Physical modelling as a tool in the design process of coastal structures

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DEME

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Physical modelling at DEME

- 2011: SARB island (UAE) – 2D (overtopping, stability) and 3D (overtopping, stability, wave agitation).
- 2011: Ada coastal protection (Ghana) – 2D (rock stability).
- 2015: TTP1 (Singapore) – 3D (stability of scour protection in propeller wash).
- 2017: Cotonou coastal protection (Benin) – 2D (rock stability).
- 2018: Hail & Gasha (UAE) for tender – 2D (stability, overtopping).

Also to study scour around offshore windmill foundations (DEME Offshore):

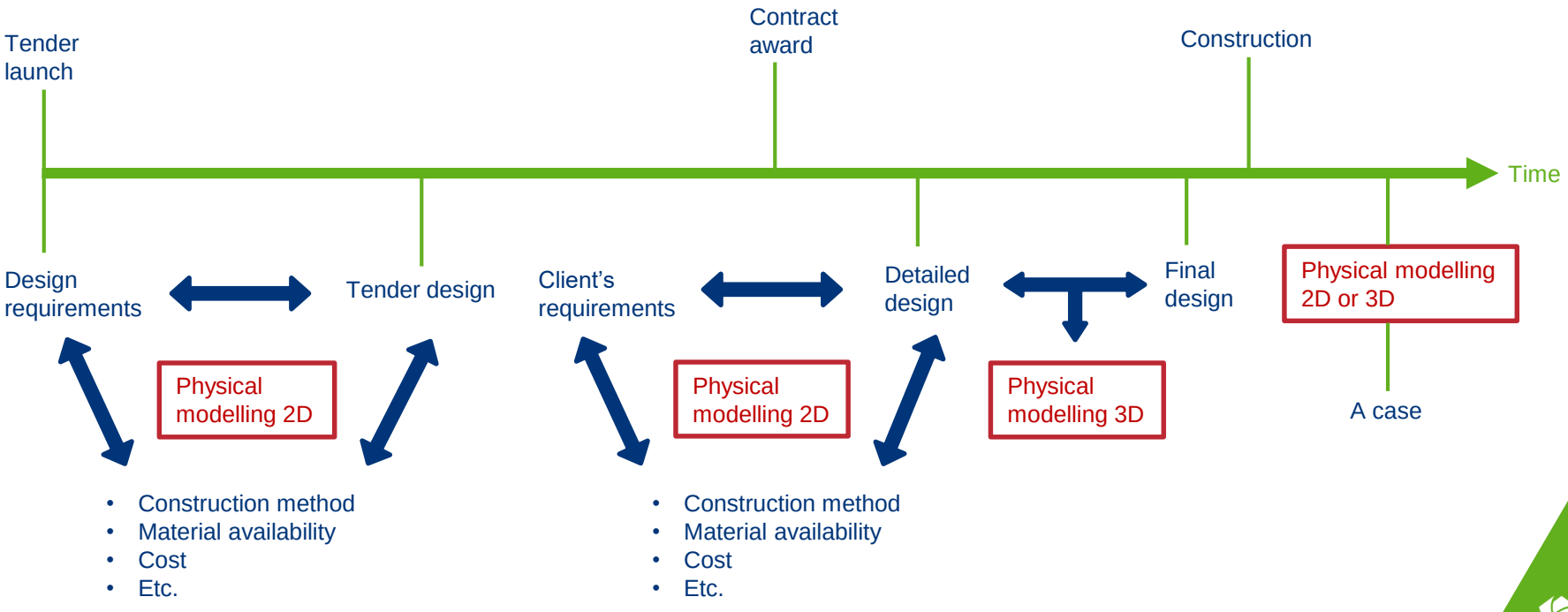
- Hohe See (Germany).
- Merkur (Germany).
- Trianel Borkum West (Germany).
- Seamade (Belgium).

A timeline

A case

COB

Timeline of the design process of coastal structures



An example of 3D physical modelling

Temporary rock structure protecting a future development area.

Scale 1:40.

Design stability criteria: initiation of damage.

Design overtopping criteria: q < 1 l/s/m

Design conditions with a return period 1/10 years for a temporary structure

Prototype values

Return period [years]	H_{m0} [m]	T_p [s]	h_{toe} [m]
1/1	1.30	7.5	
1/10	2.25	8.4	
1/20	2.55	8.7	
1/50	2.95	9.1	5.64
1/100	3.30	9.3	
Cyclone	3.80	14.5	

Design conditions

Calibration of waves with a spending structure.

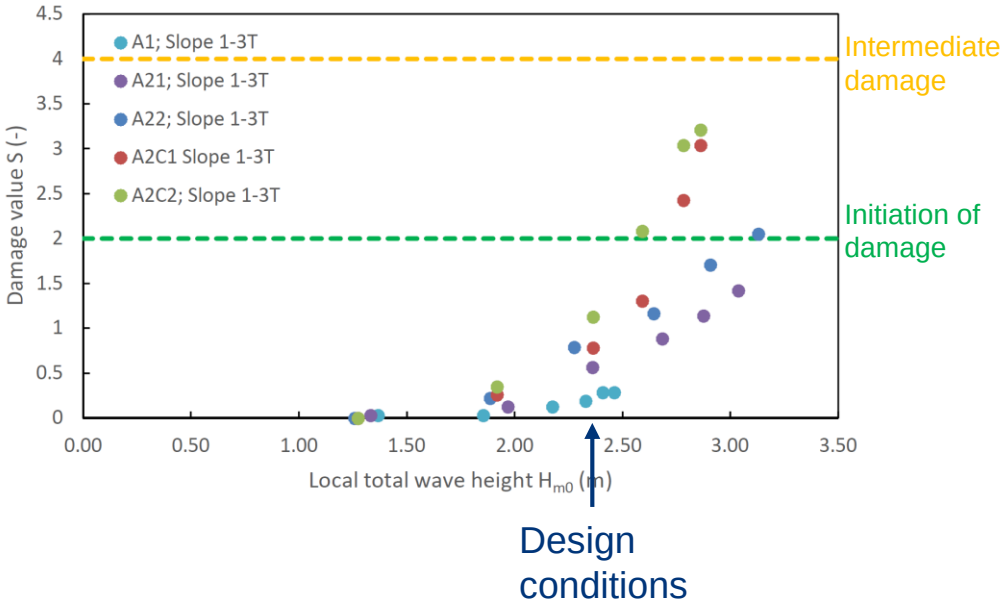
1000 waves with a JONSWAP spectrum (γ = 3.3).

Measurement of wave conditions offshore and at the toe of the structure.

The shore protection is stable for design conditions

Overtopping: <0.01 l/s/m for design conditions
(criteria: 1 l/s/m)

Stability (except cyclone conditions):



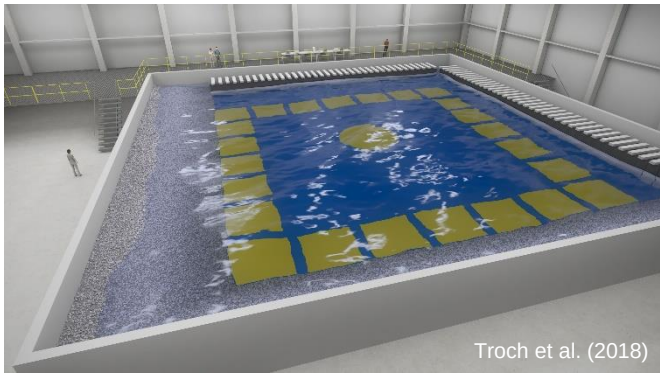
The relation between DEME and the COB will be productive

State-of-the-art facility near our HQ to perform 3D physical modelling for the design of coastal structures.

Also physical modelling related to offshore projects.

Close collaboration with the COB partners.

Research projects to push forward the frontiers of knowledge.

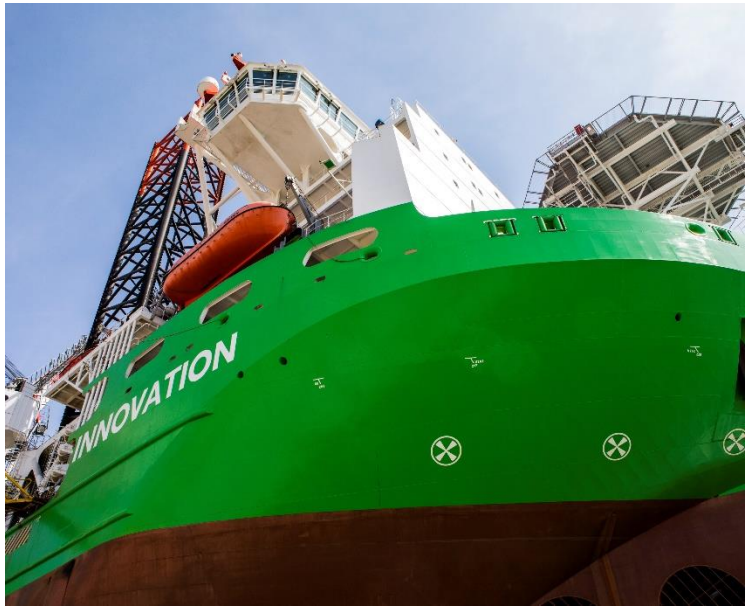

Troch et al. (2018)

Take-home messages

The use of physical modelling is an intrinsic part of the design process of coastal structures.

The fulfillment of the design criteria can be checked. Optimizations can be tested.

At DEME we are looking forward to becoming active users of the COB.



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