Assessing Climate Change Adaptation Options for Local Governments

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What is this work about?

- Prioritising climate adaptation options for local governments
- Develop a method (national/international) for better climate investments
- Developed vs developing:
  - Comparing climate adaptation prioritisation differences for two local areas:
    - Cochin municipal corporation, Kerala, India
    - **Ku-ring-gai council, Sydney, Australia**

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Ku-ring-gai vs Cochin locale

Temp mean: **7-25ºC** 25-35ºC
Annual rainfall: **1090mm**, 3500mm
Population density: ~**11**, 63 person/hectare

INDIA

AUSTRALIA

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Assisting local community action

- Public exposure through Nobel Peace Prize winners
  - (IPCC, 2007), ‘Warming of the climate system is unequivocal’
  - Al Gore’s ‘An Inconvenient Truth’
- Awareness that time for action is now, but how?
- Reluctance among local councils to act
  - Uncertainty in climate projections
  - Unavailability of local predictions
- As a precautionary principle local councils should act
  - Impacts of climate change differ among regions

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How to start: challenges/ideas

- PROBLEMS
  1. No predictions at local scales
  2. Difficulty in valuing costs, benefits & preferences
- SOLUTIONS
  1. Try climate extremes e.g. bushfires, flood,..
     - Historical data for extreme events are very rare
  2. Triple bottom line (financial, environmental and social) aspects
     - Discount rate dilemma (Stern vs Nordhaus)

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Discount rate debate

- Climate investments today may not give immediate benefits
  - Inter-and intra-generational equity issues
- Discount rates – to standardise costs and benefits occurring at different times
  - Ethical ~ 0% – social discount rate (e.g. Stern)
  - Market ~ 7% - financial discount rate (e.g. Nordhaus)
- But is this debate important for local governments?

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Councils choice of discount rate

- Low rate if willing to sacrifice for the future
- Risk probability of the council
- Unlike state/national governments limited fund allocation
- Fund source likely to be a loan at market rate
- Financial returns - very slow – long term investment
- High discount rate is justified by requirement for fiscal probity

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Evaluate 3 aspects of all options

TBL: financial, environmental & social

- Going forward:
  - Extremes; TBL for coverage; high discounting

FINANCIAL Options	Cost	Benefit	Rank of NET i.e. benefit – cost
1.			
2.			
etc			

SOCIAL Options	Cost	Benefit	Rank of NET benefit – cost
1.			
2.			
etc			

ENVIRONMENTAL Options	Cost	Benefit	Rank of NET i.e. benefit – cost
1.			
2.			
etc			

- Challenges
  - – Lack of data; difficulties of valuing

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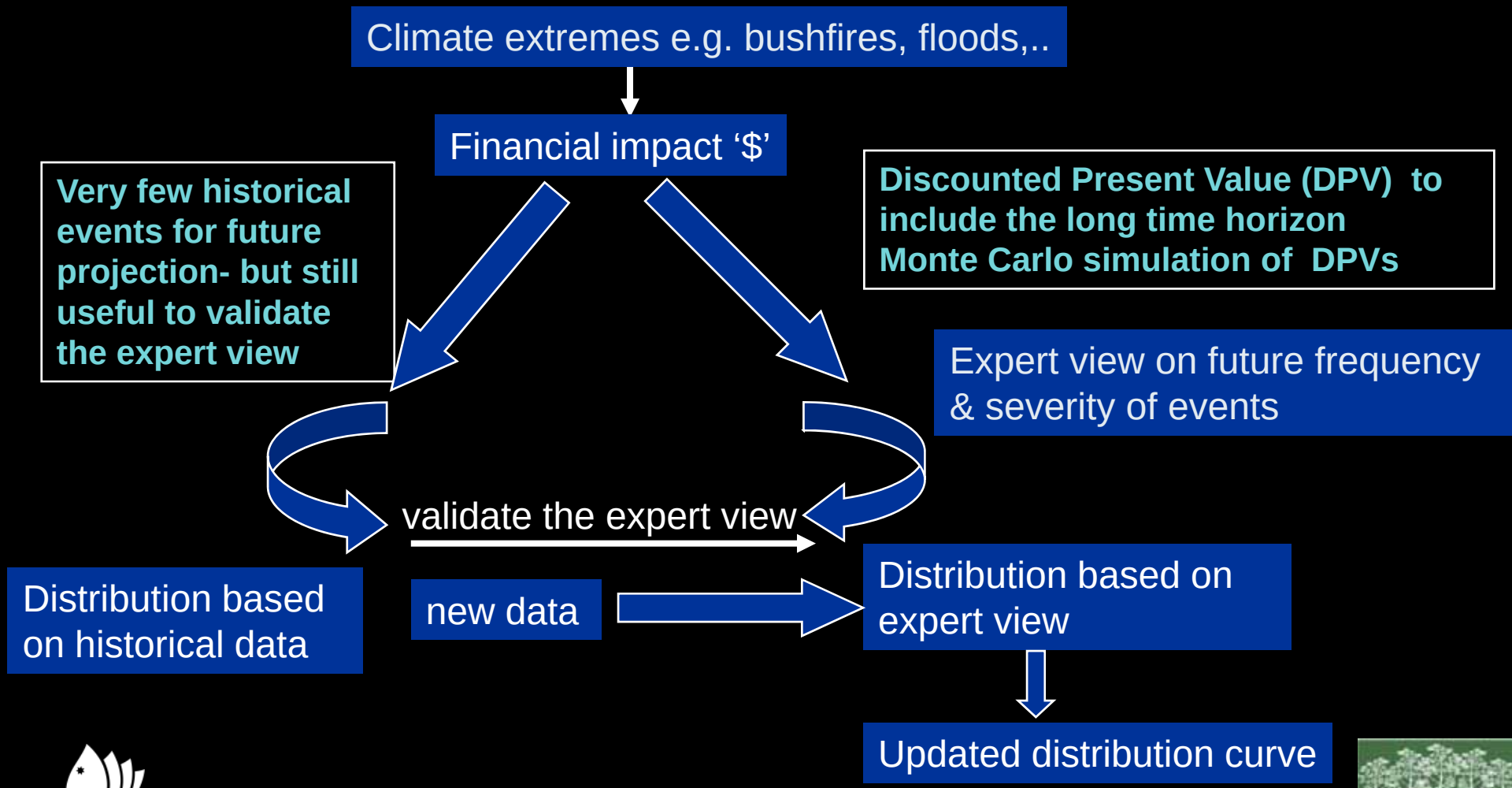
No data: use Bayesian inference



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Example: bushfires financial case

Modeling results incorporating expert views from 2010 (discount rate is bank's current interest rate)

- Best case scenario-present climate continues
  - House loss by 2050 if we assume that the present climate continues = A$25 million
- Scenario in which climate change affects frequency
  - House loss by 2050 if we assume an increase in bushfire frequency = A$32 million (1 bushfire every 10 years)

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Valuing? Cost Benefit Analysis or?

- Cost benefit analysis (CBA)
  - Put $ values to all financial, social and environmental cases
  - Complete CBA could be costly and time consuming
  - Partial CBA doesn't make sense
    - $s to a beautiful scenery or clear blue sky????
  - Not an appropriate method for a local council
- Arrow's impossibility theorem (Nobel Laureate, 1972)
  - Consistent collective ranking is possible if only one agent's preference determine social choices
- Rational decisions in ranking – council experts
  - Financial ranking based purely on $ values

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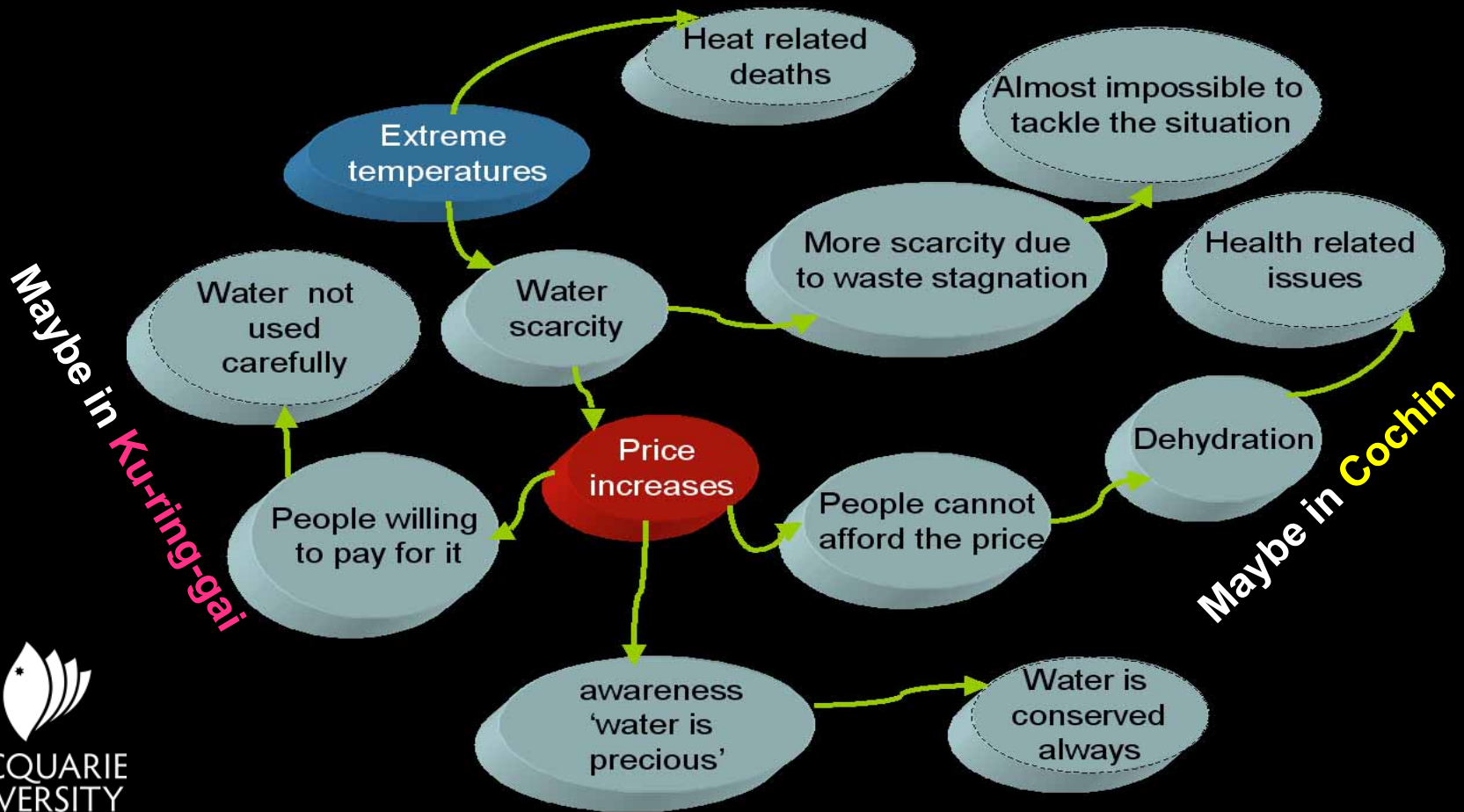
Environmental case

Option	COST = Envi. negative impacts	BENEFITS=Env. positive impacts	RANK (how closely does each option satisfy the envi. objective?)
Building of fire trails	Natural habitat destroyed, pollution during construction process, sound pollution during construction, biodiversity always disturbed due to human interference (tourism),	Loss of biodiversity will be less due to the less spreading of fire though more intense fires are expected compared to over time 2020	Rank 2(Reduced spreading crucial as intensity may increase)
Rezone land to restrict dev in high risk areas	Loss of biodiversity due to bushfire spreading, pollution problem, intense spreading fires may affect the natural habitat	Less encroachment of buildings saving the biodiversity and almost nil houses in the danger zone	Rank 3(Biodiversity preserved, but requires some strategy to reduce the intensity of bushfires)
New rural fire control centre	Arson lit bushfires – increasing loss to biodiversity	Reduces the intensity of fires immediately- less loss of biodiversity due to intense bushfires. Due to more intense and frequent bushfires fire control services will be more required	Rank 1 (Immediate response, less harm to the biodiversity)
No action	More loss of biodiversity due to bushfires, pollution problem, intense spreading fires	Some plants need bushfires,	Rank 4

- Challenge
  - Social case even harder

Social case

3D visualisation tool to reduce the difference in opinions - converging to an almost ‘unique’ decision



How to combine 3 ranked aspects
financial, environmental & social

FINACIAL/ Options	Rank of NET i.e. benefit – cost
1.	7
2	20
etc	11

Bayesian inference

SOCIAL/ Options	Rank of NET i.e. benefit – cost
1.	1
2.	16
etc	3

3D tool ?

ENVIRONMENTAL / Options	Rank of NET i.e. benefit – cost
1.	21
2.	2
etc	15

Env. impact statement

- Challenge
  - Combining different ranked values

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Borda counts for net rankings

- Jean Charles de Borda in 1781 developed a system for combining ranks
- n options ranked in the order of preferences, points n-1, n-2, …..0 respectively are assigned to first, second, …last ranked options.
- Option with the greatest total number of Borda votes will be the winning option.

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Many more challenges ahead

- Data for Australia is hard & data for India is still in searching stage
- Consider many more climate extremes
- Reduce the subjectivity in ranking environmental aspects
- Testing the 3D visualisation tool to demonstrate applicability and acceptance

THANK YOU

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