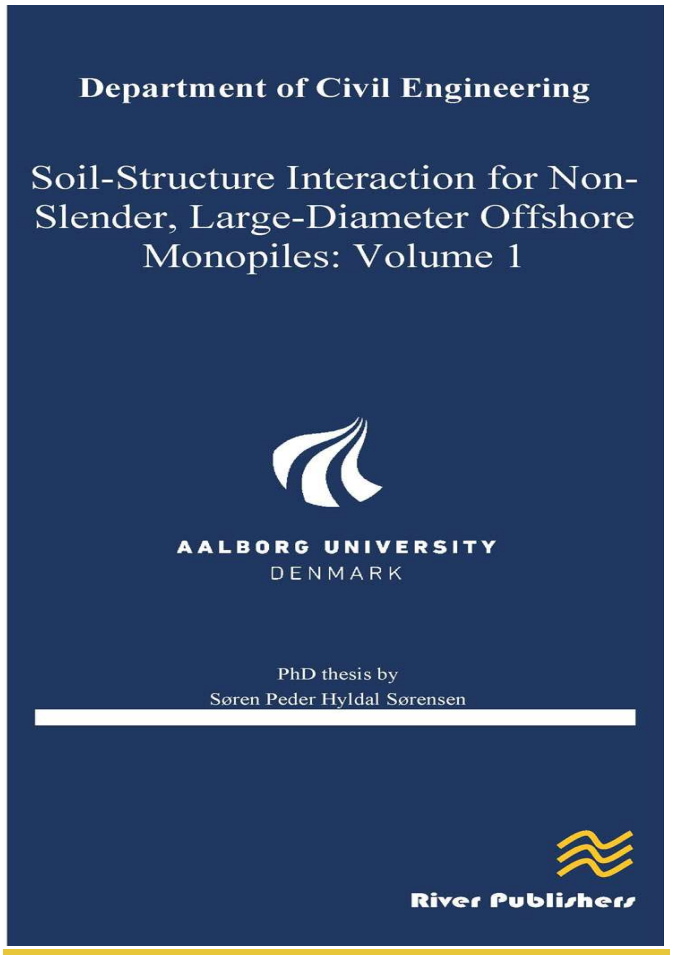
Offshore wind power is a domestic, sustainable and largely untapped energy resource. Today, the modern offshore wind turbine offers competitive production prices compared to other sources of renewable energy. Therefore, it is a key technology in breaking the dependence on fossil fuels and in achieving the energy and climate goals of the future.

For offshore wind turbines, the costs of foundation typically constitute 20-30% of the total costs. Hence, improved methods for the design of foundations for offshore wind turbines can increase the competitiveness of offshore wind energy significantly. The monopile foundation concept has been employed as the foundation for the majority of the currently installed offshore wind turbines. Therefore, this PhD thesis concerns the soil-pile interaction for non-slender, large-diameter offshore piles.

A combination of numerical and physical modelling has been conducted. The initial part of p-y curves for non-slender piles has been investigated by means of numerical modelling. The general behaviour of eccentrically loaded non-slender piles has been investigated by physical modelling. These tests have been conducted in the pressure tank at Aalborg University. Hence, the application of an overburden pressure is possible. The timescale of the backfill process and the compaction of soil material backfilled around piles in storm conditions have been investigated by means of large-scale physical modelling.



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