

Changing questions on climate change

- More people asking questions – general community, farmers, industry groups, policy makers and anyone organising a conference.

Nature of questions changing from

Is this real ? to.. What can we do about it ?

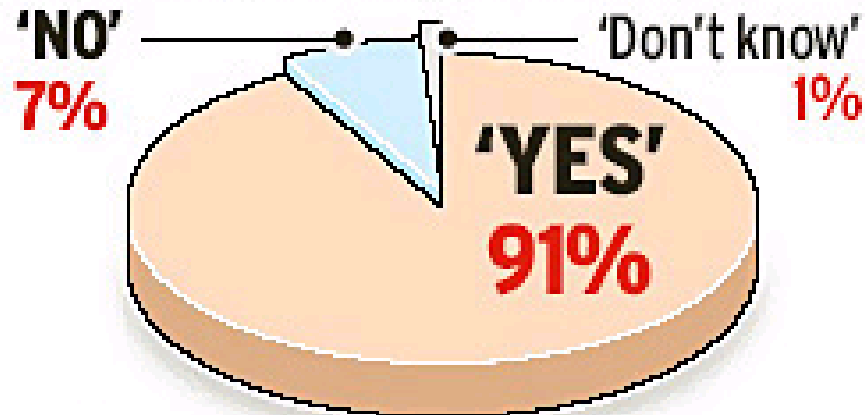
Reduce – Adapt - Innovate

Why such a change on attitudes to climate change in rural sector?

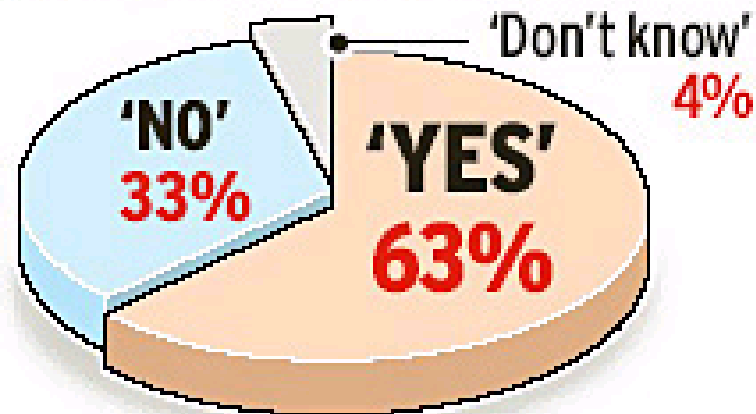
- Anecdotal, backed up by AGO commissioned survey work
- Rapidly changing
- Reflects national and international trends
- Media
- “Spooked by the weather”

THE HEAT IS ON

● Is global warming a problem?

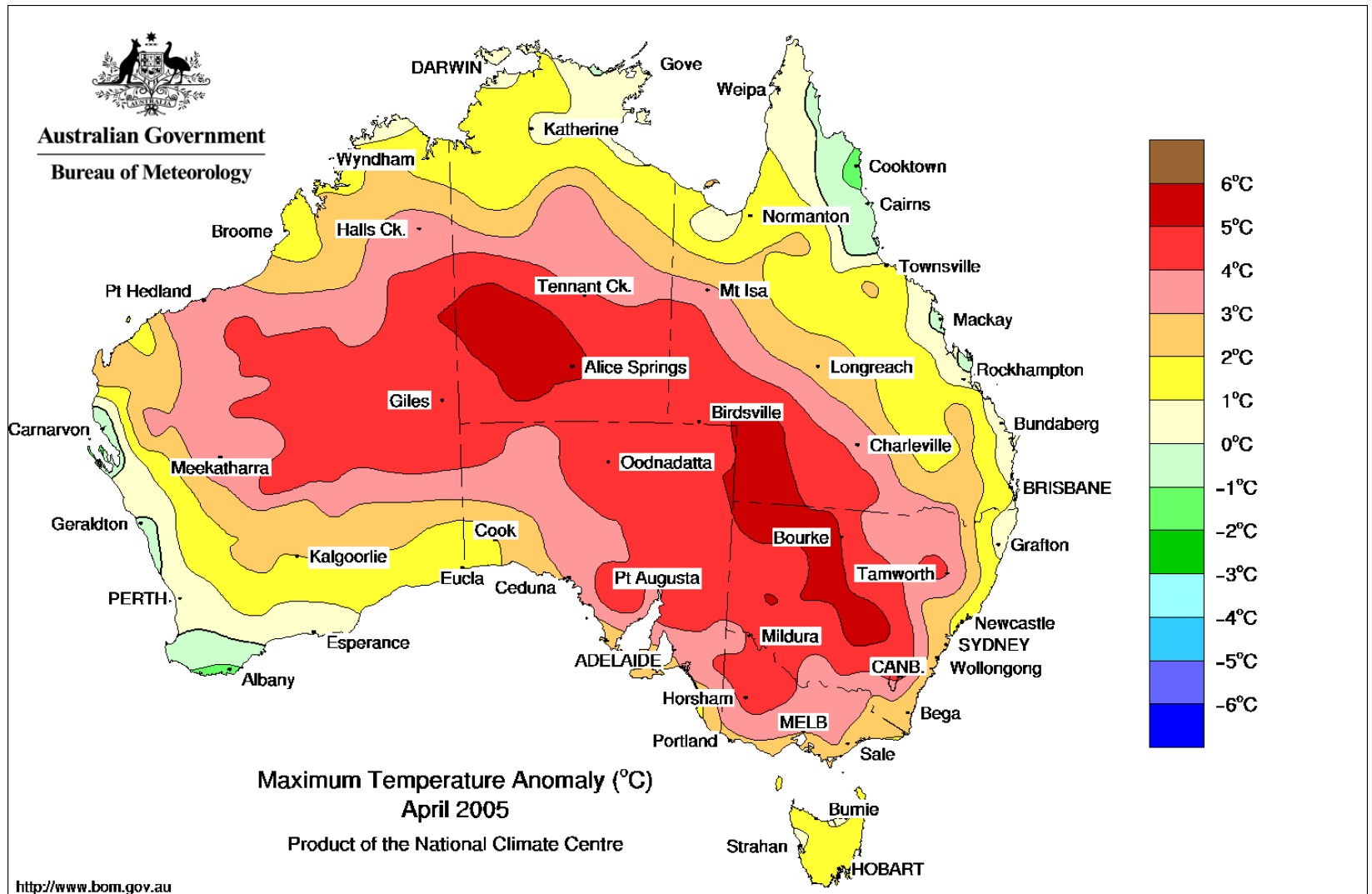


● Are you prepared to pay more to reduce greenhouse emissions?

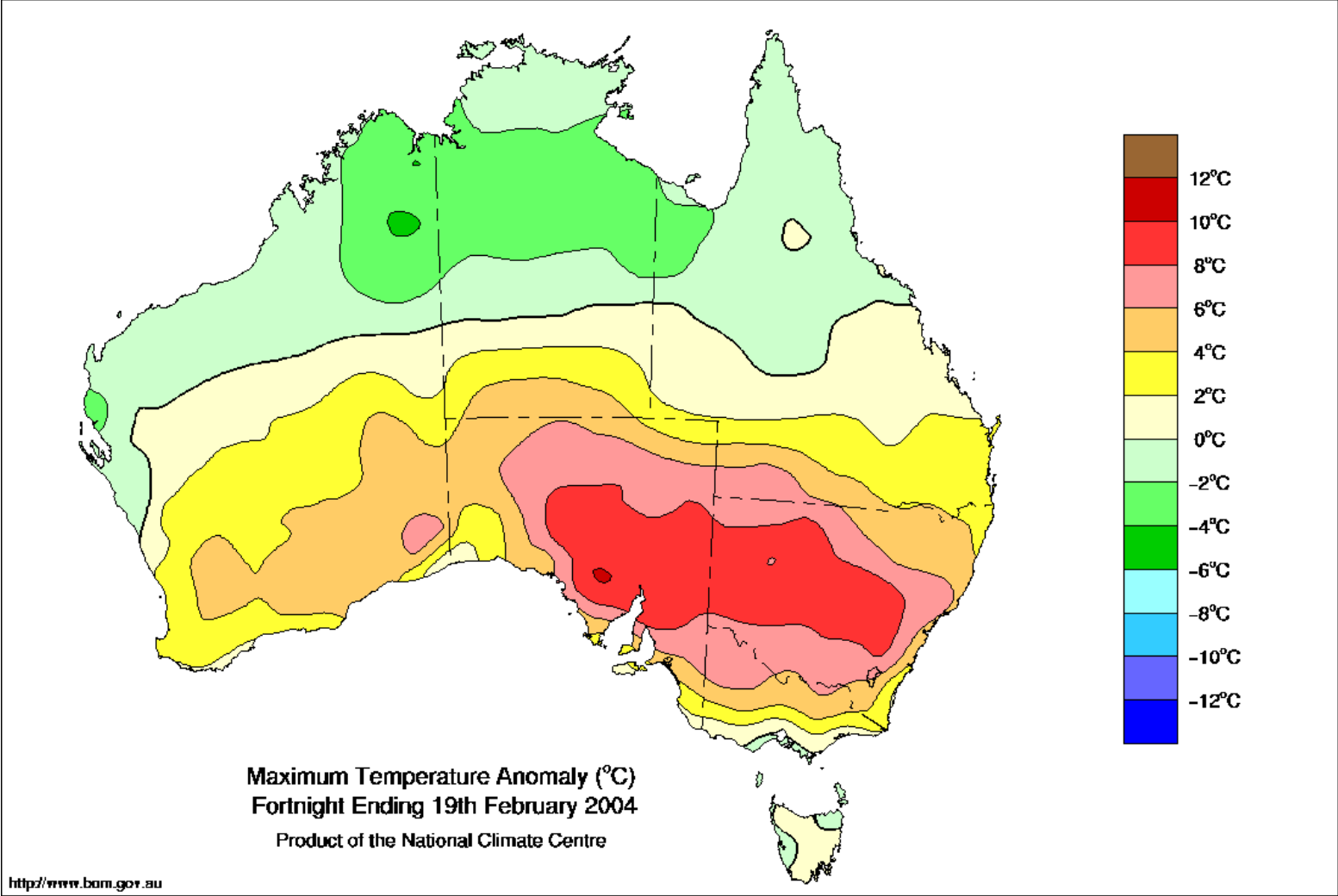


FIGURES MAY NOT ADD UP TO 100% DUE TO ROUNDING SOURCE: ACHIESEN

2005 - An exceptional April

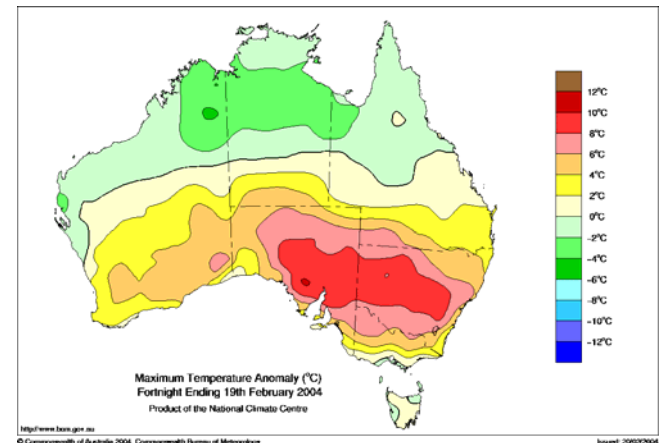


Impact of a single heat wave in February 2004



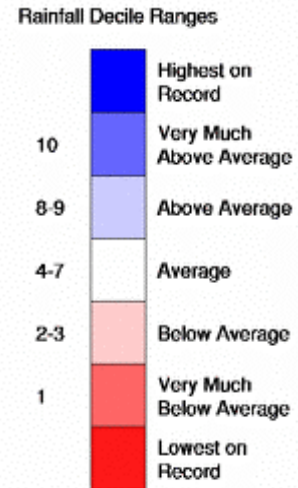
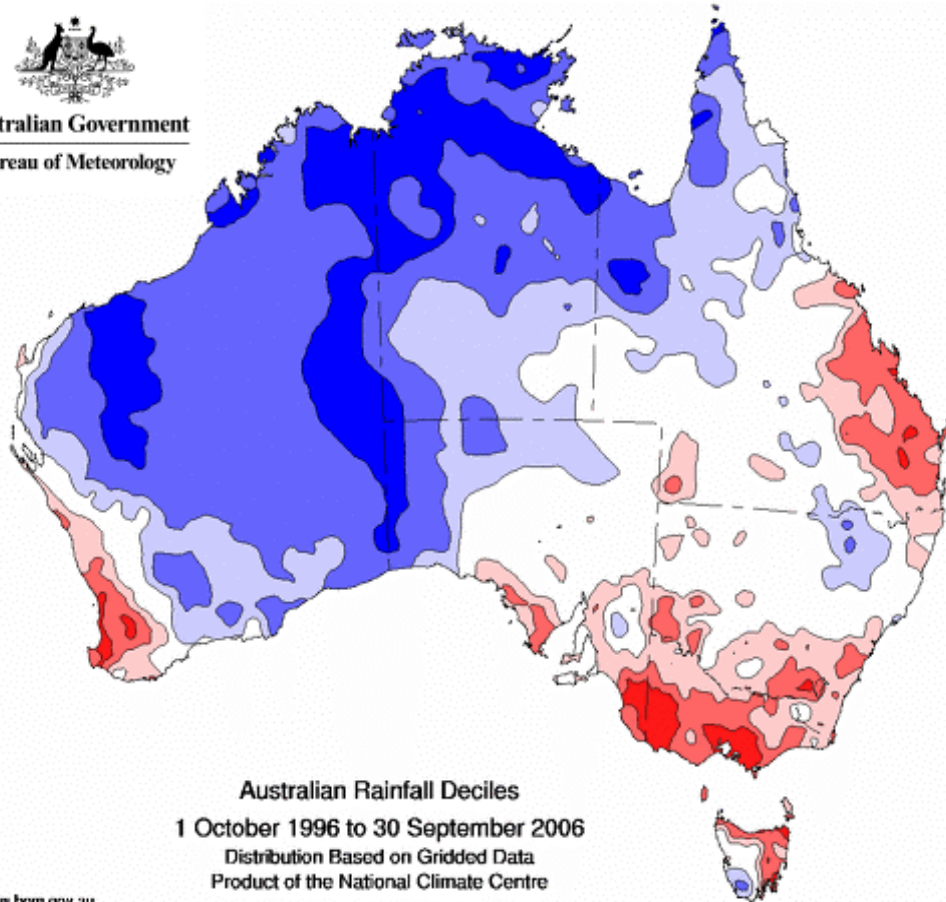
Impact of a single heat wave

- Vine– physiology of heat shock not really well understood
- Wine – quality – fruit recovered
- Vineyards – occupational and health issues
- Wineries – logistics
 - » Cost of cooling fruit
 - » Delays in processing





Australian Government
Bureau of Meteorology



Australian Rainfall Deciles
1 October 1996 to 30 September 2006
Distribution Based on Gridded Data
Product of the National Climate Centre

<http://www.bom.gov.au>

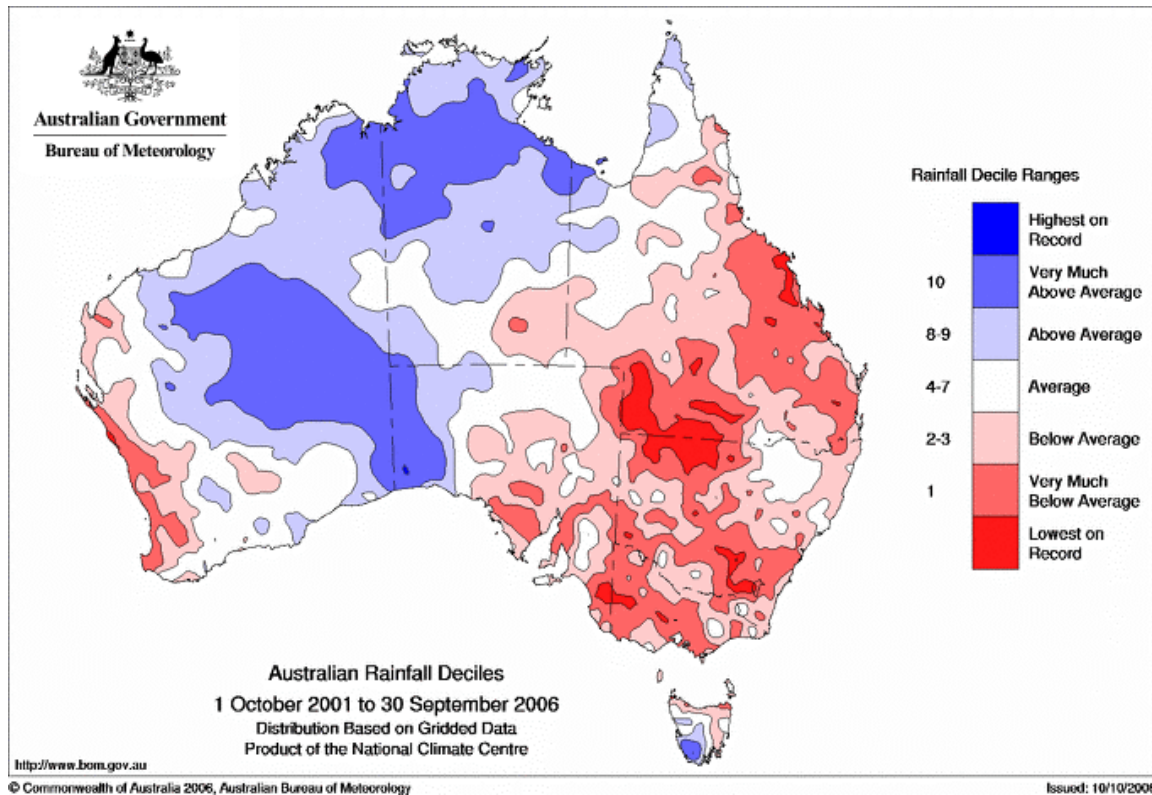
© Commonwealth of Australia 2006, Australian Bureau of Meteorology

Issued: 06/10/2006

SW WA – general drying trend since 70s SE Australia following a wetting trend since 1950s



A drought?! But that only happens in the country!

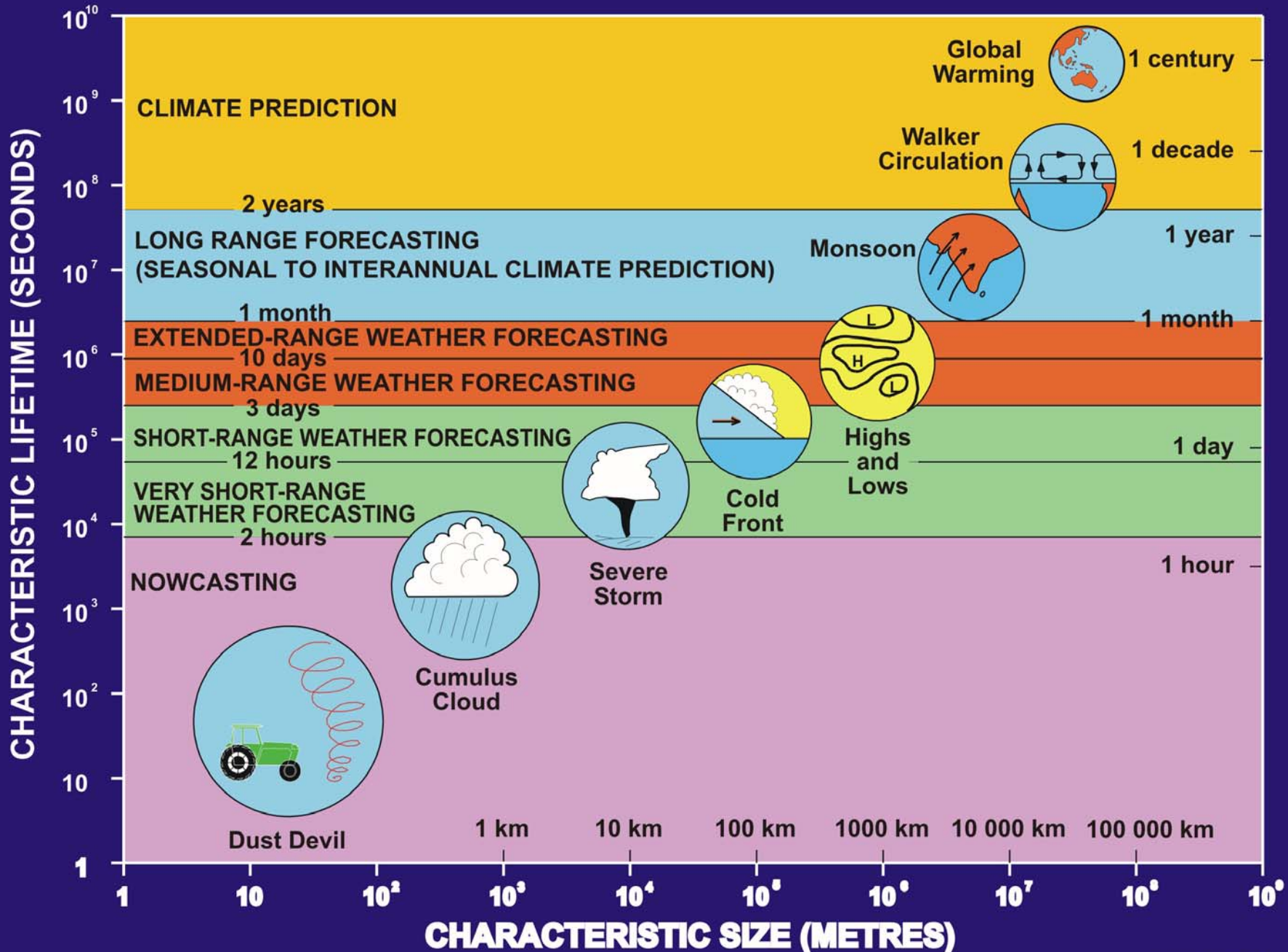


An important feature of current interest in climate change is the link with the current drought and water availability— this presents both opportunities and challenges.

Nicholls 2006 Detection & Attribution of Aust climate trends

- The widespread warming is very likely to be due to increased greenhouse gas concentrations.
- The rainfall decrease in southwest Western Australia is likely due to a combination of increased greenhouse gas concentrations, natural climate variability, and land use change.
- The increased summer rainfall in northwest Australia may be due to increased aerosols resulting from human activity, especially in Asia.
- The apparent decline in pan evaporation is mainly due to changes in instrumental exposure.
- No study has attributed a cause to the rainfall decrease along the east coast.

TIME AND SPACE SCALES OF ATMOSPHERIC PHENOMENA



"The warming over the past 10 years, you can't explain that. There isn't any great variability from year to year; it's going up and up and up. If it was natural variability you would be having years of below-average temperature." But he said that judging the effects of climate change on rainfall patterns was much more complex. It could take another 20 to 30 years for a clear trend to emerge. Mr Hunt said if people believed the drought was entirely caused by climate change, they might think it was no longer an issue once better rain returned. "So it's very important to feed into the public consciousness the fact that there is a lot of climatic variability going on, with which the greenhouse effect is interacting." Mr Hunt said it appeared likely that south-eastern Australia would become drier, with climate change increasingly responsible.

Managing our variable and non stationary climate

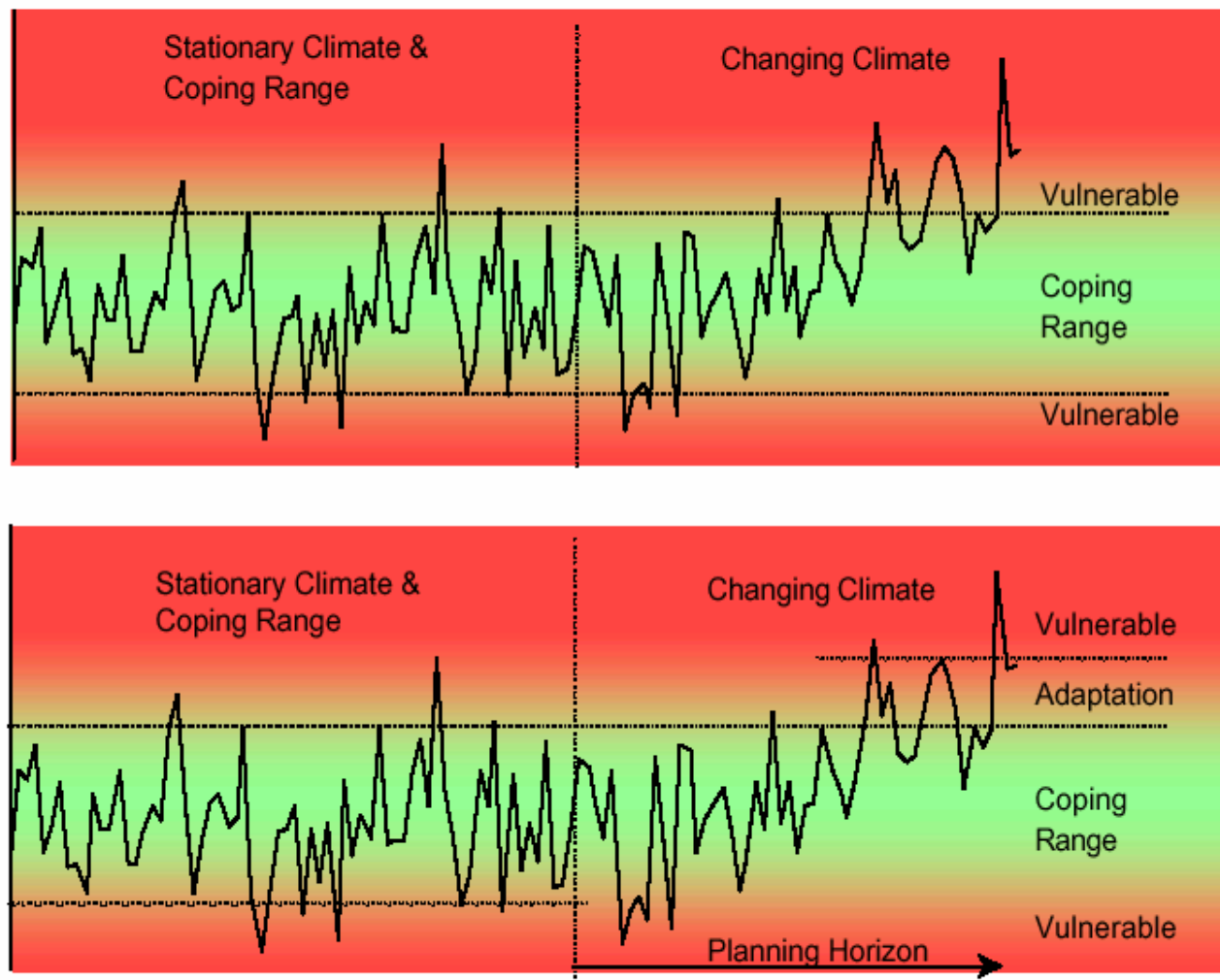


Figure 35: Coping range showing the relationship between (a) climate change and threshold exceedance, and (b) how adaptation can establish a new critical threshold, reducing vulnerability to climate change.

Changes to the atmosphere

Changes to global climate

*Unequivocal evidence of
warming*

Changes to SA climate

Impacts on local systems

Changes to the atmosphere



Changes to global climate

Accepted by most, but
not all climate scientists

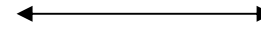
Changes to SA climate

Impacts on local systems

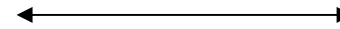
Changes to the atmosphere



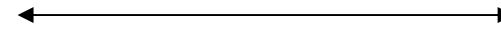
Changes to global climate



Changes to regional climate



Impacts on local farming systems



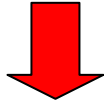
www.stephenschneider.stanford.edu

Cascading uncertainty

Changes to the atmosphere



Changes to global climate



Changes to regional climate



Impacts on local farming
systems

www.stephenschneider.stanford.edu

Cascading uncertainty

Changes to the atmosphere



Changes to global climate



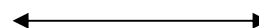
Changes to regional climate



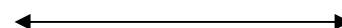
Impacts on local farming systems



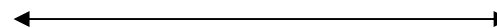
Emission scenarios



Global circulation models



Downscaling models



Impact models

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Cascading uncertainty

Human choice

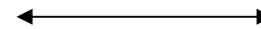
Changes to the atmosphere



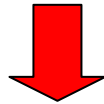
Emission scenarios



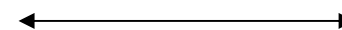
Changes to global climate



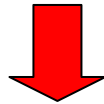
Global circulation models



Changes to regional climate

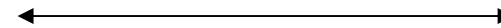


Downscaling models



Human choice

Impacts on local farming systems



Impact models

www.stephenschneider.stanford.edu

Cascading uncertainty

Changes to the atmosphere



Changes to global climate



Changes to regional climate

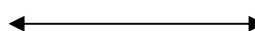


Impacts on local farming systems

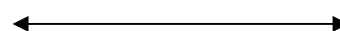
Top down impact analysis



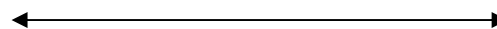
Emission scenarios



Global circulation models



Downscaling models



Impact models

Bottom up – vulnerability analysis

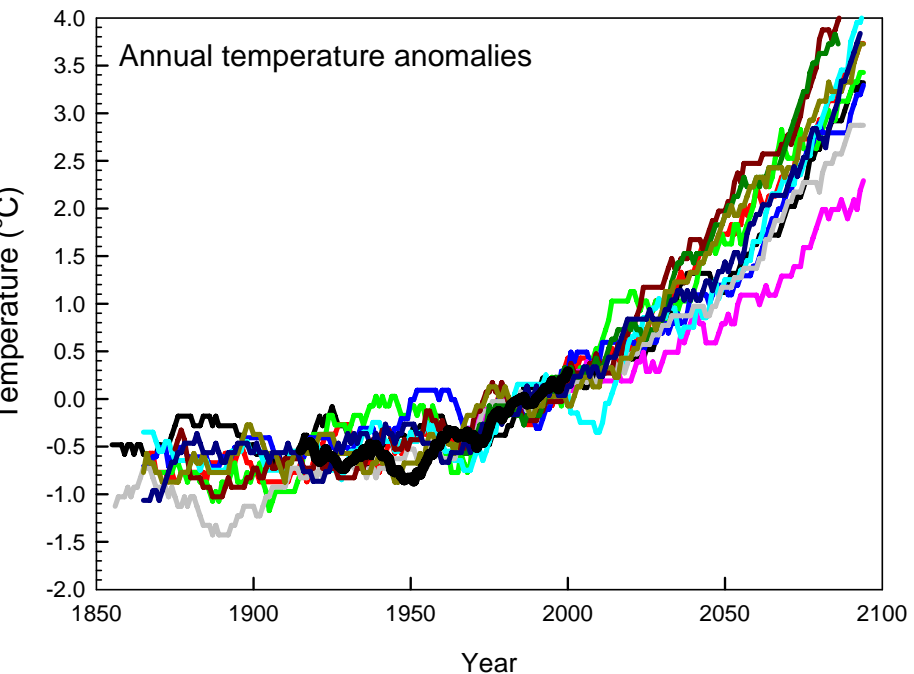


Cascading uncertainty

For climate change projections for Australia

<http://www.dar.csiro.au/impacts/future.html>

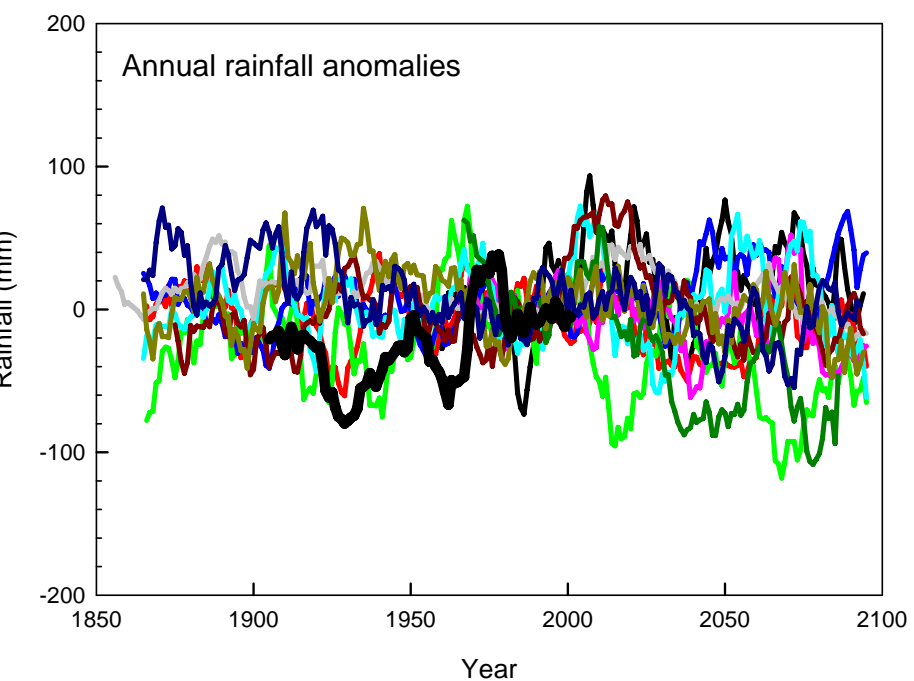
South Australia



- BCCR
- GFDL 2.0
- GFDL 2.1
- MIUB
- CC50
- MPI-ECHAM5
- MRI
- NCAR-CCSM
- CC50
- HADCM3
- HADGEM1
- Observation

Projections from 13 Global
Circulation Models (GCM) with
SRES A2

CSIRO report for SA 2006 using
11 best models from 23 GCMs for
current round of IPCC

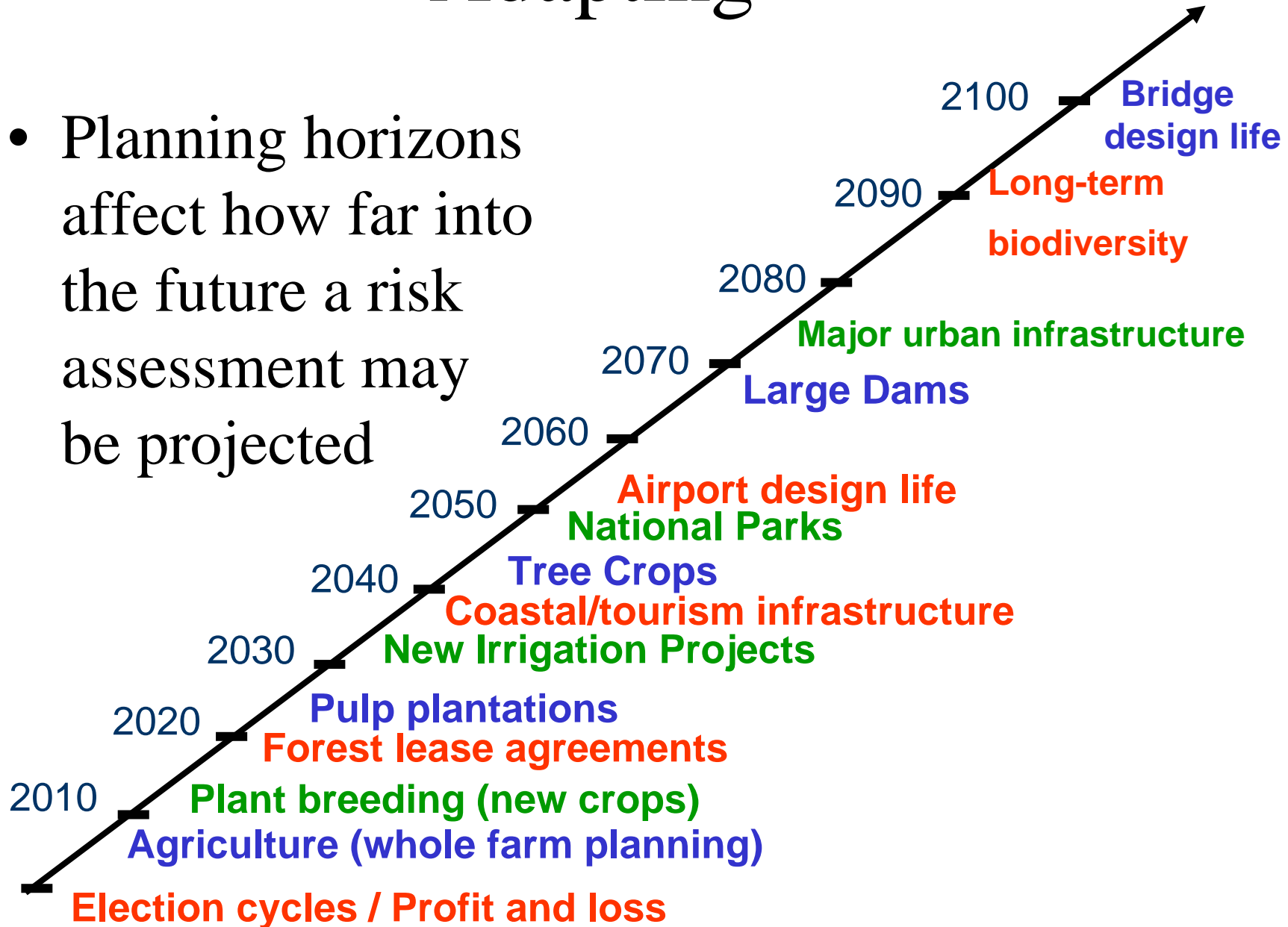


Adaptation vs GHG reduction

- The nature of uncertainty and tradeoff with irreversibility is different for adaptation strategies than need to reduce greenhouse gasses.
- It is harder to set targets and to find actionable knowledge from climate science for adaptation strategies.

Adapting

- Planning horizons affect how far into the future a risk assessment may be projected

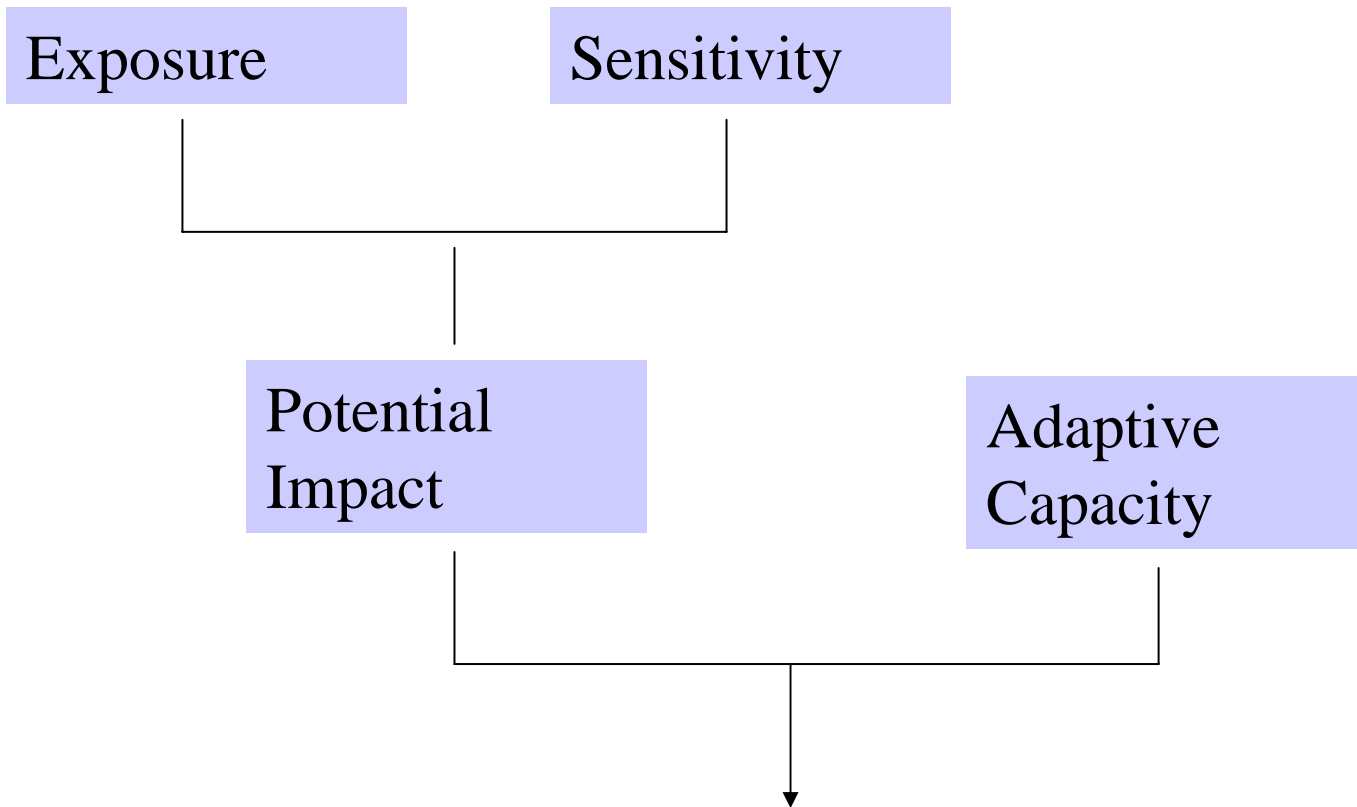


UK Climate Impacts Programme 2003

- **Under adapt** (spend too little time and resources on adapting to worrying but uncertain climate change)
- **Over adapt** (spend too much of scarce resources and ignore immediate problems)
- **Mal adapt** (use resources in a way that severely limit future adaptation options and/or adapt to a small set of future outcomes that are unlikely).

Focus on vulnerability

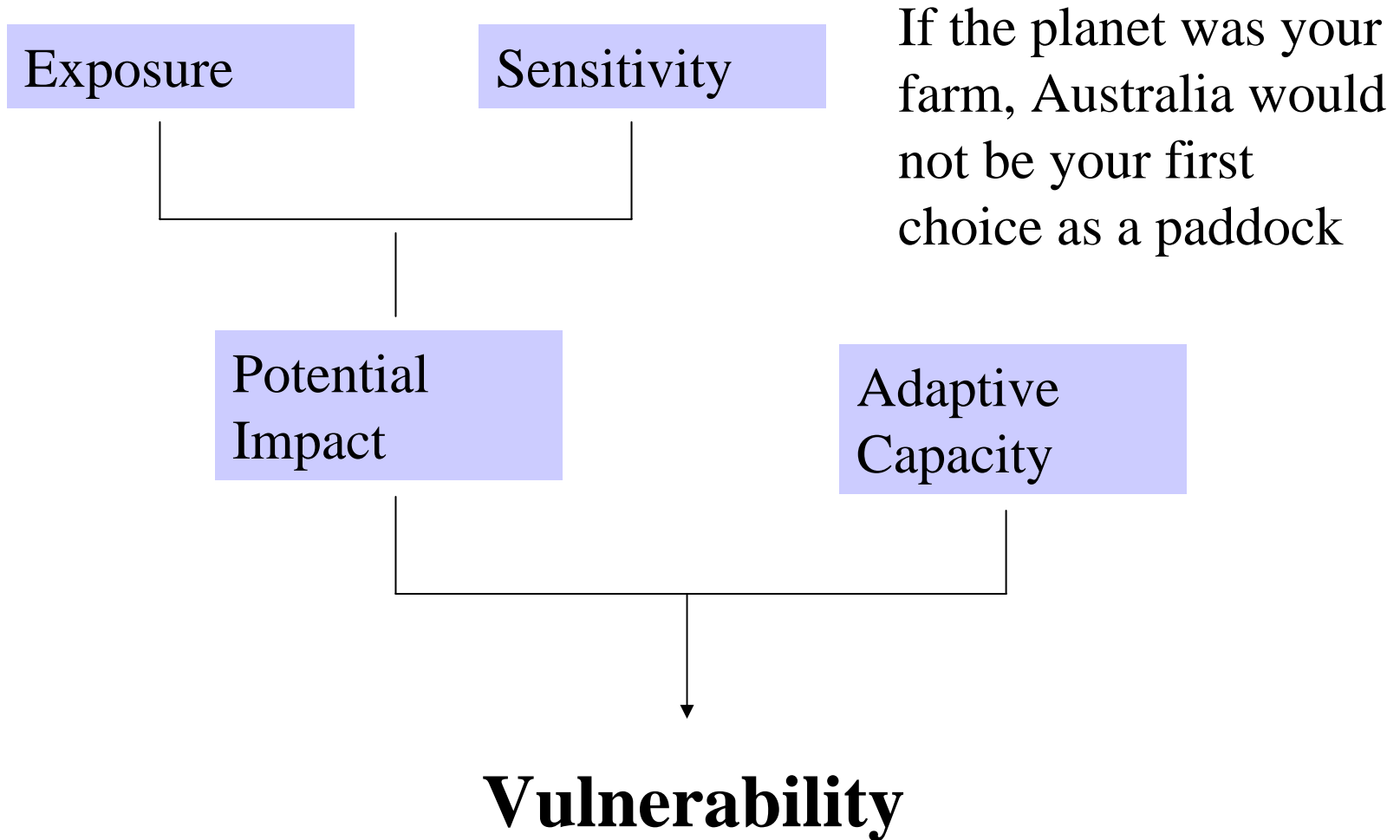
- Climate change projections have irreducible uncertainty (both in time and space)
- We are not good at imagining the future (eg many 19th C projections to year 2000)
- It helps with managing short term climate risk
- It gives a framework to interpret the projections.



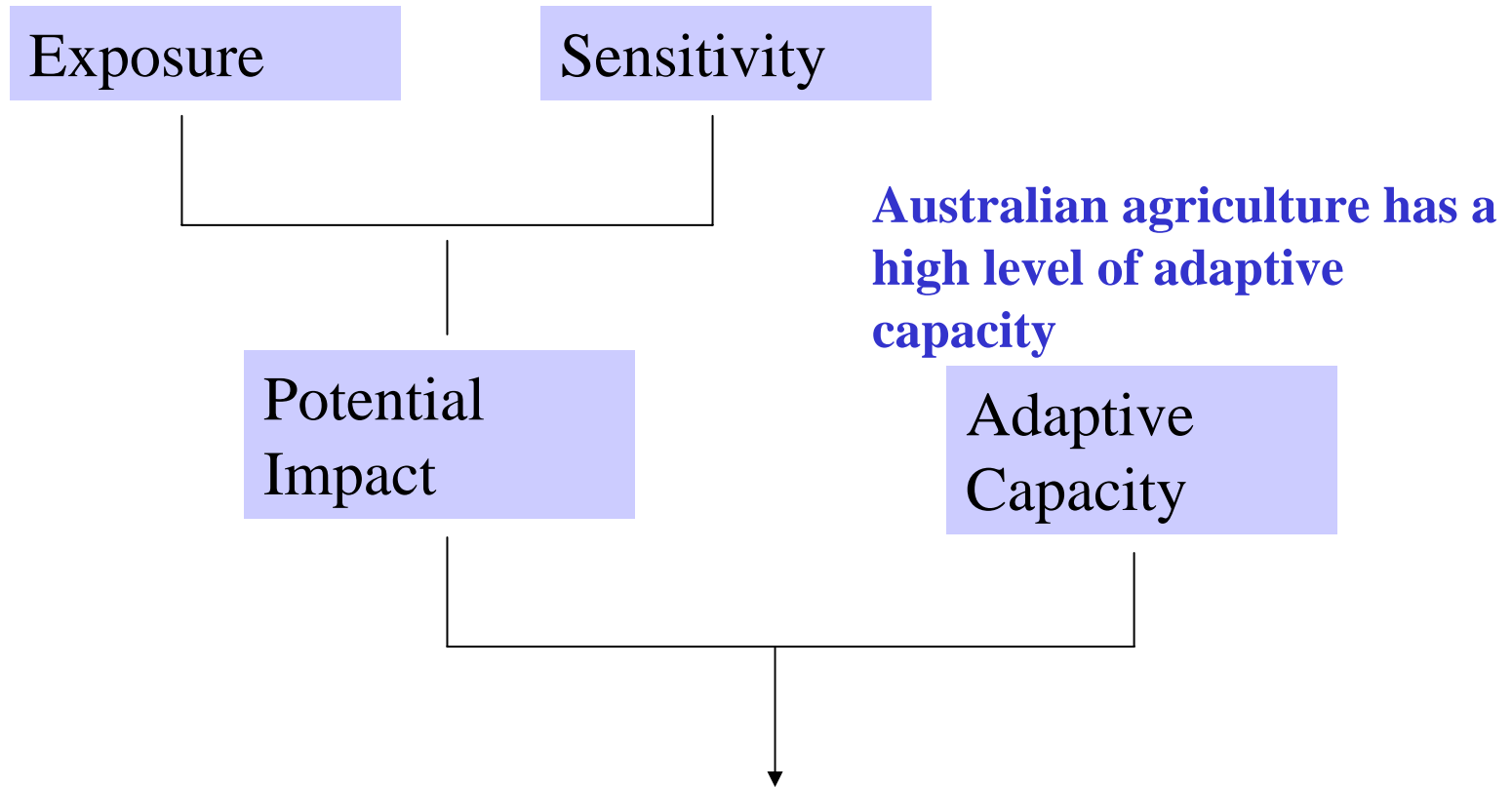
Vulnerability

Climate Change Risk and Vulnerability
Allen Consulting 2005

Agriculture in Australia is exposed and sensitive to climate



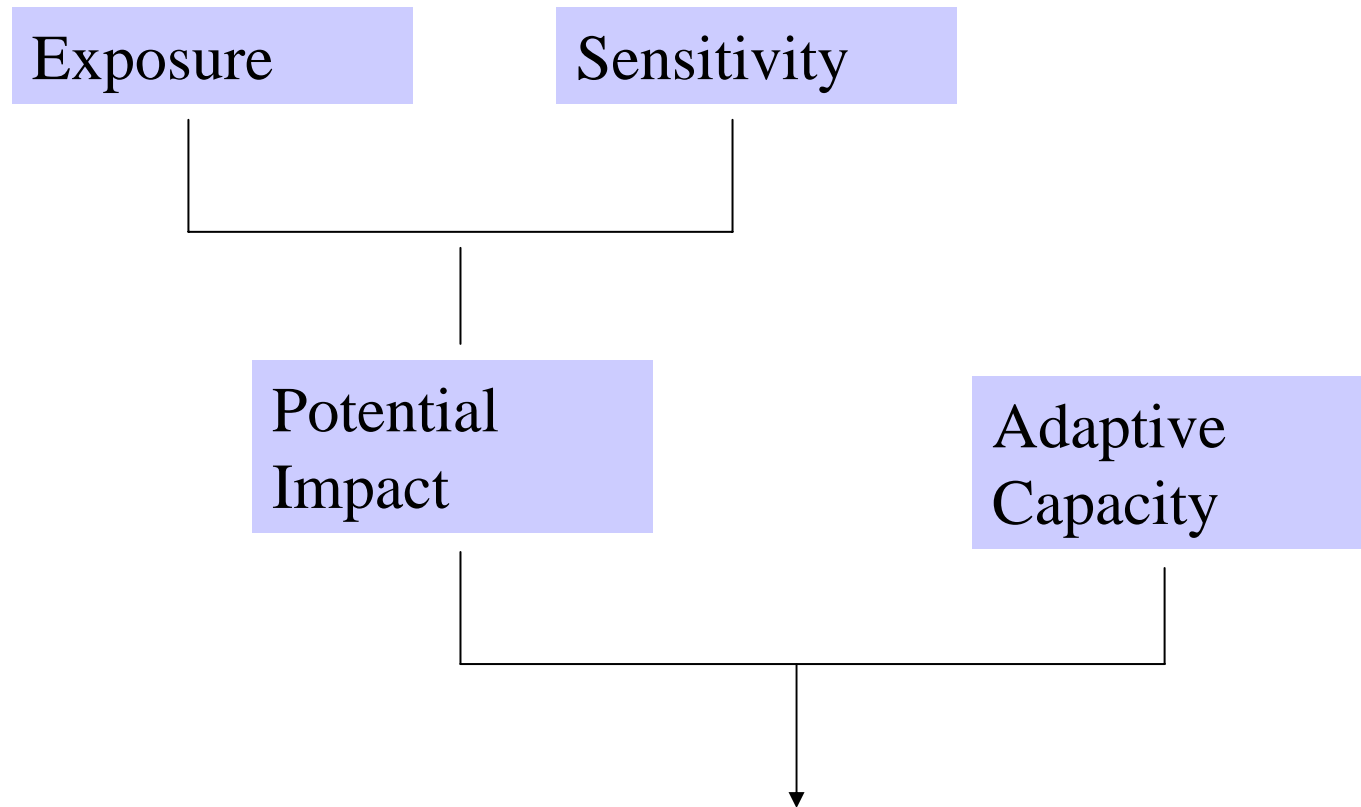
Agriculture in Australia is exposed and sensitive to climate



Australian agriculture has a high level of adaptive capacity

Vulnerability

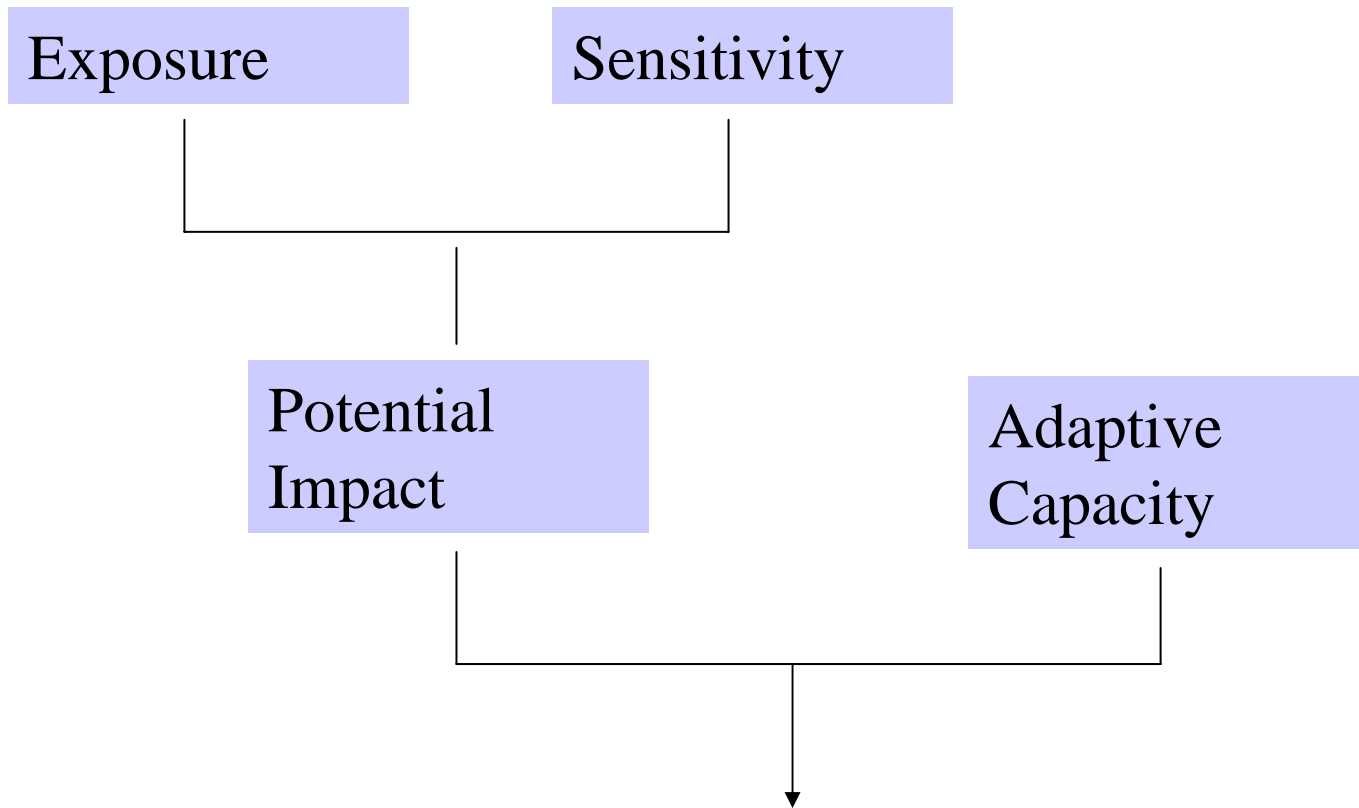
Impact, adaptive capacity and vulnerability at crop, farm, industry and community level



Vulnerability

Climate Change Risk and Vulnerability
Allen Consulting 2005






Talking through Impact and Adaptive capacity avoids taking people from denial to despair in one workshop



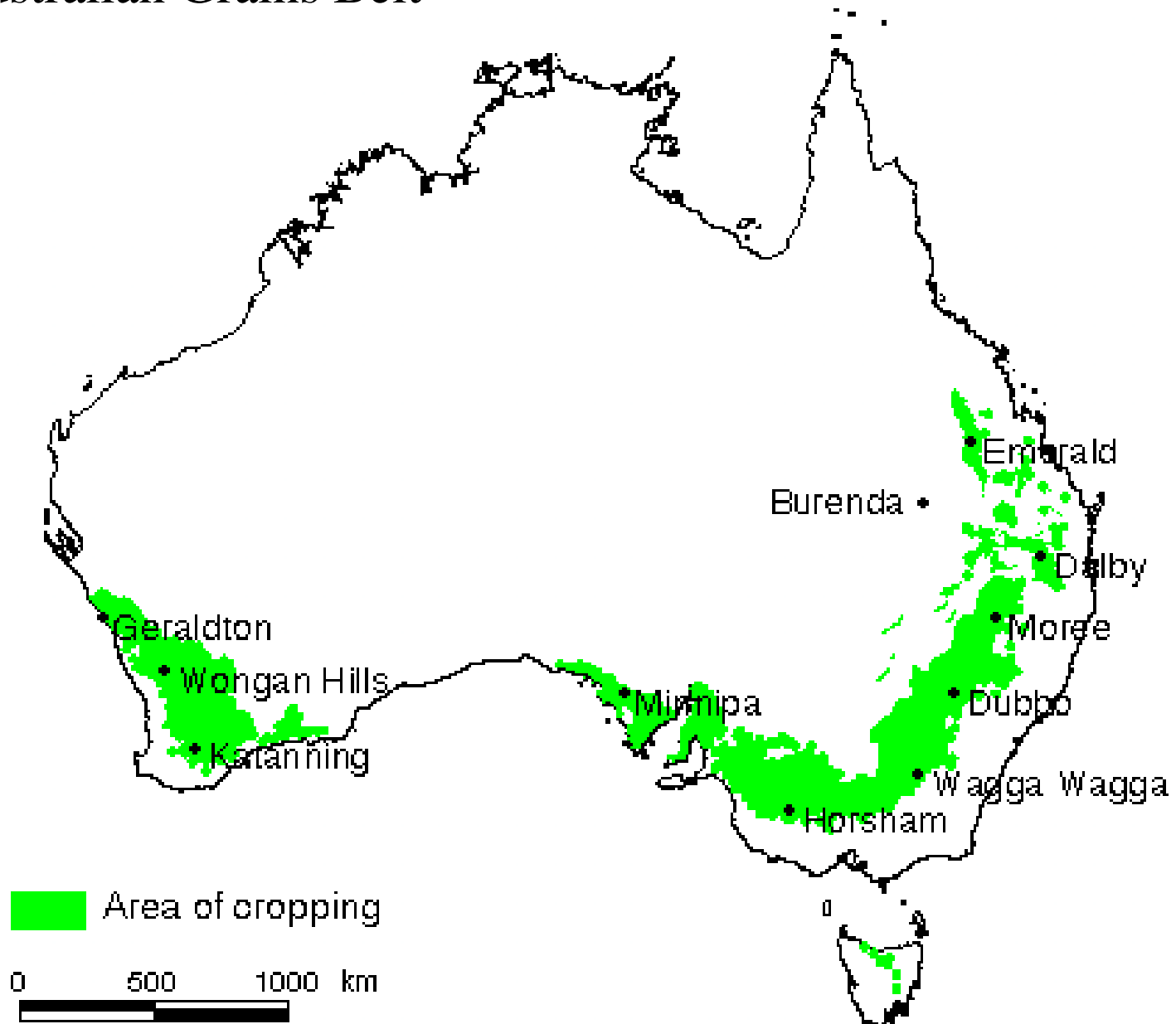
Vulnerability

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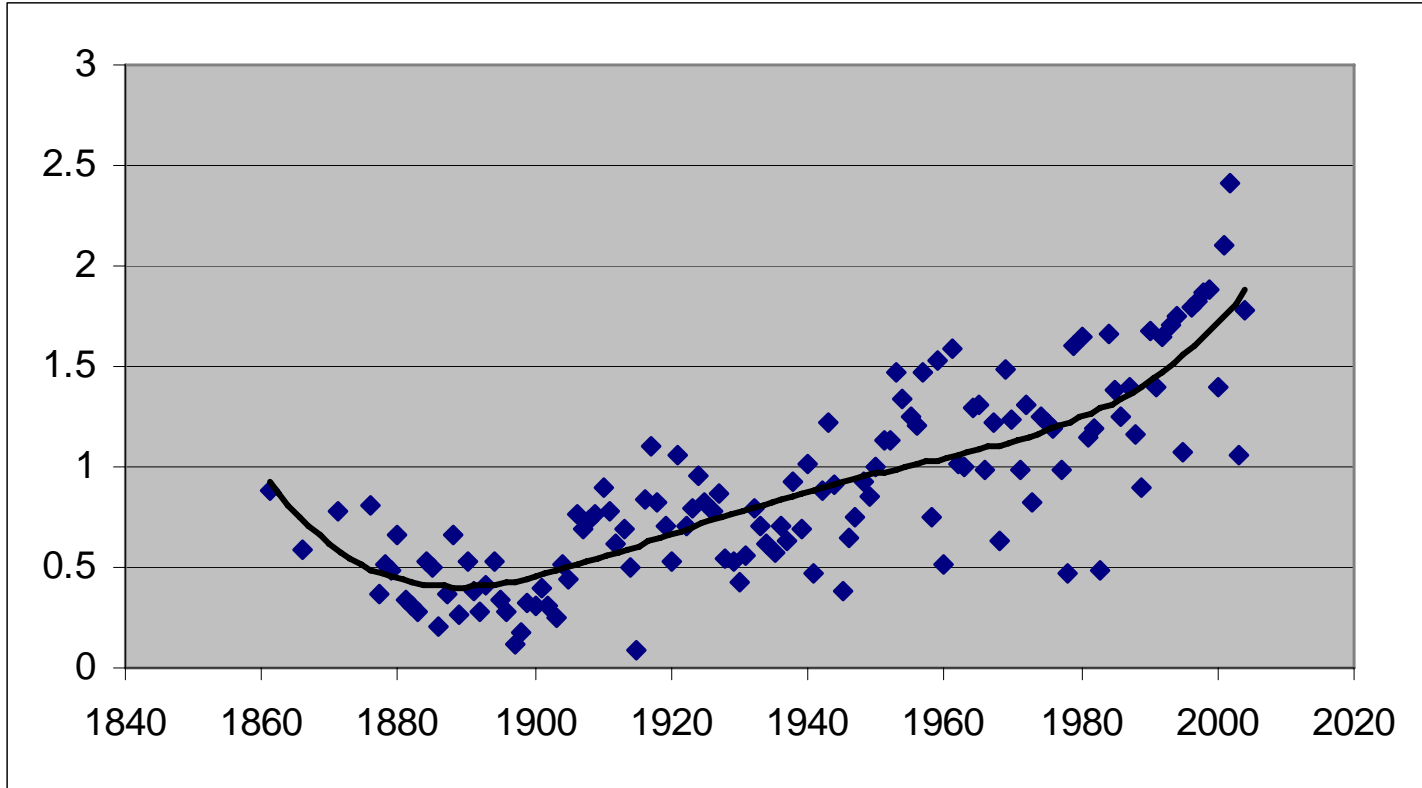
History of Goyder's line

-  Following settlement of SA in 1836, agriculture rapidly expanded northwards
-  After severe drought during 1863-1866 the Surveyor-General Goyder established a 'line' beyond which cropping should not be permitted
-  Farming expanded again 1870 to 1882 over the line but retreated again during the late 1880's and 1890's
-  Expansion again occurred 1906-1926 but retreated again in the 1930's
-  In each retreat there was major economic, social and environmental cost

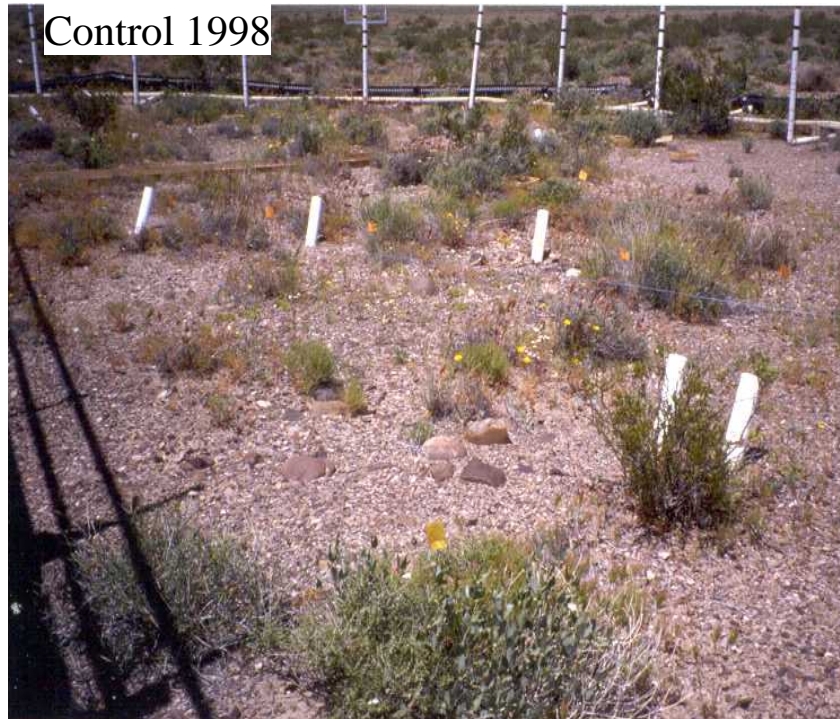
Australian Grains Belt



SA Wheat Yields



CO₂ 'fertilisation'

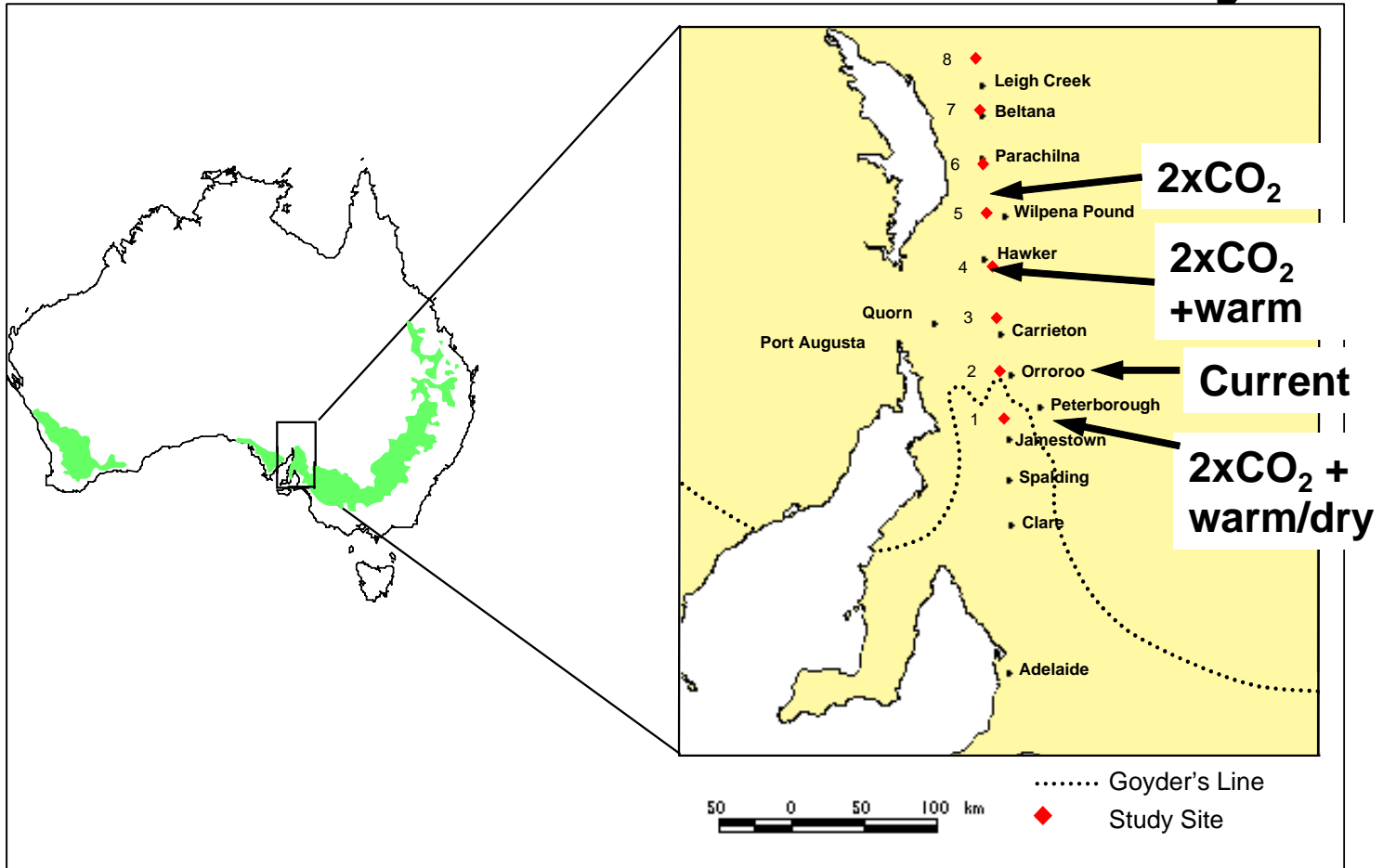


Ambient ~360ppm CO₂



550ppm CO₂

Earlier, scenario-based study



Reyenga et al. (2001)

‘Changes in the location of Goyder’s line’ 2070

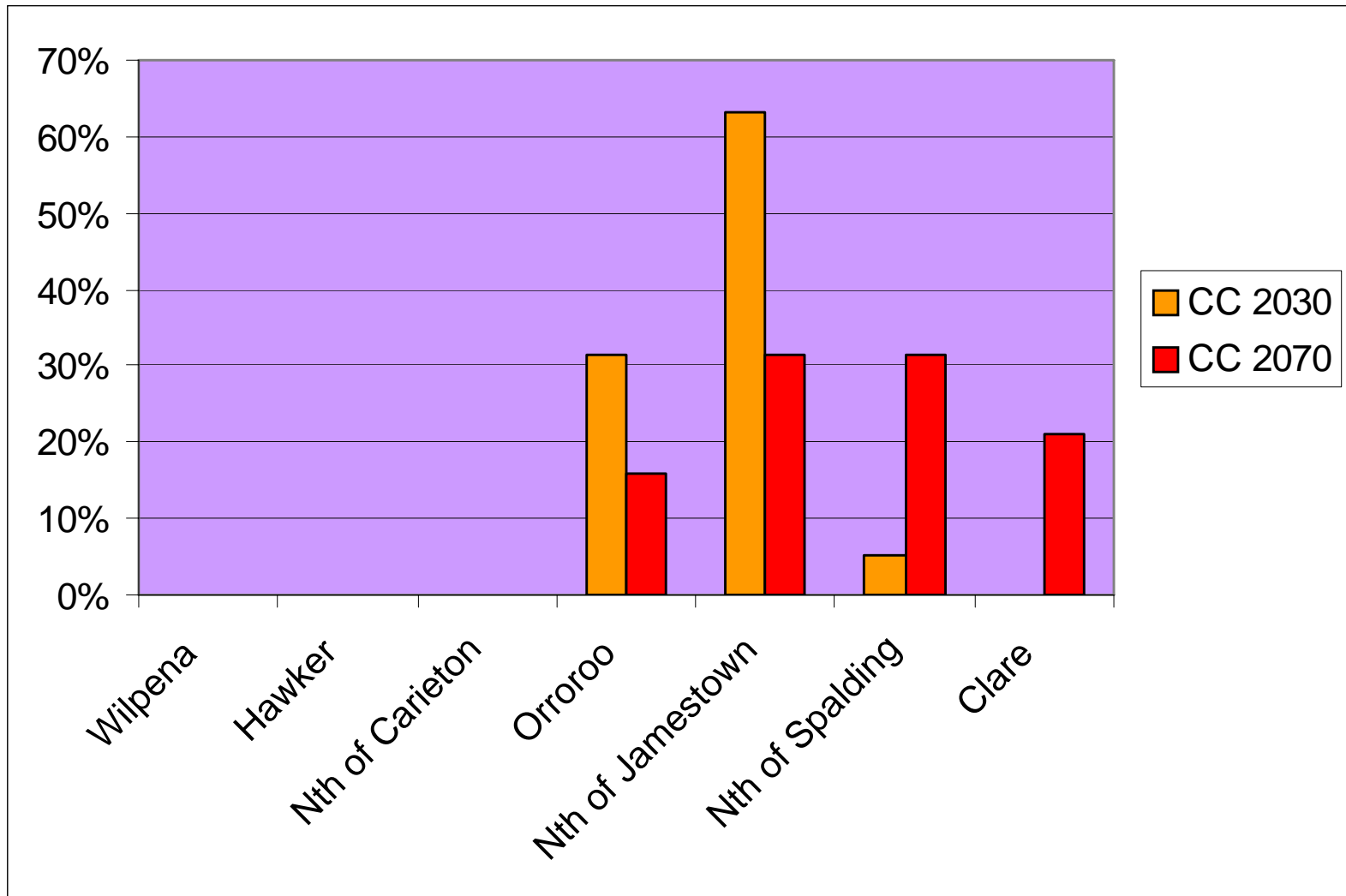
Adapting to a probability distribution



Asked 300 farmers and advisers where they thought Goyder's line would end up

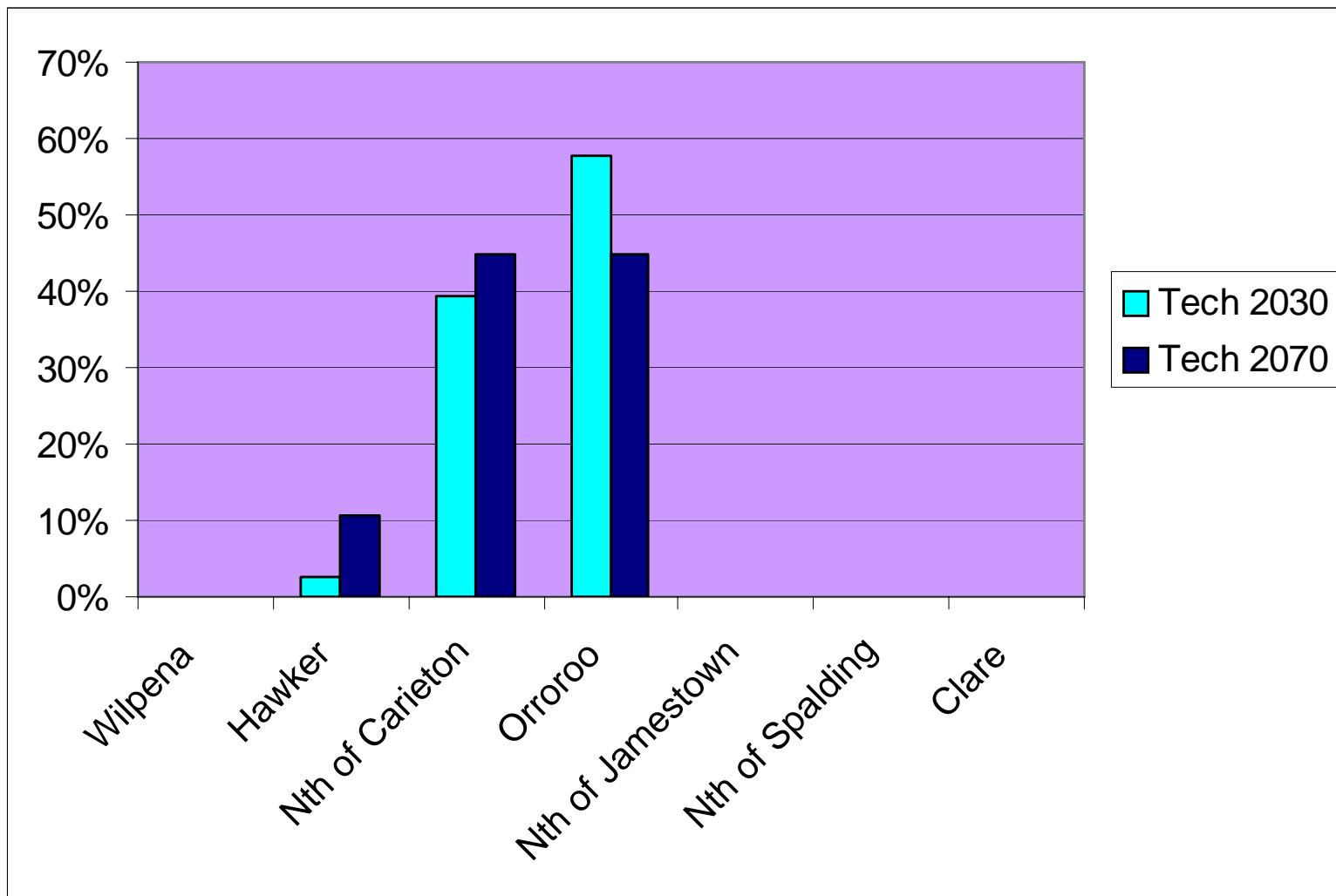
1. With technology improvement and no climate change
2. With climate change and no technology improvement
3. With CC & technology improvement

Climate change pull



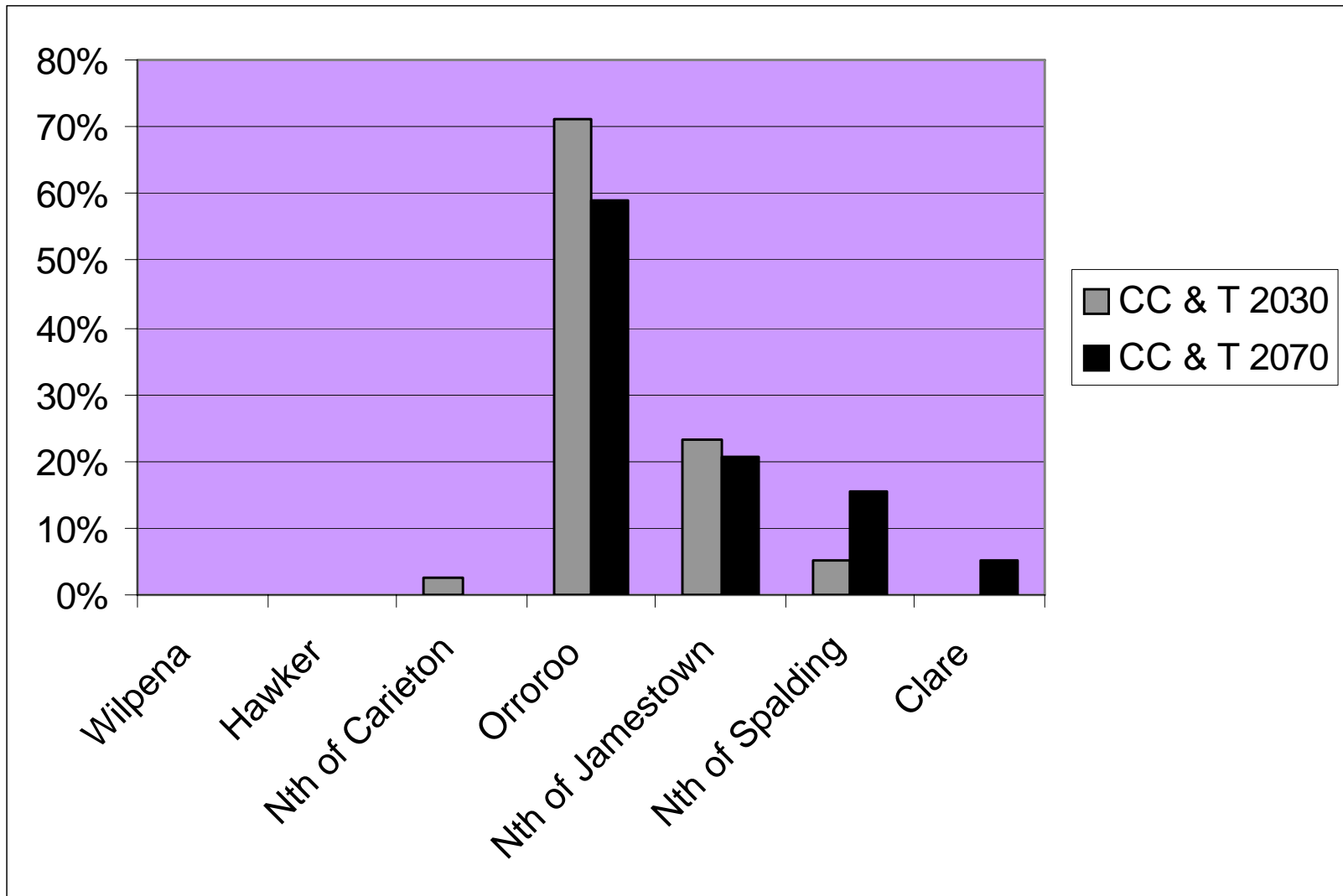
Upper North

← Technology Push



Upper North Survey

← Technology and Climate change →



Upper North

‘Changes in the location of Goyder’s line’ 2070

