



# Climate adaptation in Australia: successes, failures and some lessons learnt

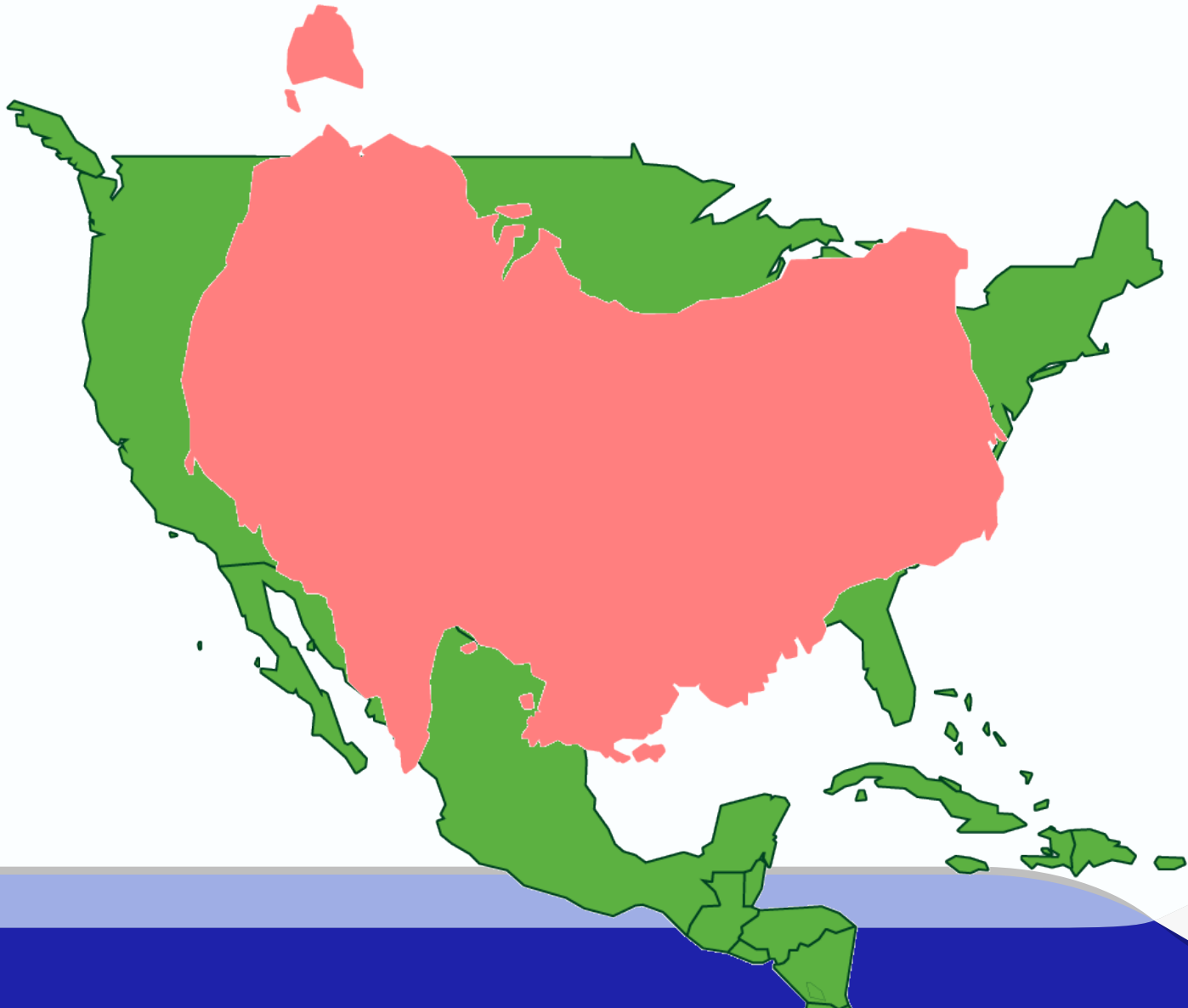
CLIMATE ADAPTATION

Mark Howden and many colleagues

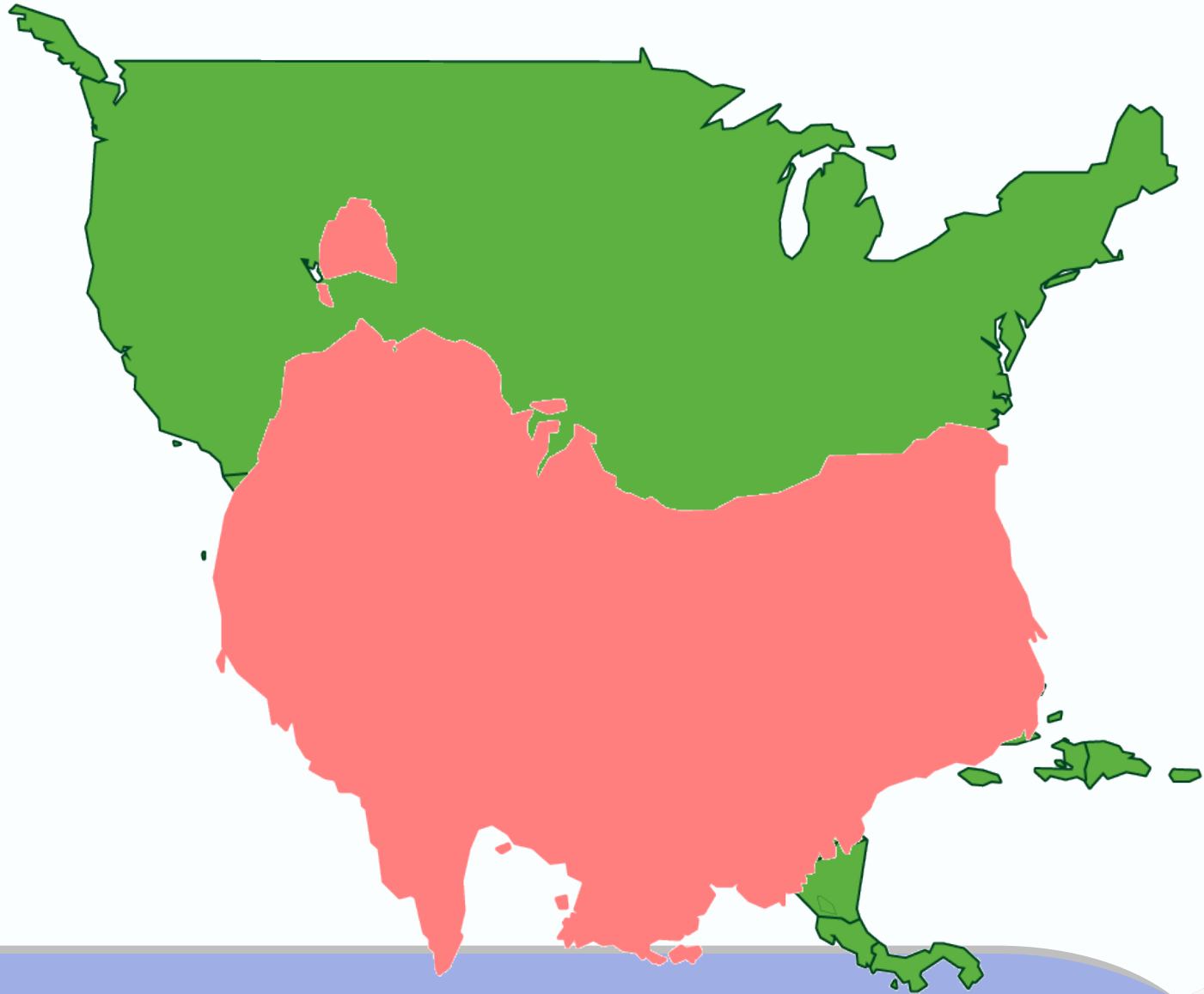
University of Arizona, Tucson, January, 2014



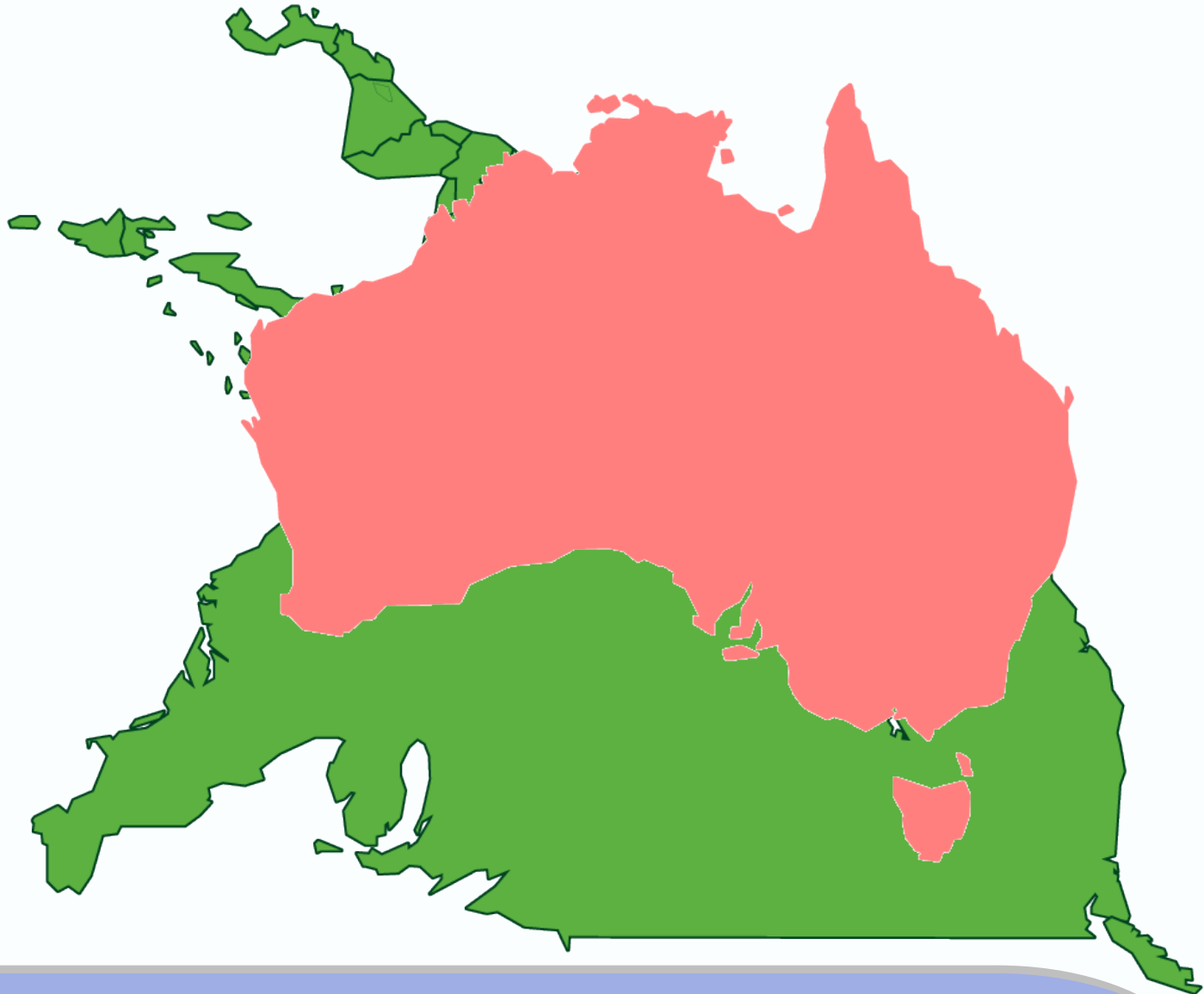
# USA and Australia: similar size



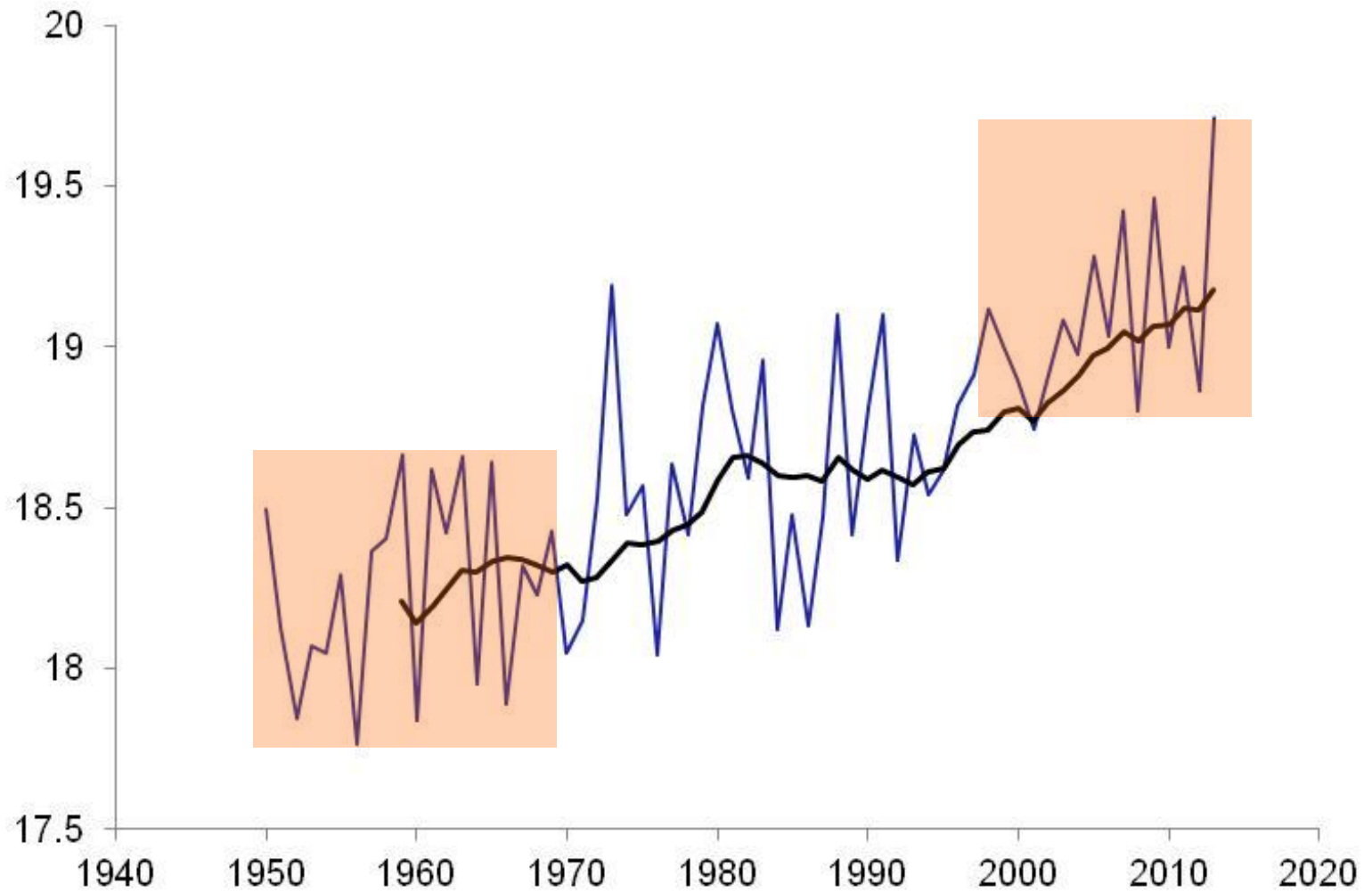
# USA and Australia: latitudinal position



# USA and Australia: preferred orientation



# Climate changes hard to ignore



# Climate changes hard to ignore

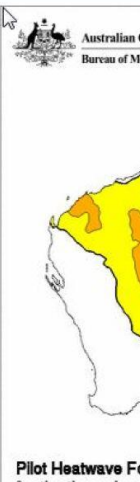
- 2013 was the hottest year on record
  - mean was 2.2°F above average (exceeding previous record by 0.31°F)
  - maximum was 2.6°F above average (exceeding prior record by 0.4°F)
  - minimum was 1.7°F above average (2nd highest on record)
- 2013 had hottest day (105°F), week and month, the longest national heatwave (7 days > 102°F), warmest winter day etc etc

# Climate extremes hard to ignore

- 'Catastrophic' fire conditions: new category

## *Current heatwave*

- Likely 50% increase in death rate
- >1000 fires, 71 out of control fires across southeast
- 100, 000 houses without electricity due to demand
- 20% reduction in this years wine harvest
- Over 100,000 fruit bats dead in Qld
- Interruptions at the Australian Open Tennis etc etc



# 'Climate change projections happening in front of our eyes'

'Much of the rain has come in summer storm events and less in autumn, winter and spring. It is just like watching the CSIRO predictions come true before our eyes'

*John Pettigrew, Farmer, Shepparton, Victoria*

- The rationale for increased attention to adaptation is strong
- Adaptation: *'changing what we do to get what we want'*



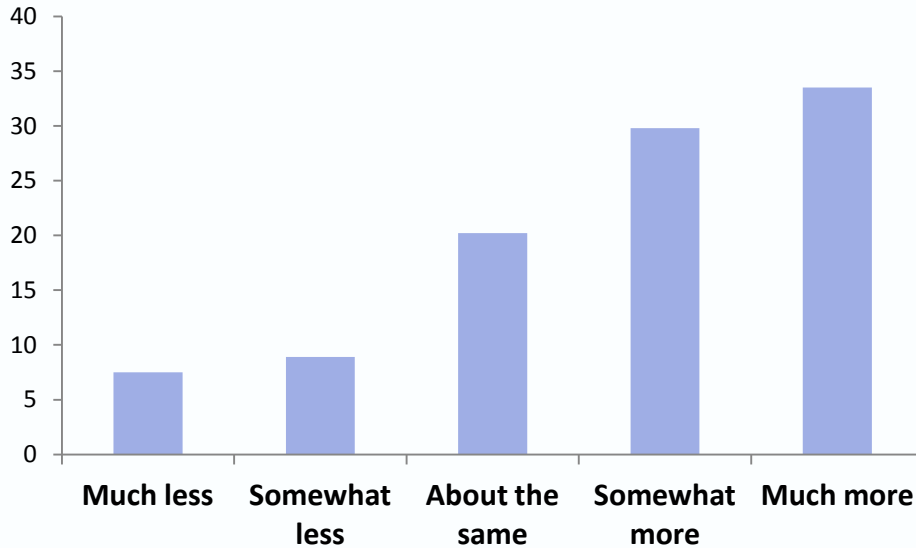


# Failed to win over leaders

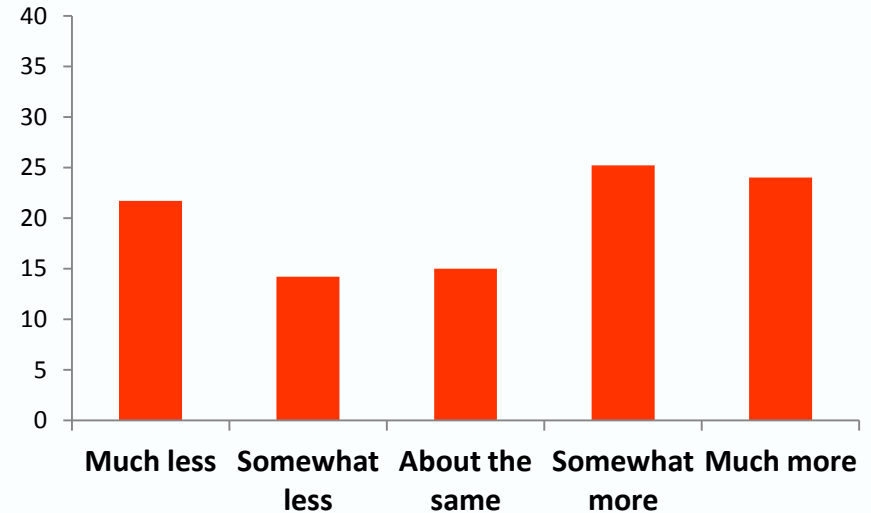
- Prime Minister who has said '*climate change is crap*'
- At National and State gov't levels, essentially complete removal of climate change from departments, programs and policy
- Anti-climate change – high profile (e.g. PMs Chief Business Advisor '*climate change is a scientific delusion*' and '*IPCC resorts to dishonesty and deceit*'), Fox media
- Yet Brulle (2013) showed that political leadership was the most critical factor in public opinion
- USA: Executive Order and Climate Action Plan

# Success: Australian public support for climate change action

## Adaptation



## Mitigation



# The way science is done does not necessarily foster better decisions

- Not relevant
- Not appropriate for the decision
- Not reliable or trusted
- Not legitimately sourced
- Conflicts with users values or interests
- Unavailable or untimely
- Poorly communicated
- Whose decision is 'better' ?
- Moving from '*climate-centric*' to '*decision-centric*'

# Moving from analysis to action

- What is the goal of adaptation ? Who adapts ? How ?  
What are the success measures ?
- The purpose of assessing adaptation options is to *develop and test them*,
  - of adaptive capacity is to *build it*
  - and of vulnerability is to *reduce it*
- Adaptation to climate change needs to be integrated with other issues
  - what research will provide options to work better in terms of water supply, drought, food security, energy security and GHG, value chains, NRM and ecosystem services, conservation and community fabric and function ?

# Multiple change factors: climate change is only one

- Industry and policy stakeholders work in complex environments, climate is often a secondary or tertiary issue, occasionally rising to prominence, interacting with other stressors



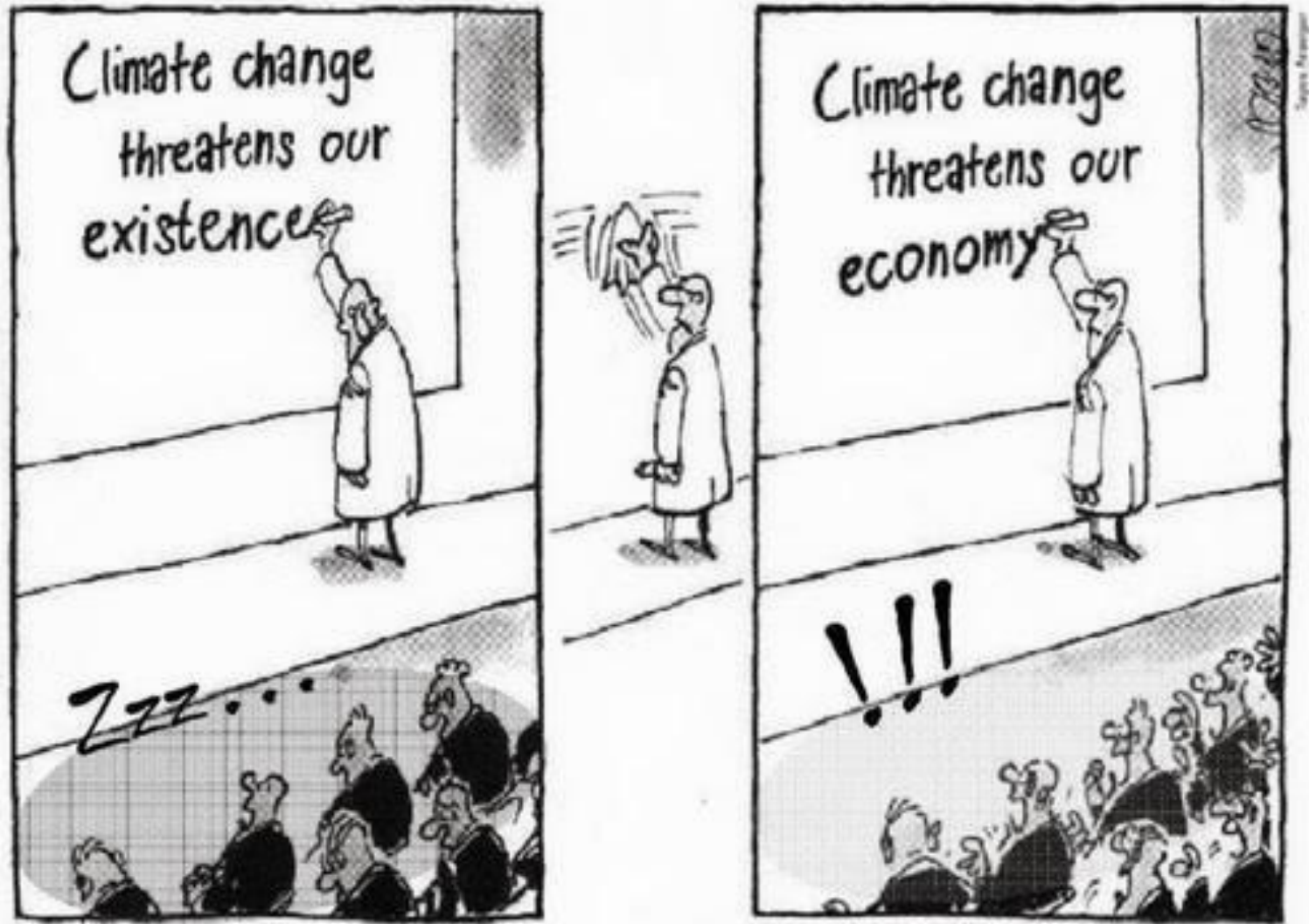
# Partnerships are crucial as is engagement

- Pathway to impact
- Better define the questions
- Co-invest – build a bigger team
- Co-design research
- Pool knowledge
  - scientists often not the dominant knowledge holders
  - broader range of solution options
- Own the solutions, operate the ‘tools’
- Relevance, credibility, legitimacy and rigour

# Climate adaptation: a journey from the technical to strategic business management

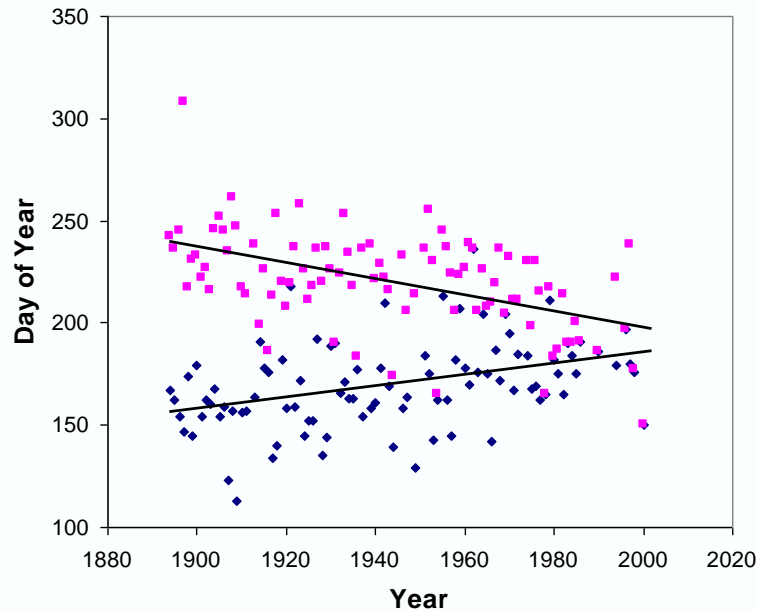
2007	2009	2011	2012
<ul style="list-style-type: none"> <li>• no cultivation, no-till and stubble retention</li> <li>• guidance systems</li> <li>• press wheels for water harvesting</li> <li>• inter-row sowing</li> <li>• opportunity cropping</li> <li>• less canola and pulses</li> <li>• hay</li> <li>• soil testing for N and water</li> <li>• sowing by the calendar not on moisture (dry sowing)</li> </ul>	<ul style="list-style-type: none"> <li>• containment areas for livestock</li> <li>• low P rates and N only just in time</li> <li>• postpone machinery purchases</li> <li>• no burning of stubbles</li> <li>• shorter season and heat tolerant varieties</li> <li>• variable sowing rate</li> <li>• improve sheep production</li> </ul>	<ul style="list-style-type: none"> <li>• canola only on soil moisture</li> <li>• bought and leased more light (sandy) country</li> <li>• concentrate on marketing (futures and foreign exchange rates)</li> <li>• decrease debt</li> <li>• off-farm income</li> <li>• reduce costs</li> <li>• improve harvest efficiency</li> </ul>	<ul style="list-style-type: none"> <li>• simplify all operations</li> <li>• larger paddocks – easier management</li> <li>• improve labour efficiency</li> <li>• improve financial management</li> <li>• requirement for more information and knowledge</li> </ul>

# Talk the language of our stakeholders





# Frost risk – money talks



<i>Frost risk strategy</i>	<i>Ignore</i>	<i>100-year</i>	<i>Adaptive</i>
Mean gross margin	\$34	\$29	\$52

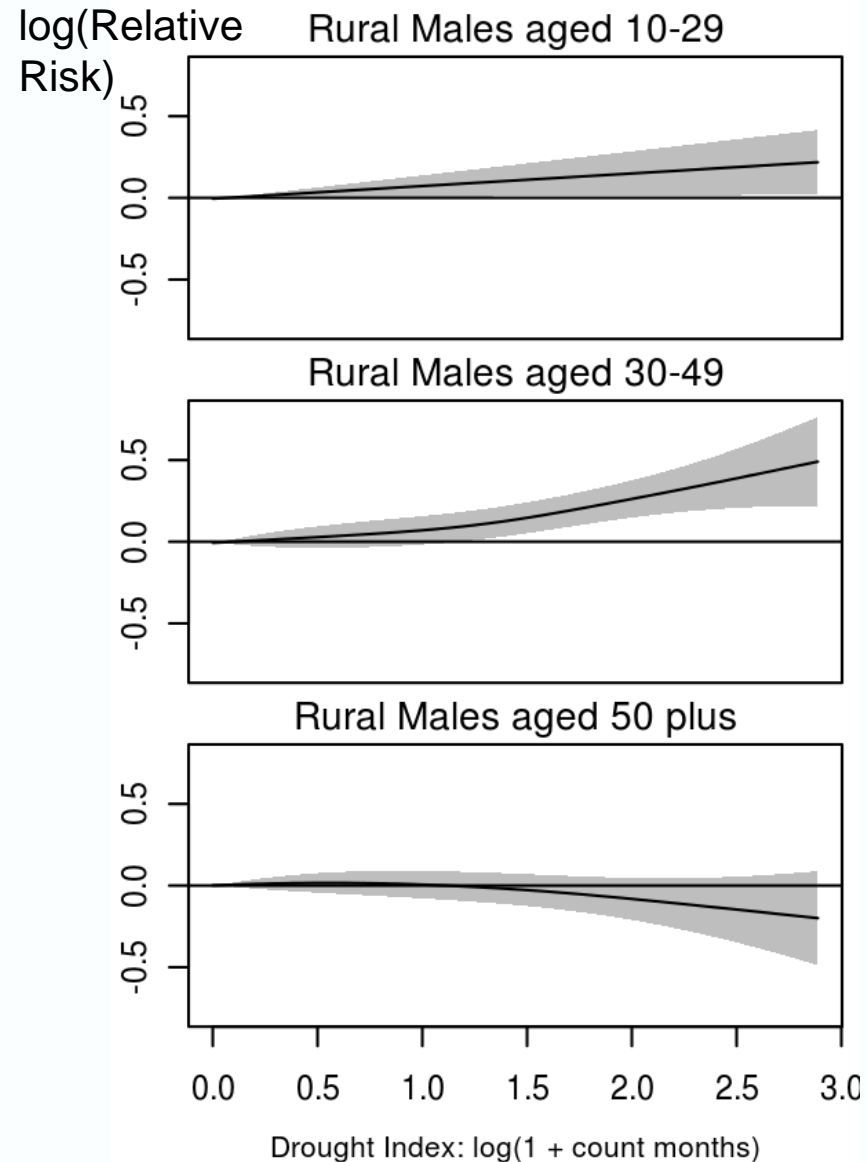
- not matching the genetics/management to changing climate causes either underperformance and/or increasing risk

# Re-framing science-policy discussions

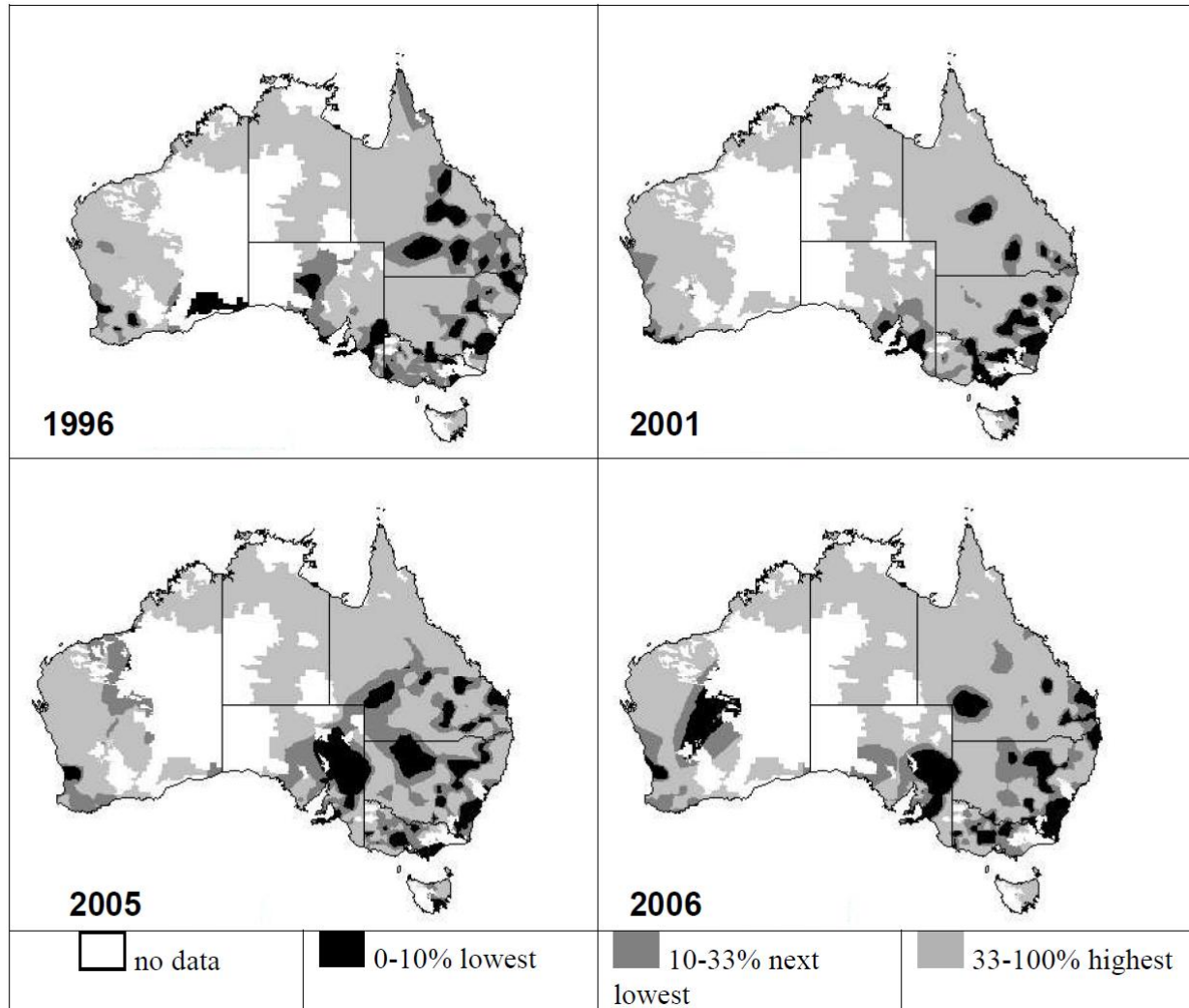
- Alter the policy discussion from a science-gap model (knowledge will lead to action) to an economic policy agenda with a clear rationale for government intervention
  - including through addressing market and public values failures and barriers to adaptation including institutional inertia
- When combined with outcomes-focussed research we hope this will help change the focus from defining the problem to participating in developing the solutions

# Drought and Suicide

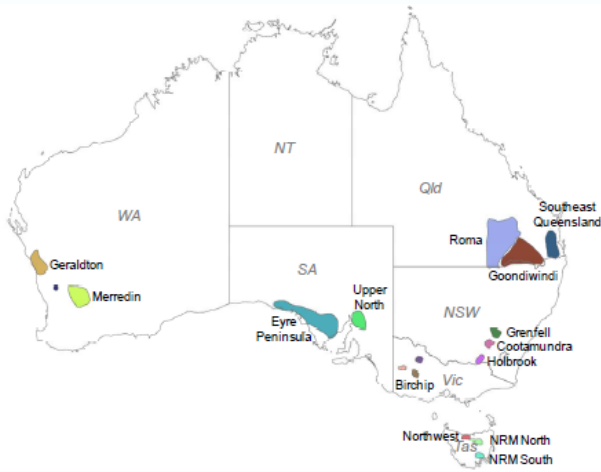
- Suicide rates linked to drought stress, particularly in spring
- Suicide rates vary by gender and by age (middle-aged males worst off)



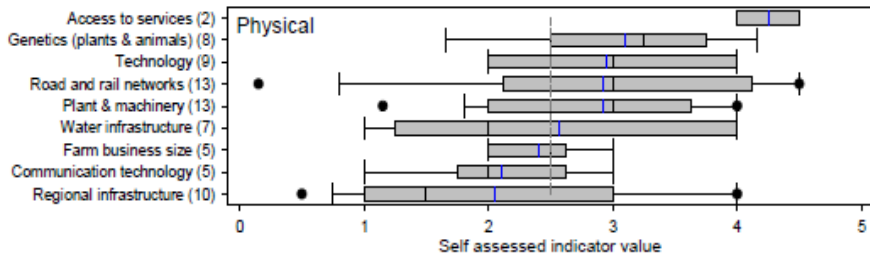
# Tracking adaptive capacity and vulnerability



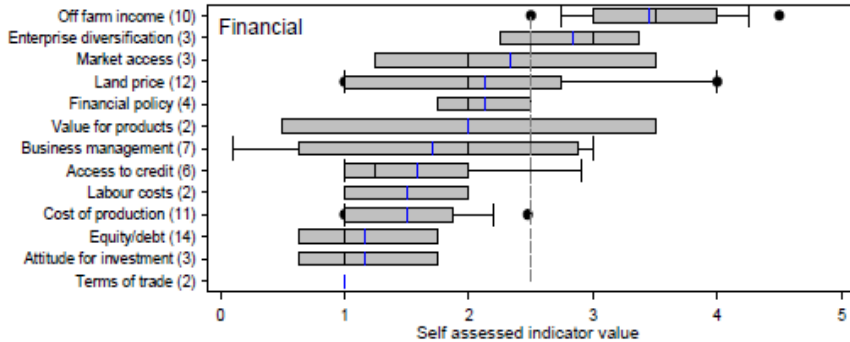
# Enabling and constraining adaptation



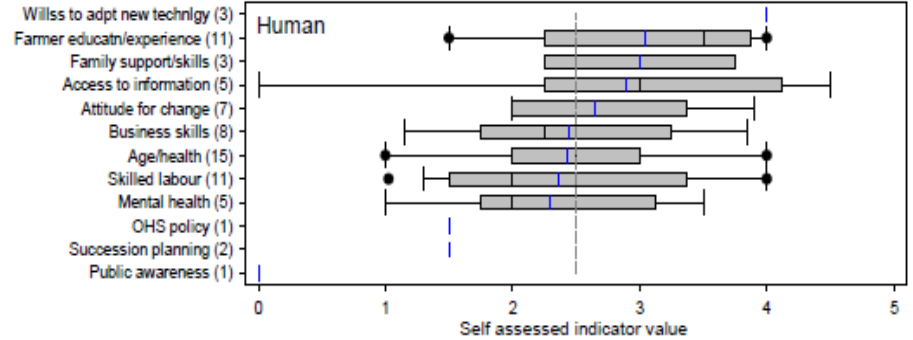
Self assessed irrigator value



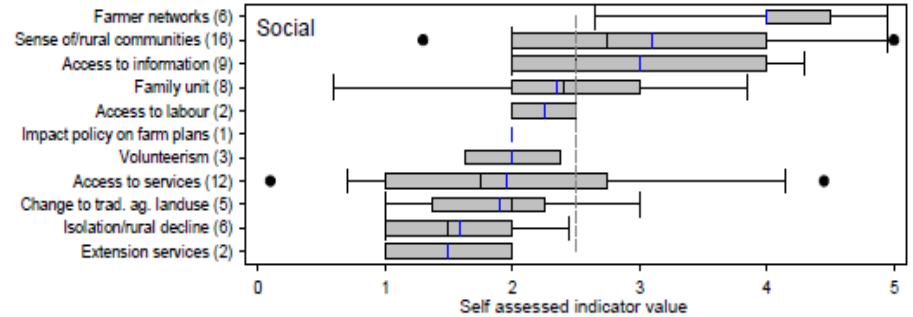
Self assessed indicator value



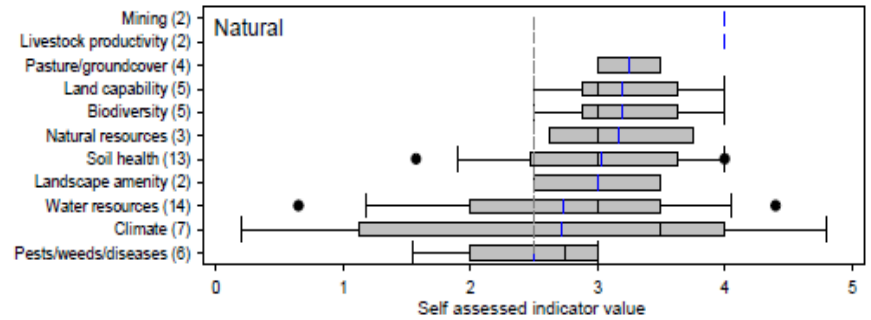
Self assessed indicator value



Self assessed indicator value



Self assessed indicator value



Self assessed indicator value

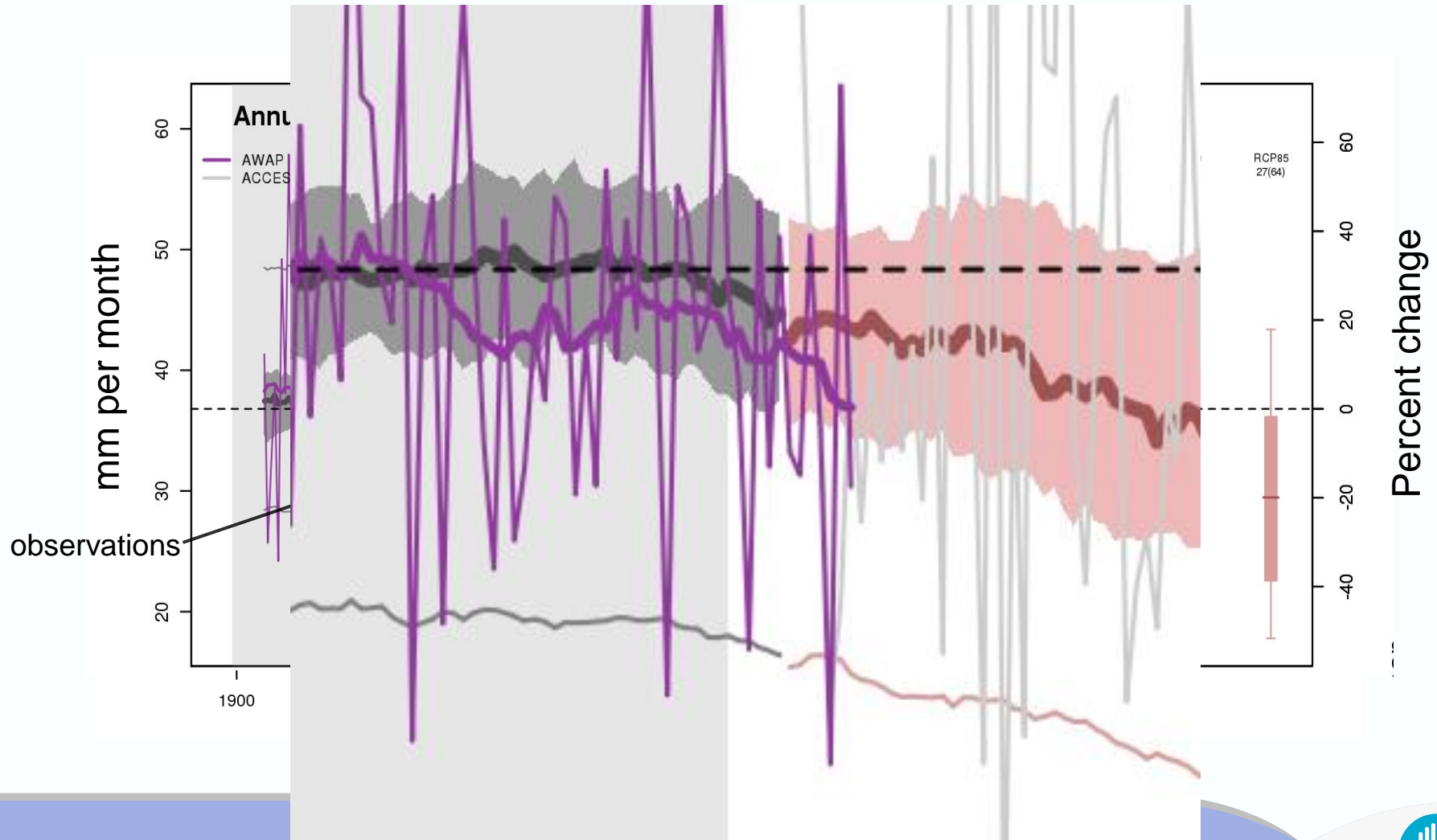
# How do we design better adoption paths ?

- Relative advantage
  - Compatibility
  - Complexity or simplicity
  - Trialability
  - Observability
- 
- All challenging if framed as only for future risk
  - Therefore need to focus on existing systems and managing climate variability and trends

# Approaches that do not need 'climate certainty'

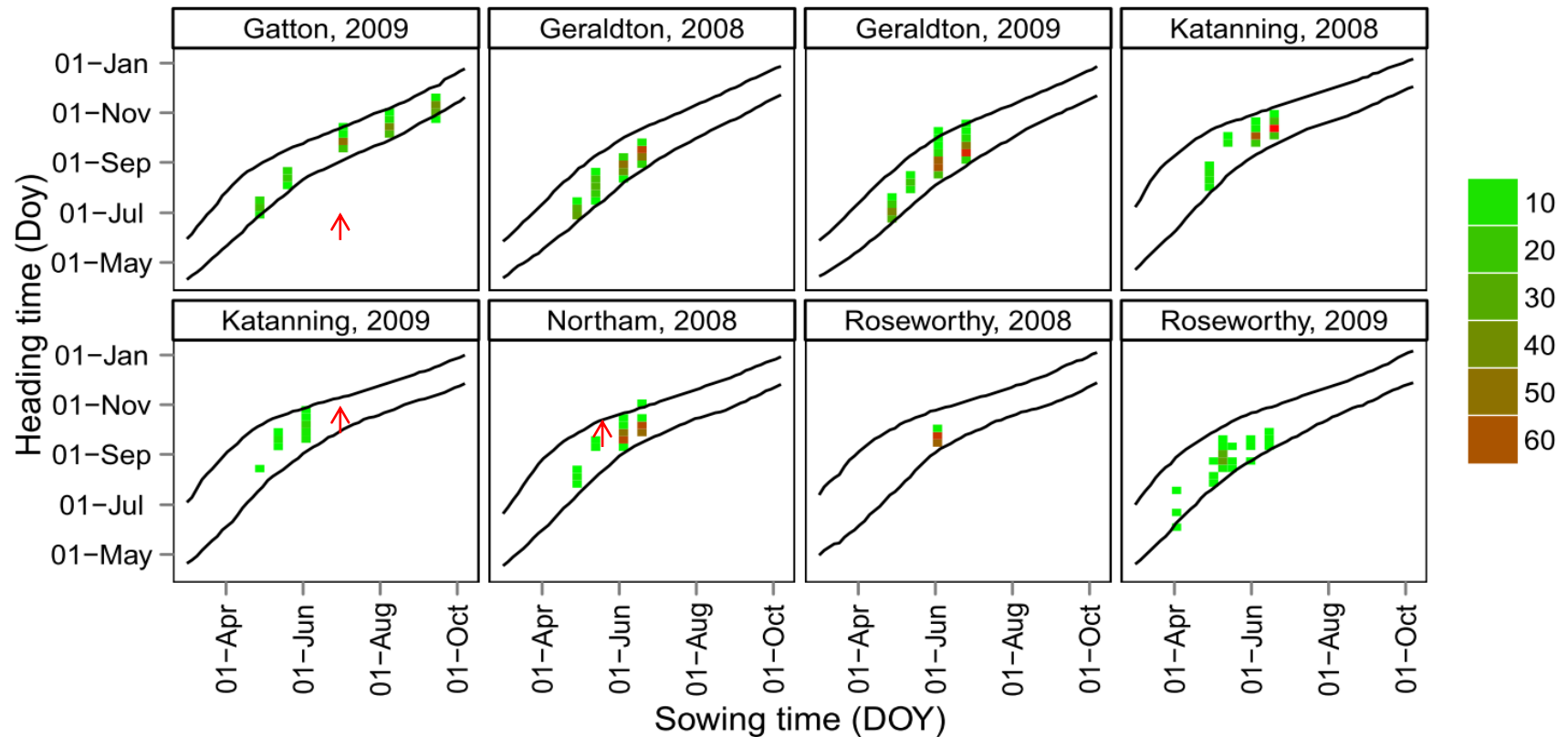
- In many cases GCM output provides little information at the timescale of interest
  - and low confidence of changes
- Develop approaches that do not overly rely on GCM output: 'No-regrets', 'Low regrets' and 'Robust' options
- Long-term: practical application of real options
- *Do not make climate projection uncertainty the focus of policy or practice discussion*

# Potential of GCMs to under-estimate risk: precipitation projections (SW WA): CMIP5





# Do we have the adaptation options ready ?

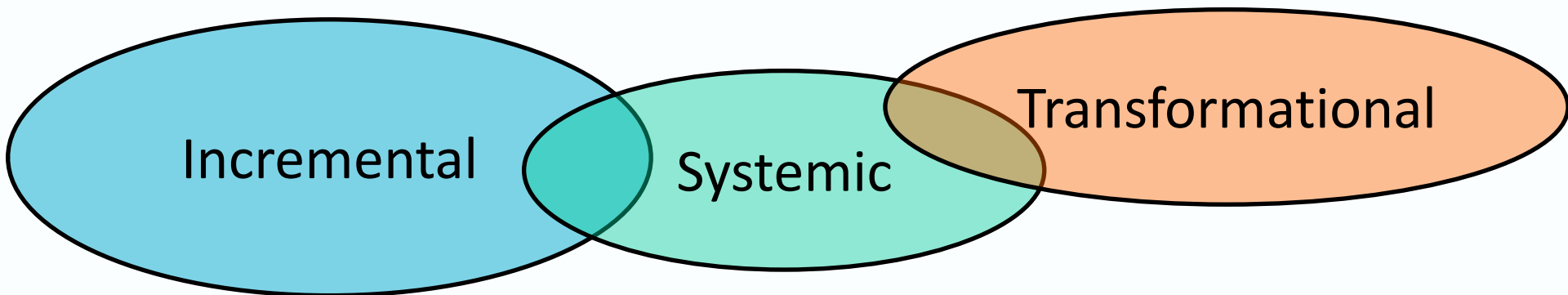


Colours = number of genotypes heading on a certain date

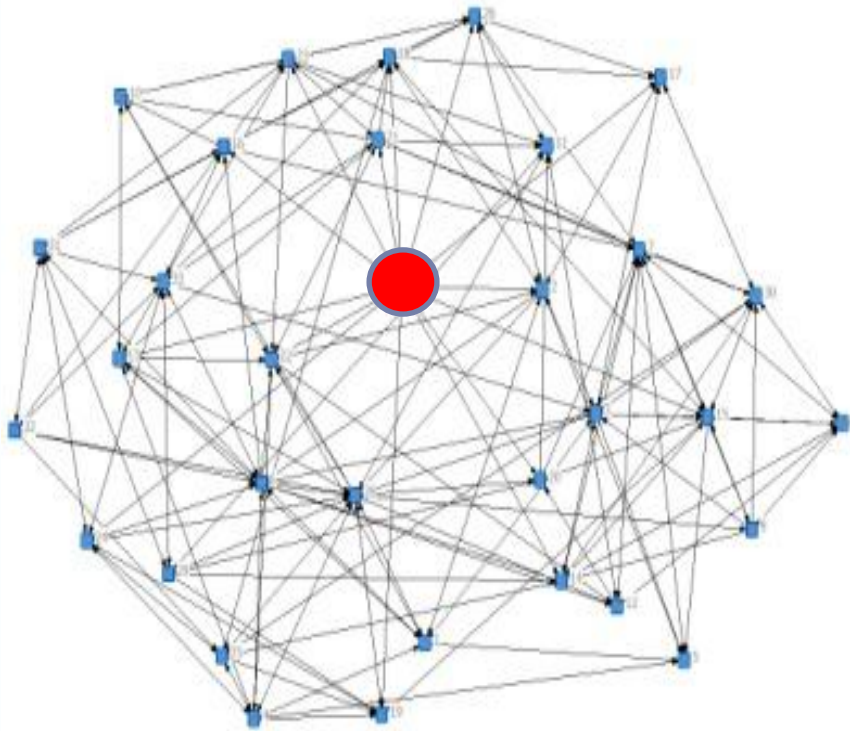
Lines represent 'genetic potential' for flowering date

# Comprehensiveness: More than incremental

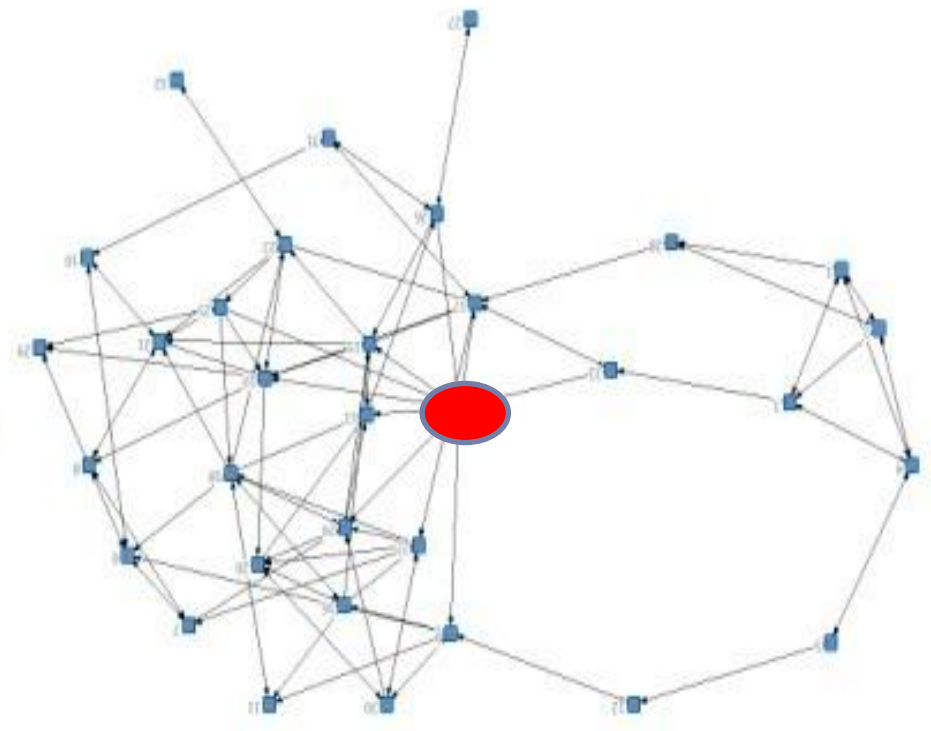
- Focus on existing systems only may result in maladaptation
  - and in missed opportunities
- Need to consider more systemic and transformational adaptations
  - increasingly so as changes continue



# Social support networks

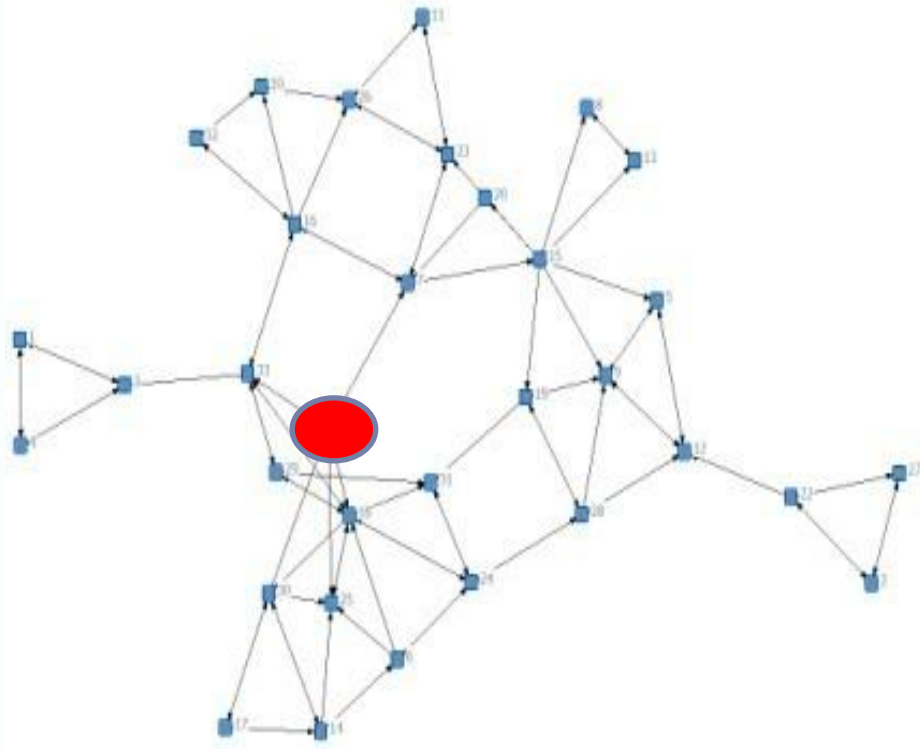


A. Incremental adaptor

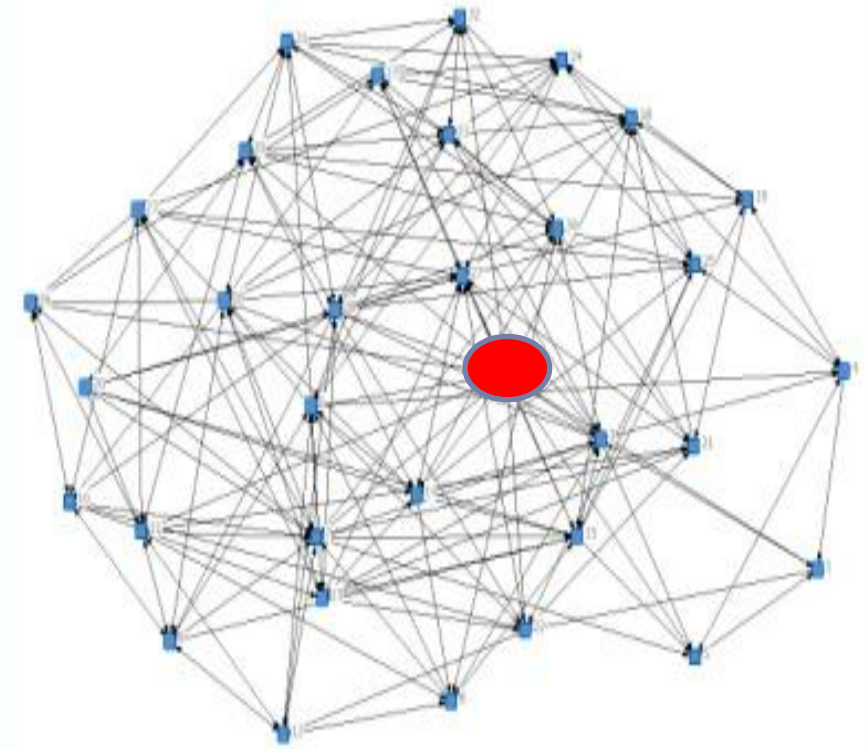


B. Transformational adaptor

# Information networks

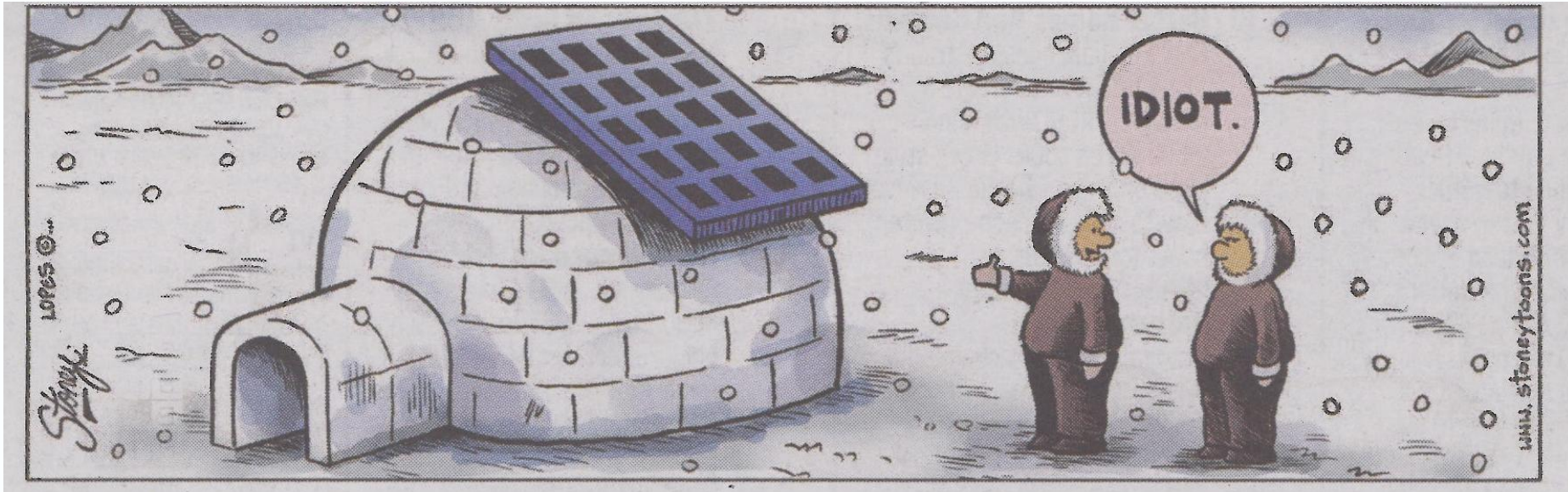


A. Incremental adaptor



B. Transformational adaptor

# Avoiding maladaptive responses



- Maladaptation readily apparent after the fact ....
- Do we know what 'good adaptation' looks like ?  
How to measure it ?
- Evaluation

# Change in questions needs change in science: we need to adapt too

- Is it real ?
- Does it matter ?
- Can we do anything about it or its impacts ?
- How do we take action ?
- How do we know we are doing the right thing ?

Bio-physical  
scientists

Economists,  
social scientists,  
stakeholders

Policy  
analysis,  
philosophy,  
politicians,  
stakeholders

# Summary

- Climate changes a clear and present danger
  - an opportunity
- Compelling engagement/comms strategies
- Building adaptive capacity
- Focus on outcomes, adoption paths
  - appropriate methods
  - tools available ahead of time
- Cross-issue/sectoral/scale integration
- Comprehensive: incremental to transformational
- Evaluation and monitoring - linked to decisions
- Continue to adapt our science

# Education is crucial for adaptation

In times of change, learners inherit the  
earth

*Eric Hoffer (1898-1983)*





# Thank you

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