

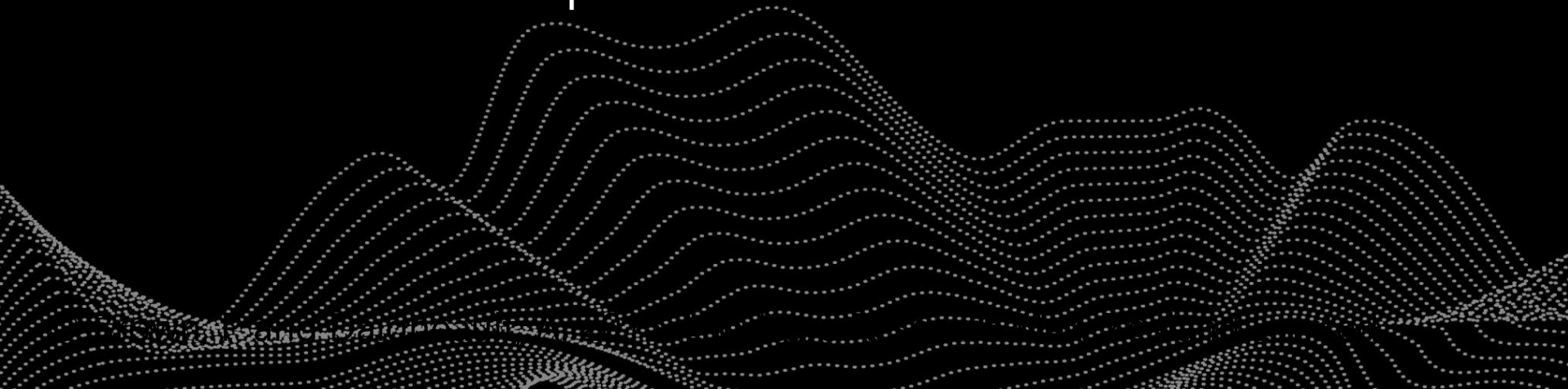


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Landcare Research

Refining CBA

Sensitivity analysis

Distributional impacts





7 Steps in conducting a CBA

1. Determine the objectives of the Cost-Benefit Analysis



2. Identify costs and benefits



3. Value costs and benefits



4. Aggregate costs and benefits



5. Perform sensitivity analysis



6. Consider distributional impacts



7. Prepare recommendations



Sensitivity Analysis [step 5]

- CBA often requires us to predict the future, which is uncertain
- Some costs and benefits are hard to value accurately, especially nonmarket values
- Uncertainty about some aspects of a CBA may alter the results of the analysis
- Because so many assumptions go into CBA, performing robustness checks on preferred management options is critical



Sensitivity Analysis

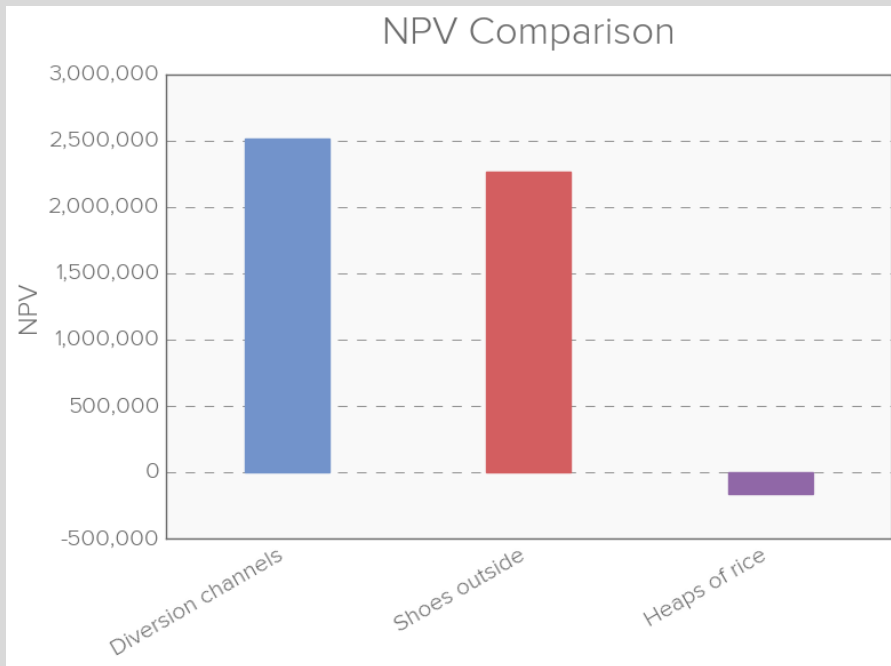
- What happens if engineering costs run over? Or a new retailer floods the market with inexpensive shoes? Or rice prices rise unexpectedly?
- Steps in undertaking **sensitivity analysis**
 1. Identify key parameters that are uncertain
 2. Examine the impact that a change in each would have on the project's net present value
 3. Ask "Does this change the decision about the project?"



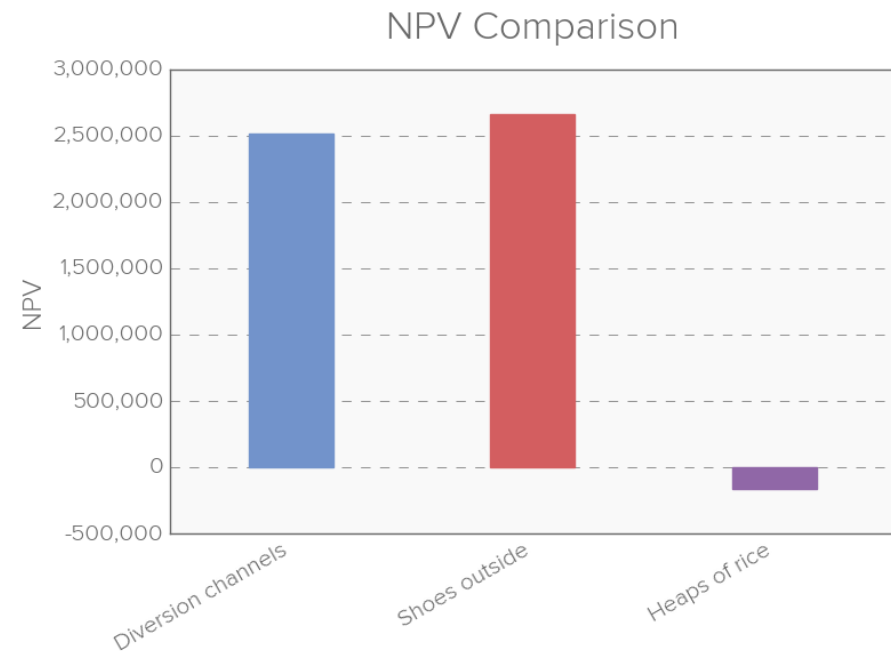
Sensitivity Analysis

- If fashionable shoes cost \$180 instead of \$200, you would recommend leaving shoes outside over diversion channels based on present value

Initial assumptions



Lower cost of shoes



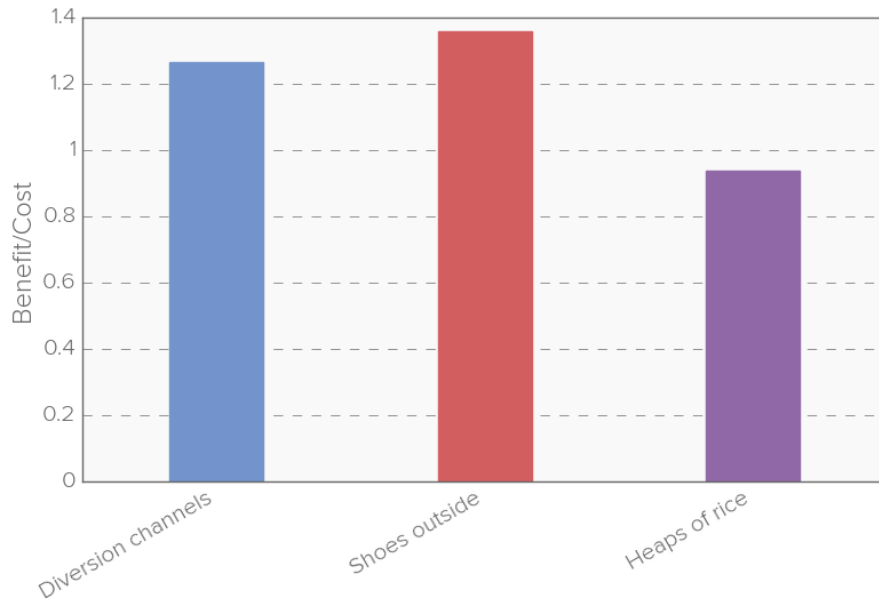


Sensitivity Analysis

- If leaving rice outside the door required only 1 part-time compliance officer, you would recommend leaving rice outside based on benefit-cost ratios

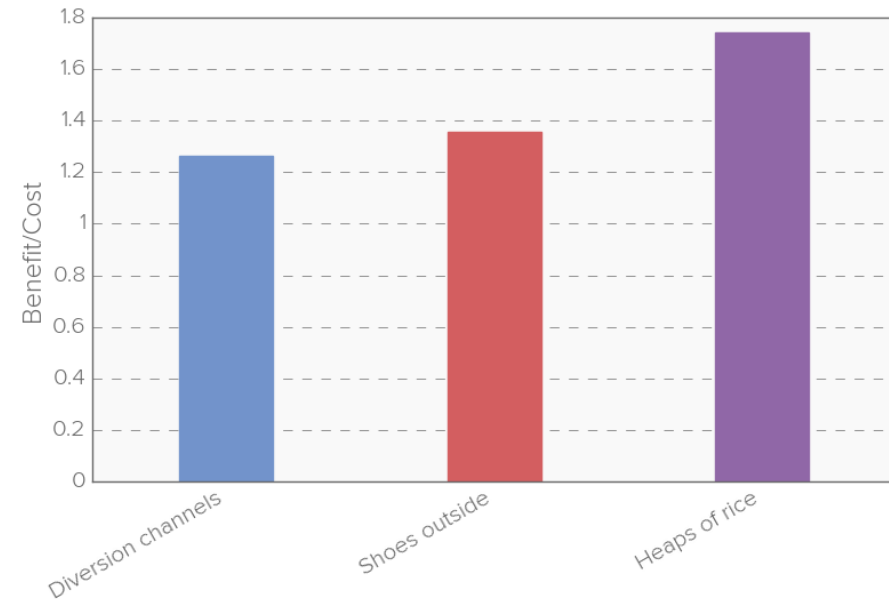
Initial assumptions

Benefit-Cost Comparison



Part time compliance officer for rice

Benefit-Cost Comparison

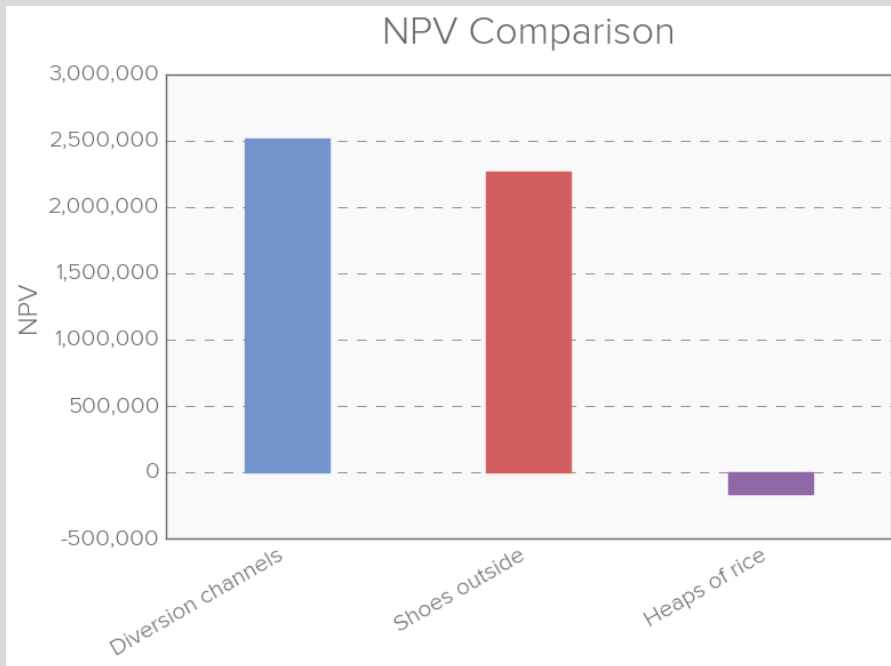




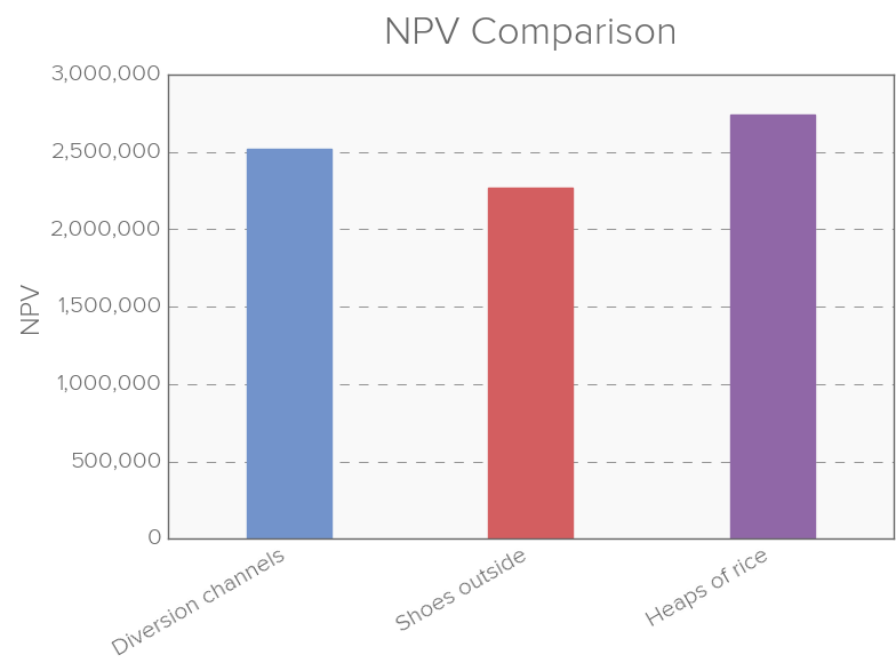
Sensitivity Analysis

- If the population growth rate for leaving rice outside was 0.02 instead of 0.10, you would recommend leaving rice outside based on present value

Initial assumptions



Lower pop growth with rice





Sensitivity Analysis

- If the ranking of net benefits does not change when considering risk and sensitivity to assumptions, then our policy recommendations are **robust**
- Your report should state ranges for which policy recommendations hold

The screenshot shows the EPEST software interface with the 'Sensitivity Analysis' tab selected. The table below displays the results of the sensitivity analysis for three management options.

Management Option	New Growth Rate	New Carrying Capacity
Diversion channels	-0.2	300
Shoes outside	-0.06	300
Heaps of rice	0.02	300

A green arrow points to the 'New Growth Rate' value of 0.02 for the 'Heaps of rice' management option.



Sensitivity Analysis

- If the ranking of net benefits does not change when considering risk and sensitivity to assumptions, then our policy recommendations are **robust**
- Your report should state ranges for which policy recommendations hold

Rank				
Exogenous Variable:	New Growth Rate			
Endogenous Variable:	NPV			
New Growth Rate	Diversion channels	Shoes outside	Heaps of rice	
0.00	2	3	1	}
0.01	2	3	1	
0.02	2	3	1	
0.03	1	3	2	
0.04	1	2	3	
0.05	1	2	3	
0.05	1	2	3	
0.06	1	2	3	
0.07	1	2	3	
0.08	1	2	3	
0.09	1	2	3	
0.10	1	2	3	



Sensitivity Analysis

- When you report results, describe sensitivity tests and rank order your options

Cost/Benefit Category	Diversion channels	Leave shoes outside	Heaps of rice
Current example, $b_{\text{rice}}=0.10$	\$2,517,557	\$2,264,522	-\$163,633
Rank	1	2	4*
PV, $b_{\text{rice}}=0.02$	\$2,517,557	\$2,264,522	\$2,816,417
Rank	2	3	1
PV, $b_{\text{rice}}=0.06$	\$2,517,557	\$2,264,522	\$1,024,464
Rank	1	2	3

* Negative PV indicates that it is less preferred than 'do nothing'

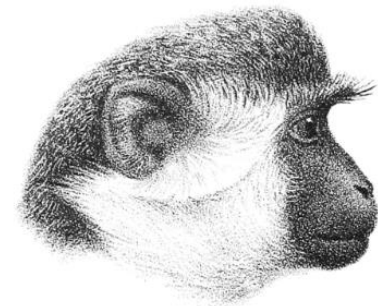


Consider distribution of costs and benefits [step 6]

- Think about a policy with the following benefits & costs

Stakeholder	Benefits	Costs	Net Benefits
Group 1	30	10	20
Group 2	10	20	-10
Group 3	25	10	15
Group 4	15	20	-5
Group 5	15	25	-10
Overall social impact	95	85	10

- Benefits exceed costs to society, yet society would not vote for this because while society as a whole gains, more people lose than win



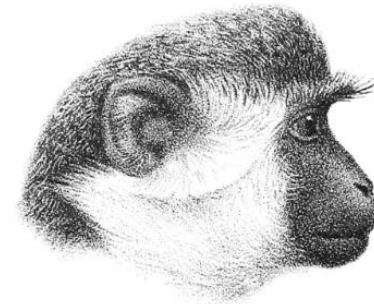


Consider distribution of costs and benefits [step 6]

- Think about a policy with the following benefits & costs

Stakeholder	Benefits	Costs	Net Benefits
Farmers	30	10	20
Fishermen	10	20	-10
Retailers	25	10	15
Environmentalists	15	20	-5
Children	15	25	-10
Overall social impact	95	85	10

- Benefits exceed costs to society, yet society would not vote for this because while society as a whole gains, more people lose than win
- Depending on who those people are, the policy may be infeasible, and an alternative policy may be preferred





Consider distribution of costs and benefits [step 6]

- In general, our role is to note the distribution of costs and benefits in our reports
- Ultimate decision-making authority rests with others

