

Marine and maritime research, partnerships and knowledge exchange supporting a sustainable future

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There will be 9 billion of us by 2050,
11 billion by 2100.

By European or American standards, we will need

FOUR OR FIVE PLANETS

to sustain our growing demand for resources



Find out more: www.southampton.ac.uk/iroe

SEAFOOD

brought to you by ocean engineers.

50%

of fish caught globally for consumption is from aquaculture⁴

TELECOMMUNICATIONS

brought to you by ocean engineers.

99%

of internet communications traffic travels through submarine cables²

GOODS

brought to you by ocean engineers.

90%

of world trade is carried across the oceans by ship⁵



University of
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TRANSPORTATION FUEL

brought to you by ocean engineers.

30%

of crude oil
comes from
offshore
resources⁴

GAS

brought to you by ocean engineers.

40%

Domestic use of
gas as percentage
of total UK
consumption⁹

PETROCHEMICALS

brought to you by ocean engineers.

Demand for
plastic is the
key driver for
**petrochemical
demand**

ELECTRICITY

brought to you by ocean engineers.

>4000

UK homes powered
by one 5 MW offshore
wind turbine¹

A man and a woman are kneeling on yoga mats in a room with large windows in the background. The man is on the left, wearing a black t-shirt and a headband. The woman is on the right, wearing a black sports bra and a pink headscarf. They both have their eyes closed and hands resting on their knees, appearing to be in a meditative state. The room has a wooden floor and a shelf with various items on the right side.

IN THE AIR WE BREATHE

The oceans produce half of the oxygen we inhale

Find out more at www.southampton.ac.uk/iroe

An aerial photograph of the ocean with white-capped waves breaking against a dark blue-green background. The text is overlaid on this image.

The oceans hold

INDISPENSABLE RESOURCES

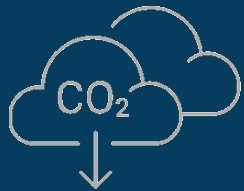
but we must utilise them responsibly

Find out more at www.southampton.ac.uk/iroe

Marine & Maritime Challenges

Stressors and tensions of meeting human rights to resources, energy and food, ensuring social wellbeing and respecting cultural differences, without exceeding planetary boundaries when confronted by population growth, climate change, sea level rise and increasing demand on ocean space.

Need for:



Decarbonisation



Reduced pollution



**Reduced damage
of biosphere**



**Sustainable use
of fish stocks**

Marine & Maritime Solutions for a Sustainable Future

Delivered through

- > Research

- > Partnerships

- > Knowledge exchange

Decarbonising shipping

Global shipping – responsible for ~ 3% global carbon emissions, equivalent to large industrialised nation



Clean Maritime Demonstration Competition

Future fuels and storage



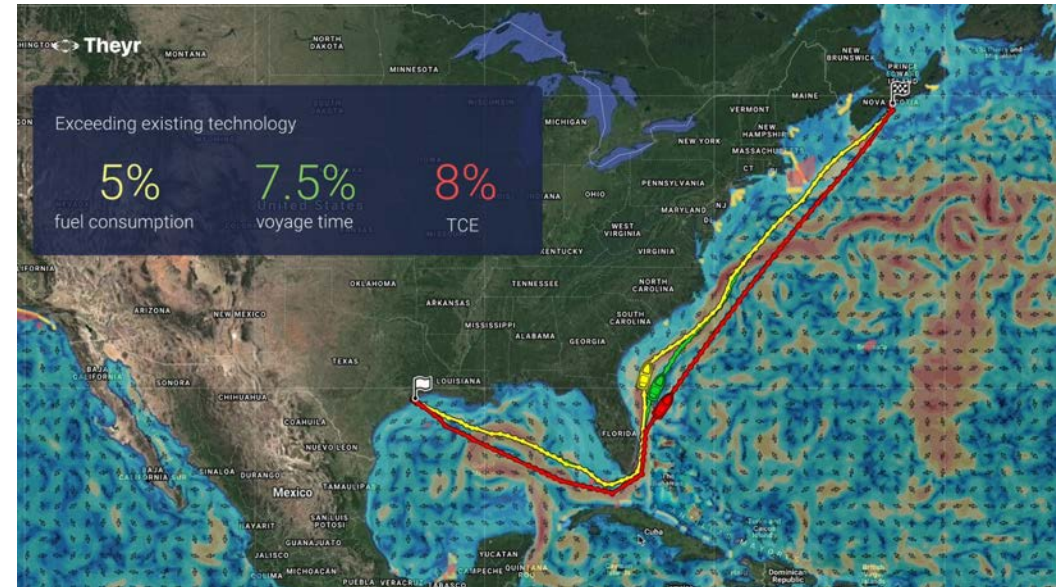
Investigate feasibility of solid-oxide fuel cells to provide base electrical load for large cruise vessels



Develop and demonstrate technology for ammonia-based power and propulsion for OI Armada ASV fleet

Solutions: future fuels, electrification, storage, operational efficiency, green corridors and cross sector collaboration

Real time ML-supported route optimization



Sobey et al



Decarbonising shipping

Public debate and policy



Royal Academy of Engineering
@RAEngNews

Addressing sustainability in shipping - join us and @BAESystemsplc for a free online event to explore the challenges of rapidly decarbonising the shipping sector.

1 March
6.30pm - 7.30pm

#EngineeringZero



10:30 AM · Feb 20, 2022 · Buffer

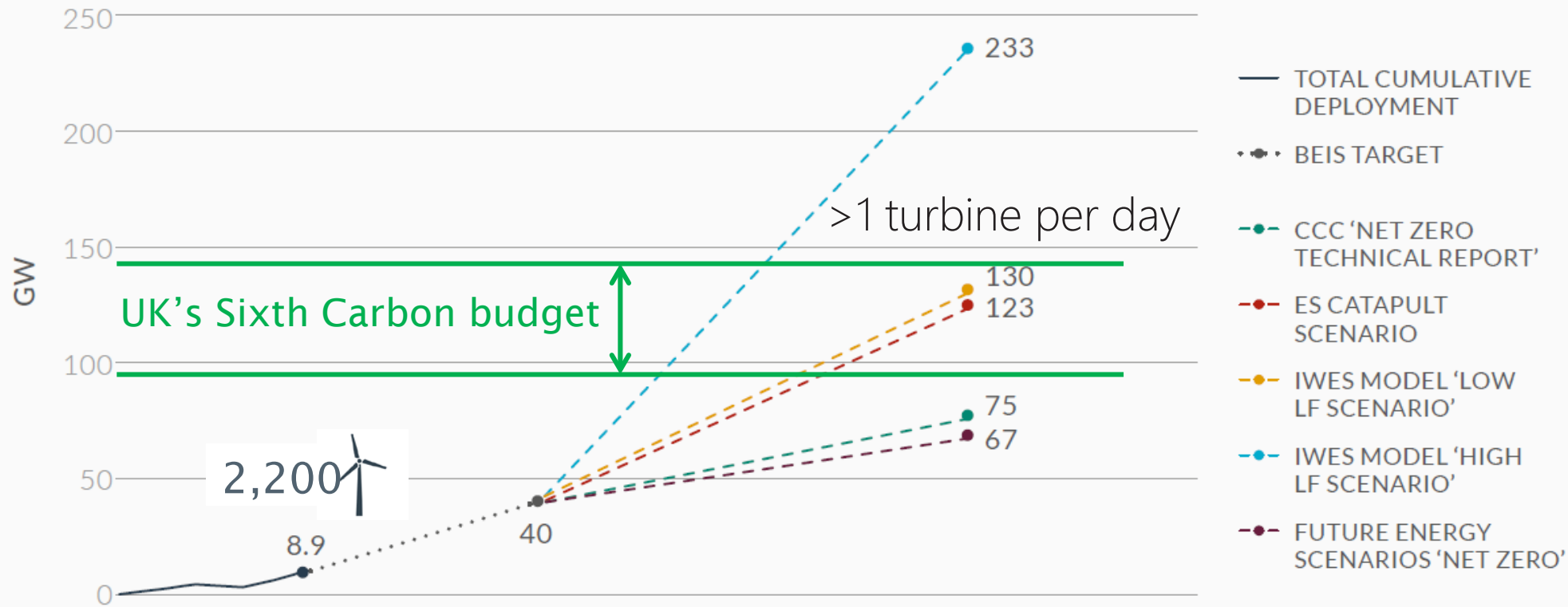


UN CLIMATE
CHANGE
CONFERENCE
UK 2021

IN PARTNERSHIP WITH ITALY

Offshore renewable energy

Massive renewable energy capacity required to support decarbonised energy sector

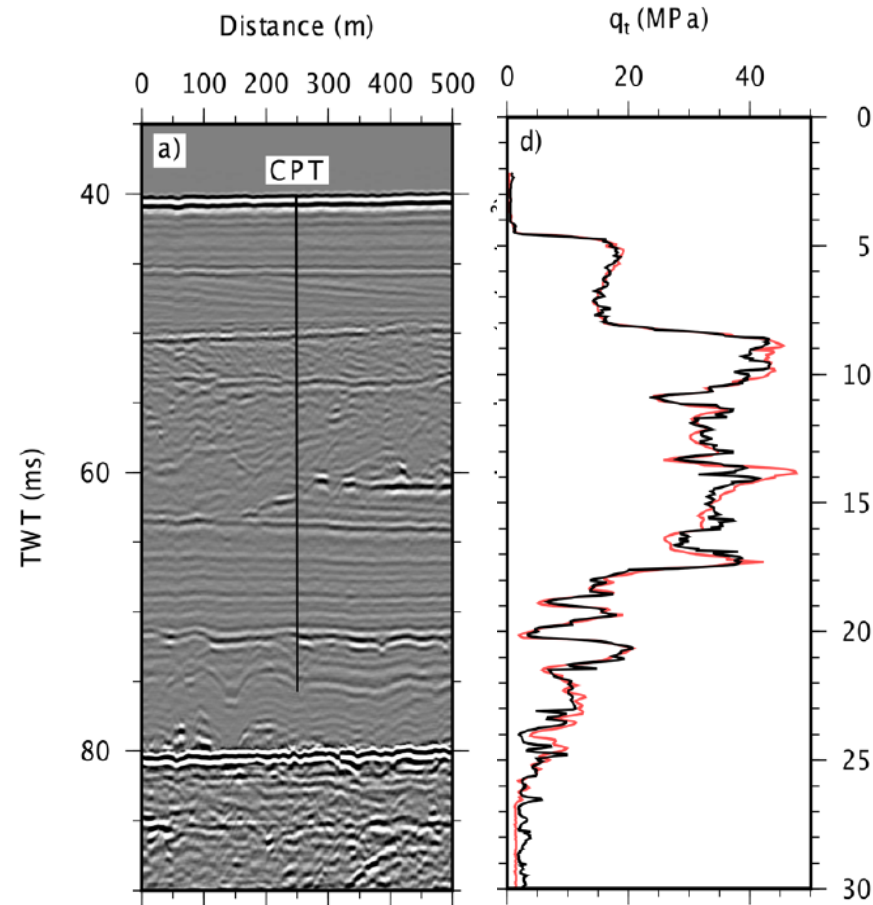


OWIC/OREC 2020

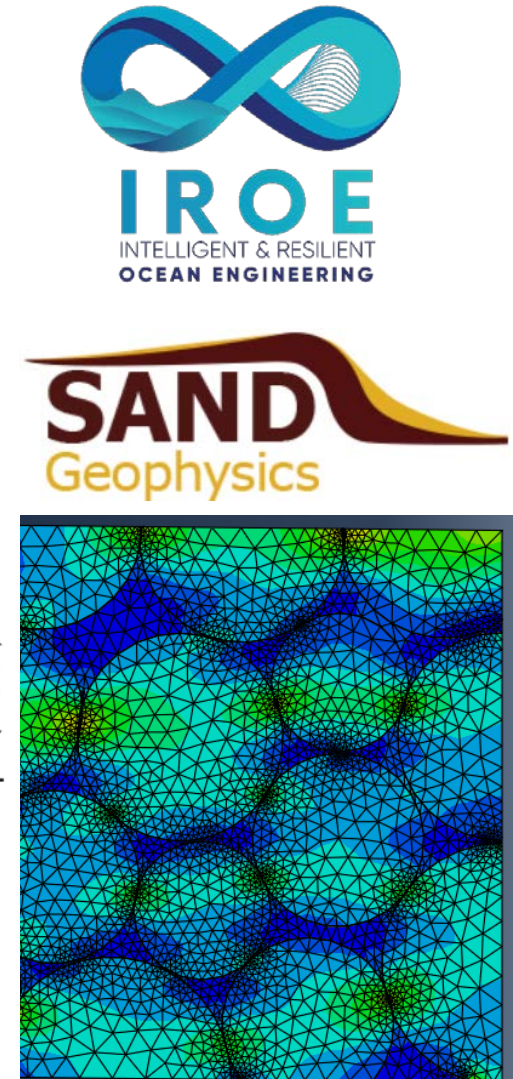
Figure 1.2 Total installed capacity of offshore wind in the UK - comparison of different scenarios

Offshore renewable energy

Seabed characterisation at meaningful spatial scale



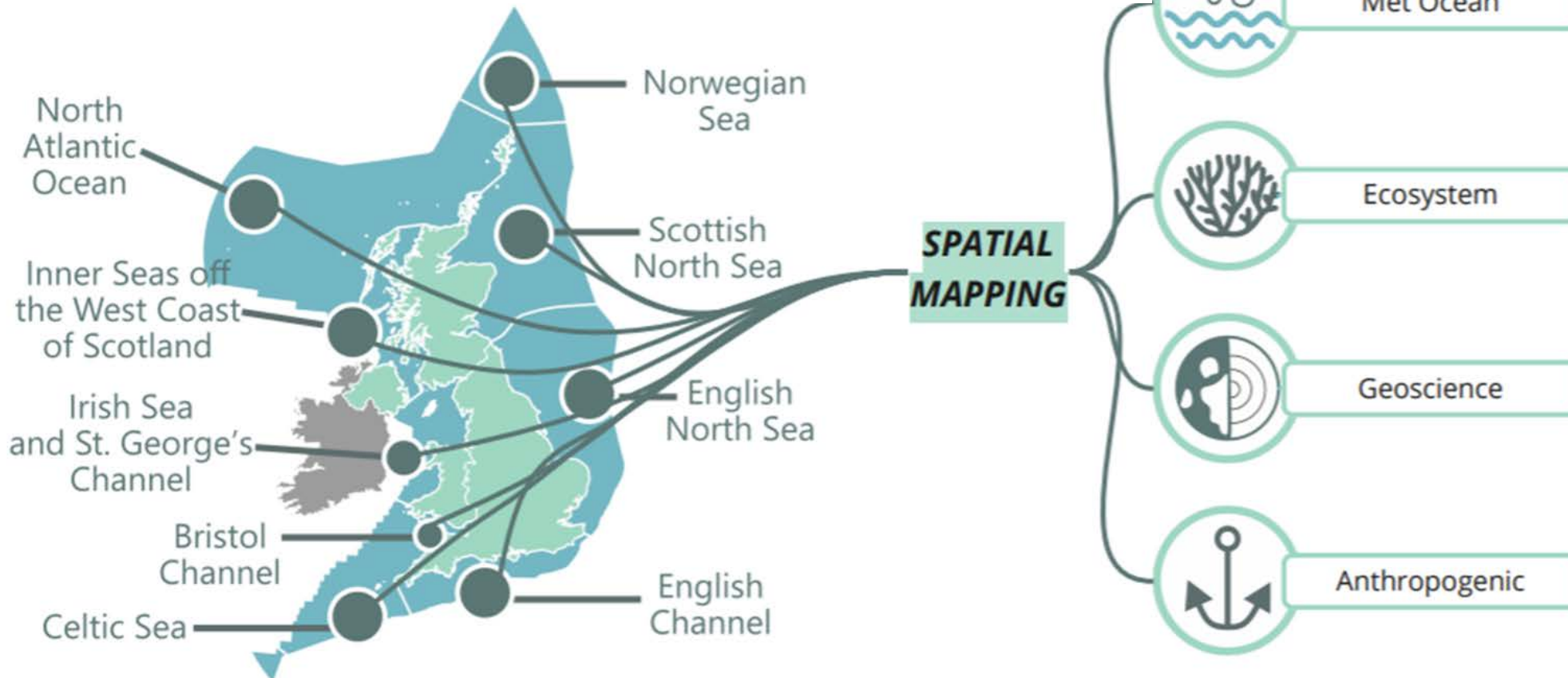
Vardy et al. 2017



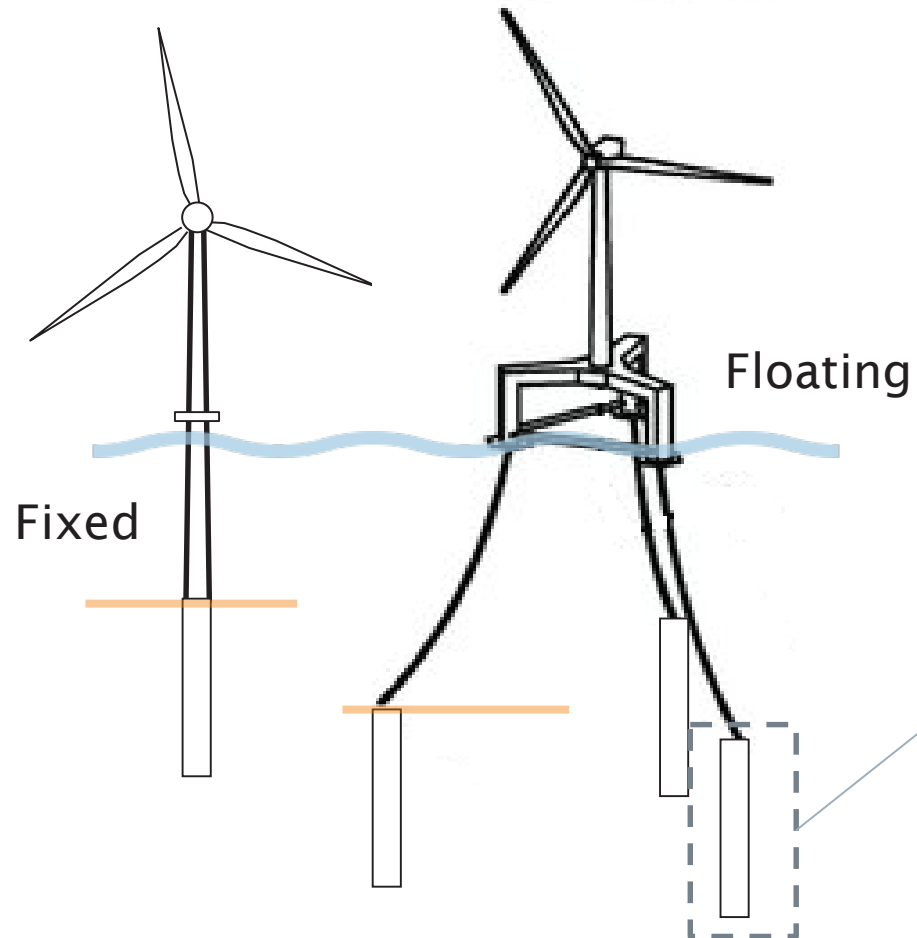
Charles et al.

Offshore renewable energy

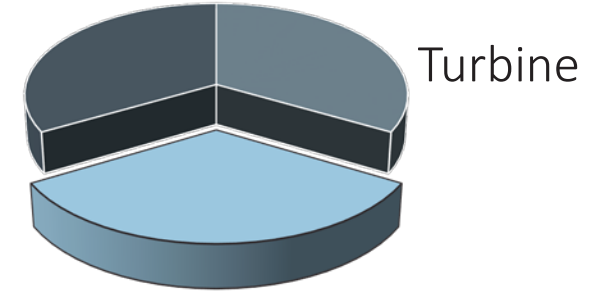
Where to put offshore wind turbines ...



Offshore renewable energy



Operations & maintenance



Anchor & Mooring systems

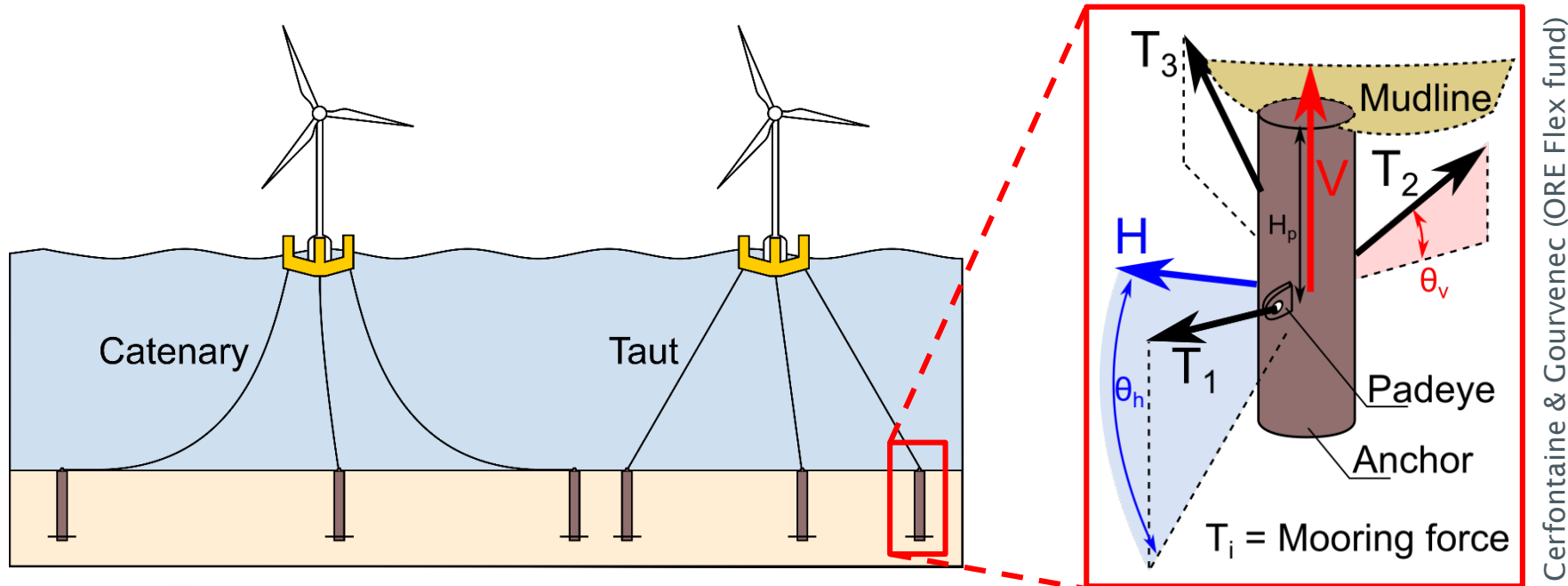


Source: Mastermo

> More foundations (anchors) per structure = higher cost

Offshore renewable energy

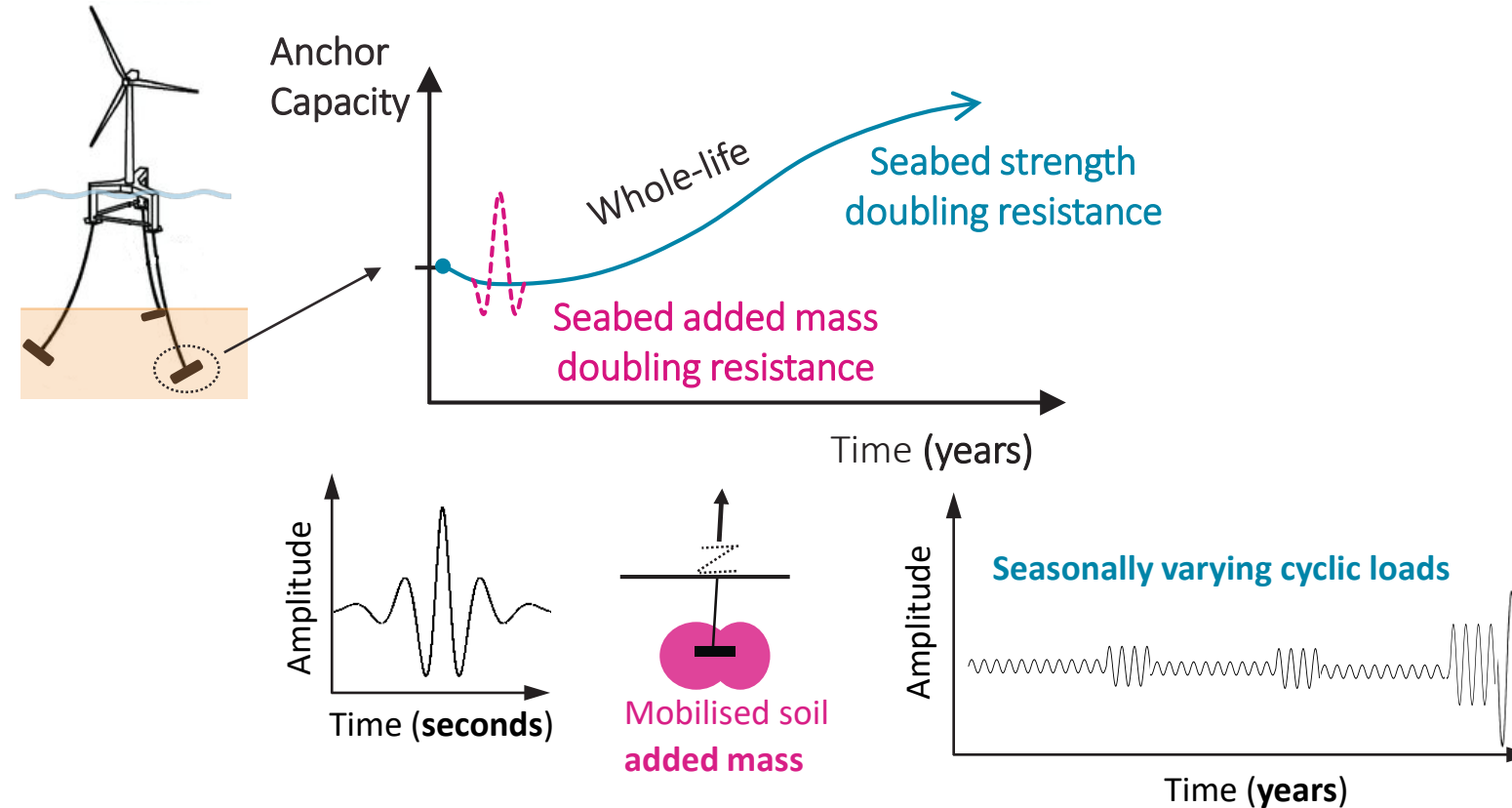
Shared anchors for mooring efficiency



> Multiple lines per anchor = less anchors per windfarm = lower cost

Offshore renewable energy

Efficient and coupled seabed model for smaller cost effective anchors

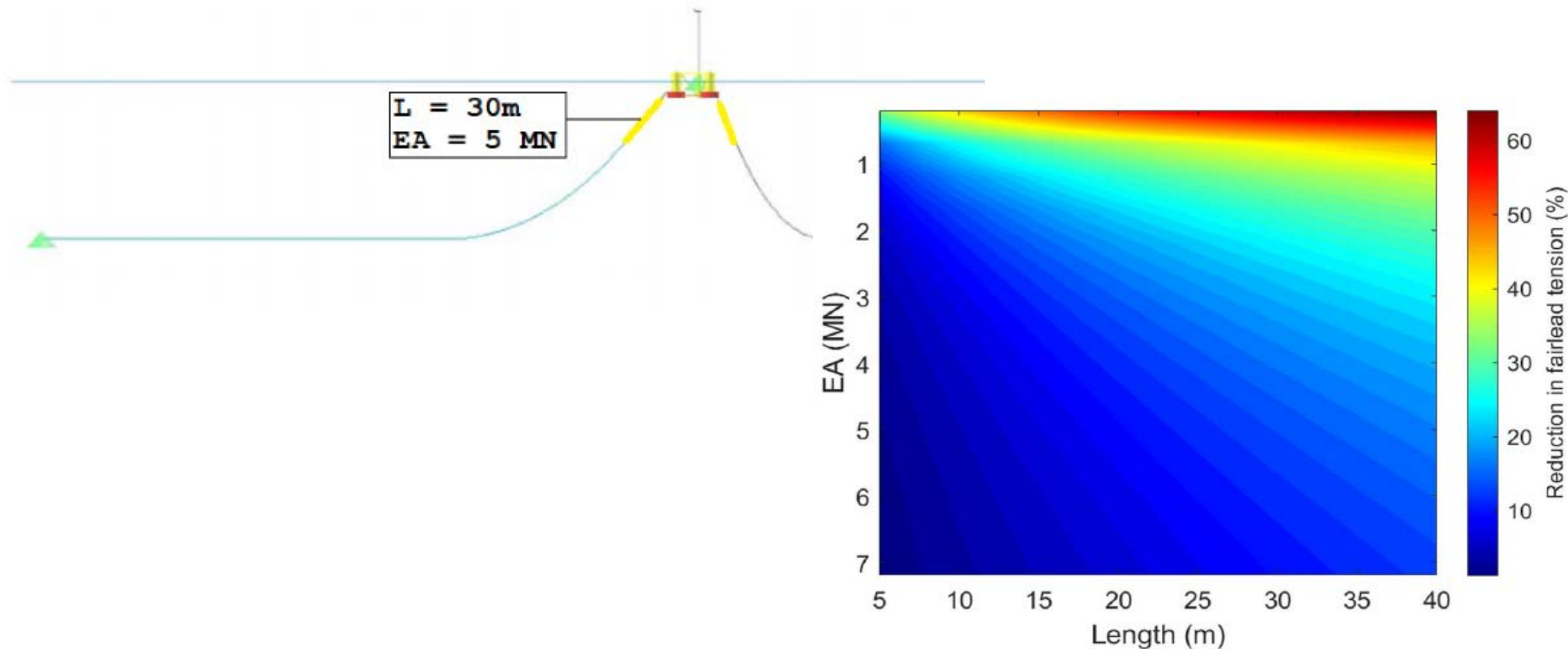


Kwa K. & White D.J. (2021)

> Extra seabed resistance = smaller anchors = lower cost

Offshore renewable energy


Responsive moorings to absorb peak loads for smaller anchors



Festa et al.

> Reduced mooring line tension = smaller anchors = lower cost

Research training



INSPIRE NERC DTP


PhD Projects How To Apply Background Partners Researchers Training/PhD Programme


Welcome to INSPIRE – the Interdisciplinary Southampton Partnership for Investigators Researching the Environment.


On 10th Oct 2018 **NERC** announced INSPIRE as one of the successful bids for the next round of its Doctoral Training Partnerships (DTPs). INSPIRE will receive funds for 16 studentships per year over each of the next five years, an increase from the 15 per year awarded to **SPITFIRE** (its predecessor).

INSPIRE will equip environmental scientists to excel in their chosen field, to thrive in interdisciplinary research teams, to apply cutting edge technology to environmental research, and to act as ambassadors of global environmental issues to industry and society. We will train students in research, professional and transferable skills within world-leading research teams to enable them to develop as future leaders. The main scientific themes of INSPIRE are:

1. Oceans and climate

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 **National
Oceanography
Centre**

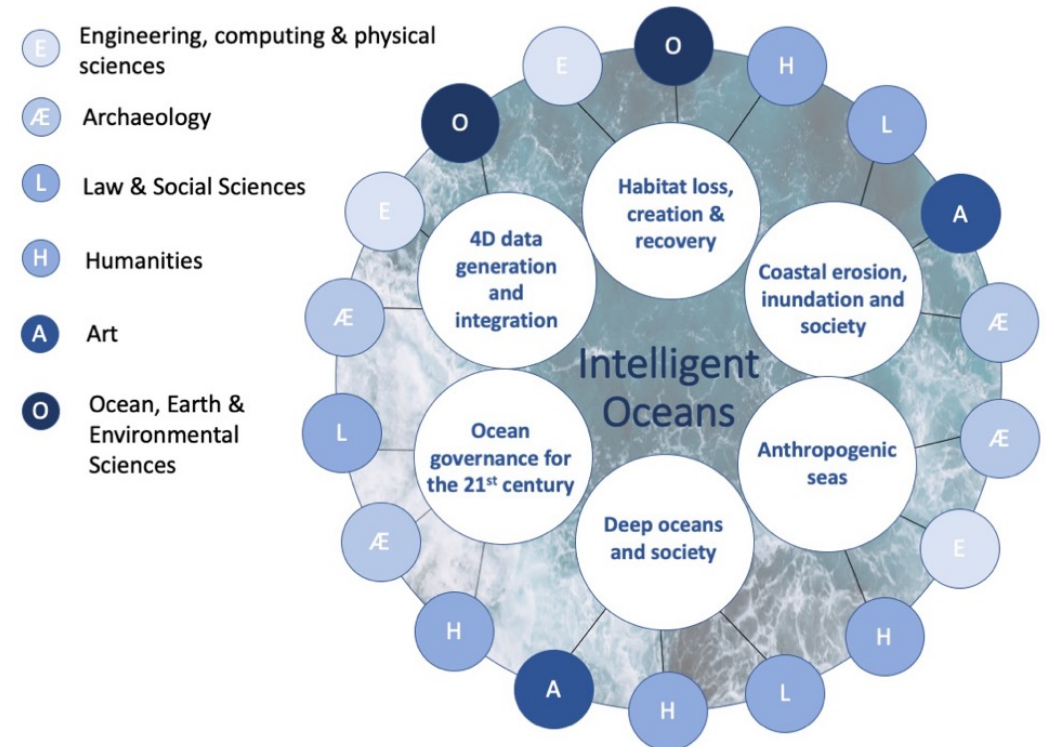
 **Natural
Environment
Research Council**

<https://inspire-dtp.ac.uk/>

NERC-DTP SPITFIRE, NERC-EPSRC NEXUSS, and
Leverhulme “Understanding Maritime Futures”
Plus > 60 part funded SMMI PhD Scholars

LEVERHULME TRUST

DOCTORAL SCHOLARS PROGRAM
Intelligent Oceans



<https://www.southampton.ac.uk/smmi/students/intelligent-oceans-scholarship.page>

Policy engagement and impact

Placements, secondments and projects



Policy Briefs

Policy briefs from projects across the SMMI



Blogs

Read blogs from the SMMI community, where academics reflect on their impact journey and on the role which research could play in recent policy developments



Responses to calls for evidence

Discover Southampton Marine and Maritime Institute's responses to calls for evidence

Marine & Maritime Policy projects



The Resilience and sustainability of Mekong Delta

This project examines the Mekong Delta's resilience and sustainability to changes in water and sediment fluxes.



Solid Bulk Cargo Liquefaction

This project is identifying key factors contributing to the risk of SBCL and developing practical technical, regulatory, educational and communication tools to mitigate risks and reduce loss of life.



Ecosystem Level Impacts of Plastic Pollution

Click here to see 'Understanding ecosystem level impacts of plastic pollution', led by PhD student Stephanie Lavelle.

Public Policy/Southampton >

Rhiannon Jones' NERC-funded marine policy placement with Defra and the G7 FSOI

11 May 2022

Connect with [Rhiannon Jones](#) via [Twitter](#) and [LinkedIn](#)



Department
for Environment
Food & Rural Affairs



The Ocean sustains and supports life on Earth through a myriad of inter-related processes, mechanisms, and feedbacks. Microscopic photosynthesising organisms that live in the surface ocean produce up to 80% of the oxygen we breathe (Source: NOAA), whilst around 3 billion people rely on seafood as a primary source of protein (Source: World Wildlife Fund).



Natural
Environment
Research Council

UKRI NERC Logo



Rhiannon Jones

Our relationship with the ocean is complex and vital, and as we continue

University of Southampton PhD secondments at the MCA



Emission Reduction Technologies

Click here to learn more about Dr Lina Zapata and Natasha Easton's placement with the MCA



High Density Batteries

Click here to learn more about Benjamin Craig's placement with the MCA



Emission Reduction Technologies

Click here to learn more about Tao Zhu's placement with the MCA

Civic engagement



 **SOLENT LOCAL
ENTERPRISE PARTNERSHIP**

 **SOLENT
FREEPORT**
THE UK'S GLOBAL GATEWAY

Solent Local Enterprise Partnership
& The Solent Freeport Consortium Ltd

INVITE YOU TO

THE SOLENT SUMMIT

to launch the
SOLENT FREEPORT
and the
SOLENT 2050 STRATEGY

Horizon Cruise Terminal, Berth 102, West Bay Road, Southampton SO15 1AW

9.30am-2.00pm
Wednesday 8th June 2022

Refreshments and a light lunch will be provided

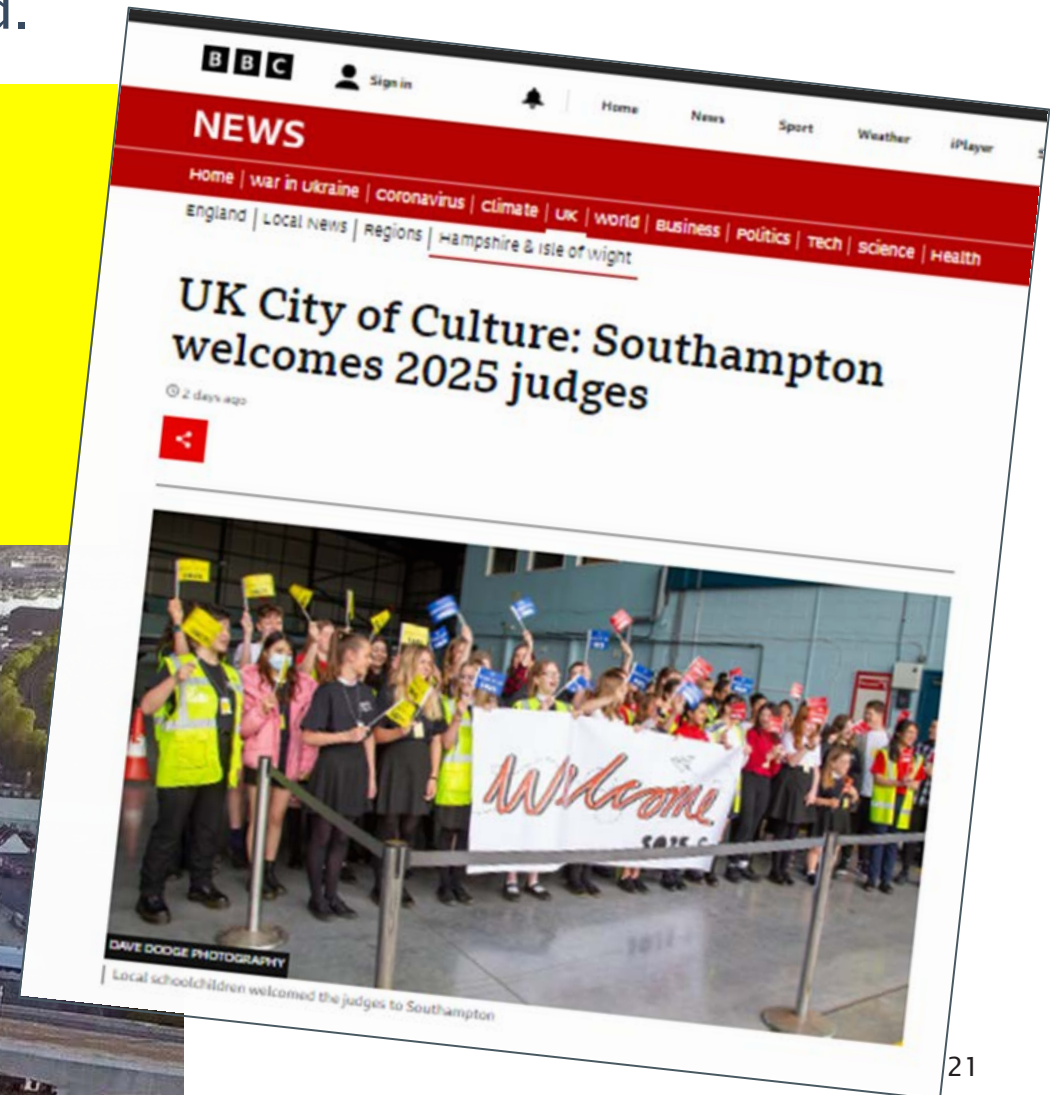
Zero Carbon Coastal Highway



MarRI-UK
Research & Innovation

Civic engagement

University of Southampton key partner in Southampton's City of Culture 2025 bid and SMMI leadership led research that underpinned the bid.





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ADDRESSING GLOBAL MARINE AND MARITIME CHALLENGES

SOUTHAMPTON MARINE & MARITIME INSTITUTE

Producing knowledge through research

<https://www.southampton.ac.uk/smmi>

