



ACEAS

Australian Centre for Excellence in Antarctic Science

A Special Research Initiative of the Australian Research Council

Data Management Strategy

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Cataloguing data

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1. Acknowledgement of Country

We acknowledge the Traditional Owners of Country throughout Australia and their continuing connection to land, sea and community.

We pay our respects to them and their cultures and to their elders past and present.

2. Background

The Australian Research Council (ARC) Australian Centre for Excellence in Antarctic Science (ACEAS) is a collaboration between Australian universities, government agencies and international research institutions. The Centre is committed to delivering new knowledge of East Antarctica and the adjacent Southern Ocean, connecting the researchers with the community, governments, industry and academia.

The evolution of East Antarctica and the Southern Ocean affects most of the global population, both exacerbating and mitigating the impacts of climate change on physical environments and ecosystems. Industries, infrastructure, housing and lifestyles will all change as the ice sheet increasingly discharges more ice into the Southern Ocean. Ocean acidification will impact the ocean food web and fisheries and changing sea ice will shift Australia's weather and climate. The exact changes that will emerge, the timescale over which they will occur, and the impact they will have, remain highly uncertain.

The research is planned and conducted with a clear eye on guiding decisions made by domestic and international governments, recommendations made by policy-informing bodies, and preparations made for the impact of climate change by all sectors of society.

ACEAS's program of research is funded by \$25 million of ARC and Australian university funds. The research formally commenced in late 2021 and will run for an initial period until 2025. The partners of ACEAS are the University of Tasmania, the University of New South Wales, Australian National University, University of Canberra, University of Melbourne, University of South Australia, University of Western Australia, and Curtin University, with more than twenty other partner organisations within Australia and overseas.

For ACEAS research, data management is heavily influenced by several existing programs and platforms, including the Australian Ocean Data Network (AODN), the Australian Antarctic Data Centre (AADC) and the Antarctic Treaty.

The AODN, originally established as a partnership between Commonwealth agencies, now includes a broad representation across the Government and University sectors. Organisationally, the AODN is also the data management facility of the Integrated Marine Observing System (IMOS). Both the partnership and facility provide data management standards, infrastructure and guidance for the Australian marine science community through the National Marine Science Data Sub-committee (also known as the AODN Technical Advisory Group) reporting to the National Marine Science Committee. The IMOS AODN facility is also the centralised aggregation point for all Australian marine science datasets described by metadata.

The Australian Antarctic Data Centre (AADC) was established in 1996 to provide long-term management of Australia's Antarctic data. The AADC helps fulfill Australia's obligations under the Antarctic Treaty which states that "Scientific observations and results from Antarctica shall be exchanged and made freely available." As a party to the Antarctic Treaty, Australia agreed to establish a National Antarctic Data Centre (NADC) and to publish data in a timely manner through the collaborative systems established by Antarctic Treaty members. The AADC serves as Australia's NADC. It is one of a number of Antarctic NADCs whose data publication activities are internationally coordinated via the SCAR Standing Committee on Antarctic Data Management (SCADM).

The University of Tasmania brings a broad and knowledgeable data management team to establish and build on existing principles, strategies, guidelines and infrastructure for both ACEAS and as a key participant in the broader marine science community. Additional resources from national providers the AODN and AADC bring standards, infrastructure knowledge and economies of scale.

3. Strategy aims

The primary aims of this strategy are to ensure ACEAS researchers

- meet the requirements for data management as outlined in the Australian Code for Responsible Conduct of Research;
- manage data in accordance with the FAIR data principles and publish as open data wherever possible;
- ensure published data and research outputs acknowledge ACEAS and associated researchers, and support appropriate acknowledgement when reused by implementing licensing, persistent identifiers, and acknowledgment guidelines;
- ensure the ARC and any other relevant funding is acknowledged in accordance with the respective legal agreements; and
- meet its obligations under the Antarctic Treaty in relation to data.

This strategy is supported by resources and infrastructure including:

- A data analyst and other data management staff at the Institute for Marine and Antarctic Studies who have a role to work with the ACEAS researchers, and other stakeholders, to translate data and information into relevant outputs that align with this strategy.
- allocation of resources to support data management, from the initial data capture through to ongoing delivery and curation.
- information technology infrastructure: hardware, software and other facilities that underpin data-related activities.
- support services: resources allocated to support implementation of metadata management so that data records can be used for both internal and external purposes.

4. Data management approach

This strategy provides guidance on the objectives, key steps and resources to ensure that research data collected during the life of ACEAS is managed to meet the requirements of the Australian Code for Responsible Conduct of Research, the ARC Open Access Policy and ACEAS Grant Agreement, and the Antarctic Treaty and managed according to the FAIR data principles for the long term.

This strategy describes:

- who will be responsible for data management related activities
- data management practices used
- who owns and can access and use data and products collected as part of ACEAS activities
- metadata standards used
- products and data storage, security, privacy and unique identifiers
- product legacy planning
- facilities and equipment used or required.

The [Australian Research Data Commons](#) (ARDC) provides an overview of data management plans and the FAIR data principles. Many Australian Universities have [data management policies and tools](#) available for use by researchers to create a data management plan at the start of a research project.

As outlined in the [Australian Code for the Responsible Conduct of Research](#), researchers will have primary responsibility for managing their research data. ACEAS will provide guidelines for researchers outlining requirements and processes required to effectively manage and publish their research data and provide resources to assist them in doing so.

Metadata and data collected or collated will be published in publicly accessible data repositories complying with FAIR data principles and must include ACEAS acknowledgement. In general, all data must be made

openly accessible within 12 months of publication. Some data may be subject to restricted access based on its classification under privacy legislation or for ethical, commercial or sensitivity reasons.

In order to ensure its sustainability for the long term, ACEAS researchers will take advantage of, and contribute to, existing institutional and national data management infrastructure. This will function as a distributed data network to make research data publicly and freely accessible. Figure 1 shows an overview of this data network. All data (via metadata records) will be aggregated to the AODN, Research Data Australia (RDA) and the AADC national information repositories to maximise discoverability and access. The AADC will coordinate aggregation of metadata at international level through the Antarctic Master Directory (AMD). Where appropriate, some metadata and data may be additionally aggregated to other national or global information repositories (e.g. the Ocean Biodiversity Information System, OBIS and the Southern Ocean Observing System, SOOS).

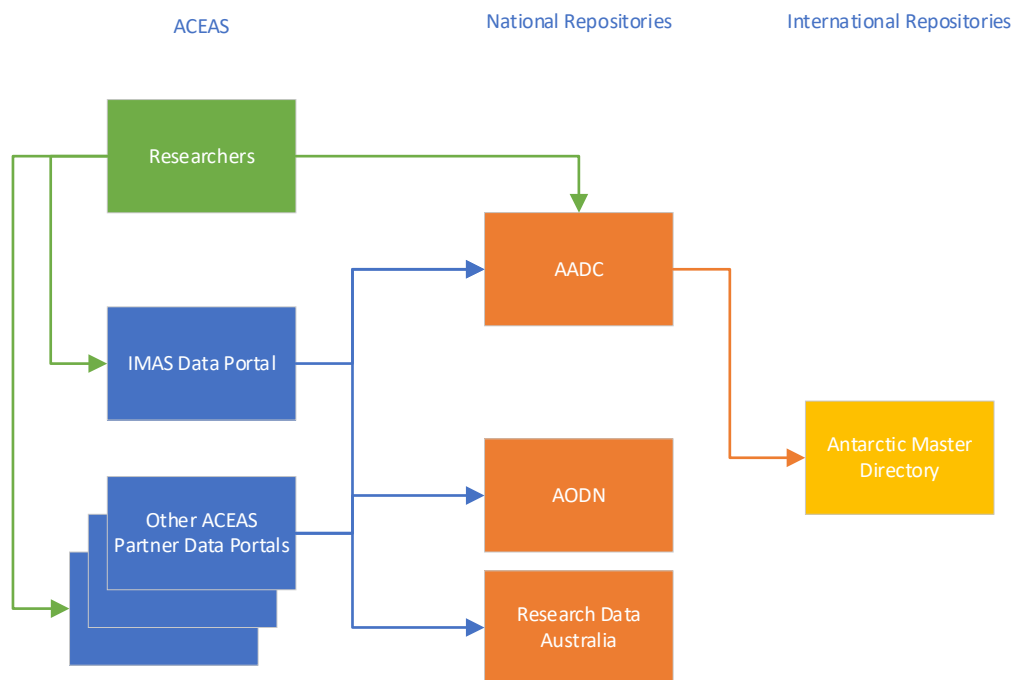


Figure 1: Data management infrastructure

Research data will be published using partner repositories or discipline-specific repositories, where available. Selection of data repository will generally follow project leadership affiliations or can be otherwise guided by the ACEAS Research Data Analyst. Where no appropriate partner repository exists, data will be published through the University of Tasmania (using the Institute for Marine and Antarctic Studies, IMAS, [data repository](#)).

ACEAS partners managing their own data repositories will work with the ACEAS Data Analyst to ensure minimum requirements regarding access and sustainability are met. Partners intending to act in this capacity will provide researchers with working storage and adequate resources and infrastructure to ensure appropriate access and backup security.

A Data Working Group will be established to discuss and act on the research data management needs of researchers across programs and institutions.

5. Roles and responsibilities

5.1. ACEAS Research Data Analyst

The Data Analyst's activities include working with researchers and other stakeholders to integrate research data outputs into national data repositories, digital systems, and decision support tools. This includes ensuring data management aligns with the FAIR data principles to maximise the use and reuse of public data. The Data Analyst is responsible for coordinating and conducting data discussions with research projects, providing guidance to projects on best practice data management, reviewing project data management plans, tracking data management milestones, maintaining and inventory of ACEAS research data and the review of final datasets for publication.

The ACEAS Data Analyst role will be fulfilled by IMAS data management staff.

5.2. Researchers

It is the researcher's role to develop a project-specific data management plan in conjunction with project team members and the ACEAS Data Analyst.

Researchers will have primary responsibility for managing their research data and must comply with agreed data management milestones as outlined in their implementation plan.

Researchers are responsible for ensuring Intellectual Property requirements in the use of third-party data are appropriately managed and acknowledged so as to not restrict access to ACEAS funded research outputs or infringe the rights of other Intellectual Property owners.

All researchers are strongly encouraged to have an Open Researcher and Contributor Identifier ([ORCID](#)) for inclusion in metadata records and institutional research profiles.

5.3. ACEAS Director

It is the Director's responsibility to provide oversight of data management activities and access to related infrastructure.

5.4. Partner institutions and data specialists

Where partners provide access to data management infrastructure or other specialised data management roles, they must comply with the relevant sections in this document and the guidelines (document in progress). Where partner institutions are unable to provide a metadata service, the IMAS metadata service will provide this service.

Partner data specialists will work with the ACEAS Data Analyst to ensure these standards are adequately met.

6. Types of research products and data

A broad range of research products are expected to be generated throughout the life of the ACEAS. These products can be broadly categorised as data outputs and may include the following:

- raw data sets including spatial data
- analysis and data products such as geographic information system-derived maps
- images, maps, photos, videos, animations
- computer model outputs and code
- software and other tools, such as decision support tools or software

- websites, mobile or tablet apps
- unspecified emerging technology.

7. Data storage

For the purposes of this manual, Data storage is divided into two categories:

- **Files** are data stored in drive files (e.g. text files, images, PDFs, Microsoft Excel spreadsheets, Microsoft Access databases, NetCDFs)
- **Databases** are data stored in structured storage, often with multiple pages or tables and a relational structure (e.g. Microsoft SQL Servers or Oracle RDBMS)

Data will be stored in secure facilities, backed up to ensure adequate disaster recovery when needed, and use security commensurate with the confidentiality requirements for specific datasets. This applies to both working and archival storage.

Due to the large sizes and transient nature of modelling data files, these would normally be retained withing the National Computational Infrastructure (NCI), Pawsey, or other High Performance Computing (HPC) systems rather than in the IMAS Data Portal or partner repositories that will host ACEAS data. Where archival storage for large modelling datasets is required, discussions should be held in the first instance with the ACEAS Research Data Analyst to formulate a solution.

8. Ownership and intellectual property rights

At the commencement of each project, a clear understanding of the ownership of the rights, including any intellectual property rights associated with each acquired or generated research dataset and any contractual constraints, must be documented.

This document does not seek to alter existing intellectual property ownership rights defined or assigned under agreement, including the ACEAS Agreement and agreements between staff or students and their research organisations or educational institutions. In general:

- Intellectual Property ownership of data collected in the execution of ACEAS funded projects will remain with the party or partner carrying out the project, and may be governed by employment conditions, policies or other agreements binding individuals.
- Owners of Intellectual Property vested in data and data products generated in the execution of ACEAS funded projects will be required to make their data and products freely and openly available in such a way that complies with the FAIR data principles and the Australian Code for Responsible Conduct of Research.
- Researchers will be required to prepare a data management plan for all ACEAS funded projects which will include details of Intellectual Property ownership and licensing for data generated as part of a project or introduced as background Intellectual Property.

9. Data licensing

All research data collected as part of an ACEAS funded project are required to be made available through an appropriate data repository under an appropriate [Creative Commons](#) or [Open Source Initiative](#) license to enable flexible public reuse, unless specifically exempt under [Exceptions to the open data policy](#). Third Party material collated by, or supplied for use in ACEAS research activities, is also subject to these guidelines, unless data use agreements between Third Party data providers and Hub researchers (or organisations) explicitly prohibit this.

Guidelines will be developed to provide procedures on data repositories, licensing and access restrictions.

10. Metadata

Researchers will take all reasonable steps to create high-quality metadata records for all data resulting from ACEAS funding. This provides the contextual information needed to enable data reuse appropriately and consistently. High-quality metadata can facilitate findability of data, allow for more successful data integration and increase data value.

All metadata created will conform to the ISO19115-3 standard and be published in a supported metadata repository that can be harvested by, and aggregated to, the AODN Metadata Catalogue and/or the AADC. Metadata should contain a link to any related publications.

Metadata must include certain minimum attributes to ensure discoverability and effectiveness for re-use. Specifically:

- is available online, provides links to the data (unless legitimately restricted), and is accessible by web search engines and metadata harvesting web services (e.g. OAI-PMH)
- describes the nature and purpose of the data along with contextual background information
- describes the methods used in the dataset creation and all data attributes, and highlights the quality and limitations of the dataset
- defines or links to online (or otherwise published) definitions of all terms used in the data
- provides links to key reports and papers that provide additional context and data details
- provides contact information, and access locations, for the data
- provides licensing information and any use restrictions for the data
- includes provenance information for any data that has been used to generate the data described by the record.

11. Persistent identifiers

Persistent identifiers are globally unique numeric and/or character strings that reference a digital object and are guaranteed to be managed and kept up to date over a defined time (intended for the long term). A Digital Object Identifier (DOI, a type of persistent identifier that indicates a research product is static in nature) will be assigned to all research data collected in ACEAS funded projects. If a DOI is not available, then a permanent Uniform Resource Locator (URL) link must be provided.

12. Exceptions to the open data policy

There may be instances where open access to research data may not be suitable. Decisions to restrict access to sensitive research data must be justified. In cases where restricted access applies, an enduring copy of the unaltered data must be kept, and metadata record(s) made publicly available that describe the data and why it has not been released. Publishing metadata that flags the existence of restricted data ensures ACEAS research outputs are comprehensively catalogued in the public domain.

Sensitive research data may include, but not necessarily limited to:

- location information for highly desirable or collectable species
- location information for rare species
- data derived from commercial activities, e.g. commercial fishing
- culturally significant site data
- social data restricted by privacy law or considerations
- other heritage or sensitive Indigenous matters
- commercially sensitive information

Data management plans will be required to identify potentially sensitive data and information that will be generated during the project.

It is the researcher's responsibility to communicate and justify requests for exceptions to the open data policy to the ACEAS Data Analyst and must be approved by the ACEAS Director.

13. ACEAS acknowledgement

Support from the Australian Government must be acknowledged in all research data outputs.

To acknowledge Australian Government funding, outputs must include the following funding acknowledgement statement:

“This research was supported by the Australian Research Council Special Research Initiative, Australian Centre for Excellence in Antarctic Science (Project Number SR200100008).”

14. Risks

Key risks, treatments and mitigation.

RISK	EXISTING OR IN PROGRESS CONTROLS	MITIGATION
Personnel unaware of data collection and management process	Data collection guidelines and/or training	Initial and annual refresher training as required
	Data Analyst management of data process in consultation with researchers	Data Analyst referred to by, and involved with, potential Project Leader from inception and design of project Scheduled reviews Relationship development Establishment of Data Management Plan as part of implementation plan development
Intellectual property transgressions and possible legal action	Data management guidelines and/or training	Satisfaction feedback mechanism with project participants Data Analyst referred to by, and involved with, potential Project Leader from inception and design of project Scheduled reviews Relationship development
Data unusable/un-interoperable	Project proposal review and data collection guidance by Data Analyst	Projects to follow Standard Operating Procedures or well-known methodologies (where available) with regards to experimental design and data collection, where appropriate.
Loss of data	Data Analyst to establish and enforce requirements for supported data repositories including minimum storage and backup requirements	Establish data transfer pathways and ensure scheduled data transfers Field data copies made onto different media as soon as practical after acquisition.

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