Cost and reliability tradeoffs: Defining success for e-flow objectives

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DEPARTMENT OF PRIMARY INDUSTRIES

Shifting the focus

Focus has been on acquisition of water

- Efficiency – value for money
- Effectiveness – portfolio suited to outcomes

Cost of different levels of reliability

- Likelihood of success
  - Tolerance for failure to meet requirements

E-flow objectives

Key environmental assets identified by MDBA

- Protecting assets creates environmental outcomes
- E-flow regimes – volume, frequency, duration, timing

Knowns and the unknowns

- Time since event, allocation rules, infrastructure
- Water availability and price

Minimise cost of achieving e-flow regime
subject to
reliability constraints

Reliability

Cost tradeoffs for increasing confidence

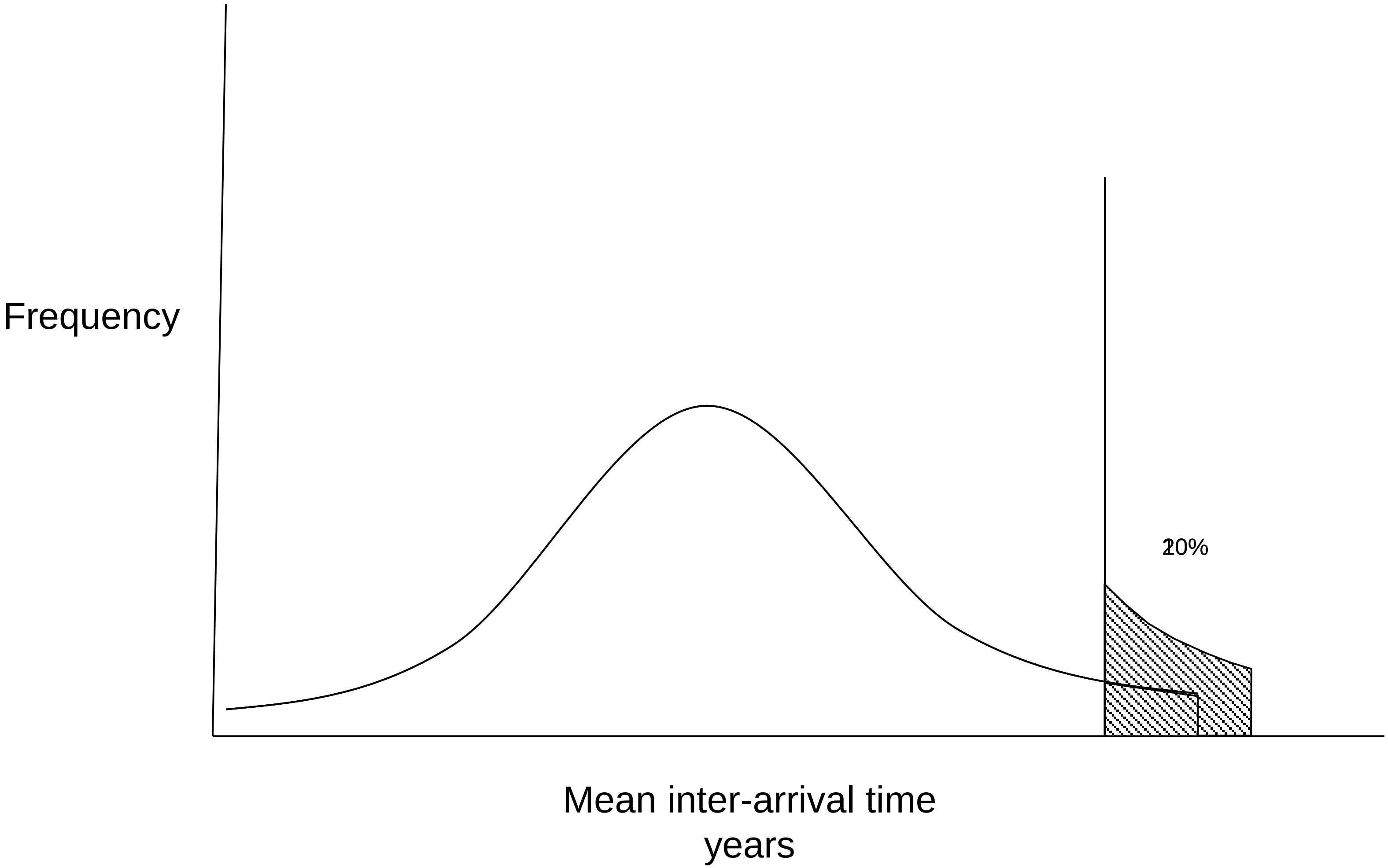
Success rate for meeting e-flow requirements

- 80% chance of e-flow event – ‘success’
  - volume, duration, periodicity

Specified for each regime

- risk preferences

Relaxing the constraint



Modelling framework

Demand curve from Brennan spatial equilibrium model

Modelled data of historic flows

Rule based optimal decision

Minimise opportunity cost of water
subject to reliability constraints
given inflows and allocation rules

Setting the rules

Optimal decision rule

Prevailing conditions

- Time since last event
- Price of water (availability)
- Tributaries, spills, inflows

Generates decision variable

1. Large event
2. Medium event
3. Small event
4. Wait

Goulburn Floodplain

Three outcomes – three e-flow regimes

- Common volume – 30,000 ML/day
- Different duration, periodicity
  - Small – 1 day
  - Medium – 7 days
  - Large – 30 days
- Ordinal

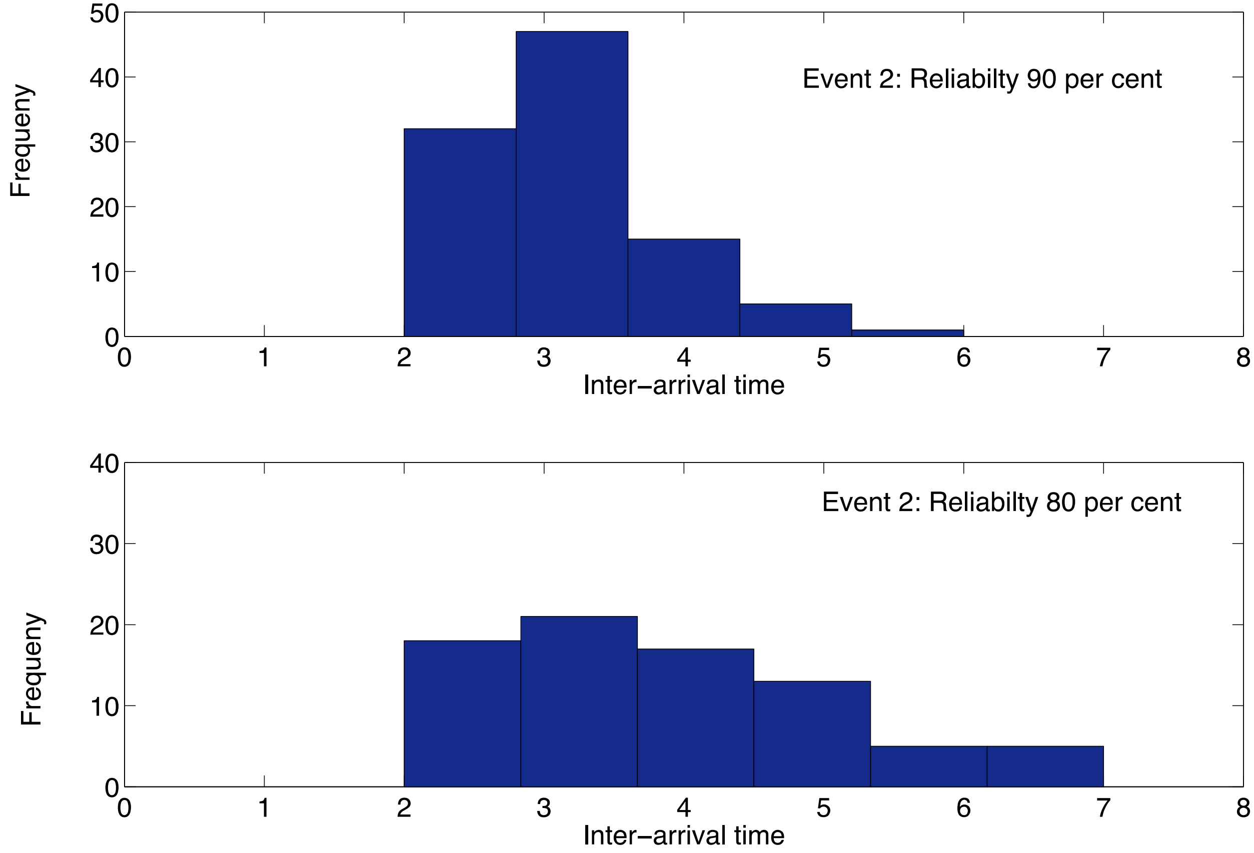
E-flow manager – 150 GL entitlement

- Buy, sell, carry over (up to 30% of allocation)
- Release or wait

Total cost

Total cost ($m NPV)	"Training"	Actual
90% reliability ALL	1008	1630
80% reliability SLACK LG	840	1200
80% reliability SLACK MED	815	1100
80% reliability SLACK SM	970	1610

Arrival time distribution



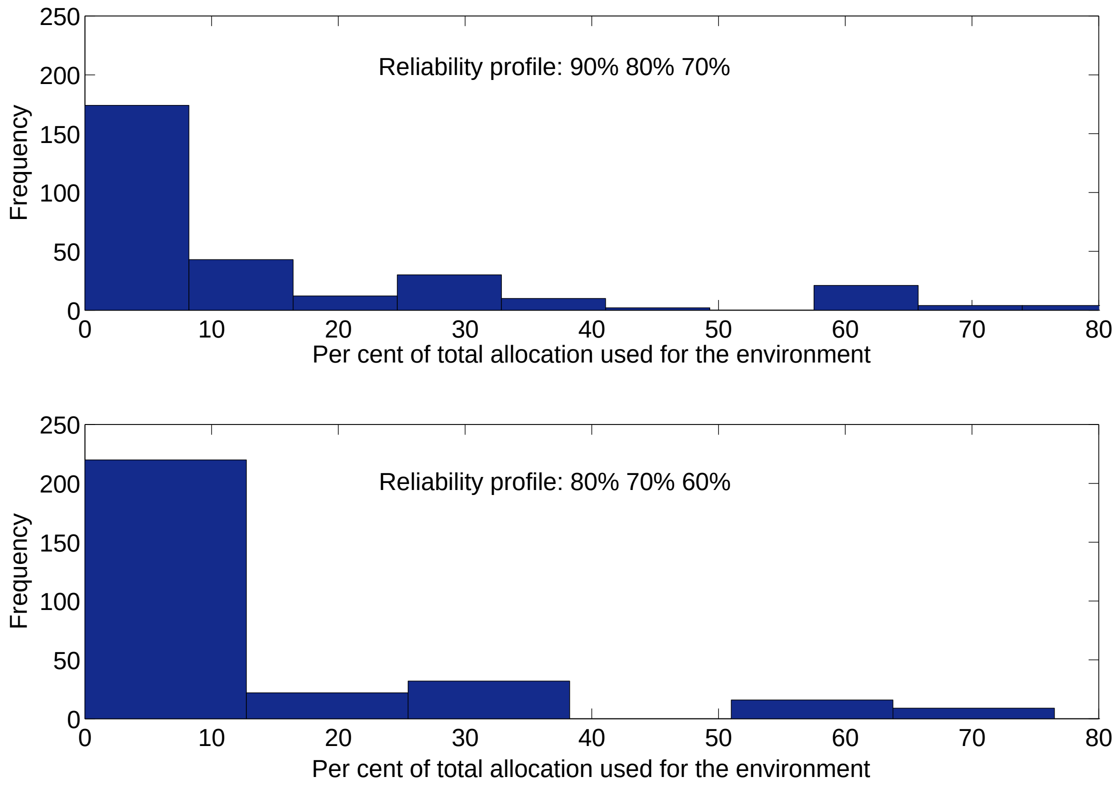
Hitting the target – large event

	Target Large event %	"Training" %	Actual %
90% reliability ALL	90	90	84
80% reliability SLACK LG	80	92	92
80% reliability SLACK MED	90	93	89
80% reliability SLACK SM	90	90	84

When all are not equal…

	SM % reliability	MED % reliability	LG % reliability	Actual Cost ($m NPV)
Tight	90	90	90	1630
Slacker	90	80	70	820
Slackest	80	70	60	530

How much is too much?



Key points

Tight reliability constraints

- Are expensive
- Lower costs through ‘slacker’ constraints
  - Relaxing the smallest event doesn’t help much
- Less opportune and less sensitive to price
- More likely to purchase water for e-flows

Slack constraints

- More likely longer inter-arrival times
- More sensitive to inflows, tributaries
- Less sensitive to time since last event

Concluding remarks

Metric around cost-reliability tradeoffs

Can take account of risk preferences

Performance evaluation

- Increasing reliability is expensive
- Need to reconsider ‘failure’

Reality will diverge from the rule

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