

MP Multi-Use

Multi-(re)-use scenarios for existing offshore monopiles infrastructure: a conceptual, economical, legal and structural reliability study

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Subsidized by EnergieTransitiefonds call 2022  FOO Economic, KMO, Middenstand en Energie

Objectives

The project studies the feasibility of (re)-using existing infrastructures (monopiles foundation and electrical equipment) for hybrid energy generation and/or repurposing it for wave/tidal energy, floating solar

or accommodating storage technologies as alternative for a full decommissioning.

Project rational:

399 offshore wind turbines of which 345 on monopiles are currently installed in the Belgian Part of the North Sea. The oldest WTGs are already 15 years operational.

Our research question:

Can we re-use monopiles foundations by giving a second end-of-life use for these structures?

Method

WP 1: State of the Arts & Concept Selection

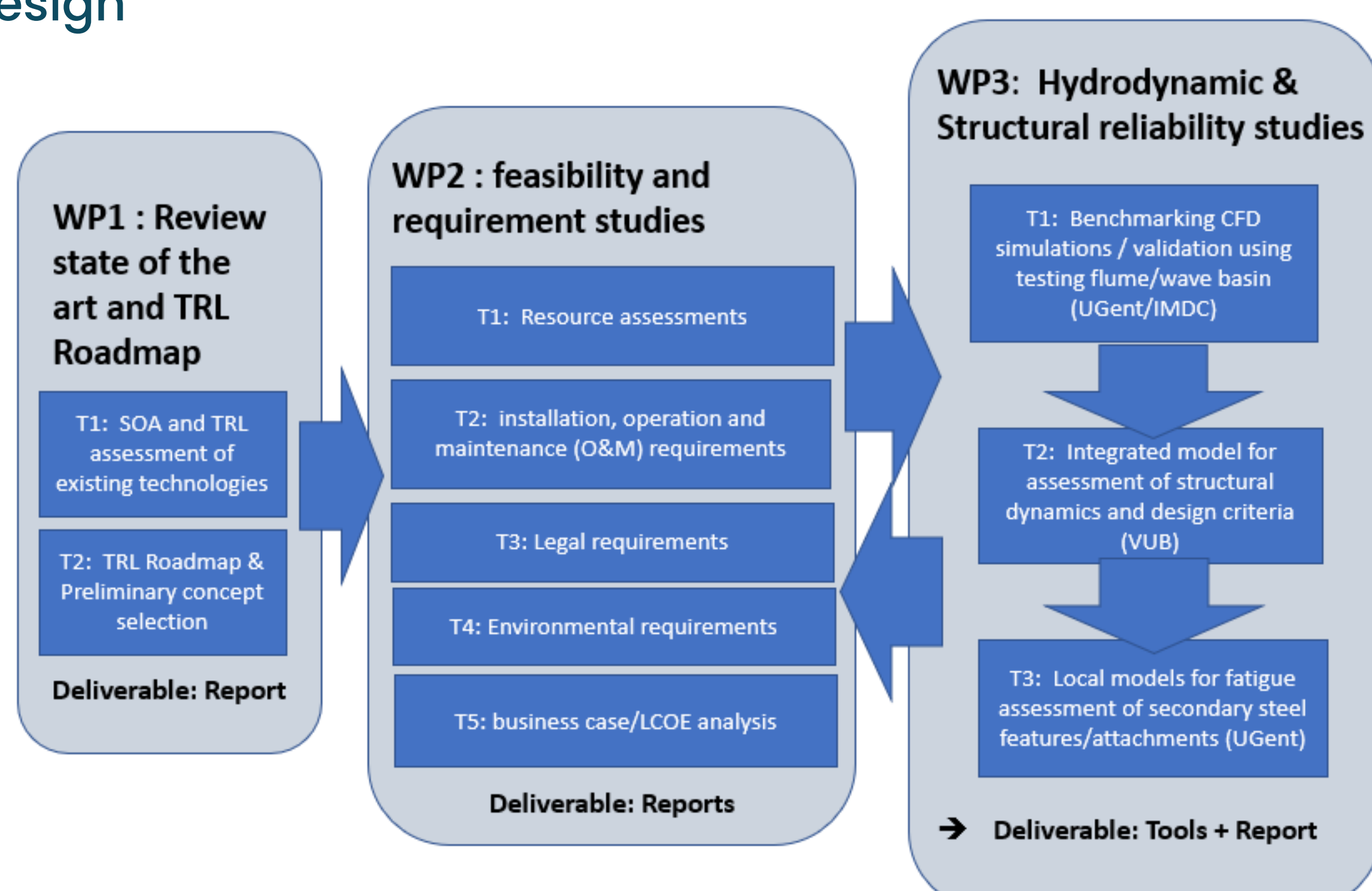
- State of the arts of technologies (wave energy, tidal energy, Floating PV, energy storage...)
- **Semi-quantitative Multi Criteria Decision Analysis (MCDA)** with criteria such as constructability, operability, energy resource, business case, TRL and readiness, environmental and legal
- Preliminary legislation screening and gaps analysis

WP 2 Feasibility study and business case

- Energy Resource assessment
- Constructability and Operability study
- Legal requirement
- Preliminary environmental screening
- LCOE & business case

WP3 : hydrodynamics, CFD and structural reliability studies

- Hydrodynamics validation incl. Model test at Coastal & Ocean Basin (waves and currents) in Oostende
- Verification of structural reliability of monopile
- Fatigue assessment of secondary steel and new connection design

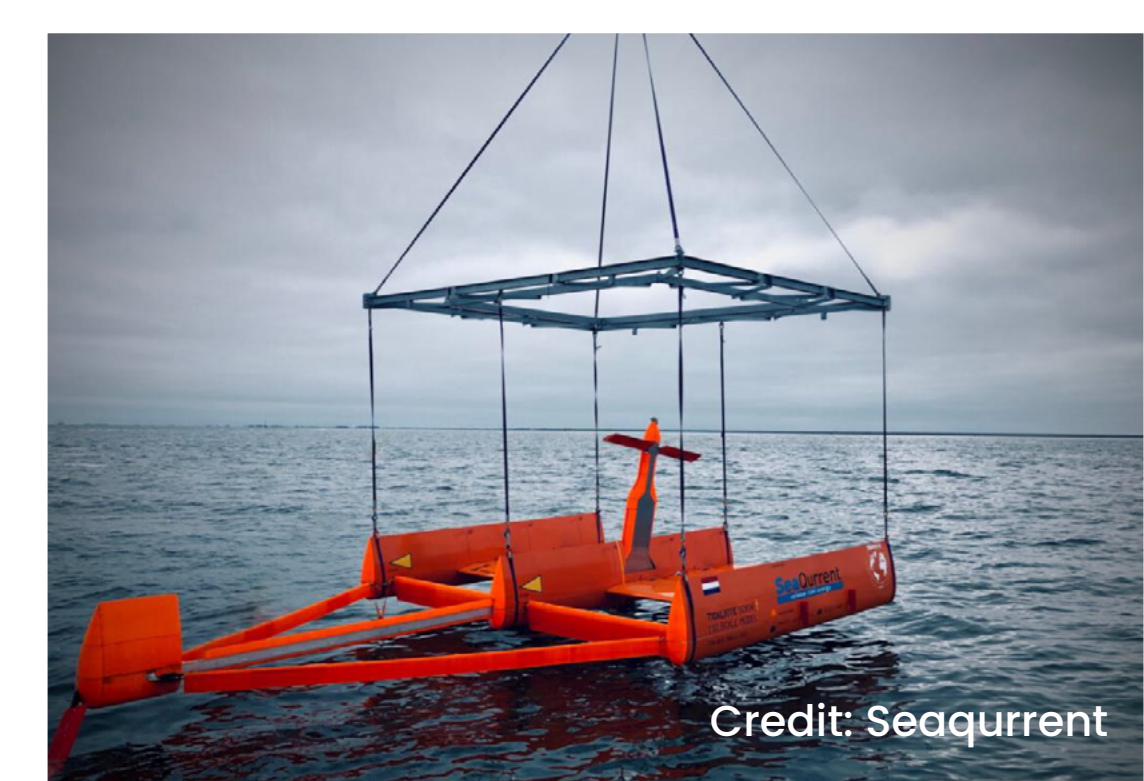
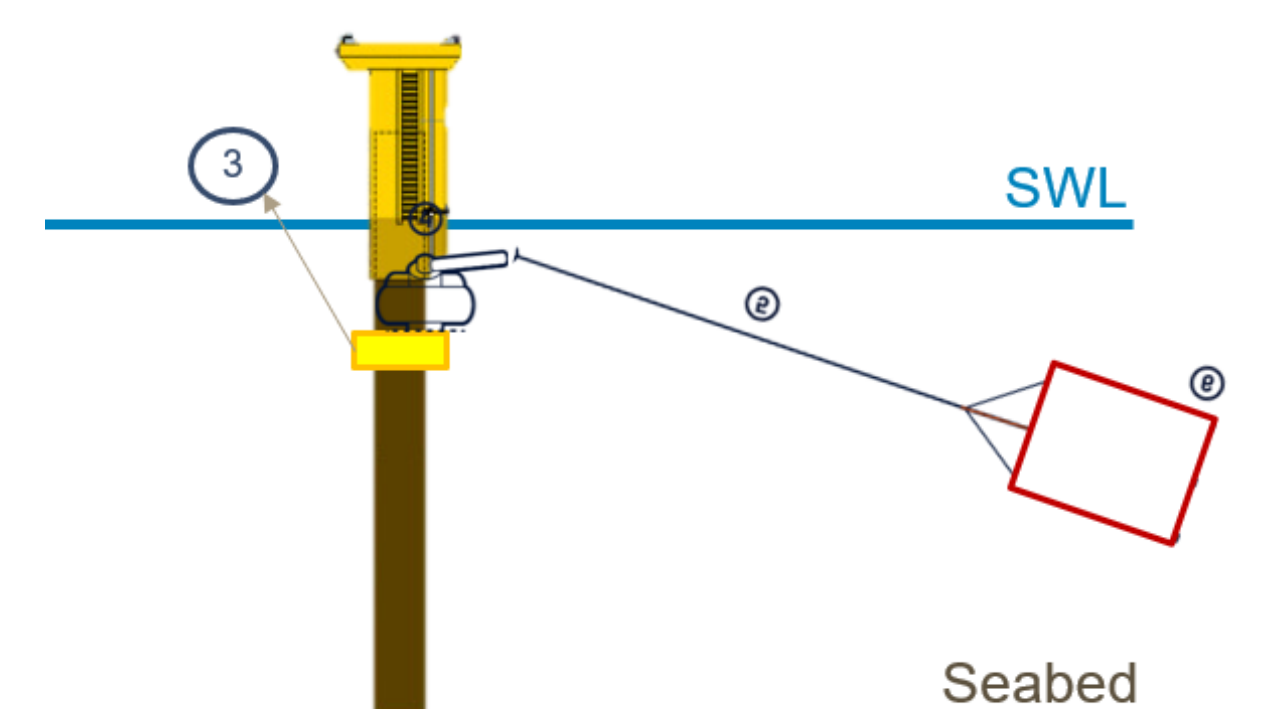


Results

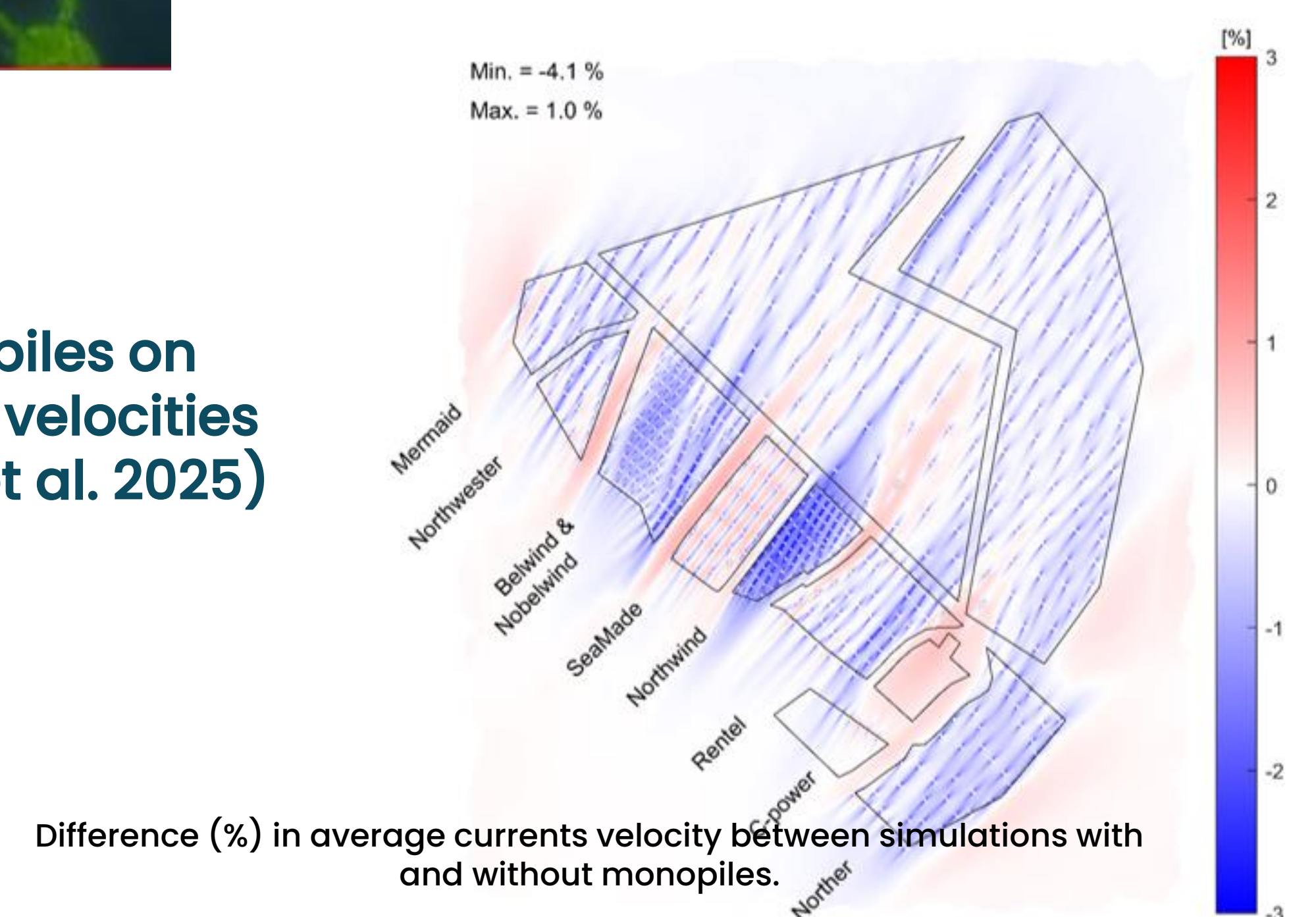
Results MCDA

Preferred concepts to be assessed during WP2 & WP3:

- Tidal Kite (e.g. Seacurrent, Minesto)
- Wave energy (Wavehexapod, Wave star, Sigma Energy)
- additional technologies to enhance the business case:
- Floating solar
- Energy storage,
- Radar/lidar
- Testing centre



Impact of monopiles on average current velocities (+/-3%) (Alemi, et al. 2025)



Conclusions & next

- Assess the economical viability (energy resources, LCOE...)
- Design for Constructability and For Operability
- Assess structural integrity of monopiles and fatigue
- Preliminary impact environmental study and legal recommendations