



Integrated Marine
Observing System



IMOS Strategy 2030

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About IMOS

Australia’s Integrated Marine Observing System (IMOS) was established in 2006 as a joint venture between seven top Australian marine research institutions. The National Collaborative Research Infrastructure Strategy (NCRIS) supports this national infrastructure, which includes over 50 facilities and sub-facilities around Australia. The facilities collect observations and measurements of ocean conditions, species and habitats — from the open ocean to coastal waters. This timely, quality-assured, centralised data is freely available to researchers, industries, managers and policy-makers. The data support the sustainable use and management of our marine estate, and deliver benefits to all Australians.

Statement of acknowledgement

We wish to thank the Australian Government, IMOS partners and an extensive range of stakeholders for their continued support, which has been instrumental in IMOS’ advances and achievements since 2006. We also acknowledge the dedication of Australia’s marine science community that has helped us reveal long-term patterns and trends.

Acknowledgement of Country

IMOS acknowledges the Traditional Custodians and Elders of the land and sea on which we work and observe, and recognise their unique connection to land and sea. We pay our respects to Aboriginal and Torres Strait Islander peoples past, present and future.

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Executive summary

As we move deeper into the 21st century, Australia's Integrated Marine Observing System (IMOS) has never been more essential for rising to the grand challenges and realising the great opportunities of Australia's oceans and coasts. The IMOS Strategy 2030 has been designed to help us answer this century's clarion call.

Since IMOS' inception in 2006, our ocean and coastal data have helped Australia sustainably manage the third largest marine estate in the world. Our data have helped forecast and predict ocean and weather conditions, supported the operational needs of marine industries, informed marine policy-making and more. But there is still much that Australia doesn't understand about its marine estate. Nor can Australia meet its challenges and opportunities without the knowledge base to make decisions, plan, invest and mitigate risk.

Over the coming decade, Australia needs to better track and understand the impacts of climate change and extreme weather events on coastal communities, iconic marine environments and maritime operations. Ocean and coastal observing data will help drive the projected \$100 billion-a-year blue economy, technological advancements, the potential of marine renewable energy and cutting-edge research on contemporary issues. Our regional and international neighbours also need IMOS data to close knowledge gaps about global oceans.

The scale of these challenges and opportunities requires a coordinated national marine monitoring system with the scale, capabilities, leadership and impact to match. IMOS is that system, and we have developed five Missions to guide our work over the next 10 years.

- Provide data and knowledge to improve decision-making and support marine operational safety and efficiency, including weather forecasting and prediction services.
- Provide an increased understanding of the environmental, economic, social and cultural impacts of and resilience to climate change and extreme events.
- Enable improved understanding of conditions, species and habitats to support management and protection of our precious marine estate.
- Support research, training and education, and facilitate innovative approaches to provide future ocean-monitoring capabilities for industry, science and management.
- Engage at local, national, regional and international scales to ensure our capacity and capability is leveraged for greatest impact.

Twelve Objectives underpin our Missions and aim to fulfil Needs, grow Impact, Amplify capacity and apply Capability. IMOS will:

- turn data into useful, easily applied information for end users
- work with stakeholders to support decision-making and the blue economy
- generate international synergies and continue Indo-Pacific leadership
- measure social, environmental and economic impacts to maximise benefits
- leverage observations and investment through partnerships
- design our observing system for impact and national priorities
- integrate multiple marine variables and scales
- enhance marine communication, understanding and literacy
- empower next-generation scientists with data and infrastructure access
- sustain and evolve IMOS capability
- support and enhance marine modelling and forecasting services
- partner up, articulate gaps and develop solutions to marine issues.

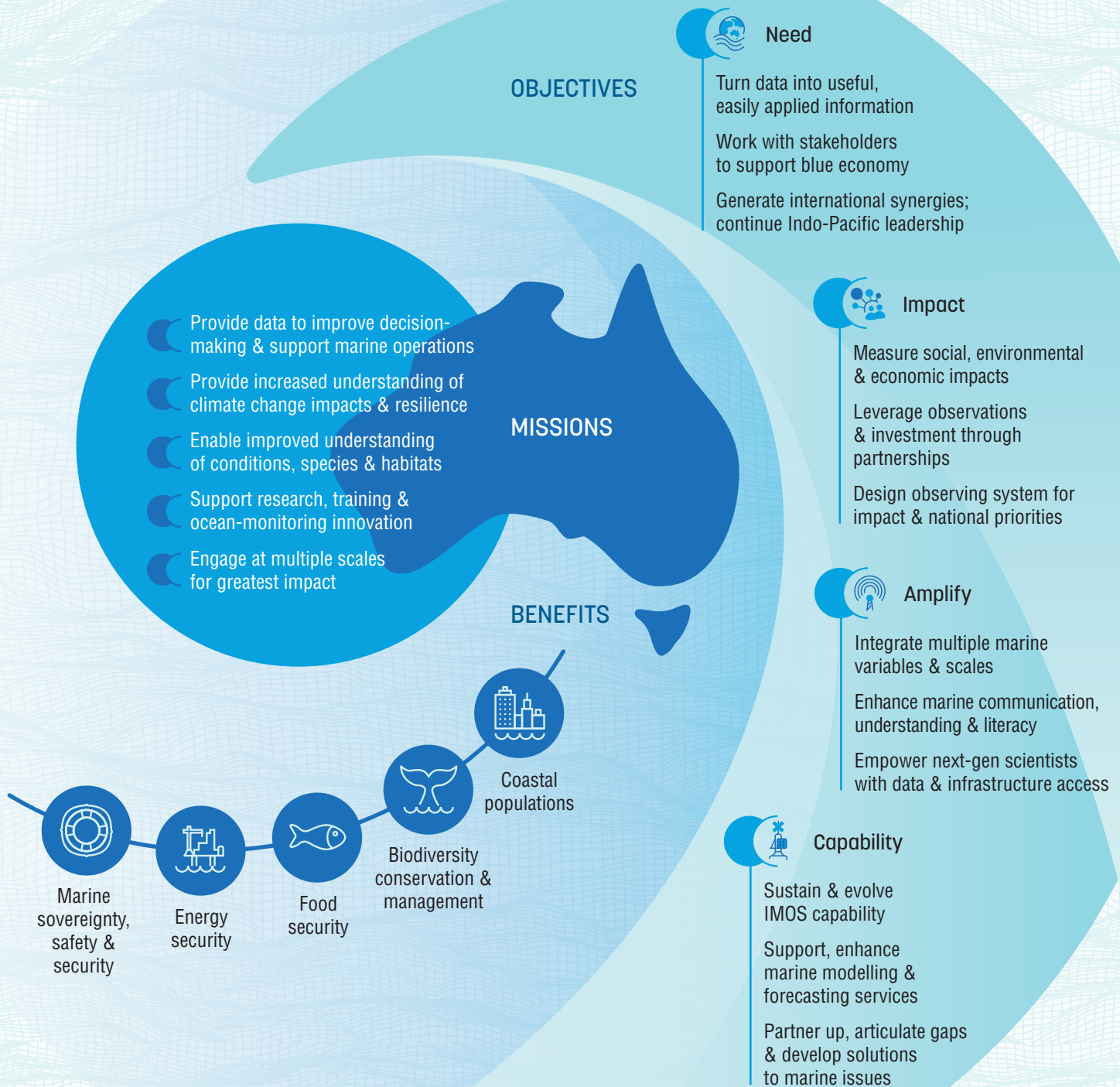
Over the last 14 years, the IMOS partnership has developed into a world-leading observing system with investments in infrastructure, data systems and human capability by the federal government (\$24 million p.a.) and our partners (\$39 million p.a.). The impacts of these targeted and sustained observations have been profound. As we look forward in this Strategy to the future needs of end users and stakeholders, it is clear we must continue to observe many of the systems and variables we have focused on to date.

However, there are also significant gaps, particularly in the coastal zone where most Australians — city dwellers, regional centres and First Nations peoples — live and access the oceans. Our Strategy encompasses these currently unmet needs and will require sustained and increased funding if we are to achieve our Missions, and help deliver the energy, food, jobs, security, recreation and wellbeing of all Australians.

John Gunn
Chair, IMOS Governing Board

IMOS Strategy 2030

Rising to the challenges and realising the opportunities of Australia's oceans and coasts



Director's message: what we will look like in 2030



Australia's oceans and coasts are more important than ever to our way of life. They continue to be a source of recreation, wellbeing, food and clean energy, and a major driver of global weather and climate. The IMOS partnership has played a key role in maintaining the sustainable use and management of Australia's marine estate and growing the blue economy. We've achieved this by integrating IMOS observations into weather and climate forecasting to help support maritime industries and inform management and policy decision-making processes.

IMOS has helped Australia weather global crises such as the coronavirus pandemic by continuing to deliver important data streams that support and facilitate science, industry and jobs. We also continue to play a critical role in informing responses to ongoing and emerging disturbances to our world and oceans, including climate change. IMOS has helped the public, policy-makers and industry better understand climate change impacts, their effects on Australia and the effectiveness of our mitigation and adaptation measures.

By integrating observational data into accessible, easily applied information and products, we have improved the safety and efficiency of leisure and operational maritime activities, helped monitor and manage critical food resources, supported renewable energy operations, and informed decision-making and policies on ocean use and management. Ports, fishing, tourism, shipping and other sectors better understand the importance of ocean observing data, as well as the conditions in coastal regions where use and stressors are greatest. Expansion into coastal observing has supported the needs of planners, regulators, infrastructure investors and the public in understanding and managing the changes that continue to occur in coastal areas.

Over the past decade, our data have helped drive significant advances in technology to study our oceans and coastal waters. These innovations have vastly expanded our knowledge through targeted sustained observing. Meanwhile, our data and products have empowered and trained the next generation of marine scientists. Partnerships with people, including Indigenous communities and citizen scientists, have also expanded our observing capability into areas we could not sustain otherwise. Through these partnerships, we have gained a richer understanding of our oceans and their role in shaping our communities and country.

IMOS has made significant contributions to national and international programs, and serves as a touchpoint and benchmark for other nations. We have continued to play a leadership role in the global ocean observing community, and our collaborative model, data integration and outputs are world-leading. Our role in the Indo-Pacific has also increased. We have worked more closely with our regional neighbours to better understand our oceans at scales that are relevant to their nations and ours.

We have grown the IMOS community and deepened our partnerships with the public and private sectors. During this time, we have continued to demonstrate that as a community IMOS is greater than the sum of our parts, and through partnership we build from strength to strength.

Michelle Heupel
IMOS Director

Introduction

The IMOS Strategy 2030 is a roadmap guiding our priorities for infrastructure, partnerships, leadership and research over the next 10 years. The Strategy is structured around five key Missions and 12 related Objectives. To achieve these Missions and Objectives, we will address national and international Needs, increase Impact, Amplify national ability and apply our Capability.

This roadmap builds on the previous IMOS Strategy 2015–2025; however, its fundamental drive remains the same. IMOS will deliver sustained, systematic and scientifically robust observations that will support the sustainable use and management of our vast and valued marine estate. We will work with our partners to address fundamental questions and challenges facing our oceans and coastal waters, and deliver national benefits to all Australians.

Australia has one of the world’s largest marine estates. Its ocean territory is greater than its land area and stretches over millions of square kilometres. This marine estate is not only large and extremely diverse, but it is also highly valued socially and economically. With 90% of Australians living within 100 kilometres of the coast, recreation and culture are closely entwined with the marine environment. By 2025, marine industries are projected to contribute around \$100 billion to Australia’s economy annually¹.

A large, valuable marine estate comes with an equally large responsibility for sustainable management to benefit Australia and its regional neighbours. Effective management requires a knowledge base and capability to regulate and manage access to, use of and benefits derived from the marine estate. This can only be achieved through focused, long-term observation and study.

In an era of rapid environmental and social change, Australia faces new challenges in achieving sustainable management of marine resources over the next decade. Successfully addressing these challenges requires strong and diverse partnerships, multiple observing platforms, timely access to relevant data, the ability to integrate and synthesise relevant data, and a concerted effort by engaged scientists.

IMOS and our partners possess the capabilities to answer that call and a mission-based Strategy will guide the way. Our efforts and observations will deliver benefits across marine sovereignty, safety and security; energy and food security; biodiversity conservation and management; and coastal populations. We will address the needs of communities, industries, scientists, policy-makers and managers, and ultimately support the jobs, recreation, health and wellbeing of all Australians.



IMOS provides us with critical in situ observations that our meteorologists and researchers use to ensure Australia’s weather and climate services are world-class, and to provide our community with information to make critical decisions for the protection of life and property.

.....
Nichole Brinsmead, Chief Information Officer and Group Executive Data and Digital,
Bureau of Meteorology

¹ National Marine Science Committee (2015),
National Marine Science Plan 2015–2025.

Our Missions 2021–2030

We have developed five Missions to guide our work, and to address the challenges and realise the opportunities of Australia's marine estate over the coming decade. We will achieve these Missions through strategic collaboration, connections to industry, user engagement and best-practice data stewardship.



Provide data and knowledge to improve decision-making and support operational needs, safety and efficiency of marine industries and organisations, including weather forecasting and prediction services.

Provide an increased understanding of the environmental, economic, social and cultural impacts of and resilience to climate change and extreme events.



Enable improved understanding of conditions, species and habitats to support management and protection of our precious marine estate.

Support research, training and education, and facilitate innovative approaches to provide future ocean-monitoring capabilities for industry, science and management.



Engage at local, national, regional and international scales to ensure our capacity and capability is leveraged for greatest impact.



See how we track our Missions on Page 14

How we work

IMOS is one of the world's most comprehensive and successful ocean observing systems. Our 50 facilities and sub-facilities are based around Australia, and use a wide range of infrastructure to collect observations and measurements on ocean conditions, species and habitats – from the open ocean to coastal waters.

These high-quality ocean observations help monitor marine ecosystems, define patterns and trends, and address fundamental questions and challenges facing our marine estate. IMOS data help researchers, governments, industries and communities understand climate change impacts and many other pressures on marine systems. We also improve marine industry efficiency, safety and sustainability, and help strengthen Australia's marine security.

IMOS undertakes and supports a range of activities, such as:

- providing critical contributions to weather and climate forecasting, including contributions to reporting by the Intergovernmental Panel on Climate Change
- working with government agencies such as the Department of Defence, and maritime industries such as oil and gas, ports and renewable energy to collect data on waves, currents and weather for operational decision-making
- testing and implementing novel technologies to improve ocean observations, reduce observing costs and improve data access and delivery
- informing models and ocean observations that commercial fishers use in daily operations
- helping to understand episodic events such as coral bleaching and marine heatwaves by collecting sustained and targeted data
- informing models and information to guide management of Australian Marine Parks, including management of the Great Barrier Reef
- informing coastal communities about the waves, currents and climate conditions that affect them
- using marine species monitoring data to inform fisheries management and status reports, and threatened species management at state and Commonwealth levels
- contributing to state and Commonwealth State of the Environment reporting with long-term observational trends in key ocean variables
- improving our understanding of Southern Ocean dynamics by operating in remote and harsh environments
- contributing to the Global Ocean Observing System, which is calling for coordinated and concerted action to understand and sustain our ocean ecosystems.



The NCRIS investment and the IMOS collaborative model have provided a quantum leap in the availability of ocean data in Australia, and in the collaborative partnerships between data users across the university, government and industry sectors.

National Marine Science Plan 2015–2025: Driving the development of Australia's Blue Economy



IMOS undertakes systematic and sustained observing of Australia's marine estate.



Operates a portfolio of platform-based facilities to acquire ocean observations.



Plans its operations through internationally peer-reviewed science processes.



Engages with users across universities, governments and industries to drive uptake and impact.

Our facilities

Deep water moorings



Ships of opportunity



Satellite remote sensing



Wireless sensor networks



Ocean radar



National Mooring Network



Ocean gliders



Autonomous underwater vehicles



Animal tracking
Acoustic telemetry



Argo floats



Animal tracking
Animal tagging



Marine Microbiome Initiative



New technology proving

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101001
000100



Australian Ocean Data Network

Strategic Objectives

The Strategy's 12 Objectives are designed to achieve our Missions by fulfilling Needs, growing Impact, Amplifying capacity, and applying and building Capability.



Need: our national and international context

There is an established need and ongoing priority for ocean observing within and beyond Australia. Marine industries and organisations require these observations for operational support. Better understanding of Australia's oceans and coasts is also crucial for managing risk, developing industries and realising national benefits in an era of unprecedented change. IMOS will strive to remain agile in these changing times by producing data and outputs that are relevant and responsive to stakeholder needs, national priorities and emerging issues.

Organisations and industries such as the Bureau of Meteorology (BOM), Department of Defence, ports, renewable energy, oil and gas, and fisheries rely on IMOS observations to understand the ocean state, trends and processes affecting their operations.

Meanwhile, many ocean processes that drive climate, weather and marine systems have large uncertainties, limiting the value of future-state projections. Maritime operations need access to more reliable information and modelling about increasingly extreme events, such as tropical cyclones. Ocean renewable energy from waves, tides, currents and thermal energy conversion hold some promise, but also require ocean data for development and decision-making.

By 2025, Australia's marine industries are also projected to contribute around \$100 billion to our economy each year. For industry and government to plan, invest and mitigate risk, they need an evidence base of essential knowledge about ocean systems and resources. The development of new marine technologies and innovations is also necessary to drive marine science discovery, industry development, job growth and sustainability.

The priority requirement for systematic and sustained ocean observing has been stressed in a range of high-level national and international fora over the last five years. These include the *National Marine Science Plan*, the National Science and Research Priorities, the *National Climate Science Strategy*, *Global Ocean Observing System 2030 Strategy*, the United Nations Decade of Ocean Science for Sustainable Development 2021–2030 and the United Nations Sustainable Development Goals.

IMOS is actively engaged, and in many cases is a global leader, in ocean observation science. In particular, we play a strong role in observing the Southern Ocean, and we are a regional alliance in the Global Ocean Observing System.

IMOS will fulfil three Objectives to meet these Needs:

Transform our data into information and products that are useful and easily applied by researchers, industries, government and the public.

Work with stakeholders who utilise systematic and sustained observations of Australia's marine estate to support decision-making and the blue economy.

Collaborate as a strong partner in global ocean observing and international partnerships to add value to Australia and provide leadership within the Indo-Pacific to help support our regional neighbours.



Impact: harnessing our influence

IMOS observations and measurements will drive and enhance research that delivers impact and economic, environmental and cultural benefits for Australia and beyond.

We grow and enhance impact by aligning our strategic planning with national and international priorities. We also establish partnerships with the research sector, industry and communities, and undertake direct engagement with researchers, managers and policy-makers. This approach provides an opportunity to create solution-based advice in collaboration with Australia's marine research community.

IMOS ensures that impact is achieved by understanding how observations provide national benefit via our stakeholders, and tracking what benefits those observations help produce. We do this across five overarching societal themes: food security; energy security; biodiversity conservation and management; marine sovereignty, safety and security; and coastal populations. We embed these themes into a framework of OECD-derived indicators of world-leading research infrastructure to measure our impact.

IMOS will fulfil three Objectives to meet these Impacts:

Measure and analyse our impact across areas of society, the environment and the economy to ensure we are maximising benefits. Work to increase relevance and impact in sectors with unrealised potential.

Leverage IMOS observations and core investment through partnerships with state and territory governments and marine industries to enhance data use, applicability and outcomes.

Design our observing system for greatest impact in order to contribute and respond to national priority setting and emerging needs.





Amplify: enhancing national ability through leadership

Through partnership, knowledge-sharing and integration of our extensive data holdings, IMOS can support solutions to complex issues facing our marine estate. These include climate change and extreme events, maritime safety and security, food and energy security, increasing coastal populations, and biodiversity conservation and management.

IMOS is a collaboration of Australia's leading marine science institutions that plays a fundamental role in supporting and advancing marine research. We serve as a platform and benchmark for collaboration and integration in national and international arenas.

We provide national programs with observations that support a range of climate and ecosystem-based research. Ocean observing systems in other countries look to IMOS for leadership, and have adopted several of our innovative approaches to ocean observing.

IMOS and its partners are also in a unique and powerful position to address a number of national issues. Together, we support the Australian Ocean Data Network and a diverse portfolio of ocean and coastal observing infrastructure across a broad range of environments. These attributes position our portfolio to support solution-oriented research. These features mean IMOS can amplify our national ability in ways that single institutions could not accomplish alone.

IMOS will fulfil three Objectives to Amplify Australia's marine science:

Integrate multiple marine and coastal variables measured over a range of spatial and temporal scales to improve knowledge of ocean systems and processes.

Communicate an enhanced understanding of the marine environment to increase ocean literacy in communities within and beyond Australia.

Empower the next generation of marine scientists through access to unparalleled marine infrastructure, expertise and data.



IMOS investments in global ocean observing have enabled a more complete understanding of the role of the ocean in weather and climate, and improved predictions of societally relevant environmental changes.

Dr David Legler, Chief, Climate Observations Division, National Oceanic and Atmospheric Administration



Capability: the power of our people and infrastructure

IMOS will contribute to national priority areas while continually improving technology, processes, information and products. Our capability spans regional and global elements, enabling us to contribute data and solve problems at multiple scales.

Many of Australia's science, industry and weather-forecasting operations need more than one observation type to be successful. Integrating multiple observations and measurements provides greater knowledge and benefits. As a highly collaborative partnership, IMOS can deliver diverse expertise and multiple observations, making our whole greater than the sum of our parts.

IMOS will use our **Capability** to fulfil three Objectives:

Sustain and evolve IMOS capability to realise full value from investments, promote benefits through continuity of critical observations and respond to technological developments.

Support and enhance ocean and coastal modelling, and forecasting and prediction services to improve safety and efficiency of maritime operations.

Articulate ocean observation gaps, develop solutions and work with partners and stakeholders to address current and emerging marine issues.



Implementing the Strategy and tracking our success

We will implement the IMOS Strategy 2030 via a series of detailed Five-Year Plans developed in consultation with our partners, stakeholders and end users. In the spirit of continual improvement, we will conduct rolling program and capability reviews to ensure IMOS maintains efficiency and effectiveness, as well as relevance and impact. IMOS will also apply an impact framework to track the success of our Missions. As part of this framework, we will collect and analyse indicators of the use and users of IMOS observations. These indicators will determine observation users, and why, how and where they have used our observations for the benefit of all Australians.



Provide data and knowledge to improve decision-making and support operational needs, safety and efficiency of marine industries and organisations, including weather forecasting and prediction services.

- Assess and analyse the use of IMOS data and related research by fisheries, oil and gas, and renewable energy initiatives.
- Assess and analyse the use of IMOS data and related research by organisations such as BOM and the Department of Defence.
- Assess and analyse the use of IMOS data and related research in various policy documents.



Support current and future research, training and education, and facilitate innovative new approaches to provide future ocean-monitoring capabilities for industry, science and management.

- Assess and analyse the use of IMOS data in university-based training and projects.
- Assess and analyse the use of IMOS data in digital apps and other innovative products and technologies.



Engage at local, national, regional and international scales to ensure our capacity and capability is leveraged for greatest impact.

- Assess and analyse stakeholder and end-user engagement with local, national, regional and international institutions and partnerships.



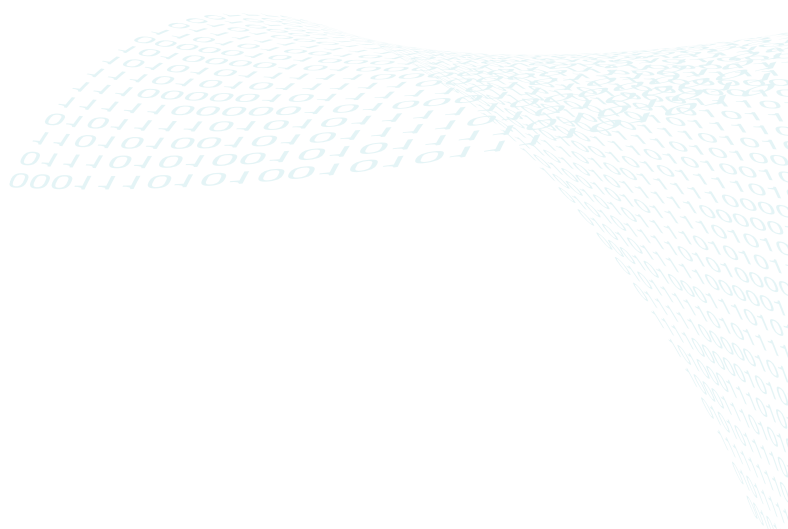
Provide an increased understanding of the environmental, economic, social and cultural impacts of and resilience to climate change and extreme events.

- Assess and analyse the use of IMOS data in state-of-the-art climate change research, modelling and forecasting.



Enable improved understanding of conditions, species and habitats to support management and protection of our precious marine estate.

- Identify how our observations and supported research contribute to biodiversity conservation and management, and food security.





Australia's oceans and coasts are more important than ever to our way of life. They continue to be a source of recreation, wellbeing, food and clean energy, and a major driver of our global weather and climate.



IMOS
Integrated **Marine**
Observing System



NCRIS
National Research
Infrastructure for Australia
An Australian Government Initiative

Australia's Integrated Marine Observing System (IMOS) is enabled by the National Collaborative Research Infrastructure Strategy (NCRIS). It is operated by a consortium of institutions as an unincorporated joint venture, with the University of Tasmania as Lead Agent.

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PRINCIPAL PARTICIPANTS

UNIVERSITY of TASMANIA 
(Lead Agent)


Australian Government


AUSTRALIAN INSTITUTE OF MARINE SCIENCE


Australian Government
Bureau of Meteorology


CSIRO


Government of South Australia

SARDI

SOUTH AUSTRALIAN RESEARCH AND DEVELOPMENT INSTITUTE


THE UNIVERSITY OF WESTERN AUSTRALIA


sims
sydney institute of marine science

 **UTS**

 THE UNIVERSITY OF SYDNEY

 **MACQUARIE**
University

 **UNSW**
SYDNEY

SIMS is a partnership involving four universities.

ASSOCIATE PARTICIPANTS

 **Curtin University**


Australian Government
Department of Agriculture, Water and the Environment
Australian Antarctic Division

 AUSTRALIAN ANTARCTIC PROGRAM

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