

**Dr Neil Gilbert, CEP Chair**

# Managing the Consequences of A Changing Antarctic Environment

An imprecise response to an uncertain  
situation



# Outline

---

- Defining the scope
  - What are we trying to achieve?
- Explore climate change implications and possible response options for:
  - Antarctic science
  - Management of the Antarctic environment
  - National Antarctic Programmes
- The Antarctic Treaty System response
  - Is the status quo approach to managing Antarctica acceptable?
- Conclusions

# Scope

---

- A globally significant issue, but being handled through other fora (e.g. UNFCCC)
- Our focus should be:
  - Limited to Antarctic climate change and the implications for Antarctica itself
  - Limited geographically to the CCAMLR Convention Area
  - To understand, but not to review the science
  - To identify the policy response



# What are we trying to achieve?

- Not a steady state - climate and environmental change is ongoing



50-40 Million Years Ago



Antarctica had no ice.

35-30 Million Years Ago

warm



Ice sheets began to develop.

15-10 Million Years Ago

cold



The Antarctic ice sheets formed.

5 Million Years Ago

warm



Sometimes the Antarctic ice sheets retreated.

Today

cold



Antarctic ice sheets with frozen ocean.

warming

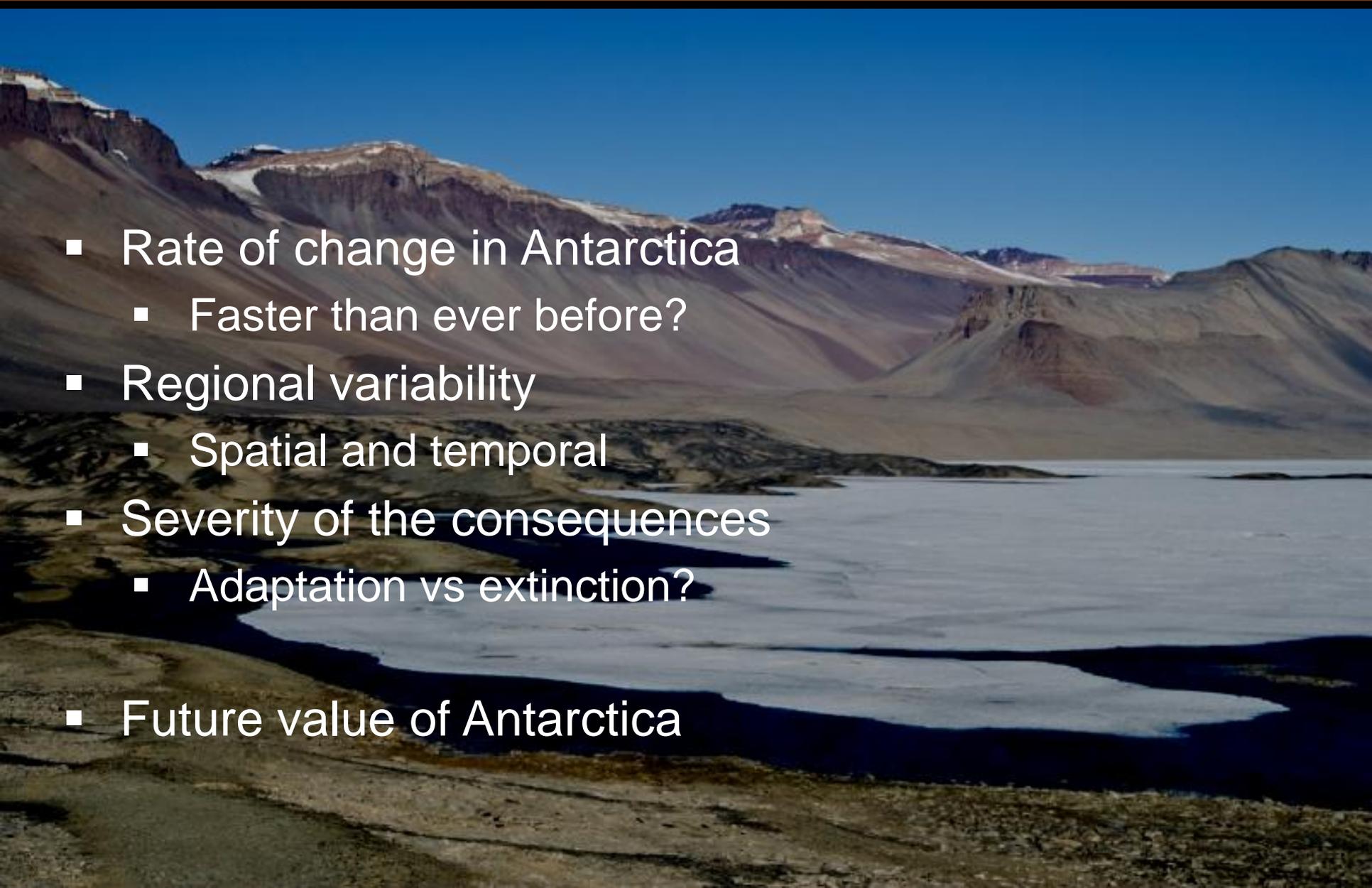
Future

The Next 1000 Years?



# Unknowns

- Rate of change in Antarctica
  - Faster than ever before?
- Regional variability
  - Spatial and temporal
- Severity of the consequences
  - Adaptation vs extinction?
- Future value of Antarctica



# What are we trying to achieve?

- Future proofing
- Preservation of the values we place on Antarctica  
“A natural reserve devoted to peace and science”
- Through: vigilance, informed management and wise governance

# Climate change implications for science



# Climate change implications for science

- Antarctic science is highly valued
  - Globally important – to IPCC / governments
  - Regionally important – to ATCM / CCAMLR
  - Never been a more important time to undertake polar research



- SCAR's ACCE report provides significant opportunity
  - First state of the environment report for Antarctica
- Essential that we develop a strategic policy response

# Climate change implications for science

---

- How might we respond?
- ACCE report requires recognition – ATCM statement
- Report contains 32+ recommendations on future research needs – some urgent
  - Coordinated and planned response is required
    - SCAR
      - national research committees
      - Science programme reviews
    - ATCM and CCAMLR “oversight”
      - CEP and SC-CAMLR engagement
- ATCM request SCAR to report against progress

# Climate change implications for science

---

- Innovative ways to enhance the science – policy dialogue
  - Enhanced advisory role for SCAR
  - New means of synthesising research information to support policy discussions / decision making
- Improved international and domestic support for Antarctic research - including funding
- Enhanced collaboration between national programmes



# Climate change implications for science

---

- Science and the environment inherently linked
- A changing environment may lead to a loss of Antarctica's science value
  - Direct climate change consequences e.g. invasive alien species
  - Antagonistic effects of human activity e.g. pollution / disturbance events
  - Logistical challenges to support research
- Wise management will be required to maintain Antarctica's value as a global scientific resource

# Climate change implications for environmental management



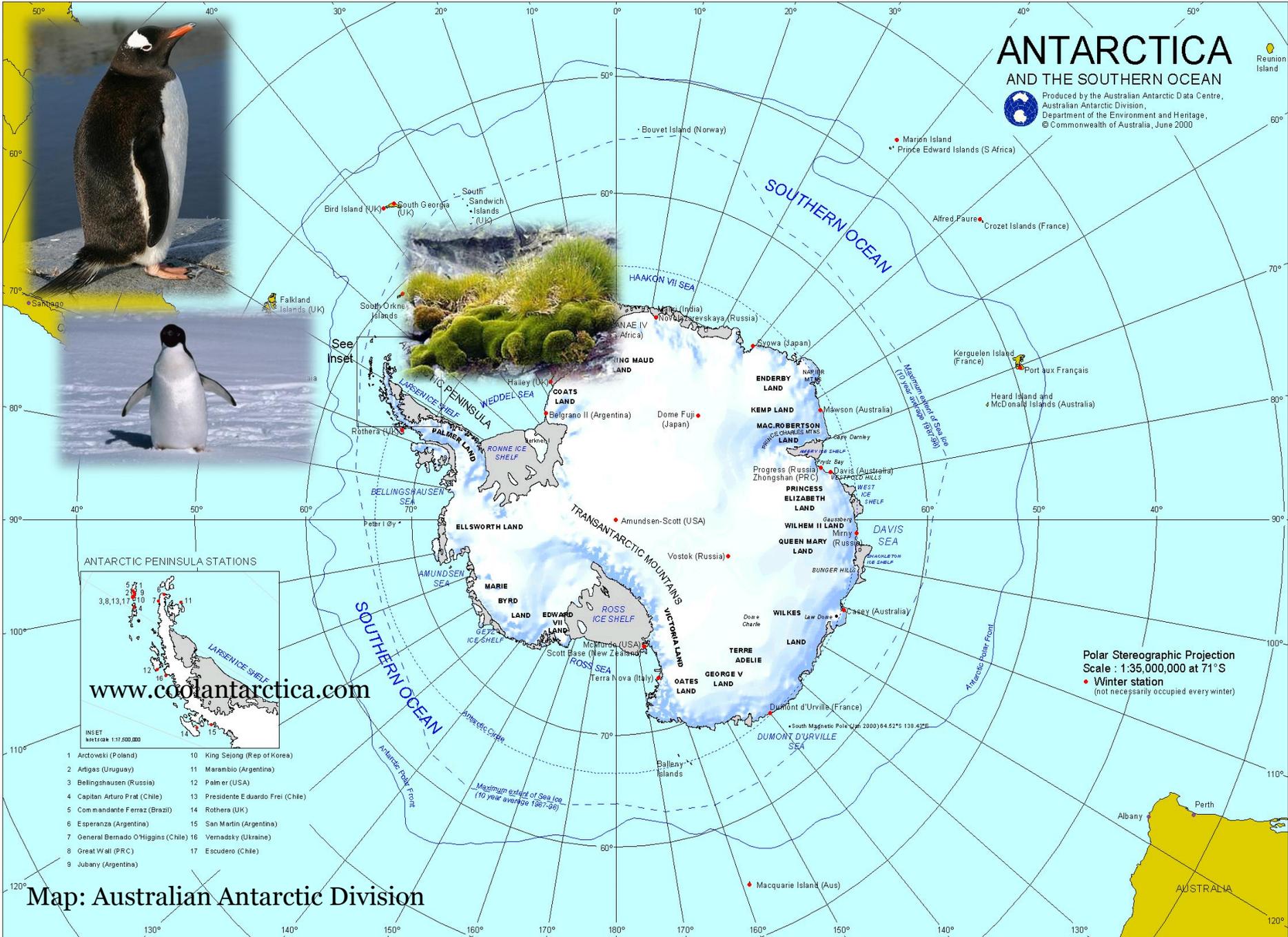
# Climate change implications for environmental management

- SCAR ACCE report - the next 100 years will see:
  - Temperature and water availability affecting terrestrial ecosystems
  - Temperature, precipitation and wind speed affecting freshwater systems
  - The risk of non-native species establishments / invasion
  - Changes in sea temperature, circulation, sea-ice and acidity coupled with increased ice berg scour affecting benthic and pelagic ecosystems
  - Regional extinctions of some seal and penguin species and expansions in the range of others
  - Increased likelihood of invasive marine species (and expansion of displaced native species)

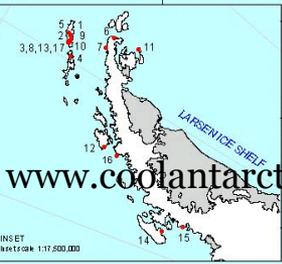


# ANTARCTICA AND THE SOUTHERN OCEAN

Produced by the Australian Antarctic Data Centre,  
 Australian Antarctic Division,  
 Department of the Environment and Heritage,  
 © Commonwealth of Australia, June 2000



## ANTARCTIC PENINSULA STATIONS



[www.coolantarctica.com](http://www.coolantarctica.com)

- |                                      |                                    |
|--------------------------------------|------------------------------------|
| 1 Arctowski (Poland)                 | 10 King Sejong (Rep of Korea)      |
| 2 Artigas (Uruguay)                  | 11 Marambio (Argentina)            |
| 3 Bellingshausen (Russia)            | 12 Palmer (USA)                    |
| 4 Capitán Arturo Prat (Chile)        | 13 Presidente Eduardo Frei (Chile) |
| 5 Comandante Ferraz (Brazil)         | 14 Rothera (UK)                    |
| 6 Esperanza (Argentina)              | 15 San Martín (Argentina)          |
| 7 General Bernardo O'Higgins (Chile) | 16 Vernadsky (Ukraine)             |
| 8 Great Wall (PRC)                   | 17 Escudero (Chile)                |
| 9 Jubany (Argentina)                 |                                    |

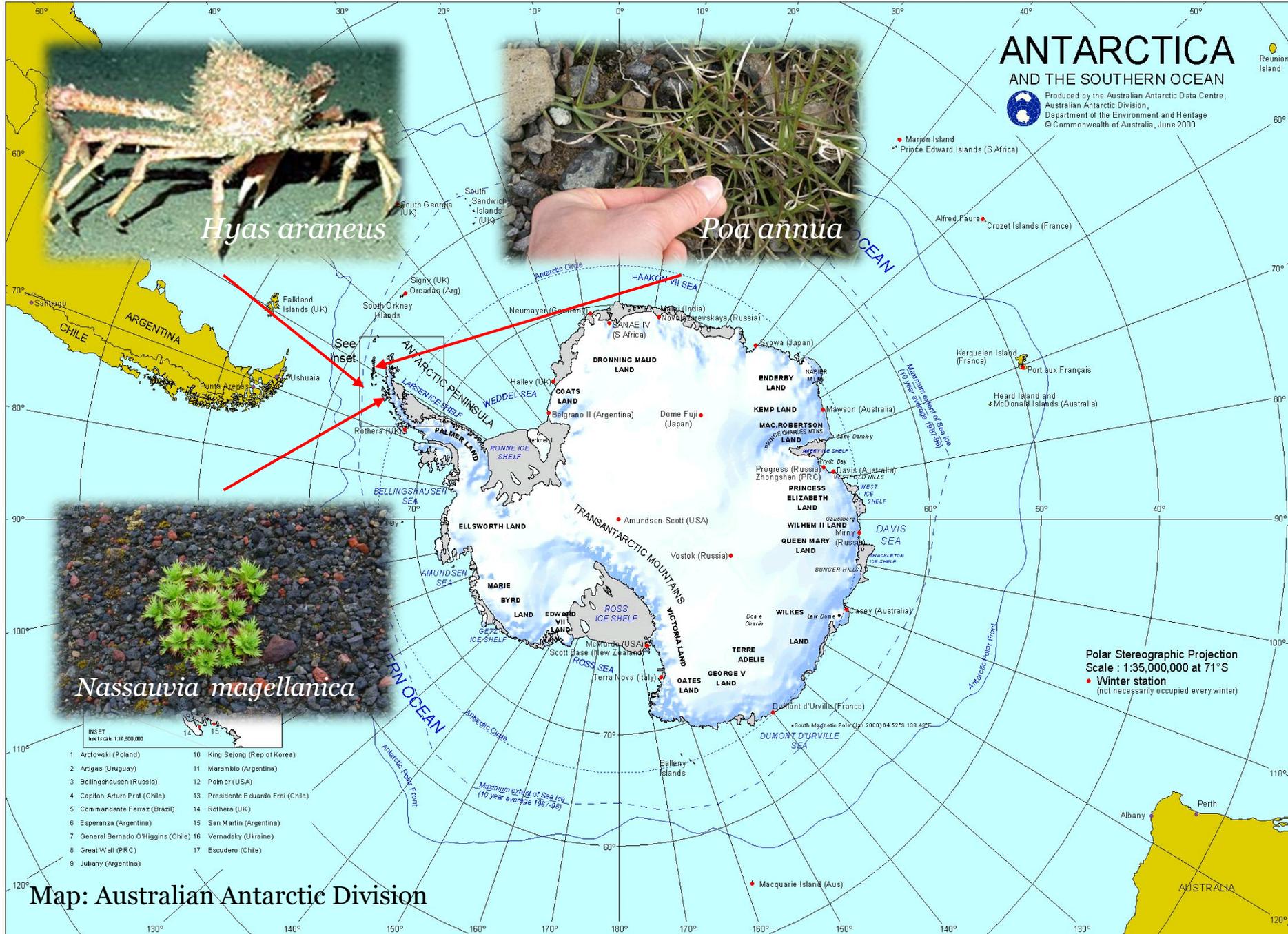
Map: Australian Antarctic Division

Polar Stereographic Projection  
 Scale : 1:35,000,000 at 71° S  
 • Winter station  
 (not necessarily occupied every winter)

# ANTARCTICA AND THE SOUTHERN OCEAN



Produced by the Australian Antarctic Data Centre,  
Australian Antarctic Division,  
Department of the Environment and Heritage,  
© Commonwealth of Australia, June 2000



*Hyas araneus*

*Poa annua*

*Nassauvia magellanica*

INSET  
SCALE 1:17,500,000

- |                                      |                                    |
|--------------------------------------|------------------------------------|
| 1 Arctowski (Poland)                 | 10 King Sejong (Rep of Korea)      |
| 2 Artigas (Uruguay)                  | 11 Marambio (Argentina)            |
| 3 Bellingshausen (Russia)            | 12 Palmer (USA)                    |
| 4 Capitán Arturo Prat (Chile)        | 13 Presidente Eduardo Frei (Chile) |
| 5 Comandante Ferraz (Brazil)         | 14 Rothera (UK)                    |
| 6 Esperanza (Argentina)              | 15 San Martín (Argentina)          |
| 7 General Bernardo O'Higgins (Chile) | 16 Vernadsky (Ukraine)             |
| 8 Great Wall (PRC)                   | 17 Escudero (Chile)                |
| 9 Jubany (Argentina)                 |                                    |

Map: Australian Antarctic Division

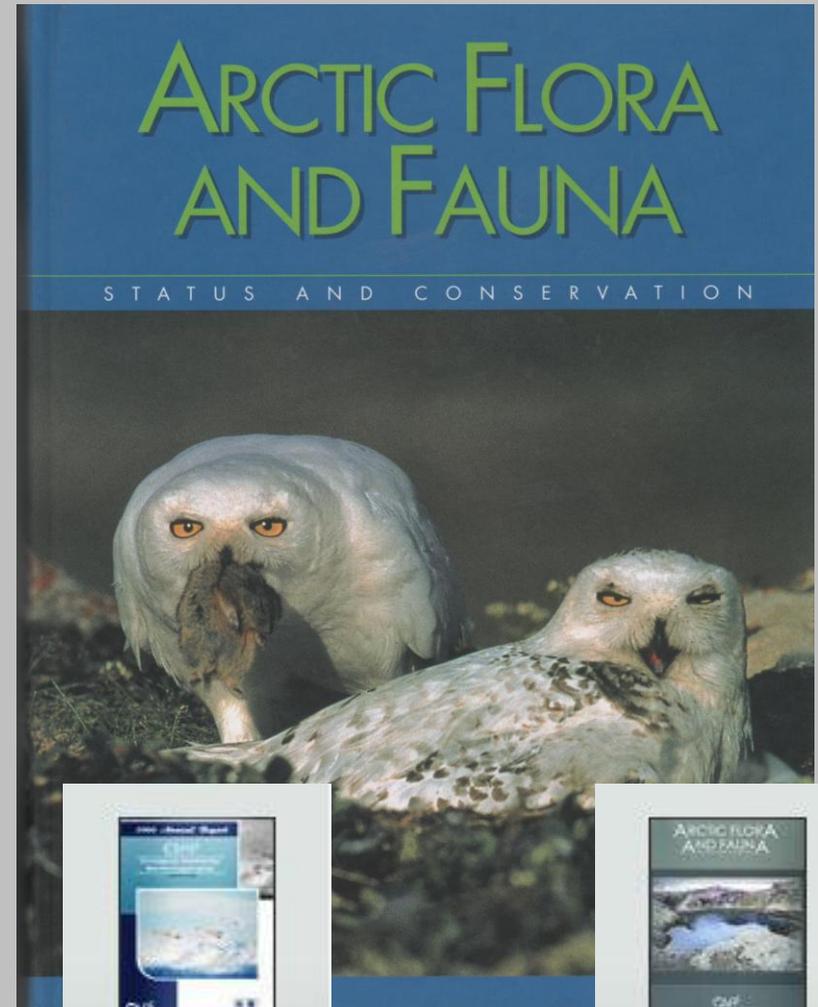
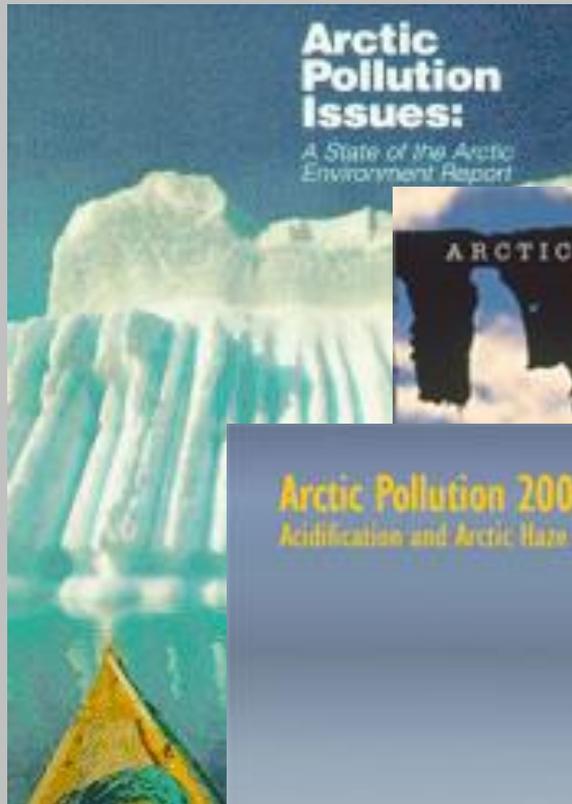
Polar Stereographic Projection  
Scale : 1:35,000,000 at 71° S  
• Winter station  
(not necessarily occupied every winter)

# Climate change implications for environmental management

---

- How might we respond?
- ~~Improved~~ **Monitoring** on appropriate spatial and temporal scales. SCAR ACCE report stresses urgent need for:
  - Baseline biodiversity and biogeographic surveys
  - Systematic and robust monitoring programmes at a network of “flagship” locations
- ~~Qualitative risk assessments~~ **Quantitative risk assessments** and scenario planning
  - Regional basis (e.g. Peninsula); shorter (decadal) timescales; key environments or species
- ~~Mitigating~~ **Mitigating** antagonistic effects of human activities
  - Rigorous use of existing management tools (species and area protection, environmental guidance and EIA)
  - Bold decisions based on a precautionary approach

# Arctic responses



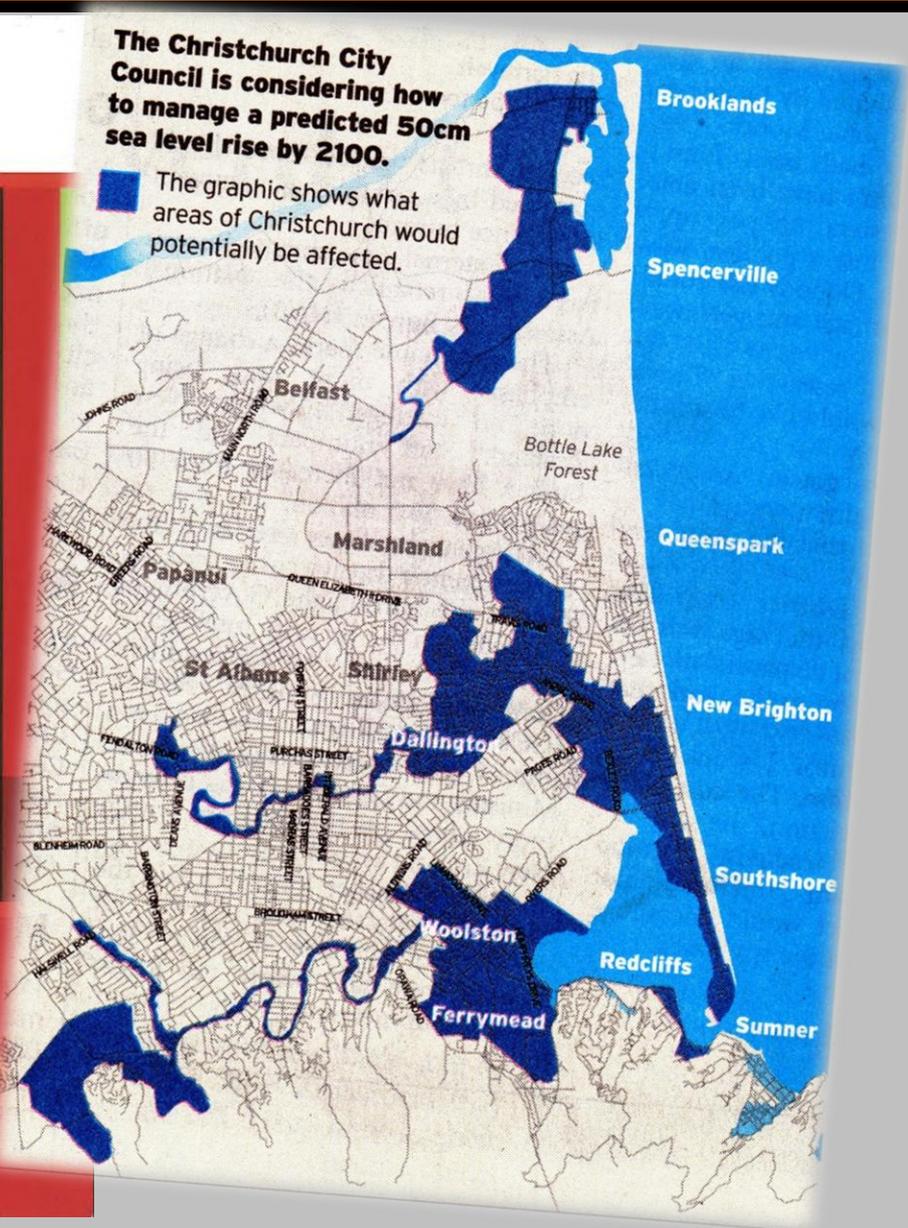


# Climate change implications for environmental management

---

- How might we do this?
- ATCM to make clear
  - The priority it places on climate change
  - Its expectations of the CEP
- CEP to develop climate change work programme taking account of ACCE recommendations
  - Prioritised and with resourcing options
    - Dedicated working group: risk assessments & scenario plans for key regions, environments, species
    - CEP and SCAR to develop a terrestrial ecosystem monitoring programme (ACCE Recommendation)
    - CEP and SCAR to identify innovative ways of enhancing the science – policy dialogue

# Scenario planning



## Preparing for climate change

A guide for local government in New Zealand



# Climate change implications for National Programmes



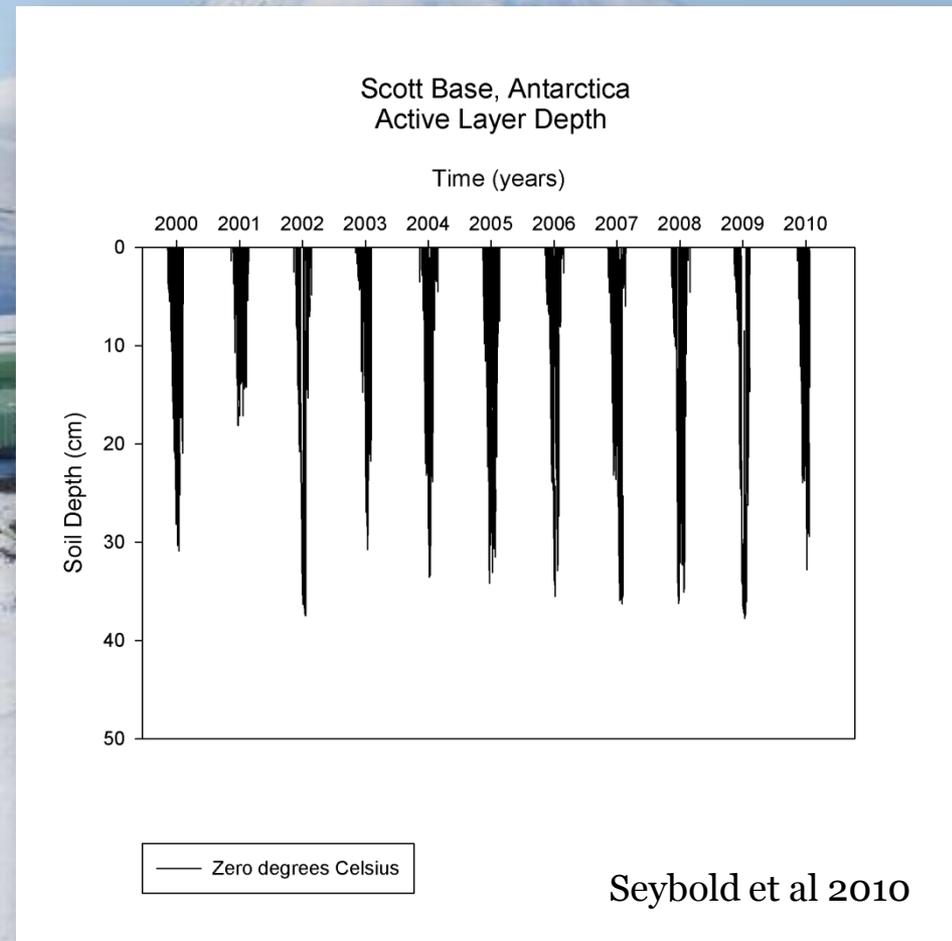
# Climate change implications for National Programmes



- A changing Antarctic environment has clear implications for:
  - Infrastructure
  - Access to the continent
  - transport

# Infrastructure

- ACCE report – 90% of Antarctic bases are located in regions susceptible to permafrost change



# Permafrost melt – already an Arctic challenge



# Permafrost melt – already an Arctic challenge

---





**British Antarctic Survey**



**British Antarctic Survey**

# Shipping access



**South African National Antarctic Programme**

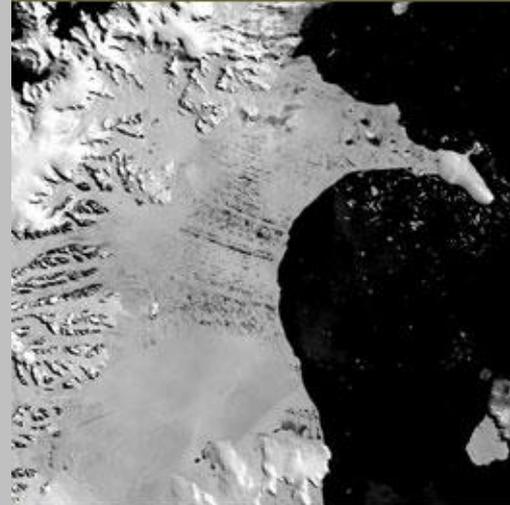


**British Antarctic Survey**

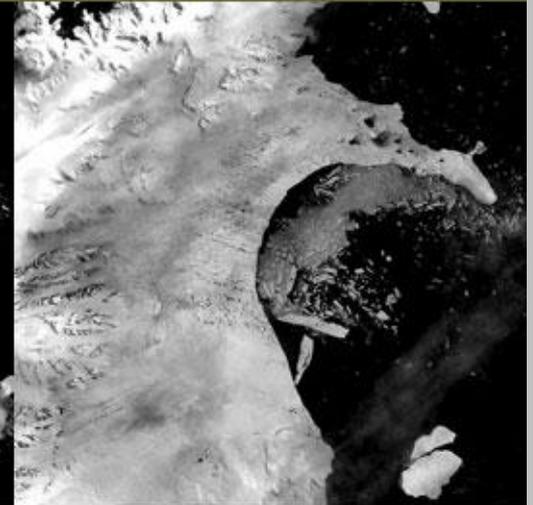
# Shipping access



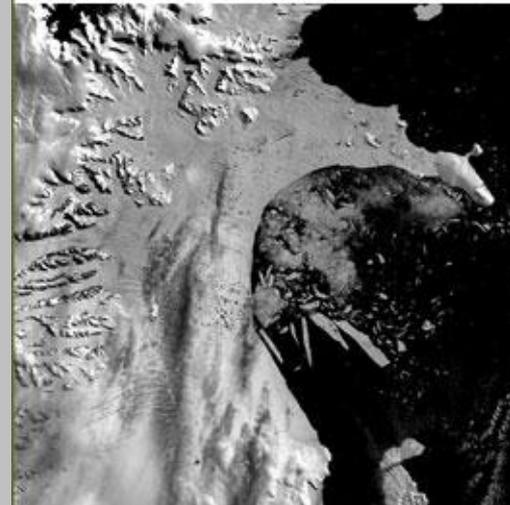
Larsen B ice shelf collapses in Antarctica



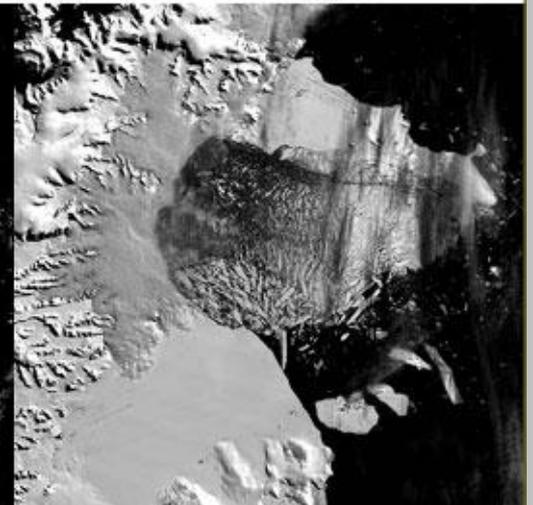
31 January 2002



17 February 2002



23 February 2002



5 March 2002

**Note:** Satellite imagery analyzed in early 2002 revealed that the northern section of the Larsen B ice shelf had disintegrated and separated from the continent within a 35-day period.  
**Source:** Moderate Resolution Imaging Spectroradiometer (MODIS), NASA Terra satellite, National Snow and Ice Data Center, University of Colorado ([nsidc.org/iceshelves/larsenb2002/](http://nsidc.org/iceshelves/larsenb2002/))

# Air access



# Climate change implications for logistics

---

- How might we respond?
- Planning for change in our logistical operations
  - Identifying areas at risk from ice loss / permafrost change
  - Identifying alternative logistical and science support options (e.g. remote sensing) and locations
  - Ensuring climate change implications become standard considerations in logistical EIAs
- Request COMNAP to undertake thorough risk assessment of climate change impacts on national programmes – based on SCAR's ACCE report.

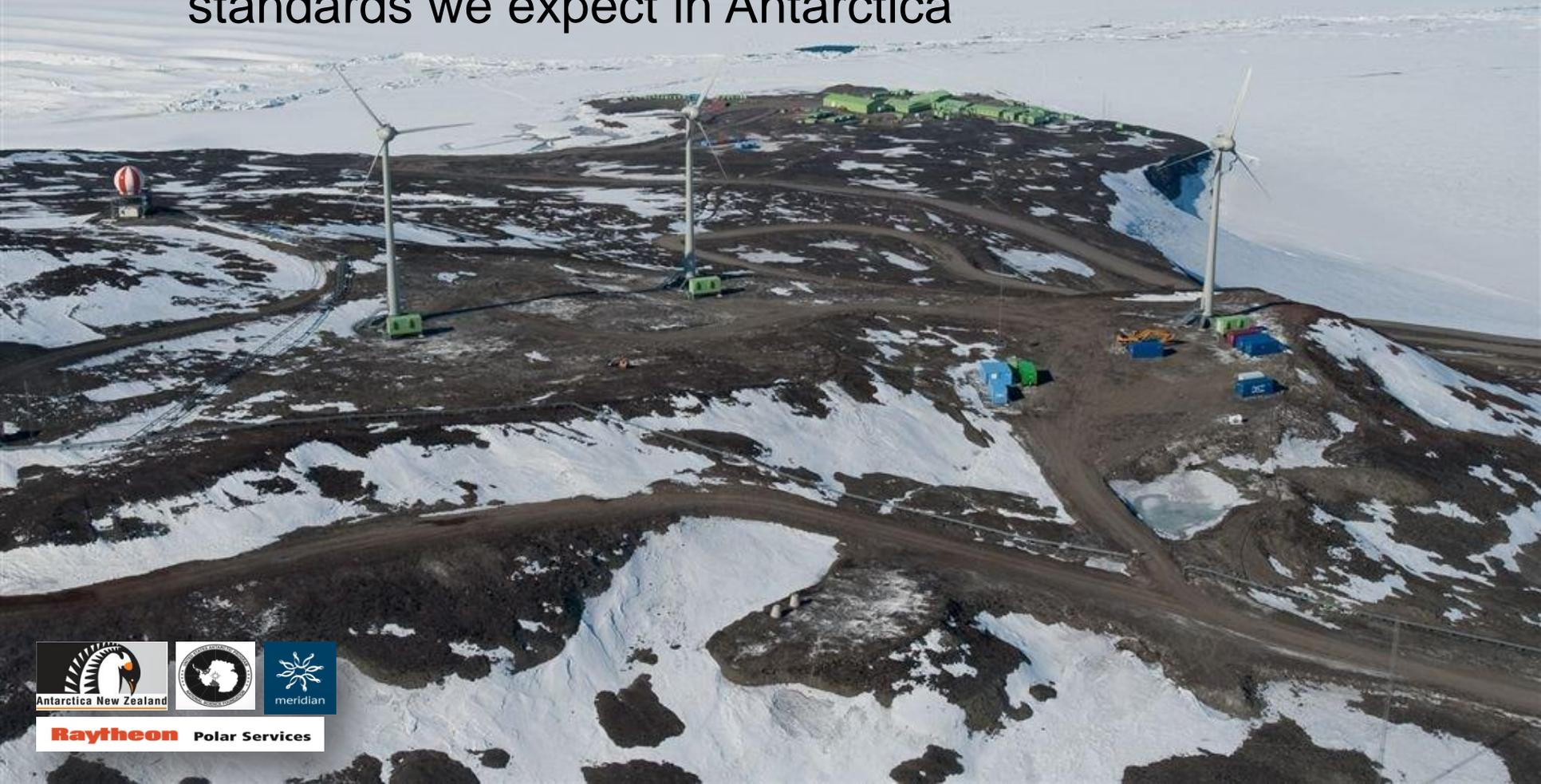
# Sustainable National Programmes

- National programmes as exemplars of sustainability



# Sustainable National Programmes

- Not because it makes a difference globally....  
....but because such an approach is consistent with the standards we expect in Antarctica

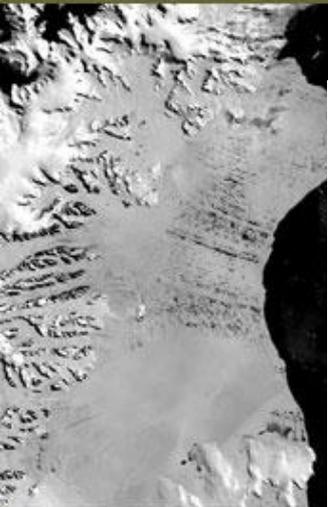


# Climate change implications for the ATS

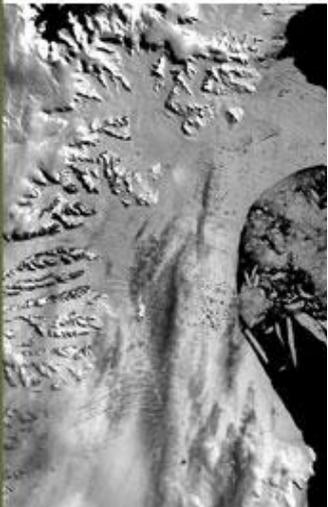


# Progress to date

Larsen B ice shelf collapse in Antarctica



31 January 2002

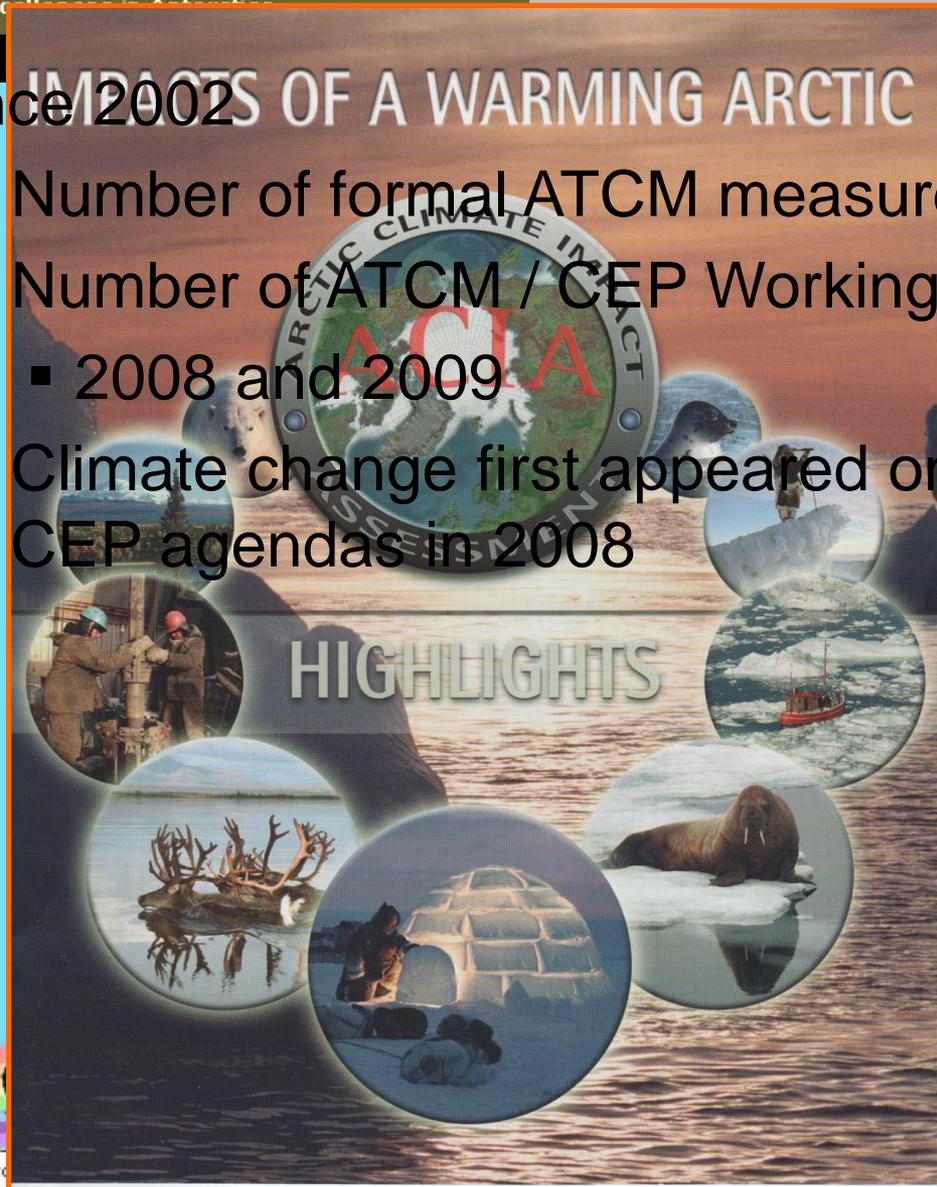


23 February 2002

**Note:** Satellite imagery analyzed by the National Snow and Ice Data Center, University of Colorado (nsidc.org/images/news/larsenb2002/)  
**Source:** Moderate Resolution Imaging Spectroradiometer (MODIS) data from the Earth Observing Satellite (EOS) Terra satellite.

## IMPACTS OF A WARMING ARCTIC

- Number of formal ATCM measures – 1
- Number of ATCM / CEP Working Papers – 3
  - 2008 and 2009
- Climate change first appeared on ATCM / CEP agendas in 2008



# Climate change implications for the ATS

---

- Is the status quo approach to managing Antarctica acceptable?
  - Climate change in Antarctica is happening, is insidious and unstoppable
  - Implications suggest “do nothing” is not an option
  - At stake:
    - Loss of the environmental, scientific and political values we place on Antarctica
    - Loss of credibility of the Treaty System

# Climate change implications for the ATS

- Antarctic Treaty System is well established
  - Legal and political mechanisms
  - Advisory bodies (CEP; SC-CAMLR)
  - Secretariats
  - Expert bodies (SCAR; COMNAP)



# Climate change implications for the ATS

---

## 50<sup>th</sup> Anniversary declaration:

- **Recalling** their commitment to the comprehensive protection of the Antarctic environment and dependent and associated ecosystems, and the designation of Antarctica as a natural reserve, devoted to peace and science,
- **Concerned** about the implications of global environmental change, in particular climate change, for the Antarctic environment and dependent and associated ecosystems,
  - Underscore the importance of the Protocol on Environmental Protection to the Antarctic Treaty;
  - Pledge to strengthen their efforts to preserve and protect the Antarctic terrestrial and marine environments;
  - Confirm their intention to work together to better understand changes to the Earth's climate and to actively seek ways to address the effects of climate and environmental change on the Antarctic environment and dependent and associated ecosystems;

# Climate change implications for the ATS

---

- How might we respond?
- Issue placed firmly on ATCM and CCAMLRLR agendas
  - ATCM and CCAMLRLR to identify expectations of their advisory bodies
  - CEP / SC-CAMLRLR to develop clear work programmes using ACCE as a basis
    - e.g. dedicated working groups established
- Improved co-operation / information exchange between ATCM and CCAMLRLR (CEP and SC-CAMLRLR)
- Consideration of additional resources for Treaty Secretariat
  - e.g. data and information management

# Summary

## An imprecise response to an uncertain situation

- SCAR's ACCE report is seminal
- How the Treaty System responds is crucial
  - At risk are the environmental, scientific and political values we currently place on Antarctica
- If the Treaty System is to retain its integrity and achieve its objectives, essential that an effective response to ACCE report is developed:
  - The issue is placed as a high priority on meeting agendas
  - Enhanced science effort and improved science / policy dialogue
  - Clear climate change response programmes
  - ATCM and CCAMLR make clear their expectations and coordinate their activities