


HARNESSING OCEAN POTENTIAL

**Chair in Emerging Technologies:
Intelligent & Resilient Ocean Engineering**

Harnessing benefit from our oceans more efficiently,
with less impact on the environment, and with more
capability to project human influence with lesser risk.

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

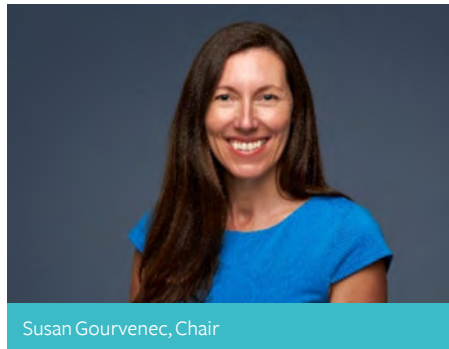
ROYAL ACADEMY OF ENGINEERING CHAIR IN EMERGING TECHNOLOGIES IN INTELLIGENT & RESILIENT OCEAN ENGINEERING

The Royal Academy of Engineering Chair in Emerging Technologies in Intelligent & Resilient Ocean Engineering drives activities to create a step change in ocean engineering design to support responsible, sustainable and economic use of ocean resources.

Activities address technology gaps at each stage of the engineered life cycle of ocean structures, from characterising and forecasting ocean and seafloor behaviour, to the design and operation of novel platforms for ocean facilities.

By harnessing the intelligence of robotics, autonomy, sensors and big data, next generation resilient engineered systems will unlock ocean resources for energy, food, space and transport, more efficiently, more sustainably, and with less risk to life.

The activities reach beyond engineering solutions, engaging with the public and policy makers to raise awareness of ocean engineering and guide policy for future use of our oceans.



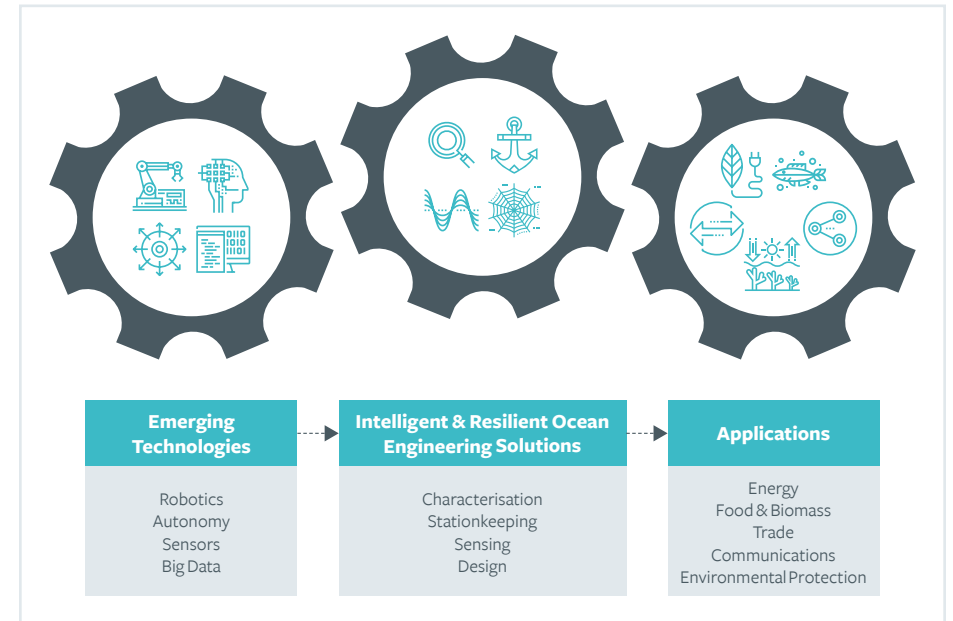
Susan Gourvenec, Chair

Vision

My vision for this Royal Academy of Engineering Chair is for all next generation engineered ocean systems to embody intelligence, developed with new paradigms of design for greater resilience. This will be achieved through driving transformational research and embedding it in engineering practice, developing the next generation of ocean engineers and creating a community of ocean custodians.

INTELLIGENT & RESILIENT OCEAN ENGINEERING

Embedding intelligence in engineered ocean systems - whether evolved traditional systems such as vessels, platforms, subsea structures and characterisation tools, or future systems yet to be conceived - will transform our use of the oceans. Capability and resilience of engineered ocean systems will be improved, humanity's access to ocean space and resources widened, and human risk, cost and environmental footprint reduced.



The Royal Academy of Engineering Chair in Emerging Technologies in Intelligent & Resilient Ocean Engineering harnesses the intelligence of robotics, autonomy, sensors and big data to develop next generation resilient engineered ocean systems to support responsible, sustainable and economic use of ocean resources for an increasing and increasingly wealthy global population.

“Oceans are a critical ecosystem for a healthy planet. Irresponsible or over utilization of the oceans would be catastrophic for humanity.”

“Engineering is a humanitarian endeavour and the role of technology is to improve human life not to replace it.”



Sustainability



Safety

GOALS

The overarching goal of this Royal Academy of Engineering Chair in Emerging Technologies in Intelligent & Resilient Ocean Engineering is to develop the next generation of intelligent and resilient ocean engineering solutions to meet the growing demands of an increasing global population of increasing wealth, in a sustainable manner to protect the health of the oceans. This goal will be achieved through four key research goals alongside four key operational goals that will enable transformation of the use of our oceans within the boundaries of commercial, environmental and societal pressures.

Research Goals



Characterisation - Create intelligent site characterisation tools for autonomous deployment or operation to upscale capability without upscaling cost



Stationkeeping - Create smart mooring and anchor systems for efficient and stable platforms in increasingly harsh environments



Sensing - Create living designs by embedding intelligent sensing in engineered ocean systems that inform on system health and ultimately self-certify



Design - Create next gen concepts and methodologies, enabling modular mass produced resilient systems, performance-based design and optimal life-cycle cost

Operational Goals



Centre of Excellence - Establish a Centre of Excellence in Intelligent & Resilient Ocean Engineering



Dissemination - Research dissemination, stakeholder engagement, public engagement and outreach



Deployment - Deploy developed technologies in live offshore projects



Impact - Achieve uptake and impact from developed technologies

The goals of the this Royal Academy of Engineering Chair in Emerging Technologies in Intelligent & Resilient Ocean Engineering will deliver the next generation of engineered ocean systems, develop an enduring network between researchers and end users, support clean growth and the blue economy.



CLEAN GROWTH

Intelligent and resilient ocean engineering will make a vital contribution to clean growth through reducing greenhouse gas emissions. This will be achieved through reduced dependence on fossil fuels by unlocking ocean renewable energy resources (e.g. wind, tidal and wave); through carbon capture and storage; and through reducing dependence on traditional livestock farming through unlocking ocean biomass resources (e.g. aquaculture, seaweed, algae). Intelligent and resilient ocean engineering will reduce pressure on coastal space and the hinterland around ports by providing space to develop industrial activity and open up more versatile use of ocean space (e.g. for floating forests or floating farms). This will relieve the pressure on intensely urbanised areas, bringing food production closer to urban populations to reduce transport, and liberating coastlines for tourism and social amenity while maintaining vital activities of working ports. New technologies will enable new uses of deep ocean space, such as for open ocean energy harvesting, production and storage of zero-emission fuels, as re-fuelling stations for transoceanic journeys, as data collection, processing and transmission stations of oceanographic data or data generated by fleets of autonomous vehicles monitoring the health of the oceans.

¹OECD (2016) The Ocean Economy in 2030, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264251724-en>

²DoT (2019) Maritime 2050. <https://www.gov.uk/government/publications/maritime-2050-navigating-the-future>

³TOVG (2017) A valuation of the UK's offshore renewable energy resource. http://publicinterest.org.uk/download/archive/offshore_valuation_full.pdf

⁴BEIS (2013). Wave and tidal energy: part of the UK's energy mix. <https://www.gov.uk/guidance/wave-and-tidal-energy-part-of-the-uks-energy-mix>

⁵OREC (2018) Tidal stream and wave energy cost reduction and industrial benefit. <https://ore.catapult.org.uk/?orecatapultreports=tidal-stream-and-wave-energy-cost-reduction-and-industrial-benefit>

£2.3tn

Global ocean industry value-added by 2030¹

£40bn

Gross value added to UK economy from maritime sector²

1m

Number of jobs supported by maritime sector in UK²

30%

Share of practicable renewable resource to harness to reduce UK CO₂ emissions by 1.1bn tonnes by 2050³

50%

UK's share of Europe's tidal energy resource⁴

14,500

Potential new UK jobs from tidal energy⁵

£1.4bn

Potential gross value added to UK economy from tidal energy⁵



Find out more

www.southampton.ac.uk/iroe

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Royal Academy of Engineering Chair in Emerging Technologies Scheme

The Academy's Chair in Emerging Technologies scheme aims to identify global research visionaries and provide them with long term support to lead on developing emerging technology areas with high potential to deliver economic and social benefit to the UK.

Find out more: <https://www.raeng.org.uk/grants-prizes/grants/support-for-research/chair-in-emerging-technology>