



Submission to the Joint Standing Committee on the National Capital and External Territories Inquiry into Australia's Antarctic Territory

Executive summary

Australia's infrastructure assets and capability in Antarctica have traditionally been outstanding. They have secured Australia's national strategic interests, served national and global scientific imperatives, maintained leadership in international engagement, and fostered multiple opportunities. Examples include globally innovative research on krill dynamics, leadership in the Commission on the Conservation of Antarctic Marine Living Resources (CCAMLR), and new understanding of the impacts of environmental change on Antarctica and the Southern Ocean. They have also enabled Australia to take an exemplary and leading role in developing and implementing the strong environmental protections that are required to meet international obligations under the Antarctic Treaty System, specifically under the Conservation of Antarctic Marine Living Resources Convention and the Protocol on Environmental Protection to the Antarctic Treaty.

Despite increased recent support through funding for new infrastructure and a new icebreaker, the effectiveness of Australia's investment in assets and capability continues to decline in several key areas.

Ready restoration could be achieved by:

- Establishing coordination between the Australian Antarctic Science Program process and grants from other agencies such as the Australian Research Council.
- Development of a formal collaboration between the Australian Antarctic Division and the Australian Academy of Science's National Committee on Antarctic Research to help guide Australian Antarctic Research in a national and international strategic context.
- Increasing the numbers of research scientists participating across all areas of the national Antarctic science program.
- Securing new science funding and streamlined operating models, by end 2018, including to support the Antarctic science nexus in Hobart, represented most notably, but not exclusively, by the Antarctic Climate Change and Ecosystems Cooperative Research Centre and other capabilities centred in Tasmania.
- Improving marine science research time in days per year at sea on our icebreaker and/or the Marine National Science Facility, RV Investigator.
- Enhancing access to Antarctica, by 2020, for research of longer and more flexible periods and for more scientists through capacity and flexibility at research stations and in other capabilities.

Introduction

The Australian Academy of Science welcomes the opportunity to respond to the Joint Standing Committee on the National Capital and External Territories' *Inquiry into Australia's Antarctic Territory*.

The Australian Academy of Science promotes scientific excellence, disseminates scientific knowledge, and provides independent scientific advice for the benefit of Australia and the world. The Academy is made up of more than 500 of Australia's leading scientists, each elected for their outstanding contribution to science. The Academy has a long and substantive history of involvement in the development of Australia's Antarctic science programs, dating back to the Academy's foundation in 1954. Recently, in 2014, the Academy provided an extensive submission to the *20 Year Australian Antarctic Strategic Plan* (the Press inquiry)ⁱ, and provided oral evidence to the Senate Foreign Affairs, Defence and Trade References Committee inquiry into *Australia's future activities and responsibilities in the Southern Ocean and Antarctic Waters*ⁱⁱ.

In response to the Inquiry by the Joint Standing Committee on the National Capital and External Territories into the adequacy of Australia's infrastructure assets and capability in Antarctica, this submission provides a science-based perspective.

Australia has significant, wide-reaching, national strategic and scientific interests in Antarctica. These include maintaining a geopolitical claim to the continent, ensuring sustainability in Southern Ocean fishing industry, understanding Antarctic-climate dynamics and its role in Australian seasonal climate variability, and influencing the international direction of Antarctic governance and activity. Given the arrangements of the Antarctic Treaty System, national and strategic interests are inextricably linked.

As an original signatory to the Antarctic Treaty, Australia is assured its decision-making or consultative status in the Antarctic Treaty. However, its ability to influence affairs in the region is dependent on its scientific credibility. Those countries that are not original signatories to the Treaty only achieve decision-making status by conducting *substantial research activity in the region*. In consequence, science leadership is the key to strategic influence. This leadership rests on infrastructure assets and human capability both in Australian Antarctic Territory and across the region.

Much of our national capability lies in the researchers and scientists that constitute Australia's Antarctic science community. With respect both to infrastructure assets and scientific capability, Australia is falling behind other nations that are taking an increasingly high interest in the Australian Antarctic Territory, particularly China, Russia, and India. The recent 'Special Meeting' held by China at Antarctic Treaty Consultative Meeting XL (Beijing, 2017) was a notable exercise of this new influenceⁱⁱⁱ.

Science in Antarctica and the Southern Ocean is conducted by a range of organisations in Australia, including universities and agencies such as the Australian Antarctic Division, Geoscience Australia, the Antarctic Climate and Ecosystems Cooperative Research Centre, the Bureau of Meteorology, and CSIRO. Australian Antarctic and Southern Ocean research is funded directly by these organisations,

and by the Australian Research Council. The majority of logistical support for Antarctic and Southern Ocean science is provided by the Australian Government through the Australian Antarctic Division. Given the international scope of research in the Antarctic region, several research endeavours are, however, supported by other countries through research collaborations or direct grants to associated investigators. Such multi-national, multi-disciplinary, collaborative research has been recognised as the key to future science in the region^{iv}, and will require the continued investment of significant infrastructure capability^v. Such collaboration is the route to science capability and the promotion of national interests in the region. Many nations are now growing their asset base and scientific research capabilities. For example, New Zealand recently announced both a major upgrade to Scott Base and a substantial increase in its annual Antarctic science funding^{vi}. The ability to lead Antarctic research serves Australian strategic and national interests.

Science support from the Australian Antarctic Division leverages collaborations to enable impactful research – Australian Antarctic Division projects currently collaborate with over 150 institutions in 28 countries. Its support takes two major forms. The first is logistic support for getting to and working on the continent (and both Macquarie and Heard Islands) and in the Southern Ocean. This covers three permanent scientific research stations on the continent and one at Macquarie Island, marine science activities, remote field stations in Antarctica, a range of transport capabilities, and the logistic arrangements to keep the support operational. The second form of support is provided through direct grants (\$1.05M per year) to cover research and some logistic costs (such as medical screening) to scientists, typically university-based, holding projects through the Australian Antarctic Science Program. The Australian Antarctic Science Program also provides a mechanism for enabling access to, and prioritization of, logistic support for scientists who apply through the scheme. Scientists from organisations external to the Australian Antarctic Division (and other Commonwealth-funded bodies), such as universities, are eligible to apply for financial grants and logistics support through the Australian Antarctic Science Program. By contrast, investigators from Federal Government organisations can only apply for logistic support, with staff time and running expenses costed as organizational contributions.

Science and science policy trends

Australia has long been one of the leading countries conducting science in Antarctica and the Southern Ocean. In consequence, Australia also leads diplomacy regarding the region, which is largely based on science. In turn, this places Australia in strong position to address its interests in the region. Given Australia's unique geographical location over the Southern Ocean and East Antarctica, there are no other agencies willing or able to carry out research that benefits Australian national interest. As such, in a very real sense, crucial understanding of global climate processes such as ocean heat and carbon uptake, Antarctic sea-ice cover, and ice-sheet dynamics, would be incomplete without Australian leadership in Antarctic and Southern Ocean science.

Australia is currently in a unique science and policy leadership position. Australia is among the top three nations in terms of submissions of working papers to the Antarctic Treaty Consultative Meetings, which form a key means for directing Antarctic governance decisions^{vii}. Between 1992 and 2010, Australia also ranked fourth among Antarctic nations in its production of scientific papers, and among the top three when the output is normalized for GDP^{viii}. Australian scientists have three times

won the prestigious Tinker-Muse for Science and Policy in Antarctica and were instrumental in the leadership of the recent Antarctic Science Horizon Scan and Roadmap Challenges Project. An Australian currently chairs the Committee for Environmental Protection of the Antarctic Treaty System, another is President of the Scientific Committee on Antarctic Research (SCAR), and a third is Chair of the SCAR committee that provides advice to the Antarctic Treaty. Australia's leadership in Antarctic and Southern Ocean science also underpins our leadership in related global scientific fora such as the Intergovernmental Panel on Climate Change (IPCC). Australians hold a number of key leadership positions in IPCC in part due to our leading role in Antarctic and Southern Ocean science. These leadership positions are testament to the success and impact of past scientific endeavour.

Several indicators suggest, however, that Australian leadership in Antarctic science is receding, which is impacting Australia's influence in the region. Most significantly, scientific activity and output have declined substantially. The number of projects supported by the Australian Antarctic Science Program (or its equivalent) declined from 138 in 1997/8 to 84 in 2016/17. New project approvals amounted to just 25 in 2016/7. While scientific output, counted as numbers of publications (2011-2015) has remained relatively high (3rd among Antarctic Nations)^x, the influence of these works, counted, for example, as citations per publication, is comparatively low – 10th among the Antarctic Treaty Consultative Parties^x.

In part, this trend is a consequence of changing arrangements in the support of science in the region. At present, the number of supported projects is relatively small, with several of these including no actual presence in Australian Antarctic Territory. In several cases, Australian researchers have directed their activities to other sectors of the Antarctic region in order to leverage support through international collaboration. While such international collaboration is beneficial, Australian interests are best served where Australian researchers can take leading roles, rather than strictly collaborative ones serving the science priorities of other nations. Moreover, without significant investment, leadership of truly ground-breaking work, that is inevitably international and inter-disciplinary, remains out of reach.

Infrastructure assets and science staff capability

The Australian Antarctic Division has a long history of providing capable support to science in the region. The proposal in the *Australian Antarctic Strategy and 20 Year Action Plan*^{xi} for year round air access is a promising development. Plans for traverse capability, station upgrades in the Australian Antarctic Territory and a new research station on Macquarie Island are similarly welcome, as is the decision to replace the *RSV Aurora Australis* by 2020 with a new research and resupply icebreaker, along with ongoing operational support for the vessel.

Investments in an Antarctic and Southern Ocean research infrastructure asset program must be maintained, and crucially, must be aligned with the National Collaborative Infrastructure Roadmap across the Government-funded science sector.

Despite these developments in improving infrastructure assets, concerns remain. Most notably, staff capability to make scientific use of these assets has not kept pace with the developments. Indeed, the numbers of research scientists capable of making full use of the assets has declined through reductions in scientific staff numbers at the Australian Antarctic Division, staff changes in other

national organizations such as the CSIRO, and reductions in the numbers of projects funded through national competitive grants. The absence of positions clearly precludes science from being undertaken. Just as significantly, the transition of positions in Antarctic science to short-term contracts or the absence of funding in the area mean that scientists are compelled to redirect their interests to other research areas. In several cases, Antarctic research scientists have also transferred their efforts to collaborations led by other countries. Together these developments mean that Australia is losing its capability to lead science, and is instead becoming a follower in many areas, dependent on agendas set by other nations and serving their interests foremost.

The uncertain future of the Antarctic Climate Change and Ecosystems Cooperative Research Centre (ACE CRC) is a further significant concern. Over the 2017-2019 period, funding both to ACE CRC and to the Antarctic Gateway Partnership will come to an end, removing a combined \$13M of Commonwealth Antarctic science funding per year. Failure to develop ongoing support for this nexus of capability, represented in particular by the ACE CRC, will result in significant erosion of science capability. New relationships to secure the nexus of Antarctic and Southern Ocean science capability in Hobart, and its role in fostering Antarctic science capability across Australia, are urgently required. The intellectual critical mass represented by the Hobart nexus is a major drawcard for international scientific partnerships. This engagement attracts tangible benefits to Australia and to Hobart in particular, including international students, research ship resupply stops, and international conferences.

In addition to the increase in science staff capability, operating models must be explored to provide adequate access and support to ensure that the research, which forms the foundation for Australian leadership in Antarctic, can be undertaken in all facilities. Specifically, on Antarctic stations, long-term access to innovative laboratory facilities and residence for multiple scientists should be in place, which can also accommodate international collaborations. The operating model for the new vessel must also allow for extensive marine science capability throughout the year to provide the evidence required to direct policy about the Southern Ocean including its fisheries resources and to access remote coastal areas of the Australian Antarctic Territory. The Marine National Facility, the *RV Investigator*, is a great addition to Australia's marine research capability but is presently only funded to operate for 180 days per year and while it is ice-strengthened, it is not an ice-breaker and it cannot safely enter the sea ice zone. It is therefore essential that the new icebreaker is available for marine research over extended periods. Nonetheless, use of the *RV Investigator* for marine and terrestrial research to support goals such as investigations of the Heard Island and McDonald Islands' environment require additional support.

Across the Australian Antarctic program the competing demands of logistics and science, both supported either entirely (logistics) or partly (science) from the Australian Antarctic Division's budget, leave science vulnerable to financial changes or other exigencies (government budget changes, fuel price fluctuations, emergencies such as rescues). Over the short to medium term, as facilities are upgraded, the ways in which these interacting demands are met will have to be managed carefully to ensure that science capability is grown over the period, rather than eroded.

Reductions in support, either directly or through short- to medium-term competition owing to other requirements, affect capability to undertake competitive science across the range of fields in which

Australia has long been considered a leader. To a large extent, this is already reflected in reduced numbers of projects undertaken directly in Australian Antarctic Territory. Continuation of this trend will result in Australia losing its science and policy leadership positions in the region. Such a loss would impact Australia's ability to lead and direct international collaborations of national interest, understand changes in economic opportunities in the Southern Ocean, understand risks to Australian industry from climate change, and maintain its position as a leader in evidence-based environmental conservation. Indeed, no matter how significant the investment in infrastructure assets, without the capability to make scientific use of them, Australia's Antarctic Strategy will fail in its goals and ambitions. Australia's capability to advance its strategic interests will consequently falter.

Direct granting

A primary source of support to Australian scientists from the Australian Antarctic Division is the Australian Antarctic Science Program which provides both direct grant financial support and/or a means to access large logistic support in terms of ship time at sea, field operations, and access to station facilities and accommodation. Although the Australian Antarctic Science Program has provided excellent support to Australian scientists across a range of institutions in the past, and the *Australian Antarctic Strategy and 20 Year Action Plan* suggests such support will be improved, current signs are that the overall support situation has declined.

Direct Australian Antarctic Science grants to Australian universities remain relatively small (*ca.* \$150,000 spread over a maximum of 4 years). These relatively small grants from the AAD need to meet additional costs in addition to funding the direct costs of research. They often remain insufficient to cover employing research staff nor the running expenses of the kinds of high-end scientific research that is required to stay competitive in the Antarctic science arena, let alone maintain Australian leadership in world-class, high-priority Antarctic science. Examination of the grant structures for Antarctic research to ensure that they are fit for purpose, and to ensure that the research that is carried out is properly supported, is required.

Several investigators have sought further to support their work by applying for project or similar funding from the Australian Research Council. While this is in part a solution, no formal mechanism exists for coordinating support for an Australian Research Council-supported project with logistics required from the Australian Antarctic Division. In consequence, an investigator may face a situation where they have the required research running and personnel costs, but are unable to secure logistic support because the project has not been supported through the Australian Antarctic Science Program. This is highly inefficient for both the funding agencies and investigators involved. The announcement of a new Antarctic Foundation in the *Australian Antarctic Strategy and 20 Year Action Plan* may in part alleviate the situation. However, further means to streamline and facilitate coordination among national endeavours in order to make better use of government investment in Antarctic and Southern Ocean research is required.

The science granting situation could be improved not only through deployment of further direct funding, but also by providing larger total grants to enable larger complex projects to be undertaken. A new, enhanced formal collaboration between the Australian Academy of Science's National

Committee on Antarctic Research and the Australian Antarctic Division would also help facilitate coordination of national scientific interests in the Antarctic region and help inform the Australian Antarctic Program of new scientific developments in the region.

Conclusions and recommendations

Australia has long had a leading position in science, governance and environmental consideration in the broader Antarctic region. That position can be significantly strengthened by the following:

- Establishing coordination between the Australian Antarctic Science Program process and grants from other agencies such as the Australian Research Council.
- Development of a formal collaboration between the Australian Antarctic Division and the Australian Academy of Science's National Committee on Antarctic Research to help guide Australian Antarctic Research in a national and international strategic context.
- Increasing the numbers of research scientists participating across all areas of the national Antarctic science program.
- Securing new science funding and streamlined operating models, by end 2018, including to support the Antarctic science nexus in Hobart, represented most notably, but not exclusively, by the Antarctic Climate Change and Ecosystems Cooperative Research Centre and other capabilities centred in Tasmania.
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- Enhancing access to Antarctica, by 2020, for research of longer and more flexible periods and for more scientists through capacity and flexibility at research stations.

ⁱ Press, A.J. (2014) *20 Year Australian Antarctic Strategic Plan*. Available at:

<http://20yearplan.antarctica.gov.au/final-report>

ⁱⁱ The final report of the Senate inquiry is available at:

http://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Foreign_Affairs_Defence_and_Trade/Southern_Ocean_and_Antarctic_waters/Report

ⁱⁱⁱ http://english.gov.cn/state_council/vice_premiers/2017/05/23/content_281475664964704.htm

^{iv} Kennicutt, M.C. & Horizon Scan Authors (2014) Six priorities for Antarctic science. *Nature* 512: 23-25.

^v Kennicutt, M.C. & others (2015) Delivering 21st century Antarctic and Southern Ocean Science. *Antarctic Science* 28: 407-423.

^{vi} <http://www.mbie.govt.nz/info-services/science-innovation/innovative-new-zealand/budget-2017-funding>

^{vii} Dudeney, J.R. & Walton, D.W.H. (2012) Leadership in politics and science within the Antarctic Treaty. *Polar Research* 31: 11075.

^{viii} Dudeney & Walton *Op Cit.* P.8.

^{ix} Gray, A.D. & Hughes, K.E. (2016) Demonstration of "substantial research activity" to acquire consultative status under the Antarctic Treaty. *Polar Research* 35: 34061

^x Gray & Hughes *Op Cit.* P.7.

^{xi} *Australian Antarctic Strategy and 20 Year Action Plan*, Commonwealth of Australia 2016

http://www.antarctica.gov.au/data/assets/pdf_file/0008/180827/20YearStrategy_final.pdf