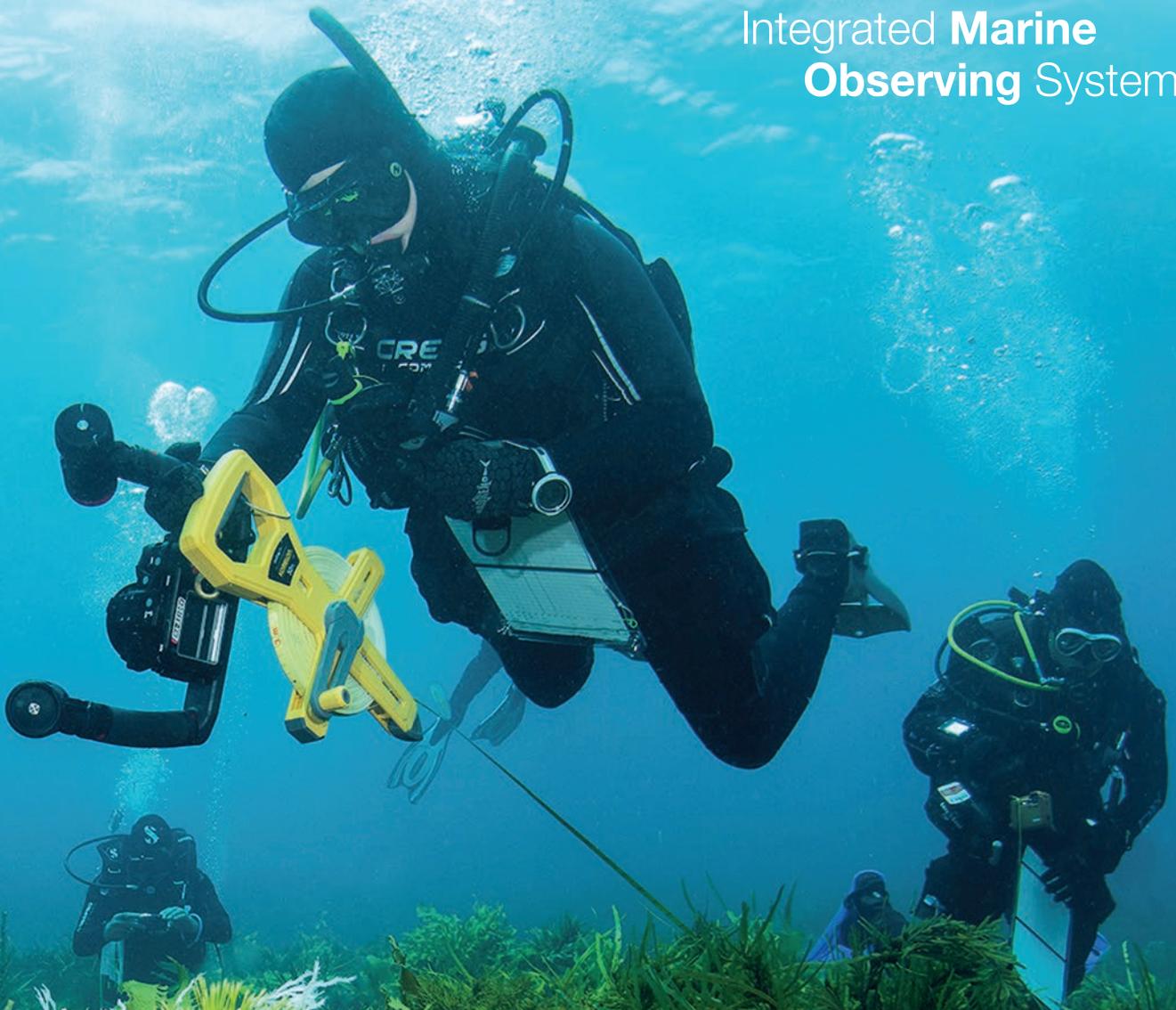




Integrated **Marine**  
**Observing** System



**2021–2022**  
HIGHLIGHTS

Enabling research that delivers benefits across Australian society, its environment, and its economy.

The 16th year of operation for the Integrated Marine Observing System (IMOS) revealed the resilience and commitment of the marine science community as we continued to operate despite ongoing COVID-19 disruptions. The achievements outlined in this document are a testament to the strength, resilience and commitment of our partners and the marine science community.



During 2021–2022 the Australian Government released the 2021 National Research Infrastructure Roadmap which guides future investment for the NCRIS program. The new Roadmap highlighted the importance of skilled individuals in delivering national infrastructure and signalled a step-change investment was required to support climate and environmental needs in Australia. IMOS will be a key element in helping realise this objective and we have always been a strong advocate for the skilled staff that work to deliver our program. As we work toward the next phase of investment we hope to see new elements phased into IMOS to increase our ability to deliver societal benefit for Australia.

Evidence of the benefit IMOS delivers on both national and global scales can be seen through extensive use of IMOS data streams in key documents and reports. The Intergovernmental Panel on Climate Change (IPCC) Working Group II

Climate Change 2022: Impacts, Adaptation and Vulnerability report released in February 2022 included numerous publications using IMOS data. Similarly, IMOS data had a strong presence in the 2021 State of the Environment (SoE) Report released in July 2022. While IMOS data featured heavily in the marine chapter, IMOS observations were included in a number of the other chapters. The IPCC and SoE reports utilised data from a range of IMOS Facilities indicating both the breadth of our program and the applicability of the data produced. Integration of IMOS data into both of these outputs creates a pathway to impact as the reports guide policy and other actions.

In addition to the two high-level reports released this year, IMOS continued to deliver a range of high-quality outputs and ensure our data are available and accessible to a range of stakeholders and end-users. As we look to 2022-2023

we hope to expand our user base as well as the benefit IMOS can provide within and beyond Australia.

As always, I extend immense thanks to all our partners, collaborators and supporters for helping make IMOS successful. I hope you enjoy seeing some of the highlights of 2021–2022 and look forward to what we can collectively achieve as we move into the next tranche of NCRIS funding.

**Michelle Heupel**  
IMOS Director



### Application of IMOS data to analysis and conclusions in the 2022 IPCC working group II report

The Intergovernmental Panel on Climate Change (IPCC) Working Group II Climate Change 2022: Impacts, Adaptation and Vulnerability report was released in February 2022.

IMOS contributions cover the breadth of our program including long-term and recently established observing capabilities.

The 2022 IPCC Report includes 64 publications using data from IMOS infrastructure which were cited 90 times. Publications using IMOS data ranged across the physical, chemical and biological variables we observe in Australia's oceans.

Significantly, these publications cover a range of IMOS Facilities

including Argo Floats, Ships of Opportunity, Deep Water Moorings, Ocean Gliders, Autonomous Underwater Vehicles, National Mooring Network, Animal Tracking, IMOS OceanCurrent, and Satellite Remote Sensing.

Data from some of IMOS' newer Facilities such as Surface Waves and Event Based Sampling were used in publications cited in the report providing an early demonstration of their value for understanding climate change.

### IMOS a major contributor to the State of Environment Report 2021

IMOS was a major contributor to the State of Environment (SoE) report 2021 released by Minister for the Environment and Water Tanya Plibersek earlier this year. The State of the Environment 2021 combines scientific, traditional

and local knowledge. Indigenous and non-Indigenous people have worked together to create this first holistic assessment of the state of Australia's environment. The report aims to help shape policy and action, influence behaviours, and assess our actions as stewards of the Australian environment.

The SoE report includes 99 publications using data from IMOS infrastructure which were cited 170 times. The citations were predominantly in the Marine and Antarctica chapters, but also in the Coasts, Overview, Climate and Extreme Events chapters.

This demonstrates the value of the sustained ocean observations IMOS provides, improving our understanding of conditions, species and habitats to support management and protection of our precious marine estate.

# IMOS HIGHLIGHTS 2021–2022

## Turtle tagging aids conservation

A new olive ridley turtle satellite tagging program is revealing migration pathways and key habitats to inform the conservation of this iconic, endangered species. The tags were deployed during an expedition earlier this year to the Tiwi Islands as part of a collaboration between the Department of Defence, Tiwi Islands Marine Rangers and IMOS. The turtle behaviour observations will provide a better understanding of habitat use and enable Traditional Owners and management agencies to refine the designation and protection of critical areas for turtle nesting and feeding.



## Ningaloo Mooring monitors Leeuwin Current

The Leeuwin Current flows southward through Ningaloo Reef which is an UNESCO World Heritage listed marine park, adjacent to highly productive fisheries in the Exmouth Gulf and the North West Shelf. The strategic location of the IMOS Ningaloo mooring provides valuable monitoring of this important region, as well as the strength of the Leeuwin Current. Variations in the Leeuwin Current have ramifications for coastal ecosystems from Ningaloo Reef to the Capes in the southwest.



## New surface waves product

The product provides up to date surface wave conditions around Australia, with data gathered from Australia's coastal wave buoy network, several satellites and the Bureau of Meteorology's AUSWAVE-R model. The product features 2-hourly maps of surface waves and is available via the IMOS OceanCurrent website. The product will be useful for understanding wave conditions during intense storms and severe weather events.



## IMOS data contributes to the Global Carbon Budget

The 2021 Global Carbon Budget was launched last year at COP26. Australia is a major contributor to determining the ocean's role in the Budget, through the observations collected by IMOS via Ships of Opportunity and Acidification Moorings. One third of the data used to constrain the Southern Ocean (and Southern Hemisphere) CO<sub>2</sub> uptake has been provided to the Surface Ocean Carbon Atlas through IMOS, making Australia the largest data provider for these regions over the last decade.



## Collaboration essential for maintaining Bonney Coast mooring

The IMOS mooring located on the Bonney Coast collects sustained observations that improve our understanding of the upwelling processes that underpin this productive marine region. COVID-19 restrictions have continued to disrupt regular servicing of this mooring. Our partners in Victoria and South Australia stepped up to the challenge and worked collaboratively to ensure this crucial time-series of data is maintained.

## Microplastics on the Yongala Shipwreck

A recent study provided the first temporal assessment of plastic pollution at the IMOS Yongala National Reference Station mooring on the Great Barrier Reef, highlighting the pervasiveness of plastics and microplastics even in pristine marine environments. IMOS is building on the work at this site to establish a database of microplastics contamination in coastal and shelf waters around Australia.



## Multi-decadal ocean temperature data products

New multi-decadal ocean temperature time-series and a range of daily temperature climatologies have been published recently using IMOS mooring data. The 17 new ocean data products are from four long-term monitoring sites around Australia. The sites were started by CSIRO in the 1940s and have been continued by IMOS since 2009 as a core component of our network of National Reference Station Moorings. The products will be useful for studies of ocean temperature variability, trends, anomalies and change.

## National Reef Monitoring Network Database

IMOS is bringing together shallow reef survey data from around Australia into a new centralised database. IMOS collates, cleans, stores and makes the data rapidly available via the AODN Portal. This is the largest diver-collected marine biodiversity dataset in the world, combining data from the global Reef Life Survey program, long-term Australian Temperate Reef Collaboration and Parks Victoria datasets into one interoperable and open resource covering almost 4,000 sites across 54 countries and territories.



## IMOS data

IMOS delivers more than 990 million ocean measurements from 60 IMOS Facilities and sub-Facilities based around Australia. These ocean measurements are freely available and discoverable through the IMOS Australian Ocean Data Network (AODN) Portal for the marine and climate science community. IMOS converts these measurements into data, time series, products and analyses that can be used to improve decision-making and support operational needs, safety and efficiency of marine industries and organisations, including weather forecasting and prediction services.



## Decade of Southern Ocean observations

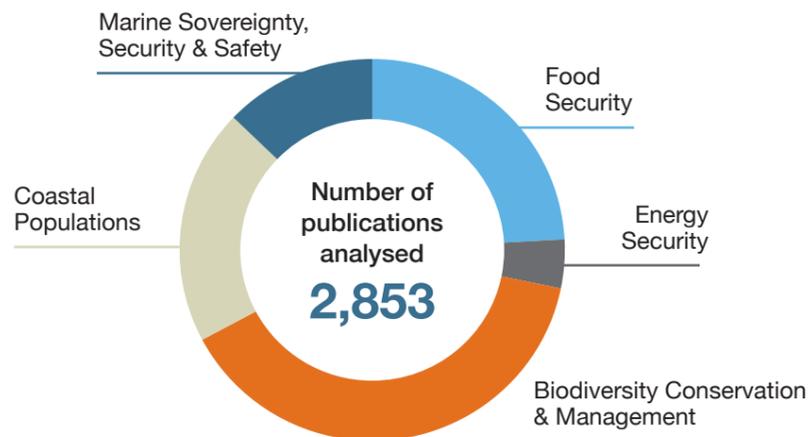
Recovering the 10th IMOS Southern Ocean Flux Station earlier this year is a huge engineering achievement as well as an exciting scientific milestone. The station is the only long-term air-sea flux and biogeochemistry mooring in the Southern Ocean. The decade of observations IMOS has collected are essential for providing advice about how climate variability is affecting us now and into the future.

## Societal Benefit

Australia has an expansive marine estate, which influences many aspects of our social, cultural and economic lives, and the environment in which we live. The importance of our marine estate is reflected in the range of areas where it intersects with areas of societal benefit. IMOS has identified five areas of societal benefit where our observations and data can produce value for Australia: coastal populations; food security; energy security; marine sovereignty, safety and security; and biodiversity conservation and management.

IMOS tracks and records uses across these five societal benefit areas, and an analysis of 2853 publications in our IMOS Impact Database from 2006–2022 (see above right) reveals how IMOS is providing value to Australia.

Analysis of Publications 2006–2022



## Financial Summary

A summary of the IMOS finances for 2021–22

FINANCIAL OVERVIEW	2021–22	2020–21
Capital	4,039,095	6,548,763
Personnel	14,083,741	13,982,413
Other	5,617,662	4,251,629
<b>Expenditure relating to NCRIS funds</b>	<b>23,740,498</b>	<b>24,782,805</b>
Cash Co-investments	4,689,949	3,711,271
In-kind Co-investments	27,462,919	34,808,241
<b>Total – Resources utilised</b>	<b>55,893,366</b>	<b>63,302,317</b>

Photo: Jakob Weis, University of Tasmania

## IMOS on the world stage

IMOS Director Michelle Heupel was invited to present at the twenty-second meeting of the United Nations (UN) Open-ended Informal Consultative Process on Oceans and the Law of the Sea at UN headquarters in New York in June. The meeting focused its discussion on the theme of *ocean observing*.

Michelle was invited to outline how IMOS engages with end-users and how ocean observations are used by decision-makers. She was also an invited panellist at a side event where she described generation of societal benefit through biodiversity monitoring. This event provided an opportunity to showcase the IMOS program to an audience of international delegates.



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

## PRINCIPAL PARTICIPANTS



SIMS is a partnership involving four universities.

## ASSOCIATE PARTICIPANTS



IMOS thanks the many other organisations who partner with us, providing co-investment, funding and operational support, including investment from the Tasmanian, Western Australian and Queensland State Governments.

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 and present.

## PARTNERS

**CO-INVESTORS AND OPERATIONAL PARTNERS** • Australian Antarctic Program Partnership • Austral Fisheries • Australian Longline • Australian Museum • Australian Wildcatch Fishing • BHP Billiton • Darwin Port Corporation • Defence Science and Technology Group • Department of Agriculture and Fisheries, Qld • Department of Defence • Department of Environment and Science, Qld • Department of Fisheries, WA • Department of Jobs, Tourism, Science and Innovation, WA • Department of Planning and Environment, NSW • Department of Primary Industries and Regional Development, WA • Department of Natural Resources and Environment, TAS • Department of Regional NSW • Department of State Growth, Tas • Department of Transport, WA • Director National Parks • Environmental Protection Authority, SA • Environmental Protection Authority, Victoria • Flinders University • Geoscience Australia • Greybits Engineering • Griffith University • James Cook University • Macquarie University • Manly Hydraulics Laboratory • Marine National Facility • Minderoo Foundation • Monash University • Murdoch University • Oceanographic Field Services Pty Ltd • OMC International • Parks Australia • Parks Victoria • Pilbara Ports Authority • Quadrant Energy • Queensland Museum • Reef Life Survey • Research Attraction and Acceleration Program, NSW • Royal Australian Navy • RPS MetOcean Pty Ltd • South Australia Water • Sydney Water Corporation • TT Line • University of New South Wales • University of Queensland • University of the Sunshine Coast • University of Sydney • University of Technology Sydney • Voyager Seafoods • Woodside Petroleum Pty Ltd • **INTERNATIONAL COLLABORATORS** • Centre National de la Recherche Scientifique, France • European Space Agency • First Institute of Oceanography, China • French Polar Institute • Hokkaido University, Japan • Institut Polaire Français Paul-Emile Victor, France • LOCEAN, France • National Aeronautics and Space Administration, USA • National Institute of Water and Atmospheric Research, New Zealand • National Oceanic and Atmospheric Administration, USA • National Science Foundation, USA • Natural Environment Research Council, UK • Ocean Tracking Network • Scripps Institution of Oceanography, USA • Sealord, New Zealand • Shanghai Ocean University, China • Sofar Ocean Technologies • Southern Ocean Observing System • St Andrews University • Stockholm University, Sweden • TOSCA Dumont d'Urville expedition, France • University of Stockholm • Woods Hole Oceanographic Institution, USA • **RESEARCH PARTNERSHIPS AND COLLABORATORS** • Australian Research Data Commons (ARDC) • Australia's Academic and Research Network (AARNET) • ARC Centre of Excellence for Climate Extremes • ARC Centre of Excellence for Climate System Science • ARC Centre of Excellence for Coral Reef Studies • Atlas of Living Australia • Bioplatforms Australia • Blue Economy Cooperative Research Centre • Bluelink Ocean Forecasting • CSIRO Centre for Southern Ocean Hemisphere Oceans Research • Department of Agriculture, Water and the Environment • eReefs • Fisheries Research and Development Corporation • Global Ocean Observing System • Great Barrier Reef Marine Park Authority • National Environmental Science Programme Marine and Coastal Hub • National Research Providers' Network (Fishing & Aquaculture) • Ningaloo Research Program • Reef and Rainforest Research Centre • Reef 2050 Integrated Monitoring and Reporting Program (RIMReP) • Tasmanian Partnership for Advanced Computing (TPAC) • Terrestrial Ecosystem Research Network • Western Australian Marine Science Institution (WAMSI) • Various ARC-funded Projects