National Marine Science Plan and the Blue Economy

Focus on the blue economy throughout the marine science system

NATIONAL MARINE SCIENCE COMMITTEE

Executive Summary

This paper presents a desktop analysis which identifies the experts within fields relevant to the NMSP blue economy agenda. In undertaking this analysis, the following methodology was used:

- Identify the fields of research that are relevant in analyses of drivers, planning and implementation of the blue economy
- Identify Australian experts and programmes within these fields of research

The following paper offers:

1. an initial categorisation of the established and emerging industries and services that make up Australia's blue economy;
2. an identification of traditional marine science fields of research and a summary of other non-traditional marine science fields of research and the way in which they may be engaged to assist the NMSC with advancing Australia's blue economy; and
3. a desktop analysis of program, projects and collaborations within and beyond the NMSC Partnership.

This paper was presented to the NMSC on 19 October 2017.

Context

The NMSP declares marine science will drive the development of the Australia's blue economy. It states that its aspirations will not be realised with a 'business as usual' approach to marine science. The NMSP recognises that to advance Australia's blue economy, the NMSC and the Australian marine science community will need to create an explicit focus on the value of marine science throughout the blue economy.

The National Marine Science Plan could be said to represent the goals of the traditional marine related scientific fields of research, and how they plan to be integrated into Australian society to address the grand challenges:

- Marine Safety, Sovereignty and Security
- Food Security
- Energy Security
- Resource Allocation
- Biodiversity Conversation
- Sustainable Urban Coastal Development
- Climate Change Adaptation

With the world's third largest maritime jurisdiction, the blue economy is of significance for Australia. Defining the blue economy is a daunting task,[1] and for the purposes of this initial analysis the following definition and concept will apply: A sustainable ocean economy emerges when economic activity is in balance with the long-term capacity of ocean ecosystems to support this activity and remain resilient and healthy.[2]

Industries and Services of the Blue Economy

1 Alistair McIlgorm, "The Challenge of Managing Earth's New Economic Frontier: Our Oceans," The Conversation (2015).

2 The Economist, "The Blue Economy: Growth, Opportunity, and a Sustainable Ocean Economy," The Economist Intelligence Unit Briefing Paper for the World Ocean Summit 2015 (2015).

The following discussion is merely to initiate a discussion of the industries and services within Australia's blue economy, and intends to offer a starting point in quantifying and clarifying what Australia's blue economy includes for the purposes of the National Marine Science Plan. The following offers a merging of three concepts of industries and services within a blue economy from three sources: The Economist's Intelligent Unit Briefing Paper, the AIMS Index of Marine Industry, and the National Marine Science Plan (see Appendix 1 for methodology).

The industries and services that make up the conceptual totality of the blue economy are wide ranging and constantly evolving. At a broad scale, the blue economy can be said to encapsulate the economies involving utilisation of living resources, non-living resources, the benefits derived from ocean-related commerce and trade, and the role of ocean health in the economic stability and prosperity of a nation.

In narrowing such a broad notion of a blue economy to the national level, it could be said that some components have more economic significance for Australia. The AIMS Index of Marine Industry,[3] a regular report on the contribution of Australia's marine industries to the economy, divides the blue industrial economy into two major activities. The first is marine resource activities and industries, including fishing and oil and gas exploration, the second are activities related to marine services, such as ship building, marine tourism and recreation, and transportation.

The AIMS Index is purely industry based, and as such is focused on the quantifiable dimension of the blue economy. Some value-adding industries directly related to the blue economy have been excluded, such as land-based port and water terminal operations and stevedoring services,[4] and activities such as desalination and carbon capture. In acknowledging the usefulness in being able to quantify industries, this study will take a broader review of relevant areas in order to encompass the developing industries that are not yet making a broad-scale economic impact.

The National Marine Science Plan further identifies actors and industries central to Australia's blue economy.[5] Taken together, the following industries and services can be identified (Figure 1).

Figure 1: Industries and Services of Australia's Blue Economy

Fields of research

[3] Australian Institute of Marine Science, "Aims Index of Marine Industry 2016," (2016).
[4] ibid.14
[5] National Marine Science Plan pages 13-14

A blue economy should be built on a triple bottom line, with social, economic and environmental factors taken into account in decision making. Any discussion on greater integration of the National Marine Science Plan into the development and support of the Australian blue economy will therefore be a naturally multi-disciplinary inquiry.

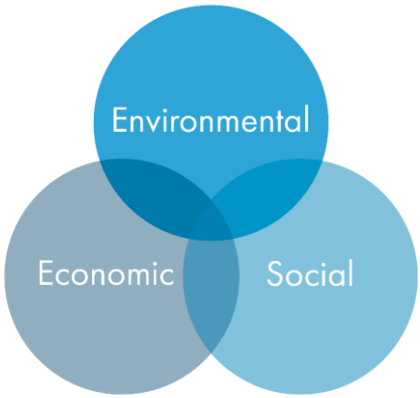

Figure 2: Triple Bottom Line

The traditional marine science fields of research, as defined by the Australian Research Council (ARC), can broadly be described as encompassing:[6]

- **Mathematical sciences**
- **Biological sciences**
- **Chemical sciences**
- **Earth sciences**
- **Physical sciences**
- **Environmental sciences**

The fields of research that are directly related to both the support and advance of marine science are:

- **Engineering**
  - This ARC field of research includes: aerospace, automotive, biomedical, chemical, civil, electrical and electronic, environment, geomatic, manufacturing, maritime, materials, mechanical, and interdisciplinary engineering; food sciences, and resources engineering and extractive metallurgy.
  - Beyond the traditional types of engineering of which the marine science community is well aware - including maritime engineering and that involved with new and innovative marine technologies, are the food sciences. The food sciences can include experts in the fields of marine related food security, one of the grand challenges identified by the National Marine Science Plan.
- **Technology**
  - This ARC field of research includes: agricultural, environmental, industrial and medical biotechnology; communications technolgoies; computer hardware; and nanotechnology.
  - These disciplines are clearly essential to marine science, and its development through data creation and delivery, innovation, and other advancements.

To ensure that the blue economy is supported and advanced by the knowledge derived from the marine science community, the following fields of research can contribute the following:

[6] The ARC fields of research are used to circumvent the definitional and often subjective issues surrounding categories and definitions of academic disciplines, an analysis of which is beyond the scope of this paper. The fields of research can be found at: http://www.abs.gov.au/ausstats/abs@.nsf/0/050A7395E86A9719CA257418000477A2?opendocument

- **Information Sciences**
    - It is acknowledged that this sits between traditional science and other fields of research, particularly in the data space.
    - This ARC field of research includes: artificial intelligence and image processing, computation theory and mathematics, computer software, data formatting, distributed computing, information systems, library and information studies – including informetrics, organisation of information and knowledge resources, records management and social and community informatics.
    - Beyond the examples of data handling per facilities such as the Australian Ocean Data Network, the contribution of this discipline can be in the translation of technical scientific data to broader fields of research such as data visualisation support, and knowledge of how information can be shared between fields of research, businesses, industries, institutions and levels of government.
- **Education**
    - Education includes: educational systems such as higher education and technical and workplace education; science, technology and engineering pedagogy and curriculum; and specialist studies including education of science teachers and technology and computing education.
    - The contribution of education can be seen most prominently in the support of the skills based focus of the NMSP, including the education of the next generation of scientists and support staff. It can also assist with the training of the current cohort – with additional support possible to teachers and university staff at this time of rapid technological change.
    - Advancing the broader Australian skills base logically leads to greater innovation and sustainability within marine industries – so this approach can be seen to add value and advancement beyond the education of marine scientists, and to the blue economy's frontline workers.
- **Economics**
    - Economics includes: economic theory; applied economics such as agricultural economics, economic development and growth, environment and resource economics, experimental economics, industry economics and industrial organisation, international economics and international finance, labour economics, macroeconomics, public economics, transport economics and urban and regional economics; econometrics including cross-sectional analysis, econometric and statistical methods, economic models and forecasting, and time-series analysis; comparative economics; and ecological economics.
    - Being a cornerstone of the 'triple bottom line' this critically important discipline offers much richness in the organisation, value, sustainability, and viability of all marine services and industries and offers analysis of the interaction between industry, environment and economic value. The sub-fields of research also cater to the link between the industries and the broader grand challenges.
- **Commerce, Management, Tourism and Services**
    - This discipline includes: accounting, auditing and accountability research including management, taxation, financial and sustainability accounting and reporting; banking, finance and investment; business and management research including business information systems, corporate governance and stakeholder engagement, entrepreneurship, industrial relations, innovation and technology management, international business, logistics and supply chain management; organisation and management theory, organisational behaviour, management and planning, and small business management; commercial services; marketing; tourism research including impacts of tourism, tourism forecasting, management, marketing, resource appraisal, behaviour and visitor experience; transportation and freight services including maritime.
    - This broad-scale research discipline cuts across many of the industries and services of the blue economy, and can naturally serve to integrate the broader grand challenges, the triple bottom line into the traditional blue economy business models.

- **Studies in Human Society**
    - This research discipline includes: anthropology; criminology; demography including population trends and policies; human geography, including economic geography, recreation, leisure, tourism, social, cultural, urban, and regional geographies; policy and administration including Aboriginal and Torres Strait Islander policy, arts and cultural policy, communications and media policy, crime policy, economic development policy, education policy, defence studies, environment policy, public administration, public policy, research, science and technology policy, social policy, tourism policy, and urban policy; political science including Australian government and politics, comparative government and politics, defence studies, environmental politics, government and politics of Asia and the Pacific, international relations, and political theory; sociology, including applied sociology, program evaluation, and social impact assessment, environmental sociology, rural sociology, social change and theory, sociology of science and technology, and urban sociology.
    - Another broad discipline, studies in human society can assist most pointedly as a conduit between pure marine science and government decision making, and its impact on the community, particularly in grand challenge areas such as resource allocation and its relationship to marine industries.
- **Psychology and Cognitive Sciences**
    - This discipline includes the research of: educational psychology, industrial and organisational psychology, social and community psychology, decision-making science, and knowledge representation and machine learning.
    - Psychology and cognitive sciences can assist in the broader shift towards the NMSP agenda, in particular with decision-making processes that support the adoption of marine science knowledge into the blue economy.
- **Built Environment and Design**
    - Built environment and design research includes: architecture, architectural design, heritage and conservation, science and technology (including structure and ecologically sustainable design), and management; building construction management and project planning, building science and techniques, and quantity surveying; design practice and management including design innovation, industrial design and visual communication design; engineering design, methods, knowledge, systems design and modelling; transport planning; urban and regional planning including community planning, land use and environmental planning, regional analysis and development, and urban design.
    - This has particular pertinence to the challenge of coastal development and adaptation in the face of a changing climate and related sea level rises. More broadly, it can contribute terrestrial spatial planning expertise to the science of sea level rise and extreme weather events, and also assist with the communication of related impacts.
- **Language and Communication Studies**
    - This discipline supports research in: communication and media studies including technology and digital media studies, international and development communication, media studies, and organisation, interpersonal and intercultural communication; and globalisation and culture.
    - Such research can assist with effectively advancing the agenda of both the blue economy and the role of marine science in the blue economy, through appropriate mediums, while also providing support when facing potential barriers between fields of research, and between other institutions.
- **Law and Legal Studies**
    - Law and legal studies can provide research and expertise in: Aboriginal and Torres Strait Islander Law; administrative law; civil law and procedure; commercial and contract law; comparative law; conflict of laws; constitutional law; corporations law; criminal law; environmental and natural resources law; intellectual property law; international law; international trade law; labour law; law and society; litigation, adjudication and dispute resolution; property law; taxation law; and torts law.

- While of broad application, law and legal studies can assist with knowledge of international, national and state level laws and obligations; and provide advice in many areas such as jurisdiction, environmental protection, commerce, and risk.

As discussed above, there is a plethora of knowledge that can be (and in some cases has been) valuable in ensuring marine science's value and impact. These fields of research could be more deeply engaged and integrated into the Australian marine science community's advancement of a sustainable blue economy. This could be facilitated through various collaborations and through investment in fostering cross-disciplinary skills (Figure 3).

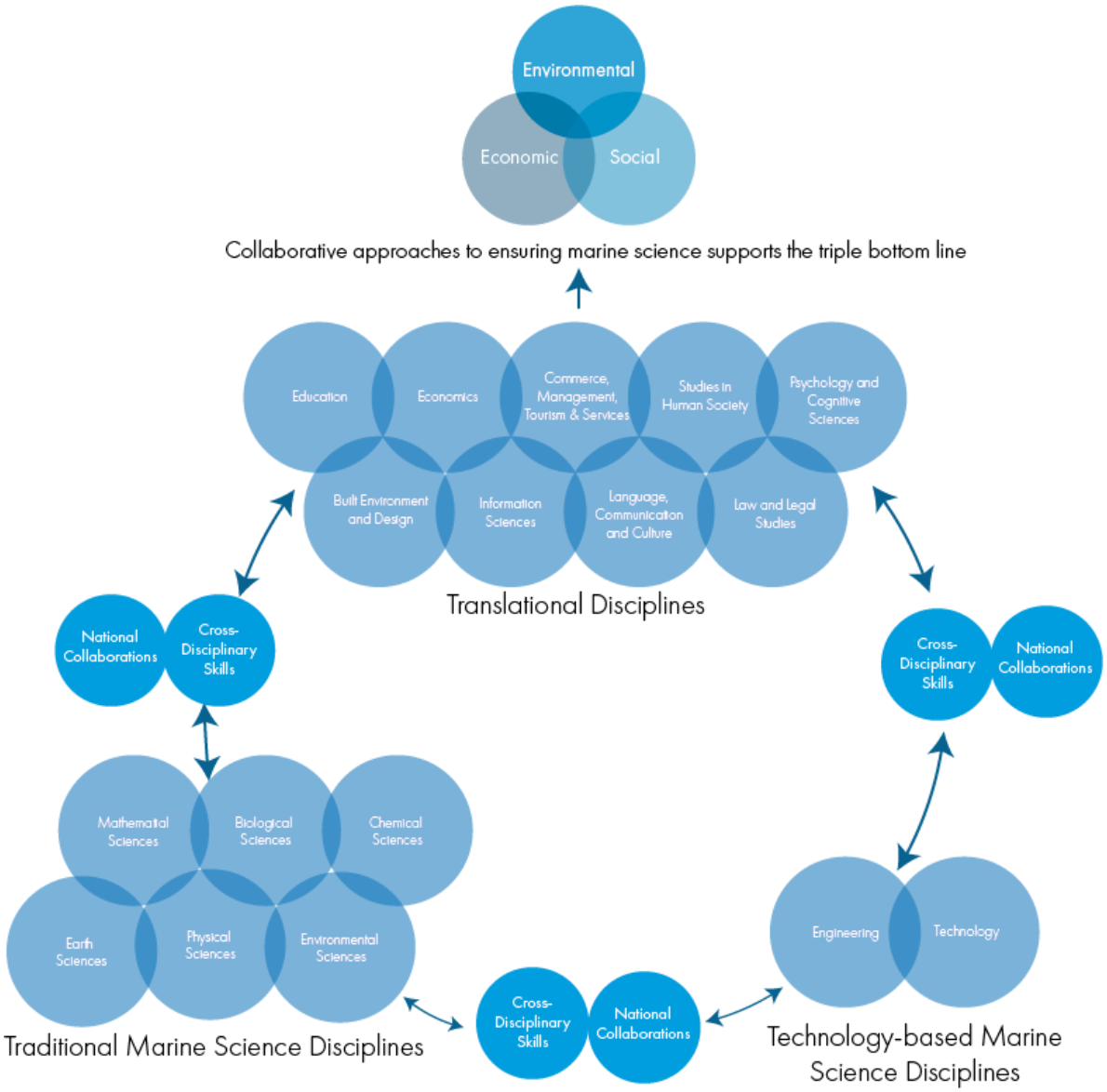

Figure 3: Collaborative Fields of research and the Triple Bottom Line

Current Blue Economy Research in Australia

A logical next step is to look at existing programmes and experts to determine the best approach to future engagement. The concept behind collating these publicly funded research institutes, university institutes, partnerships, collaborations and projects, and non-governmental sectors is to avoid

'reinventing the wheel', to build on any existing partnerships, and to ensure national collaboration and knowledge sharing on advancing marine science's role in the blue economy.

The table attached provides information on NMSC Members and non-NMSC Members who have institutes, programs or collaborations relevant to the non-science fields of research identified above and the areas of the blue economy most pertinent to that research and expertise. It also identified various leaders and experts from within those programs who could be engaged in a future Working Group on the Blue Economy.

As identified in the attached table (Non, the NMSC Members have significant expertise in the relevant, yet not traditionally 'marine science' fields of research, most notably CSIRO, UWA and UTAS. Many of the programs of expertise, however, are not represented strongly in the current NSMC partnerships and collaborations. These programs exist within both NMSC member and non-Member organisations, with a 'heat map' shown in Figure 4 below.

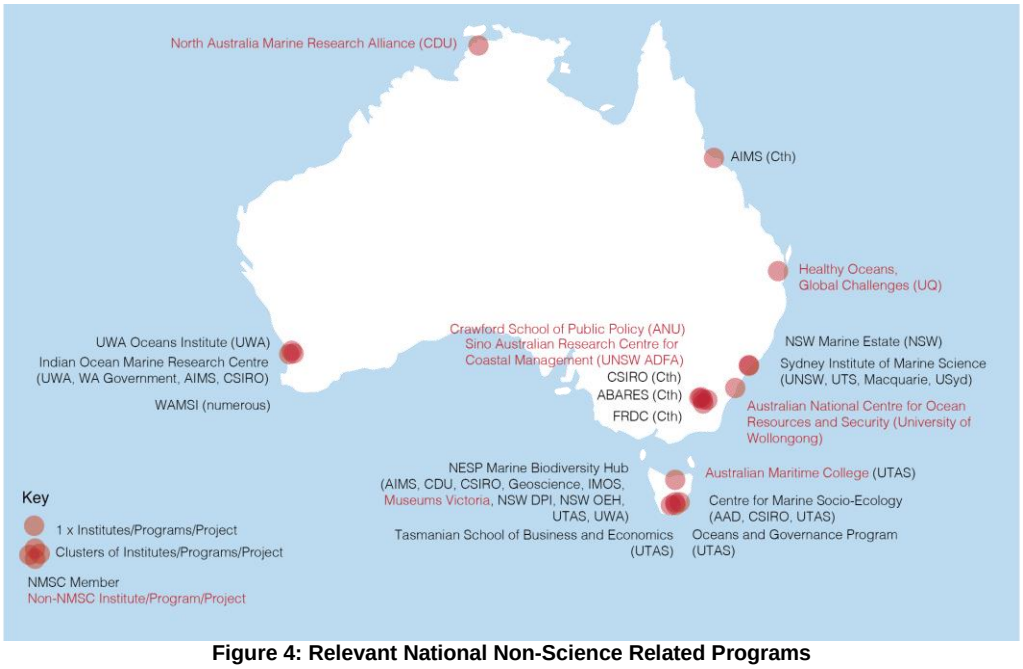

Figure 4: Relevant National Non-Science Related Programs

Recommendations from the Paper to the NMSC

Upon presentation, the paper recommended that:

- NMSC discuss this paper,
- Provide additional information regarding projects, partnerships, and experts that may be useful to consider and engage with in this analysis (to Indi Hodgson-Johnston: indiah.hodgsonjohnston@utas.edu.au,)
- Agree that a plan be devised to engage with, and capitalise upon, the significant expertise in what are not traditionally marine science fields of research, to assist with the advancement of the Australia's blue economy.

Following the presentation on the 19 October 2017, the Committee discussed the general topic of the paper.

Prepared by: Indi Hodgson-Johnston (IMOS Project Officer, External Relations) and Tim Moltmann

Table 1: Relevant Committees, Institutes, Programs, Projects

Name	Examples of Relevant Committees, Institutes, Programs, Projects[7]	Non-Marine Science Fields of research[8]	Industries and Services[9]	Discipline Project Collaborators[10]	Relevant/Lead Contact
Australian Antarctic Division Commonwealth National Marine Science Committee Member	AAD is a partner in the Centre for Marine Socioecology – see below.	• All	• All	• CSIRO • University of Tasmania	Dirk Welsford
Australian Bureau of Agricultural and Resource Economics and Sciences Commonwealth National Marine Science Committee Member	ABARES provides the Australian Government with advice on economic factors for decision-making, including in the areas of fisheries and climate. It also provides advice on social research such as: Recreational vessel biofouling management practices and diversity in Australia's agricultural, fishing and forestry industry workforces	• Economics • Studies in Human Society	• Marine Environment Management & Protection • Fisheries and Aquaculture • Marine Renewable Energy and Carbon Storage •	-	-
Australian Fisheries Management Authority Commonwealth Entity National Marine Science Committee Member	AFMA Research Committee: considers essential research priorities that contribute to improved management for fisheries	• Economics • Commerce, Management, Tourism and Services • Law and Legal Studies	• Fisheries and Aquaculture • Marine Environment Management & Protection •	-	-

[7] Defined broadly as inter-disciplinary, or blue economy focussed. These may include committees within Departments, and projects with a management or economic focus. Excludes multi-disciplinary science collaborations if no explicit broader fields of research than the traditional marine science fields of research.

[8] As discussed in paper

[9] As defined in the paper

[10] Collaborators for inter-disciplinary or blue economy focused program – not more broadly.

Australian Institute of Marine Science Commonwealth Entity National Marine Science Committee Member	AIMS projects that involve explicit inter-discplinary aspects include the sustainable coastal ecosystems and industries in tropical Australia and data and technology innovation. The AIMS Index of Marine Industry is also a critically important analysis (*no individually identified authors)	• Commerce, Management, Tourism and Services • Information Sciences	• Offshore Oil and Gas • Marine Industry Infrastructure • Marine Transport • Marine Environment Management & Protection • Coastal Infrastructure	• WAMSI • Gladstone Healthy Harbour Partnership •	Dr Richard Brinkman r.brinkman@aims.gov.au http://data.aims.gov.au/staffcv/jsf/external/view.xhtml?partyId=100000020 Dr Britta Schaffelke b.schaffelke@aims.gov.au Dr Lyndon Llewellyn L.Llewellyn@aims.gov.au
Commonwealth Scientific and Industrial Research Organisation Commonwealth Entity National Marine Science Committee Member	CSIRO has stated that it recognises that core Australian expertise, including marine spatial planning, marine ecosystem management and restoration, and socio-ecological modelling will be needed to build Australia's blue economy. CSIRO notes that the Australian Government supports the blue economy on a regional scale through the Indian Ocean Rim Association and Asia Pacific Economic Cooperation. CSIRO has expertise in areas of socio-economic research such as social and economic long-term monitoring of the human dimensions of the GBR, blue carbon and blue tech, harnessing of wave energy, climate adaptation planning including on the coast, and marine management and planning. There are also broader scale projects which analyse relevant international obligations to the blue economy, such as the UN Sustainable Development Goals. CSIRO is a partner in the Centre for Marine Socioecology- see below.	• Information Sciences • Economics • Commerce, Management, Tourism and Services • Studies in Human Society • Built Environment and Design	All	• James Cook University (GBR Human Dimensions) • Great Barrier Reef Foundation (GBR Human Dimensions) • GBRMPA (GBR Human Dimensions) • University of Tasmania • AAD	Dr Andy Steven Dr Beth Fulton Beth.Fulton@csiro.au Dr David Smith David.C.Smith@csiro.au (http://marinesocioecology.org/people-2/members/)
Fisheries Research and Development Corporation Commonwealth National Marine Science Committee Member	FRDC funds social and economics research through its Social Sciences and Economics Research Coordination Program (SSERCP) programme. This programme aims to 'maintain awareness of the need for, and improve the use of, social science and economics research, as well as to enable such research to be better integrated with traditional fisheries science research'	• Economics • Studies in Human Society	• Fisheries and Aquaculture • Marine Environment Management & Protection	• Institute for Marine and Antarctic Studies, University of Tasmania	Dr Emily Ogier (IMAS UTAS and Centre for Marine Socioecology) Emily.Ogier@utas.edu.au Dr Sarah Jennings (Tasmanian School of

					Business and Economics and Centre for Marine Socioecology, University of Tasmania) Sarah.Jennings@gmail.com.au
Institute for Marine and Antarctic Studies, University of Tasmania University Institute National Marine Science Committee Member	The Institute for Marine and Antarctic Studies at the University of Tasmania includes the Oceans and Antarctic Governance theme, which 'makes the results of our scientific research relevant to policy and legal formulation by undertaking cross-disciplinary research'. The University of Tasmania also has a cohort of resource economists who specialise in marine governance, fisheries and economics. IMAS hosts the Centre for Marine Socioecology which addresses the challenges of current and future use of coasts and oceans. This is in partnership with the University of Tasmania, CSIRO and the Australian Antarctic Division. There are four research themes, including: interdisciplinary research spanning oceanography, climatology, ecology, engineering, economics, social sciences, law, arts, history, governance and policy; transdisciplinary methods; monitoring and performance evaluation; and decision support toolboxes. IMAS also hosts the NESP Marine Biodiversity Hub	• All	• All	• CSIRO • Australian Antarctic Division • National Environment Science Programme Marine Biodiversity Hub (host)	Prof Marcus Haward (IMAS) Marcus.haward@utas.edu.au (Oceans Governance) Stewart Frusher stewart.frusher@utas.edu.au Karen Alexander karen.alexander@utas.edu.au http://www.utas.edu.au/profiles/staff/imas/karen-alexander Dr Dugald Tinch (Tasmanian School of Business and Economics) Dugald.Tinch@utas.edu.au http://www.utas.edu.au/profiles/staff/tsbe-faculty/dugald-tinch John Tisdell Professor of Natural Resource Economics John.Tisdell@utas.edu.au http://www.utas.edu.au/profiles/staff/economics/john-tisdell
Macquarie University University Institute National Marine Science Committee Member	(see Sydney Institute of Marine Science)	-	-	-	-
NESP Marine Biodiversity Hub Research Collaboration	The Marine Biodiversity Hub has various themes with multi-disciplinary focus, including: supporting management decision-making; integrating social, economic and environmental values; and understanding biophysical, economic and social aspects of the marine environment.	• Information Sciences • Commerce, Management, Tourism and Services	• Marine Environment Management & Protection • Fishing and Aquaculture	• Australian Institute of Marine Science • CSIRO • Geoscience Australia	Dr Sean Pascoe (CSIRO) Sean.Pascoe@csiro.au Dr Sarah Jennings

National Marine Science Committee Member		• Studies in Human Society •		• University of Tasmania • University of Western Australia • Clean Ocean Foundation • Integrated Marine Observing System • James Cook University • Malak Malak Ranger Group • Murdoch University • Northern Australian Indigenous Land and Sea Management Alliance Ltd (NAILSMA) • National Oceanic and Atmospheric Administration • Northern Territory Government – Fisheries • Parks Victoria • Western Australian Government – Fisheries • Other NESP Hubs • The Nature Conservancy • South Australian Research and Development Institute • Reef Life Survey Foundation • University of Melbourne • Western Australia Museum	Sarah.Jennings@gmail.com.au
NSW Department of Primary Industries State Government National Marine Science Committee Member	NSW Marine Estate is an interdepartmental and agency authority that manages the NSW marine environment. The Marine Estate Expert Knowledge Panel provides advice to the Management Authority on environmental, social and economic considerations.	-	-	• NSW State Government Departments	-

Sydney Institute of Marine Science Research Collaboration National Marine Science Committee Member	Beyond the traditional marine science fields of research, SIMS leads research projects such as the World Harbour Project – a broadscale integrated project, and the Sydney Harbour Research Program and OEH Coastal Processes and Responses Node which have strong elements of integration with government policies.	• Information Sciences • Commerce, Management, Tourism and Services • Studies in Human Society • Built Environment and Design •	• Marine Environment Management & Protection • Coastal Infrastructure	• Australian Climate Change Adaptation Research Network for Settlements and Infrastructure (ACCARNSI) • NSW Office Of Environment and Heritage • UNSW • University of Sydney • Australian Museum • Macquarie University • UTS • NSW Department of Primary Industries • NSW Government • Ian Potter Foundation	Prof Peter Steinberg p.steinberg@unsw.edu.au
University of Western Australia Oceans Institute University Institute National Marine Science Committee Member	The UWA Oceans Institute is a broad scale multi-disciplinary research institute. Its research areas include offshore resources, resilience building, governance and policy integration, and biodiversity. The marine environmental governance research stream include scholars in fields such as law, justice and regulation, public policy, international relations and politics, environmental history, economics, geography, business and psychology. These involve topics such as legal analyses, optimal management of marine systems, benefit cost analysis, community preferences and values, market analysis, policy evaluation, and productivity and risk analysis.	• All	• All	• ARC Centre of Excellence for Coral Reef Studies • Indian Ocean Marine Research Centre • NERA (ITRH) • Integrated Marine Observing System • CSIRO (Pilbara Marine Conservation Partnership) • Western Australian Marine Science Institution • Woodside Futurelab Oceanworks • Woodside RiverLab	Erika Techera Director, UWA Oceans Institute erika.techera@uwa.edu.au http://www.web.uwa.edu.au/person/erika.techera Julian Clifton Senior Lecturer julian.clifton@uwa.edu.au http://www.web.uwa.edu.au/people/julian.clifton
Western Australia Department of Primary Industries and Regional Development (Fisheries) State Government National Marine Science Committee Member	The WA Department of Primary Industries and Regional Development (Fisheries) is part of the Indian Ocean Marine Research Centre is a collaborative research centre that, amongst other research, seeks to provide new policy options available to Government and industry for sustainable management of ecosystems in the Indian Ocean and the Timor Sea.	• Information Sciences • Commerce, Management, Tourism and Services • Studies in Human Society • Economics • Law and Legal Studies	• Marine Environment Management & Protection • Fishing and Aquaculture •	• Australian Institute of Marine Science (AIMS) • CSIRO • UWA's Oceans Institute	-

Western Australian Marine Science Institution Research Collaboration National Marine Science Committee Member	The Kimberley Marine Research Program is a regional program built on supporting the marine environment of the Kimberley Region. The Indigenous knowledge project is aimed at integrating Indigenous knowledge and management practices into Kimberley marine conservation and management. The Kimberley Marine Research Program previously had projects elements of human use and social values, however these have concluded. The Western Australian Marine Science Blueprint sits in the same category as the NMSP and involves collaborations of marine science fields of research for the advancement of the blue economy.	• Commerce, Management, Tourism and Services • Studies in Human Society • Information Sciences	• Marine Environment Management & Protection •	• Kara Jarri Rangers • Dambimangari Rangers • Uunguu Rangers • Nyul Nyul Rangers • Bardi Jawi Rangers • Balanggarra Rangers • Nyamba Buru Yawuru Ltd • Kimberly Land Council • UWA • Charles Darwin University	Dean Mathews KISSP Project Leader and Yawuru working group representative dean.mathews@yawuru.org.au
University of Wollongong University Institute	UOW Australian National Centre for Ocean Resources and Security (ANCORS) 'Blue Economy' project investigates the capabilities of the Illawarra and Shoalhaven region to build and support a new 'Blue Economy' based on sustainable and equitable use of our oceans natural capital. It specifically highlights potential areas for sustainable development and growth as well as addressing key environmental concerns for the area. It aims to develop a "blue print" to guide the successful implementation of a regional Blue Economy, including identifying possible areas of innovation and growth. There is also focus on the 'blue carbon futures', which researches changing patterns of mangroves from an interdisciplinary perspective. UOW ANCORS, more broadly, is related to the blue economy, climate change, fisheries and food security, fisheries governance, fisheries management and the marine economy, legal regulation of fishing, the marine environment, maritime limits and boundaries, maritime regulation and enforcement, maritime strategy and security, ocean law and policy, and ocean governance.	• Law and Legal Studies • Studies in Human Society • Economics • Information Sciences	All	-	Prof Stuart Kaye (ANCORS Director) skaye@uow.edu.au Prof Alistair McIlgorm Professor of Marine Economics amcilgor@uow.edu.au https://theconversation.com/profiles/alistair-mcilgorm-121881/articles Michelle Voyer Research Fellow mvoyer@uow.edu.au http://ancors.uow.edu.au/staff/UOW215892.html Aurélie Delisle Research Fellow adelisle@uow.edu.au http://ancors.uow.edu.au/staff/UOW187909.html Richard Kenchington Professor rkenchin@uow.edu.au http://ancors.uow.edu.au/staff/UOW099843.html Karen Raubenheimer kraubenh@uow.edu.au

					http://ancors.uow.edu.au/staff/UOW189616.html
University of Queensland University Institute	Healthy Oceans is a broad scale project with a multi-disciplinary approach to climate impacts on the ocean, complex social problems derived from ocean changes, and communities, wellbeing and oceans. This project includes the expertise from the UQ Schools of Social Science, Civil Engineering, Geography, Planning and Environmental Management, and Law.	• Law and Legal Studies • Studies in Human Society • Economics • Information Sciences • Built Environment and Design	• Coastal Infrastructure • Marine Environment Management & Protection • Fishing and Aquaculture	-	Prof Ove Hoegh-Guldberg Director Global Change Institute oveh@uq.edu.au https://theconversation.com/profiles/ove-hoegh-guldberg-2012/articles
University of New South Wales - ADFA University Institute	The Coastal and marine natural resource management, people, policy, practice program at the Sino Australian Research Centre for Coastal Management aims to foster excellence in comparative research on natural resource management in China, Australia and with other international partners, and share research knowledge and development of new insights and capacity to contribute to marine and coastal natural resource management.	• Law and Legal Studies • Commerce, Management, Tourism and Services •	• Marine Environment Management • Fishing and Aquaculture •	• Ocean University of China	A/Prof. Stuart Pearson s.pearson@adfa.edu.au
Charles Darwin University University Institute	NAMRA (North Australia Marine Research Alliance) aims to build marine research capacity and capability in northern Australia. NAMRA research includes: • Marine biodiversity and natural resource management • Marine and coastal livelihoods and governance	• Commerce, Management, Tourism and Services •	• Marine Environment Management & Protection •	• AIMS • Australian National University • Northern Territory Government •	Dr Pierre Feutry pierre.feutry@cdu.edu.au
Australian National University University Institute	The Crawford School of Public Policy's National Security College is focussed on the specific area of security and defence. Their analyses and products aim to provide strategic foresight and support the Australian national security community in identifying emerging risks and opportunities for policy development and cooperation. Several of their experts include defence and maritime experts.	• Law and Legal Studies • Studies in Human Society •	• Maritime Safety and Security	-	Anthony Bergin anthonybergin@aspi.org.au https://www.aspi.org.au/bio/anthony-bergin Margaret Keen Associate Professor/Senior Policy Fellow meg.keen@anu.edu.au http://ssgm.bellschool.anu.edu.au/experts-publications/experts/margaret-keen
Australian Maritime College, University of Tasmania University Institute	The Maritime Human Factors and the Sustainable Ports, Shipping and Logistics research themes are Australian Maritime College projects that incorporate human behaviour, and social, economic and business aspects into the maritime industry.	• Studies in Human Society • Psychology • Commerce, Management, Tourism and Services • Information Sciences	• Marine Transport • Marine Industry Infrastructure • •	• University of Tasmania	Hilary Pateman H.Pateman@amc.edu.au http://www.utas.edu.au/profiles/staff/amc/hilary-pateman Margareta Lützhöft Margareta.Lutzhoft@utas.edu.au

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DEFINING ELEMENTS OF THE AUSTRALIAN BLUE ECONOMY