

A wide-angle photograph of an Antarctic landscape. In the foreground, the snow is covered in deep, wavy tracks. In the middle ground, several dark-colored research vehicles, including a large truck and smaller trailers, are parked in a line. The background features snow-covered mountains under a bright blue sky with a large, glowing sun on the right side, creating a lens flare effect.

NEW ZEALAND ANTARCTIC & SOUTHERN OCEAN SCIENCE

DIRECTIONS AND PRIORITIES 2010-2020

A wide-angle photograph of a vast Antarctic sea. The water is a deep, dark blue, and the surface is covered with hundreds of ice floes of various sizes, from small chunks to large, flat sheets. The sky is a mix of light blue and white, with large, billowing clouds that catch the light, creating a dramatic effect. The sun is low on the horizon, casting a warm, golden glow across the scene. The overall mood is serene yet powerful, emphasizing the scale and beauty of the southern ocean.

NEW ZEALAND ANTARCTIC & SOUTHERN OCEAN SCIENCE

DIRECTIONS & PRIORITIES 2010-2020

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FOREWORD

New Zealand's close association with Antarctica began more than 100 years ago when explorers and scientists left New Zealand ports to explore Antarctica and make their way to the Pole. In 1923, New Zealand claimed sovereignty over the Ross Dependency. In 1957, Scott Base was established by Sir Edmund Hillary to support the Commonwealth Trans-Antarctic Expedition and became a permanent station for scientific research. In 1959, New Zealand was one of the 12 original signatories to the Antarctic Treaty. We subsequently became party to other related agreements that make up the Antarctic Treaty System.

Since 1957, New Zealand research programmes in Antarctica have underpinned New Zealand's interests in Antarctica by providing a credible presence in the Ross Dependency, by contributing to the protection of the unique Antarctic environment, and by supporting the Antarctic Treaty System.

There is worldwide interest in the Antarctic research programmes led by our scientists, and we collaborate with many international science teams. The logistical support for our science also draws on international collaboration; New Zealand pools logistics with the US and Italian Antarctic programmes which use Christchurch as their gateway to Antarctica and this collaboration is an important strand to New Zealand's relationships with both these countries.

The New Zealand Antarctic and Southern Ocean Science Directions and Priorities 2010 – 2020 creates a framework for New Zealand's Antarctic science during this decade. Under the unifying theme of global change, it identifies three high level research outcomes encompassing climate, ice and atmosphere; inland and coastal ecosystems; and the broader marine environment.

These directions and priorities will guide all New Zealand government funded research in Antarctica and the Southern Ocean and will ensure the science contributes to New Zealand's wider interests. The science will help us to understand Antarctica's role in the global climate and impact of global changes on Antarctica; they will improve knowledge about inland and coastal ecosystems and enable us to better protect them; and they will improve the conservation and management of living resources in the oceans around Antarctica.

Antarctica is a unique and fragile environment. It is also part of our heritage and part of our future as New Zealanders. As the key Ministers responsible for New Zealand's investment in Antarctic and Southern Ocean science, we expect that the science undertaken within this framework will contribute to the protection and wise stewardship of the continent and surrounding environs. We encourage all those involved in the implementation of this framework to be guided by its priorities and directions to ensure we deliver the best science outcomes we can for the benefit of New Zealanders and the wider international community who share our fascination with this special part of the world.



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Hon Murray McCully
Minister of
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INTRODUCTION

VISION

ADVANCING NEW ZEALAND'S INTERESTS THROUGH RELEVANT
HIGH QUALITY, COLLABORATIVE ANTARCTIC AND SOUTHERN
OCEAN RESEARCH

Purpose of document

This document provides high-level direction for developing a coherent and dynamic New Zealand Antarctic and Southern Ocean science programme. For New Zealand government agencies, this framework identifies priority science areas in Antarctic and Southern Ocean research that require investment over the next ten years. For Antarctic researchers, the framework identifies the research goals required to meet these government priorities over the same period within three broad outcomes covering climate, terrestrial and coastal ecosystems and the marine environment.

New Antarctic issues and research needs are likely to emerge over the term of the framework, so this document will be reviewed and updated to reflect these changing priorities. For example, relevant guidance or direction from international bodies such as the Scientific Committee on Antarctic Research (SCAR) or new initiatives following on from International Polar Year research will be incorporated into this framework as appropriate.

This document was completed after a Cabinet mandated public consultation process that ran from June to August 2010.

Science in Antarctica: Funding and expected outcomes

New Zealand has been directly involved in scientific research in Antarctica and the Ross Sea for more than 50 years. In 1957, Scott Base was established as New Zealand's permanent scientific research station. Since that time the research focus has broadened and New Zealand researchers have become involved in a wide range of scientific endeavours and numerous international collaborations on the land, the ice and in the seas of the region. New Zealand researchers have, for example, played a major part in paleoclimate drilling initiatives, Ross Sea biodiversity and fisheries, long term climate, and environmental programmes.

Most of New Zealand's Antarctic research effort is supported by government agencies which provide funding for science and logistical support. Some research priorities are determined by agencies with specific management or policy responsibilities, while others are driven by issues that emerge from the academic science community.





Currently Antarctic research funding is supported through five government Votes:

- Vote Science and Innovation supports research through contestable investments by the Ministry for Science and Innovation, the Marsden Fund, and Crown Research Institute (CRI) Core Funding.
- Vote Fisheries, through the Ministry of Fisheries, commissions research to assist the management of the Ross Sea toothfish fishery and for a Ross Sea marine biodiversity programme.
- Vote Education through funding for university staff and students undertaking Antarctic research.
- Vote Foreign Affairs and Trade, through Antarctica New Zealand, which manages Scott Base and provides logistical support for research programmes in Antarctica.
- Vote Lands, through Land Information New Zealand, provides operational support by maintaining and delivering geodetic surveys, placenaming, topographic mapping and hydrographic charting for research programmes.

This framework covers all government funding sources and all government agencies with interests or responsibilities relating to Antarctic research. To receive government support, research must align with this framework. However, funding and logistical support for high-risk or blue-skies research, such as that funded by the Marsden Fund or the Human Frontier Science Program, will not be required to align with this framework.

The Government expects that Antarctic research will be targeted towards projects that will have clear benefits for New Zealand and contribute to at least one of the three outcomes identified in this framework. Some research will be short-term projects to answer specific questions; other research will be longer term and involve more basic concepts and studies. Some will be multidisciplinary and cut across outcomes while others will fall within a single outcome. Antarctica New Zealand will continue to provide logistical support to researchers who receive funding for research that aligns with the outcomes of this framework. Overall research programmes are expected to be relevant, cost-effective, collaborative and of an international standard.



Research can contribute to the framework outcomes in a number of ways. It can:

- Provide information and knowledge that helps shape New Zealand policy and assists New Zealand's participation in international fora on global issues such as climate change.
- Provide information and knowledge that helps existing New Zealand strategy to be implemented more effectively. An example is the research conducted to enable the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) to manage the Ross Sea region toothfish fishery.
- Provide baseline data and information about physical and biological changes over time. This may in turn identify strategic or tactical research needs.

Over time, New Zealand's Antarctic research programme is likely to include a range of long and shorter term research programmes, involving basic and applied research, that contribute across this range of outcomes.

The context for the New Zealand Antarctic and Southern Ocean Directions and Priorities 2010 - 2020

- **Antarctic Treaty System:** The priorities set out in the framework accord with New Zealand's interests in the Antarctic Treaty System (which includes the Antarctic Treaty (1959), the Protocol on Environmental Protection to the Antarctic Treaty (1991) and the Convention on the Conservation of Antarctic Marine Living Resources (1980)).
- **Other international treaties and forums:** In addition to the Antarctic Treaty System, New Zealand is party to a number of international treaties and participates in international science forums (e.g. the Scientific Committee on Antarctic Research (SCAR)) that also have relevance to Antarctica and the Southern Ocean.
- **Climate change:** Global climate change is fast becoming an integrating theme for the scientific activities of Antarctic Treaty nations because of the importance of the polar regions in the earth's climate systems and their response to climate change.

- Other impacts: Access to and utilisation of resources in Antarctica is increasing. This includes tourism and fisheries. As these and other activities increase, so do the potential threats to the Antarctic environment.
- Location: New Zealand has a strong interest in the Ross Sea region, and maintains a continuous presence there at Scott Base.
- Gateway: New Zealand's role as an important Antarctic gateway provides significant economic benefit to New Zealand in supporting Antarctic research programmes.
- Antarctic Living Marine Resources: As a participant in the Ross Sea toothfish fishery managed under CCAMLR, New Zealand has a responsibility to contribute to science which supports the management of fisheries in accordance with CCAMLR's conservation principles.
- Antarctic environment: New Zealand has a long demonstrated commitment to the protection of the Antarctic environment and the understanding of the unique range of fauna and flora in Antarctica and the Southern Ocean.

Challenges for Antarctic and Southern Ocean Science

- Research budgets: Resources for funding Antarctic research activities are limited and are distributed across government departments, CRIs and Universities.
- Costs and logistics: It is difficult and expensive to conduct research and undertake field work in Antarctica and research programmes need to recognise logistical costs in their planning.

Opportunities for Antarctic and Southern Ocean Science

- Antarctic presence: New Zealand maintains a year round operational presence at Scott Base and science programmes could make use of this.
- Partnership with the United States: New Zealand's longstanding and strong scientific and logistic cooperation with the United States is highly valued.
- Other international partners: New Zealand plans to work with other Antarctic Treaty Parties in areas of common interest. Particular opportunities exist with a number of countries, including longstanding partners such as Italy and Australia, as well as with more recent partners, such as Russia, Korea and Canada.
- Scientific endeavour: Antarctica is a relatively untouched environment and provides a unique opportunity for low impact scientific research. The opportunity to observe, monitor and investigate scientific hypotheses in extreme environments at high latitudes is unique and the findings frequently have profound global implications.

Government Science Priorities for Antarctic and Southern Ocean Science

- Ross Sea region focus: New Zealand government support for Antarctic research will focus on the terrestrial, coastal and marine areas of the Ross Sea region. This does not preclude collaboration in other areas of Antarctica or in Arctic research.
- Need: Government support for research projects located in Antarctica will only be considered when it is essential for the project to be undertaken in the Antarctic environment. The intention here is to ensure that logistical support for Antarctic science will not be used when proposed research projects could be undertaken in places that are easier to access and less expensive to operate in.





THE UNIFYING THEME FOR NEW ZEALAND'S ANTARCTIC AND SOUTHERN OCEAN SCIENCE

Global change is the unifying and overarching theme for New Zealand Antarctic and Southern Ocean Science in this ten year framework. Global change covers past change which has resulted in Antarctica's unique physical and biological characteristics, establishing baselines of understanding from which change may be measured, understanding current change and predicting future change.

The unifying theme of global change is intended to stimulate multidisciplinary and interdisciplinary research that will progress our understanding of the effects of global change at multiple scales, and facilitate appropriate policy responses. A more thorough understanding of global change and the potential impacts on these systems will also help us to understand and manage human impacts on the Antarctic environment.

HIGH LEVEL RESEARCH OUTCOMES

The key research outcomes in which scientific progress is sought over the next 10 years are:

1. CLIMATE, CRYOSPHERE, ATMOSPHERE AND LITHOSPHERE:

Improved understanding of the past and current state of Antarctica, its significance and implications of the role of Antarctica in global change, and implications of global change for Antarctica.

2. INLAND & COASTAL ECOSYSTEMS:

Improved understanding of inland and coastal ecosystems of the Ross Sea region leading to enhanced knowledge, conservation and protection priorities in Antarctica.

3. MARINE SYSTEMS:

Improved conservation and resource management of the Antarctic marine environment.

These three research outcomes are strongly linked and there are a number of benefits that arise from science interactions between the different research outcomes. Increasingly greater scientific value results from a multidisciplinary approach therefore close collaboration across research disciplines will be encouraged. Research funding and logistical support will be based on the merit of the research and will not necessarily be prioritised equally across the outcomes. However, over time, it will be important that research is undertaken across all three research outcomes.

Science outputs that help government agencies achieve their goals will be actively encouraged. This will require greater collaborative efforts between scientists and government agencies.





New Zealand contribution:

New Zealand is a world leader in sediment coring research in the McMurdo Sound area. The New Zealand Antarctic programme has also achieved significant international recognition through a strong history of research into many aspects of the cryosphere, including sea-ice and atmosphere / ocean circulation processes, which influence ice sheet loss and sea level.

Atmospheric measurements, including sampling the boundary layer greenhouse gases and monitoring the ozone hole, are a key component to understanding global processes, particularly as high latitudes are an ideal location for upper atmospheric research. These and other long-term monitoring projects contribute directly to global networks and will continue to be a core part of New Zealand's research effort in Antarctica.

It is important that New Zealand's Antarctic research linked with Outcome 1:

- aligns with two of SCAR's five main Scientific Research Programmes, "Antarctica and the Global Climate System" and "Antarctic Climate Evolution". Such alignment will help to facilitate the development of research connections with international research teams.
- meets obligations to provide data to international networks.
- provides innovative leading edge approaches to Antarctic global change research.



We will know we are delivering on this Outcome when, for example:

- climate and sea level projects assessed by the IPCC are using information from New Zealand-supported Antarctic research as inputs into climate and sea-level models.
- refined climate and sea level projections assessed by the IPCC include the impact of Antarctica and are being used as input into the Government's climate change policy.
- we have an improved understanding of past and present processes that take place in Antarctica and the Southern Ocean to determine the southern influences on New Zealand's land, ocean and climate and hence better identify Antarctica and the Southern Oceans impact on, and response to, climate change.
- we have an improved understanding of the Antarctic atmosphere's response to global change, the future status of ozone loss in the Antarctic and Antarctica's role in the global carbon cycle.









It is important that New Zealand's Antarctic research linked with Outcome 2:

- aligns with one of SCAR's five main Scientific Research Programmes⁴, specifically "Evolution and Biodiversity in the Antarctic" and its successor programmes. Such alignment will help facilitate the development of international research connections.
- facilitates ongoing improvement of policy development and management of human impacts in Antarctica.

We will know we are delivering on this Outcome when, for example:

- there is continued recognition that New Zealand is a leader in the management of the Antarctic environment, particularly in the Ross Sea region, and the development of protective measures and environmental standards.
- we have a better understanding of the responses of inland and coastal Antarctic flora and fauna to global change.
- New Zealand has met its international obligations under the Protocol on Environmental Protection to the Antarctic Treaty and contributed to the Committee for Environmental Protection's priority areas of interest.
- New Zealand's representatives at international Antarctic fora are well-equipped and informed and their input to discussions on Antarctic ecosystems is sought.
- international researchers seek to collaborate with their New Zealand counterparts on biodiversity and ecosystem functioning research.

⁴ <http://www.scar.org/researchgroups/#SRP>



SAFETY FIRST



It is important that New Zealand's Antarctic research linked with Outcome 3:

- aligns with New Zealand's Ross Sea Strategy.
- aligns with one of SCAR's five main Scientific Research Programmes "Evolution and Biodiversity in the Antarctic". Alignment with this research programme will help facilitate the development of international connections related to this work.
- supports New Zealand's role in managing Antarctic marine living resources through CCAMLR.
- provides strong scientific support for the selection, development and monitoring of marine protected areas as a management tool.



We will know we are delivering on this Outcome when, for example:

- a network of marine protected areas has been established that, in particular, safeguards the long-term ecological viability of marine ecosystems and protects Antarctic marine biological diversity and areas potentially vulnerable to human impacts.
- CCAMLR's abilities to engage in ecosystem-based management and advance its Conservation Principles and adopted conservation measures are enhanced.



SUMMARY

IMPORTANT ATTRIBUTES OF NEW ZEALAND'S ANTARCTIC AND SOUTHERN OCEAN SCIENCE PROGRAMMES

Research programmes developed to deliver the outcomes outlined in this document are also expected to have the following attributes:

Science quality

Scientific excellence will continue to be a key goal for New Zealand's Antarctic and Southern Ocean science programme. Research proposals must demonstrate high scientific standards and high levels of scientific credibility.

Training of new researchers

The development of young scientists in New Zealand is a key issue for many science areas, including Antarctic research. We note the critical role of universities in ensuring a flow of quality graduates into science careers. Proposals which incorporate training and development opportunities for young scientists are encouraged.

Science publications and outreach

Science programmes in Antarctica should aim to produce outputs that directly support New Zealand's three research Outcomes for Antarctic science.

Publications

Timely publication of results will be required in an array of high profile and peer reviewed journals.

Wider science outreach

Researchers will be required to develop innovative ways to communicate science to a wider audience of New Zealanders. Web-based science outreach is becoming more widely used and this is encouraged, particularly through established websites.

National and international collaborations

Strong national and international collaborations will be encouraged to:

- assemble world class and multi-disciplinary teams
- help programmes to reach a greater critical mass
- assist dissemination of science findings to a wider audience
- help up-skill researchers and expose scientists to different approaches
- share the costs of science and logistics
- assist with building international links and relations.

Multi-disciplinary approaches

Multi-disciplinary approaches to Antarctic science will be encouraged as the issues faced today are increasingly complex and cut across multiple disciplines.

Environmental impact

The environmental impacts of a project should not outweigh the likely benefits of the scientific research and its outcomes, which are becoming increasingly well prescribed. It should be noted all proposed activities are subject to an Environmental Impact Assessment (EIA) process under the Antarctica (Environmental Protection) Act 1994.

Logistical costs and the efficient use of resources

Projects with large logistical costs will need to be of particularly outstanding scientific merit to justify the allocation of resources.



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