Climate Change & Variability

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Natural "Background" Greenhouse Effect:

- Water vapour; carbon dioxide

"Enhanced" Greenhouse Effect

- Carbon dioxide; Methane; NOX; HCFCs

Climate Variability

Science:

- Uncertainty, Modelling, Projections, Congruence

Policy

Intergovernmental Panel on Climate Change (IPCC): 3rd Report - 2001

WG 1: Climate System Science: Current knowledge

- Temperatures have increased
- Snow & ice cover have decreased
- Sea level has risen and heat content has increased
- Precipitation has changed
- But:
  - Much of the Southern Hemisphere is not hotter
  - No discernible change in Antarctic sea ice extent (!)
  - Storm intensity & frequency dominated by climate variation
  - No systematic changes to storms

WG 2: Impacts, Adaptation & Vulnerability

- Temperature increases have affected biological systems
- People have been affected by floods and droughts
- Natural systems are vulnerable, some irreversibly

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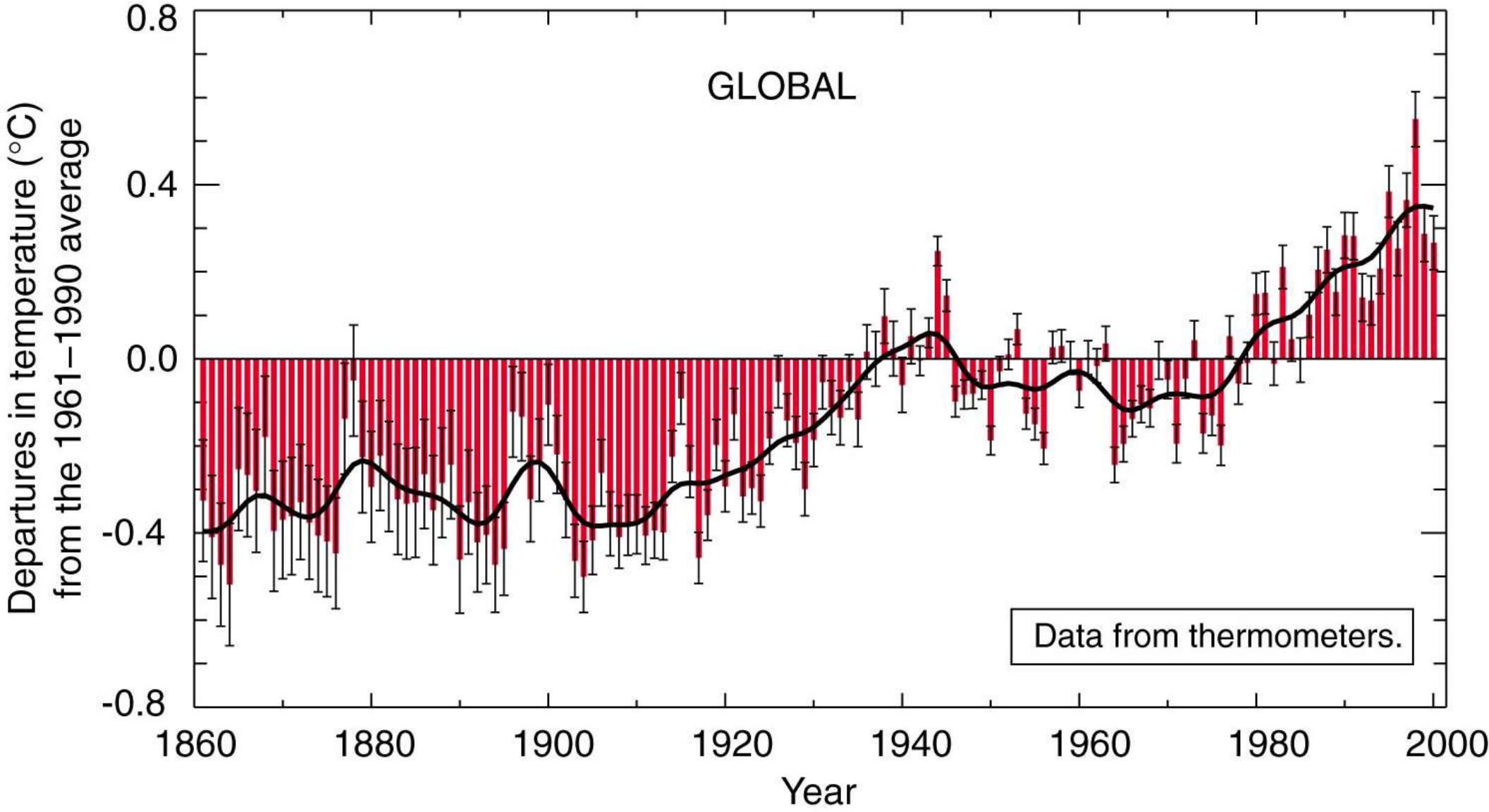
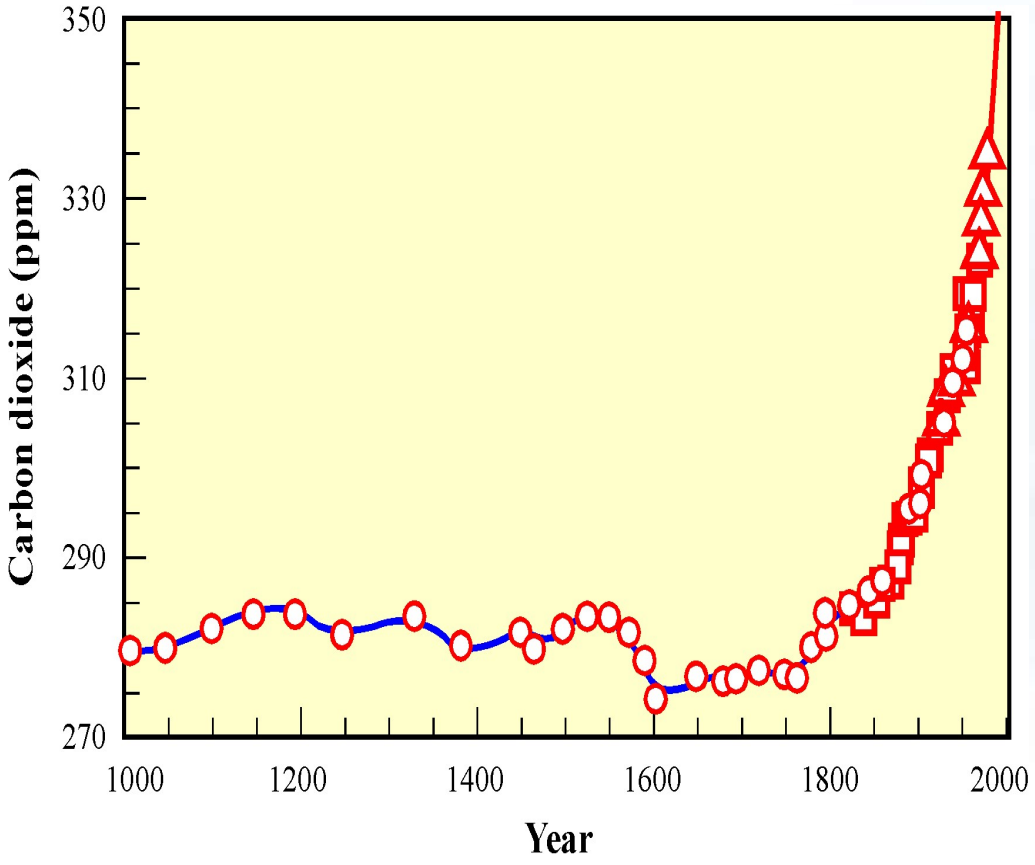
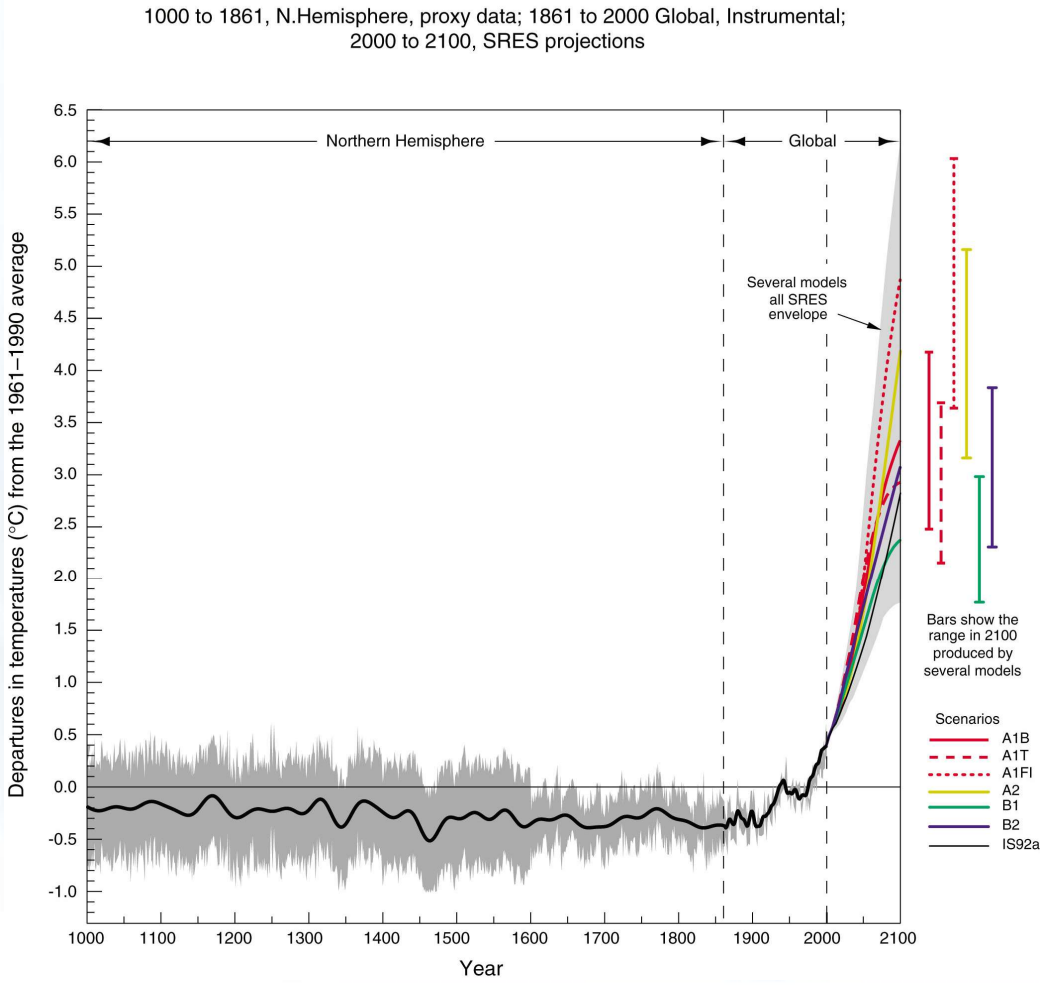
IPCC: Observations give a collective picture of a warming world



IPCC: Greenhouse gases and aerosols continue to alter the atmosphere





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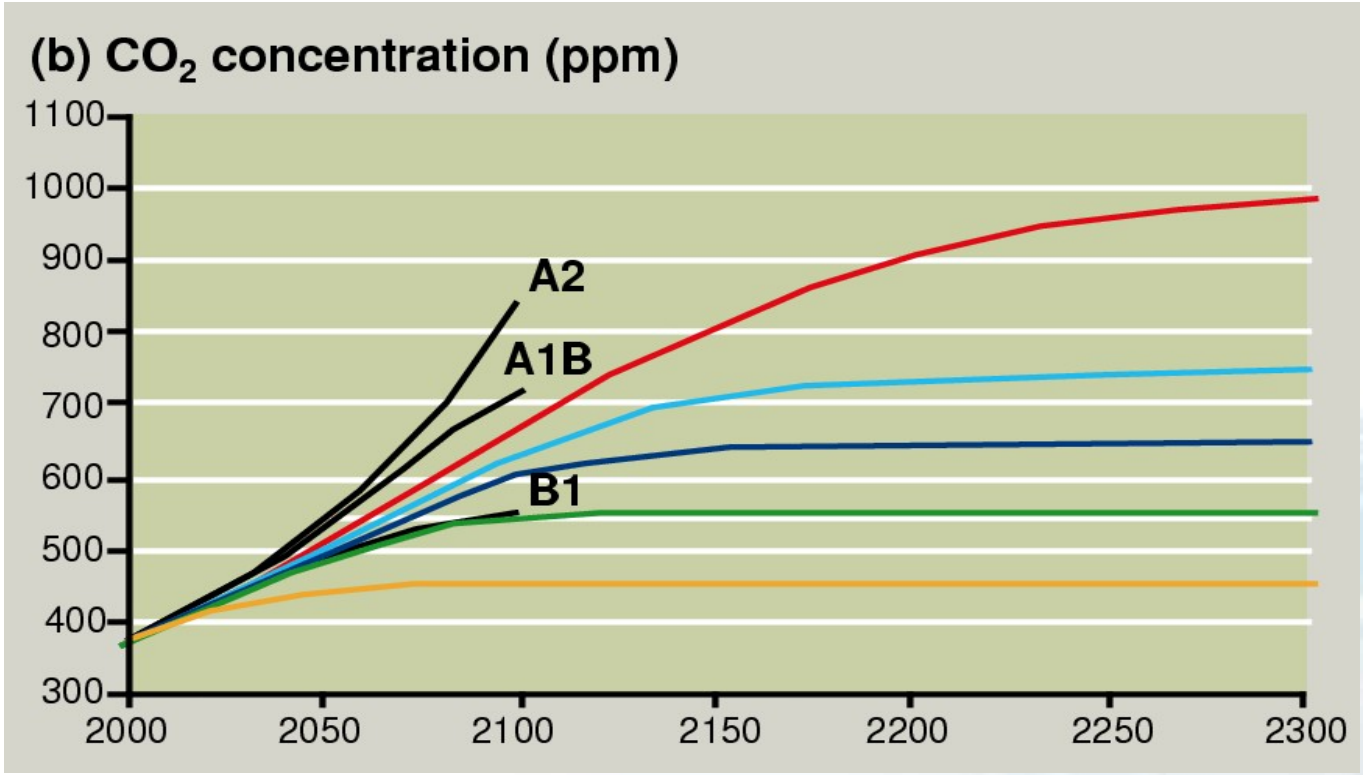
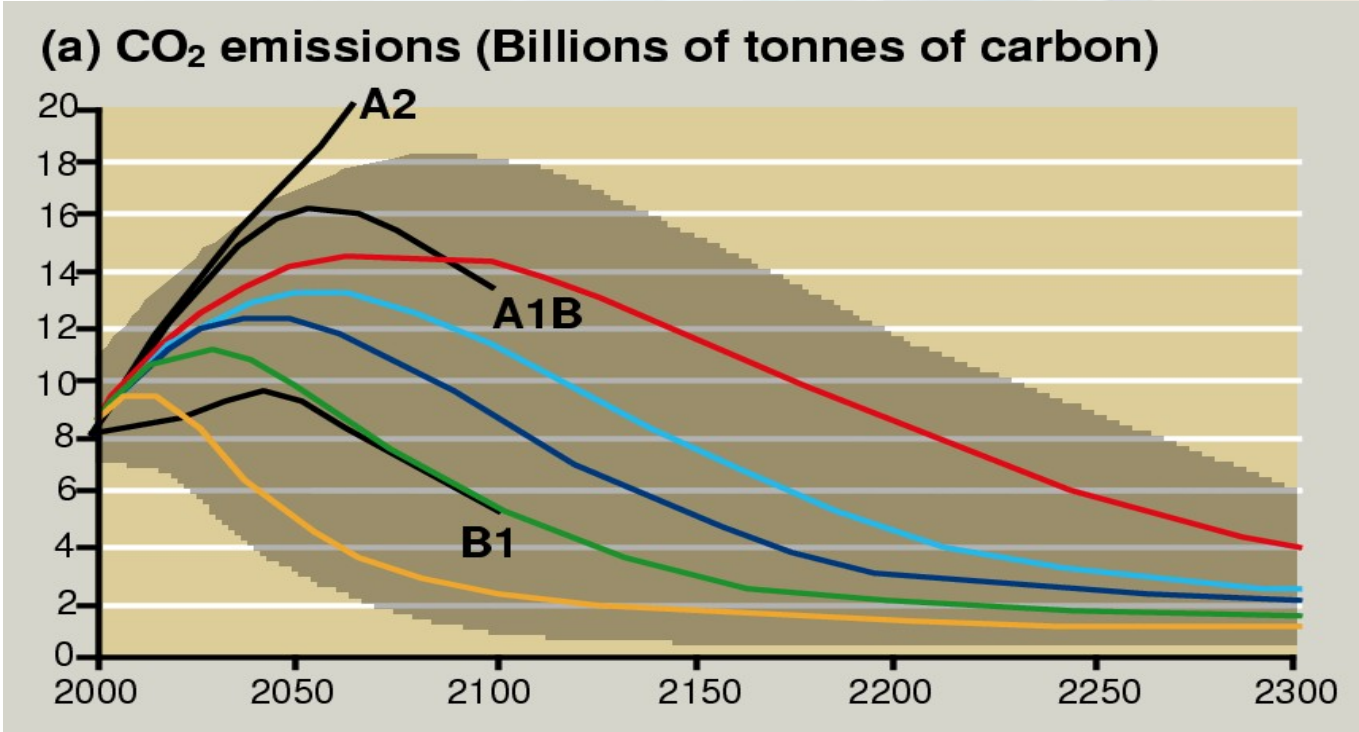


Future GHG level scenarios

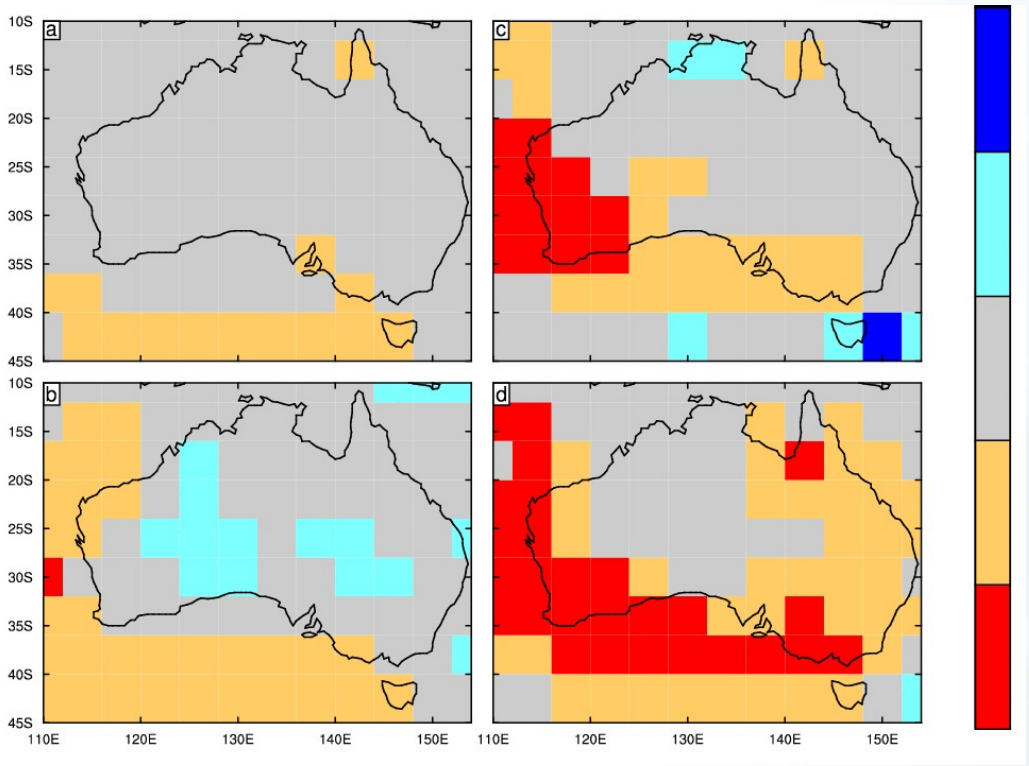
Future emission scenarios



IPCC: Confidence in climate model predictions has increased

Summer

Winter



Inter-model Consistency

7/9 large increase

7/9 increase

Inconsistent

7/9 decrease

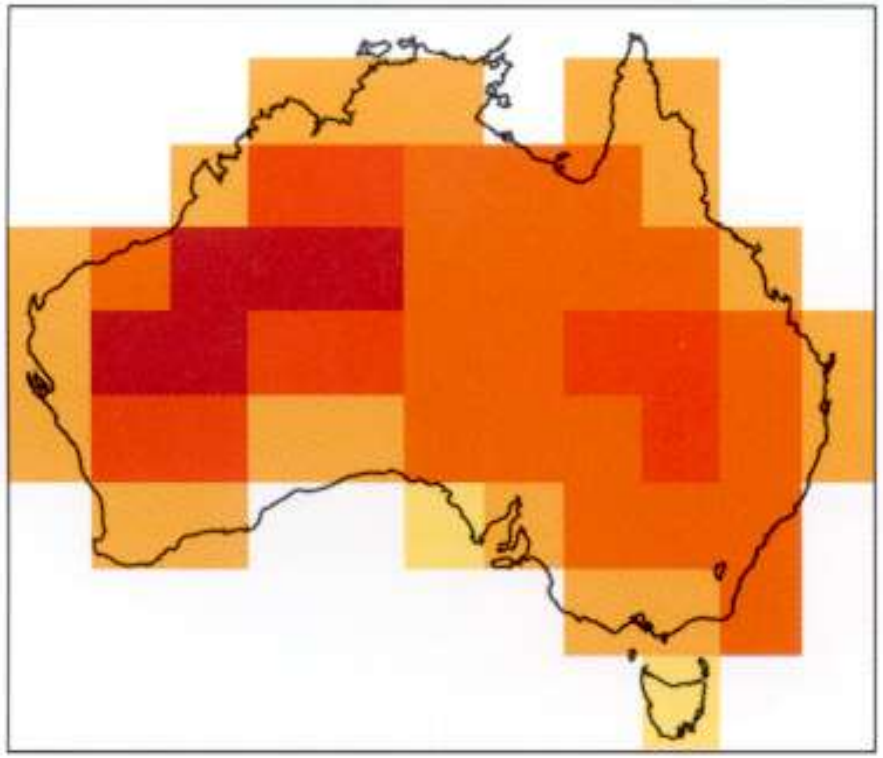
7/9 large decrease

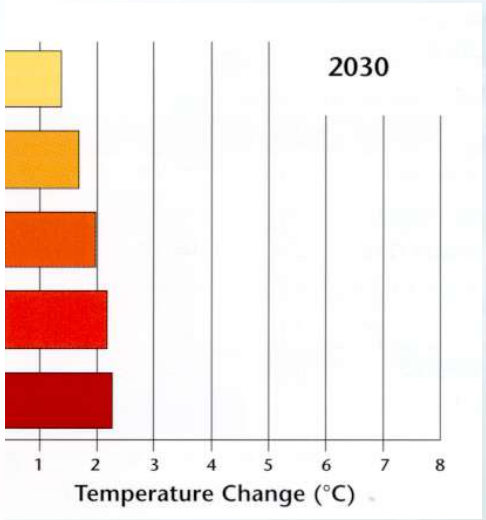
Autumn

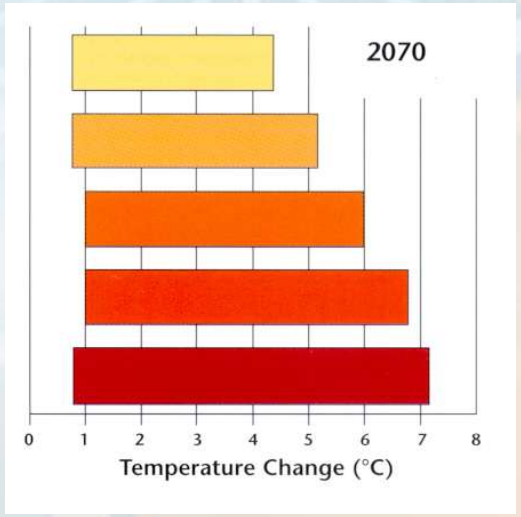
Spring

Projected Rainfall Changes

IPCC: Confidence in climate model predictions has increased

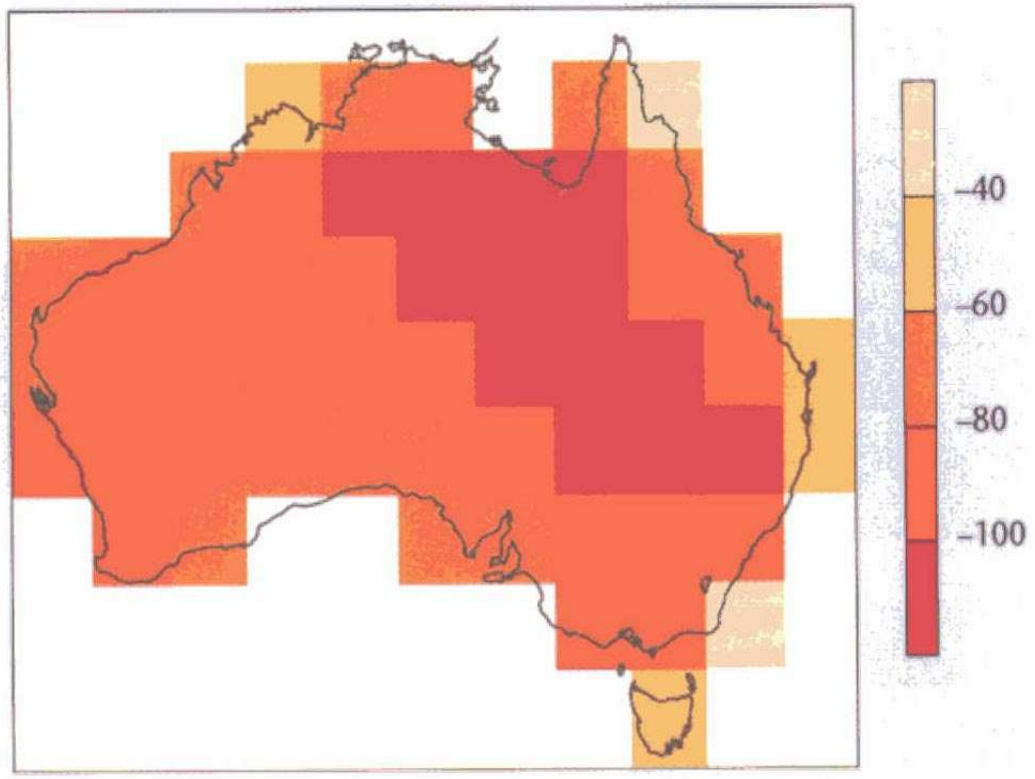






Australia: Impacts - Temperature

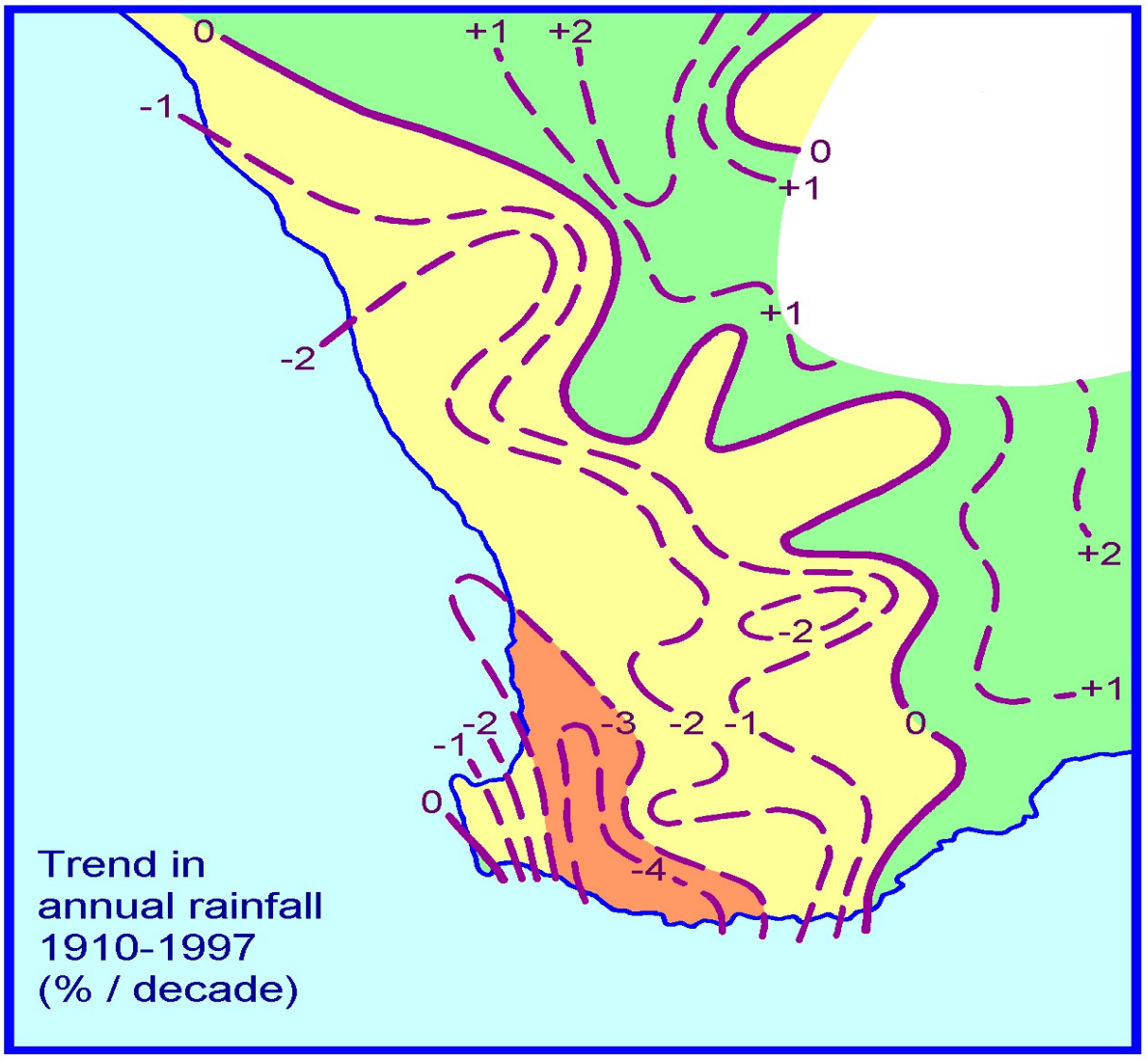
IPCC: Confidence in climate model predictions has increased



- mm / yr / 1°C temperature increase

Australia: Impacts - Soil Moisture Change

Western Australia's experience: Climate Variability



Trend in Annual Rainfall: 1910 - 1997 (% / decade)

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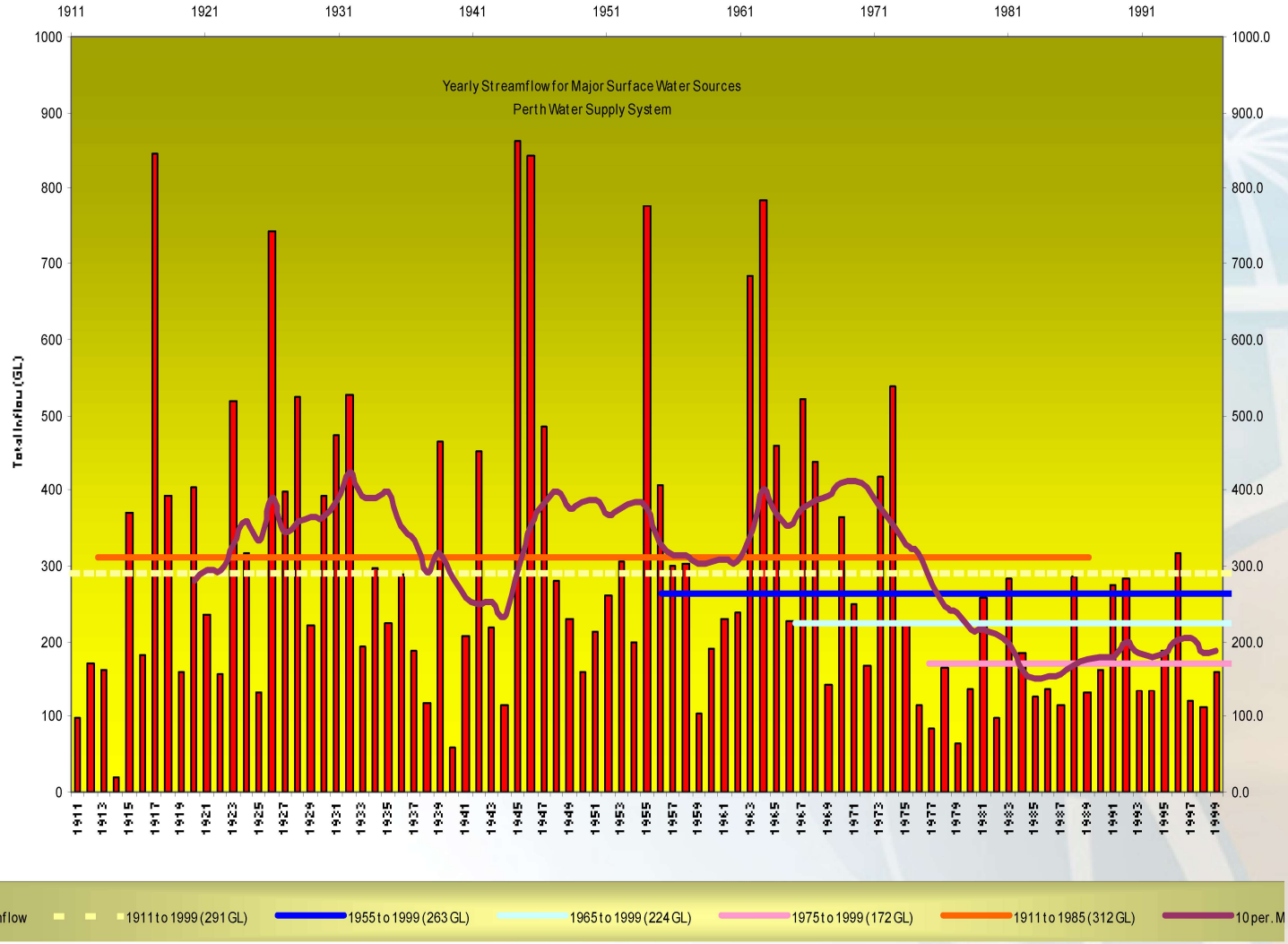
Western Australia's experience: Climate Variability -



Runoff to urban surface water reservoirs

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How do managers of our natural resources and climate-dependent industries plan when the past no longer predicts the future?

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"Our knowledge of the climate system will *ALWAYS* suffer from significant uncertainty because of its open, complex, and heterogeneous character and the long time scales involved."

H von Storch & N Stehr, *Nature*, *405*, 615, 2000

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US National Academy of Sciences (Feb 2001)

- IPCC's conclusions accurately reflect current scientific thinking
- The IPCC report is an admirable summary of research activities
- No changes were made to the policy summaries without consent of convening lead authors

• Chartered Insurance Institute (Feb 2001)

- Do nothing is not an option
- Non-linearity of storm events -> severity and storm damage

Australia:

- Party to UNFCC
- Has signed but not ratified Kyoto Protocol
- Government position:
  - No ratification without US and developing nations

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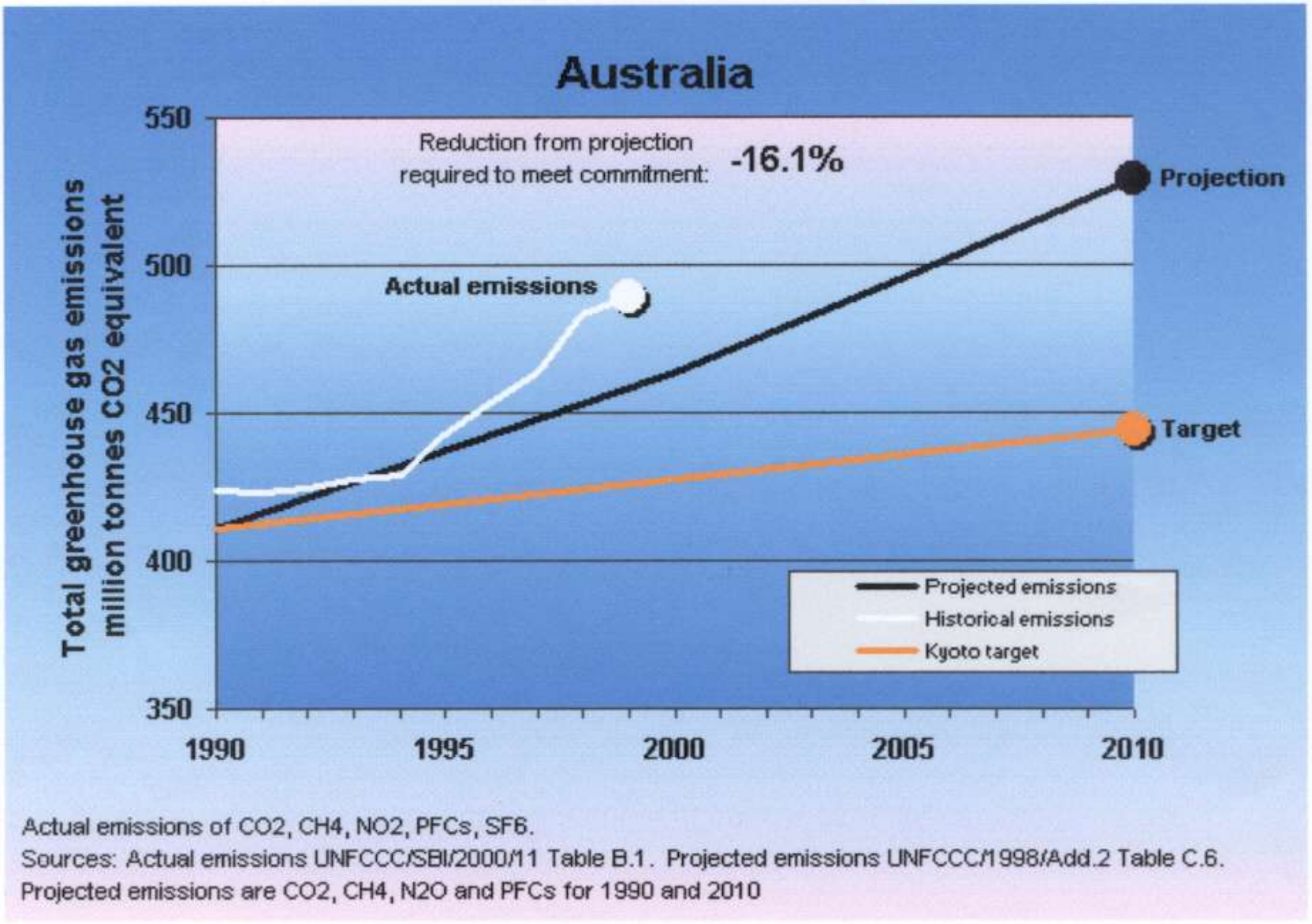

Actual emissions of CO2, CH4, NO2, PFCs, SF6.
Sources: Actual emissions UNFCCC/SBI/2000/11 Table B.1. Projected emissions UNFCCC/1998/Add.2 Table C.6.
Projected emissions are CO2, CH4, N2O and PFCs for 1990 and 2010

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Western Australia

- W A Greenhouse Strategy
  - Adaptation
  - Sinks
  - Reduce Emissions
  - New Industries

Adaptation:

- Nature Conservation
  - Knowledge
  - CARRS
  - Off-reserve conservation
  - Off-site conservation
- Sustainable Community Benefits
  - Ecosystem services
  - Wildfires
  - Plantations
  - Facilities
  - Risk to visitors

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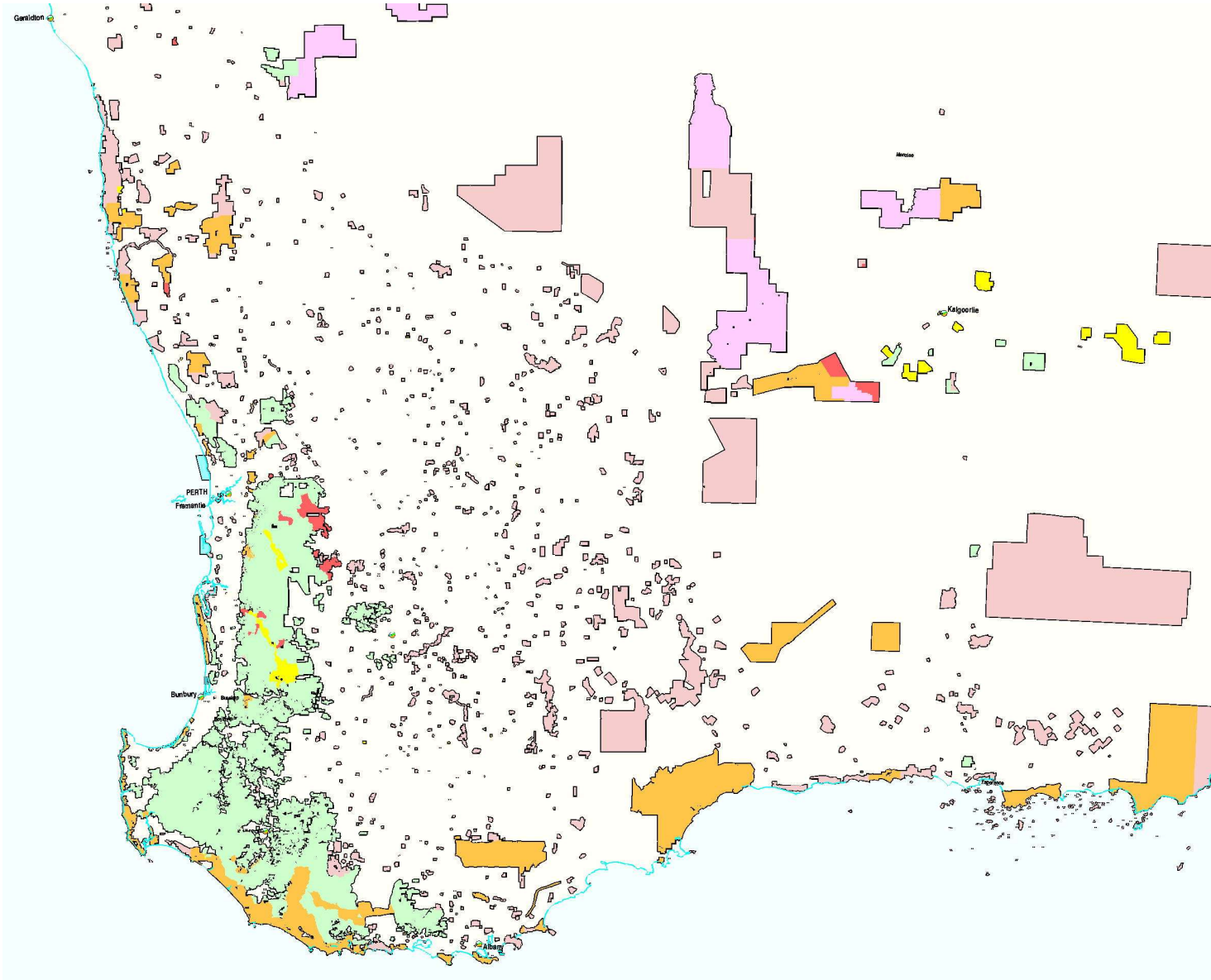
Conservation Status

- 352 R & E Plant Sp
- Salinity: 450 spp at risk
- Greenhouse: ???
- Representation

  in reserves ???



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Summary

- Real threats to Western Australia's Biota
  - Uncertain, but potentially serious
  - Research: impacts & response
- Revegetation has several benefits:
  - Carbon sequestration
  - Off reserve conservation
- Research required on fire: emissions & carbon cycle
- Departmental Leadership

Next Steps

- WA Greenhouse Strategy
  - Adaptation; Bioenergy & Sinks Policies;
- CR Legislation
- Departmental Greenhouse Strategy:
  - Research
  - Leadership: Energy audits; renewables
  - Opportunities: Carbon rights
  - Threats: Biodiversity
    - Workshop: 2 July 2002.