ANTARCTICA

NEW ZEALAND *profile*

New Zealand Government

OUR VISION

ANTARCTICA AND THE SOUTHERN OCEAN – VAL

Antarctica and the Southern Ocean *Valued, Protected, Understood*

U E D, P R O T E C T E D, U N D E R S T O O D

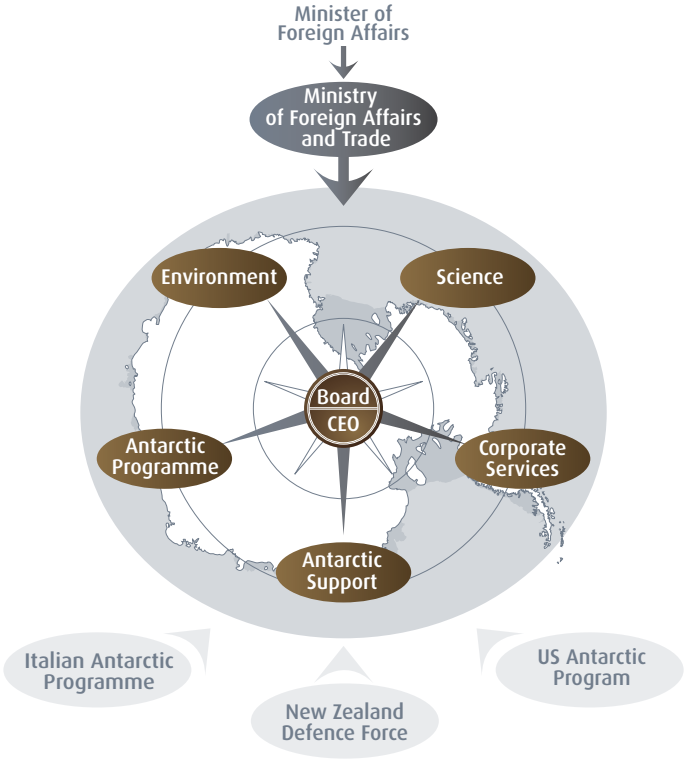
VALUES

People are the key to Antarctica New Zealand's success. This includes permanent staff; fixed term and contract staff; seconded staff from the New Zealand Defence Force and our many strategic partners in Government, the science community and other national Antarctic programmes. We seek to create a high performance organisation underpinned by a culture of shared beliefs, in particular through:

- **Safety**
  We have an uncompromising commitment to each other's safety.
- **Caring for the environment**
  Sustainability is at the core of our work and we are totally committed to minimising our environmental impact.
- **Learning environment**
  Feedback is actively encouraged and we will learn from previous experiences to continuously improve our performance.
- **Customer service**
  We strive to deliver ever improving value to our stakeholders.

© L. Simon

ANTARCTICA NEW ZEALAND STRUCTURE



PURPOSE

Advancing appreciation, conservation and knowledge of Antarctica and the Southern Ocean for the benefit of New Zealand and the world community through leadership, partnership and involvement in high quality Antarctic and Southern Ocean-related activities.

Antarctica New Zealand

SUPPORTING

OUR SCIENTISTS

Antarctica New Zealand's role in science is to maintain and enhance the quality of New Zealand Antarctic scientific research. To achieve this aim, Antarctica New Zealand works closely with the Antarctic science community to develop and support a range of high-quality science programmes.

LATITUDINAL GRADIENT PROJECT

The Latitudinal Gradient Project (LGP) has combined the power of small science projects to answer the big questions in Antarctica. The aim of the LGP is to increase our understanding of the marine, freshwater and land-based ecosystems that exist at five sites along the latitudinal gradient of the Victoria Land coast. This will enable the LPG to establish a benchmark for the measurement of the effects of climate change in Antarctica. Researchers from several disciplines are cooperating to obtain a clearer picture of the future impacts of these changes on the Ross Sea region.

ANTARCTIC GEOLOGICAL DRILLING

Antarctic Geological Drillling (ANDRILL) is a US$30m, multi-year, geological drilling project committed to understanding the effects of past climate changes on the margins of Antarctica. The project is a multi-national collaboration supported by Italy, Germany, New Zealand and the United States. The drilling project has been managed by New Zealand over the past two summers: first from a platform on the ice shelf at Windless Bight and, in the second season, from a sea ice platform in Southern McMurdo Sound. The ANDRILL drilling team have extracted high quality sediment cores from 1285 metres deep into the sea bed, giving a unique view of the dramatic and sometimes quite abrupt climate changes that have taken place in Antarctica over the past 20 million years.

CENSUS OF ANTARCTIC MARINE LIFE

New Zealand's major International Polar Year contribution has been through the Census of Antarctic Marine Life, aimed at establishing a base-line of marine life in the Southern Ocean. With this in place, it will be possible to get a better understanding of how climate change might affect the most productive marine ecosystem on Earth. During the International Polar Year, scientists and ships from 18 countries have been deployed to carry out this research. New Zealand's contribution has taken the form of a 50-day voyage by the RV *Tangaroa* into the Southern Ocean and the Ross Sea in February/March 2008. During the voyage samples were obtained from some of the more remote parts of the Southern Ocean and many previously unknown species were discovered.

INTERNATIONAL POLAR YEAR

The goal of the 2007-2008 International Polar Year (IPY) has been to further human understanding of the Antarctic and Arctic environments through an international programme of coordinated scientific research. Work has been conducted over a two-year period, which has allowed participant researchers the opportunity to observe two complete polar cycles and has also allowed a second chance at on-site research activities given the harsh and unpredictable polar operating environments. Organisers have endorsed 228 projects, of which 43 are focused on Antarctica.

The International Polar Year was an initiative led by the International Council for Science and the World Meteorological Organisation to begin a new era in polar research. The last such year, the 1957 International Geophysical Year, marked the founding of Scott Base and the beginning of New Zealand's cooperation with the United States science programme in Antarctica. The IPY has provided an opportunity not seen for fifty years to concentrate international science and research in the polar regions.

For New Zealand scientists, the International Polar Year has represented a unique opportunity to participate in a number of important Antarctic scientific collaborations. These are likely to produce major advances in Antarctic science and reinforce the position of New Zealand as a serious and high quality science partner in the Ross Sea region.

PREDICTING BIOCOMPLEXITY IN DRY VALLEY ECOSYSTEMS

Prof. Allan Green and Dr Craig Cary, University of Waikato

The environment of the McMurdo Dry Valleys has been described as one of the most extreme on the planet. At one time it was believed that the Dry Valleys were a desert, devoid of life. However, recent studies have indicated just how much diversity of life there is in this ecosystem and that most is dormant, waiting for suitable conditions to reactivate. This multi-national, multi-disciplinary project is aiming to measure the biocomplexity of the ecosystem and discover what conditions control the distribution and activity of these life forms. By looking at environmental factors and biodiversity in the Miers, Marshall and Garwood Valleys, scientists hope to explain why and where things occur, and better forecast what will happen if the environment changes. One of the ecosystems being studied is the soil under mummified seals. These areas have nutrients and moisture that provide an environment quite different from that surrounding it. This environment can provide an indication for what might happen if the environment of the Dry Valleys becomes wetter, with a corresponding increase in nutrients. This project will create a database model, linking biodiversity, landscape and environmental factors which will provide a basis for managing Antarctic terrestrial ecosystems.

NZ-INTERNATIONAL POLAR YEAR TRANS-ANTARCTIC SCIENTIFIC TRAVERSES: CLIMATE VARIABILITY ALONG THE VICTORIA LAND COAST

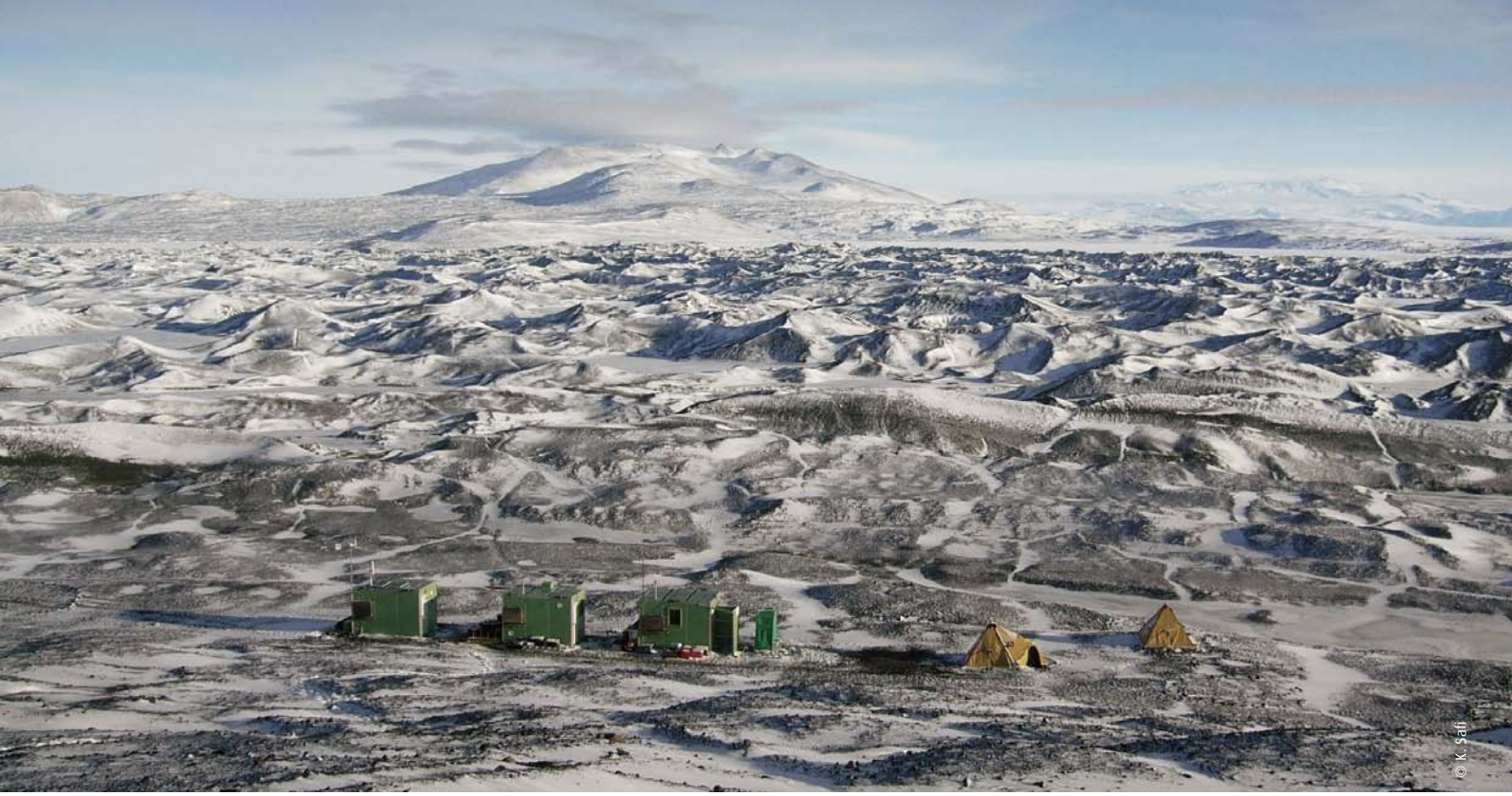
Dr Nancy Bertler, Victoria University of Wellington

Unprecedented changes are occurring in the Earth's climate. The 1990s was the warmest decade in the last 2000 years and average global temperature is projected to rise between 1.1°C and 6.4°C by 2100. Although the scientific evidence of climate change is now widely regarded as incontrovertible, predicting regional impacts is proving more problematic. This is especially true in the Southern Hemisphere, where historical and observational data are less abundant than in the Northern Hemisphere. This project aims to provide high resolution, seasonally resolved, climate records for the last few millennia by sampling ice cores from the Antarctic margin. These ice cores are obtained from a 14° latitudinal transect of the Victoria Land coastline. This information will contribute to a larger climate data pool that has been formed around other projects such as the International Trans-Antarctic Scientific Expedition, the International Partnerships on Ice Coring Sciences, the Latitudinal Gradient Project, and ANDRILL. Ultimately this will lead to an improved understanding of regional patterns of climate behaviour and more realistic regional climate models for future predictions.

POLAR CRYOSPHERE REMOTE SENSING

Dr Wolfgang Rack, University of Canterbury

The cryosphere is the portion of the Earth's surface where water is in a frozen form. The knowledge of the cryosphere's mass balance is fundamental to understanding the impacts of climate change. Much of the research into the key components of the cryosphere is based on measurements of ice surface height, sea ice thickness, and snow morphology. A large amount of this information is derived from satellites. In order to make this information reliable, it is derived from algorithms developed and tested with robust ground truth data. This is reference data of physical snow and ice properties collected on the ground. The purpose of this research is to increase the accuracy of satellite measurements and to ultimately improve remotely sensed information in the Ross Sea region.



ANTARCTIC INLAND AQUATIC ECOSYSTEMS

Dr Brian Sorrell, NIWA

The freshwater ecosystems of the Darwin Glacier region and the McMurdo Ice Shelf exist in one of the most extreme environments on the planet. This study will look at how climatic variables such as temperature, wind and irradiance influence the physical and chemical characteristics of these freshwater habitats and how this in turn affects the diversity and productivity of the biological communities within these habitats. This will be done by linking climate-driven models that describe the physical and chemical processes that in turn determine key biological processes (photosynthesis, respiration, nutrient transformations) within the dominant microbial communities. This project will contribute to the larger Latitudinal Gradient Project, which will consider natural environmental gradients to provide a range of conditions within which to further develop and test these models. Historical data will also be examined as a method of testing the resilience of these aquatic ecosystems to climate variability.

STRUCTURE AND FUNCTION OF ROSS SEA COASTAL MARINE ECOSYSTEMS

Dr Vonda Cummings, NIWA

Understanding the structure and function of sea floor communities and determining their relationships to key environmental factors is essential to an improved understanding of Antarctic marine ecology and wise management of the Antarctic coastal zone. This research programme will investigate the environmental processes that influence sea floor community dynamics, the spatial structure of populations and the potential for climate variability and human impacts to influence this environment.

The differences in sea floor ecosystems over a range of latitudes within the Ross Sea will be used to measure how the structure, diversity, complexity and productivity of these ecosystems respond to differing environmental influences. This work contributes to the Latitudinal Gradient Project and will enable researchers to link productivity of disturbed sites and primary production networks, to spatial distribution and biodiversity over a range of time and geographical scales.

SEA ICE AND SOUTHERN OCEAN PROCESSES

Dr Timothy Haskell, Industrial Research Ltd, with collaboration from Victoria University of Wellington, University of Otago, and NIWA

The relationship between the sea ice, ocean and atmosphere of Antarctica is complex and the system they create undergoes large-scale change though the polar seasons with a significant impact on the global climate. The Sea Ice and Southern Ocean Processes project will characterise the relationship between Antarctic sea ice, and the ocean and atmosphere of McMurdo Sound with the intention of obtaining a better understanding and the ability to predict the climate variability of the region. The research will cover a range of scales, from microns in the structure of sea ice to thousands of kilometres in the process of sea ice dispersal in the Southern Ocean. The ultimate goal of the project is to gain a better understanding of the influence of sea ice on the world oceanographic system and consequently on global climate.

DELIVERING THE SCIENCE

To deliver world class science in Antarctica, we invest in up-to-date systems, infrastructure and skilled people.

SIR EDMUND HILLARY

Sir Edmund Hillary was the Ross Sea Party leader of the 1957 Commonwealth Trans-Antarctic Expedition which was responsible for the establishment of Scott Base. The founding of the Base also marked the instigation and development of New Zealand's science programme in Antarctica.

This ground work has enabled New Zealand to have a scientific and operational presence in the Ross Sea region for over fifty years which has contributed to a greater understanding of the continent.

Sir Edmund Hillary visited Scott Base on a number of occasions and played an integral role in Scott Base's fiftieth anniversary celebrations in 2007.

Sir Edmund Hillary passed away on 11 January 2008 and will be sadly missed by all with connections to Antarctica.

ANTARCTIC PROGRAMME

Scott Base was officially opened on 20 January 1957, making it one of the earliest operational bases to be established on the continent. The Base can accommodate up to 85 people, as well as housing safety and logistical equipment vital for survival in Antarctica. Scott Base also has specialised laboratory spaces, computer networks and satellite communication links, engineering and mechanical workshops and the Hillary Field Centre, commissioned in 2005, which houses supplies, vehicles and field equipment.

ANTARCTIC SUPPORT

Working in Antarctica and running Scott Base presents some unique challenges. Antarctic support involves the transportation of people and cargo to Scott Base by ship and air. The operational season is from October to February and during that time up to 160 tonnes are transported by the US Air Force and the NZ Defence Force. The annual ship visit to McMurdo Sound allows another 400 tonnes of fuel and cargo to be off-loaded. In addition to the cargo movement, up to 350 people are kitted out, briefed and transported to Antarctica each summer season.

In order to achieve this international cooperation is required. The National Programmes of New Zealand, Italy and the United States contribute to a joint logistics pool and in the case of the United States Antarctic Program this relationship has been standing for over 50 years. Antarctica New Zealand maintains a strong network of New Zealand contractors and suppliers. These relationships, along with other Antarctic National Programmes and related business, make a significant contribution to the Canterbury economy.

In addition to the logistical requirements, the Antarctic Support Team runs a number of projects such as the energy centre upgrade and the fire protection upgrade which keep Scott Base a safe, environmentally friendly and technologically capable working environment.

ROSS ISLAND WIND ENERGY PROJECT

Antarctica New Zealand and Meridian Energy are in the process of building the southernmost wind farm in the world. The project will see turbines providing clean power to both Scott Base and McMurdo Station on Ross Island. The power delivered by the wind farm will enhance Antarctica New Zealand's contribution to the joint logistics pool with the United States Antarctic Program.

The scheme will reduce power generation fuel consumption and will involve the construction of three wind turbines on Crater Hill, linked to the electrical grids of both McMurdo Station and Scott Base.

The Stage 1 project will cut consumption by approximately 463 000 litres of fuel every year between the two bases, reducing fuel consumption by 11%. The project will also result in a reduction of greenhouse gas production from both bases by 1242 tonnes of CO_2 annually.

© E. Barnes

ENVIRONMENT

The Environmental Protocol to the Antarctic Treaty designates the whole of Antarctica as a natural reserve devoted to peace and science. The Protocol sets strict rules regarding the management of human activity in the region. The Environment Team maintains a leading role in Antarctic environmental management by:

- Managing 13 protected areas within the Ross Sea region including the Dry Valleys Specially Managed Area which covers 15 000 square km of unique environment.
- Assessing and reporting on the state of the Antarctic environment.
- Preparing and assessing environmental impact assessments for our and others' activities on the environment, including through a rigorous monitoring and auditing system.
- Enforcing high standards of management of waste, biosecurity, energy and environmental incidents throughout the organisation.
- Providing policy support for New Zealand's involvement in the Antarctic Treaty System and in particular the Antarctic Treaty's Committee for Environmental Protection.
- Educating all Antarctica New Zealand staff and supported events in minimising our environmental footprint.

New Zealand has made a strong commitment to the conservation of the intrinsic and wilderness values of Antarctica and the Southern Ocean through active and responsible environmental stewardship. Key goals for Antarctica New Zealand remain to seek increased protection, promote high environmental awareness and foster an active commitment to reduce our environmental footprint.

EXTERNAL PARTNERSHIPS

© H. Thompson

Promoting the value, understanding and knowledge gained through scientific and environmental activities means engaging in global and national partnerships.

GOVERNMENT PARTNERSHIPS

Key agencies with an interest in Antarctica include:

- The Ministry of Foreign Affairs and Trade, which has primary responsibility for pursuing New Zealand's interests in the Antarctic Treaty System.
- The Ministry of Fisheries which leads the research, management and compliance of sustainable fisheries and marine protection in the Ross Sea region.
- The Department of Conservation which oversees the Conservation Act 1987 as it relates to the advocacy of conservation values within the Ross Dependency, as well as associated marine mammal legislation.
- Land Information New Zealand which undertakes the Ross Sea hydrographic survey and the naming of geographic locations in the Ross Dependency.
- The Rescue Coordination Centre New Zealand which has accountability for rescue coordination in the Ross Sea sector from New Zealand to the South Pole.

NEW ZEALAND DEFENCE FORCE

The New Zealand Defence Force (NZDF) makes a significant and critical contribution to New Zealand's presence in Antarctica. Every season the Air Force provides the intercontinental air link, cargo handling services in Christchurch and in Antarctica and communications staff support at Scott Base. The NZDF provides direct contributions to the New Zealand Antarctic Programme which includes:

- The Hercules C-130s, which provide cargo and personnel transport to Antarctica as part of the combined logistics pool for the New Zealand and United States Antarctic programmes.
- The provision of air movement support in Christchurch and Antarctica and trained personnel for the cargo ship off-load.
- The P-3 Orion marine observation flights, which are part of New Zealand's commitment to the Convention for the Conservation of Marine Living Resources (CCAMLR).

ARTS AND MEDIA PROGRAMMES

Antarctica New Zealand has had a long tradition of supporting artists and media visits to the Ice. The media and artists programmes actively promote the science and environmental work of the organisation and embed the concept of Antarctica in the culture of New Zealand.

- Media Initiatives programme: Each summer season well-proven journalists in a diverse range of media are selected to visit Antarctica and cover New Zealand's science and environment stories.
- IPY Media Scholar: Each year a student from the University of Canterbury's Graduate Diploma in Journalism is selected to spend up to six weeks at Scott Base, covering science, environmental and general interest stories.
- Invited Artists: Up to two prominent, senior artists are selected each season to travel to Scott Base and communicate through their art the history, science and environment of Antarctica.

INTERNATIONAL REPRESENTATION

New Zealand's standing as an influential Antarctic nation is reinforced through participation and collaboration with international Antarctic forums and agencies including:

- **Antarctic Treaty Consultative Meeting (ATCM)**
  The ATCM is hosted by the 28 Consultative Parties to the Antarctic Treaty, which has met since 1961. Other invited parties include non-Consultative Parties, observers and invited experts. Measures, Decisions and Resolutions, which are adopted at the ATCM by consensus, give effect to the principles of the Antarctic Treaty and the Environment Protocol and provide regulations and guidelines for the management of Antarctica and the work of the ATCM.

- **Committee for Environmental Protection (CEP)**
  The Committee was established in Article 11 of the Environmental Protocol to the Antarctic Treaty. Its functions are to provide advice and formulate recommendations to the Treaty Parties in connection with the implementation of the Protocol. The CEP consists of representatives of the Antarctic Treaty Parties who are signatories to the Environmental Protocol and is currently chaired by Dr Neil Gilbert, Antarctica New Zealand's Environment Manager.

- **Council of Managers of National Antarctic Programmes (COMNAP)**
  COMNAP was established in 1988 to bring together those managers of national agencies responsible for the oversight of Antarctic operations supporting science. The Council includes representatives from 29 countries.

Antarctica New Zealand

ISBN 0-478-10969-5

Front cover photograph: © A. Apse

Antarctica New Zealand
Private Bag 4745
International Antarctic Centre
38 Orchard Road, Christchurch, New Zealand
Tel 64 3 358 0200 **Fax** 64 3 358 0211
www.antarcticanz.govt.nz