Global Marine Technology Trends 2030

Lloyd's Register

QinetiQ

University of Southampton

Agenda

Introduction

Commercial shipping

Naval

Ocean space

Concluding Remarks

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Introduction

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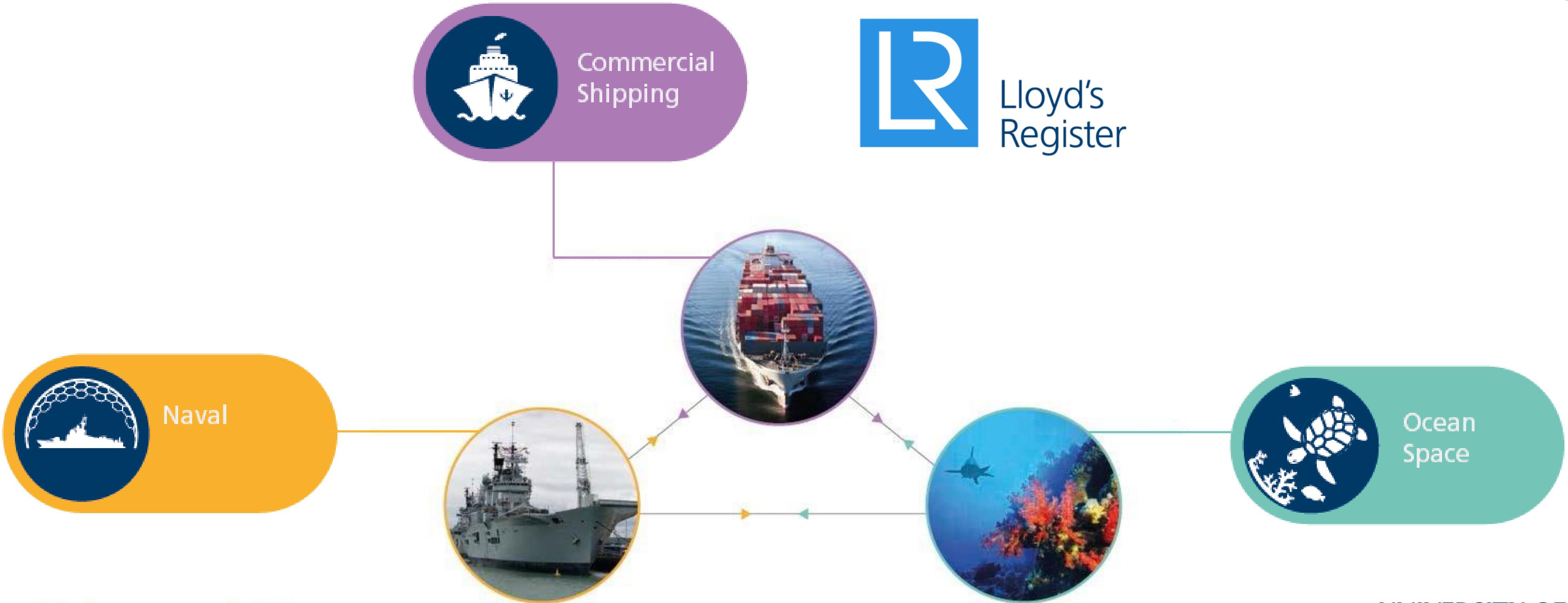
Three Sectors



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Methodology - Horizon Scanning

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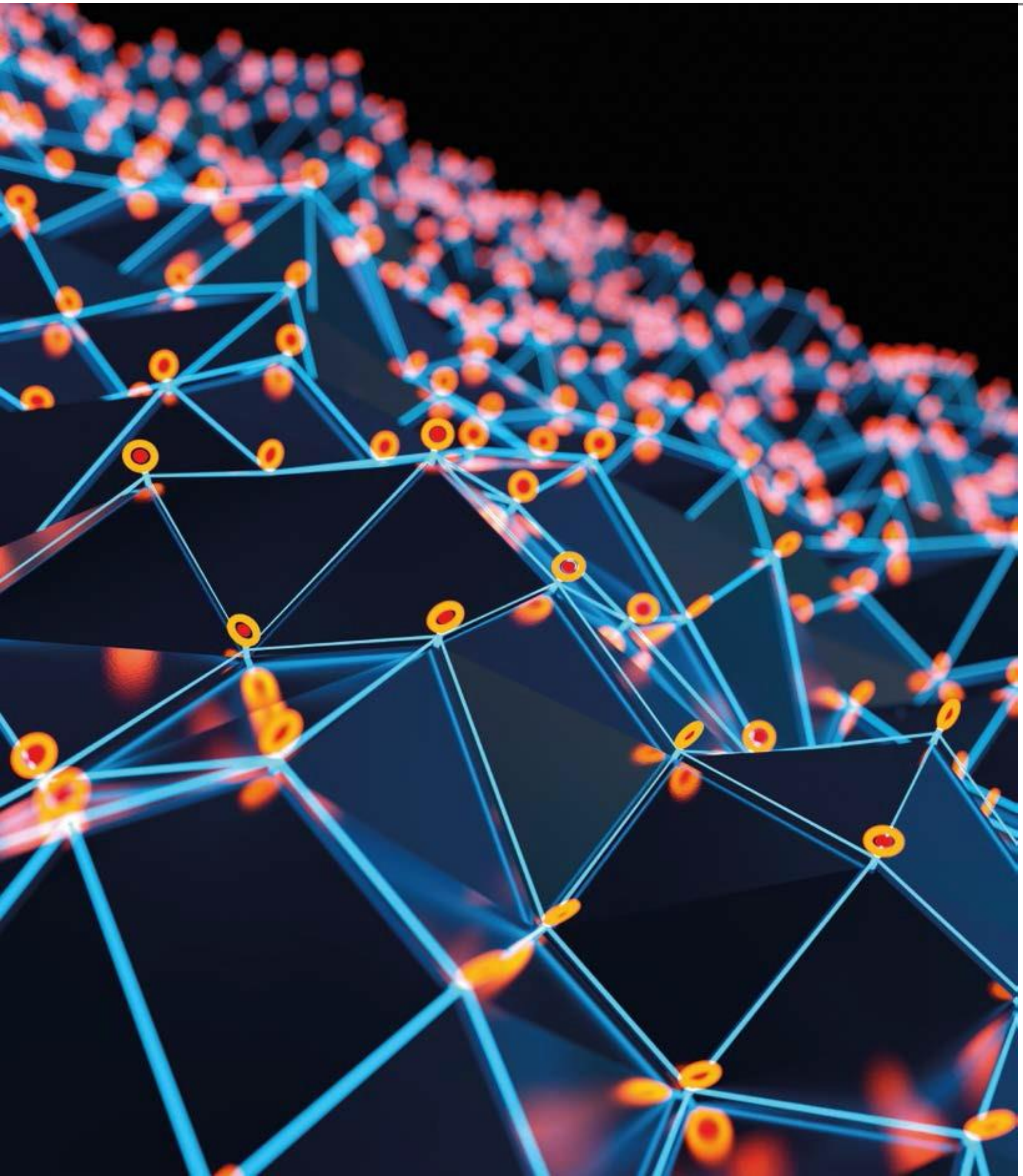

56 technologies evaluated
18 technologies chosen
8 technologies for each sector

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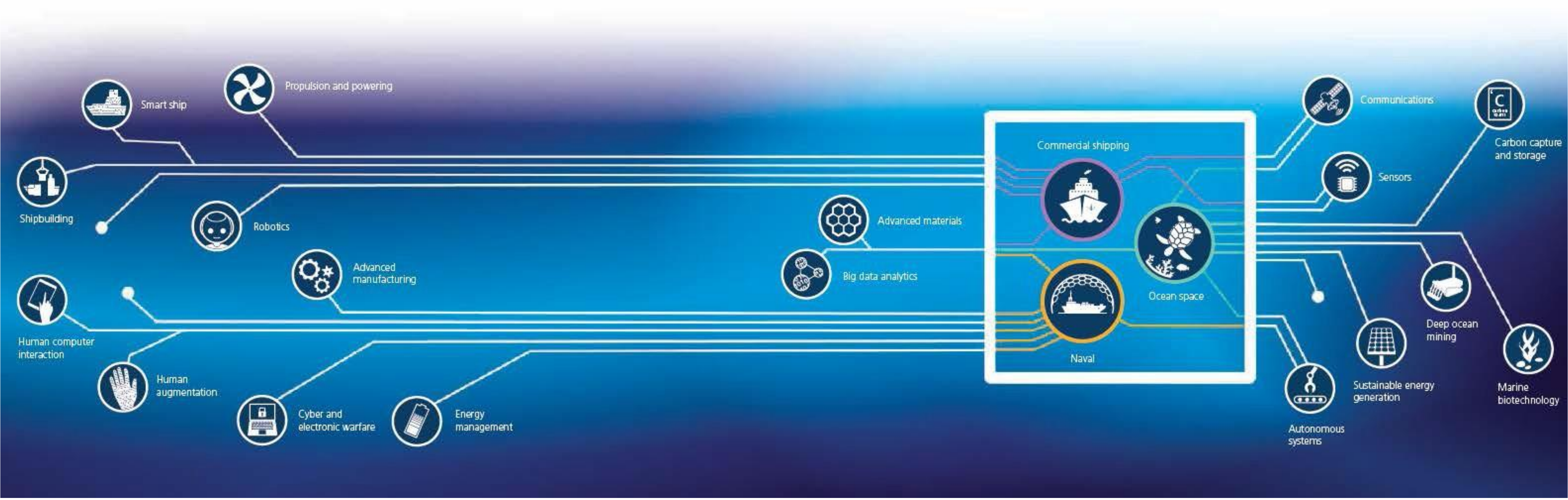
18 Transformational Technologies for 3 Sectors

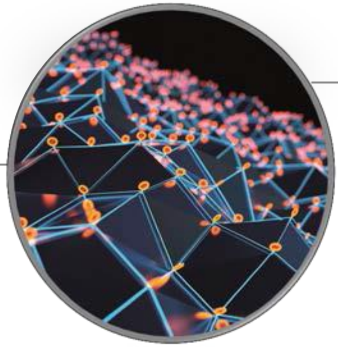


Structure of the GMTT2030 Report

Future competition landscape

EIGHT marine technologies in individual sector:

1) What a technology providers wish to sell,
2) Why an end user wish to buy,
3) What are the risks and uncertainties (investor's perspective), and
4) What is the impact on the industry (stakeholders' perspective).



Transformational effects on each sector :

The report provides visions summarising the transformational effect of the selected technologies on a given sector.

Commercial Shipping

Commercial Shipping

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8 Transformational Technologies

First arena: Internal developments

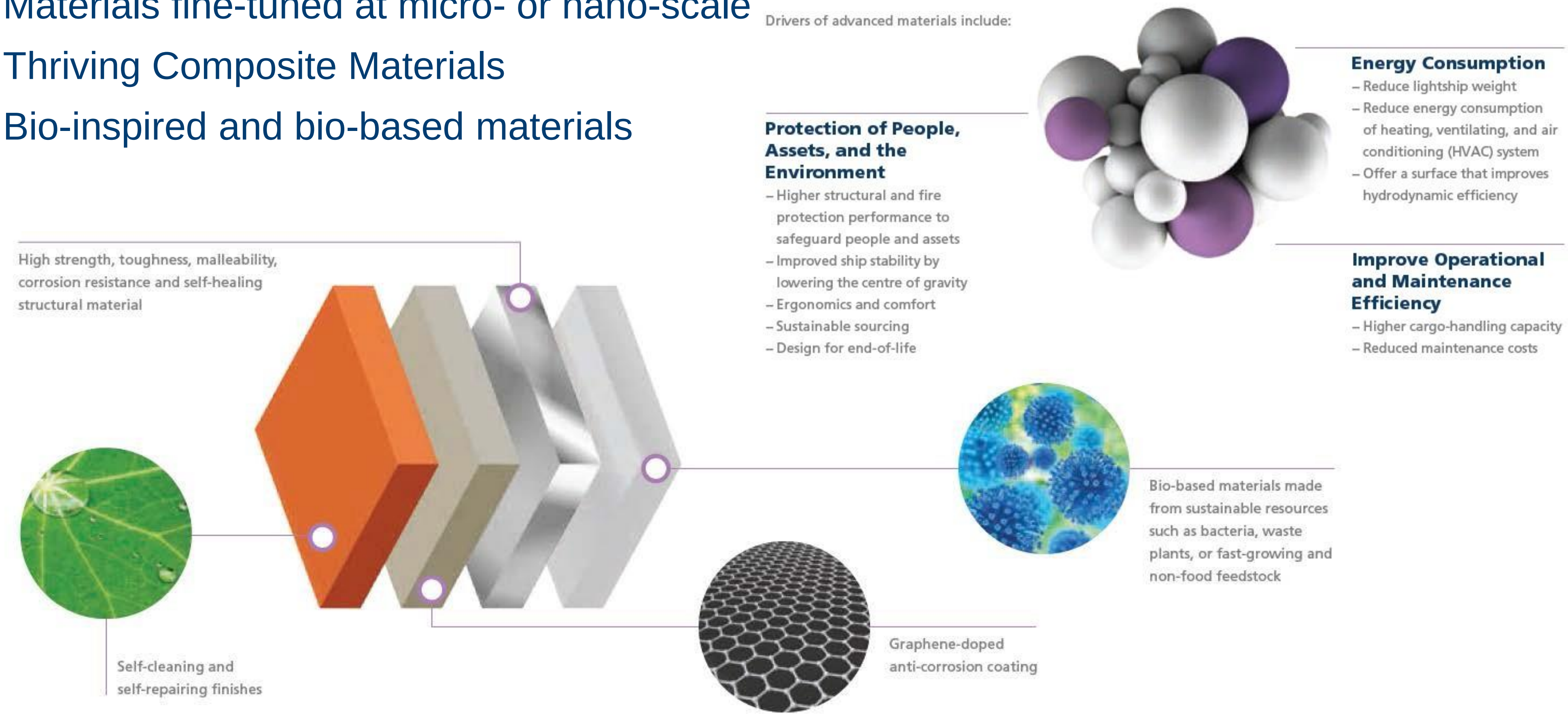
- Shipbuilding
- Propulsion and powering
- Smart ship

Second arena: External developments

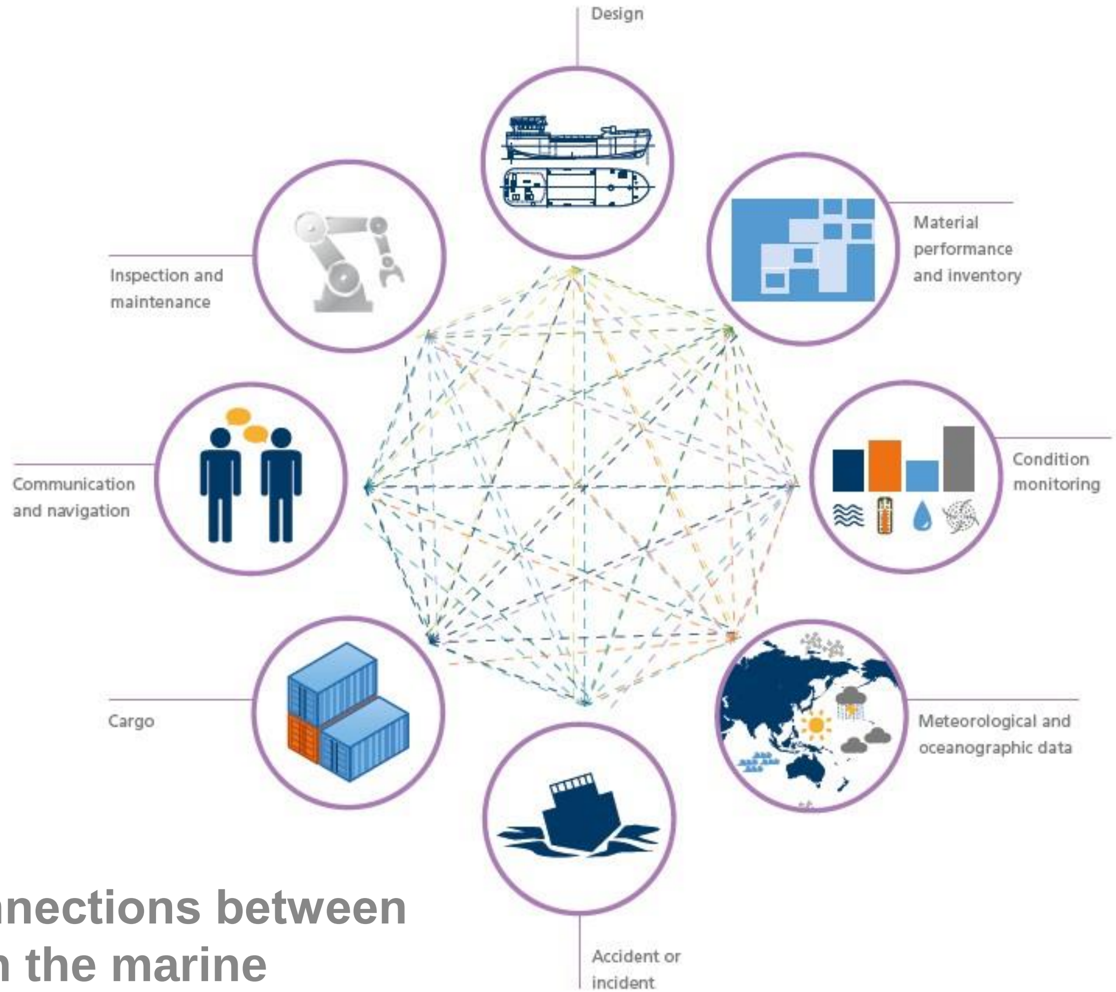
- Advanced materials
- Big data analytics
- Robotics
- Sensors
- Communications

Advanced Materials

- Materials fine-tuned at micro- or nano-scale
- Thriving Composite Materials
- Bio-inspired and bio-based materials



Big Data Analytics



Data's multiple connections between different sources in the marine industry

Robotics

Cognition

Robots will have cognitive capabilities in terms of attention, dialogue, perception, memory and decision making

Senses

Speaking, touching, seeing, listening senses will enhance robots' capabilities

Versatile

Swim, fly and climb functions will provide a multitude of resources to researchers and engineers both onboard and onshore

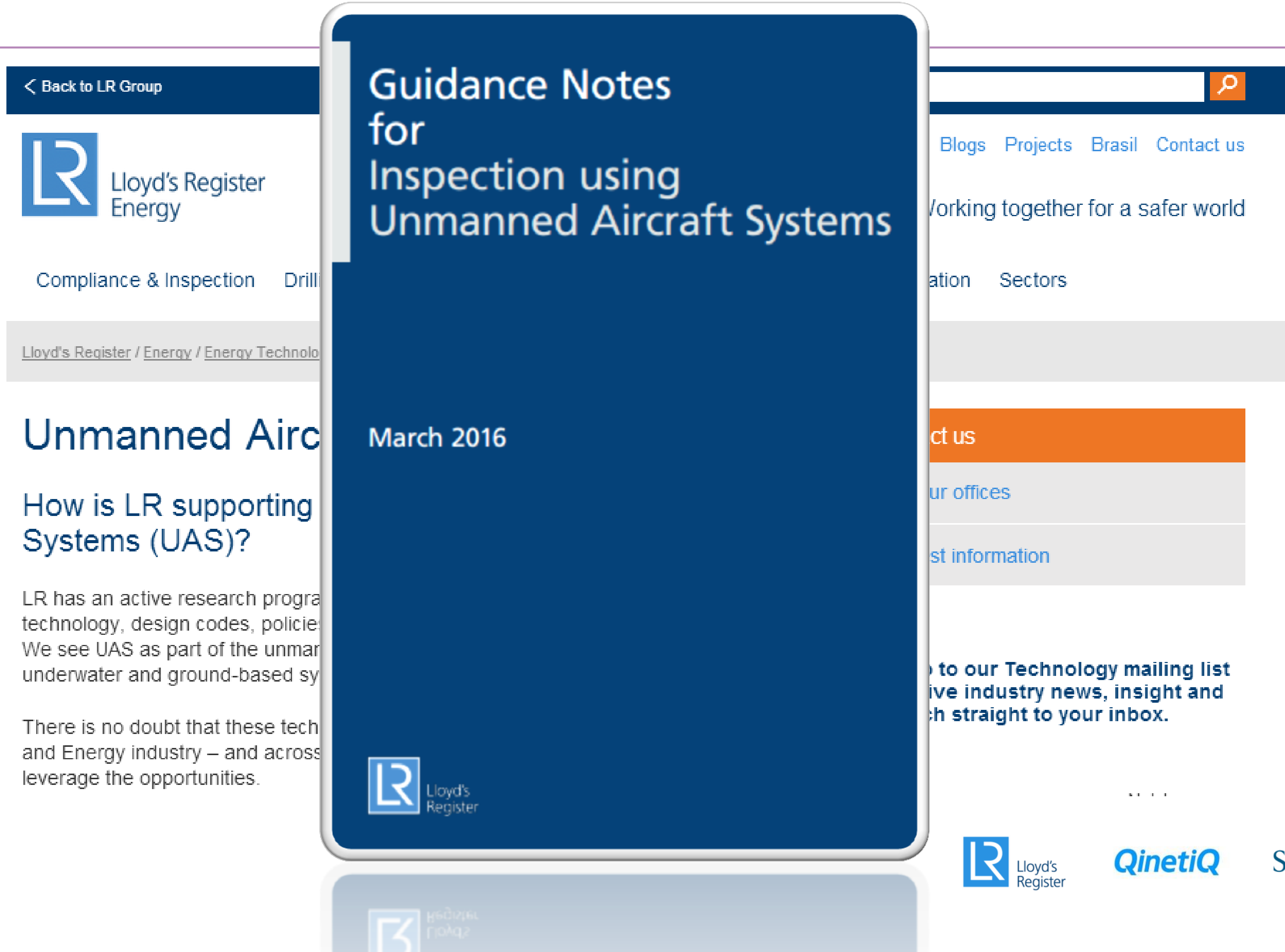
Adaptability

Ability to carry out specific tasks autonomously, ability to operate in subtropical and Arctic areas, battery-powered, wireless communication with other networks: these features will be of paramount importance for the shipping industry over the decades to come

Imitation

The re-creation of animal–human actions, like soft arms inspired by an octopus or articulations inspired by human fingers, will provide a full range of capabilities

Robotics



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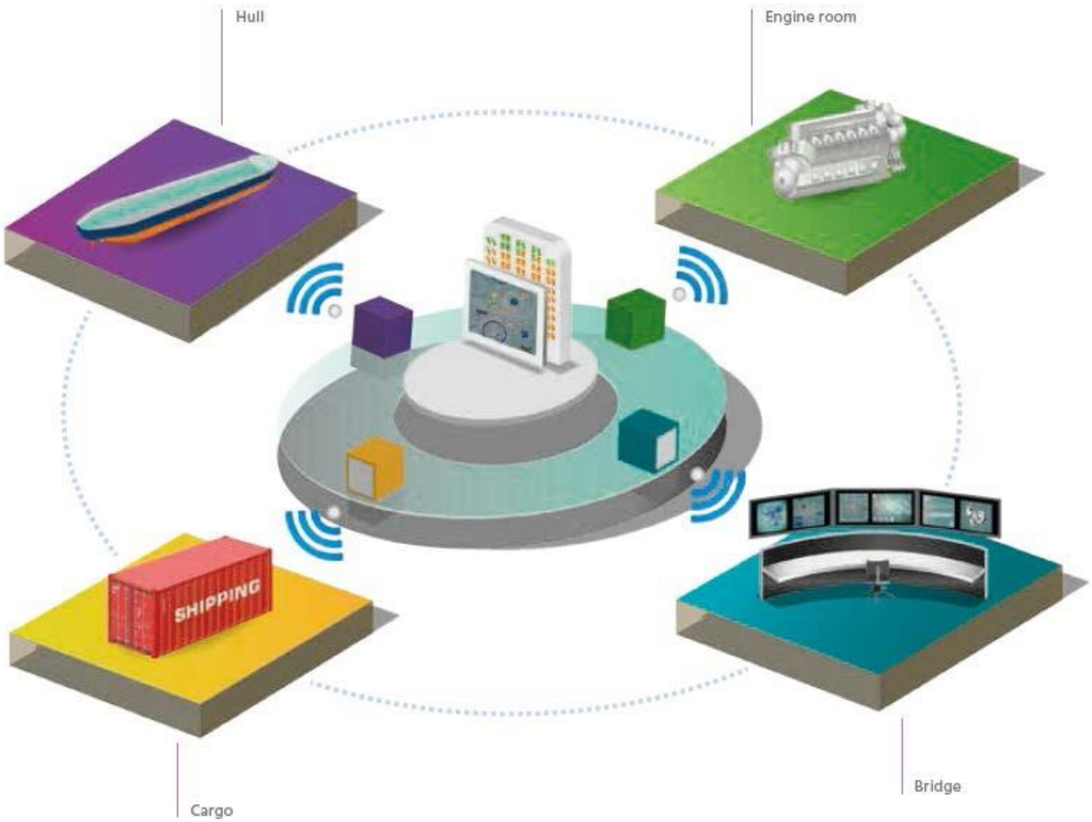
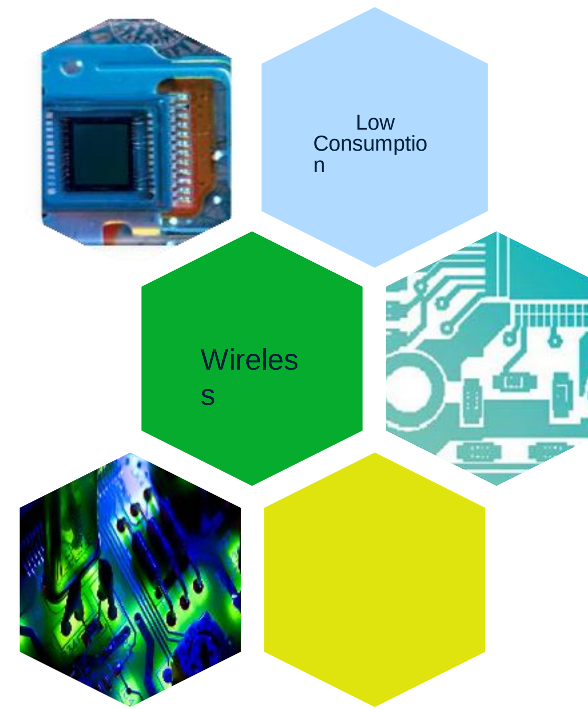
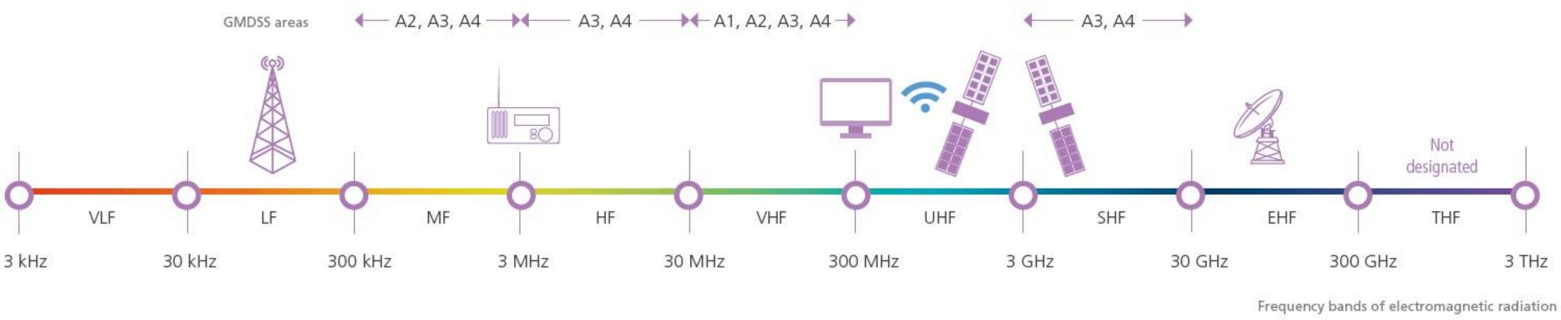
Sensors

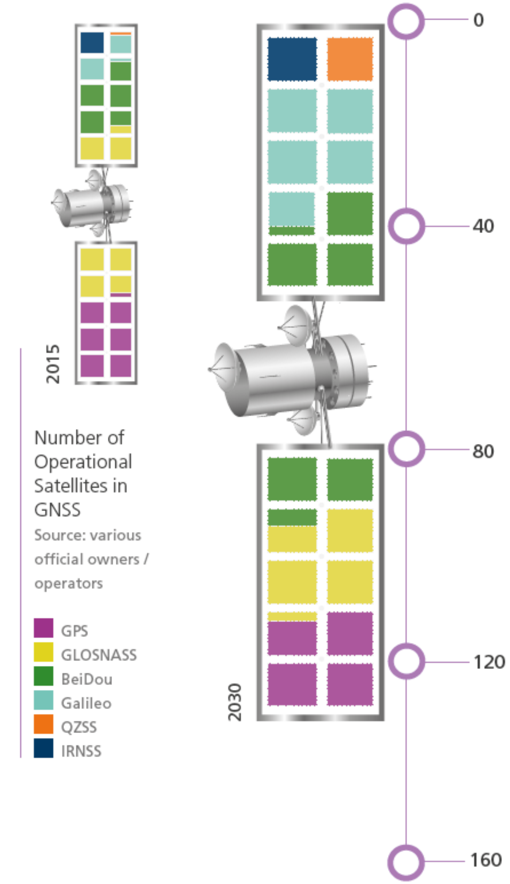

Hull
Engine room
SHIPPING
Cargo
Bridge


Low Consumptio n
Wireles s

Communications

- The frequency spectrum congestion
- Explore in higher frequency bands





Shipbuilding

- Higher level of automation
- Software integration
- Data visualisation
- Additive manufacturing
- Adaptive hull form and less/no ballast design

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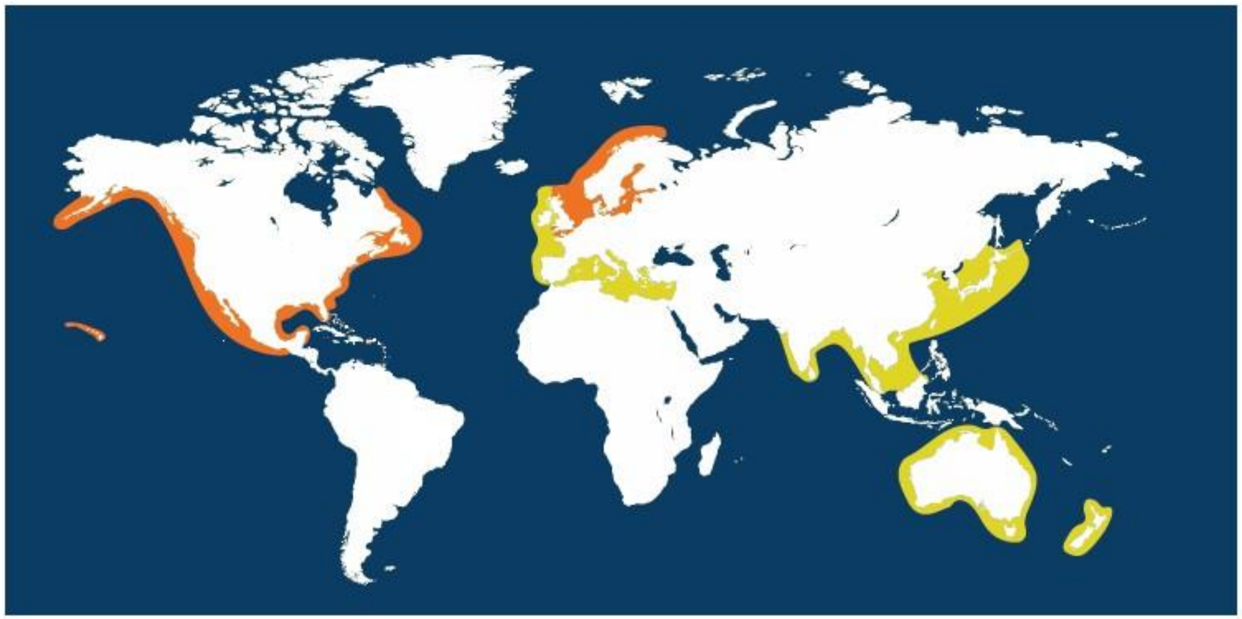
Propulsion and Powering



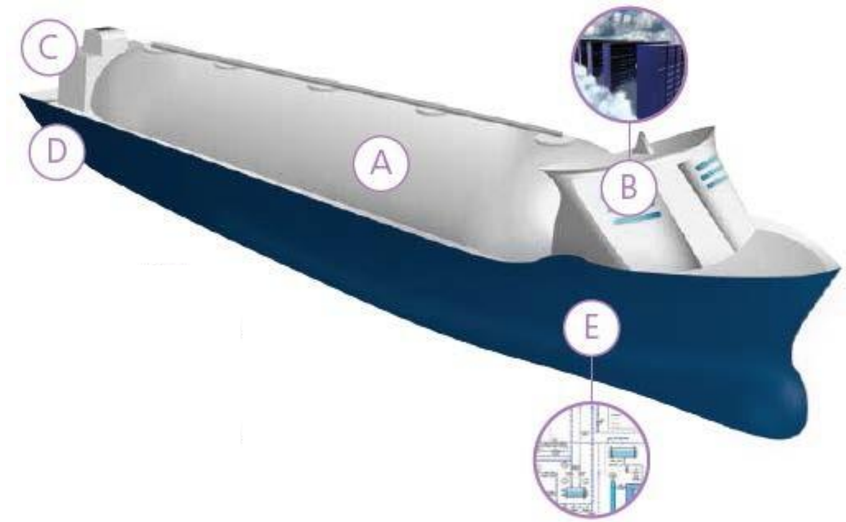
	Non ECAs – focus on proven technology	Future and Existing ECAs – focus on novel technology
Marine fuels and non-renewable energy sources	Use of distillates (MGO) and low-sulphur heavy fuel oil Start of adoption of LNG as a marine fuel	LNG, methanol, Bio-diesel Fuel cells (with hydrogen or methanol) Nuclear energy
Prime Movers and auxiliary systems	Main engine re-rating Advanced/intelligent engine tuning and electronic control	Diesel-electric and hybrid propulsion Waste heat recovery (Rankine Cycle)

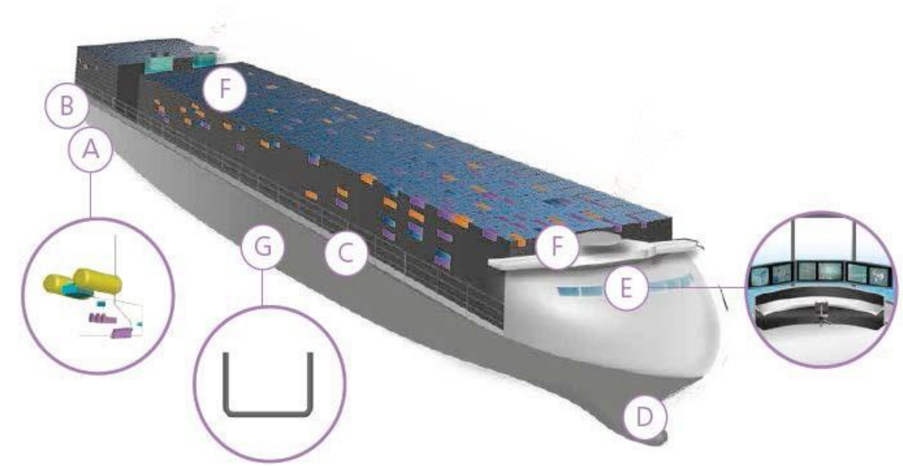
- Non ECAs
- Existing ECAs
- 2030 ECAs

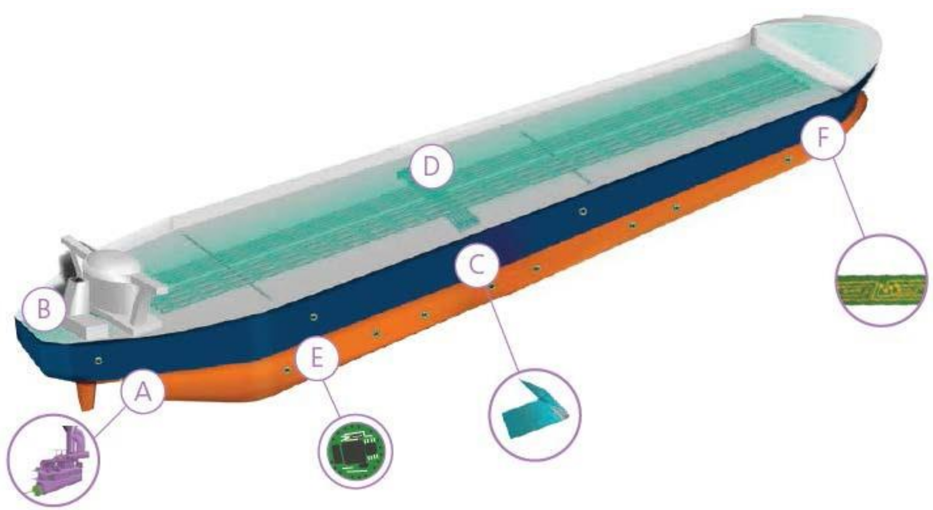
Smart Ship

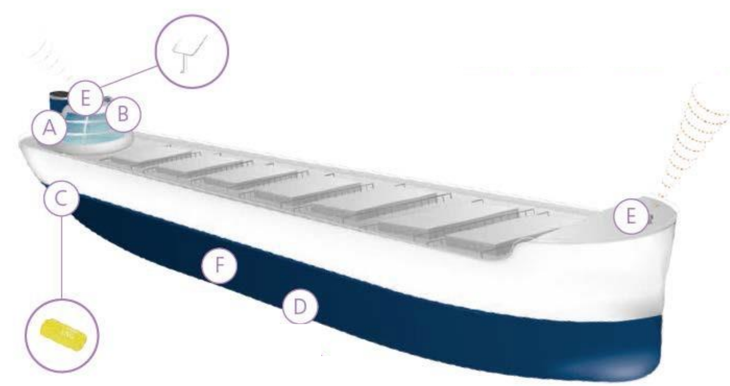

Electronics and technology
Wearable technology
Crew
Surveyor
Crew
Offboard robots

Transformation effect: TechnoMax Ships 2030









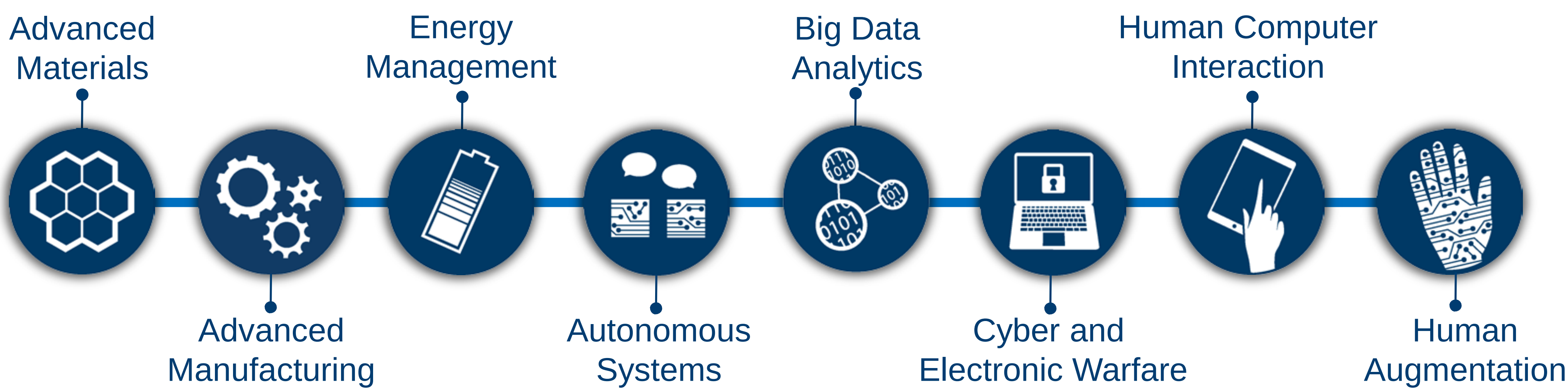
Transformational Effect: Supply Chain

Naval

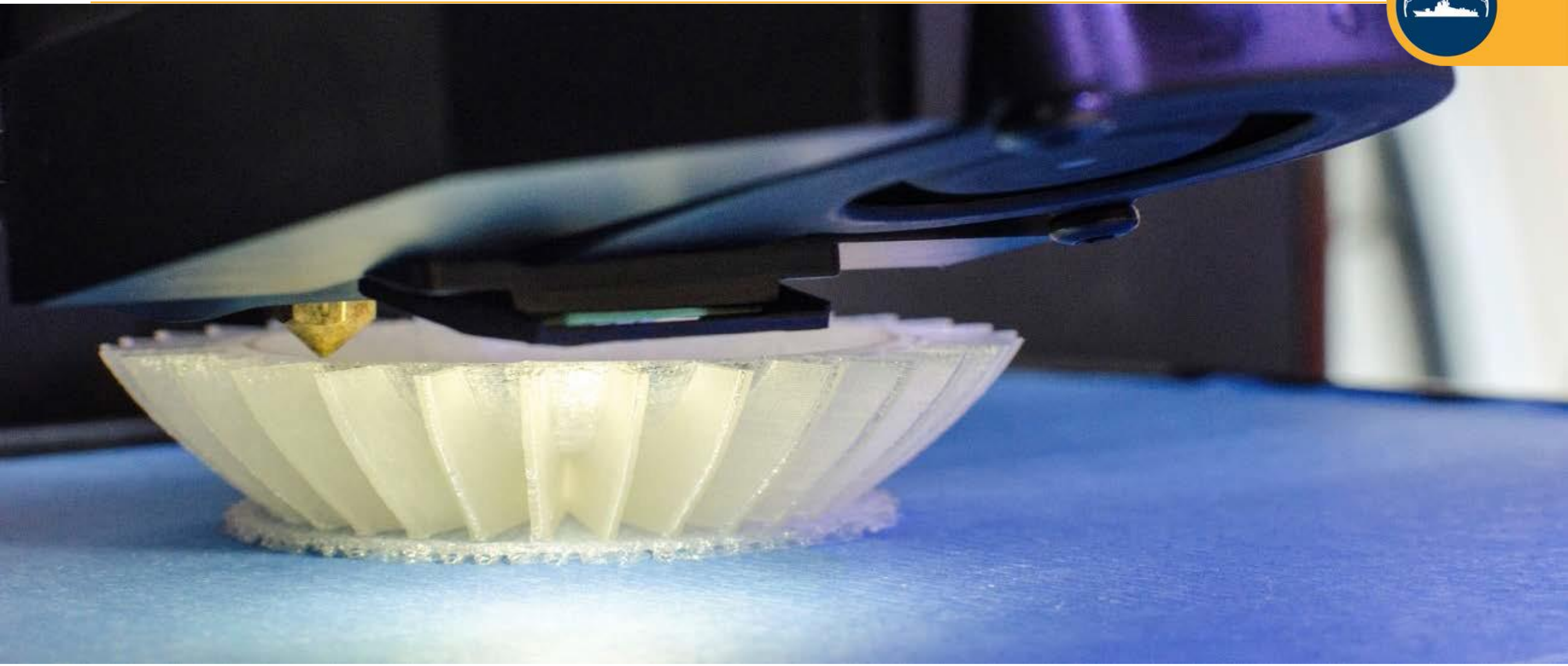
Naval

Setting the scene

8 Technologies



Advanced Manufacturing



Energy Management

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Cyber and Electronic Warfare

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Human Computer Interaction

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Human Augmentation

Human Augmentation

Article Source: New Scientist Magazine (Online)

Robotic suit gives shipyard workers super strength

Workers building the world's biggest ships could soon don robotic exoskeletons to lug around 100-kilogram hunks of metal as if they're nothing

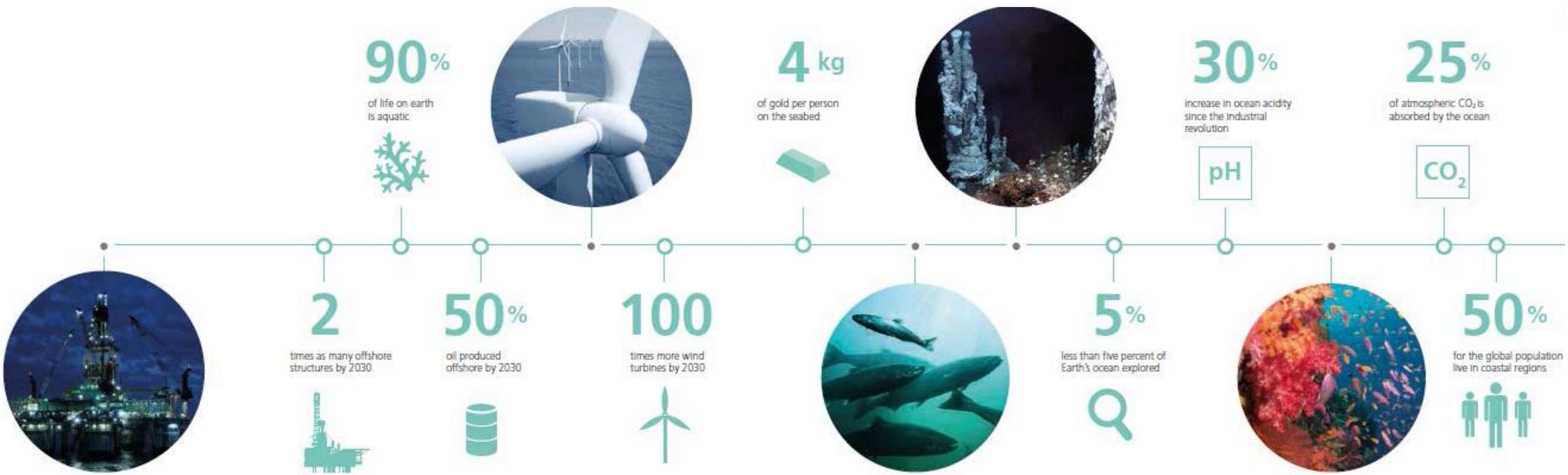
By Hal Hodson

RoboShipbuilder
(Image: Daewoo)

Ocean Space

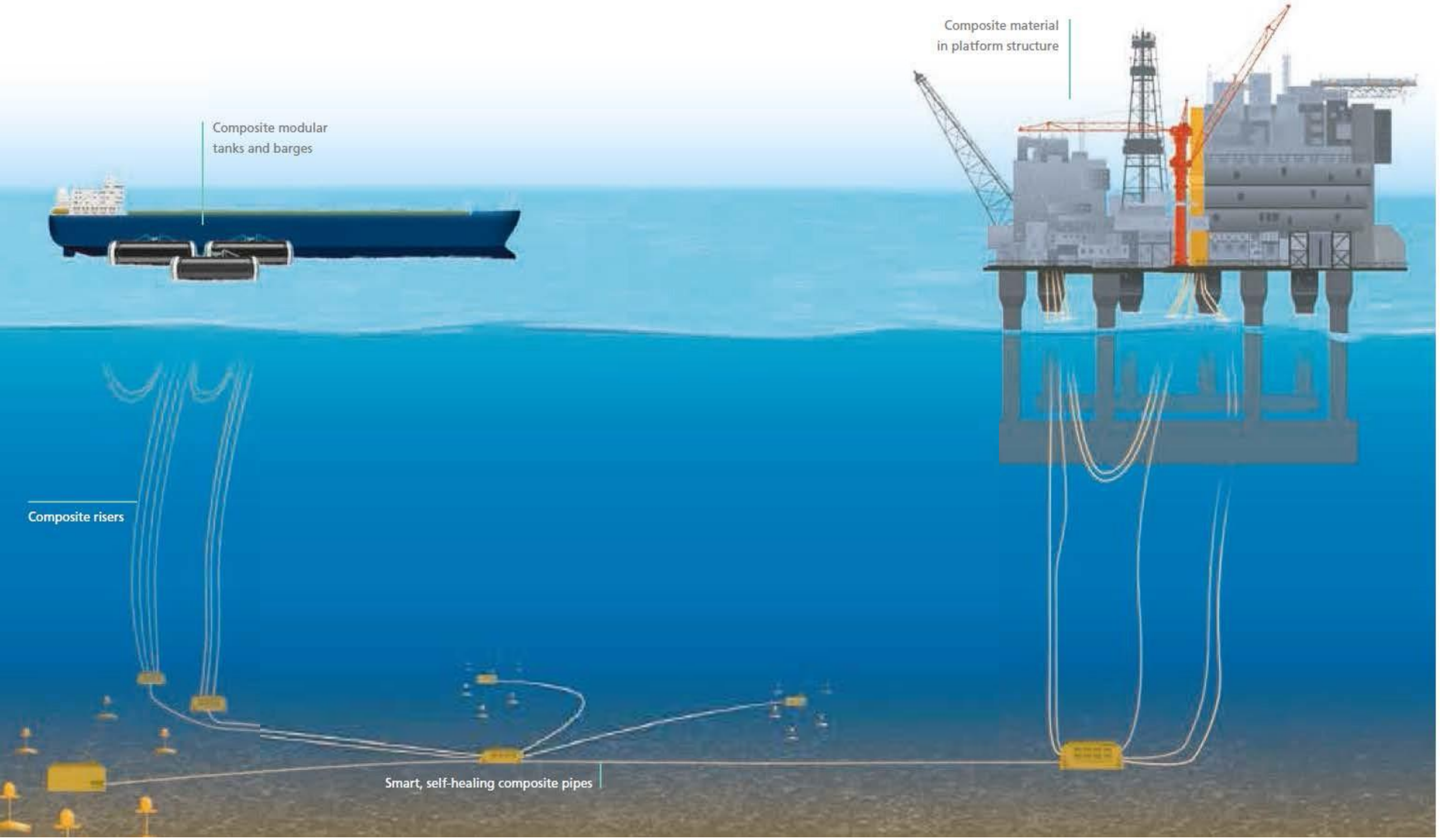
Ocean Space

Setting the Scene



8 Transformational Technologies for Ocean Space

Advanced Materials



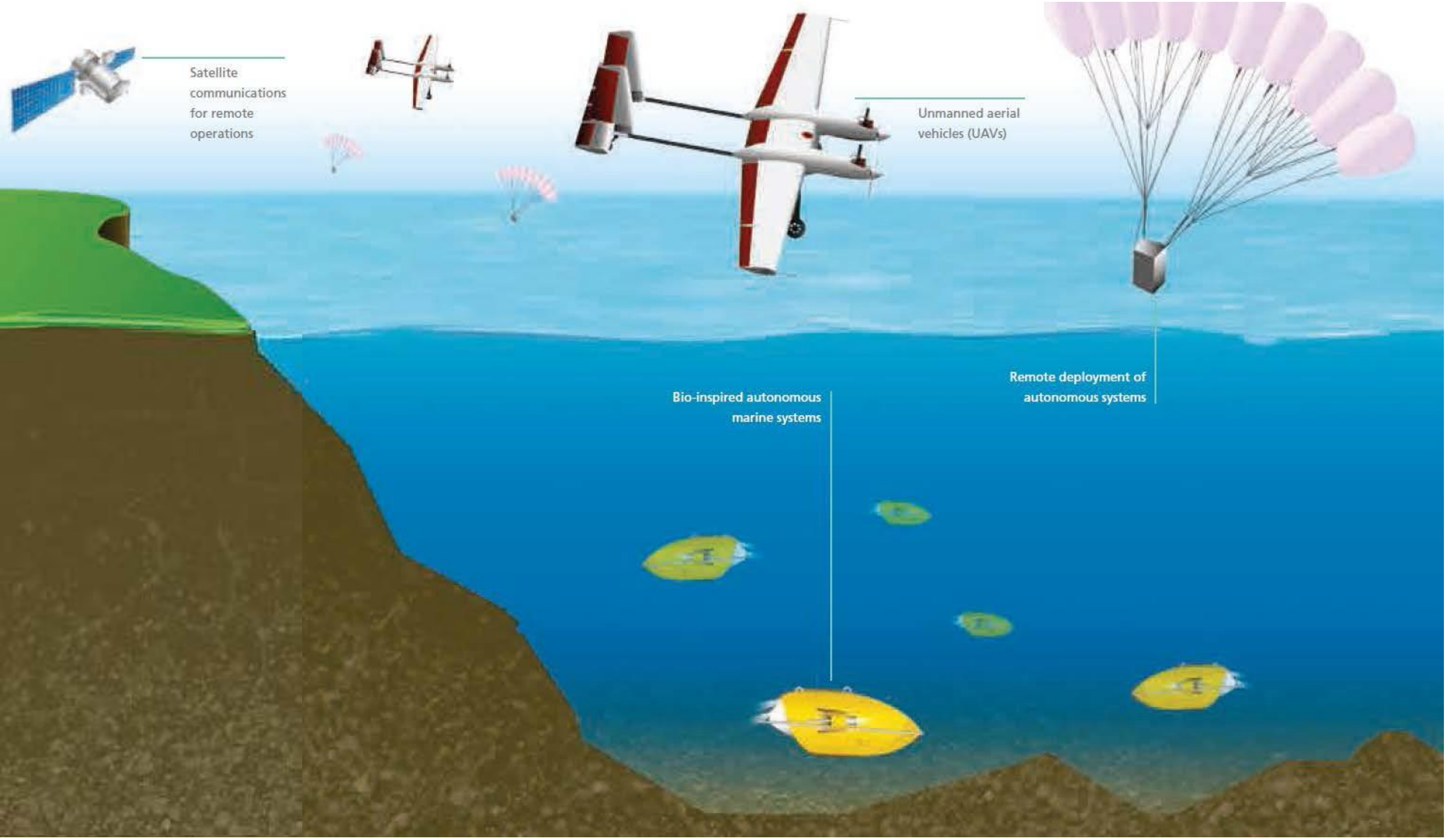
Three new facets of fibre reinforced polymeric composite materials:

- Ultra strong materials (carbon nanotubes and graphene)
- Smart materials with embedded sensors
- Self-healing materials

These new smart and extremely lightweight materials will enable

- Higher level of durability
- Reduced downtime for maintenance
- Lower operational costs
- Increased levels of robustness
- More reliable operations.

Autonomous Systems



Mass deployment of marine autonomous systems

Commercial drivers:

- Coastguard
- Research organisations
- Weather and climate bureaus
- Ocean space industries such as deep ocean mining, oil & gas and pharmaceutical companies

Technical enablers:

- Cheaper long endurance marine robotic
- Powerful sensing, communications and navigation systems.
- Improved reliability and robustness

Autonomous Systems

Article Source: BBC News (Online)

Starfish-killing robot close to trials on Great Barrier Reef

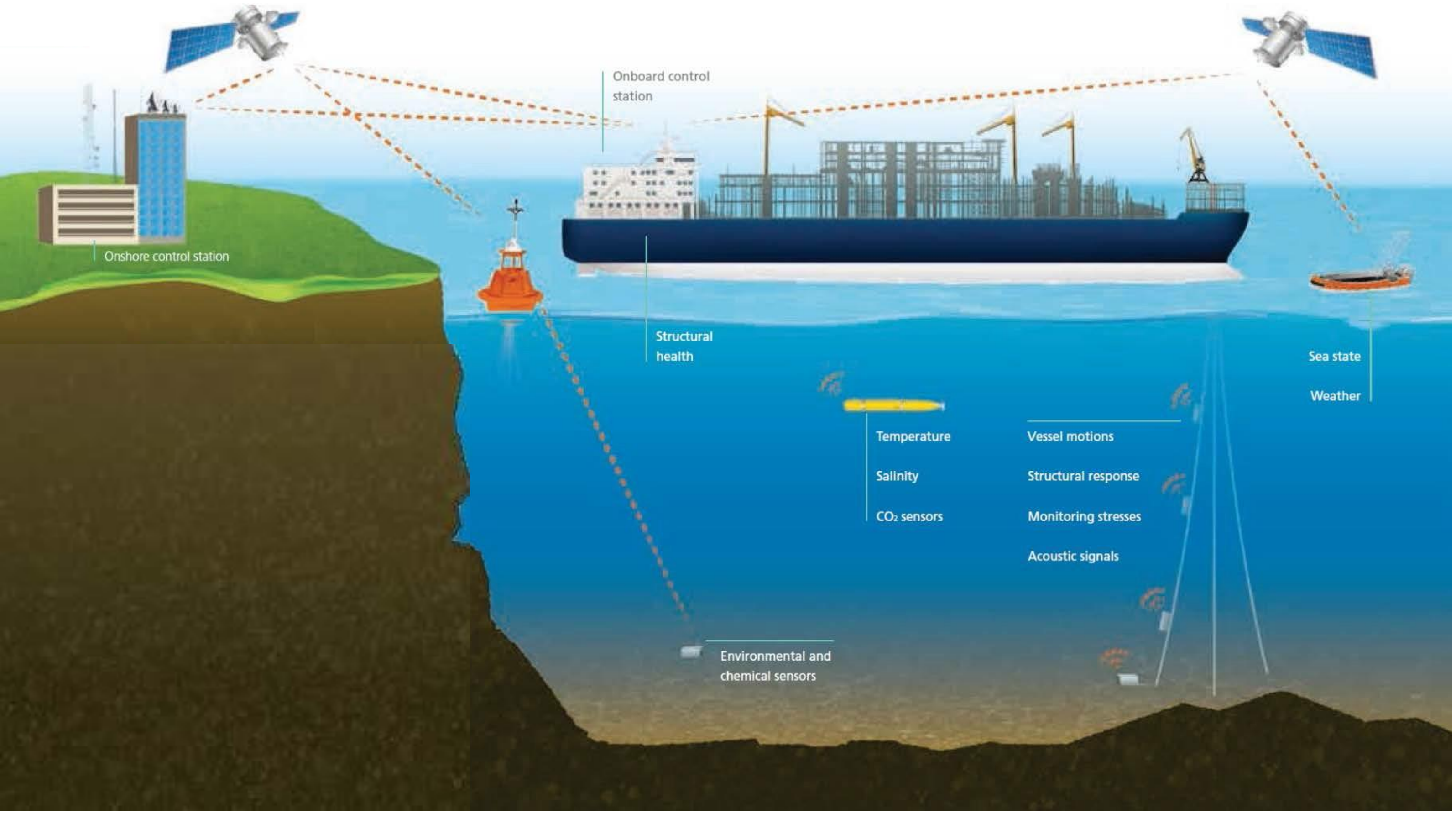
By Tom Espiner
Technology reporter

2 September 2015 | Technology

Crown-of-thorns starfish have been described as a significant threat to the Great Barrier Reef

The Cotsbot is designed to autonomously search for crown-of-thorns starfish and destroy them

Sensors and Communications



There is a need for obtaining detailed information from a wide range of sources throughout the Ocean Space

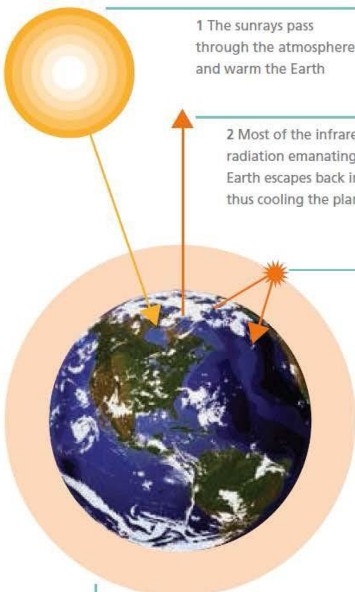
This may be achieved thanks to

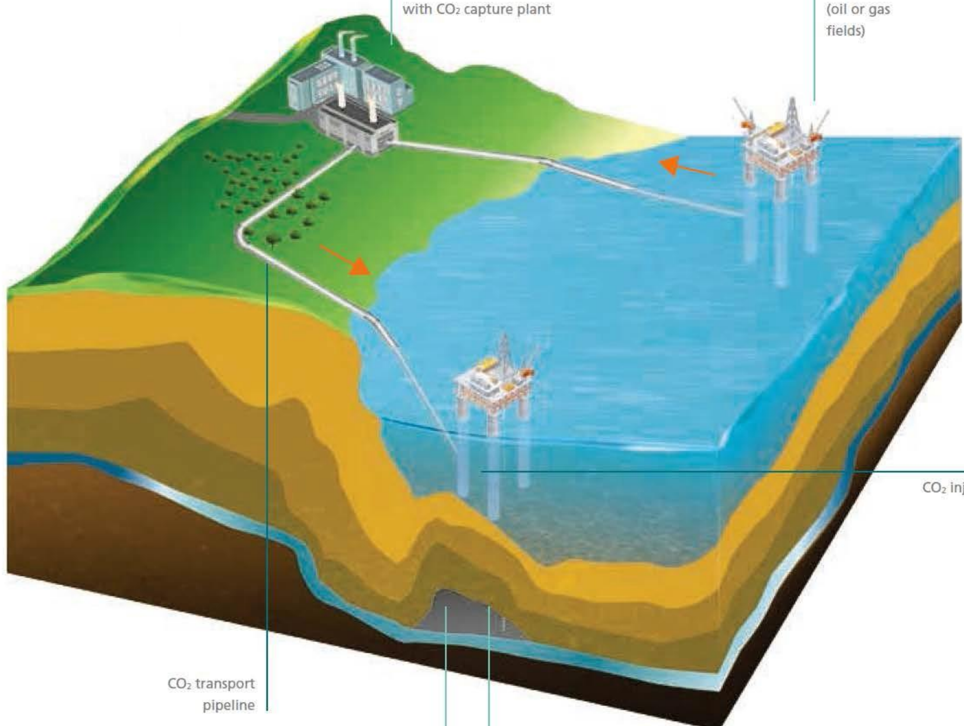
- Miniaturisation of sensors at a reduced cost
- Accessible commercial satellite networks with high uplink capacity

Positive outcomes include

- Lifecycle monitoring of offshore structures
- Process efficiency optimisation
- Robust safety rules enforcement
- Better understanding of the marine environment

Carbon Capture and Storage





Aims to reduce the CO_2 emission to the atmosphere and the ocean environment.

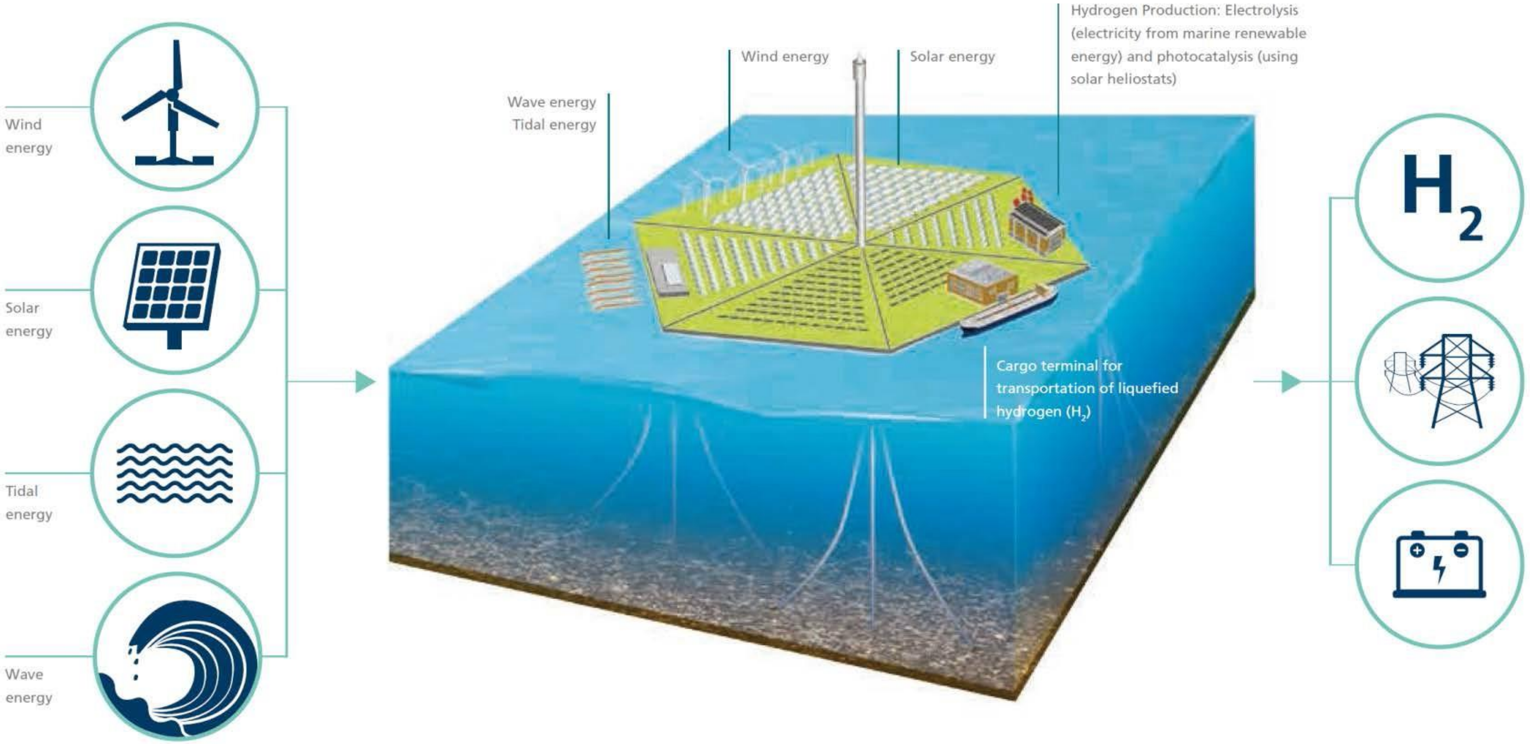
Industry benefits

- Sustainable geological oil and gas sites (natural)
- Use of existing oil and gas infrastructure (man-made)

Societal benefits

- New industry and jobs
- Continued access to cheap energy sources promoting economic growth
- Improved air quality and reduced pollution in densely populated areas

Sustainable Energy Generation



The offshore floating platform housing energy-generation plants, processing plants and storage plants, as well as living accommodation and docks for ships.

Provide cleaner power

- Utilise solar, wind, wave and tidal energy

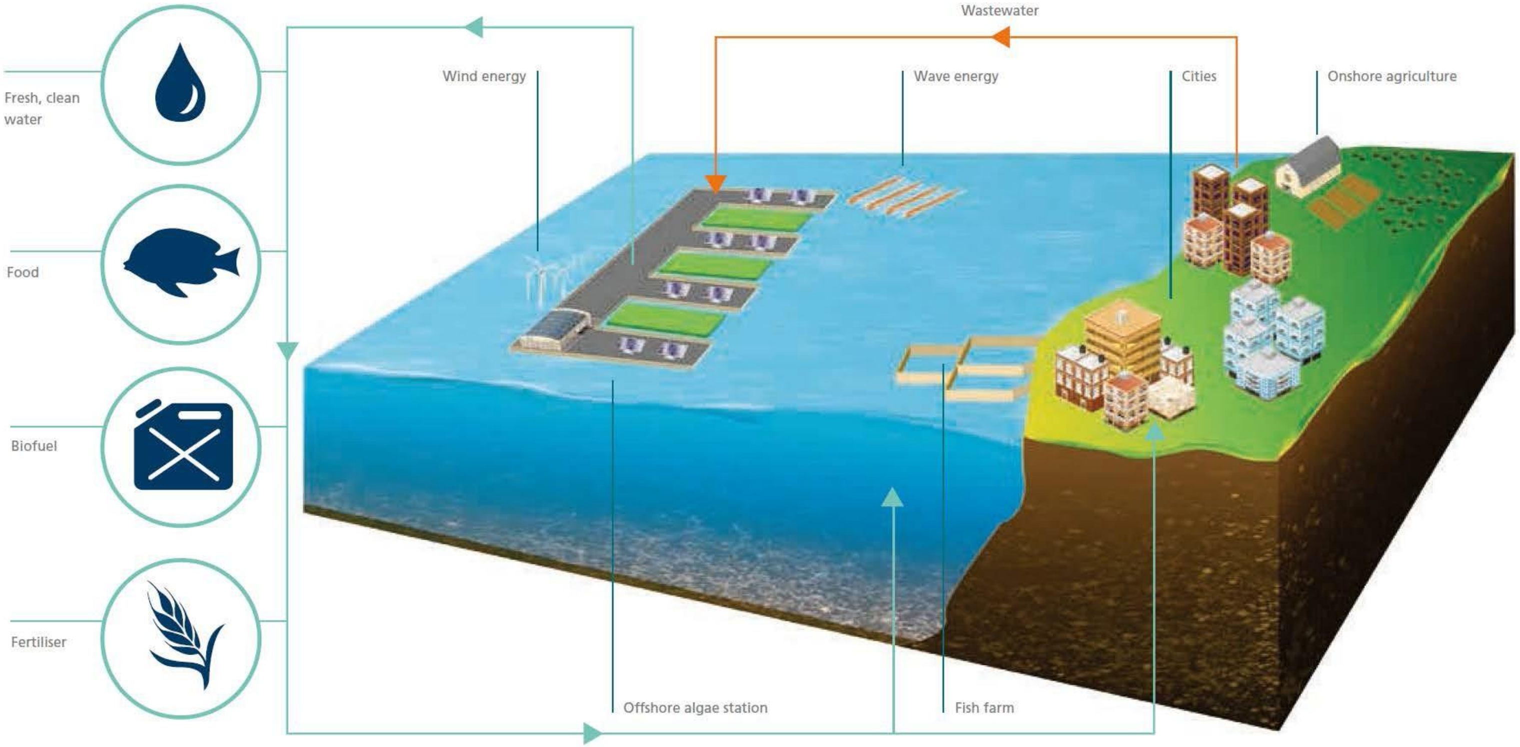
Enabled by

- Abundance of raw material
- Existence of floating marine devices

Positive outcomes include

- Potential to create new supply chain industry and distribution industry
- Contribution to reduction of the fossil fuel consumption

Marine Biotechnology



Potential benefits that algae offshore stations will bring to society:

- New drug development
- Fuel security
- Goods and services from the ocean
- Resources
- Food and fresh water

Key enablers:

- Adaptability of facility to produce different products
- Technologies proven at pilot scale
- Existing market chain

Ocean Space Transformed

Humanity will need to adapt to

- Climate change, sea level rise, increased risk of extreme weather events
- Growing population in coastal regions
- Reduced capability to provide enough food, energy, and resources on-shore

Challenges at this scale will require:

- Adoption of emerging marine technologies
- Understanding and exploiting their linkage
- Integrating them with legislative and management structures

Three key missions bind humanity to the ocean space:

- Protecting the People
- Protecting the Environment
- Providing for the People

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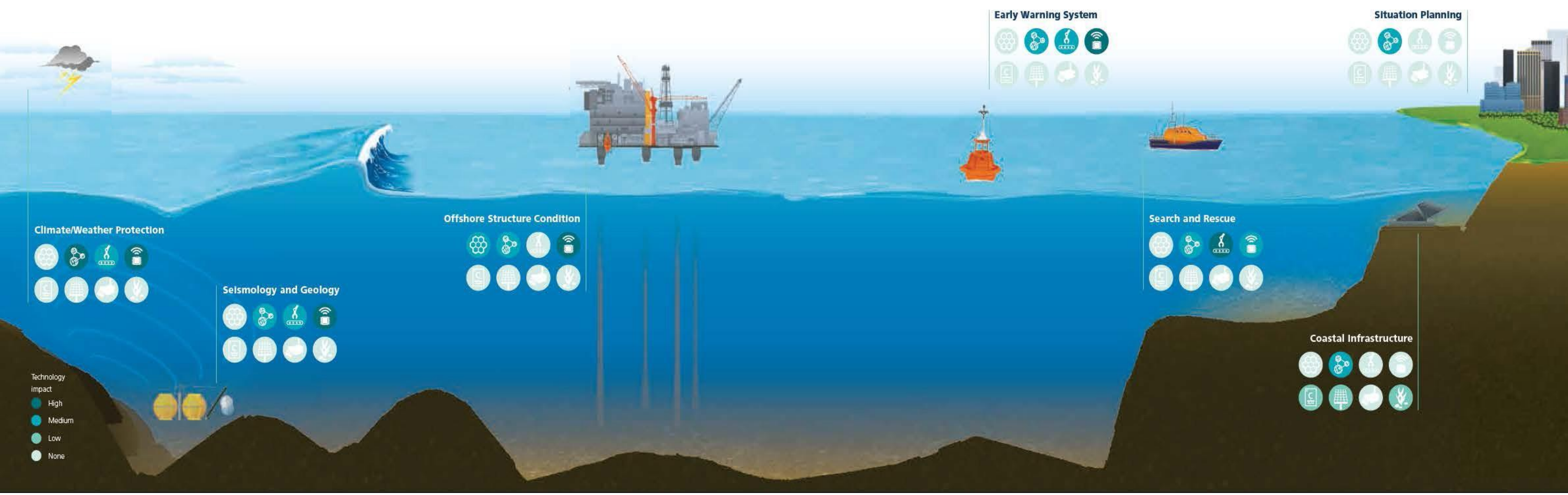
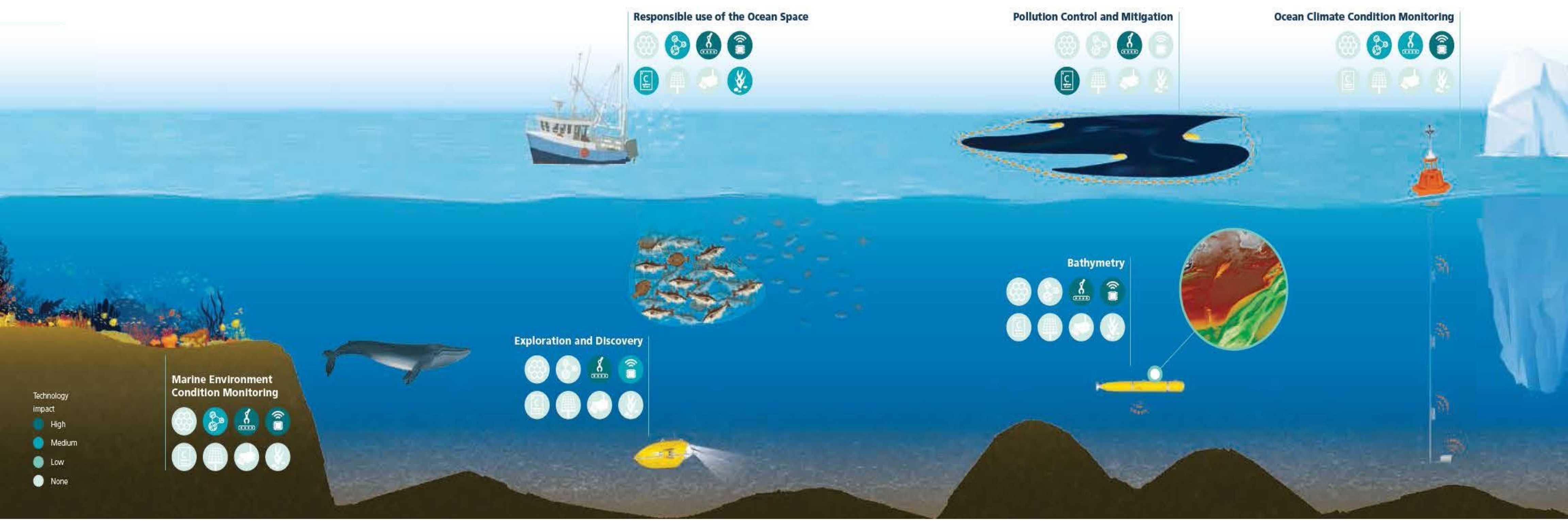
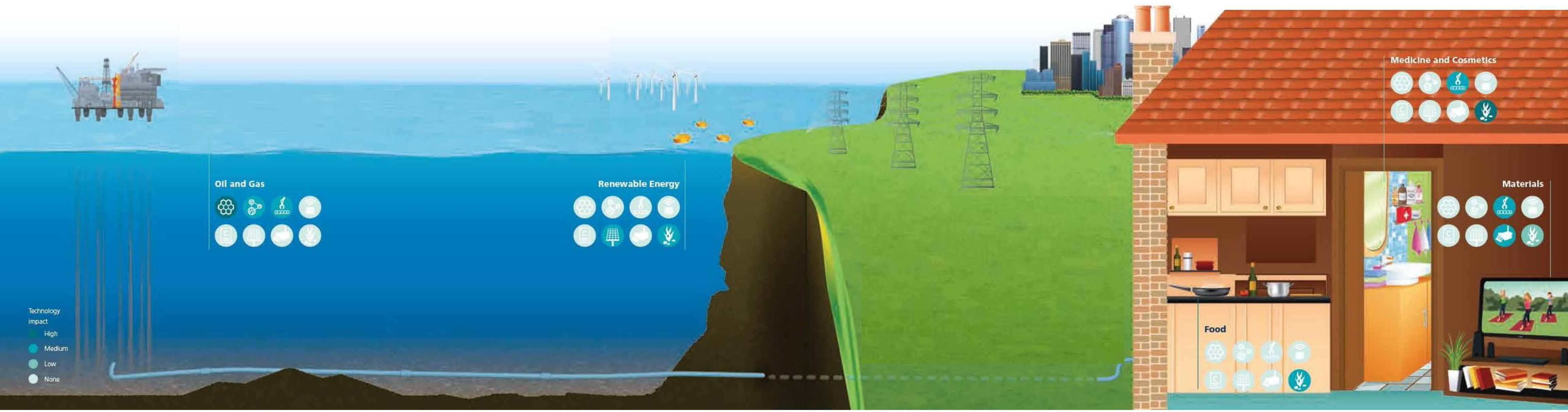
Protecting the people



Protecting the environment



Providing for the people



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