



# Adapting to Climate Change: Irrigated agriculture in the Goulburn-Broken.

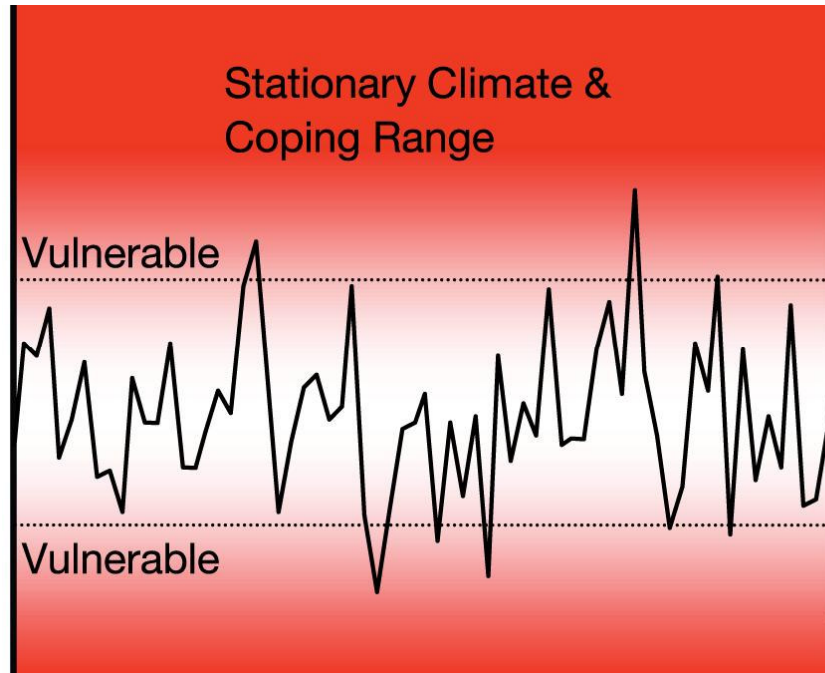
Jason Leeman

2<sup>nd</sup> June, 2009

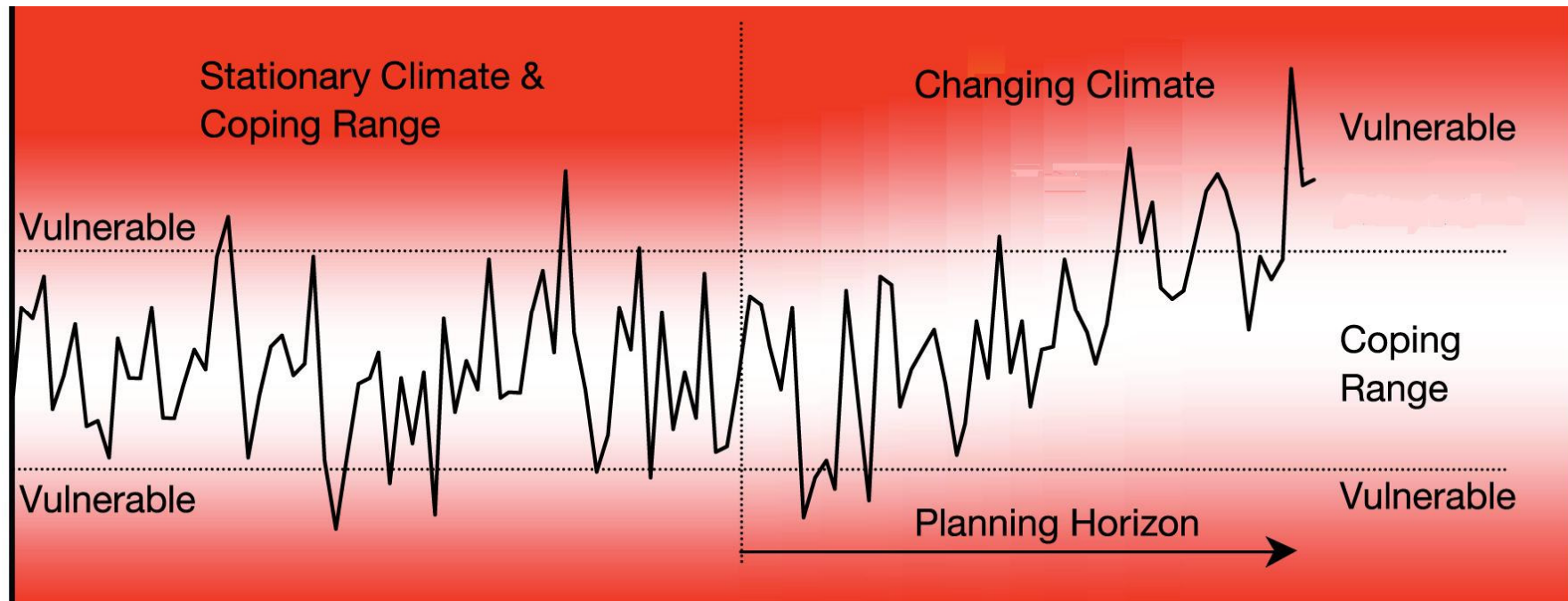
## Points for Discussion:

- Adaptation 101.
- Agricultural adaptation
- Irrigated dairy
- Irrigated horticulture

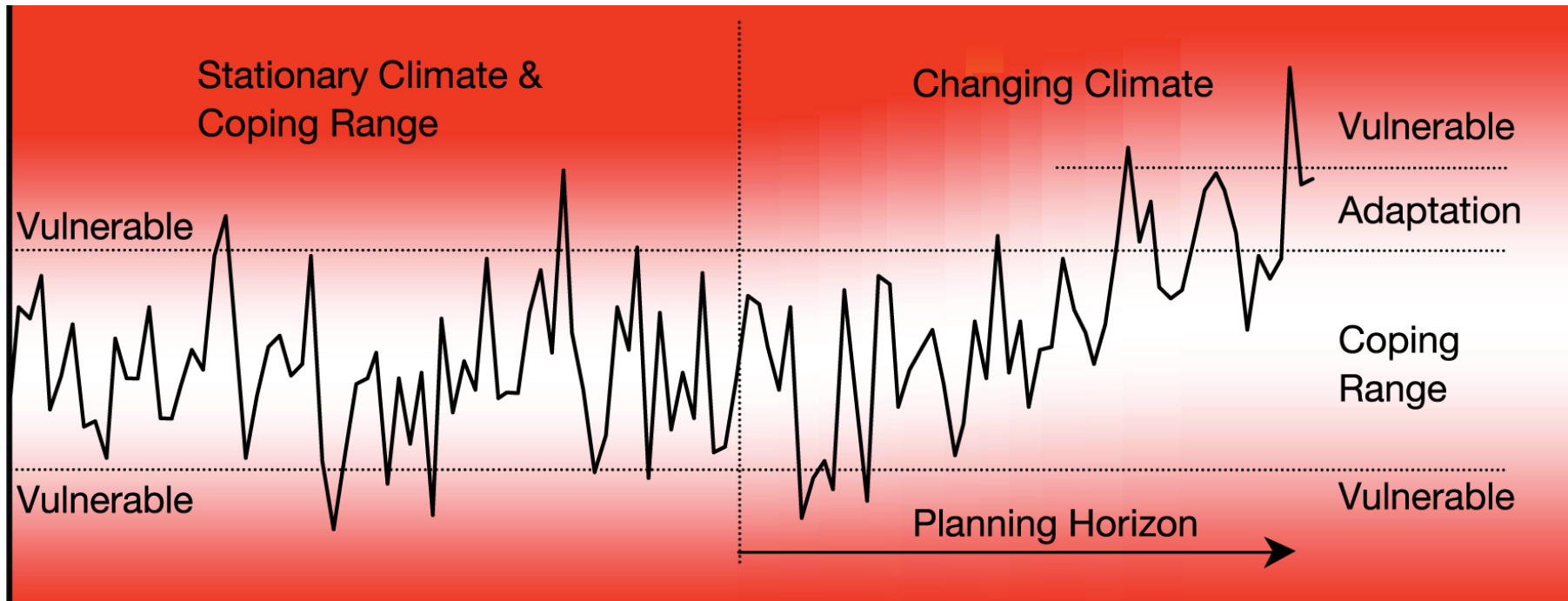




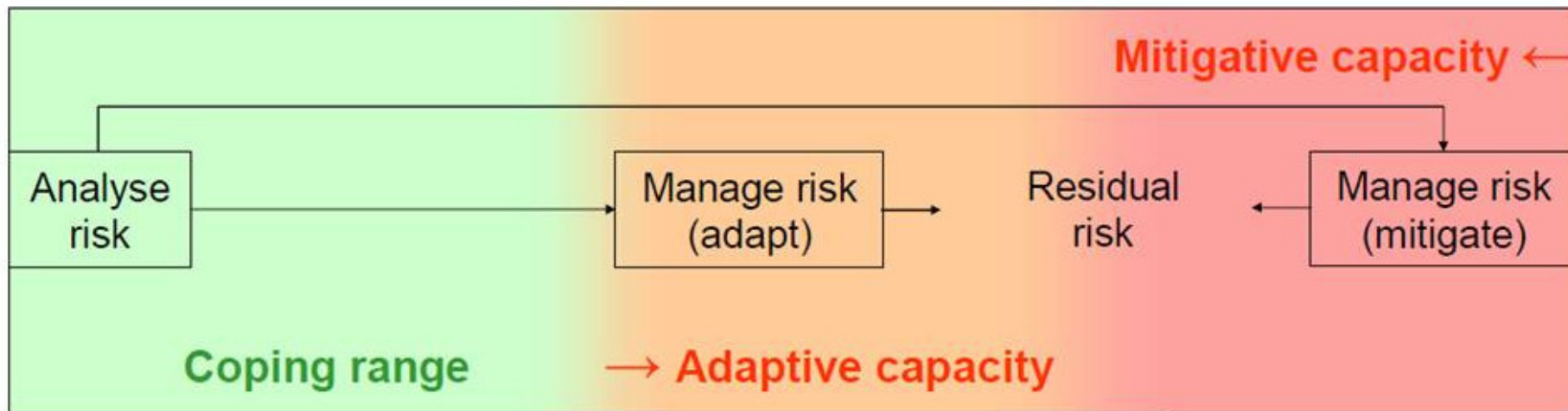
Taken from: *IPCC Fourth Assessment Report: Working Group II Report "Impacts, Adaptation and Vulnerability"*  
Figure 2.3



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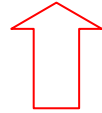


**Figure 18.** Schematic representing the complementary relationship between mitigation and adaptation. Adaptive capacity expands the coping range of affected systems reducing their vulnerability, while mitigation reduces the magnitude of climate change to which systems are exposed. Thus, mitigation and adaptation approach risk from opposite directions, but collectively minimize the likelihood of a particular consequence.

Taken from: *Climate Change Impacts on Australia and the Benefits of Early Action to Reduce Global Greenhouse Gas Emissions.* Preston, B.L. and Jones, R.N.(CSIRO) February, 2006

**Vulnerability = Impacts - Adaptation**

**Sensitivity**



**Exposure**



**Drivers of Change**

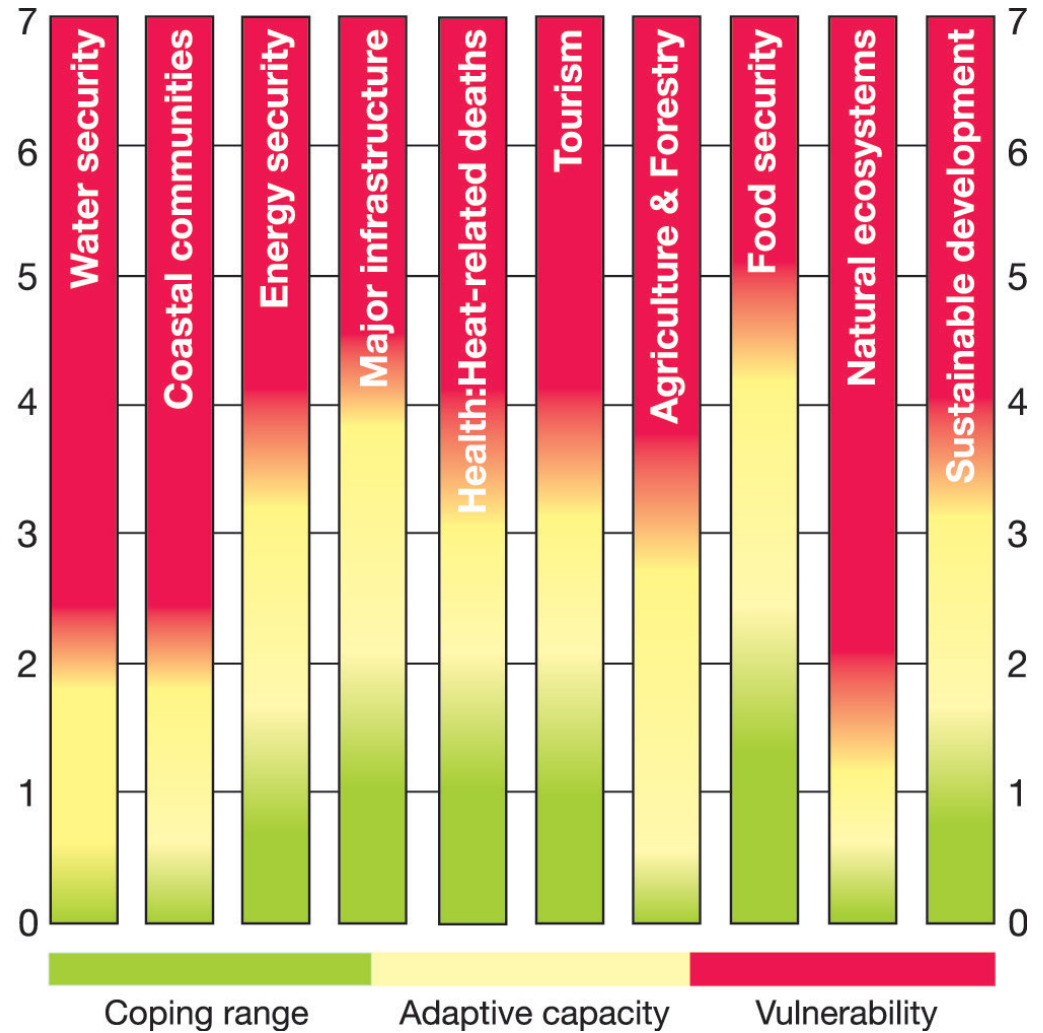
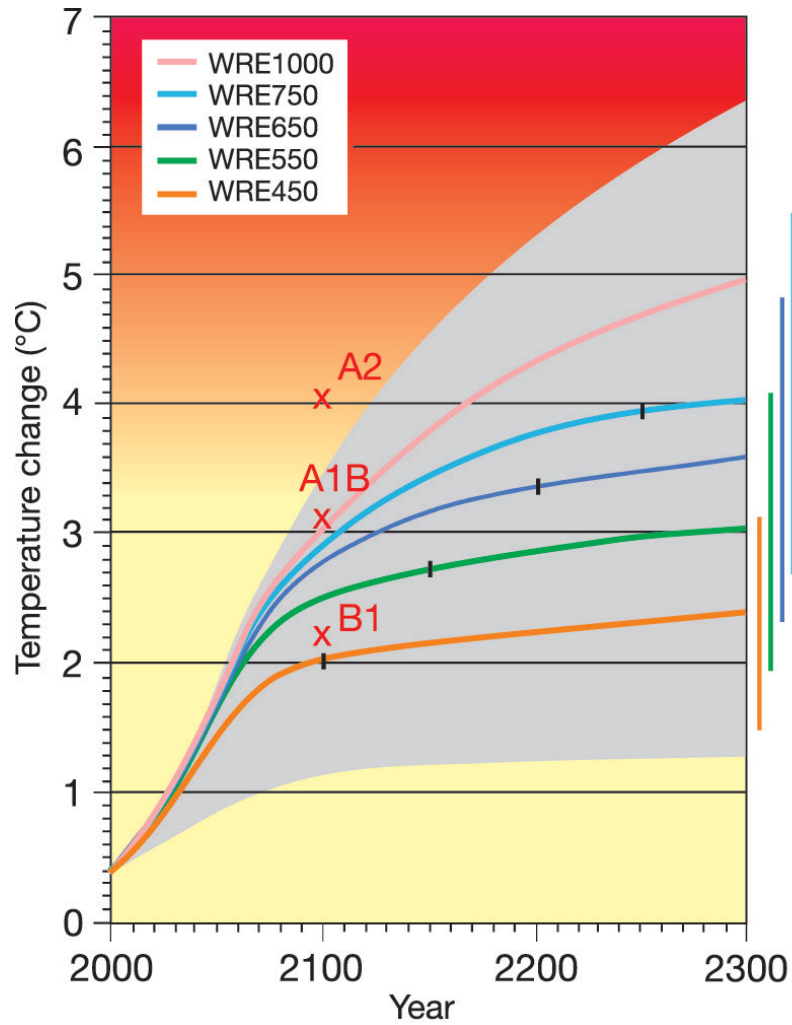
**Build resilience**



**Reduce exposure**



**Adaptive capacity**



# Seven steps on the pathway to adaptation

1. Robust decision-making in the face of uncertainty
2. Creating new social norms
3. Innovative technologies and practices
4. Appropriate institutional and policy settings
5. Balancing incremental and transformational adaptation
6. Putting adaptation in the context of other drivers
7. Integrating adaptation and mitigation

Adaptation measures provide opportunities to manage risks and adjust economic activity to reduce vulnerability and improve business certainty.

**Agriculture is an intrinsically adaptive activity.**

# Types of response:

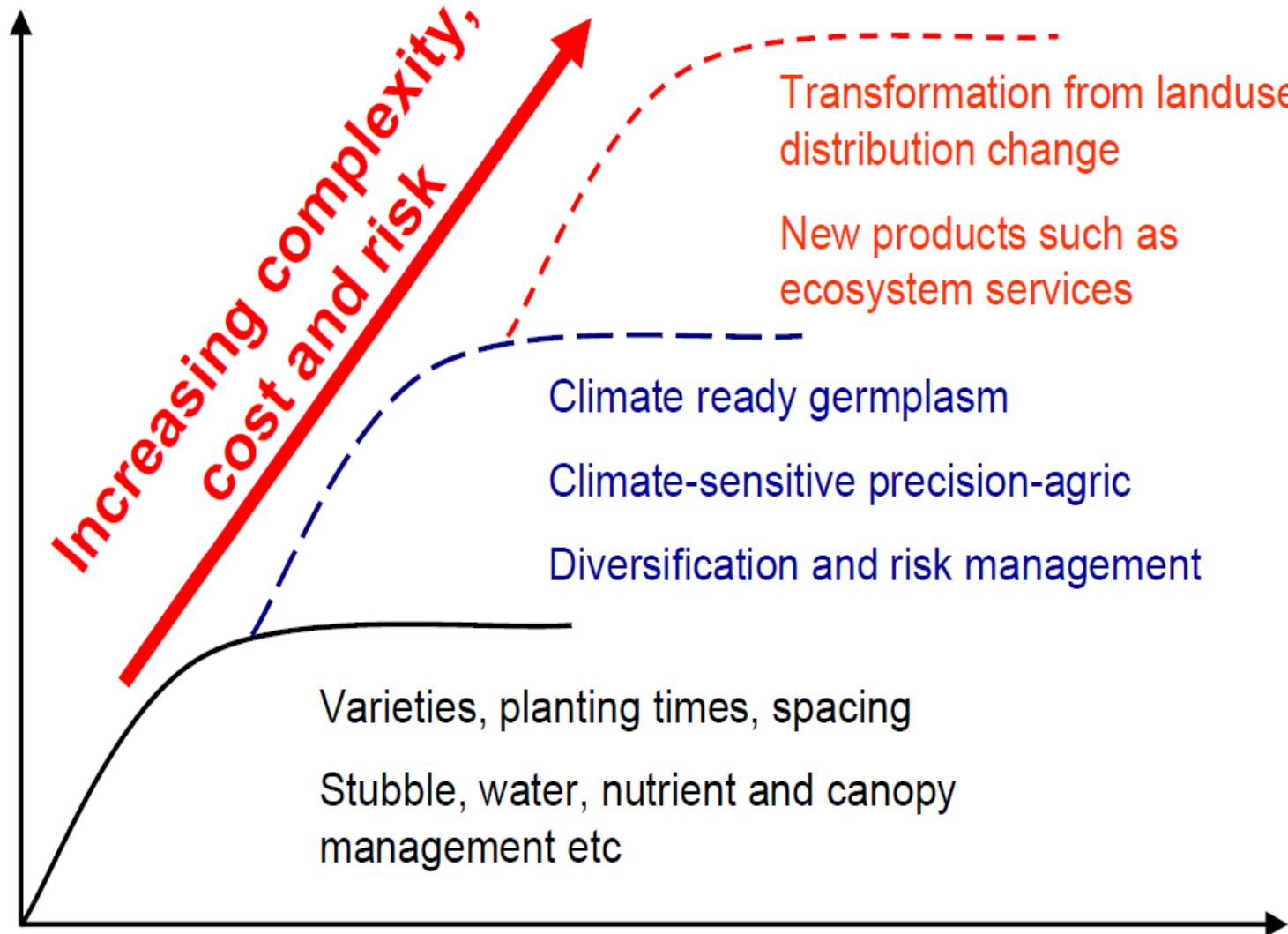
- Bear the loss
- Share the loss
- Modify the threat
- Prevent or avoid effects
- Change use
- Adjust Location
- Research
- Educate, inform and encourage behavioural change.

# Positive adaptive capacity

Capacity to adapt to climate change will be improved by:

- Ability to cope with current climate variability and similar ‘shocks’ (e.g. swings in international market prices)
- Well established networks and mechanisms for generating and applying new knowledge.
- Ability to manage and apply resources (property, stock, equipment, budgets etc.) with flexibility.

**Benefit from  
adaptation**

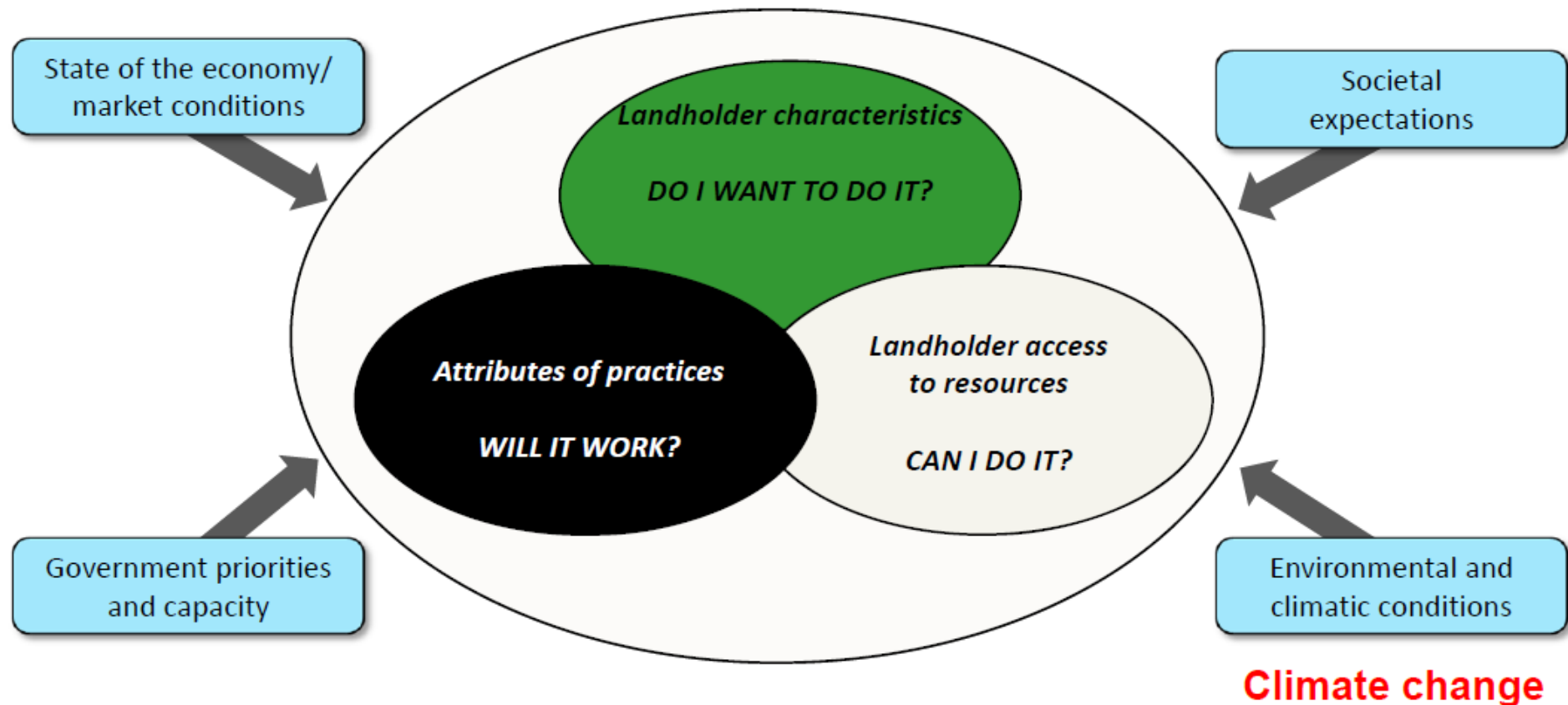


**Climate change**

Howden et al. (2007)

# Theoretical framework

## Factors influencing landholder decisions making and adaptive capacity



# Our longer term challenge for 2050:

**“How do we double global food production whilst reducing greenhouse emissions by 60%, and adapting to a changing climate?”**



# Horticulture



- Relatively low contributor to GHG emissions.
- Less scope for mitigation, greater need for adaptation.
- Rate of climate change is a threat to horticulture due to potential limited adaptive capacity (finite land & water resources)
- Water is the 'wild card'.
- Guaranteed water = increased growth (CO<sub>2</sub> fertilisation)

# Horticulture

- Biggest potential risk to pome & stone fruit is lack of vernalisation.
- Lack of chilling tends to result in:
  - Low flower bud initiation (fewer flowers)
  - Prolonged blossoming
  - Bud deterioration (or drop)
  - Reduced yields
  - Lower fruit quality
- Also risks of heat damage/sunburn and disruption to ontogeny (fruit set and development)
- Long-lived perennials more at risk than short lived horticultural crops.

## General adaptation options for horticulture

- Geographic relocation to cooler areas with better water supplies. Shift growing regions. Shift cropping seasons.
- Adopt alternative cultivars that suit anticipated climate changes. Diversification of crop cultivars. Genetic improvement of crop cultivars (eg. More heat tolerance).
- Continue improvement in irrigation systems for better timing and delivery of water resources. Increased water use efficiency.
- Improved farming technologies. Better farm management practices eg. Grow/install wind-breaks, mulch soil surface to prevent evaporation, improve soil structure to increase root density, root depth and water-holding capacity.
- Enhanced disease and pest monitoring systems.



**Shrivel**



**Stalled development**



**Berry collapse**

**Sunburn**

**Tip burn**

**Leaf burn**

**Wine quality?**



Limestone pan-poor root penetration



NS orientation-east

NS orientation-west

Shaded bunches



## Adaptive capacity:

Management practices that made a difference

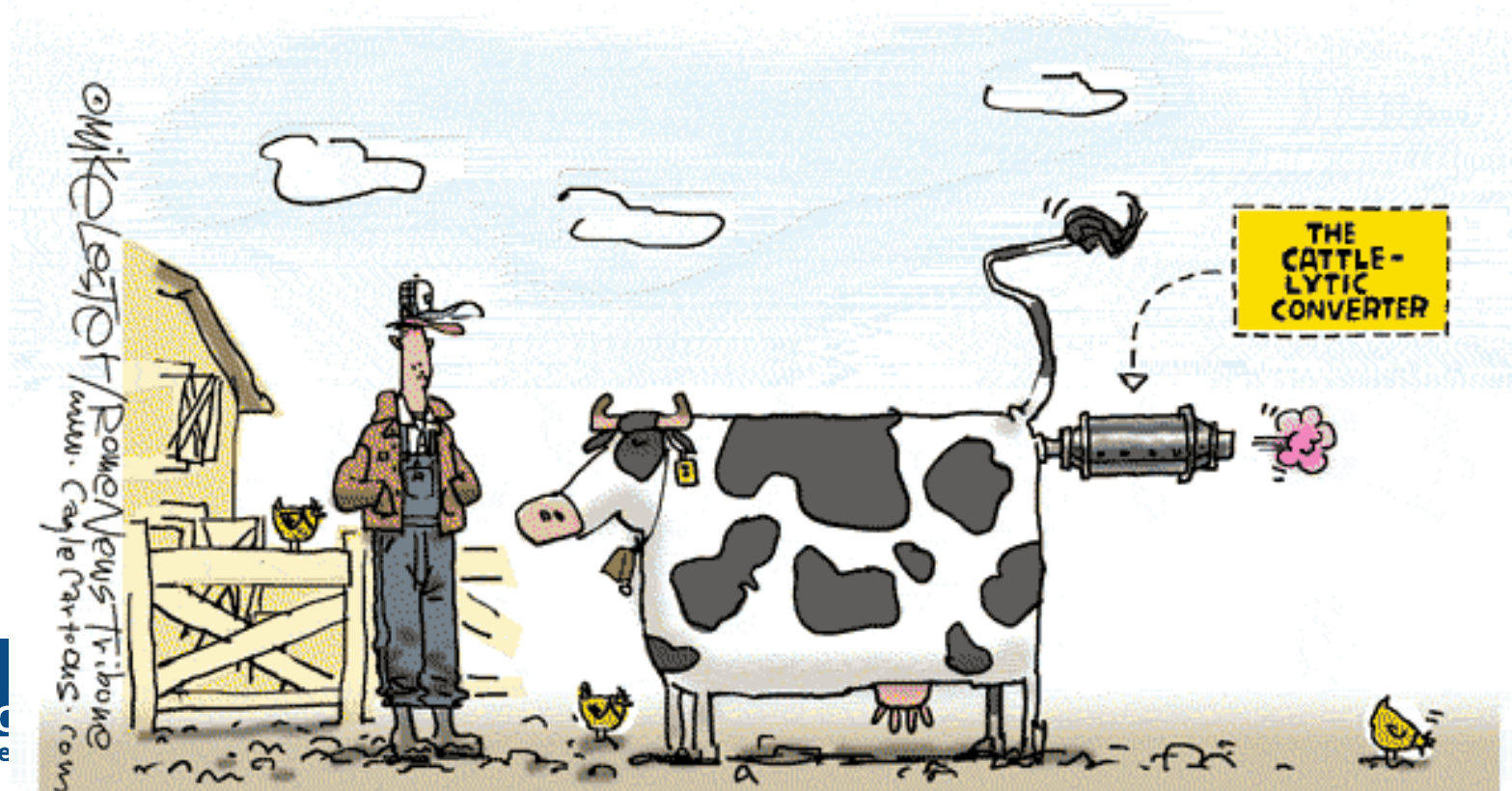
1. Water access/ availability
  - Irrigation PRIOR to the event
  - Rootstock/graft (canopy)
  - Soil type/structure and water holding capacity
  - Watering to crop load
2. Row orientation EW vs. NS **and** aspect
3. Phenological stage (/X variety?)
  - Pre or Post Veraison? (veraison=onset of ripening)
4. Canopy/ inter-row cover
  - Reduce radiation impact



**Cross-regional and inter-regional  
management guidelines for coping with  
hotter temperatures**

# Irrigated dairy

U.N. REPORT IDENTIFIES "COW EMISSIONS" ARE MORE DAMAGING TO PLANET THAN CO<sub>2</sub> FROM CARS... SOLUTION?



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**“You don’t look anything like the  
long haired, skinny kid I married 25 years ago.  
I need a DNA sample to make sure it’s still you.”**

# Climate Change...dairy's ultimate farm system challenge.

- Water
  - Strong competing demand; cost; availability; need for efficiency
- Grains (underpins 40% of milk)
  - World wide change in supply and demand
  - Purchase and access strategies
  - Farming Systems re-evaluation
- Fibre – pasture, crop, silage/hay
  - Short lived, water efficient, shoulder systems
- People and Land
  - The confidence of people; the value of land



# Irrigated dairy

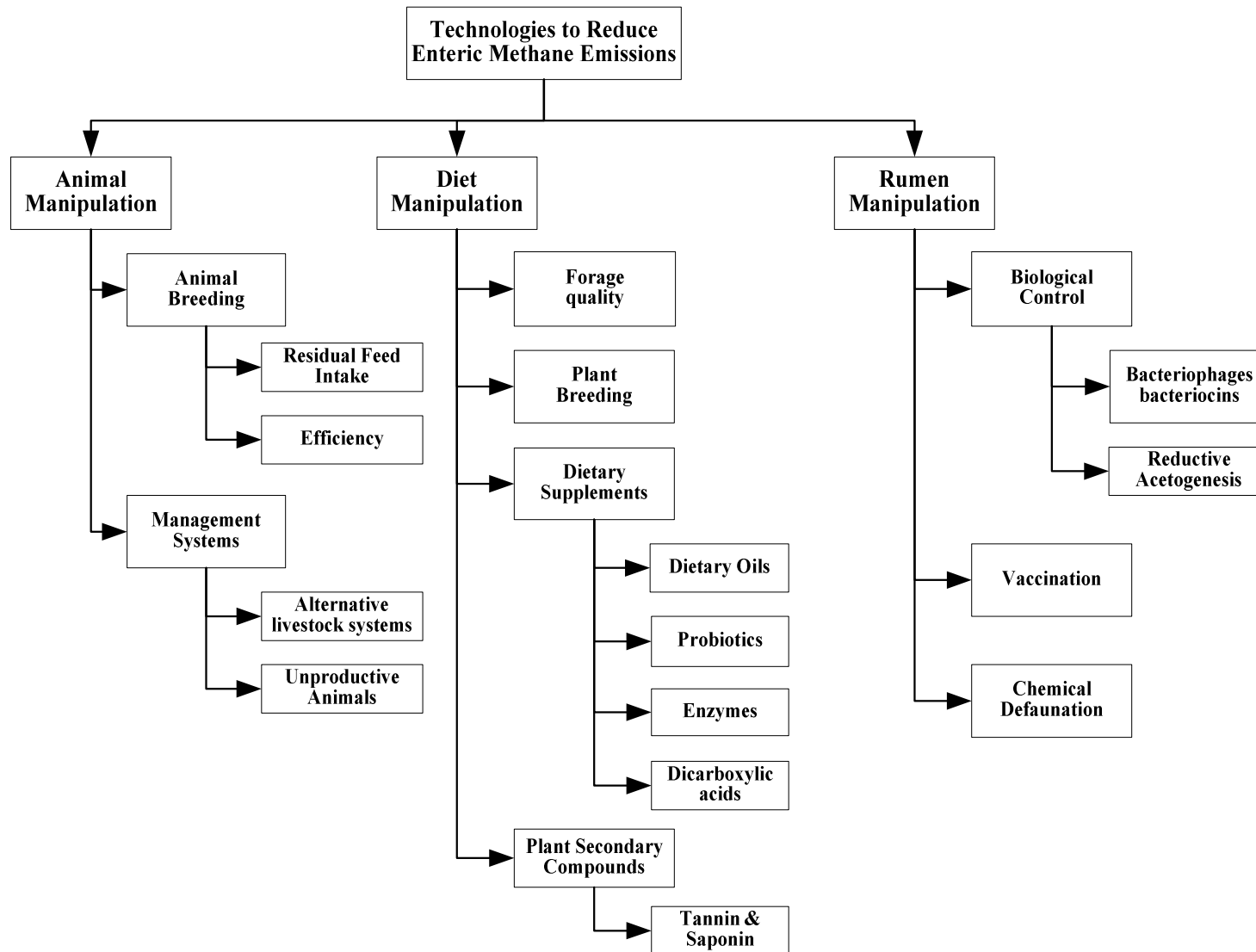
- All of the above impacting on farm systems..plus



# Adaptation in dairy farming.

- Systems based adaptation will continue
- Adopt precision agriculture technologies that will improve efficiencies.
- Look for opportunities that climate change may bring – c sequestration, new crops and WUE.
- Spread risk through multiple holdings in different climatic regions





**And of course – what do footballers think?**

**Ron Barrassi says there are 3 types of people:**

1. Those that “Watch it happen”
  2. Those that go “What happened?!”
  3. Those that “Make it happen”
- Which response is the right one for us?

# Making things happen

- Consider:
- Does your agency have the capabilities to “drive” your climate change response or are you largely “reactive”
- Links and network with key expertise/collaborators and developing regionally specific responses/actions
- Each region is different (specific changes in climate, the risks and opportunities, and exposure to policy/trade impacts)
- Have you undertaken a risk analysis/planning of what this means for your business, agency, staff
- Which key risks are you responsible for managing?

# Thank you.

