



# THE BLUEPRINT FOR marine science **2050**

Refresh 2022-2027



WESTERN AUSTRALIAN  
**MARINE SCIENCE  
INSTITUTION**

Better science **Better decisions**



## Blueprint for Marine Science 2015 - 2050

The Blueprint for Marine Science 2050 (Blueprint 2050) released in 2015 is the strategic plan for applied marine science in Western Australia. It sets the scene and scope for state-wide marine science for the next 30 years and identifies knowledge gaps, which if not filled, could undermine effective management of our marine values and development of marine industries.

## Blueprint Refresh 2022-2027

This Blueprint Refresh 2022-2027 (Blueprint Refresh) provides the contemporary view, developed with advice from key Western Australian stakeholders to refresh the scientific knowledge required to head into the future. It highlights the need for strategically important research that delivers better science to help inform decision-making on some of the big picture, complex multi-sectoral issues facing governments, industry, and communities.

WAMSI acknowledges the Traditional Owners of the land where we work and live. We pay our respects to Elders past, present and emerging and celebrate the stories, culture and traditions of Aboriginal and Torres Strait Islander Elders of all communities who also work and live on this land.

## WESTERN AUSTRALIA'S MARINE ENVIRONMENTS

Western Australia's coastal waters and estuaries include an impressive array of natural assets. Home to some of the planet's most incredible ecosystems and marine wildlife, many of the State's marine species are found nowhere else in the world. The 12,000-kilometre coastline supports unique environmental and social values and is immensely valuable to our marine industries and coastal populations. Any decisions that support a sustainable future for Western Australia's marine environment must be based on the best scientific knowledge available.

"The Blueprint 2050 identified priorities for future marine research in Western Australia, shaped by the short- and long-term knowledge needs of those in government, industry and the community. These priorities recognised the need to enjoy and protect the incredible diversity of Western Australia's marine and coastal environments while supporting the sustainable development of our marine industries and regional growth."

- Dr Luke Twomey (WAMSI CEO)

The world and the marine context have changed since the Blueprint 2050 was released in 2015. In recognition of the changing needs and emphasis, WAMSI has reviewed the research priorities presented in the Blueprint 2050 to identify short-term knowledge gaps for marine science that will provide a contemporary, clear direction for marine stakeholders, while continuing to promote sustainable growth for the State.



FIELD WORK ON SEA COUNTRY SIMON ALLEN

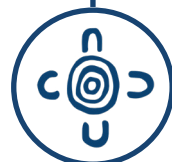
This Blueprint Refresh signals a renewed focus for marine science in Western Australia. It has been shaped by changes and advances to the marine context since the release of the Blueprint 2050, backed by the knowledge and experience of stakeholder and industry representatives and WAMSI's partners. Within this setting, the Blueprint Refresh identifies opportunities and initiatives for marine science that WAMSI, its partners and the science community may pursue over the next five years to improve the future sustainable use and management of Western Australia's coastal and estuarine marine environments.



## THE NEW LANDSCAPE FOR STATEWIDE MARINE SCIENCE HAS BEEN SHAPED BY:



**Public recognition of the severity of climate change impacts** and the threats it poses to marine ecosystems, coastal areas, and industries



**Increased recognition of the role of co-development with Traditional Owners** in maintaining the natural environment and the importance of their knowledge, culture, and values



**Growing acceptance of the interlinked relationship between social, economic and environmental factors**



**Growing international movements to mitigate threats** to the marine environment from overfishing, plastic pollution and climate change, which will influence national and state policy



An increased focus in Western Australia on **cumulative environmental impact assessment**.



**A move toward more renewable energy resources** including wind and wave power and green hydrogen with new infrastructure required to support new projects



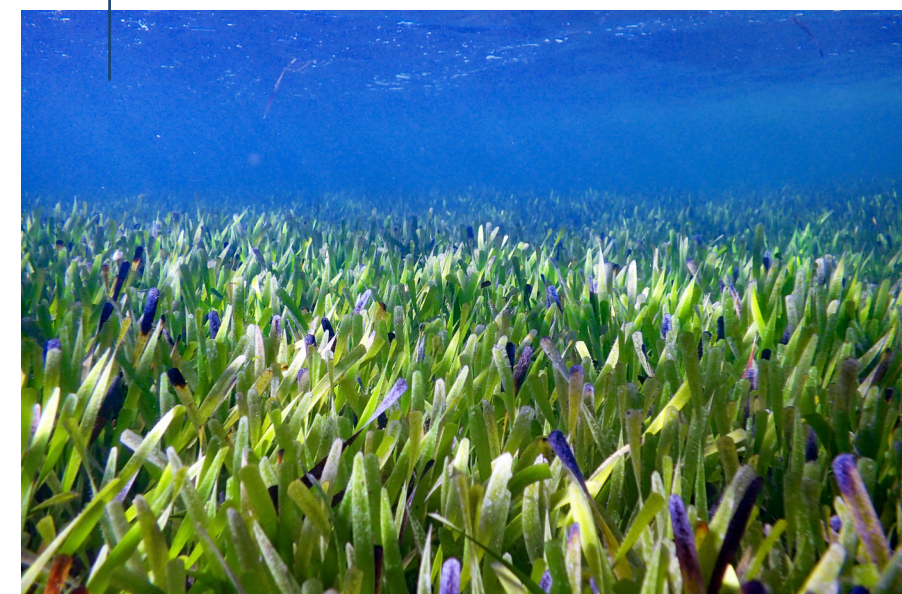
**A pathway towards consolidated and coordinated data collection and curation** to support complex environmental decisions

The ocean and marine environment are critical natural assets for Western Australia and our immensely valuable marine industries. While the marine environment is considered in 'good' condition by the State's environmental regulator, and its industries well managed, our coastal and estuarine ecosystems are under increasing pressure from population growth, economic activity, and climate change. Strong direction backed by good science is needed to manage these pressures into the future.

Australia's marine science priorities must be able to combat the cumulative pressures impacting our oceans and coasts and the interconnection between these environments calls for greater alignment between national and state research initiatives, with an emphasis on strong Indigenous engagement to improve co-management of sea Country.

The most recent [Australia State of the Environment \(SoE 2021\)](#) report, released every five years by the Australian Government, found that pressures arising from climate change and pollution are not being adequately managed and new national systems are required to manage Australia's marine environment into the future.

SEAGRASS POSIDONIA AUSTRALIS RACHEL AUSTIN



The Australian Government has committed to working with States to integrate national priorities with State initiatives, ensuring marine science carried out at the regional or local scale has linkages to the broader national research themes identified by the National Environmental Science Program.

Moving forward, national level research programs that encompass Western Australian science, technology, innovation, and Traditional-knowledge capabilities could produce the collective new science knowledge needed to better embed science into government decision making and tackle pressures to our coasts and oceans.

TRADITIONAL OWNER RANGERS AND RESEARCHERS MONITORING ON SEA COUNTRY  
DEPARTMENT OF BIODIVERSITY, CONSERVATION AND ATTRactions

These priorities provide an opportunity to look at broad strategic directions for the application of state-wide marine science, to provide the best possible scientific advice for maintaining and enhancing our marine environment. They provide focused research guidance for sustainable economic development, and to ensure the State's ongoing marine science capability and capacity.



The world is witnessing accelerating impacts in response to a changing climate. This is more pronounced in Western Australia, as the South West has been characterised as a 'global hotspot', and only one of 24 marine regions identified as a discrete area where ocean warming is fastest. There is now a greater worldwide expectation to put in place actions to conserve and sustainably use the marine environment and this is especially important for Western Australia.

Global initiatives to oversee the sustainable development of marine resources were released by the United Nations in 2015, and this Blueprint Refresh coincides with the start of the *United Nations Decade of Ocean Science* (2021-2030), an exciting global movement creating ocean science solutions focusing on 'the science we need for the ocean we want'.



"In 2015, the first World Ocean Assessment warned that many areas of the ocean had been seriously degraded, the greatest threat to the ocean being the failure to deal with the many pressures caused by human activities. The message in the second World Ocean Assessment (2021) is that, to ensure sustainability, we must work together to improve integrated ocean management, including through joint research, capacity development and the sharing of data, information and technology."

- Antonio Guterres (United Nations, World Ocean Assessment II)

Underpinning these initiatives, is the need for collaborative science and the sharing of data and capacity to inform policies and solutions to prevent and mitigate the effects of a heating climate and their impacts.

The Blueprint for Marine 2050 was delivered to ensure Western Australia's strategic plan for applied marine science over the next 30 years was guided by real world priorities.

Providing a greater focus on the way forward for marine science, the Blueprint 2050 has given users a clear perspective of the challenges ahead as the demands on the Western Australia's marine environment become increasingly more significant.

Community expectations are driving changes in the way governments and industry invest which has led to an emerging focus on environmental, social, cultural and governance issues. To maintain social license to operate, industry and the State Government must respond to changing societal expectations and regulatory requirements, demonstrating greater transparency in decision-making and greater accountability in biodiversity conservation, as well as better accounting of society values that extends beyond financial costs.

Since its release, the Blueprint 2050 has facilitated greater collaboration across all sectors operating in the marine environment and accelerated discussions on emerging key areas, including ocean energy and renewables and how to tackle the ongoing challenges brought about by climate change. By international standards, Western Australia's wave, offshore wind, and tide (in the north) resources are abundant, and the conversation is now focused on long-term energy transition and implications for industry as we move from fossil fuels towards renewables.

One of the strong recommendations to come out of The Blueprint 2050 was the need to improve access to existing data as stakeholders realise the value of previously collected information. In 2020, the Department of Water and Environmental Regulation and WAMSI, launched the [Index of Marine Surveys for Assessments \(IMSA\)](#) for the systematic capture and sharing of marine data created as part of an environmental impact assessment, providing unparalleled benefits from access to industry information.

The developing need for science knowledge at a regional scale has seen a move towards strategic multidisciplinary research programs across the State, including in the Kimberley, Pilbara, Exmouth Gulf, Cockburn Sound and the South Coast, addressing the science needs of multiple users, and contributing to greater management effectiveness of the Western Australian marine estate.

A standout message from the Blueprint consultation was the need for the marine science community to better integrate Indigenous peoples' knowledge with western science to ensure the best outcomes for future management and conservation of the marine environment. Over the last five years, all marine sectors have endeavoured to include Traditional Owner voices. The Blueprint Refresh recognises Traditional Owner participation in marine science as a focus area that intersects all marine science themes and that should be embedded throughout any marine science initiative.





**The Blueprint 2050 is stakeholder focused, aimed at better understanding the marine science needs of the sectors that interact with WA's coastal and estuarine marine environments.**

The focus areas and marine science themes that form the foundation of this Blueprint Refresh were informed by a wide range of Western Australian Government and industry stakeholders and organisations, representing a broad range of marine users within the State and enabling a genuine assessment of stakeholder interests and priorities.

As part of the process, WAMSI met with Traditional Owners and representatives across research, government, universities, industry, NGO's and community groups over a nine-month period to elicit detailed feedback on priority areas requiring a State-wide marine focus. Individuals and stakeholder groups provided their knowledge and vision for Western Australian marine science through a series of direct interviews and workshops.

In addition to canvassing the same representative groups originally consulted in the development of the Blueprint 2050, WAMSI sought additional input from Indigenous representatives and Natural Resource Management groups for a comprehensive understanding of marine science needs across the State.

**The result is a contemporary snapshot of the existing and emerging marine science needs of Western Australia's marine industries, managers, regulators and the wider community.**

The priority areas identified in the Blueprint 2050 continue to remain relevant - marine data management (or accessibility), baseline data and synthesis, shared observing effort and Indigenous knowledge - and are reflected across the key themes in this Blueprint Refresh.

More detail on the key research areas captured through the stakeholder consultation and represented across each sector can be found [here](#).

- Three cross-cutting focus areas emerged from the collective stakeholder input which are relevant across research themes and should be integrated into the development of any marine science program, from the design and implementation phases, through to its monitoring and evaluation. These areas are central to delivering a collaborative, future-focused marine research portfolio for the State and reflect current national and global science priorities.

**Traditional Owner participation**

*Research that merges modern marine science with Traditional ecological knowledge to enable two-way learning and joint management of Sea Country.*

WAMSI recognises the unbroken cultural connection, Traditional Ownership and custodianship of Indigenous people to their traditional Sea Country, while fully supporting the well-established principles of mutual respect, reconciliation and Native Title. Through its research programs, WAMSI acknowledges and respects the culture, values, practices and depth of knowledge of Indigenous people.

Protecting, conserving and sustainably developing the State's and nation's extensive natural assets presents a significant opportunity for the science community to work closely with Traditional Owners. There are enormous benefits to learning from their historic knowledge of the natural environment to improve the way we collectively manage the coast and the marine environment and expand understanding of biodiversity and ecosystem function.

The role of Indigenous land and sea management will need to be expanded to improve the state of the environment for all Australians. Indigenous rangers have an important role to play in conserving both cultural heritage and natural values, and their communities derive wellbeing from being on and caring for Country. At a national level, the need for greater funding certainty for Indigenous land and sea management, Indigenous Protected Areas and jointly managed areas, is recognised to incorporate Indigenous knowledge and leadership in caring for Country.

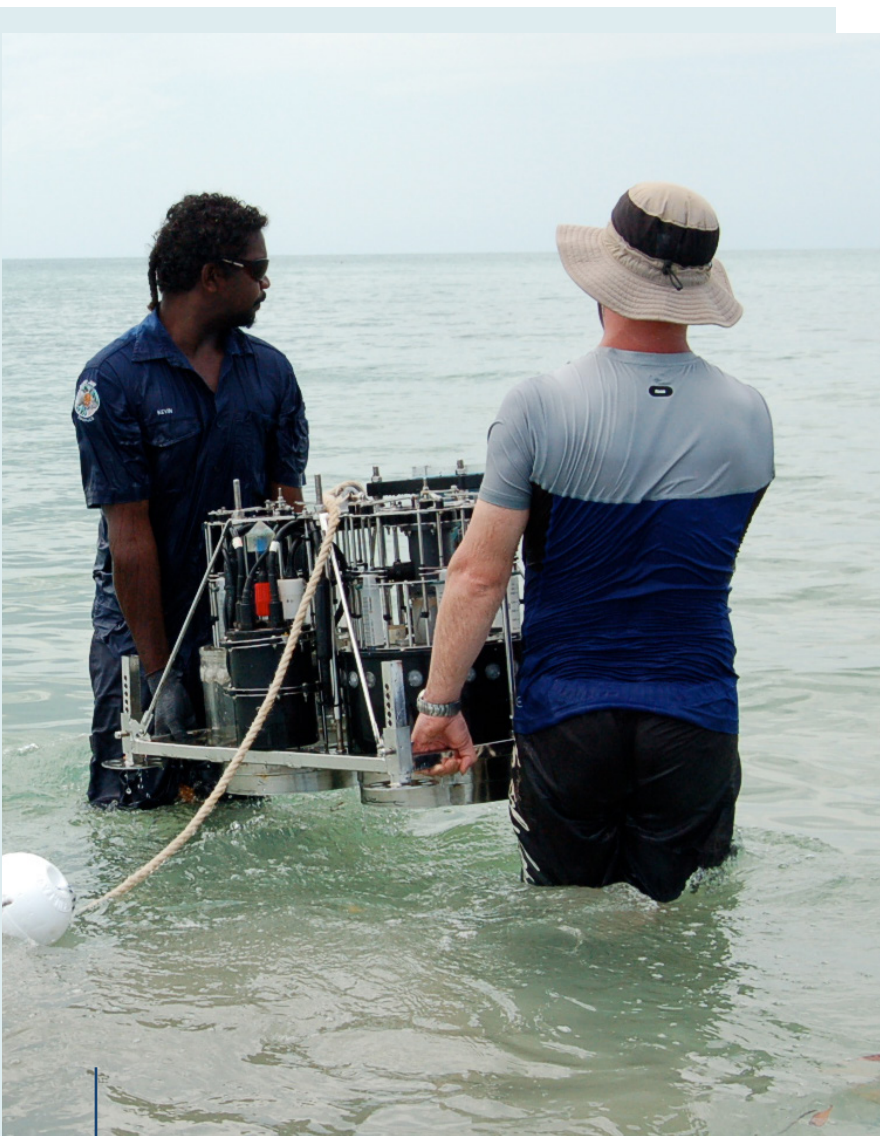
**TRADITIONAL OWNER INSIGHTS INTO COUNTRY**  
DEPARTMENT OF BIODIVERSITY, CONSERVATION AND ATTRACTIONS



SHARK BAY SIMON ALLEN







WATER QUALITY MONITORING MAT VANDERKLIFT

The cultural importance of Sea Country to Traditional Owners and their desire to be involved in marine science for their own healthy country aspirations should be considered from the onset of any research program. A clear starting point is the co-design of research projects at early stages that incorporate Traditional knowledge, language, and culture, to complement western scientific thinking and ensure information needs and research questions are shared.

Working with Traditional Owners requires investing in foundational elements to build mutual respect, confidence, community consent and ways to work together. The science community needs to find better ways to engage with Traditional Owners to work together on shared research questions, integrate Traditional ecological knowledge with western science and effectively deliver findings and information back to Traditional Owners. This combined understanding could increase the capability and capacity for Traditional Owners to better support their management of Sea Country, as well as to articulate their views on the potential impacts or benefits of proposed development and activities.

Moving forward requires broad consultation and a commitment by those involved in marine research to strengthen Indigenous engagement and two-way learning across all science programs. Organisations must lead by example and develop consistent processes for researchers embarking on marine research projects as well as the tools to enable them to undertake collaborative marine science and build capacity within Indigenous communities.

TURTLE TRACK MONITORING CAMDEN SOUND  
DEPARTMENT OF BIODIVERSITY CONSERVATION AND ATTRACTIONS



## Accessible Data

*Science data accessible to all stakeholders and the community, providing better opportunities for shared decision-making.*

Marine data underpins robust and transparent decision-making across government, industry and the community. While accessibility to marine data has always been of great importance for decision-making, it has recently become even more relevant in support of understanding cumulative impacts to environmental values. Specifically, the the [Western Australian Government's Environmental Protection Amendment Bill 2020](#) explicitly requires the Environmental Protection Authority to consider the cumulative impacts of proposals on the environment (section 3(1b)). This focus area aims to continuously improve data quality and availability, fundamental to increasing confidence in our understanding, impact prediction and management of the natural environment.

Currently many marine environmental data and assessment processes do not provide publicly accessible information in standardised formats. Access to the best possible environmental information is crucial and the challenge is for the

Western Australian science community to commit to ensuring marine science data are transparent, discoverable, and available for reuse.

This requires suitable infrastructure to analyse, manage and share these data, integrating knowledge from different stakeholders, such as: citizen science programs; commercial fishers; Traditional Owner knowledge; licensing and approvals information from industry; monitoring data from government programs and research data from science institutions. The development of shared data and analytical facilities for a given region would, with appropriate processes and protocols, provide opportunities to optimise organisational efficiency and effectiveness through combined effort and could provide the capabilities required to support multifaceted environmental decisions, particularly as the potential for cumulative impacts increases.

Moving forward, a pathway towards digital environmental assessment could support interpretation of the State's environmental and cultural values and how they may be affected by a proposed project, policy, plan, or emerging pressure, ultimately providing a shared view of a region's marine environment.



## Social engagement & education

*Empowering the community with marine science knowledge to participate and understand the basis for decision-making.*

Community education needs to be incorporated into any research program, using marine science to increase awareness of ocean values and marine issues and the underlying science to the public, regulators, planners, and politicians. Science that helps to service end users doesn't also necessarily enable the public to understand how the science will benefit them. The role of coastal community groups and grassroots stakeholders are examples of resources that can be incorporated to facilitate this social engagement and the participation of the community in research and in shared environmental outcomes.

As well as generally raising awareness of the importance of the marine environment, this focus area is aimed at increasing community confidence that decisions are made on a sound scientific basis. Opportunities exist for better education, collection of on-the-ground observations and knowledge, identification of key values at early stages of policy decisions and development proposals, and better recognition of the community's capabilities to digest complex problems when they are communicated appropriately.

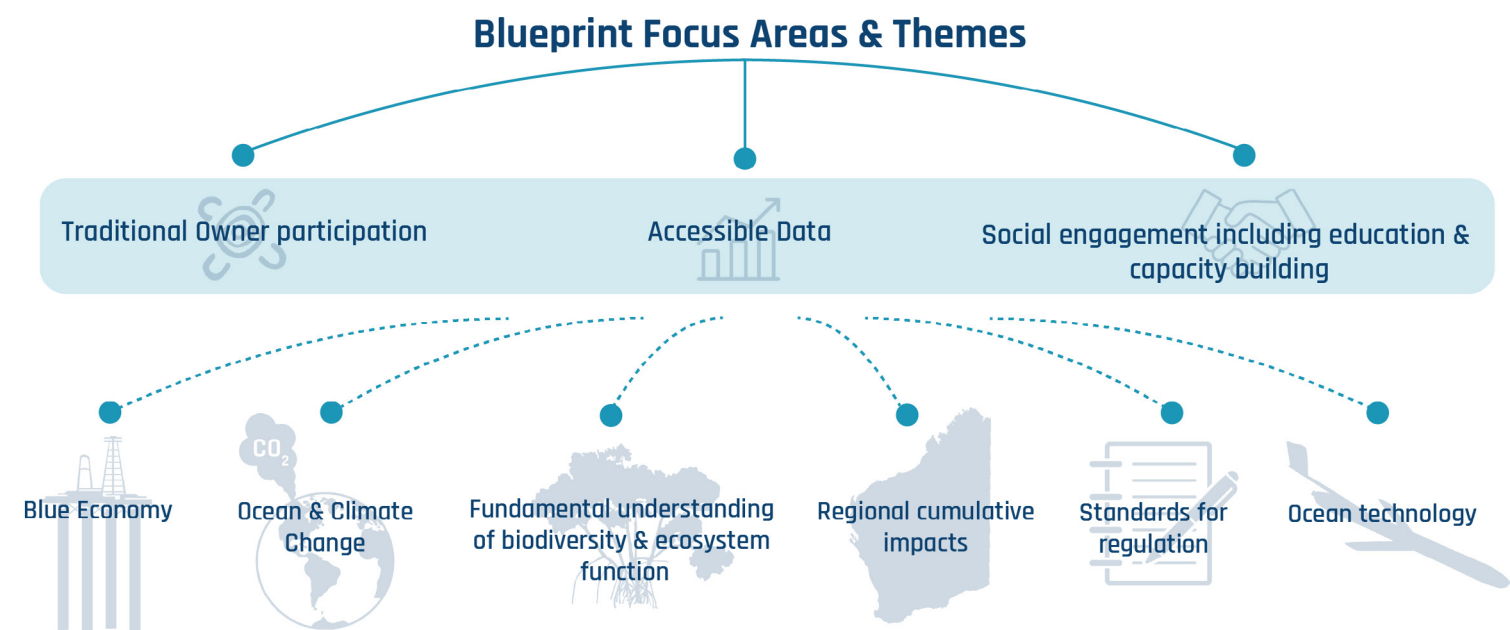
There are also increasing opportunities to involve local communities in science and management by incorporating social and community values into environmental policy and assessment processes. Enabling the public to engage meaningfully in decision-making processes and articulate acceptable levels of change, leads to better acceptance of government policy decisions, and business social license to operate.



SEEDS FOR SNAPPER PROGRAM SEED COLLECTION OZFISH

Part of this vision is focused on preparing all generations with the relevant skills and knowledge to rise to the challenge of creating a new sustainable model for marine science. Ground-breaking solutions are found when people with different expertise and perspectives work together sharing knowledge and ideas. Western Australia needs to inspire and nurture the next generation of marine scientists across disciplines as an investment in our future.

The **Blueprint Refresh** represents six major marine science themes and identifies key knowledge gaps to guide research initiatives and programs over the next five years that can be pursued by the State's leading scientific experts and organisations. The research themes represent a snapshot based on our collective knowledge, best available information and vision for Western Australian marine science.



**Figure 1.** Cross-cutting focus areas and key marine science themes in the Blueprint Refresh.

Connectivity between these themes is expected and should be explored through the integration of the cross-cutting focus areas into any strategic marine research program that aligns with the overarching direction of the Blueprint 2050.





## THEME 1: BLUE ECONOMY

Blue economy refers to economic activity taking place in, or affecting, the marine environment, including the impacts and sustainability of ocean health under the combined effect of those activities. It includes extraction of marine resources such as fisheries and mariculture, new energy sources in the ocean, exploitation of minerals (deep-sea mining, sand and gravel extraction), oil and gas (ocean seismic, drilling, processing), and the development of clean technologies, pharmaceuticals, cosmetics and desalination, etc.

*Specific priority topics of research are:*

**Carbon reduction and sequestration/blue carbon:** Identifying opportunities and benefits of reducing carbon in marine activities, including through quantification of existing and potential blue carbon stocks and carbon accumulation rates, and their spatial and temporal variability.

**Decommissioning:** Guidance for decommissioning of offshore assets, including the science to inform the opportunities/risks of man-made structures in the marine environment as well as coastal/intertidal aspects.

**Marine infrastructure:** Using a science approach to guide development through integrating engineering, environmental, social, and recreational factors for coastal, port and offshore infrastructure, as well as the role of 'nature based' solutions as a growing areas of 'greening' marine infrastructure.

**Marine renewable energy:** Exploring opportunities for offshore renewable energy generation including wind, wave, tidal and solar, opportunities for habitat enhancement and mariculture, as well as best practice to minimise environmental impacts.



## THEME 2: OCEAN AND CLIMATE CHANGE

*Climate change is recognised as one of the largest challenges being faced globally and we will need a better understanding of the impacts of climate change on our coastline and marine ecosystems along with potential adaptation strategies to ensure the sustainability of ecosystems, coastal development and infrastructure, culturally significant sites and associated activities.*

*Specific priority topics of research are:*

**Impact of heatwaves:** Understanding of heatwaves and their effects beyond predictive models, including practical guidance for mitigation and restoration of ecosystems damaged by marine heat waves and tidal/storm surges.

**Oceanographic conditions:** Improving understanding of oceanographic conditions, and potential consequences of climate change, affecting ocean, near-shore and coastal infrastructure to guide location, engineering design and investment decisions including through improving our ability to forecast coastal impacts.

**Coastal vulnerability:** Understanding coastal vulnerability, and impacts of changes on marine biodiversity, from changing environmental conditions, such as frequency of storms, changes in wind and wave patterns, warm water pulses, and sea level change. There are opportunities to inform mitigation, whether through traditional or nature-based engineering, as well as understanding the economic and social aspects that inform the difficult choices that will have to be made.

**Nature-based coastal adaptation strategies:** Understanding the benefits and opportunities for innovative multi-use nature-based approaches that may provide some protection to coastal habitats and infrastructure such as seagrass meadows, mussel beds, artificial reefs and sediment nourishment programs that build ecosystem resilience.



## THEME 3: FUNDAMENTAL UNDERSTANDING OF BIODIVERSITY & ECOSYSTEM FUNCTION

*A key element of the Blueprint 2050 framework is the need for baseline and fundamental research to understand our marine environment that underpins decision-making for sustainable management. The current focus of this theme is improving our understanding of biodiversity distribution, marine ecosystem function and the connectivity between species and environments.*

*Specific priority topics of research are:*

**Taxonomic capability:** Building taxonomic capacity to ensure ongoing species discovery and accurate species identification that underpins biodiversity research.

**Strategic baselines:** Investigating biodiversity and key functions within ecosystems to provide information prior to development decisions.

**Cross-ecosystem functions:** Identifying critical linkages or dependencies between ecological systems (e.g. inter-tidal and sub-tidal systems).

**Assessing ocean and coastal health:** Developing an approach for ocean and coastal waters health reporting and ways to implement environmental accounting.



## THEME 4: REGIONAL CUMULATIVE IMPACTS

*There is growing recognition that the cumulative pressures and impacts on the environment from multiple sources have become quite significant in many regions and must be given greater consideration when proposing further development. It is clear that climate change is impacting ecosystems in extreme ways, but the magnitude of impacts and the effectiveness of management will depend on the additive or multiplicative impacts from other local and global stressors.*

*Further, there is an increased expectation surrounding the transparency and robustness of environmental decision-making and assurance that expected outcomes and protections are achieved. Understanding cumulative environmental impact at a regional level will require collaboration across science disciplines, industries, marine/terrestrial tenures, and government agencies. Coupled with this is the practical application of regional environmental scientific knowledge to marine spatial planning to ensure a regional network of protected areas suitable to support relevant marine ecosystems. Hence, understanding cumulative impact baselines, using experimental and field-based methods, are critical for future adaptive management.*

*Specific priority topics of research are:*

**Building a sustainable process for assessing cumulative impacts:** Undertaking a regional economic and environmental study including development of integrated science and modelling of marine, coastal and terrestrial systems along with the development of analytic tools that can assess multiple activities over time and at varying spatial and temporal scales.

**Marine Protected Areas:** Providing the science to support marine spatial planning at a regional level, along with ongoing monitoring and management of marine protected areas to ensure important ecosystems are conserved and protected.

**Terrestrial-marine interface:** Understanding the role and importance of coastal, estuarine, and terrestrial environments, and cross-ecosystem processes for healthy marine ecosystems, and incorporate this knowledge into environmental impact assessments and marine regional planning.

**Models to support environmental decision-making:** Developing models or conceptual frameworks that reflect ecosystem element interdependencies to aid in regional-scale environmental decision-making, and communicating learnings from, and limitations of, models.

**Applying cumulative approaches to assess fisheries impacts:** New methods to assess fisheries impacts, including target species and bycatch and threatened species habitat, and cumulative effects research that supports an Ecosystem-Based Fisheries Management approach.





## THEME 5: STANDARDS FOR REGULATION

*This theme aims to inform and support regulatory policy and processes by providing scientific guidance, and support in adopting or developing standards for marine conservation, assessment and mitigation. This may be through a combination of developing digital solutions to accelerate assessment timeframes, improve quality and consistency of outcomes and support cumulative assessment as well as proactively identifying areas of potential development and providing baseline information and scientific foundations to inform decision-making at early stages of development consideration.*

*Specific priority topics of research are:*

**Proactive identification:** Providing the science to improve efficiency of marine infrastructure and coastal development assessment and approvals including through identifying suitable areas to locate novel infrastructure developments critical to the State (e.g. offshore wind farms).

**Policy and regulations:** Providing the science to better inform environmental policy development and decision-making across the marine and terrestrial domains to ensure better continuity and management consistency across marine, coastal and estuarine environments.

**Data delivery:** Developing digital technology along with data analysis standards to ensure information is accessible for use in environmental assessments.

**Standards development:** Developing standards and guidelines for sustainable aquaculture and stocking levels, assessing ecological and environmental response to pressures and mitigation strategies, and assessing and managing the cumulative impacts of light and noise pollution on marine ecosystems.



## THEME 6: Ocean technology

*This theme refocuses current priority needs on supporting emerging and developing technologies, and their application in ocean science. Innovations in technology and engineering related to sensors and autonomous observation platforms have allowed for finer scale and spatially expanded ocean data collection. Additionally, cost-effective and user-friendly sensors, along with mobile applications, and the deployment of sensors on non-scientific ships, are also facilitating the expanded collection of ocean observations. This can provide a better understanding of oceanographic conditions and enhanced modelling capabilities. The development of real-time monitoring technologies provides new opportunities to fine-tune environmental understanding, and to allow faster response to events.*

*Specific priority topics of research are:*

**Sensor technology:** Identifying, developing and validating new sensing technologies including sensors for measuring physical variables such as temperature, currents, waves and sensors to measure heavy metals, plastics, chemicals, and other indicators of ocean health.

**Novel technologies:** Trialing new technologies including rapid DNA sequencing (DNA Zoo); eDNA monitoring and census, underwater noise monitoring; ecoacoustics for species identification, and techniques to elucidate trophodynamic linkages through foodwebs.

**Computing and data science technologies:** Improving and developing machine learning and artificial intelligence to process large volumes of data automatically to better understand ecosystem dynamics and linkages as well as for other applications.

**Promoting collaboration across all sectors, WAMSI has identified six themes and associated knowledge gaps to focus marine science investment and activities in Western Australia over the next five years.**

These knowledge gaps, developed in consultation with representatives from research, industry, community and government, are designed to guide research initiatives and activities that are fundamental to deliver coordinated marine science on the key challenges currently facing Western Australia.

Addressing these gaps should be central to the formation of any research program and, as the prime coordinating and facilitating body for Western Australian marine science, WAMSI supports the science







community pursuing high-quality research that contributes to our collective understanding of the marine environment to support decision-making on its sustainable use and management.

Together with our partners, WAMSI has established multiple strategic research initiatives that align with the key themes identified to focus research efforts over the lifetime of this Blueprint Refresh. These indicate where WAMSI is delivering (or has allocated funding to deliver) research programs that strike a balance between filling gaps in scientific knowledge and providing information to support decisions to sustainably develop the State's marine resources.



Table 1. Blueprint Refresh 2050 research themes by stakeholder sector

This table depicts research themes considered important to key sectors and the topics identified are a reflection of the input WAMSI has received through the stakeholder consultation on this Blueprint Refresh.

RESEARCH THEMES	SECTORS									
	Energy	Ports	Traditional Owners	Community (NGOS, NRM)	Government Conservation/ sustainable management	Government Regulation	Aquaculture	Research	Recreational Fishing	Commercial fishing
 Blue Economy	Blue carbon		✓	✓	✓			✓		✓
	Decommissioning	✓		✓		✓		✓		✓
	Marine Infrastructure	✓	✓	✓	✓	✓	✓			✓
	Renewable Energy	✓	✓	✓		✓		✓		✓
 Ocean & Climate Change	Heatwaves		✓	✓	✓		✓	✓		✓
	Oceanographic condition	✓					✓	✓		✓
	Coastal vulnerability	✓	✓	✓	✓	✓		✓	✓	✓
	Adaptation	✓	✓	✓	✓		✓	✓		
 Biodiversity & Ecosystem Function	Baselines			✓	✓	✓		✓	✓	✓
	Ecosystem function			✓	✓	✓		✓	✓	✓
	Ocean and coastal health	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Cumulative impact assessment	✓		✓	✓	✓				✓
 Regional Impacts	Marine Protected Areas	✓	✓	✓	✓	✓				
	Terrestrial-marine interface	✓	✓	✓	✓			✓		
	Models for decision making	✓		✓	✓					
	Proactive identification	✓				✓	✓			
 Standards for Regulation	Policy and regulation	✓				✓	✓		✓	
	Data delivery	✓	✓				✓			
	Standards development	✓	✓	✓	✓		✓	✓		✓
	Sensor technology	✓								
 Ocean Technology	Novel technologies	✓					✓	✓	✓	✓
	Computer technologies		✓					✓		

WAMSI Partners



Government of Western Australia  
Department of Water and Environmental Regulation



Department of Primary Industries and  
Regional Development



Department of Biodiversity,  
Conservation and Attractions



WAMSI is funded by



Government of Western Australia  
Department of Jobs, Tourism, Science and Innovation





WESTERN AUSTRALIAN  
**MARINE SCIENCE  
INSTITUTION**

Better science **Better decisions**

Western Australian Marine Science Institution (WAMSI)  
Indian Ocean Marine Research Centre  
64 Fairway, Entrance 4, Crawley WA 6009  
(61 8) 6488 4570  
[info@wamsi.org.au](mailto:info@wamsi.org.au)

[www.wamsi.org.au](http://www.wamsi.org.au)