Høgskulen
på Vestlandet

MarinLab

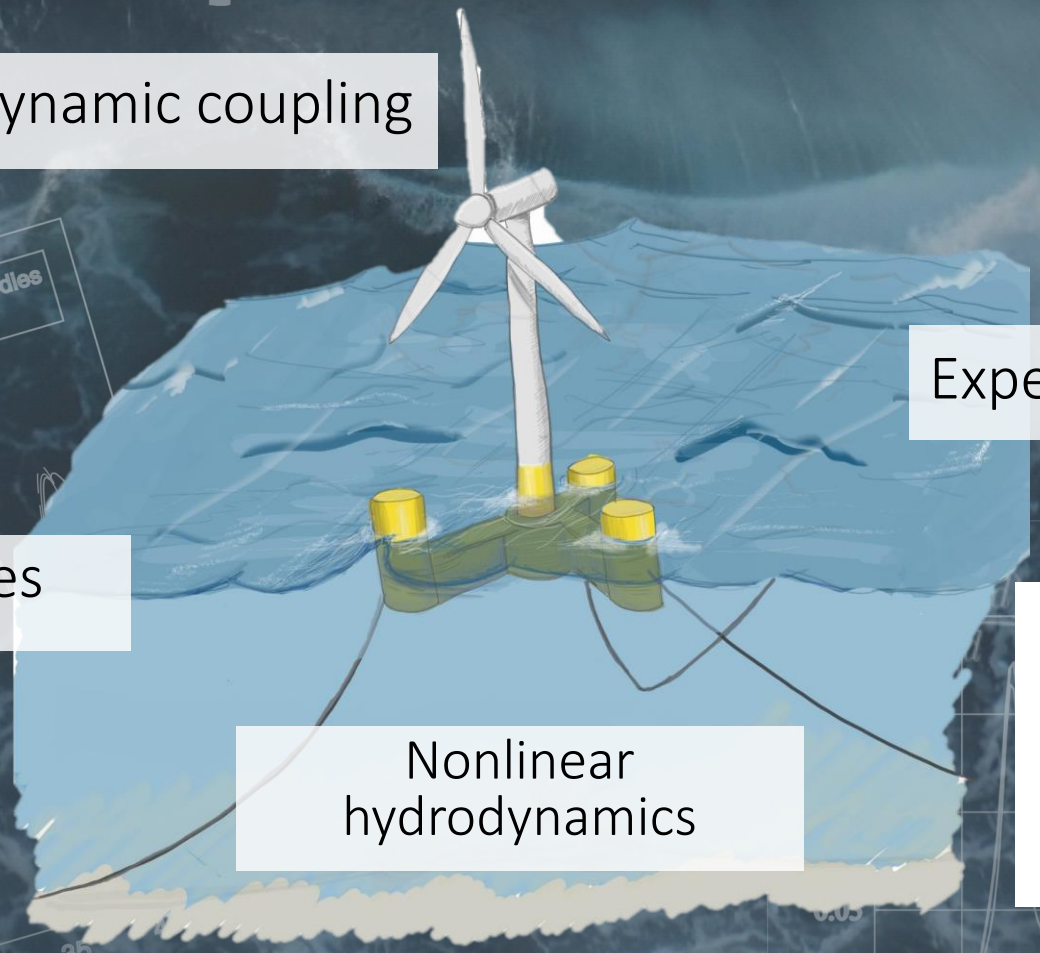
HYDROMORE

HYDRODYNAMIC MOORING ANALYSIS FOR OCEAN RENEWABLE ENERGY

The University of Manchester

University of Oslo

SINTEF



Aerodynamic coupling

Experimental Validation

Breaking waves

Nonlinear hydrodynamics

Forskningsrådet

FRIPRO

NFR IMPACT REQUIREMENTS

2.1 Potential for academic impact:

- The extent to which the planned outputs of the project *address important present and/or future scientific challenges*.

2.2 Potential for societal impact (if addressed by the applicant):

- The extent to which the planned outputs of the project address *UN Sustainable Development Goals* or otherimportant present and/or future societal challenges.

- The extent to which the potential impacts are *clearly formulated* and *plausible*.

2.3 Communication and exploitation

- *Quality* and scope *of communication* and engagement activities with different target audiences, including relevant stakeholders/users.

HYDROMORE EXPERIENCES

1. Impact must be inherent throughout the proposal:

e.g. Introduction:

- *"…challenges remain around upscaling floating wind turbine (FWT) technology to plant-size farms,…The mooring is a vulnerable structural component of an ocean renewable energy (ORE) platform. Snap loads are a particular problem in extreme waves, and also in intermediate waves affecting fatigue performance [5]. There is a widespread consensus that mooring system design and modelling is a major challenge that needs to be overcome [6]."*

HYDROMORE EXPERIENCES

2. Identify a clear knowledge-gap that has impact:

"There thus exists a gap between the computationally efficient (but limited accuracy) of coupled linear and second-order time-domain engineering models, and the excessive computational expense and accuracy offered by fully nonlinear methods. Such a gap between the methods is imperative to address, should floating wind be realised to its full potential."

HYDROMORE EXPERIENCES

3. Impact via coherent structure:

- 4 work packages – 1 milestone per WP
- Each work package clearly cross-referenced in Gantt chart

WP	Task No.	Task Name	Researcher	2021	2022				2023				2024				2025				2026	
				4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2
		Paternity leave	PI																			
1	1.1	Linear diffraction modelling	PI, PKS																			
	1.2	Multibody dynamics and mooring line model	PI, M, PhD1																			
	1.3	Numerical wave tank development	PI, PKS, PhD1																			
	1.4	Second-order damping model	PI, PKS, AJ, PhD2																			
	1.5	Numerical model comparison	PI, PKS, PhD1, PhD2, PAB						MS 1									MS 4				
2	2.1	Breaking wave prediction	PI, AJ, PhD2																			
	2.2	CFD simulation of undisturbed wave	PI, PKS, AJ, PhD2, M																			
	2.3	Hybrid breaking wave methods	PI, PKS, PhD1, PhD2																			
	2.4	Multi-directional sea-states and wave groups	PI, PhD1																			
3	3.1	Quasi-steady BEM model	PI, PhD1, M																			
	3.2	Actuator-line wake model	PI, GS, PhD1																			
	3.3	Comparison to experiment	PI, PhD1											MS 2								
4	4.1	Wave/wind testing of spar-buoy and semi-submersible FWTs	PI, PKS, AJ, PAB, PhD1, PhD2																			
	4.2	Analysis of WINDMOOR test-data	PI, PAB, PhD1, PhD2																			
	4.3	Turbine self-wake experiments	PI, PhD1, M													MS 3						
		Recruiting of Ph.D candidates	All														MS 5a					MS 5b
		Dissemination of results	All							P 1				P 2		P 3			P 4			P 5

HYDROMORE EXPERIENCES

3.1 A picture says 1000 words:

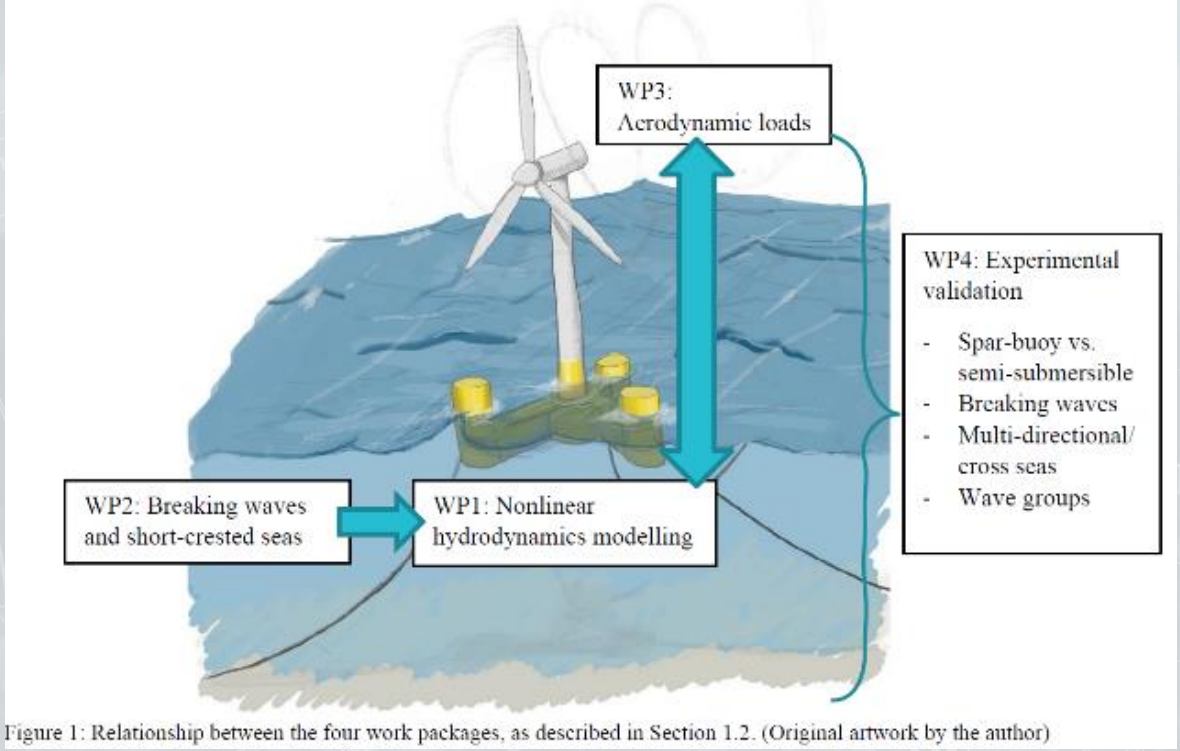


Figure 1: Relationship between the four work packages, as described in Section 1.2. (Original artwork by the author)

POTENTIAL FOR ACADEMIC IMPACT

Demonstrate excellence & feasibility

Short vs. Long-term impacts:

"In the short-term, this project will contribute to informing new methods for the analysis of mooring systems for ORE."

"In the long-term, the methods developed within this project will help contribute to the knowledge of improved coupled hydro-aerodynamic mooring load assessments for the design of ORE devices."

POTENTIAL FOR ACADEMIC IMPACT

Local impact:

"The main academic impact of this work will be the improvement of the research-informed curriculum at HVL, through the enhanced competence and knowledge gained."

"The tools for testing and numerical analysis developed through this project will directly bid towards strengthening the depth of academic knowledge available to these local businesses…"

POTENTIAL FOR ACADEMIC IMPACT

International impact:

"Many of the partners are separately involved with the development of ground-breaking floating technologies and so the methods assessed here will … potentially aiding the eventual full-scale deployments of these devices."

POTENTIAL FOR SOCIETAL IMPACT

Address each relevant SDG:

"Through elevating research-based teaching, improved education within ORE will be realised (SDG 4)."

"This project seeks to contribute to creating more sustainable communities (SDG 11) and is a direct action to reduce the impact of human-generated climate change (SDG 13)."

MEASURES FOR COMMUNICATION

Identify the stakeholders:

"The first stakeholder is the developers and consultancy firms involved in the design and commercialisation of floating offshore wind and wave technologies."

Justify with specific examples:

"These will be attracted through networks in which the partner institutions are members, for example, HVL is a member of GCE Ocean Technology, UoM is a member of the EPSRC SuperGen ORE Hub and SINTEF Ocean within the European JPWind consortium."

"The researchers…will participate in various national and international conferences throughout the duration of the project to communicate results, e.g. DeepWind (Trondheim, annual), RENEW (Lisbon, biennial), EWTEC (pan-European, biennial), SuperGen Annual Assembly (UK, annual)."

REVIEWER FEEDBACK

- *Clear academic impact is expected, the identified challenge being fully integrated in a larger problem which deserves significant investment and research.*
- *Offshore floating windmill farm is indeed identified as a clear international and sustainable goal, hence impact can be great since the fossil-free society implies that renewable electricity must be produced in large amounts.*
- *There is a clear communication plan. Very well laid out project which should produce valuable results that should reach a wide community.*