Australian Government
Department of the Environment and Energy

Department of the Environment and Energy's submission to the Joint Standing Committee on the National Capital and External Territories' Inquiry into the adequacy of Australia's infrastructure assets and capability in Antarctica

1. Executive Summary

The Department of the Environment and Energy welcomes the opportunity to provide this submission to the Joint Standing Committee on the National Capital and External Territories' inquiry into the adequacy of Australia's infrastructure assets and capability in Antarctica with regard to:

1. maintaining national interests
2. serving the scientific program into the future
3. international engagement, including collaboration and resource sharing with other countries
4. fostering economic opportunities consistent with the Antarctic Treaty System obligations
5. environmental considerations.

The Department of the Environment and Energy's Australian Antarctic Division has responsibility for leading and coordinating the Australian Antarctic Program, including management of over 3,300 Antarctic infrastructure assets with a value of over $880 million. The Bureau of Meteorology, which is an agency in the Environment and Energy Portfolio, also has a critical role in Antarctica, providing weather forecasting services and climate monitoring for East Antarctica, as well as monitoring space weather conditions. The Department works closely with the Department of Foreign Affairs and Trade, the Department of Defence and other government agencies to achieve Australia's national Antarctic interests.

The Department's submission is structured around the terms of reference for the inquiry, after first providing an overview of Australia's infrastructure assets and capability in Antarctica. Infrastructure underpins all Australian activities in Antarctica including world-leading science in the Antarctic, sub-Antarctic, and Southern Ocean. Operating in such a harsh and remote environment would not be possible without Antarctic stations, shipping, aviation, and specialised scientific and support equipment.

The Australian Government reaffirmed its strong commitment to Antarctica in the 2016 *Australian Antarctic Strategy* and the *20 Year Action Plan* which were supported by $2.2 billion in additional investment. The Strategy and Action Plan recognise the importance of infrastructure assets and capability to support Australia's science and operational leadership in Antarctica. They also recognise the important challenge of transition associated with implementing new infrastructure and capability. This requires Antarctic research and funding to be structured in such a way as to enable Australia to fully realise the opportunities offered by this investment.

The Strategy and Action Plan outline Australia's national Antarctic interests and set out major actions the Government will take over the next 20 years to protect these interests. Key actions the Government has delivered to date include:

- $1.9 billion to deliver and run a new icebreaker, a world-class scientific and logistical capability, over its four-year build program and 30-year operational life
- $200 million over ten years in additional funding for the Antarctic Division's operations
- $50 million for a new research station on Macquarie Island to replace current aging infrastructure with a more efficient and environmentally friendly station
- $45 million to re-establish an overland science traverse capability to enable research in all parts of the Australian Antarctic Territory, including to locate and drill a million year ice core
- $10 million for scoping work and the development of a business case to inform options for establishing year-round aviation access between Hobart and Antarctica, including estimated infrastructure and associated costings of options through their whole lifecycle.

The Strategy and Action Plan recognise the need for future infrastructure funding, including for maintaining or upgrading our aging Antarctic stations. The Government has committed to implement an overhaul, as needed, of the infrastructure of our Antarctic research stations to create a station network that is efficient, flexible and suited to our future needs in Years 10-20 of the Action Plan (2025-26 to 2035-36).

As well as improving our Antarctic science capability through investments in enabling infrastructure and other capabilities, the Government has committed to revitalise Antarctic science under the Strategy and Action Plan through:

- Implementing a coordinated and effective Antarctic science funding model
- Establishing an Antarctic Foundation to augment science funding with private funding
- Completing a review of the Australian Antarctic Science Strategic Plan, revising and extending the plan for a further five years.

Antarctic infrastructure is high risk and poses many logistical challenges. It is costly to build and maintain, must withstand extreme conditions, and is essential to safeguard the lives of Australia's Antarctic expeditioners. The Department manages more than 3,300 assets associated with the Antarctic Program ranging from buildings and boats to cranes and quad bikes. Average annual capital expenditure on Antarctic assets is currently $14.5 million. This is 1.64 per cent of the capital base (which is $880 million). At the current rate of investment, total asset replacement would take nearly 61 years. At present, 48.5 per cent of assets have a net value of $168 million with no remaining asset life, and a further 16 per cent have three years or less of their asset life remaining. This carries significant risk and requires an annual process of prioritisation to determine how resources are used for the service and replacement of critical assets.

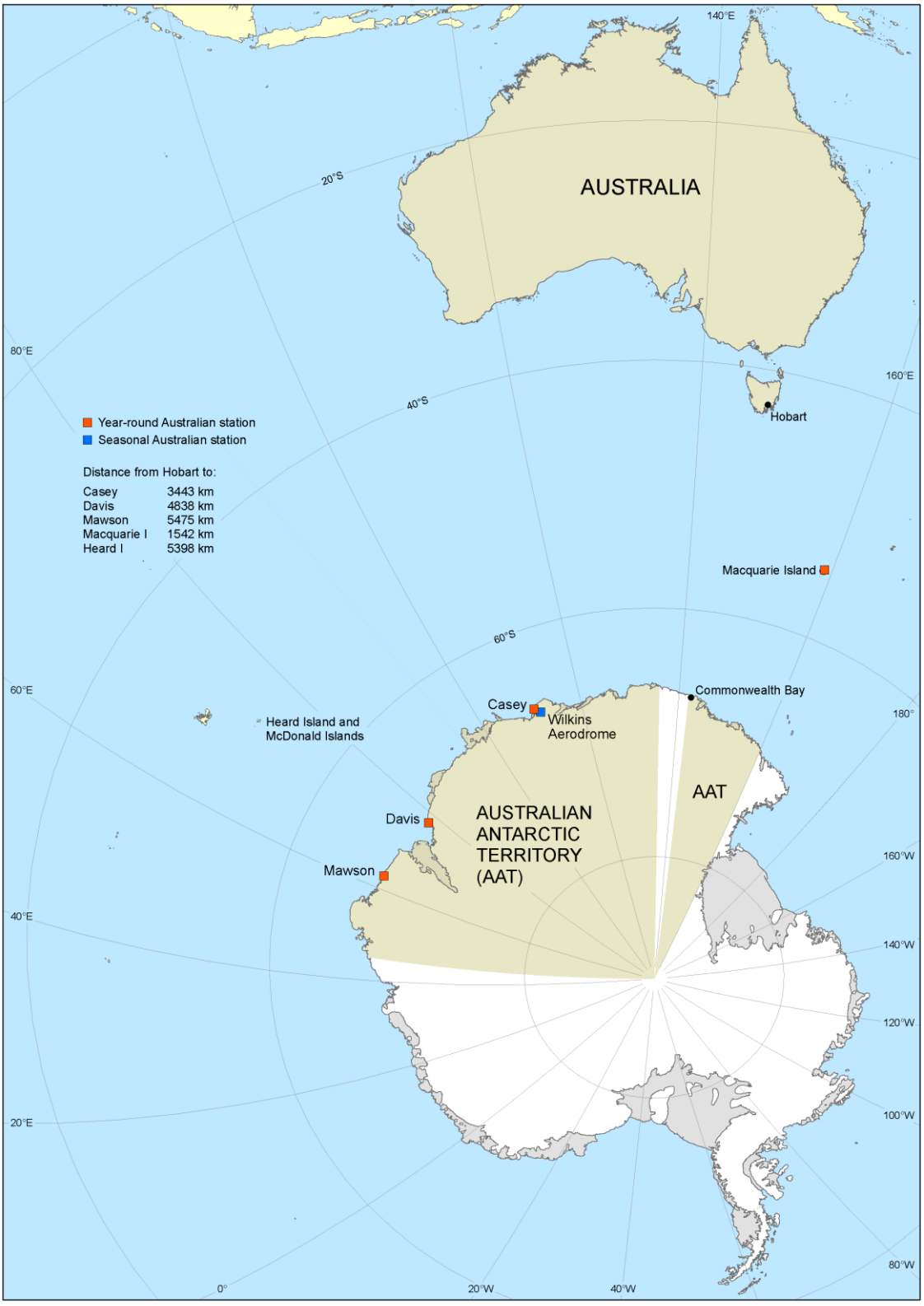
The Antarctic research stations (see Figure 1) are the Department's most significant asset group, comprising:

- Three permanent Antarctic research stations: Casey (1969), Mawson (1954) and Davis (1957)
- Wilkins Aerodrome (2004) operating as a summer-only station and its associated airfield infrastructure
- A fourth permanent research station on sub-Antarctic Macquarie Island (1948).

Australia's Antarctic research station network is resource-intensive to operate and is rapidly aging. As part of the Strategy and Action Plan, significant investments are being made to upgrade shipping and traverse capabilities and scope options for future aviation.

The need for further investment in Antarctic infrastructure has been recognised by the Government and is articulated in the Strategy and Action Plan in which it commits by 2025-2035 to implement the results of a comprehensive review of Antarctic research station infrastructure and, as needed, start a renewal program to create a station network that is efficient, flexible and suited to our future needs. The Department is in the early stages of assessing current research station infrastructure to support that commitment and the Committee's inquiry is therefore timely.

Figure 1: Australian Antarctic and sub-Antarctic Stations



Projection: Lambert Azimuthal Equal Area
Horizontal Datum: WGS84

Produced by the Australian Antarctic Data Centre, July 2017
Map Catalogue No. 14603

2. Background

Australia has a proud history in Antarctica and has long been one of the world's leading Antarctic nations. For over a century since the Australasian Antarctic Expedition (1912-14) led by Sir Douglas Mawson, Antarctica has occupied a unique place in Australia's national identity. The 2017-18 Antarctic season will be the 70th anniversary of the Australian Antarctic Program.

Australia was a key architect of, and one of the 12 original signatories to, the 1959 Antarctic Treaty. The Treaty is the cornerstone agreement of the Antarctic Treaty System which includes the Protocol on Environmental Protection to the Antarctic Treaty and the Convention on the Conservation of Antarctic Marine Living Resources. The Antarctic Treaty System provides a strong international governance framework and establishes Antarctica as a natural reserve devoted to peace and science. Key principles include freedom of scientific investigation, free exchange of scientific information, protection of the positions of Antarctic Treaty Parties on the issue of sovereignty, and the non-militarisation of Antarctica and the Southern Ocean. The Strategy and Action Plan ensure that support for, and the stability of, the Antarctic Treaty System remains a priority for Australia into the future.

Australia has sovereignty over 42 per cent of the Antarctic continent - the Australian Antarctic Territory - and associated rights over the adjacent ocean and seabed. Activities under the Australian Antarctic Program are concentrated in the Australian Antarctic Territory, which is where Australia's Antarctic infrastructure assets and capability are concentrated on the Antarctic continent. Antarctic science, aligned with our national interests and integrated with our operation capabilities, is at the heart of the Australian Antarctic Program.

Australia has a long and impressive record in conducting world-leading Antarctic science. Our research program covers physical and life sciences in the terrestrial, marine and atmospheric domains built around the themes of:

Theme 1: Climate Processes and Change

Theme 2: Terrestrial and Nearshore Ecosystems: Environmental Change and Conservation

Theme 3: Southern Ocean Ecosystems: Environmental Change and Conservation

Theme 4: Frontier Science.

It includes long-term observational and monitoring programs that support Australia's engagement and commitment to key international forums, including those under the Antarctic Treaty System.

Antarctica plays a central role in generating and driving the global weather and climate system and its complex ecosystems have much to tell us about environmental change and necessary conservation. It is a region where direct coupling between space weather and terrestrial weather occurs. The science Australia conducts in Antarctica provides vital information to understand this unique continent, including its environmental resilience, connection to global systems, influence on Australia, and the impacts on the wellbeing of Australians. Infrastructure is essential to underpin these scientific activities in Antarctica.

3. Status of Australia's Antarctic infrastructure assets and capability

Infrastructure underpins all Australian activities in Antarctica. Operating in such a harsh and remote environment would not be possible without Antarctic stations, shipping, aviation and a huge array of specialised equipment. The Australian Government is investing significantly in Antarctica, including to develop new infrastructure assets and capability.

The Australian Antarctic Program functions within a high maintenance and high capital operating environment. The Australian Antarctic Division is headquartered in Kingston, Tasmania. It manages a diverse range of assets, which are spread between Kingston, Macquarie Wharf in Hobart, Macquarie Island in the sub-Antarctic, and the Antarctic continent. The majority of the Australian Antarctic Division's assets are located in Antarctica, including:

- Four year-round research stations (Casey, Davis, Mawson and Macquarie Island) and one major summer station at Wilkins Aerodrome. There are over 370 building and infrastructure assets with a replacement cost in the order of $650 million (73.8 per cent of total assets)
- 610 mechanical plant and equipment assets totalling $66.7 million
- 736 science plant and equipment, including a unique cold-water krill aquarium, assets totalling $23.5 million
- 66 corporate property assets totalling $17.3 million
- 648 ICT telecommunications and IT assets totalling $16.2 million.

The Australian Antarctic Division manages more than 3,300 assets with a total replacement value of $880 million. Current capital investment of $14.5 million is 1.64 per cent of the capital base, as the Department's capital budget is not indexed for depreciation. Total asset replacement at that rate would take nearly 61 years at the current rate of investment.

At present, 48.5 per cent of the Australian Antarctic Division's assets (1,600 assets) have a net value of $168 million with no remaining asset life, and a further 16 per cent have three years or less of their asset life remaining. Many assets were built as part of the Antarctic rebuilding program in the 1980s and 1990s, which is why they are now nearing the end of their useful life. These figures do not reflect the current capital work required by the Australian Antarctic Program or the current condition or remaining service potential of the assets.

In recognition of the high risk profile of these assets, the Department has initiated a process to develop long-term asset management plans.

3.1 Stations

Year-round Antarctic research stations: Mawson, Davis and Casey

Australia operates three permanent research stations in Antarctica: Mawson, Davis and Casey. Mawson research station is Australia's oldest and has been continually operating since 1954. Davis research station was built in 1957 and Casey research station was built in 1969 to replace nearby Wilkes station. The last major upgrade to all stations was in the 1980s. Minor upgrades and running repairs have been conducted since then but these assets are aging and further investment in station infrastructure will be needed in the future to secure Australia's continued presence in Antarctica.

If assets fail unexpectedly, replacement can be a multi-year process. This mainly affects the Antarctic research station buildings and infrastructure (over 370 assets) which represent 73.8 per cent of the

capital base. The Antarctic operating environment limits the extent of capital works possible in any year. Limitations include freight capacity on the ship or heavy lift aircraft, numbers of beds on station for capital labour, inclement weather which restricts capital works achievable in any one year, and a 4-5 month construction window a year for all outside works.

Through the Strategy and Action Plan, the Government has committed to progress options to modernise infrastructure at Australia's three Antarctic research stations by year two of the Action Plan (2017-18). By years 10-20 (2025-26 to 2035-36), the Government has committed to implement an overhaul, as needed, of the infrastructure of our Antarctic research stations to create a station network that is efficient, flexible and well-suited to our future needs.

The Australian Government is investing significantly in Antarctica to protect Australia's national Antarctic interests. Current delivery priorities for the Department include the new icebreaker, traverse infrastructure and associated science capability, and the new station at Macquarie Island. Upgrading Antarctic station infrastructure is not an immediate priority for the Department and is currently an unfunded liability. Preliminary work to assess the status of our three Antarctic research stations is underway within existing funding.

Year-round sub-Antarctic research station: Macquarie Island

Australia operates one sub-Antarctic research station year-round on Macquarie Island, which is outside the scope of the Committee's inquiry. The Australian Government is providing $50 million over 11 years from 2016-17 to build new scientific facilities on Macquarie Island and replace the existing research station. The new station is being designed to operate more efficiently and have a lower environmental impact. This will provide an important model for any future upgrade of Australia's research stations in Antarctica.

The Bureau of Meteorology is contributing to the plan for these new facilities, in particular the refurbishment of terrestrial and space weather observing infrastructure. The Department is consulting closely with the Tasmanian Government and other key stakeholders.

Seasonal stations: Wilkins Aerodrome

Australia has one major summer-only station in Antarctica, Wilkins Aerodrome.

Wilkins Aerodrome is a seasonal station and intercontinental airfield 70 kilometres from Casey research station. It opens in October every year and operates until March, with a six week shutdown period for the ice runway at the height of summer due to ice melt. This is currently Australia's only intercontinental aviation access point into East Antarctica, and one of few such access points across all of Antarctica. Wilkins Aerodrome was built in 2004 and since 2008 has augmented personnel transfer for the Australian Antarctic Program with A319 flights. Around half of the 500 people Australia takes south each season are taken on these flights. Since 2016, the Department of Defence operates up to six seasonal flights with heavy-life C17 aircraft to Wilkins Aerodrome in support of Australia's Antarctic Program. Intra-continental flights operate on skiways, which are established seasonally at all three Australian year-round research stations in order to service ski-equipped aircraft. Skiways require on-site personnel and infrastructure to operate. Further detail on runways are provided below under section 3.3 Aviation.

A mobile inland research station is currently under development as part of the traverse project. Further detail is provided below under section 3.4 Traverse.

Other summer-only facilities, used by Australia on an occasional basis, include Law Base in the Larsemann Hills, Edgeworth David Camp in the Bunger Hills and a network of field-huts spanning outwards from Australia's year-round research stations.

3.2 Maritime

The Australian Antarctic Program is currently supported by the *Aurora Australis* icebreaker, which undertakes up to six voyages every year (between October and March). The *Aurora Australis* was launched in 1989 and purpose-built for the Australian Antarctic Program by P&O Polar, which operates the vessel for the Department on charter. The ship is 94.9 metres long and is capable of breaking ice up to 1.23 metres thick. The capability of the *Aurora Australis* was based on a two-ship support model which did not have any aviation support. At nearly 30 years old, it is reaching the end of its service life.

In recognition of the *Aurora Australis'* age, very different operating model with modern aviation, and the need to continue to support Antarctic science and operations by ship into the future, the Australian Government is investing $1.9 billion to build and operate a new Antarctic icebreaker. This is the single biggest investment in the history of Australia's Antarctic Program. The new icebreaker is currently being constructed by DMS Maritime Pty Ltd and is due to arrive in Hobart, its home port, in 2020. The new icebreaker provides a next-generation capability and has an expected life-span of 30 years. It will be 160.3 metres long and able to break ice at a continuous 3 knots in ice up to 1.65 metres thick. It will provide a step-change in Australia's Antarctic capabilities and is uniquely tailored to meet the Australian Antarctic Program's needs. It will have:

- greater icebreaking and cargo capacity
- increased endurance and operational flexibility
- a high standard of environmental performance
- state-of-the-art scientific research, rescue and resupply capabilities.

The new icebreaker will ensure that Australia's Antarctic maritime assets and capability are significantly enhanced and serve the Program well into the future. Significantly, the icebreaker is funded for its whole-of-life operations. This lessens the risk of having unfunded maintenance and repair needs in the future.

The *Aurora Australis* is supported in Antarctica by a range of watercraft for cargo operations, personnel transfer and search and rescue. Small-medium watercraft will continue to support the Australian Antarctic Program when the new icebreaker is in operation.

Antarctic infrastructure has clear links to broader national capabilities. For example, the CSIRO's research ship *RV Investigator* is now a major part of Australia's Southern Ocean research infrastructure. Navy and other shipping assets can play similar key roles to meet Australia's whole-of-government interests in the Southern Ocean.

3.3 Aviation

Aviation is an essential component of the Australian Antarctic Program.

Wilkins Aerodrome is the only intercontinental aviation access point into the Australian Antarctic Territory. Australia operates Wilkins Aerodrome and we provide support to other national Antarctic programs by flying personnel to and from Antarctica. Access to Wilkins Aerodrome is from Hobart and therefore continues to support Hobart as a leading Antarctic Gateway.

In addition to facilitating access to stations and field locations, aviation assets provide necessary support to a number of science projects including those that utilise aerial sensing, underway data collection and monitoring equipment.

Skytraders Pty Ltd operates flights from Hobart to Wilkins Aerodrome on a modified Airbus A319-115LR under contract to the Department. This carries a total of about 200 passengers south during the Antarctic summer season each year. Flights can only be conducted between October and March, with a six-week shutdown period at the height of summer due to ice melt.

The Australian Antarctic Program is also supported by a range of small aircraft including helicopters, and ski-equipped BT-67 Basler and DHC-6 Twin Otter aircraft for intra-continental travel. Each summer season, Australia constructs skiways at its three stations. Skiways are runways made from prepared ice or snow that can be landed on by small planes equipped with skis. Establishing and keeping skiways operating is intensive, high maintenance work but allows aviation access to stations.

The Department has a strong relationship with the Department of Defence which is formalised through Defence's Operation Southern Discovery and a joint Memorandum of Understanding on Antarctic cooperation and logistical support. Since 2016-17, this support includes six C-17A Globemaster III flights by the Royal Australian Air Force annually (over the Antarctic summer) to provide the Australian Antarctic Program with a heavy-lift cargo capability. The C-17A is the largest aircraft ever to land at Wilkins Aerodrome and it has been able to provide deep field air drops. Supporting deep field science projects with fuel, equipment and rations is one of the major challenges for the Australian Antarctic Program.

The Australian Government is investing $10 million into preliminary work to explore options for year-round aviation access to Antarctica. Options are being investigated for a hard surface runway in the vicinity of Davis research station which, if established, would be the only year-round aviation access point into East Antarctica. This would cement Australia's position as a leader in Antarctica and the logistics collaborator of choice in East Antarctica. Under the Strategy and Action Plan, the Government has committed to take an investment decision on delivering year-round aviation infrastructure by year five (2020-21). The business plan, which will be submitted to Government to inform its decision, will include whole-of-life-cycle costing for any capital investment.

3.4 Traverse and inland station

A traverse is a major over-snow transport train comprising tractors, vehicles, sledges and living accommodation. Historically, Australia was a leader in Antarctic traverse. In recent decades, the Australian Antarctic Program lost this capability as it focused its investment on shipping and aviation.

In the Strategy and Action Plan, the Australian Government signalled its intention to re-establish Australia's traverse capability. The Government is investing $45 million to build an over-snow science traverse, a modular mobile inland research station, and a deep ice drilling capacity. This will include the ability to prepare field landing sites to provide a scientific and logistics aviation link. A

new traverse capability will enable Australian scientists to travel into the Antarctic interior and play a leading role in the international search for a million year ice core. Finding a million year ice core is a significant goal in climate research and will shed light on major past changes in the earth's climate.

3.5 People

People are central to the Australian Antarctic Program. The integrated and cross-disciplinary capability and expertise in the Australian Antarctic Division head office and at the stations are wide-ranging and include skills in science, mechanics, medicine, engineering, operations and logistics, communications, policy and support services. This integrated model is the heart of the success of our Antarctic Program.

The Australian Antarctic Division works closely with people from a range of government agencies and research establishments, particularly scientists (see Section 5 for further information). This supports Australia's reputation as a science leader in Antarctica.

Australia's Antarctic and sub-Antarctic stations are occupied year-round, with total populations of around 80 in winter and around 200 in summer. In addition, marine scientists spend a significant amount of time on research boats and ships in the Southern Ocean during the summer months.

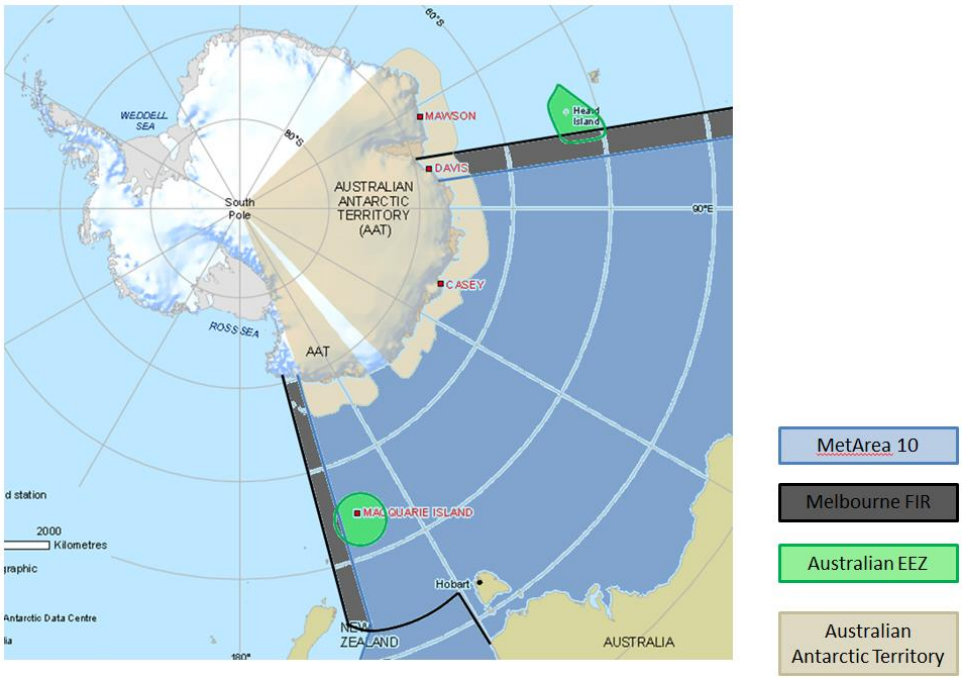
The Australian Antarctic Division provides infrastructure and asset support to many government and non-government organisations, including facilitating visits to Antarctica by officials from Geoscience Australia, the Australian Hydrographic Service and the Bureau of Meteorology (see Section 3.6 for further information).

3.6 The Bureau of Meteorology

The Bureau carries the mandate to monitor the climate and provide weather services to:

- Australians operating in the Australian Antarctic Territory, Heard Island and McDonald Islands, and Macquarie Island
- Mariners in METAREA 10 (see Figure 2), which includes sea ice information and extends to the Antarctic coast
- Aviators across the Melbourne Flight Information Region, which extends to the South Pole
- Search and Rescue support for the Australian Antarctic Division and the Australian Maritime Safety Authority.

Figure 2: The Bureau of Meteorology's routine High Latitude Weather Services



The Bureau operates and manages a diverse range of space weather and meteorological assets, which are located in Kingston, Macquarie Island in the sub-Antarctic, and the Antarctic continent. Major assets include four space weather monitoring stations, totalling $1.2 million.

The Bureau has successfully met all the weather service needs of the Australian Antarctic Division to date. The additional demands of Australia's commitment to Antarctica, particularly through the Strategy and Action Plan, is leading to a reassessment of the Bureau's Antarctic resourcing and capabilities, and current service gaps. These include:

- Iceberg monitoring and Sea Ice Service delivery
- Australian Antarctic Territory-wide tsunami warning services
- Observational capabilities such as ocean buoys and weather radar

4. Maintaining national interests

Australia's national interests in Antarctica were publicly articulated in the *Australian Antarctic Strategy* and the *20 Year Action Plan* released in April 2016. These interests are to:

- maintain Antarctica's freedom from strategic and/or political confrontation
- preserve our sovereignty over the Australian Antarctic Territory, including our sovereign rights over adjacent offshore areas
- support a strong and effective Antarctic Treaty system
- conduct world-class scientific research consistent with national priorities
- protect the Antarctic environment, having regard to its special qualities and effects on our region
- be informed about and able to influence developments in a region geographically proximate to Australia
- foster economic opportunities arising from Antarctica and the Southern Ocean, consistent with our Antarctic Treaty system obligations, including the ban on mining and oil drilling.

Maintaining a strong physical presence in Antarctica through our infrastructure assets and capability is essential to Australia's national Antarctic interests. This includes supporting our scientific activities, facilitating international collaboration, fostering economic opportunities and minimising Australia's environmental impacts in Antarctica. That is why, through the Strategy and Action Plan, the Australian Government is investing significantly to modernise the infrastructure assets and capabilities of the Australian Antarctic Program.

Australia's national Antarctic interests underpin all our activities in Antarctica and are relevant to all aspects of the Committee's terms of reference.

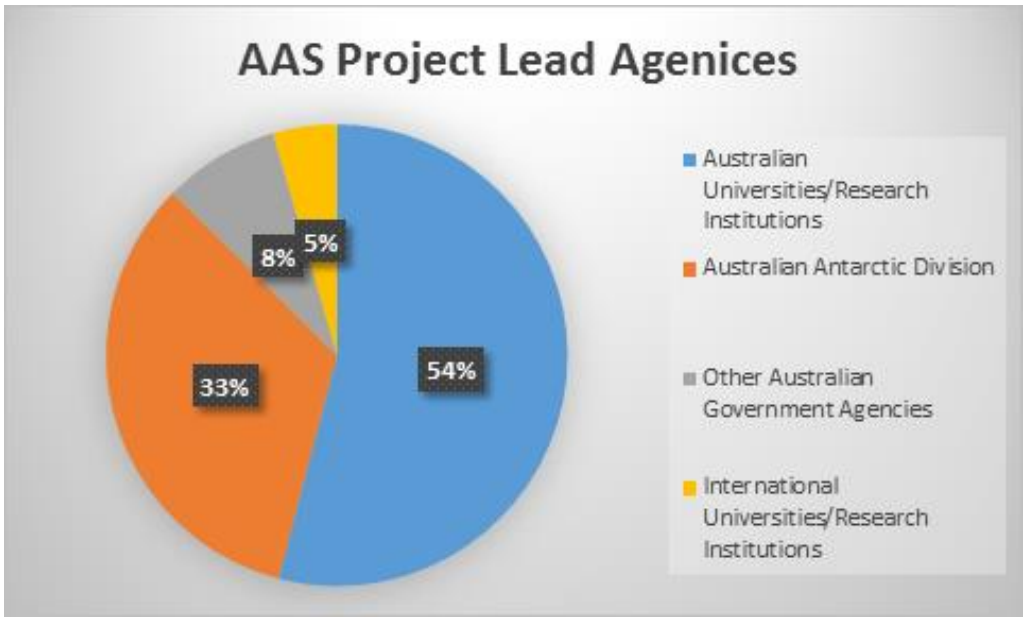
5. Serving the scientific program into the future

Science is the currency of influence in Antarctica. Leaders in Antarctic science have a great degree of leadership and influence in global Antarctic forums and governance.

Australia's expertise in Antarctic science is recognised globally. Much of our research is undertaken in cooperation with international partners and contributes to international programs and bodies such as the World Climate Research Programme, the Intergovernmental Panel on Climate Change, the Antarctic Treaty Consultative Meeting, the Commission for the Conservation of Antarctic Marine Living Resources, the Scientific Committee on Antarctic Research and the International Whaling Commission.

The Australian Antarctic Division leads, coordinates and is responsible for the overall delivery of Australia's Antarctic Program. Our Antarctic Program supports a number of Australian and international programs and research institutions through both science and operational (non-science) projects. While the Australian Antarctic Division leads around a third of the projects under the Australian Antarctic Science Program, more than half of the science projects either underway or completed since 2012-13 are led by Australian universities or institutions (See Figure 2) – this equates to more than 70 Australian universities and research institutions including the University of Tasmania, University of Melbourne, Australian National University, and Monash University. There are currently more than 100 international institution collaborators across Australian Antarctic Science Program projects including six international agencies that are leading projects (Utah State University, University of Alaska, University of British Columbia, University of Michigan, Kyushu University and New Zealand's National Institute of Water and Atmosphere).

Figure 2: Lead Agencies for Australian Antarctic Science Program projects (2012-13 – 2016-17)



The Australian Antarctic Program supports science and other applied research and operational activities for a number of Australian government agencies including Geoscience Australia, Australian Radiation Protection and Nuclear Safety Agency, Australian Nuclear Science and Technology Organisation, the Bureau of Meteorology, CSIRO, Department of Defence, and Tasmanian Department of Parks and Wildlife (Macquarie Island).

The Antarctic and Southern Ocean region is the engine room for global weather and climate and has far reaching influence on oceanic and atmospheric circulation. Scientific research in the region teaches us about our past and present climate and informs us of the nature, extent and consequences of future climate change. It also supports the wise management, protection and conservation of the region itself.

The Australian Antarctic Program is currently undergoing a range of modernisation activities to enhance our support for scientific research. The new icebreaker, traverse capability and Macquarie Island research station, once completed and operational, will increase the number of science projects that can be supported. The Department recognises that we will need to continue to adapt and review our assets and capabilities to ensure that Antarctic infrastructure is supporting science into the future.

Under the Strategy and Action Plan, the Government committed to revitalise Antarctic science. The Department is currently evaluating the *Australian Antarctic Science Strategic Plan 2011-12 to 2020-21* to identify new and emerging strategic drivers for Antarctic science. The evaluation will include assessing the progress made toward achieving the goals set out in the Science Strategic Plan since its launch in 2011 and the delivery for end users. The evaluation will inform the revision and extension of the Science Strategic Plan in line with the Government's commitment in the Strategy and Action Plan. It is expected that the revised Science Strategic Plan will be made available for public consultation later in the year.

The Government is working towards implementing a coordinated and effective Antarctic science funding model to improve the stability and efficiency in the funding model that supports Antarctic

research and align it with the new infrastructure opportunities. Any new funding model will consider existing whole-of-government funding sources (the Department, Australian Research Council, Antarctic Climate and Ecosystems Cooperative Research Centre, Antarctic Gateway Partnerships), as well as opportunities to link to private funding sources. In this regard, the Department is working closely with the private sector to support the private-sector establishment of an Antarctic Science Foundation. The Foundation will augment public science with private funding for new and iconic scientific research endeavours and build a greater public understanding of Antarctica.

Upgrades to infrastructure can come at a short-term cost to science, for example, resulting in fewer beds on station for scientists while the emphasis is on construction. But it is expected that in the medium to long-term, modernisation will result in greater benefit for the science program, ensuring that transport and research infrastructure are up to date and fit for purpose, as well as providing more beds on station for scientists as less staff are needed for day-to-day maintenance.

A modern and flexible Antarctic Program, with modern infrastructure assets and capabilities, will support science excellence. Science will be front and centre of the Department's review into Antarctic stations to ensure that our Antarctic science program is well-served into the future.

6. International engagement, including collaboration and resource sharing with other countries

The Australian Antarctic Program is highly collaborative, comprising partnerships across government and with more than 150 national and international research institutions. Together, these partnerships contribute to advancing Australia's national interests in Antarctica and the Southern Ocean. Australia also works with other national Antarctic programs to run joint international scientific and logistical support operations.

Infrastructure presents important opportunities for international engagement in Antarctica. All Antarctic nations support each other in times of emergency by providing the nearest ship or aviation asset to assist. For example, in 2016, the *Aurora Australia* ran aground at Mawson research station during a blizzard and the Japanese icebreaker, *Shirase,* provided assistance to transfer expeditioners from Mawson to Casey research station. In 2014, it was the *Aurora Australis* which rescued 52 passengers from the Russian ship *MV Akademik Shokalskiy* after it became trapped in sea ice.

The Australian Antarctic Program also supports participants from other national Antarctic programs through quid-pro-quo agreements and operational deployments. This approach enables us to make the most of our assets and asserts Australia's influence as a leader in Antarctic logistics. These agreements are a growing model and one which will become increasingly important in the future. Australia currently negotiates quid-pro-quo agreements annually with China, France, Italy, New Zealand, Norway and the United States of America.

Other countries are investing significantly in infrastructure in recognition of the broader benefits that infrastructure assets and capability have for science and leadership in Antarctica. Recent investments include: France's new icebreaker, which will be delivered in 2017; the United Kingdom's major modernisation program, which includes a £200 million new icebreaker and planned upgrade of their Antarctic stations; New Zealand's redevelopment of Scott Base, with $9 million allocated for initial scoping work; China's plans to build a fifth Antarctic research station at Inexpressible Island and a new skiway at its existing Zhongshan station in the Australian Antarctic Territory; and the

United States' major Antarctic Infrastructure Modernisation for Science program, which includes development of new facilities and infrastructure at McMurdo Station. Australia's aviation capability is a major attraction for other countries, in particular, seats on our intercontinental A319 flights from Hobart to Wilkins Aerodrome. Any infrastructure upgrades to the Australian Antarctic Program have flow on benefits for international engagement - Australia can only be an Antarctic leader if we have world-leading assets.

7. Fostering economic opportunities: Tasmania as a leading Antarctic Gateway

Investment in infrastructure is an economic opportunity for Tasmania. A vibrant Antarctic sector supports a strong economy. Tasmania is an internationally recognised Antarctic Gateway and research hub and is home to the world's greatest concentration of Antarctic and Southern Ocean expertise. As the home of the Australian Antarctic Program, Tasmania boasts direct sea and air access to Antarctica and the Southern Ocean with established maritime and air transport infrastructure and polar businesses and services.

Through the *Australian Antarctic Strategy* and the *20 Year Action Plan*, the Government is committed to further enhancing Tasmania as the leading international Antarctic research hub and logistics Gateway for East Antarctica. This includes delivering associated infrastructure in Tasmania to maximise the efficient and effective use of the new icebreaker. The Government has already committed $38 million over three years from 2014-15 for the Hobart Airport Runway Extension.

The Government's Smart Cities Plan and the Tasmanian Government's Macquarie Point development both offer interesting opportunities to increase the visible presence of Antarctic affairs in Hobart.

Tasmanian Ports Corporation runs services for Antarctic research and supply vessels at Hobart Port, including pilotage, fuel provisioning, secure expedition storage facilities and quarantine and maintenance services. Hobart Port has a dedicated Antarctic and cruise terminal at Macquarie 2 Wharf, which also houses the Australian Antarctic Division's world-class Cargo and Biosecurity Centre. Further infrastructure and Antarctic logistics investment is planned for Macquarie Wharf to service the new icebreaker. This will grow Antarctic business in Tasmania with facilities for year round lay-up and support for the next generation of Antarctic resupply and research vessels.

Many of the resources needed to sustain Australia's Antarctic and sub-Antarctic research stations are sourced from Tasmania and transported to and from Antarctica through Hobart.

Tasmania has the highest concentration of Antarctic scientific and logistical expertise in the world. Around 40 per cent Australia's marine and Antarctic scientists are based in Tasmania, at the University of Tasmania, CSIRO and the Australian Antarctic Division. Hobart is a centre for international collaboration and hub of Antarctic inspired research and innovation including in fields such as Antarctic climate science, Antarctic conservation and management, innovative new science such as polar technology development, and polar and remote medicine.

Multiple Antarctica and Southern Ocean research and education institutions, and two international secretariats are based in Hobart, bringing people from all around the world to Tasmania to work and study. The Australian Government is providing $24 million over three years to the Antarctic Gateway

Partnership, a special research initiative that fosters collaboration, to further build Hobart as a research hub.

The Antarctic sector is a major contributor to the Tasmanian economy and is a key component of the state's long term, economic growth potential. In 2011-12, the sector contributed $442 million to Tasmania's economy and it was estimated that 1,185 people were employed in the sector.[1]

Continued investment in Antarctic infrastructure in Tasmania will encourage other nations to use Hobart as the preferred gateway to Antarctica and to choose Australia as the logistics collaborator of choice. This is expected to increase the number of international visitors to the state, create new jobs and attract investment, generating further economic growth.

Improvements in infrastructure in Antarctica enable the Australian Antarctic Program to conduct more globally significant science, supported by modernised Antarctic operations and attract and invest in highly qualified people.

8. Environmental considerations

Australia is committed to protecting the Antarctic environment. The Strategy and Action Plan outline Australia's goals to be a leader and promote best practice in environmental stewardship in Antarctica across all aspects of its Antarctic Program. This includes a commitment to develop an Antarctic Clean-up strategy for legacy waste associated with the remediation of old waste and contaminated sites.

The Antarctic Treaty System provides a comprehensive protection regime for the Antarctic environment, including an indefinite ban on mining. Australia was instrumental in developing the Environmental Protocol which:

- seeks to ensure comprehensive protection of the Antarctic environment
- designates Antarctica as a natural reserve, devoted to peace and science
- outlines a system of environmental principles, measures and standards, which require that care for the environment is a fundamental consideration in the planning and conduct of all activities.

Applied environmental research, designed to support environmental management of the human presence in Antarctica, has been a core component of the Australian Antarctic Science Program for more than 25 years. Australian-led scientific research into marine and terrestrial environmental change and conservation informs and supports environmental management and protection across Australia's Antarctic and subantarctic areas of interest and has placed Australia in the forefront of environmental remediation and clean-up research.

By maintaining modern and efficient infrastructure in Antarctica, designed and operated to avoid or minimise environmental impacts, Australia can remain an environmental leader and promote best practice.

[1] Government of Tasmania 2013, *Structural Change in the Tasmanian Economy*. Available at: http://www.treasury.tas.gov.au/Documents/Structural-Change-in-the-Tasmanian-Economy-Info-Paper.pdf.