BLUE ECONOMY
COOPERATIVE RESEARCH CENTRE

Delivering innovation in sustainable seafood and renewable energy for a marine nation

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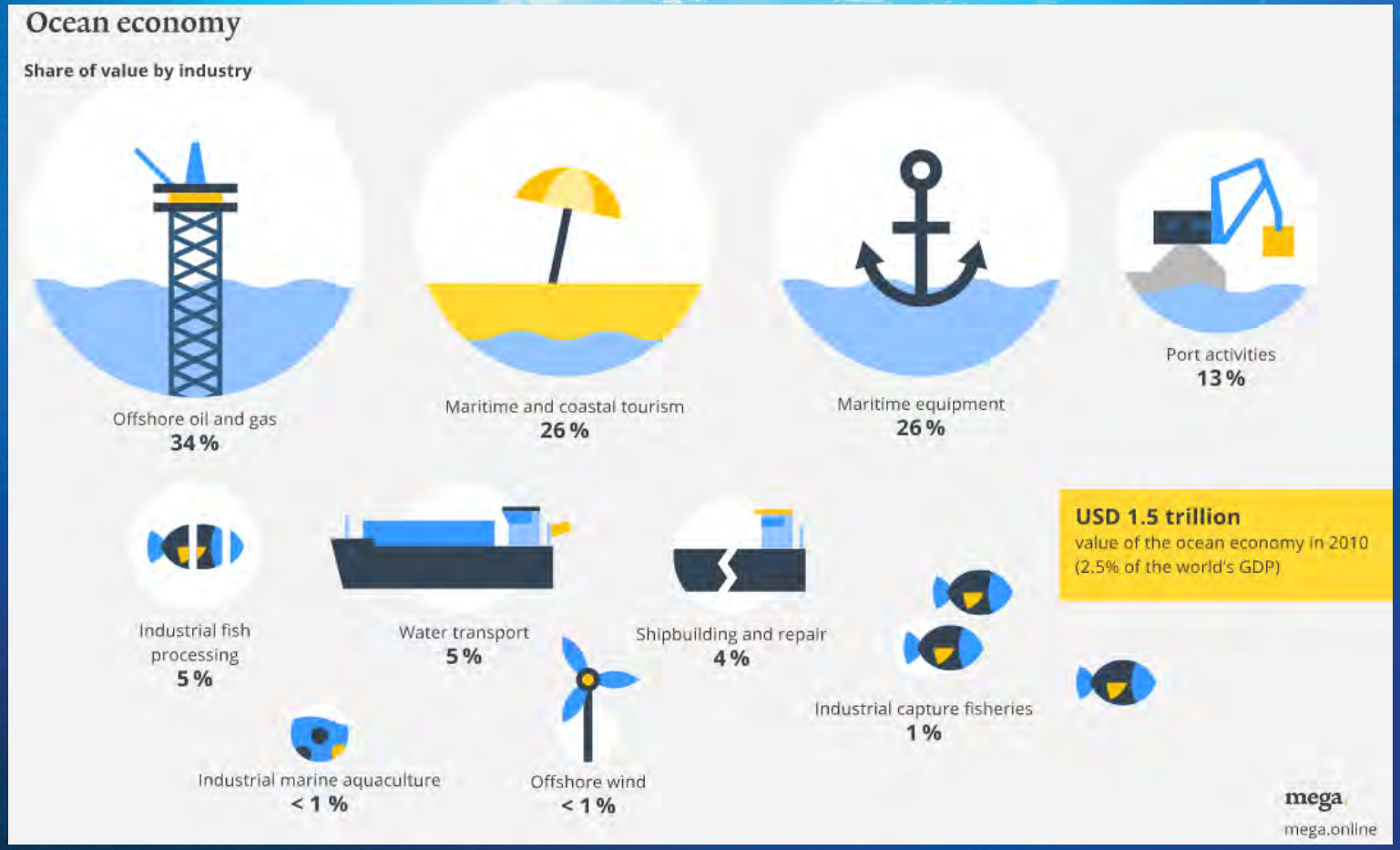
Forum for Operational Oceanography

The ocean economy is essential to the future welfare and prosperity of humankind.

It is a key source of food, energy, minerals, health, leisure and transport upon which hundreds of millions of people depend. However, the maritime industry landscape is poised to undergo a ***profound transition****.*

Globally, the Blue (or Ocean) Economy is predicted to double to US $3 trillion by 2030.


Ocean economy
Share of value by industry
Offshore oil and gas
34 %
Maritime and coastal tourism
26 %
Maritime equipment
26 %
Port activities
13 %
Industrial fish processing
5 %
Water transport
5 %
Shipbuilding and repair
4 %
Industrial capture fisheries
1 %
Industrial marine aquaculture
< 1 %
Offshore wind
< 1 %
USD 1.5 trillion
value of the ocean economy in 2010
(2.5% of the world's GDP)
mega
mega.online

Jobs
Wealth
Energy
Security
Sustainability
Food
Wellbeing
Culture

What is happening internationally – moving

California approves state's first offshore aquaculture farm

Share

First mussel processing p certification

Open Blue cobia farm plar sales

Mussel farm approved in F

Giant Robotic Cages to Roam Seas as Future

<< Back to P

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The Tropos Project is

The Project will gath

The main objective

TroposProject will f

Regions (OMRs), (

1.9 Million.

€7 Million European Project

Modular floating platforms adapted to deep water

Integrate a wide range of possible sectors: ocean renewable energy and food (aquaculture resources)

union.

New NOAA rule: federal waters in the Gulf of Mexico, stretching from 3 to 200 hundred miles offshore, will be open for the production of sustainable seafood.

Benefits of ocean energy and synergies with other sectors

Some forms of ocean energy will yield alternative products, including drinking water, heating, cooling and biofuels. New industries may be created or transferred from declining industries, which will lead to creation of new jobs and/or promote investment in new skills and capabilities.

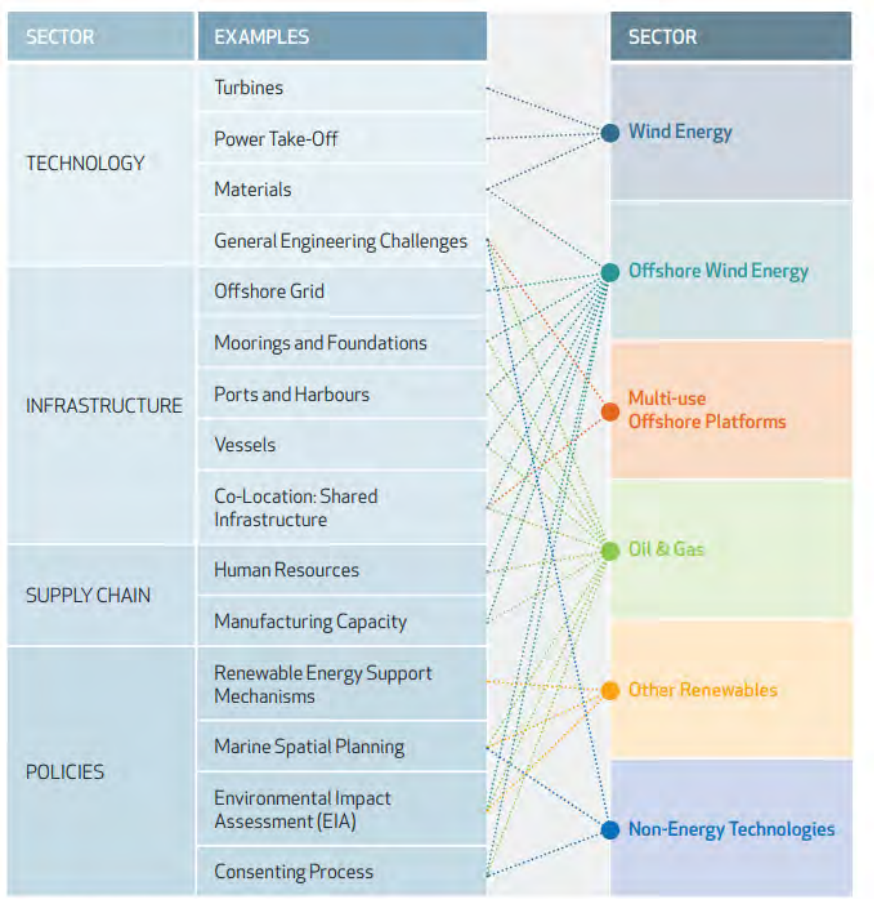


Figure k: Ocean energy synergies with other sectors

Transforming Australia's Blue Economy

- Global Blue Economy value x2 by 2030, $3t USD
- A paradigm shift in how marine protein is produced is needed *now* – scalable, sustainable offshore aquaculture
- Offshore renewable energy: solutions for off-grid applications
- Offshore engineering: building on experience
- This CRC brings together industry, R&D and government to develop compelling triple-bottom-line solutions

An Industry-Led Initiative

Large Industry

HUON AQUACULTURE
Petuna SEAFOODS & GOURMET PANTRY
tassal GROUP
xylem Let's Solve Water
pitt&sherry

Medium Industry

H2U
ITM POWER Energy Storage | Clean Fuel
Kelp Industries
OPTIMAL
oysters TASMANIA
DEME Dredging, Environmental & Marine Engineering
DNV·GL
PEARL PRODUCERS ASSOCIATION Australian South Sea Pearls
AMET Australian Marine Energy Taskforce
pacific ESI www.esi.com.au

Small Industry

saitec
ACS AUSTRALIA
Carnegie CLEAN ENERGY
BMT Clarity from complexity
Southern Blue Reef Pty Ltd
Enhancing the environment
SKRETTING a Nutreco company

International

ALBATERN Wave Energy
sabella
OceanPixel
New Zealand King Salmon
SINTEF
ECSFRI CAFS
MaREI
NUS National University of Singapore
GHENT UNIVERSITY
Plant & Food RESEARCH
THE UNIVERSITY OF AUCKLAND NEW ZEALAND
MERIC marine energy research & innovation center
CAWTHRON The power of science®
AUT UNIVERSITY
SINGAPORE

Government & Industry Growth Centres

Department of State Growth
Tasmanian Government
FIAL

Research

UNIVERSITY of TASMANIA AUSTRALIA
THE UNIVERSITY OF QUEENSLAND AUSTRALIA
CSIRO
Griffith UNIVERSITY
THE UNIVERSITY OF WESTERN AUSTRALIA
MACQUARIE University

$78m cash + $181m in-kind + $70m CRC contribution = 10 year, $329m partnership

The Research Programs

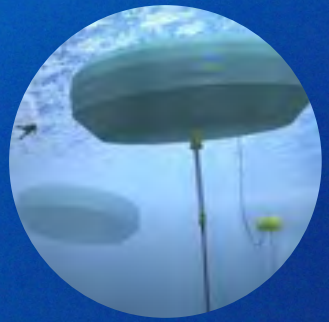
#1 Offshore Engineering & Technology

#2 Seafood and Marine products

#5 Sustainable Offshore Developments

#4 Environment & Ecosystems

#3 Offshore Renewable Energy Systems

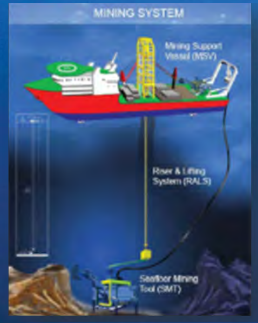


Research Program 1: Offshore Engineering and Technology

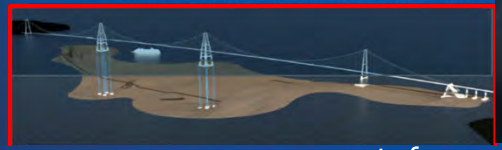
Three Major "Offshore" Industries

Emerging Technologies

Renewable Energy



Deep Sea Mining



Infrastructure

Offshore Aquaculture Farms

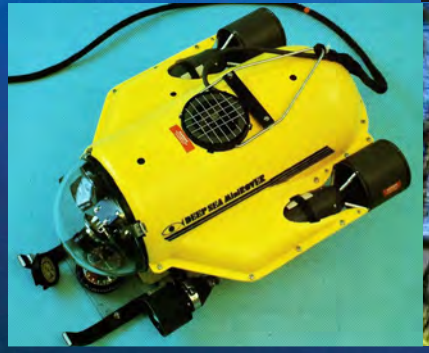
Develop conceptual designs for offshore fish cages that include floating open-cage, closed-cage, submersible-cage and protected-cage systems. Suitably tailored materials (for durability and antibiofouling) and mooring systems will be sought for the fish cages

Standardized Modular Multi-Purpose Platform Systems

Identify general requirements, develop design choices for floating structural components including basic modular shape and size, inter-modular connections, hull structural designs, global arrangements and station keeping systems for creation of land-like space floating on the ocean for various Blue Economy applications.

Remote Technologies

Develop remote sensors and autonomous platform that use aerial, surface and underwater systems to reduce operational risks for aquaculture and renewable energy.



Program 2: Seafood and Marine Products

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Supporting development of offshore aquaculture systems that provide viable and sustainable growth opportunities

Refinement – Refine existing production knowledge for animal and plant species and develop operational guidelines and protocols suitable for different offshore environments and systems.

Integration – Develop the use of integrated systems to support multiple species to increase productivity, diversify products, recover and recycle nutrients.

New Aquaculture – Align new aquaculture systems to maximise the opportunity for enhancing products from existing industry with a focus on high value products

Provide – advanced understanding and industry ready knowledge to farm offshore environments; frameworks for integrating production and engineering technologies; a platform to value and promote seafood and to identify opportunities for new seafood and non-seafood products.

Program 2: Seafood and Marine Products

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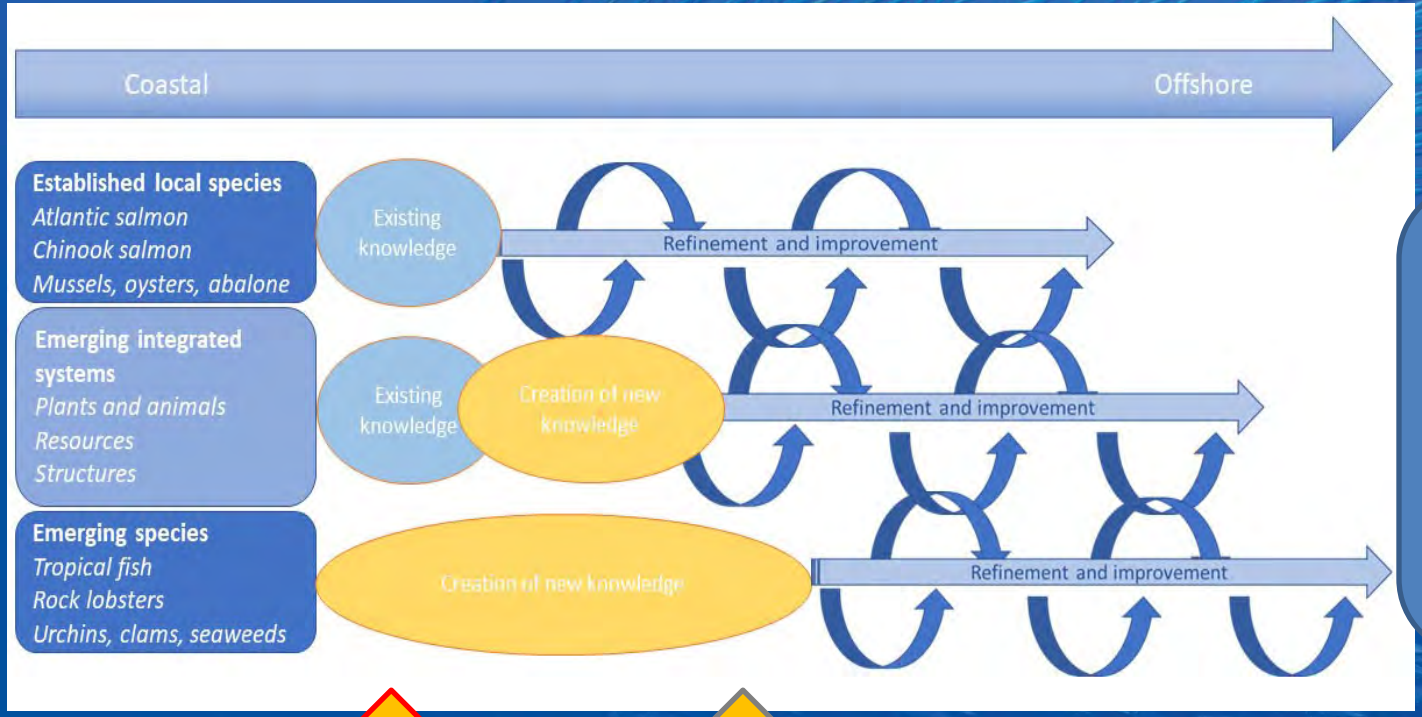


- Increased production
- Improved efficiency
- Increased variety of seafood
- Increased on-food products
- Increased recycling
- Increased sustainability
- Increased seafood quality
- Stronger credentials

Research Program 3: Offshore Renewable Energy Systems

Identify, develop and demonstrate offshore renewable energy systems e.g., conversion, storage and control optimised for co-located offshore operations.

Energy demand – Assess offshore industry energy demand - Market assessment; Energy demand modelling; Future scenarios.

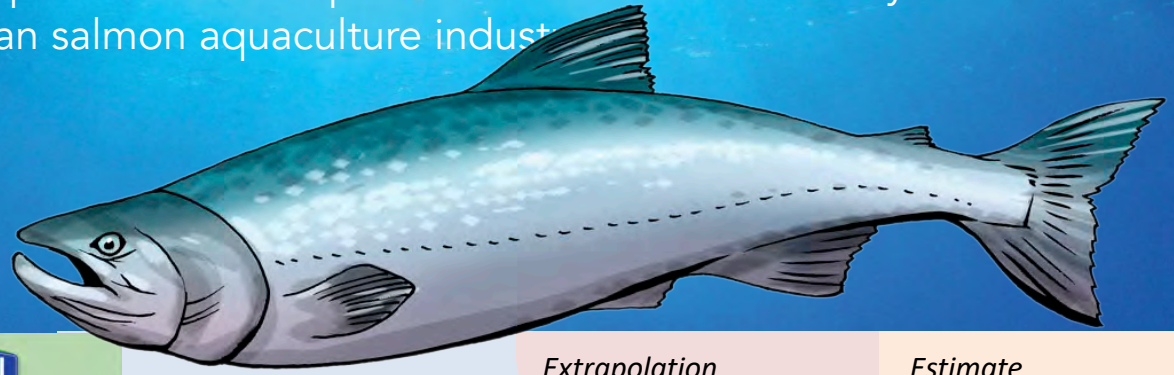
Energy availability – Resource characterisation; Site optimisation; Resource prediction and Monitoring for Energy Management; Climate scenarios.

Conversion technologies – Advance the design, performance, survivability, reliability and longevity of Offshore Renewable Energy Converter (OREC) technologies (e.g., wind, wave, tidal, solar) with consideration of off-shore industry end-user (e.g. aquaculture) requirements.

Control systems – Developing energy management strategies and control systems for integrated offshore renewable energy systems (Hybrid systems; Energy storage, including hydrogen applications; intelligent control to balance generation and demand of e.g., power, freshwater, oxygen)

Energy Demand

Offshore industry presents an exceptional Remote Area Power System market e.g., the Tasmanian salmon aquaculture indust



2018 TASSAL Production:
30883 HOG tonne

Energy demand:
14.34 GJ/HOG tonne

Diesel demand:
6.5 GJ/HOG tonne

Emissions:
1.04 T CO2e/HOG tonne

Extrapolation

TSGA 2018 Production:
~63000 HOG tonne

Energy demand:
253 GWh

Diesel demand:
115 GWh

Emissions:
66 kT CO2e

Estimate

Annual Diesel Expenditure:

$39m

Assumed diesel cost
$AUD 340/MWh (Lazard, 2017)

2030 Tasmanian Salmon Production Target: 100,000 HOG tonne (Norwood, 2017)

Diesel usage: Predominantly barge operations to service biomass, RO desalination and venturation

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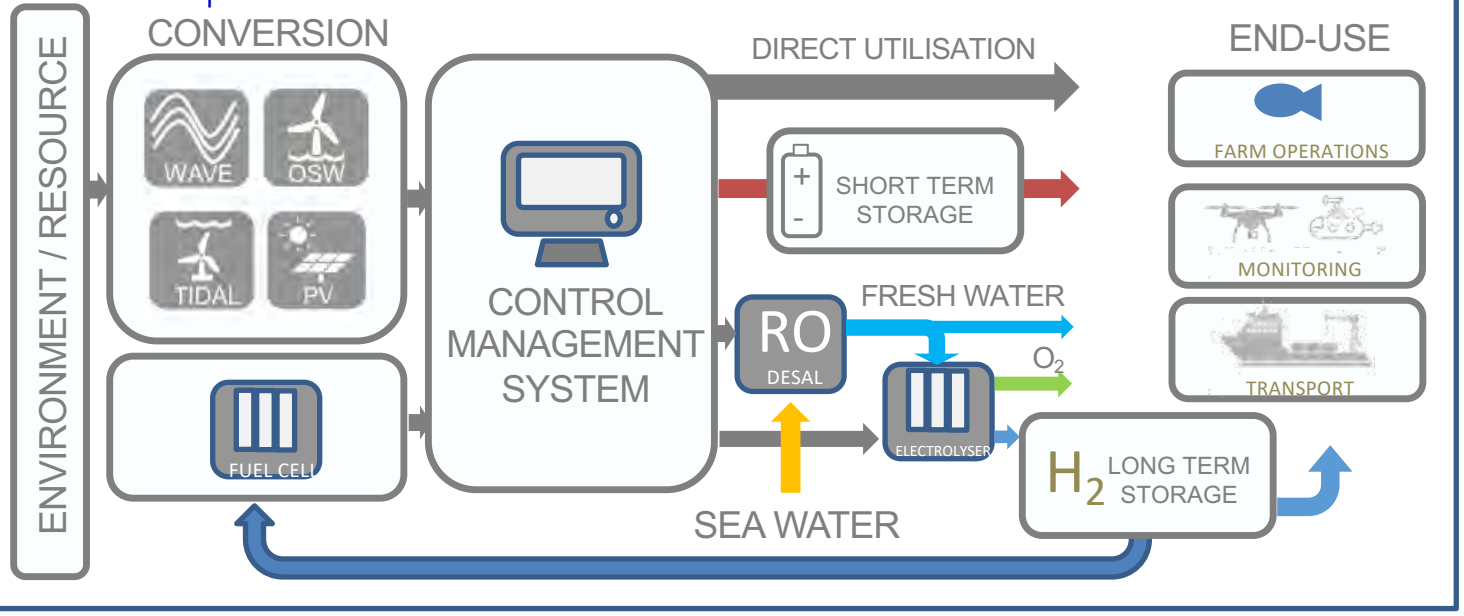
Program 3: Offshore Renewable Energy Systems

Objective: Identify, develop and demonstrate offshore renewable energy systems capturing generation, storage and control aspects optimised for co-located offshore operations.



Program 4: Environment & Ecosystems

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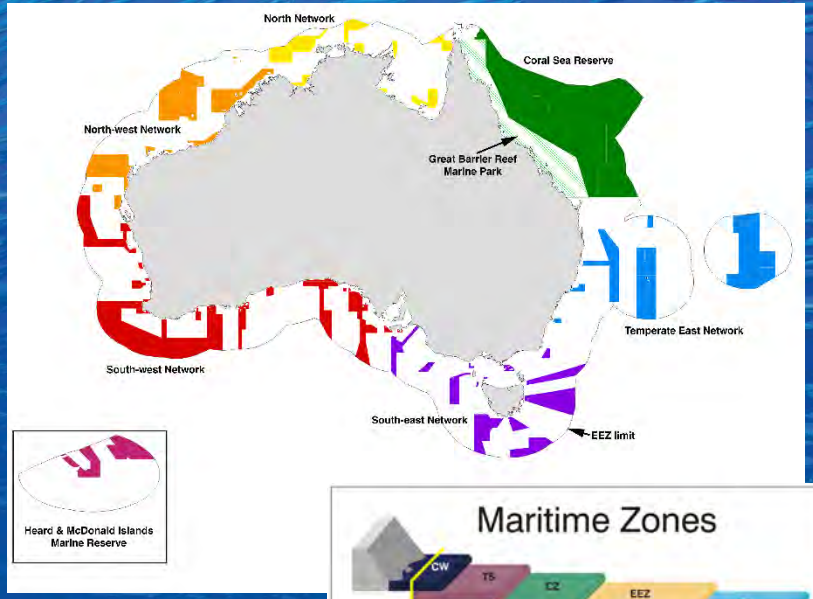
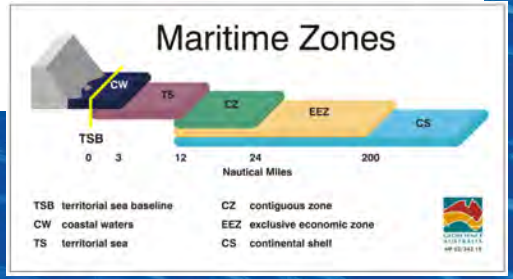
Regional Planning and zoning – Tools for identifying locations with most suitable conditions (environmentally & logistically) & least potential footprint

Specific site selection – Frameworks for specific site ecological, economic & social baselines; multi-use platform feasibility & impact assessments





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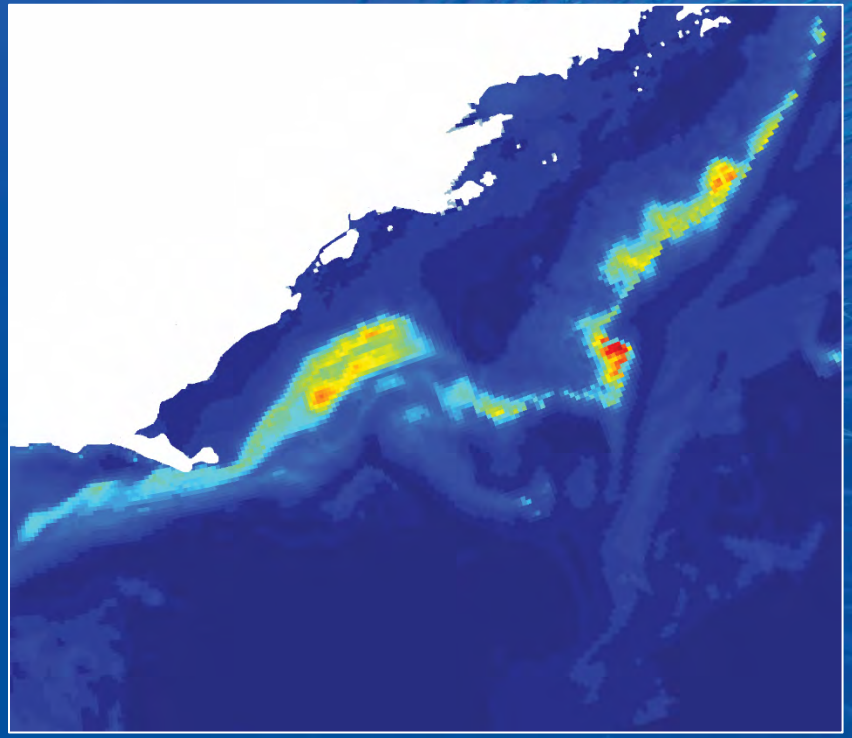

Operational Intelligence – Integrated monitoring and (near) real time operational information system (data platform, informatics & modelling)

Program 4: Environment & Ecosystems

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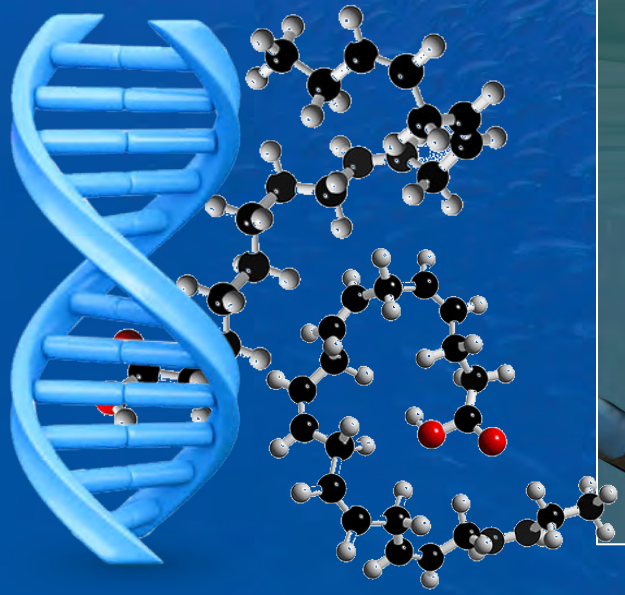
RESEARCH PROGRAM 1 2 3 4 5

Biosecurity – Development of improved biosecurity protocols and procedures both for internal (in-farm) and external (off-farm) threats



Program 4: Environment & Ecosystems

BLUE ECONOMY COOPERATIVE RESEARCH CENTRE

RESEARCH PROGRAM 1 2 3 4 5

Integration & Sustainability

Integration of information to:

- maximise benefits to ecosystem services & product quality
- minimise impacts (by & on platform activities)
- support certification and ecolabelling of seafood (C neutral & minimised ecosystem footprints)
- smooth multi-user interactions & co-benefits (e.g. joint monitoring)

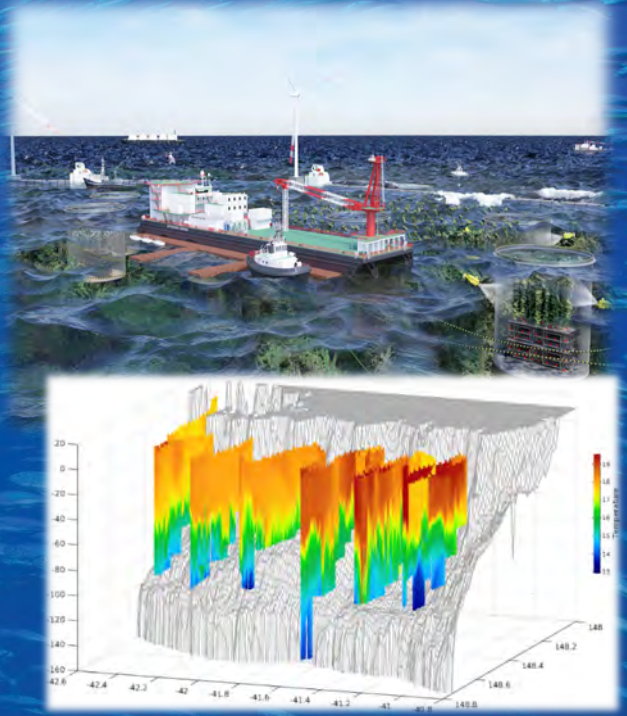


Image: IMOS

Research Program 5: Sustainable Offshore Developments

Addressing governance and management for blue economy operations on offshore sites and platforms

Legal, economic and policy frameworks for blue economy activities
Underpinning the development of environmentally sustainable operations.

Costs and benefits of offshore co-location and business development
Modelling blue economy processes and outputs, business development, financing and supply chains.

Development of a blue economy integrity and accountability system
Addressing the ethical, economic, environmental and social basis for operations.

Commercialisation, Communication and Capacity building
Ensuring research findings useful and usable to partners and external stakeholders, capacity building programs to provide skill development to public, private and third sector.

Outcomes


Technical
Innovation
Cost
Reduction
Increased
Productivity
Risk
Management
Environmental
Sustainability
Education
& Training
BLUE
ECONOMY

A Compelling Legacy

- Sustainable, competitive advantage for Australian industry
- Engineering solutions for use in offshore aquaculture
- Viable offshore renewables, with future export potential
- Adapted policy frameworks to support new offshore developments
- Unique industry capability, innovation infrastructure and market leadership

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Education & Training

Postdoctoral and PhD appointments

Industry placement & internships

Liaison with industry & government

Public outreach and education

Entrepreneurship

Events and forums