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The ecosystem service values of fish ladders in poor counties: Who should pay?

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Benefits and costs of fish passages in the Mekong

Dr Bethany Cooper, Prof Lin Crase & Adam Henderson

International Conference on River Connectivity (Fish Passage 2018), 10-14 December 2018

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Outline

- What is Benefit Cost Analysis?
- The steps in Benefit Cost Analysis
- Some complications inherent in applying BCA to fish passages
- Designing a decision support tool to help

What is Benefit Cost Analysis?

- BCA 1950s – formalised mechanism for improving choices between public projects
- Tool to assist decision-making: not the immutable truth!

- Benefits
  - Increase wellbeing (marginal)
- Costs
  - Putting a dollar value on the extra resources used to deliver the project (marginal)

BCA – change in net wellbeing from project

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Benefit Cost Analysis: 4 Steps

Some Complications inherent in: 4 Steps

Decision support tool: Fishway

Benefit Cost Analysis: 4 Steps

Some Complications inherent in: 4 Steps

Decision support tool: Fishway

1. Establish scope of benefits and costs

- Who are the ‘material winners’ and who are the ‘material losers’?
  - ‘Materiality’ to what extent do flow on effects matter?
  - Geographical scope; temporal scope (fishways are part of an entire river system)
- For consistency benefits and costs need to be measured at the same scale

- In this Case:
  - Geographic scope = Direct effects of Fishway
  - Local Benefits and Costs
  - Temporal scope = Lifespan of Fishway

2. Assign a value to each benefit and cost

- Ideally these will be in a common form
- Monetary values generally preferred (though far from perfect)

- In this case:
  - Benefit: Additional fish assigned a monetary market value for lifespan of fishway (Hortle 2007)
  - Cost: Build and maintenance for lifespan on fishway
- Note:
  - Other benefits not captured by fish market?
  - Design choices will impact on Effectiveness of Fishway and drive the yield of fish

3. Express monetary values in common time – discount future benefits and costs

- Some costs are commonly up-front (e.g. construction)
- Benefits (and some costs e.g. maintenance) accrue over the life of project
- A $ today is worth more than a $ tomorrow
- ‘Net present value’ – a way of comparing all current costs and benefits along with future costs and benefits

- In this case:
  - Allowed for different scenarios for discount rate over lifespan of Fishway
  - Assume constant returns over time in first instance

4. Apply decision rule

- Only choose projects where benefits > costs
- Ideally use economic merit i.e. proceed with the highest and positive net benefits sequentially
- Or, if benefits uncertain choose projects with lowest cost

- But…
  - Distributional considerations might change order of projects e.g. projects that benefit the poor may get priority
  - Other social and ethical considerations e.g. priority to projects that deliver higher environmental, cultural, gender benefits

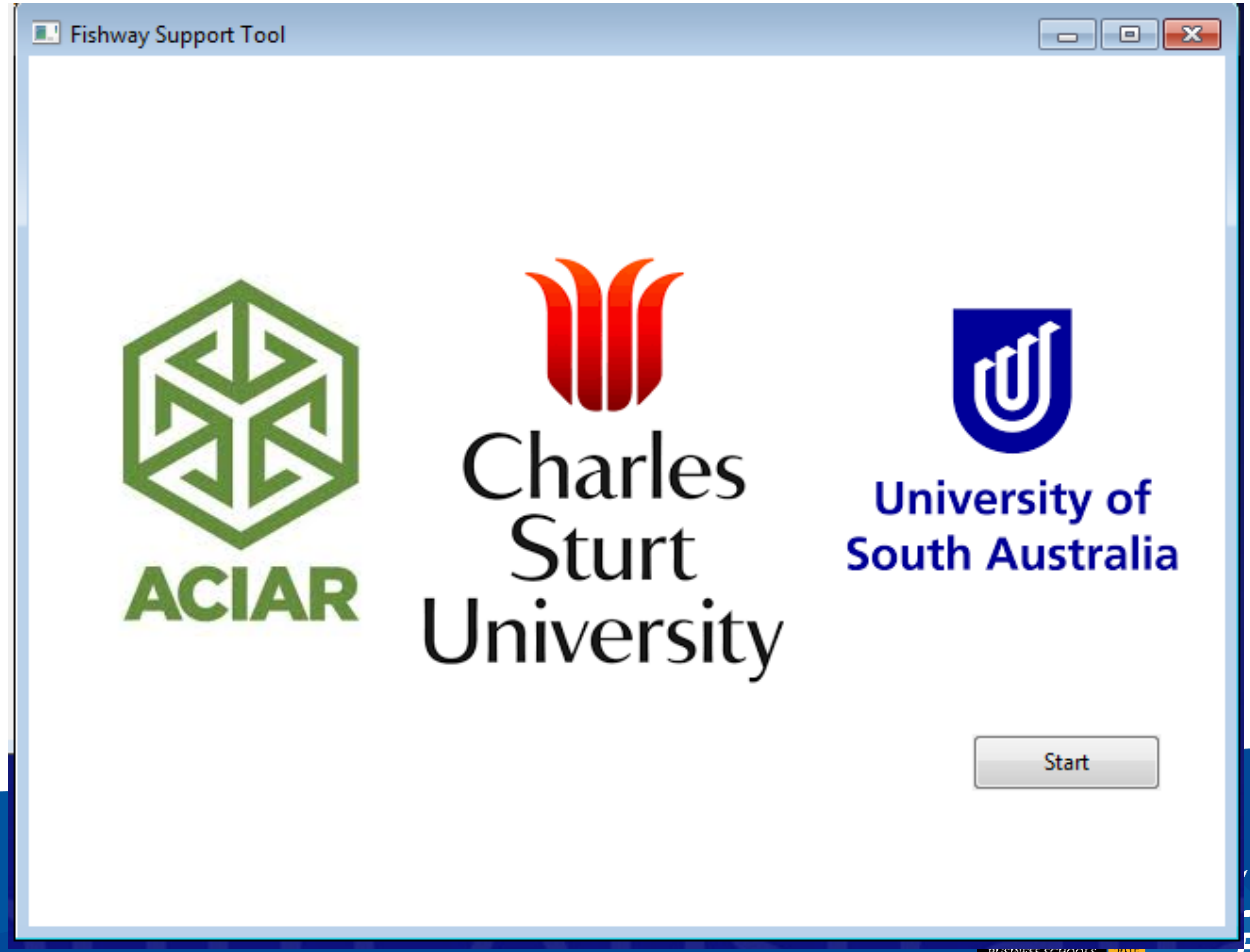
- In this case:
- Presented to the decision maker:
  - Net Present Value; Benefit Cost Ratio; Break even time period; Additional Edible protein; Conversion of protein to human nutrition
- Does a proposed fishway warrant further investigation i.e. a more detailed design?

Benefit Cost Analysis: 4 Steps

Some Complications inherent in: 4 Steps

Decision support tool: Fishway

Pilot: Fishway Decision Support Tool



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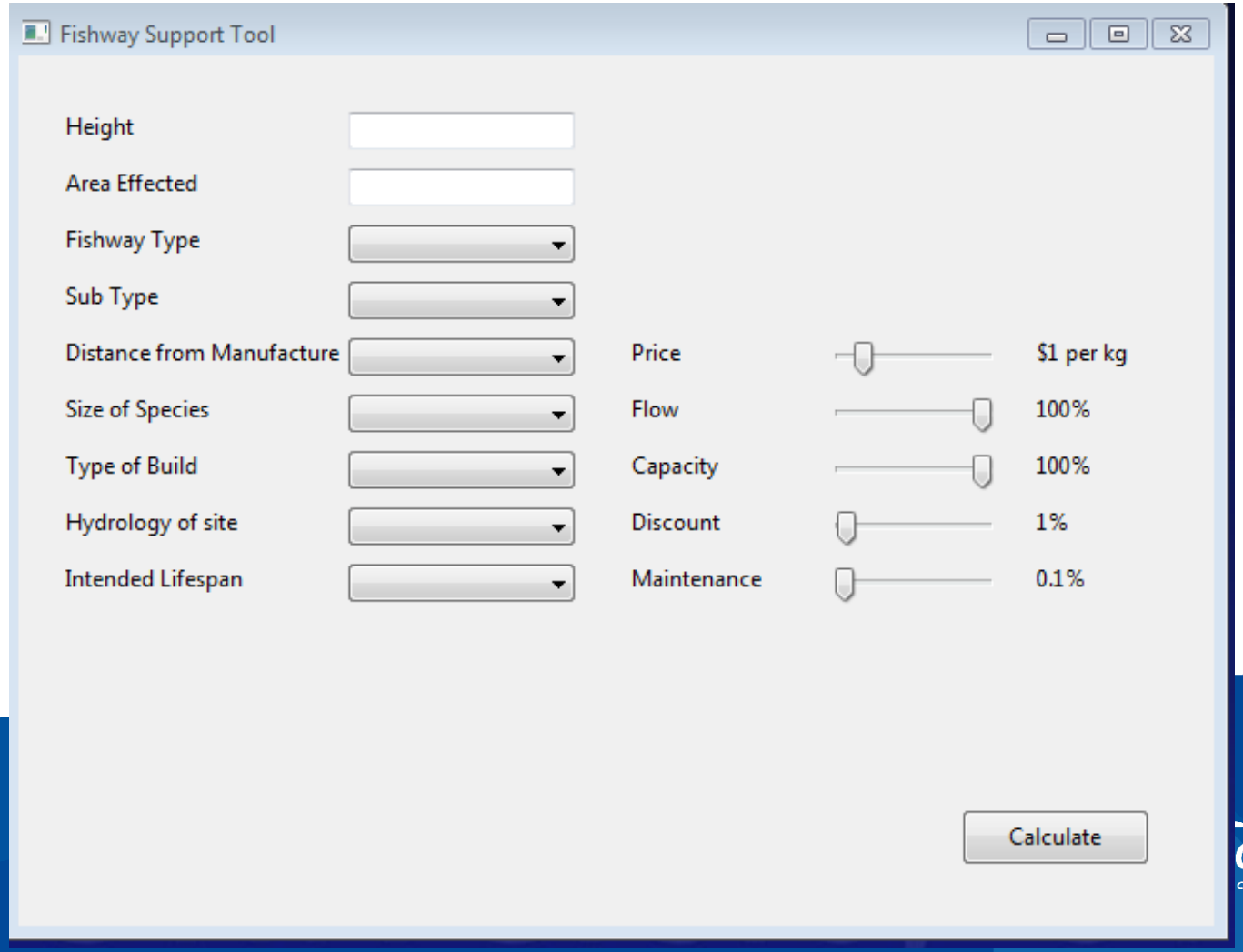
Fishway Decision Support Tool



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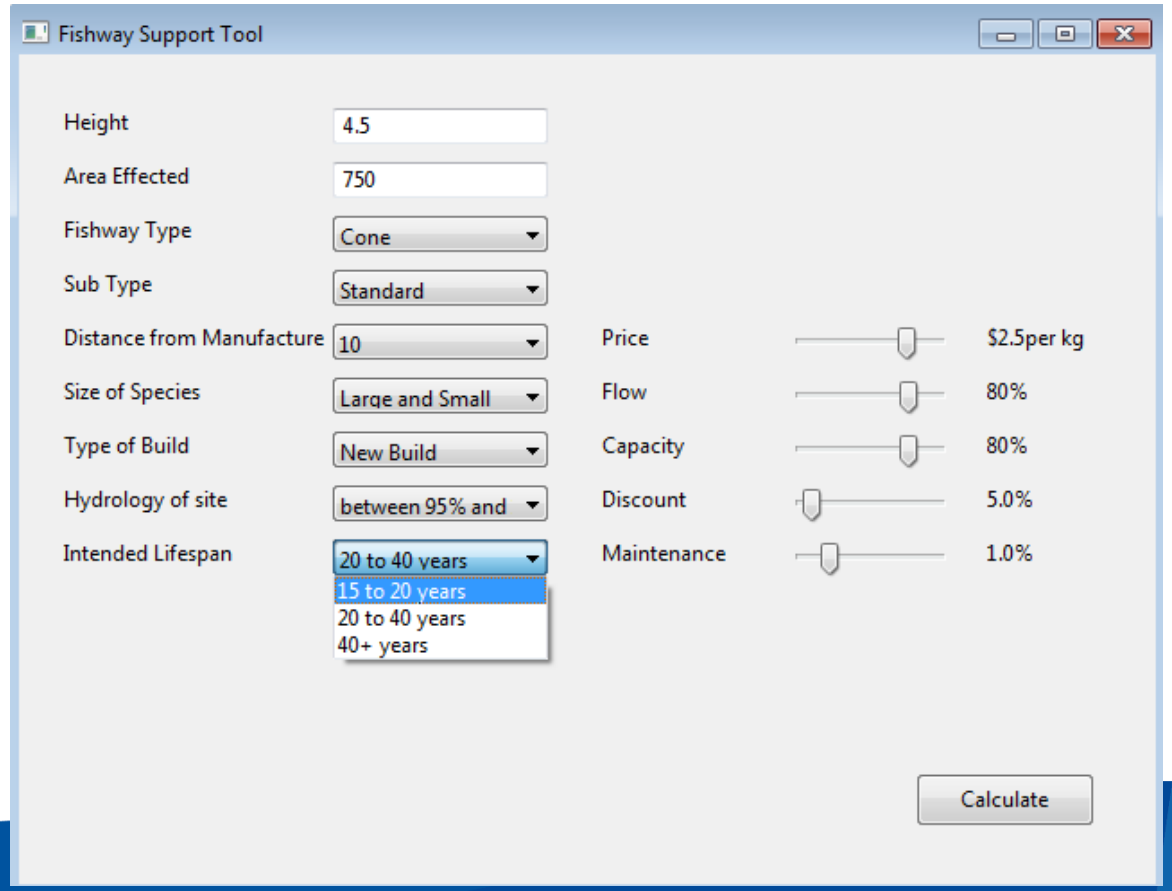
Example: Fishway Benefits and Costs



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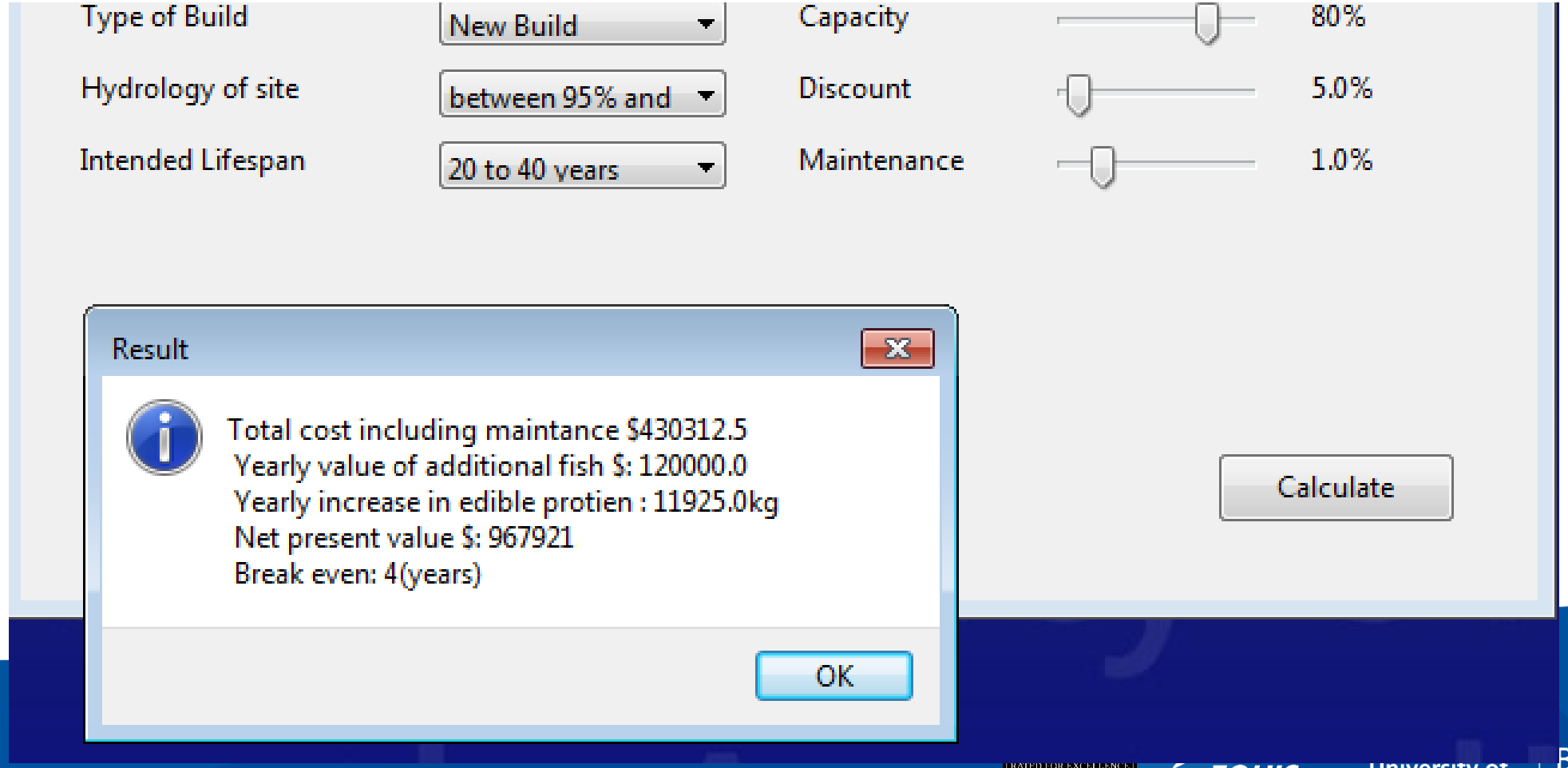
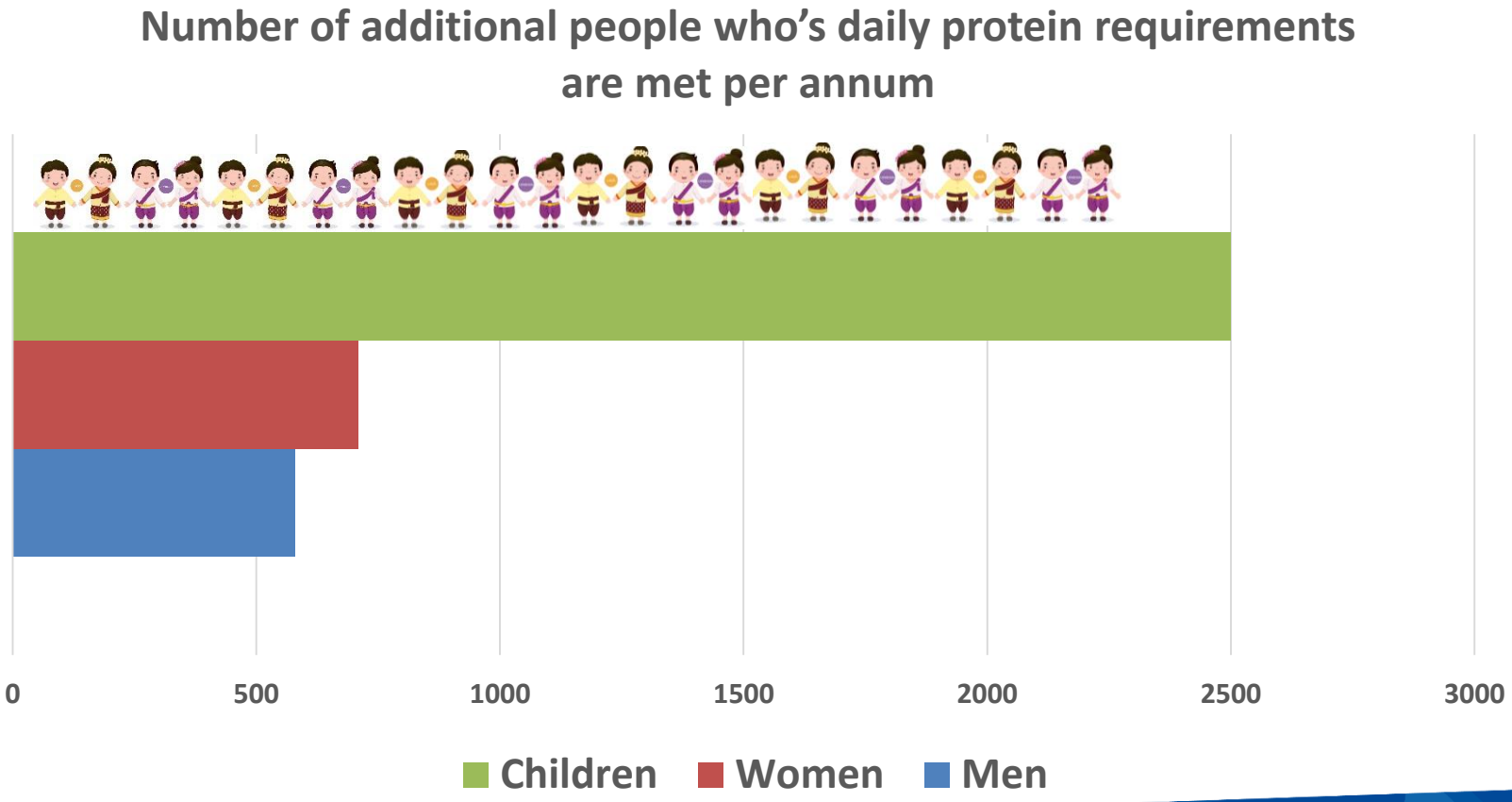
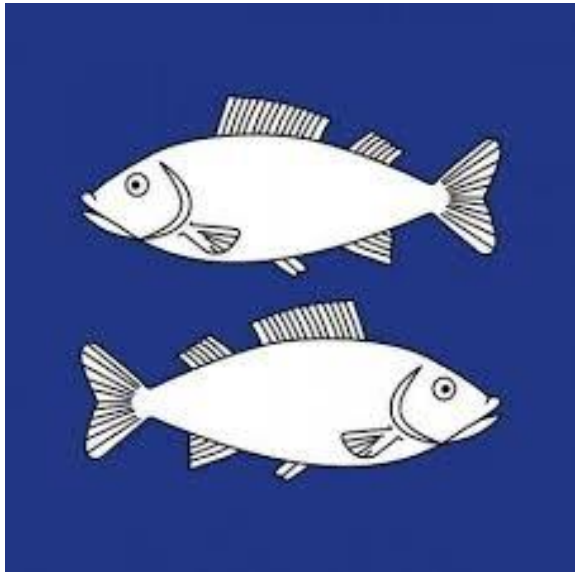
Example: Fishway Benefits and Costs



Extensions: Nutrition

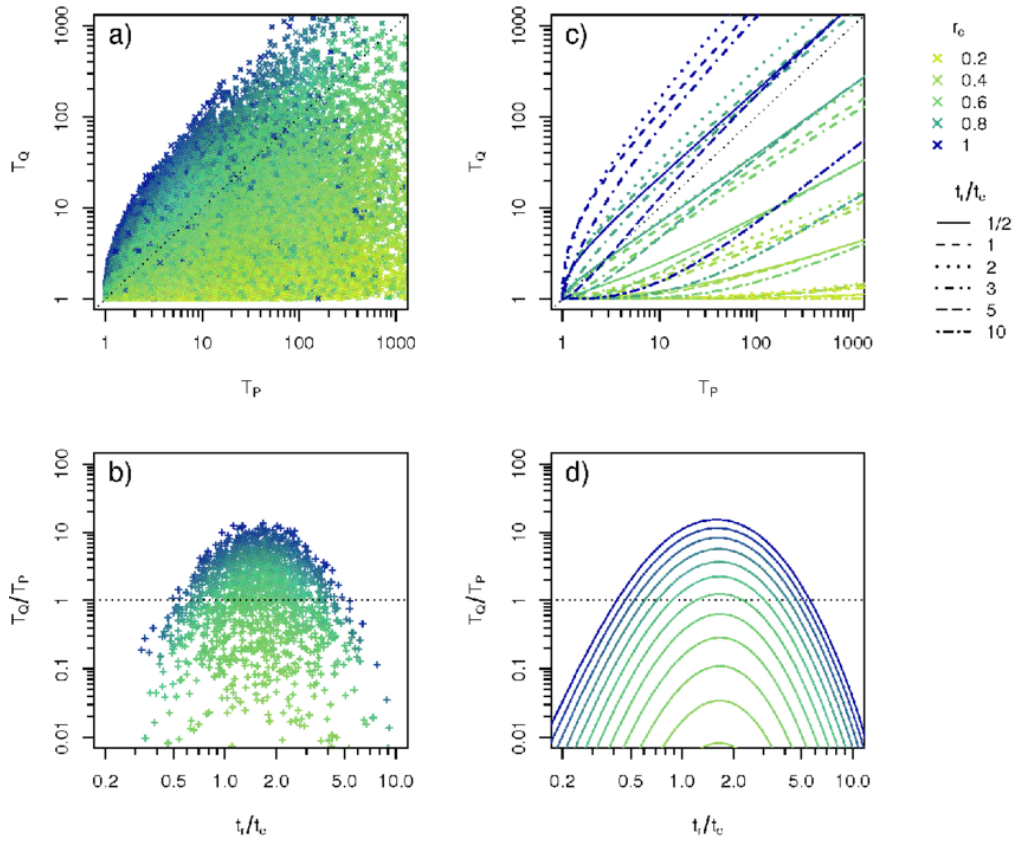




- Edible protein factor (Mogensen 2001)
- Required daily protein intake (World Health Organisation 2007)

Extensions: Uncertainty

- Flood damage (frequency and timing): impacts on Cost e.g. lifespan of fishway
- Incorporate Monte Carlo simulation to capture uncertainty



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Concluding Remarks

- Benefit Cost Analysis: tool to assist decision making
- Useful tool: Fishways
- Complexities: applying to Fishways
- Decision Support Tool
  - Does a proposed fishway warrant further investigation i.e. a more detailed design?

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Thank you

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