Royal Academy of Engineering

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INTELLIGENT & RESILIENT
OCEAN ENGINEERING

University of Southampton

Finding Space for Offshore Wind to Support Net Zero

GIS multivariate framework for marine spatial planning

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Research Showcase | Summer School on Advances School on Advances Geospatial Data Science | 10-09-2024

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Big Data and Geographic Information System (GIS)

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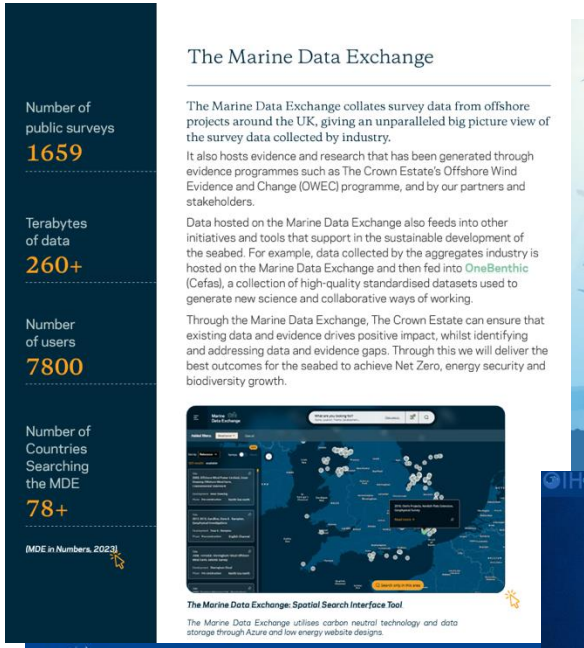
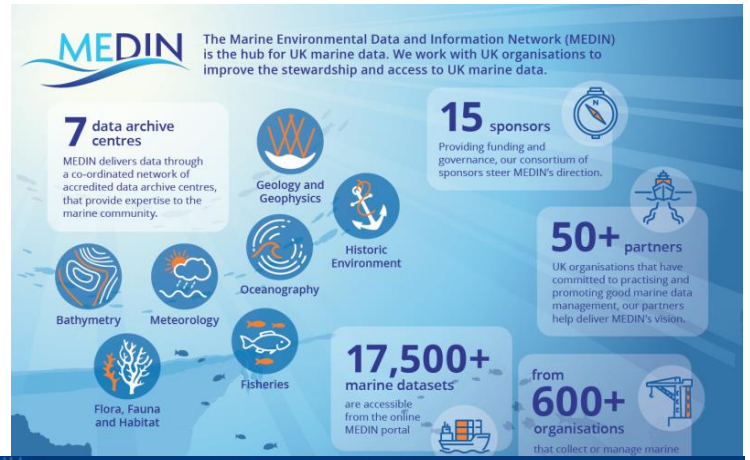
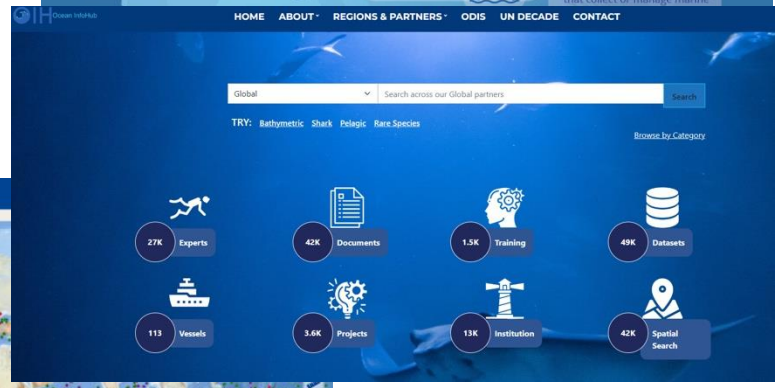
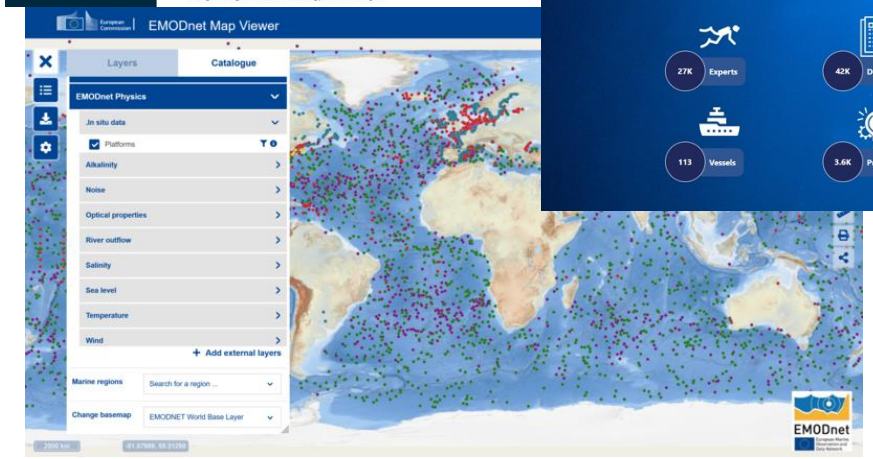


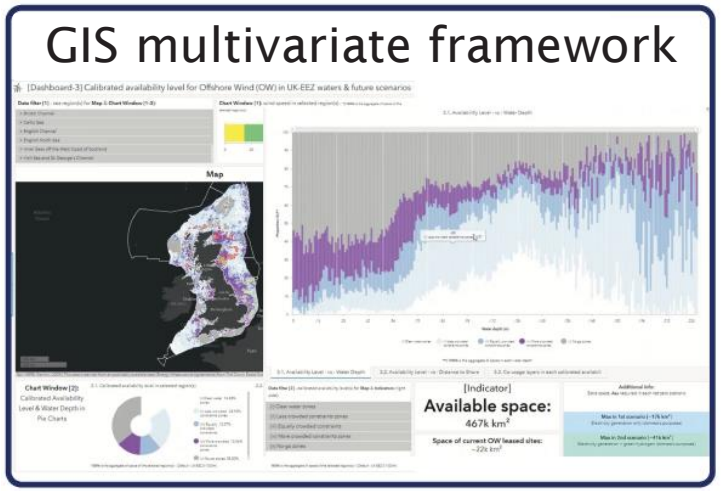






CC-BY: Wind Europe

CC-BY: RenewableUK



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GIS-based multivariate framework - CartOcean

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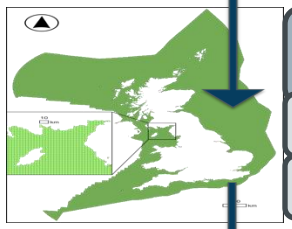
Spatial 'big' data collection



Regional Scale digitalisation

CartOcean-DB-UK v.0

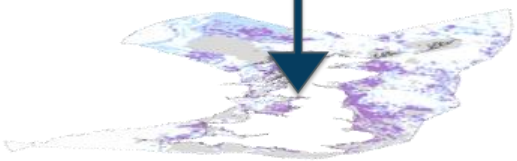
Up to 34 spatial layers

CC-BY: Ørsted

Spatial model/analysis application

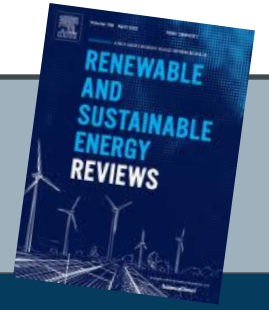
Net zero target by 2050

Spatial constrains analysis



Open access GIS platform - ***CartOcean***

Published work → Finding space for offshore wind to support net zero: spatial constraints and future scenarios in UK case study



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Supergen Offshore Renewable Energy

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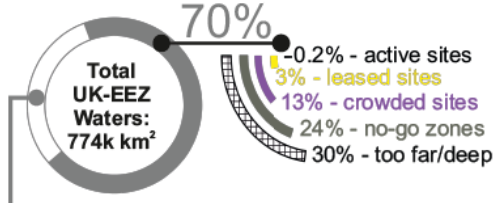
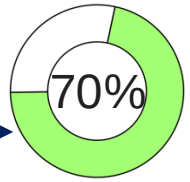
Video tour of StoryMap for:

"Finding space for offshore wind constraints and future scenarios

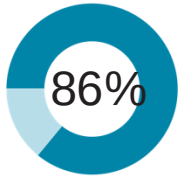


30% is available



is in **difficult seabed**

is with at least **an ecological/ anthropogenic constraint**



is in **deep water**

5% of UK-EEZ *(1/5 of avail area)* needed for net zero **(+150GW)**

Future challenges

Cumulative effects on marine ecosystems

Deeper water & further from shore

Demands on supply chain

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Development for future marine spatial planning

Spatial 'big' data collection

Enhancement of the spatial database

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10x multiplication: 300+ spatial layers

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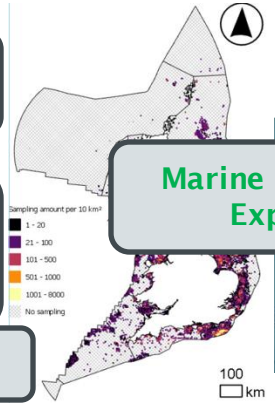

Marine Ecologist Experts

Mart Solan

Tom Williams

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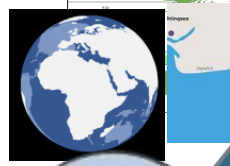

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Application of various spatial models for foundation design

to carry out engineering planning for offshore wind or other offshore structures/interventions

Installation of different anchor type

Reduction of anchor size

Reduction of mooring size/seabed footprint

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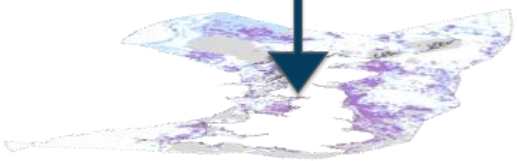

Open access GIS platform - *CartOcean*

Data insight to stakeholders

R&D + collaboration

Future challenges

[1] Cumulative effects on marine ecosystems

[2] Deeper water & further from shore

[3] Demands on supply chain

Geotech Engineering Experts

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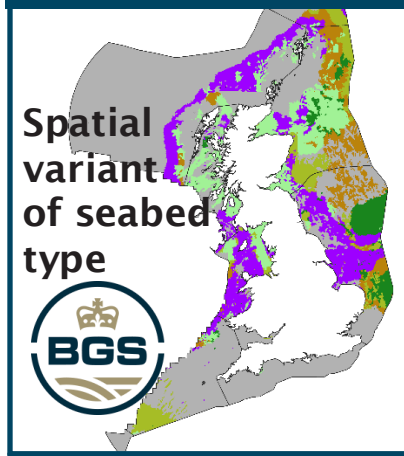
Geospatial assessment for drag anchors suitability and supply chain needed

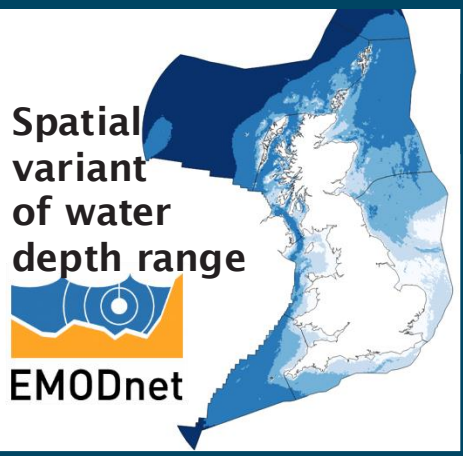
Society for Underwater Technology

University of Southampton

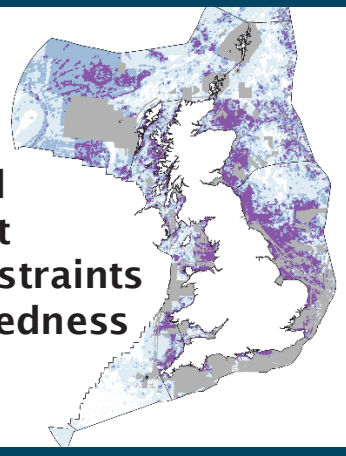
Seabed data



Water depth data



Spatial constraints and net zero target

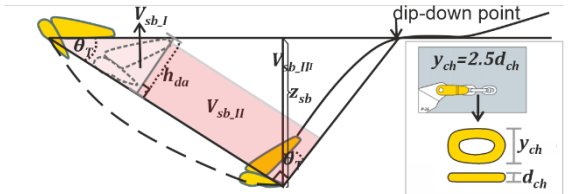


Further reading

Putuhena et al. 2023. *RSER.*

Anchors penetration and mooring dimension model **(Stevpris Mk-6)**

Illustration of drag anchors penetration

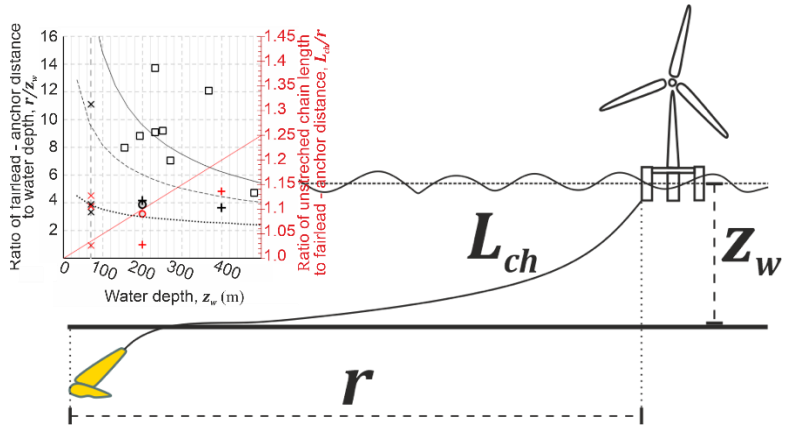


DELMAR

Model assumption:

Required capacity needed = 20MN

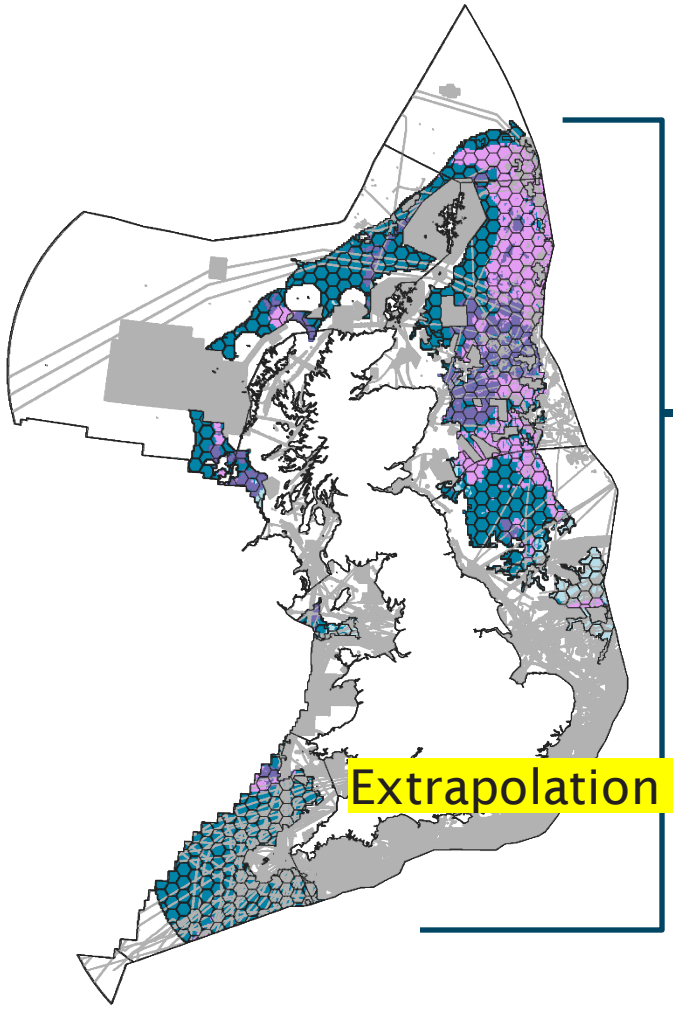
Simplified estimation of length/weight of chain needed for different water depth



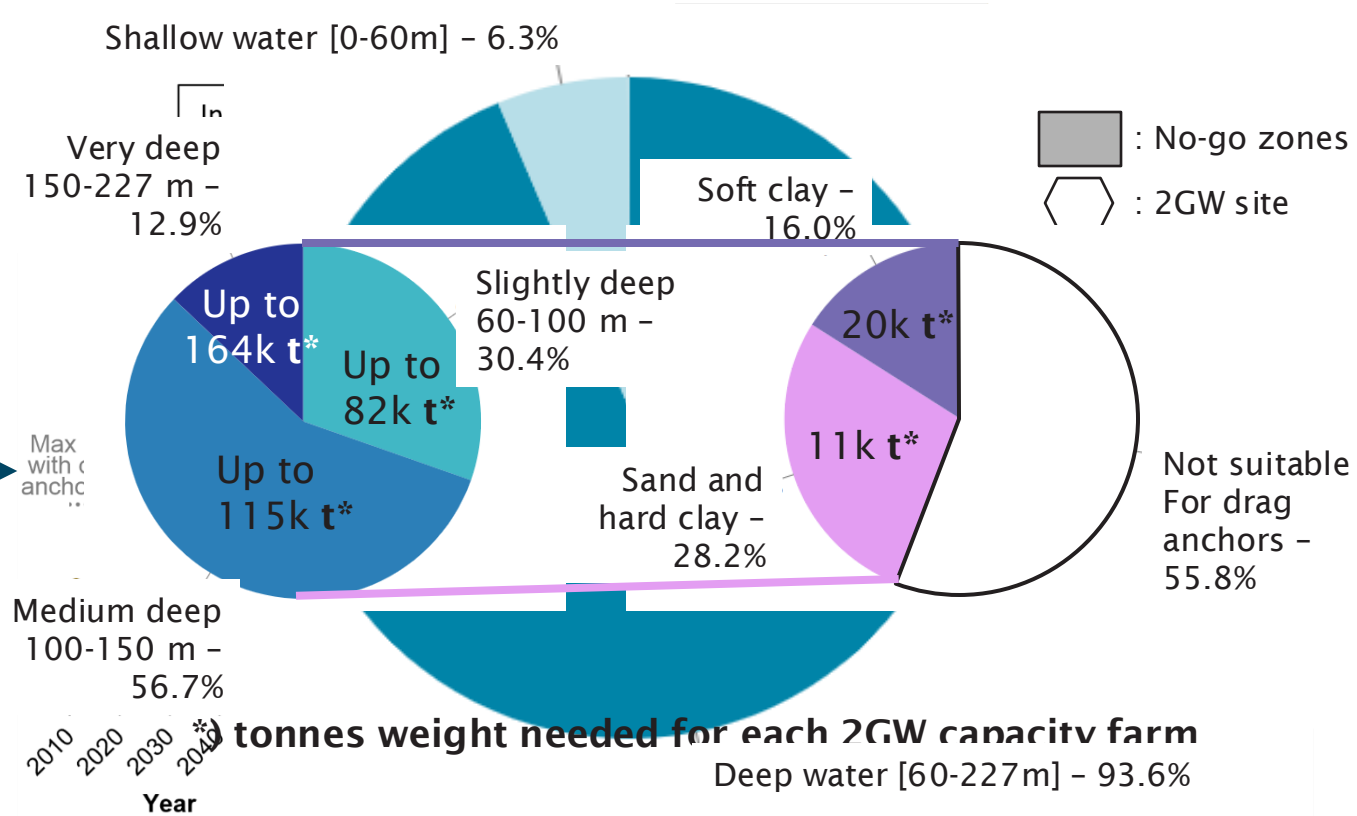
Calculating **total weights** of **drag anchors** and **chain**

Key results

Suitable area for drag anchors in UK waters (water depth variety)



Suitable area for drag anchors in UK waters in chart



Extrapolation to Global floating OW target: 264 GW, DNV (2022)

To achieve **140 GW**:

→ **38x10³ km²** area needed

→ **26x10³ km²** sand and hard clay needed

→ **11x10⁶ km²** deep water needed

Available areas for future offshore wind

Areas suitable for drag anchors → **63x10⁶ km²**

Areas w/ shallow water depth (<60 m) → **12x10⁶ km²**

Areas w/ deep water depth (60-227 m) → **175x10⁶ km²**

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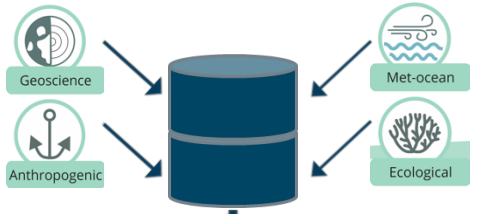

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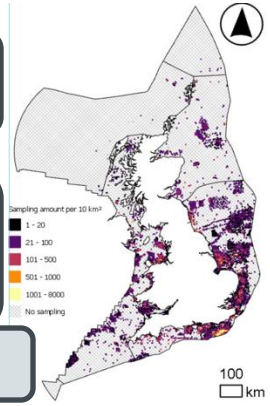

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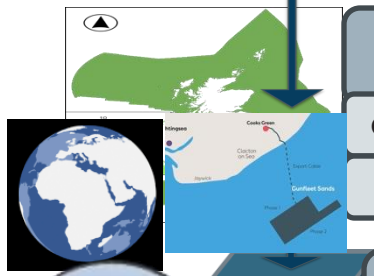

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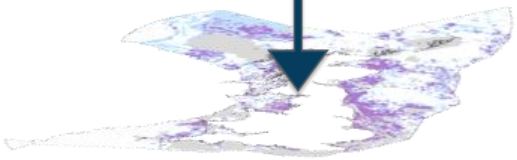

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