In 1998 the Australian Government released ‘Australia’s Ocean Policy: Caring, Understanding, Using Wisely’ (Environment Australia 1998a). The policy, released in the International Year of Oceans, recognised that our oceans contain resources of enormous past, present and future benefit to us all – resources that must be managed carefully to ensure economic benefit exists side by side with sensitive environmental care. This pioneering policy attempted to set a framework for integrated and ecosystem-based planning and management for all of Australia’s marine jurisdictions but lacked input and therefore buy-in from state and territory jurisdictions.

Under the umbrella of Oceans Policy sat Australia’s Marine Science and Technology Plan (MSTP) (Environment Australia 1999) – addressing existing and emerging priorities for marine science, technology and engineering. While implementation of Oceans Policy received dedicated funding following its release (and the establishment of the National Oceans Office) the MSTP was never directly funded.

Fast forward 18 years and only some of the key initiatives identified in Oceans Policy have come to fruition. Significantly, through the National Oceans Office and subsequent programs managed by the Australian Government Department for the Environment, marine bioregional plans have been developed for most of Australia’s marine jurisdiction and an expanded Commonwealth marine reserve system has been declared.

There has also been some progress in development of Australia’s marine science and technology base. Since 2006 the Integrated Marine Observing System (IMOS), funded under the Australian Government’s National Collaborative Research Infrastructure Strategy, has supported a step-change increase in availability of physical, biogeochemical and biological observations and data across oceanic and coastal waters. A National Sea Simulator, owned and operated by the Australian Institute of Marine Science, also provides world-leading capability to examine the cumulative impacts of climate change, pollution and disturbances caused by development in the marine environment.
The capability of Australia’s marine fleet has been enhanced with the introduction of the Research Vessel (RV) Investigator in 2014 replacing the RV Southern Surveyor, although despite clearly demonstrated science demand for full utilisation, financial constraints mean the vessel operates for only 180 days on Government funding. In 2019 a new Antarctic icebreaker will replace the Research/Supply Vessel Aurora Australis. However, somewhat inevitably Australia’s marine science and technology base has been more ad hoc because the MSTP was never directly funded.

At the same time our marine industries have also grown rapidly and the challenges of balancing development with environmental health have amplified. The rest of the world is paying increasing attention to the growth potential in their blue economies and the potential value of utilising expanding opportunities and innovations in marine science and technology.

Now, after a year of consultations and priority development, the marine science community and their government and industry stakeholders have developed an updated science plan to guide the next decade of growth in our marine environment – ‘National Marine Science Plan 2015–2025: Driving the Development of Australia’s Blue Economy’ (National Marine Science Committee 2015).

Given the increasing national and global focus on ‘blue economic’ growth, the grand challenges that our marine nation faces, and the sustainable benefits to unlock from our marine estate,¹ it seems timely that the government consider the value in revisiting the scope and intent of Australia’s Oceans Policy to take advantage of the opportunities that will be generated by the implementation of the National Marine Science Plan.

**What is a blue economy?**

Blue economy is generally taken to consider all aspects of marine, maritime and coastal regions that have a direct or indirect impact on the economy. A blue economy strikes a balance between realising the oceans’ economic potential and the need to safeguard its longer term health. It incorporates the traditional maritime industries of fisheries, coastal tourism, energy and mineral production, boat building, shipping and ports activity. It also includes new and developing industries such as aquaculture and renewable energy technologies for wind wave and tidal energy, bio-products (pharmaceutical and agrochemicals), blue carbon (carbon sequestration) and desalination (CSIRO and Department of Foreign Affairs and Trade 2015).

Australia has the third largest ocean territory on the planet. Only the USA and France have larger national footprints in the global ocean. For Australia’s future, our marine estate and a strategically developed blue economy are providing a comparative advantage.

**What is happening globally?**

In 1998 Australia was an international leader in ocean policy and in understanding the benefits of a ‘blue economy’. Today there is a growing acceptance by ocean-bordered countries across the world that a blue economy is the key to unlocking the economic benefits of the ocean while also providing environmental stewardship, with global ocean economic activity estimated to be in the realm of US$3–5 trillion per year (Department of Foreign Affairs and Trade 2015).
The USA valued its ocean economy at US$258 billion in 2010, while China’s ocean economy contributed US$962 billion in 2014 (China Releases 2013). Major trading partners, such as the European Union, China and the USA, have taken action with the development of their own blue economy strategies, national ocean policies, and investment in marine research and development.

Investment in marine science capability, research and development, and innovation is an integral part of their international strategies:

- The European Commission has developed a Blue Growth Strategy for the development of key marine industries.
- In 2013 China included the marine economy in its National Economic Development Strategy and set their marine R&D investment at 2% of the total marine economy value, the latter of which is valued at close to 10% of their national GDP (China Releases 2013).
- The US National Oceans Policy implementation plan has been developed to promote the nation’s ocean economy and maintain the resilience of marine ecosystems.

What is the value of Australia’s blue economy?

Marine industries contributed $47 billion to the Australian economy in 2011–2012 (Australian Institute of Marine Science 2014), and with increases in offshore oil and gas production, marine tourism, maritime trade, ship building, aquaculture and biotechnology, it is projected that this figure will grow to $100 billion by 2025 (Ocean Policy Science Advisory Group 2013). This equates to the marine industries sector growing at three times the rate of the overall Australian economy.

The current projected value does not include the estimated $25 billion per annum (Eadie and Hoisington 2011) worth of benefits Australia gets from ecosystem services provided by its oceans, such as carbon sequestration, nutrient cycling, erosion prevention and cultural heritage. In addition, a lack of data on emerging industries means that blue economy projections have not included the full breadth of potential marine economic activity. So these estimates are considered to be conservative.

Why develop the National Marine Science Plan?

The National Marine Science Plan (the Plan) was developed following the release of the 2013 position paper ‘Marine Nation 2025: Marine Science to Support Australia’s Blue Economy’ (Oceans Policy Science Advisory Group 2013). Marine Nation 2025 recommended the creation of a decadal plan to focus investment on the biggest development and sustainability challenges facing Australia’s marine estate, and the highest priority science needed to tackle these challenges to fulfil our blue economy’s potential.

The Plan was developed under the auspices of the National Marine Science Committee (NMSC), on which senior representatives of 23 research institutions, universities and government departments work together to plan, coordinate and communicate marine science and its application to national priorities.

Collaboration and consultation were central to the Plan’s development. The NMSC placed significant emphasis on creating a document that truly articulated and represented
the Australian marine science community (including government research institutions and universities) and their stakeholders (including both commonwealth and state governments and industry end-users). Over 500 marine scientists and stakeholders took part in the development of the Plan, beginning with the development of eight community white papers.\(^7\)

The white paper process involved stakeholders from the different marine science sectors working to identify the science required to address grand challenges identified in *Marine Nation 2025* (marine sovereignty, security and safety; energy security; food security; biodiversity conservation and ecosystem health; urban coastal environments; climate variability and change; resource allocation and infrastructure) and the additionally identified challenge area of urban coastal environments. The white papers were presented and discussed at a National Marine Science Symposium in November 2014. Following two further consultations including 73 feedback submissions, the Plan brings together the highest priority science and science capabilities (skills, infrastructure and relationships) to meet a cross-section of challenges areas in an integrated and strategic manner.

### The Plan’s recommendations

To focus the coordination efforts and investments, the Plan sets out eight high level recommendations.

1. **Create an explicit focus on the blue economy** throughout the marine science system.
2. **Establish and support a National Marine Baselines and Long-term Monitoring Program** to develop a comprehensive assessment of our estate, and to help manage Commonwealth and State Marine Reserve networks.
3. **Facilitate coordinated national studies on marine ecosystem processes and resilience** to enable understanding of the impacts of development (urban, industrial and agricultural) and climate change on our marine estate.
4. **Create a National Oceanographic Modelling System** to supply defence, industry and government with accurate, detailed knowledge and predictions of ocean state to support decision-making by policy-makers and marine industry.
5. **Develop a dedicated and coordinated science program to support decision-making** by policy-makers and marine industry.
6. **Sustain and expand the Integrated Marine Observing System** to support critical climate change and coastal systems research, including coverage of key estuarine systems.
7. **Develop marine science research training** that is more quantitative, cross-disciplinary and congruent with industry and government needs.
8. **Fund national research vessels** for full use.

The relationship between the grand challenges, the capabilities identified to address them (i.e. the 10-year steps to success) and the benefits that will flow from investment in the Plan (e.g. jobs, wealth, energy, etc.) is represented in Figure 1. The Plan also identifies a number of priority initiatives for future broad-based investment, which focus on building a strong national blue economy, including the introduction of a national blue economy innovation fund.
How will the Plan contribute to Australia’s blue economy?

In launching the Plan on 11 August 2015, the federal Minister for Science and Industry commended the marine science community and their stakeholders for ‘bringing together a comprehensive 10-year plan to guide Australia’s marine science efforts and help capitalise on the potential benefits of a projected $100 billion per annum blue economy in 2025. Note: The Biodiversity conservation grand challenge theme area includes ecosystem health/services – valued at an additional $25 billion per annum (in 2011).

Figure 1. The necessary capabilities, or ‘10-year steps to success’, as articulated through the Plan’s recommendations – to address the grand challenges facing Australia’s marine environment and help capitalise on the potential benefits of a projected $100 billion per annum blue economy in 2025. Note: The Biodiversity conservation grand challenge theme area includes ecosystem health/services – valued at an additional $25 billion per annum (in 2011).

How will the Plan contribute to Australia’s blue economy?

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However, and as stated in the Plan, to realise the potential economic, environmental and social benefits of Australia’s vast ocean jurisdiction, there still needs to be a concerted effort by all of the many stakeholders, working closely together to meet the grand challenges. At the heart of the Plan is a call to action for all those involved in the governance,
the science, the use and the protection of our 13.86 million square kilometre (Symonds, Alcock, and French 2009) national marine estate.

While further growing Australia’s blue economy is to our economic benefit, it is clear that Australians want more than economic dividends from our coasts and oceans. Australians place great emphasis on the cultural and aesthetic value of our oceans. We expect our estuaries, beaches, coral reefs, coasts and oceans to be healthy and productive. Eighty-five per cent of Australians lives within 50 kilometres of our shores (Australian Bureau of Statistics 2004), and by 2025 another 3–4 million people will be packed into coastal cities and regional centres.

If the desired balance between financial dividends, environmental health and social well-being of our marine environment is to be achieved, having the right science to inform our policy and investment decisions is critical. As such, the Plan has been developed to provide a wide range of stakeholders, including those in the science and research, government, industry, education and community sectors, with a vision and recommendations about the highest priorities on which they can make future investment and policy decisions. It outlines the research, infrastructure, skills, partnerships and investment that will drive the required changes over the next decade, and deliver the best possible long-term returns to Australia. It emphasises the importance of evidence-based science and science tools to support decision-making by policy-makers, marine industry and other end users.

The Plan is also designed to serve as a platform to drive the development of new marine technologies and product innovation that will translate marine science discovery into industry development, job growth, environmental sustainability and economic prosperity for Australia.

Investing in our future

At an estimated $450 million (National Marine Science Committee 2015), the annual funding for marine science has helped double the blue economy contribution over the last decade to the current $47 billion per annum. However given the breadth of challenges and beneficiaries of marine science, it is clear that future investment must not be limited to traditional research funding bases, but come from a broad base, including different levels of government, private industry and the community.

As stated above, over the next decade the blue economy is predicted to grow at 7.5% per annum – far outstripping the projected 2.5% growth rate of Australia’s GDP. Further marine science investment is required to ensure that this impressive trend continues. Disinvestment would have the opposite effect on Australia’s blue economy.

Realisation of the Plan will ensure that current marine science funding generates greater returns by sharpening the focus and increasing the coordination of existing science infrastructure and effort. This is particularly important given major investments in marine science infrastructure over the last decade, including the RV Investigator, IMOS and the National Sea Simulator.

Better understanding of the ocean and its influence on variability and change of climate and extreme weather will help minimise the risk and maximise the opportunities in climate sensitive industries such agriculture, aquaculture, energy and health. In sectors such as defence, maritime safety, renewable energy, offshore oil and gas, and shipping, improved knowledge and predictability of ocean state are directly linked to their operational
effectiveness and success. So far we have only mapped 25% of our marine estate and characterised much less. Innovative technologies and products arising from discoveries will open up exciting new possibilities and we further explore our ocean territory.

However, the aspirations of this decadal plan will not be realised with ‘business as usual’ marine science. It will require some fundamental and generational shifts in the way we teach and learn marine science, the platforms and technologies we use at sea and in the laboratory, and the processes through which we plan and deliver marine science. Creating an explicit focus on the blue economy throughout the marine science system will be key to our success.

This blue economy focus is already embedded in some marine science research areas, but there is an opportunity now to build on these strengths and make marine science indispensable to our nation’s growing economy.

The proposed National Blue Economy Innovation Fund (one of six priority investment initiatives proposed in the Plan) is intended to capitalise on new opportunities to sustainably develop Australia’s blue economy by promoting and commercialising innovation, such as in new ocean technology, bioprospecting, bio-products, ocean renewable energy, aquaculture and offshore oil and gas production.

Revisiting Australia’s Ocean policy

As mentioned above, it is desirable that scientific evidence informs and supports policy development and delivery. To best give effect to Australia’s blue economy it is timely to consider the benefits of re-visiting Australia’s ocean policy and bringing it up-to-date with today’s current policy context. This includes appropriate alignment with government policy at the time of the Plan’s publication (including the Australian Government’s Science and Research Priorities and Australian Chief Scientist’s Science, Technology, Engineering and Mathematics agenda (Office of the Australian Chief Scientist)), as well as policy that has been announced post Plan release (e.g. National Innovation and Science Agenda and Review of Research Infrastructure (Department of Education and Training 2015)) and future policy (e.g. Commonwealth Marine Reserves Review).

There are many other aspects to updating Australia’s ocean policy. Those articulated in Australia’s first oceans policy include: maintenance of ecosystem integrity; integrated oceans planning and management for multiple ocean use; promotion of ecologically sustainable marine-based industries; governance; managing for uncertainty; application of the precautionary principle; user-pays and other economic instruments; reporting, monitoring and assessment; duty of care and stewardship; interests and responsibilities of indigenous peoples; broader community participation; and regional and global responsibilities (Environment Australia 1998b).

In updating Australia’s ocean policy, it will be important that all stakeholders and jurisdictions come together, as they have done during the development of the Plan, to take a holistic approach to driving the development of Australia’s blue economy.

Notes

1. ‘Marine estate’ is defined as Australia’s oceans, seas, seabed, coasts, close catchments, traditional sea country, and the living and non-living resources they contain within Australia’s marine jurisdiction (i.e. water column and seabed beyond the territorial sea baseline).
4. See note 2.
5. The 7.5% blue economy growth is calculated based on our goal to increase from $47.2 billion of current value to the Australian marine economy to $125 billion by 2025. The 2.5% GDP growth rate is taken from the 2013/2014 ABS data www.abs.gov.au/AusStats/ABS@.nsf/MF/5220.0.
6. The National Marine Science Committee (formally referred to as the Oceans Policy Science Advisory Group) is an advisory body promoting co-ordination and information sharing between Australian Government marine science agencies and the broader Australian marine science community. NMSC is made up of representatives of Australian Government agencies and additional members who assist the group to access stakeholder, industry and research views and state/territory government considerations. A full NMSC membership list can be found at the end of the paper and at www.marinescience.net.au.
7. The eight white papers (including infrastructure) and subtheme papers underpinning this Plan can be found at www.marinescience.net.au.
8. See note 6.

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