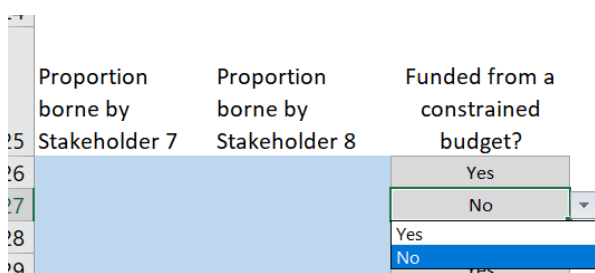


Updates to INFFEWS BCA Tool

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From 2020 to 2021 versions (12 September 2021)

Replace the previous version of BCR [= (Benefits – Other costs – Excess burden)/Project organisation costs] with new version [BCR = (Benefits – Unconstrained costs)/Constrained costs]. The previous version was an approximation of the correct calculation of BCR for ranking projects when there is a constrained budget, but the new version allows us to be exactly correct. To allow calculation of the new BCR, allow the user to specify which costs are constrained by budget and which are not.



Report constrained and unconstrained costs on Detailed results page.

Constrained and unconstrained costs* (aggregate present values)

	Overall	Project organisation
Constrained	\$1,012,618	\$788,829
Unconstrained	\$381,978	\$278,674

*"Constrained" means that resources for the cost item are drawn from a limited pool of funds.

This information is used to calculate the version of the BCR that is used to rank projects under a constrained budget. See 14. *Criteria* sheet, Note 2.

The excess burden of taxation is an unconstrained cost. Thus the Overall column may include some unconstrained costs even if all cash costs are constrained.

Create a new sheet 14. *Criteria*, showing recommended decision criteria in different contexts. Includes advice on correct way to calculate BCR for ranking independent projects when there is a budget constraint for the funds to be allocated to project.

Decision criteria to use in different circumstances

Of the decision criteria provided (NPV, BCR, IRR and MIRR), not all are suitable for guiding decisions in all circumstances. Care is needed to ensure that you use the best decision rule for your decision context. (See Note 1 below the table.) "Best" means that overall NPV from the investment portfolio is maximised. This doesn't necessarily mean that NPV is the best or the only criterion to evaluate individual projects. It depends on the context.

	Project costs subject to one constraint (from a limited pool of funds)	Projects subject to more than one constraint (e.g. two pools of funds)	Funding unconstrained
All projects independent (the benefits and costs of each project are not affected by which other projects are done)	<u>Linearly scalable projects:</u> Rank projects by BCR. Calculate BCR with constrained costs in the denominator and unconstrained costs subtracted from the numerator. (See Note 2 below.) <u>Non-linearly scalable projects:</u> constrained optimisation. OP treat	Constrained optimisation model to maximise total NPV. (See Note 3 below for further advice on constrained optimisation.)	Fund all projects with NPV > 0, BCR > 1, IRR > discount rate, or MIRR > discount rate. No ranking required. (See Note 4 below regarding IRR and MIRR.)

Show additional output on the 8. *Report* sheet.

- The potential benefits and the deduction for partial adoption and project risk.
- An extra version of BCR with all costs in denominator. Allow users to specify which version of the BCR formula is presented in the summary at top of page and in the sensitivity analysis. This is specified in the new question 1.24.
- IRR and MIRR. Include the two required parameters for MIRR on the 2. *Time* sheet (External cost of capital and the Reinvestment rate).
- Equivalent Annual Value (EAV).

Overall BCA results	Present values		Video help
Potential benefits	\$1,851,874	(not adjusted for adoption and project risk)	
Deduction	\$555,562	(adjustment for adoption and project risk)	
Benefits	\$1,296,312	(adjusted for adoption and project risk)	
Costs (total)	\$1,131,695		
- Project organisation	\$943,079		
- Other stakeholders	\$0		
- Excess burden	\$188,616		
Net Present Value	\$164,617	NPV	
Equivalent Annual Value	\$8,317	EAV = annuity for 4% constant discount rate	
Benefit: Cost Ratio (constrained budget)	0.97	BCR = (Benefits – Unconstrained costs) / Constrained costs	
Benefit: Cost Ratio (unconstrained budget)	1.15	BCR = Benefits / All costs	
Internal Rate of Return	7.6%	IRR	
Modified Internal Rate of Return	4.3%	MIRR	

Include a test for one of the problems that commonly occurs for IRR. Keep track of number of changes of sign for net benefits, and if there is more than one, show a warning on the 8. *Report* sheet saying that the IRR might have more than one value.

Include options for the discount rate: (a) constant over time,

2.4 Discount rates (%)

Discount rate constant over time
 Discount rate varies over time

Constant	Low (sensitivity analysis)	Default	High (sensitivity analysis)
	4%	7%	10%

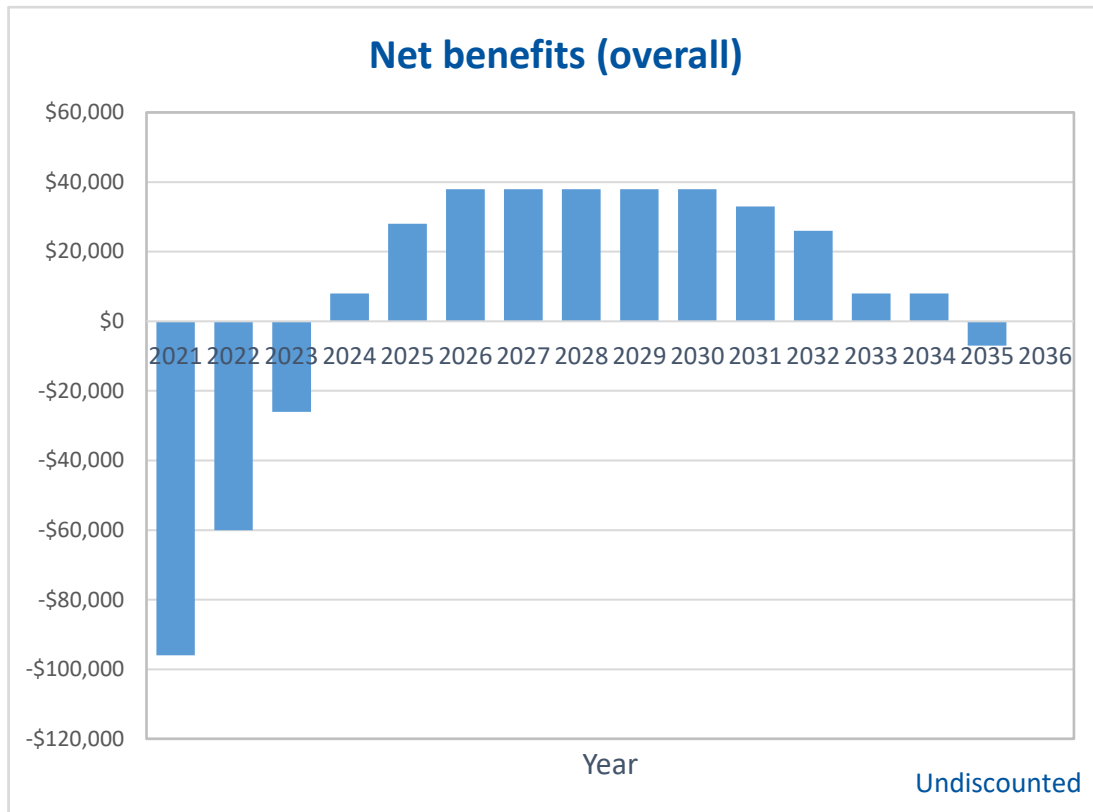
or (b) varying over time. For option (b), the user is asked to specify a different discount rate each decade. The UK government specifies the use of a discount rate that declines over time, for long-term projects. On the other hand, given very low current interest rates, users may specify a low initial rate, followed by a higher rate, potentially followed by a decline.

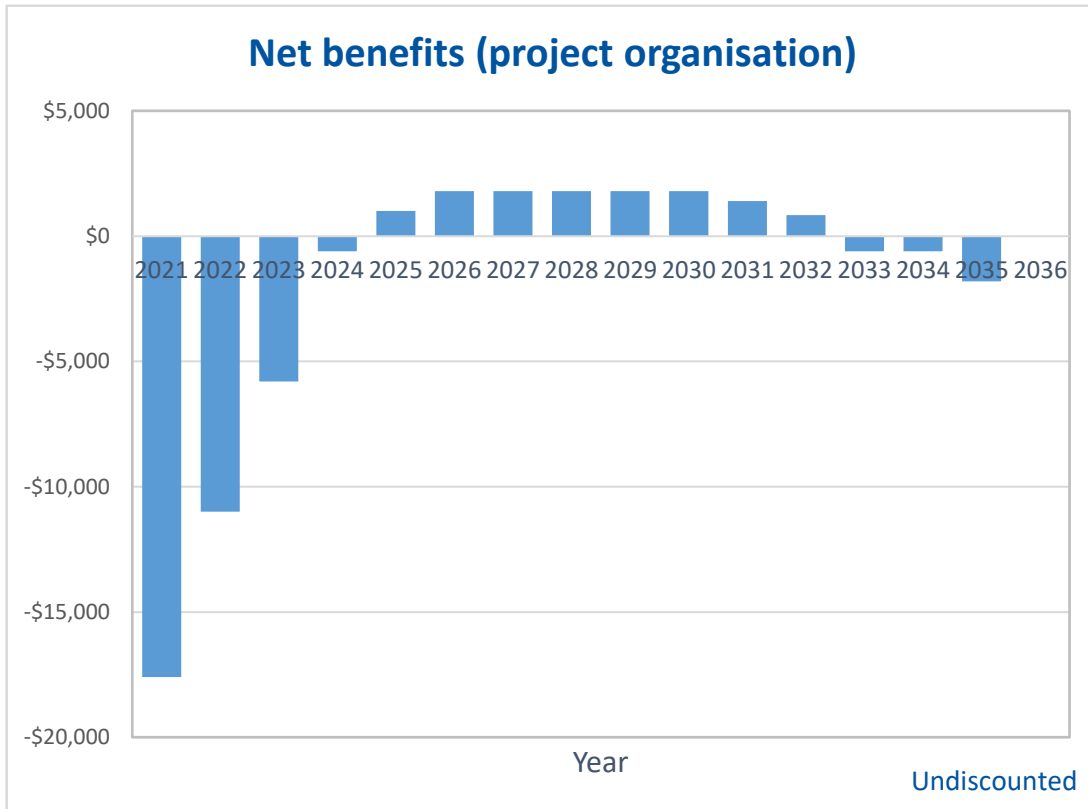
2.4 Discount rates (%)

Discount rate constant over time Discount rate varies over time

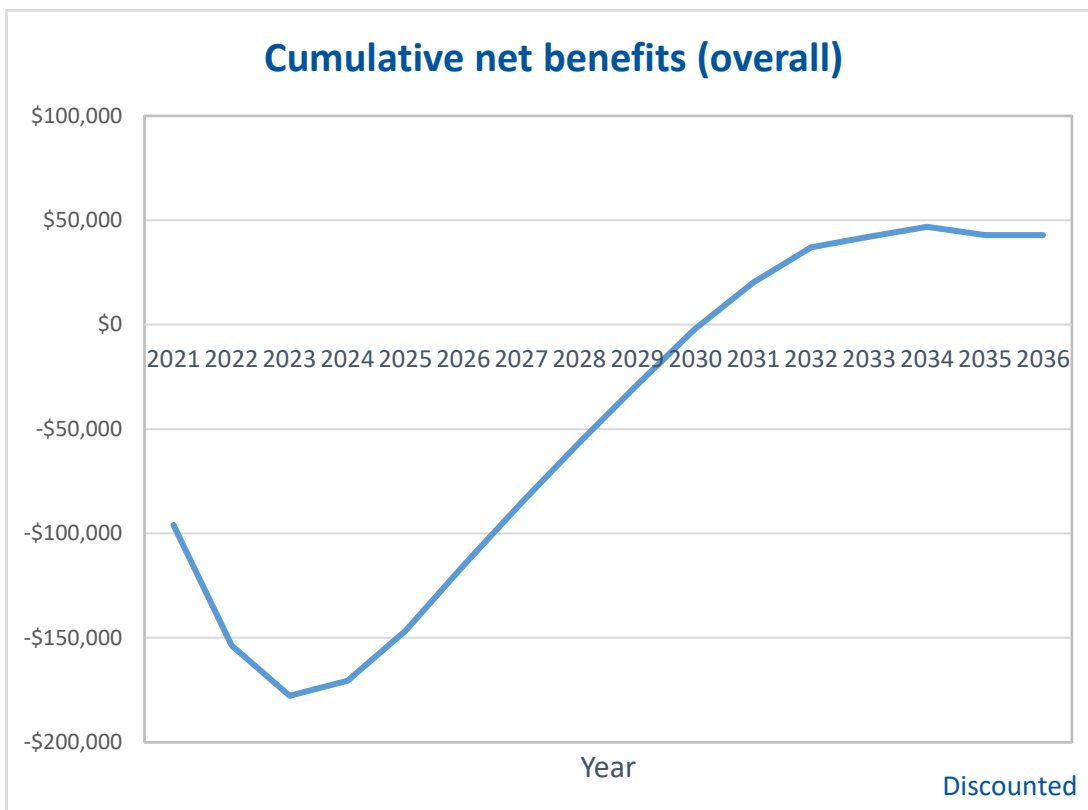
	Low (sensitivity analysis)	Default	High (sensitivity analysis)
2000 - 2009	2.0%	4.0%	6.0%
2010 - 2019	4.0%	7.0%	10.0%
2020 - 2029	4.0%	7.0%	10.0%
2030 - 2039	3.5%	6.5%	9.5%
2040 - 2049	3.0%	6.0%	9.0%

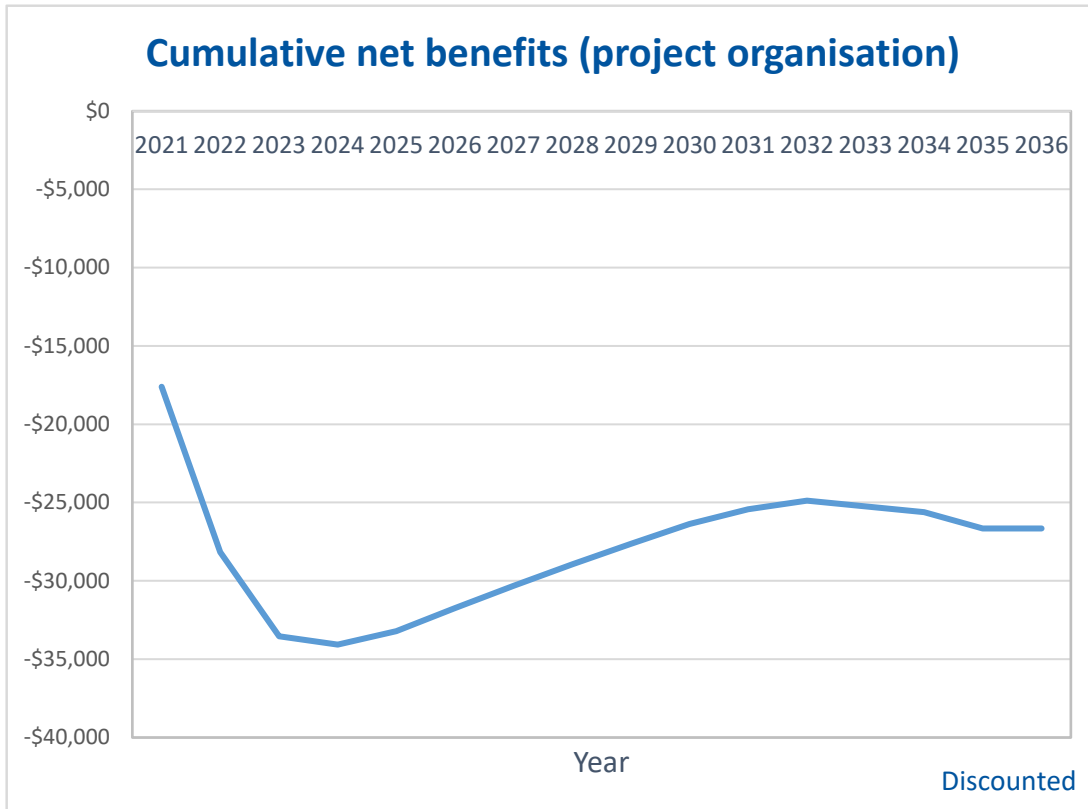
Include two new bar graphs on the 8. Report sheet, showing net benefits over time, overall and for the project organisation.



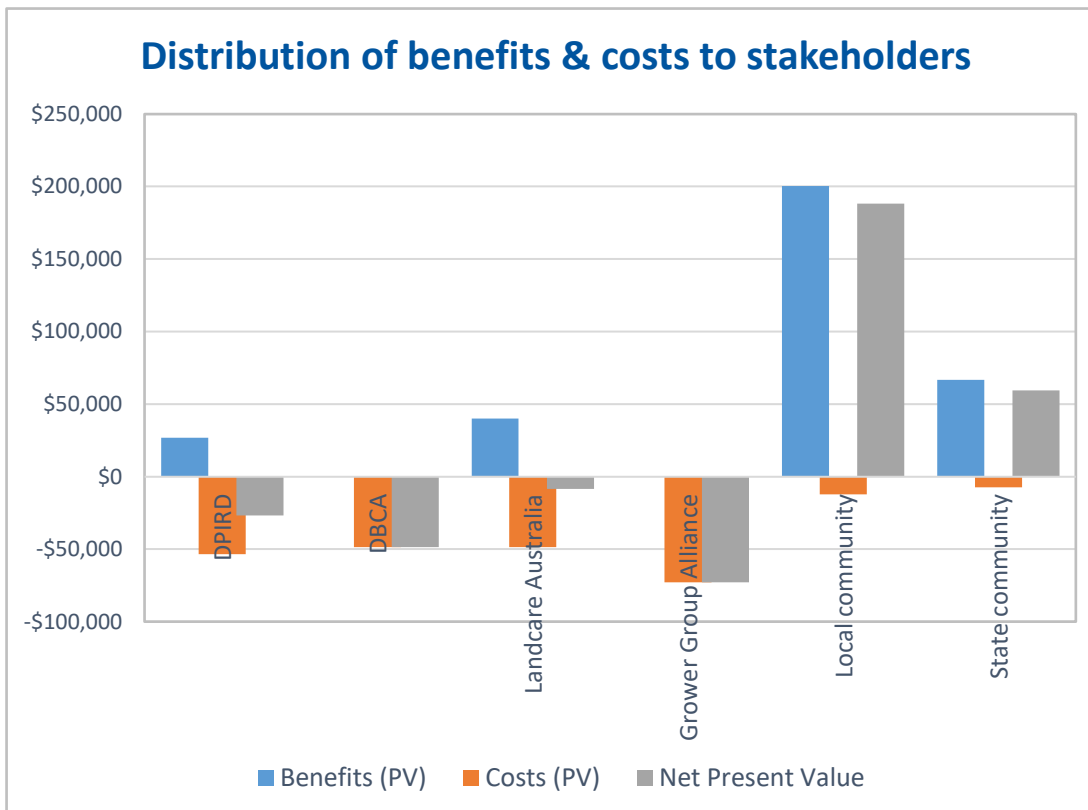


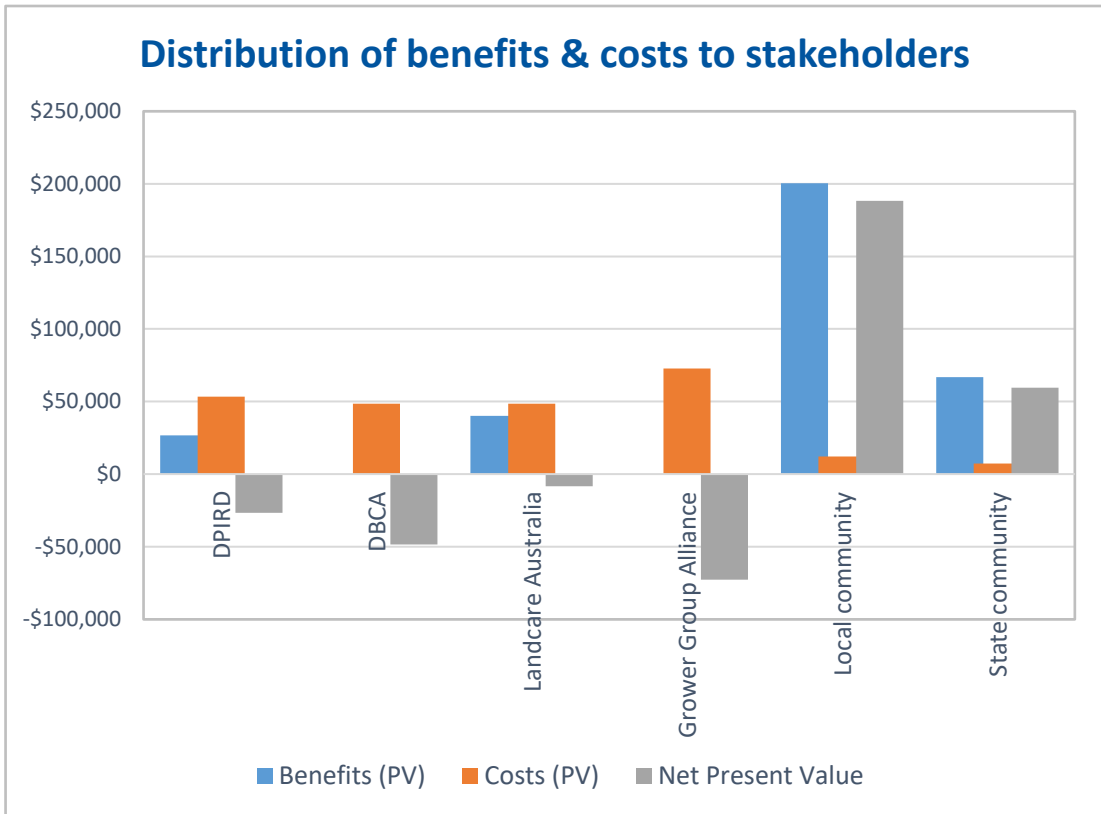
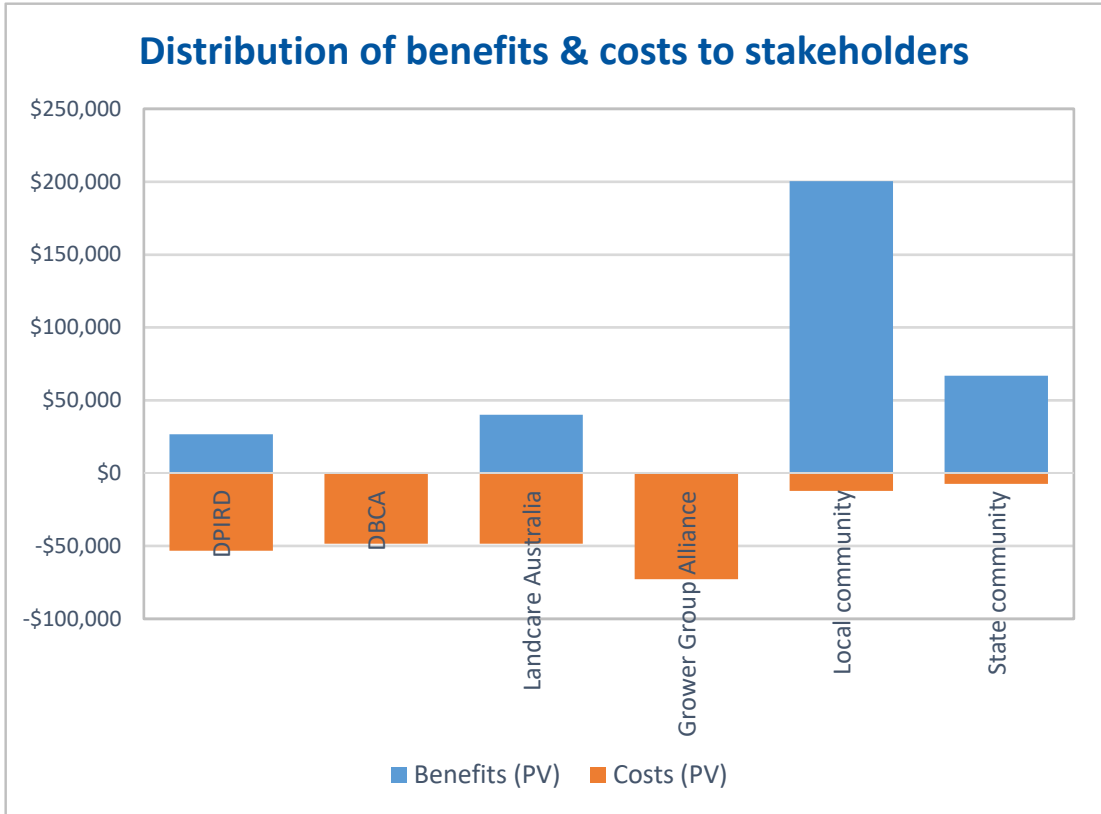
Include two new line graphs on the 8. Report sheet, showing cumulative net benefits over time, overall and for the project organisation.

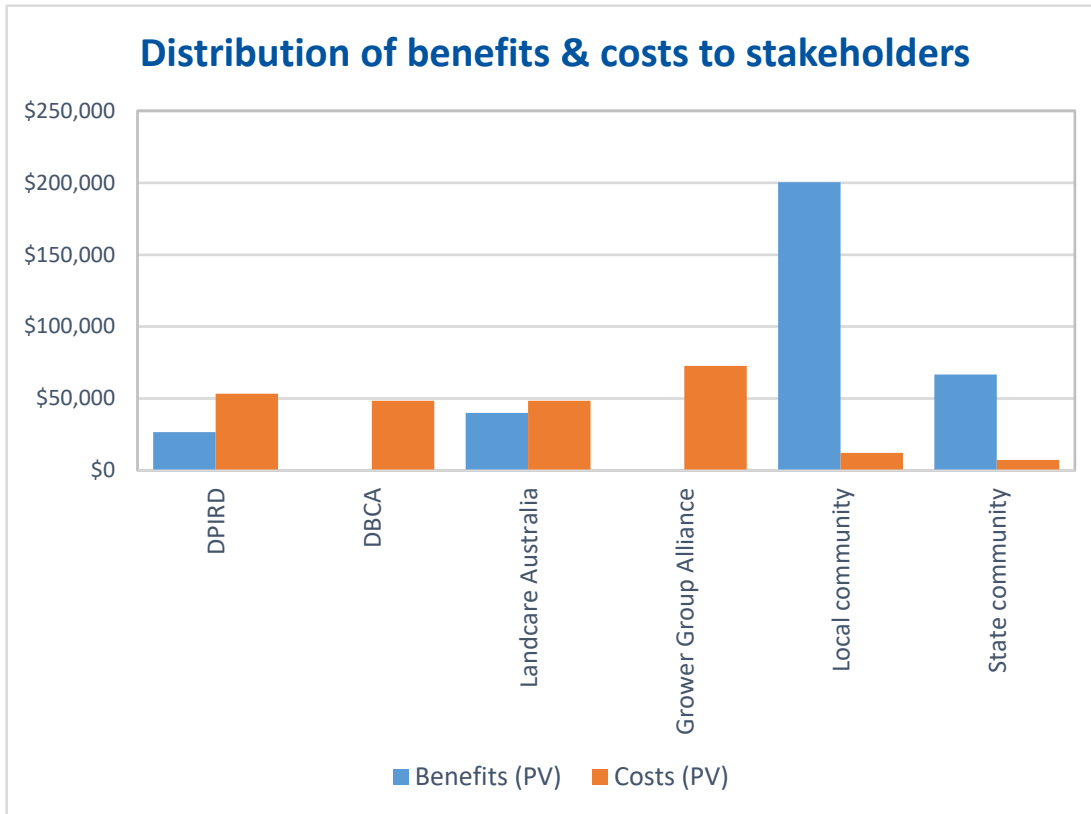




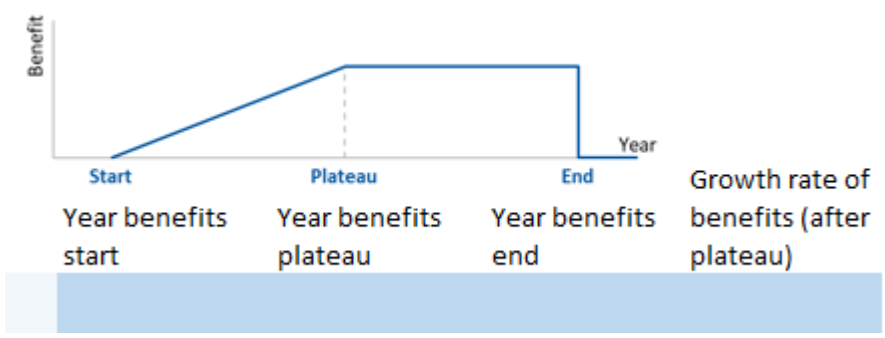
As well as the two existing pie charts, include four new bar graphs on the 11. Stakeholders sheet, showing the distribution of benefits and costs in four different ways.





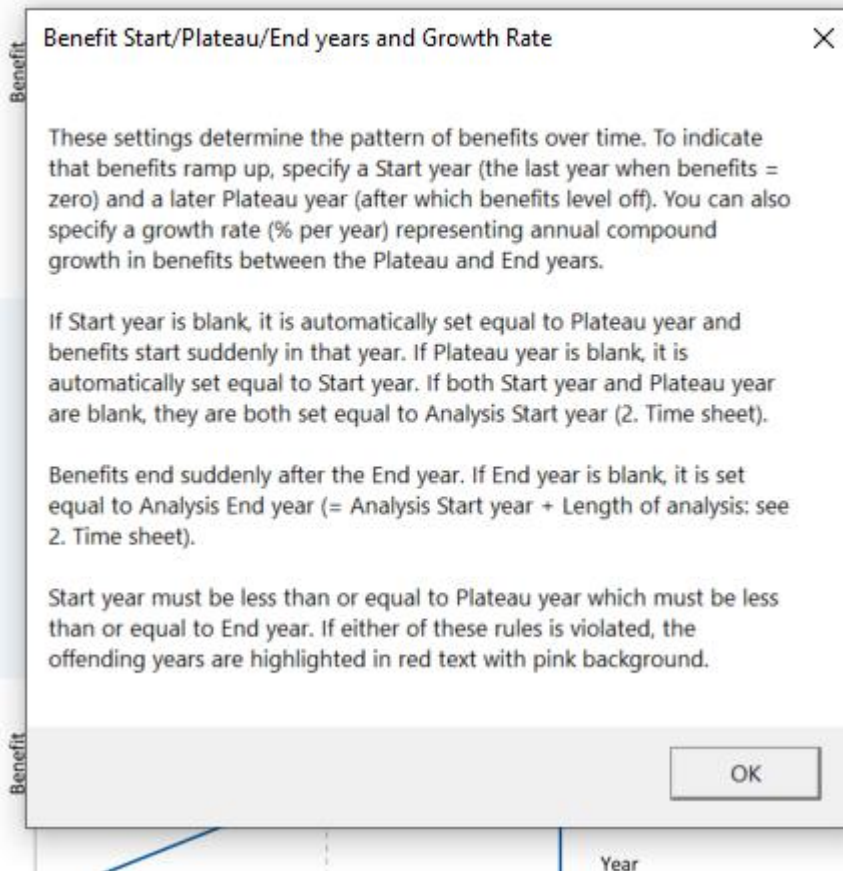


For benefit categories 1 to 4, allow user to specify that benefit ramps up over time rather than starting suddenly. Users now specify a year when benefits start to ramp up, the year when they plateau and the year when they end. Include a graph to illustrate the three different years needed.



If these years are left blank, they now take default values, as explained in a new help button.

Start/Plateau/End years and Growth Rate help



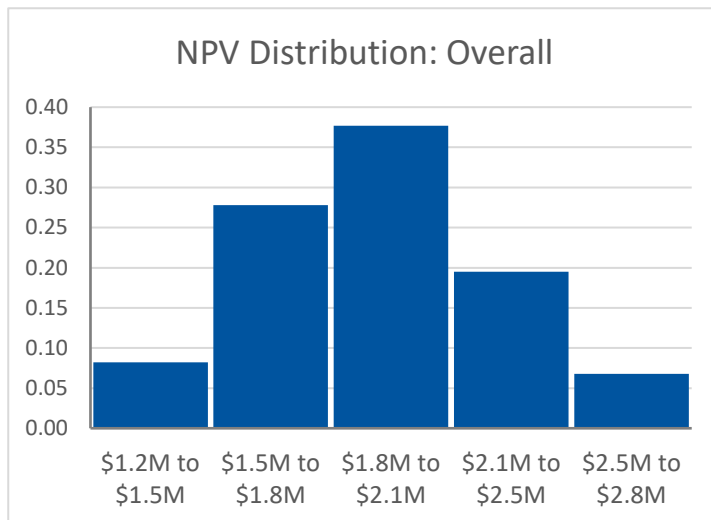
Also set up the Start and End years on the 5. *Costs* sheet so that they take default values. If they are blank, they are set at the Analysis Start year and the Analysis End year from the 2. *Time* sheet.

Include conditional formatting to highlight invalid entries and data validation for all Start, Plateau or End year cells for benefits or costs.

Increase tables for Custom benefits and Custom costs from 10 rows each to 20 rows each.

Improve the macro that switches off cut/paste so that it also switches off drag/drop within the spreadsheet and switches it back on when you shut down this spreadsheet (provided it was switched on before you loaded this spreadsheet).

Change the labels on sensitivity analysis graphs so that they give the upper and lower bounds for each bar, rather than just the upper bound.



Increase default Marginal excess burden to 20%.

Delete the footnotes to the stakeholder tables on costs and custom costs.

Hide the Monetary vs non-monetary column on Benefit Parameters sheet. This declutters the screen a bit, and it avoids a potential confusion between non-monetary benefits and non-market values.

Change the Break-even analysis and Sensitivity Index calculations to be based on NPV instead of BCR. This avoided some complexities brought about by the inclusion of two alternative versions of BCR.

When upgrading from an earlier version of the BCA Tool, if the original data entry cell contains a formula rather than a value, copy the formula to the upgraded spreadsheet, rather than just copying the value. Including some formulas in cells can help to make transparent where a number comes from, so it is to be encouraged.

If upgrading from a pre-2021 version, automatically apply the default values regarding whether the cost is constrained (yes or no) for each cost. Without this, the user had to manually enter Yes or No for each cost.

Re-size the pie charts on Stakeholders to reduce the risk of the stakeholder labels wrapping around. This addresses a problem where there was not enough space to display all the stakeholder labels if there were eight of them.

From 2019 to 2020 versions (10 December 2019)

In the 2019 versions, cut/paste and copy/paste were both locked off, which was done to protect the formulae but was pretty inconvenient. Now only cut/paste is locked off. Copy/paste is allowed.

Instead of displaying aggregated results for each Benefit Category, it now displays results for each individual benefit that has a non-zero benefit.

In the Report, Sensitivity and Stakeholders sheets, when you activate a sheet it hides results for all zero-level benefits.

In the Project Risk sheet, it now offers the option of providing one risk overall, or one risk for each benefit (instead of for each Benefit Category). If you choose one risk, the individual benefits are hidden. If you choose multiple benefits, the one-risk section is hidden. Within the multiple benefits option, rows for zero-level benefits are hidden.

In the Adoption sheet, it now offers the option of providing one adoption parameter overall, or one parameter for each benefit (instead of only offering one overall).

In the sensitivity analysis, it now shows results for individual benefits instead of for benefit categories. Results for the eight benefits with the highest overall benefits are shown.

In the Overall section of the Report, costs are broken down into Project Organisation, Other Stakeholders, and Excess Burden. The displayed level of benefits no longer deducts the latter two costs.

Tables 9.1 and 9.2 (the probability distributions for sensitivity analysis) are moved onto a separate sheet (9. Distribution) and expanded out to offer a distribution for each benefit, not for each benefit category. Rows for benefits with zero value are automatically hidden.

In the sensitivity analysis, instead of having a separate analysis for each individual project risk (which always came out looking really small), there is one overall result, in which the different project risks are assumed to be perfectly correlated.

Simplify the Comparison sheet a bit. Include three separate costs in the overall results instead of one.

Expand the Custom Costs sheet so that it has 10 rows for costs instead of 1.

Remove compliance costs from the tool entirely. People found it confusing, and they can be included within the other costs.

On the Costs sheet, changed the fifth table from Compliance to Other costs.

On Benefit Parameters and Costs, check that start and end dates are not outside the ranges set for the analysis on General.

Indicate the start and end years for the analysis above the table on Custom Benefits and on Custom Costs.

Change Benefit category 1 from Benefit per person to Benefit per person or household, and allow the unit to be specified.

In the Benefit categories, allow the growth rate to be negative. (Changed validation settings.)

Growth now starts from the Start year of benefits, not the start year for the analysis. This fixes a problem where people specified a starting benefit level for a later year, and it was automatically inflated by the growth factor.

Change font in Report and Sensitivity to avoid having zeros that look like letter O's.

In the risk scratchpad include data validation to ensure that values entered are between zero and 1.

There is now an option to set up a password for accessing the spreadsheet, and an expiry date.

A bug in the previous version is fixed. Excess Burden is treated as a negative benefit in the BCR.

Fix a bug in the sensitivity analysis where the Excess Burden was not deducted.

A bug in the break-even analysis for the project organisation is fixed.

Update the Upgrade facility to account for all these changes. Note that because of the structural changes, not everything from an older version will successfully transfer to the new version. Exceptions are listed in Appendix A of the User Guide. It is still much quicker to use Upgrade than to re-enter everything from scratch.