



ACEAS

Australian Centre for Excellence in Antarctic Science

A Special Research Initiative of the Australian Research Council

STRATEGIC PLAN

2021-2025

REVISION 2023

EXECUTIVE SUMMARY

The Australian Research Council (ARC) Australian Centre for Excellence in Antarctic Science (ACEAS) will be a national-scale, University-led, international centre focused on this goal:

To help communities prepare for climate risks emerging from East Antarctica and the Southern Ocean by integrating knowledge of the ocean, atmosphere, cryosphere, and ecosystems and their interplay.

ACEAS aspires to make significant contributions in four ways:

1. **Research impact** – developing knowledge that will reduce the chance of surprises and passing of unexpected tipping points in East Antarctica and the adjacent Southern Ocean.
2. **Establishing fundamental datasets and tools of international significance** – revealing key processes, observations of state and change, and developing new capabilities for predicting the future of East Antarctica and the Southern Ocean.
3. **Partnership and stakeholder engagement** – working with key stakeholder groups across industry, government, and international policy-informing and regulatory agencies.
4. **Workforce development** – developing a new generation of Antarctic graduates and early-career researchers trained broadly in Antarctic science, law, governance, and policy and ready for industry, government, and academia jobs.

The Centre will take five strategic approaches:

1. Undertaking world-class integrated research
2. Maximising strong national and international partnerships
3. Employing a diverse workforce
4. Leveraging and creating national research infrastructure
5. Creating pathways to local, regional, and circumpolar impact

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ACEAS OVERVIEW

The ARC Australian Centre for Excellence in Antarctic Science is a collaboration between universities and government agencies committed to delivering new knowledge of East Antarctica and the adjacent Southern Ocean to communities, governments, industry, and academia.

The future evolution of East Antarctica and the Southern Ocean will affect a large proportion of the global population by exacerbating or mitigating climate change with consequent impacts on physical environments and ecosystems, including sea-level rise. The increasing discharge of ice into the Southern Ocean and the exchange of heat and carbon between the atmosphere and the ocean will change industries, infrastructure, housing, and lifestyles. The specific changes, the timeline of their emergence, and their impact are still highly uncertain.

Decades of human endeavour in Antarctica have regularly revealed surprises, including that parts of the continent may now have passed unnoticed through tipping points. For example, too much ice is lost from ice shelves causing irreversible retreat in glaciers. Many of these tipping points remain poorly understood, and more will undoubtedly emerge – including from the Australian Antarctic Territory in East Antarctica. However, humanity must avoid such surprises by confidently understanding tipping points, determining the timescales when they may be crossed, and assessing their consequences.

ACEAS brings together 41 Chief Investigators (CIs) from across seven Australian universities – all experts in Antarctic and Southern Ocean studies – with experts in government agencies in Australia and from leading universities and research agencies overseas. The University of Tasmania leads ACEAS and includes the Australian National University, the University of New South Wales, the University of Melbourne, Curtin University, the University of Western Australia, and the University of Canberra.

Funded by \$25M of ARC and university contributions, ACEAS will commence in late 2021 and run for initially four years. It will undertake high impact research on East Antarctica and the Southern Ocean to build fundamental knowledge and research capacity, train early career scientists for broad careers, and engage with domestic and international stakeholders.

The focus of ACEAS is on excellence in research and in seeking to understand a deeply coupled and complex environmental system. There are many aspects of Antarctic research where there is little or no knowledge. For example, the spatial limits of the ocean and ice and pathways for ocean heat to melt the ice are not yet defined in some of the most vulnerable sectors of the continent. Without them, projections cannot reliably be made of future sea levels.

The research will be planned with a clear eye on making an impact on 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.

WHERE DOES THE CENTRE WANT TO BE IN 2025?

While our understanding of Antarctica and the Southern Ocean has made dramatic advancements in recent decades, there is still much to uncover, and unexpected discoveries are not rare. This uncertainty challenges communities, businesses, and policymakers and impacts areas such as climate and sea-level change, fisheries and aquaculture, agriculture, ecosystems, housing, infrastructure, and general way of life.

ACEAS aims to deliver outputs and outcomes that will have a recognisable influence on the climate awareness and preparedness of the public, national and international agencies, governments, and businesses. It will strive to align itself with the priorities identified in the Australian Antarctic Science Decadal Plan ("Decadal Plan"), which is due to be delivered in 2024.

ACEAS will generate new fundamental knowledge of Antarctica and the Southern Ocean, altering the world's perception of the southernmost latitudes and establishing a lasting legacy that future research must build upon and from which decisions must be made. By training early career scientists in not just their specific field but exposing them to cross disciplinary research will facilitate a broader understanding Antarctica and the Southern Ocean. With research integrated across scientific disciplines together with an understanding of policy, law, and governance, ACEAS alums will be employable in government and industry, equipped with advanced data handling and skills required to engage widely across many sectors of the economy.

ACEAS aspires to make significant contributions in four ways:

- Research impact
- Fundamental datasets and tools of international significance
- Partnership and stakeholder engagement
- Workforce development

Research Impact

By the end of 2025, ACEAS researchers will have developed a new understanding of key processes underway in and around Antarctica and informed key stakeholders of these findings to ensure uptake into appropriate forums.

Researchers have made new observations of change and utilised models to inform observational strategies. These observations will, in turn, inform the development and validation of models. Colleagues elsewhere will have adopted the methods and analyses we pioneered.

ACEAS will make substantial progress in line with the previous Australian Antarctic Science Strategic Plan, most substantially in "Ice, Ocean, Atmosphere, and Earth Systems: Understanding the role of Antarctica and the Southern Ocean on Australia and the World", and will then pivot to meaningfully contribute to the establishment and progress of the Decadal Plan.

The research will advance the knowledge, approach, and methods the research community uses globally, across disciplines of climate science broadly, sea level, ecosystems, geology, biogeochemistry, and others, including those working outside polar regions.

Establishing fundamental datasets and tools of international significance

By the end of 2025, ACEAS researchers will have collected or produced new and improved datasets from the field. These would have been implemented in unique predictive models and used to develop new predictive tools to inform decision-making around the future of East Antarctica and the Southern Ocean. These will be generated through the deeply integrated Research Programs 1-3. These predictive tools will be distributed in an open framework and promoted through international bodies to maximise their uptake.

The Research Programs will provide mechanisms for collecting observational paleoclimate and model datasets through Antarctic fieldwork in previously un-sampled areas using sensors on autonomous platforms, seals, and satellites. Predictive models will be built on international collaborative efforts already underway and will be shared to maximise uptake.

The Centre will train dozens of early career researchers in using these datasets and models and in advanced data analytics. Hands-on training will include the use of Generative AI in research and scientific programming in python. Researchers will be exposed to data and model outputs outside their domain. All early career researchers will develop data management plans facilitated through one-on-one discussions.

Partnership and stakeholder engagement

By the end of 2025, ACEAS will have identified and built robust and meaningful partnerships with research and stakeholder groups across universities, domestic and international government agencies, and industry. Research impact plans will be developed, and stakeholder workshops will be held regularly to report and communicate research results. Pathways to impact for select stakeholder needs have been identified, mapped, and actioned, and relationships will be developed to build trust and collaboration. Stakeholders will co-design and collaborate in aspects of research activities. Regular research summaries for policymakers will be published in collaboration with key partners, e.g., the Australian Antarctic Program Partnership (AAPP), and individually by ACEAS (e.g., an annual State of East Antarctica report).

New research partnerships will be developed, through cooperative fieldwork, sharing of data, coordinated research, and research visits. Researchers will be included in major international research programs that inform the forums of the Antarctic Treaty, notably through the Scientific Committee on Antarctic Research (SCAR) and the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR). Research of the Centre will have been used as evidence in policy-informing documents at national and international levels, including the United Nations Intergovernmental Panel on Climate Change (IPCC).

At a domestic level, ACEAS researchers will engage with others from relevant Departments, including the Department of Climate Change, the Environment, Energy and Water (DCCEEW) and Department of Industry, Science and Resources to ensure that the Australian government benefits from the investment made in innovative Antarctic science relevant to the Australian Antarctic Territory and its potential impacts on its domestic and international policy priorities.

Workforce development

By the end of 2025, ACEAS will have supported the graduation of dozens of PhD, Masters, and Honours students, with training beyond Antarctic science but also governance, law, and policy. Early career scientists will be trained in how scientific programs are designed, where their results go, and how they might be used to influence domestic and international policies, strategies, and laws.

All students and researchers will have opportunities to be trained to communicate in different contexts such as stakeholder conversations, to prepare them for careers in industry and government, as well as in academia. The delivery of yearly research forums and winter school programs will facilitate engagement between interdisciplinary research partners. Students will have access to training in advanced data analytics and in research communication including outreach and media and creating impact with their research.

Measures of success

The Director will lead an annual review of ACEAS progress against key performance indicators. Detailed plans for stakeholder engagement, graduate training, equity, inclusion and diversity, and employment have been developed. ACEAS will continue to strive towards, and exceed, these KPIs and ensure that they are reviewed where appropriate.

Risk mitigation

All plans will include the identification of risks and approaches to mitigate them. Risk is particularly evident in the fieldwork components of the programs, where delays or cancellations of fieldwork will substantially impact downstream research plans. Such risks are common in Antarctic research, and contingency plans will be developed as such risks become apparent. COVID-19 risks remain at many levels and need to be factored in by logistic suppliers, which may lead to downstream impacts.

Beyond 2025

The vision for ACEAS is that it becomes a Centre that has the expertise, scale, and duration to deliver the outcome of helping communities prepare for climate risks emerging from East Antarctica and the Southern Ocean by integrating knowledge of the ocean, atmosphere, cryosphere and ecosystems, and their interplay.

The widespread societal importance of the climate risks emerging from these regions makes the work of ACEAS urgent.

By 2025, and in the context of the Decadal Plan and parallel to other national priorities, ACEAS will have successfully made significant strides toward building an improved understanding of Southern Ocean and Antarctic systems through integrated knowledge of the ocean, atmosphere, cryosphere and ecosystems and their interplay; building the workforce; developing new and deeper partnerships and communication pathways; and developing fundamental datasets and tools of international significance and value.

ACEAS will have already developed clear pathways to impact and a road map for the future, developed new predictive capabilities regarding the future of the Southern Ocean and ice sheet and trained a further generation of Antarctic researchers with multi-disciplinary skills.

However, the depth and breadth of the unknowns in East Antarctica and the Southern Ocean mean the goal of ACEAS will only be met through resourcing beyond the funding to 2025. As such, the period to 2025 partly builds a platform for the following advances while delivering significant advances and impact immediately.

STRATEGIC OBJECTIVE 1: UNDERTAKING WORLD-CLASS INTEGRATED RESEARCH

Improving the robustness of predictions of the future of East Antarctica and the Southern Ocean requires a new understanding of the coupled ice-ocean-atmosphere-sea ice-solid Earth system advanced through model development, process understanding, laboratory analysis, and field and satellite observations.

The Centre will have three research programs

Program 1: Circum Antarctic and East Antarctica – will focus on the following overarching question:

How can we better understand shifts in carbon dioxide, heat, and moisture transport in the Antarctic and Southern Ocean to improve projections of future climate and sea level changes?

Program 2: Regional East Antarctica and its provinces – will focus on the following overarching

What are the links between the atmosphere, ocean, and cryosphere and their effects on East Antarctica's open water and under-ice biogeochemistry and ecology under past, present, and future conditions?

Program 3: Sub-regional and Regional Antarctic Margin – will focus on the following overarching question:

What is the risk to our communities of ice mass loss from key subglacial basins over the next decades to centuries, and what are the consequences for the East Antarctic ocean and ecosystem?

Undertake world-class integrated research

The Centre will be underpinned by world-class research undertaken with integrity and a commitment to excellence. The focus will be on the Centre's collective research outputs and outcomes.

Visibility of research outputs

The Centre's research outputs, from datasets to publications, will be freely available via public repositories. Datasets and model outputs will be available according to FAIR (findable, accessible, interoperable, and reusable) principles immediately upon publication.

Research designed for impact

The research will be co-developed within and beyond the ACEAS funding timeframe through collaboration with stakeholder groups. A robust understanding of stakeholder needs, including the relative importance and priority of different research areas, and required types of outputs, will be vital in developing plans to address these needs.

Structures that build collaboration

The Centre will establish policies that promote 'leaning in' to the goals of the Centre and the operation of an integrated centre, including cross-institutional supervision of researchers, working groups, workshops, and informal gatherings.

Playing a leading role in the realisation of the Australian Antarctic Science Strategic Plan.

The Centre will lead in realising the Australian Antarctic Science Strategic Plan in the "ice, ocean, atmosphere, and Earth systems" categories. It will contribute to the strategic plan in the "digital integration" category. The Centre will provide important input to inform future strategy reviews and engage with the National Committee for Antarctic Research and the Australian Antarctic Science Council.

Investing in careers and development

Career mentoring and development will be provided for all staff and students. New appointees will be inducted into the Centre's policies, procedures, and culture. All mid-to-senior career staff will be trained and provided opportunities to mentor early career staff.

Career development will also be provided in relation to stakeholder engagement skills, engaging with the media and policymakers, preparing grant applications, and education and outreach.

A mentoring plan will be developed within six months of the Centre's operation.

The Director and the Program Leaders, Graduate Training Coordinator, and Media Officer will coordinate the activities in Objective 1.

STRATEGIC OBJECTIVE 2: MAXIMISING STRONG NATIONAL AND INTERNATIONAL PARTNERSHIPS

Developing cross-institutional partnership

The Centre will develop, through policy and practice, cultures of cross-institutional partnership through postdoctoral and student supervision, training, and career development. ACEAS will develop centre-wide working groups, expert groups, seminar series and structures for sharing datasets and analytical techniques.

Activities that develop partnership

Partners in Australia (including Government agencies) and overseas will be included in the activities and lifecycle of the Centre, including student supervision, fieldwork planning and activities, and participation in the Management Committee.

Fieldwork and research that is collaborative

ACEAS will work with the Australian Antarctic Division (AAD) and aligned centres, notably the Australian Antarctic Program Partnership (AAPP) and Safeguarding Antarctica's Environmental Future (SRI SAEF), to optimise fieldwork and research resources to achieve maximum outputs and leverage greater outcomes.

Research activity across AAPP and SAEF will be mapped to clarify boundaries and collaborative activities.

Fieldwork collaborations will be developed for mutual benefit with other agencies with aligned activities, such as the German EASI2/3 voyages.

Community enabler model

Australian researchers outside the Centre will be encouraged to collaborate with research and fieldwork to optimise the Centre's scale and reach. A structure will be developed for such researchers to be affiliated with and contribute to the Centre.

Visiting Fellowships

The Centre will host visiting fellows, mainly from overseas. These will include existing and prospective new research partners. Hosted visits will be prioritised based on impact across the Centre's research and training activities and generally have multi-institutional relevance.

Advisory structures

The Centre's Advisory Board and the international Scientific Advisory Panel will provide advice, guidance, and connections, particularly in strategic planning and paths to impact.

Utilisation of online meetings

The advent of widespread videoconferencing will enhance efficient ACEAS engagement in international meetings, working groups, stakeholder events, and research programs.

Leading and contributing to international programs and agenda setting.

Researchers will be involved in leadership and international coordinating programs, notably within the SCAR Scientific Research Programs (e.g., AntClimNow and INSTANT).

The activities in Objective 2 will be coordinated by the Director and fieldwork lead researchers.

STRATEGIC OBJECTIVE 3: EMPLOYING A DIVERSE WORKFORCE

Towards a positive change in equity, inclusion, and diversity

Momentum will be generated towards achieving gender balance in Antarctic physical sciences through recruiting a diverse researcher cohort, supporting, particularly, the career development of women and minority groups, and advancing leaders from diverse backgrounds.

While PhD and ECR cohorts in Antarctic and Southern Ocean sciences are mostly from diverse backgrounds, many senior staff cohorts are not. ACEAS will work to address barriers to academic careers in Australian universities by providing mentoring and training to support ECRs as they pursue external roles. Training will be provided for ACEAS interview panels to improve the understanding of unconscious bias.

Activities that are safe for all

A culture of respect will be encouraged. Cultures that support fieldwork that is safe for all will be established, including by working with AAD and participating institutions to publicise appropriate reporting mechanisms.

Training

Early career researchers will be trained in Antarctic science, in Antarctic science fields outside their speciality, and governance, law, and policy. All researchers will be introduced to pathways to academic and non-academic careers.

Diverse and excellent leadership

The Centre will promote gender diversity in leadership and the ongoing development of all leaders through relevant management experience and training.

The activities in Objective 3 will be coordinated by the Director and the Graduate Training Coordinator.

STRATEGIC OBJECTIVE 4: LEVERAGING AND CREATING NATIONAL RESEARCH INFRASTRUCTURE

Access Antarctic logistics platforms

Fieldwork will be undertaken primarily within the Australian Antarctic Territory and the adjacent Southern Ocean. It will leverage Australia's current investments in RSV Nuyina and the new over-snow traverse capability. ACEAS will also work with other national Antarctic programs through data sharing and joint modelling research.

Capitalise on investment in equipment

Substantial use will be made of investments in equipment through deploying the UTAS Rapid Access Isotope Drill (RAID), funded through the ARC SRI for Antarctic Gateway Partnership. ACEAS will also work with the recently established Centre for Antarctic and Southern Ocean Technology (CAST), a joint venture between UTAS, AAD and CSIRO, and develop close working relationships with NCRIS-funded Marine National Facility, AuScope, and IMOS.

Access world-class computing

The National Collaborative Research Infrastructure Strategy (NCRIS)-funded National Computing Infrastructure (NCI) will provide the computational scale required to realise our ambition in numerical modelling and provide visualisations for the media and public of key outputs. Links will be developed with the Australian Community Climate and Earth System Simulator (ACCESS) National Research Infrastructure project.

Collaborate with research infrastructure bodies

The Centre will leverage support through the NCRIS-funded Integrated Marine Observing System (IMOS) in deploying oceanographic sensors and obtaining data streams through NCRIS AuScope's recent new investment in Antarctic geophysics.

Create new infrastructure

ACEAS will collaborate to build new, shared infrastructure as a legacy, including model codes, model outputs, baseline datasets and expertise.

The activities in Objective 4 will be coordinated by the Director and lead CIs in fieldwork and computing.

STRATEGIC OBJECTIVE 5: CREATING PATHWAYS TO LOCAL, REGIONAL, AND CIRCUMPOLAR IMPACT

Understand and meet stakeholder needs

Primary and secondary stakeholder groups will be identified, and workshops will be conducted with primary stakeholder groups and partners to understand needs and, where appropriate and feasible, co-design pathways to impact that can be achieved within the lifetime of ACEAS and continue beyond it. At least annual major stakeholder engagement events will be held.

Stakeholder needs will be identified, forming the Centre's focus on developing a purposeful plan to meet these needs.

Partner in stakeholder engagement

ACEAS will work closely with the Australian Antarctic Program Partnership (AAPP) and CSIRO Oceans and Atmosphere to engage with stakeholder groups, ensure communication consistency, and identify gaps and impact pathways where ACEAS can contribute uniquely. Experiences of other groups in effective engagement will also be sought.

Collaborate in Ocean and Antarctic governance, law, and policy

Partnerships will be built, and projects will be developed with researchers with expertise in national and international Ocean and Antarctic governance, law, and policy.

Enhance national and international influence

Collaborations will be built with AAD, SCAR, IPCC, CCAMLR, WCRP, and other organisations and agencies to provide conduits for research to inform and influence national and international policy and regulatory frameworks. ACEAS scientists will seek to be involved in leadership and other positions of influence within international coordinating bodies. Relationships will be developed with key individuals through one-on-one meetings and workshops. Position papers and research summaries will be published to inform discussions and policymaking.

Leverage community interest in Antarctica

Public enthusiasm for Antarctic research will be supported through participation in public events and festivals, delivery of public lectures, social media, and hosting community visits to our partner organisations. Partners and other bodies (e.g., The Australian Meteorological and Oceanographic Society) will collaborate to engage school students in Antarctic science.

Promote positive media coverage

The Media Officer will develop and implement strategies and procedures to build a high national and international profile and support the work of the Centre. Activities and findings will be communicated through conventional media and social media platforms. All researchers will be trained in working with these platforms.

Understand graduate destinations

Having trained graduates with diverse skills, a record will be kept of employment destinations, including in industry, government, and academia.

The Director will coordinate the activities in Objective 5 with the support of all CIs and Centre researchers.