CBAx Tool User Guidance

Guide for departments and agencies using Treasury’s CBAx tool for cost benefit analysis

October 2022
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Introduction

To help agencies complete fit-for-purpose cost benefit analysis (CBA), the Treasury has developed the CBAx tool to monetise impacts as part of a CBA (CBA steps 4 and 5). The CBAx tool is an excel-based spreadsheet model with a database of impact values.

CBAx is designed to support rigorous transparent evidence-based CBA of budget and policy initiatives. It is an important element to ensure that robust wellbeing and value for money assessment is applied to investment and budget decisions. The tool encourages agencies to:

- take a long-term and broad view of wellbeing impacts, ie, benefits and costs
- rigorously assess these by monetising key impacts, where possible and supported by evidence, and
- be transparent about the assumptions and evidence base.

What’s new?

This document replaces the CBAx Tool User Guidance released in September 2021. Read it in conjunction with the Budget guidance. CBAx helps agencies undertaking rigorous CBA, supporting wellbeing and value-for-money analysis.

The CBAx model structure is stable. The updates for the October 2022 CBAx are:

- Updated wellbeing domains reflecting the refreshed Living Standards Framework.
- The existing database values have been updated. New environmental values have been added, including freshwater quality (Ministry for Primary Industries).
- The discount rates are unchanged at 5%, consistent with the Treasury discount rates, and an alternative rate of 2%.
- The CBAx guidance has been updated to include the refreshed Living Standards Framework (See Appendix 2), links to the Treasury Wellbeing Report Seminar Series and a new section on distributional analysis.

Stronger wellbeing analysis with CBA/CBAx

CBAx includes the Living Standards Framework (LSF) wellbeing domains. It is designed to support wellbeing analysis and inform value for money assessments. Agencies can use the Wellbeing Impacts template (see Appendix 3 and word template) to set out identified and quantified impacts, as well as monetised impacts. The CBAx model includes as an optional tab Wellbeing Impacts, consistent with the template in Appendix 3.

The main steps to undertake a fit-for-purpose CBA, using the CBAx tool, are:

- Identify and quantify impacts, ie, the initial CBA steps and CBAx input assumptions.
- Monetise impacts where possible, by using the CBAx model, focusing on the key impacts with good evidence.
- Where the evidence base is weak, undertake reverse analysis.
**Figure 1:** CBA analysis of impacts – only a subset of the impacts is monetised

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**Be aware of the varied basis for the available impact values**

For ease of access and consistency, the CBAx database includes publicly available values for many types of impacts. Various agencies developed these values, using a variety of valuation methodologies. Each type of non-market valuation has advantages and disadvantages, and no one type is “right”.

Use the values appropriately for the particular analysis, with reasonable assumptions. The source of the values can help users understand the basis for the values. Many of the values are already in dollar terms such as government costs or personal income. Other values are derived from survey data such as the General Social Survey. Users should take care in their assumptions, eg, to not overstate the impacts when using subjective wellbeing measures.

**About this guidance**

This guidance document sets out instructions for using the Treasury’s CBAx tool. It includes: (a) An overview, (b) Wellbeing and CBA, (c) CBA steps, (d) Worked example and (e) Tips for common questions. This guidance document should be read by CBAx users, including:

- staff preparing or endorsing spending and policy proposals for Ministers (such as policy analysts and managers), or when allocating cross sector funds
- staff involved in reviewing spending proposals (such as Treasury vote staff).

Although CBAx has been designed for a central government agency, it can be used by a wider set of analysts and advisors, such as local government, iwi and community service providers.
Further information

This document is part of a suite of guidance that relates to preparing high quality funding proposals and CBAs. Other documents to be considered when preparing proposals include:

<table>
<thead>
<tr>
<th>Name of document</th>
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<tbody>
<tr>
<td>Treasury’s budget guidance and initiative templates</td>
<td>Released each year on CFISnet – agency staff should contact your Finance and Budget teams for more information</td>
</tr>
</tbody>
</table>

Feedback and improvements

The Treasury welcomes suggestions on CBAX and would like to learn from practical experiences of applying CBAX. Over time, the Treasury will improve and update the tool and guidance on the use of it.

The Policy Quarterly paper “Valuing Impacts”\(^1\) sets out the experiences from the first five years of working with agencies to design and implement CBAX.

The Treasury invites people to suggest data and information for inclusion in the CBAX impacts database. This may be information that is available and that can be shared, or it may be a request for values that people would find helpful to have included in CBAX. The Treasury anticipates refreshing CBAX on an annual basis, including reviewing the impacts in the impacts database, and considering what else could be included.

Agencies tend to use the CBAX tool for ex-ante analysis of options. We would like to know if there is user interest in and experience with using the CBAX tool for \textit{ex-post evaluation}. We could look to develop the ex-post functionality and guidance for future updates.

Please contact \texttt{CBAX@treasury.govt.nz} with comments and suggestions.

1 Overview of using CBAX

What is cost benefit analysis and CBAX?

Any government decision to allocate funds will involve a trade-off. Understanding the trade-offs between vastly different proposals is difficult. One way of helping to evaluate different proposals is to prepare a fit-for-purpose cost benefit analysis (CBA) for the different options.

Cost benefit analysis is a framework for systematically analysing the costs and benefits (ie, the negative and positive societal impacts) of various options. It is an economic evaluation of the available options helping decision-makers to compare options by providing a common language and framework.

To help agencies complete CBAs, the Treasury has developed the CBAX tool. It is a spreadsheet model with a database of impact values to monetise impacts. An impact value provides a numerical value in relation to one or more impacts of an initiative. In some situations, a value may be a cost, in others it could be a benefit or a saving. Examples include the costs of an emergency department visit, the cost of the Jobseeker Support benefit and income for individuals. The values are adjusted to reflect a common time period.

CBAX provides a tool for agencies to do in-house CBAs, with advice based on:

• A common basis for assumptions when quantifying and monetising the impacts of different proposals (for example, impact values and discount rates).

• A robust framework for estimating the broader societal impacts of options.

• New Zealand specific publicly available information to value impacts.

When should CBAX be used?

The Treasury encourages important public sector decisions to be informed by fit-for-purpose CBA. CBA contributes to the impact analysis of policy options, informing considerations of the difference for New Zealanders’ lives and the experienced wellbeing over time across wellbeing domains.

Budget initiatives need a wellbeing analysis and should be supported by a fit-for-purpose CBA. CBA and CBAX should be used in a fit-for-purpose way, so that the information is useful for decision-making. Use CBAX to monetise impacts in a CBA. The budget CBA and CBAX requirements are set out in the budget guidance, which is issued via CFISnet. For advice on these requirements, contact your finance or budget teams within your agency, or the relevant vote team within the Treasury.

Where CBAX is used to support an initiative, it is integrated into the wellbeing analysis. It is part of the full case for the proposal, which covers all of the relevant information, eg, in the budget initiative, the business case or the regulatory impact statement.

The underlying CBA information is important including the intervention logic, the broad range of monetised and unmonetised wellbeing impacts, the robustness of the assumptions and the evidence base. While the CBAX analysis provides an overall benefit cost ratio, return on investment (ROI) and a net present value (NPV) for a proposal, the Treasury consideration focuses less on these overall CBA results, and more on the underlying assumptions and information.
Strengthen value for money and wellbeing analysis with CBA

Rigorous value for money and CBA strengthens the wellbeing analysis:

- identifying wellbeing impacts in the Living Standards Framework (and other relevant frameworks such as He Ara Waiora)
- quantifying the wellbeing impacts using clear assumptions and evidence base, and
- valuing key impacts on a comparable basis.

All wellbeing impacts, whether quantified or monetised or not, are considered in the value for money assessment. A CBA is based on an intervention logic that links the intervention and impacts on a page. Distributional effects are also considered. The Treasury’s CBAx tool provides confidence and consistency when valuing wellbeing impacts. Evaluation and implementation plans should reflect the quality of evidence, provide confidence in the delivery, eg, set out key performance indicators.

The CBAx guidance can help you identify, quantify and monetise wellbeing impacts where applicable. For example, the CBAx guidance includes in Appendix 5 the recommended values to help agencies more consistently include an economic value for greenhouse gas emissions or avoided emissions.

Fit-for-purpose analysis

CBA analysis can be varied – it can be simple or comprehensive, in line with what makes sense for the proposal. Analysts should apply a fit-for-purpose approach to CBAx modelling. Small, simple funding proposals might not need monetisation or only need a simple CBAx, whereas larger proposals might justify more detailed analysis and additional modelling and research to strengthen the evidence base. When proposing to spend public money, a solid evidence base is desirable. This, along with reasonable assumptions and sensitivity analysis, can give confidence in the impacts.

If there is very little information or evidence available, an option is to use CBAx to prepare a reverse analysis. A reverse analysis means approaching the CBA from the viewpoint of ‘what would it take to make the proposal be worthwhile?’ or generate a return on investment of one with societal benefits outweighing costs. It is a simple way of considering the impacts of a proposal and assisting in judgements about whether the assumptions and values are reasonable. More information on reverse analysis can be found in the Tips section.

Transparent assumptions and evidence base

Even if the evidence base is weak, eg, in the case of pilot programmes, being transparent about these assumptions provides a basis for developing an evaluation plan.

To be able to use CBAx, agencies will need to be able to quantify impacts and success rates, for example, the number of people expected to gain employment as a result of a job-mentoring service, based on the available data and evidence. There will be gaps in the evidence base, for example, when trialling a new and innovative approach. The value of the information provided by CBAx depends on the quality of the information input into the tool. If a CBAx is based on poor evidence quality or assumptions, it will not be useful for decision-making. It is important that agencies focus on improving the quality of the information feeding into the tool to better support decision-making. Users should focus efforts on improving the evidence base for the most significant impacts.
An advantage of using CBAX is that it prompts clarity about the intervention logic, the counterfactual, the impact assumptions about who is affected, in what way, to what extent, when and for how long, and the evidence base. CBAX makes the assumptions explicit, and values different types of costs and benefits in a consistent way. While the CBAX database standardises impact values, this does not limit agencies as users have full flexibility to put in relevant and adjusted values.

**Use CBAX to monetise impacts, where monetisation is appropriate**

If you monetise impacts, use CBAX. Monetisation and CBAX may not be warranted, e.g., if the quantification is very complex and resource intensive or provide limited value in decision-making. Discuss with the Treasury whether monetisation and CBAX could inform the case.

- Focus on monetising key impacts that have a good evidence base, rather than trying to monetise all impacts. The objective is not to achieve a particular net present value or return on investment level. All impacts are considered whether monetised or not.

- Leave impacts as unmonetised, or provide sensitivity analysis and ranges, when the evidence base is limited, or the impact connection is tenuous and uncertain. Where it is not clear what the appropriate assumptions would be, the CBAX model can be used to undertake reverse analysis to identify what would be needed to make the initiative worthwhile and for societal benefits to outweigh societal costs.

**CBA and CBAX involves a variety of expertise**

CBA and CBAX analysis involve a range of people with different perspectives and skillsets. Policy analysts, subject matter and sector experts, evaluation and research teams, finance and actuarial teams all work together in completing CBA/CBAX analysis and initiative. This might also involve working with people from different organisations.

**How to prepare a budget initiative**

Preparing a budget initiative requires a wider policy analysis. Working through the policy analysis and seven CBA steps (see Section 3) will help you to be confident in the advice that you provide to Ministers and decision-makers.

The budget initiative templates include CBA information. This information can draw on CBAX modelling where monetisation of impacts is relevant.

We recommend that agencies check the annual budget guidance issued via CFISnet.

**Limitations of the CBAX tool**

We recognise that there will always be limitations to a tool like CBAX. To be able to use the CBAX tool, organisations need to quantify impacts and success rates, for example the number of people expected to gain employment, based on the best available data and evidence about the relevant impacts of an initiative. There will be gaps in the evidence for the impacts of an initiative, for example how effective an initiative might be when trying something new.

CBAX modelling is just one part of CBA and policy analysis. CBAX supplements well-researched quality policy advice including alignment with the Government’s strategic priorities, realistic costings, risk analysis and implementation and evaluation plans.
CBAx requires information and judgements on assumptions

Agencies will need to do a thorough policy analysis when conducting a CBA. This requires research, so that options are informed by evidence.

Agencies will need to make judgements, based on the best available evidence, and what is a reasonable and fit-for-purpose analysis for the proposal. For example, agencies will make judgements about the policy and intervention options (such as what options are feasible), the counterfactual and the impact assumptions.

The purpose of CBAX is not to deliver a judgement on what the assumptions should be. Instead, it is more about making these assumptions transparent, so that discussions and advice about wellbeing impacts can be better informed, and so that we can learn from our analysis in the future. Developing policy advice is inherently uncertain, as it requires advising on changes in the future. The job of advisors is to develop practical advice, based on the information available. Being clear about assumptions is key. The CBAX tool can help you do this by providing a consistent approach and standardised measurement.

Based on experiences to date, the rules of thumb for assessing the assumptions are:

- If the societal return on investment (RoI) is more than 5, it is almost certain that the impacts are over estimated, and some assumptions are too optimistic.

- If the RoI is around 2-5, it is highly likely that some impacts are overestimated or that tenuous impacts have been included.

- If the RoI is around 1-2, the assumptions are likely to be more robust.

Common problems that can lead to overestimated impacts are:

- The length of impact is too long and may double count for each cohort member. General guide: max 2 years length of impact for each person / cohort member.

- Including cohort members more than once – check the primary input profile.

- Over optimistic assumptions about success rate or magnitude of impact relative to the counterfactual.

Using and developing values

There are several non-market valuation methodologies available for developing values. The simplest values are where these are already expressed in monetary terms and part of regular reporting, such as costs of public services or people’s income. Most of the CBAX values are of this nature.

The CBAX model distinguishes fiscal impacts for the government (classified as “government”) and total economic value or wellbeing impacts for people (classified as “non-government”). Both government and non-government impacts are included in the total societal impacts. In many cases, the government impacts may be used as proxies for impacts for people, eg, hospital cost savings enable services for other people, if the savings are not returned.

CBAX values should only be applied if there is justified causation between the intervention, and the impact in question.
Traditional non-market valuation methodologies use revealed or stated preferences based on market or survey data to derive monetary values for people’s willingness to pay or accept an impact. Developments in wellbeing economics include new methodologies, including subjective wellbeing measures.

In July 2021 the UK Treasury issued “Wellbeing Guidance for Appraisal: Supplementary Green Book Guidance”. The UK guidance includes useful information on the different valuation methodologies. The UK material has been adapted in the table below.

<table>
<thead>
<tr>
<th>Valuation approach</th>
<th>Comments</th>
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| Existing values                     | • Use existing, agreed methodology.  
• From published studies, or CBAx values.                                                                                                                                                                  |
| Market price                        | • Well-functioning, competitive markets exist.  
• Consider externalities not reflected in the price.  
• Consider utility mispredictions in choices.  
• Cannot provide non-use or existence values.                                                                                                                                                    |
| **Non-market valuation methodologies** |                                                                                                                                                                                                                       |
| Revealed preference                 | • Real-world market trade-offs can be identified (eg, through time or purchase) and confounding factors sufficiently controlled for.  
• Consider externalities not reflected in the price.  
• Uses market data (eg, housing and labour market) to derive a value (eg, for noise pollution).  
• Cannot provide non-use or existence values.                                                                                                                                             |
| Stated preference                   | • Going beyond the value associated with using goods and services (‘use-value’) to ‘non-use values’ such as knowing that something exists or having the option of using or visiting.  
• Based on a survey or an evaluation, which assesses the causal wellbeing impact. Designed surveys can be time-consuming, be expensive and have biases.  
• Can be used for impacts that have *not* yet happened or been experienced.                                                                                                                     |
| Subjective wellbeing                | • Real-world trade-offs not possible to identify, convincing payment vehicles do not exist, and/or responses may be subject to strategic bias in stated preference.  
• There is a clear change of state (eg, flooding, ongoing frequent events such as social groups) which could cause a level shift in wellbeing.  
• Where existing survey information exists, such as GSS, it can be a cost-effective method of valuing non-market goods and impacts  
• Uses big data sets and econometric analysis to derive coefficient for changes to life satisfaction (evaluative subjective wellbeing) or changes to feelings (momentary subjective wellbeing). |
| Not valued                          | • Identify and quantify impact to the extent possible, without monetising the impact.                                                                                                                                 |
Subjective wellbeing valuations using life satisfaction data

Over the past decade the subjective wellbeing valuation methodology has developed. It offers the possibility of developing values for a range of impacts using existing New Zealand datasets, such as the General Social Survey. It calculates the compensating surplus for a wellbeing gain or loss. The methodology is efficient, cheap and fast, compared to expensive and time-consuming bespoke surveys used to calculate “willingness to pay”.

“The subjective wellbeing valuation technique measures the monetary value of life satisfaction, and then measures the change in life satisfaction that would arise due to a change in a specific aspect of wellbeing. This technique therefore measures the equivalent monetary value of a wellbeing outcome, by measuring the amount of money that would have the same effect on life satisfaction.”

Given that the use of subjective wellbeing values is relatively new, and we have limited experience, we recommend that users are cautious when applying subjective wellbeing values to not overstate the impacts.

In 2017, the Treasury purchased a licence to use about 60 subjective wellbeing values compiled by the Australian Social Value Bank (ASVB). The Treasury can sub-licence to the New Zealand government sector. The values include monetised impacts for wellbeing outcomes like ‘housing is no longer overcrowded’ and ‘increased hope for the future’ (see Appendix 4). See the Tips section for information on the ASVB values, the methodology and how to access a New Zealand sub-licence. Agencies with an ASVB sub-licence include: Kāinga Ora, Ministry of Health, Ministry of Justice, Ministry of Social Development, Oranga Tamariki, Police, Te Puni Kōkiri and Christchurch City Council.

There is the potential for agencies to develop subjective wellbeing values based on New Zealand data. The CBAx database includes Kāinga Ora and Sport New Zealand values, based on a methodology like the ASVB.

Using WELLBY measure of life satisfaction

Wellbeing researchers argue that policy makers should use subjective wellbeing as a common measure to evaluate policy options. The Treasury Wellbeing Report Seminar Series includes several seminars that cover subjective wellbeing, eg, Arthur Grimes, Paul Frijters & Christian Krekel, Nancy Hay and John Helliwell. See the seminars here.

WELLBY is a subjective wellbeing measure, which equates to a one-point change in life satisfaction on a 0-10 scale, per person per year. Agencies can use WELLBYs either (a) as a wellbeing cost effectiveness analysis of WELLBYs/costs or (b) as a standard CBA where WELLBYs are monetised. CBAx is flexible and can be used either way. To enable agencies to use WELLBYs in a CBA, CBAx includes values for a WELLBY - a low $5,000 and high estimate $23,000 and a midpoint value $14,000 (rounded to nearest $1,000). These values build on the UK methodology for valuing a WELLBY. The New Zealand values are lower compared to the UK values. CBAx takes a cautious approach to not overestimate the WELLBY impacts, for example by using the minimum New Zealand wage rather than the average New Zealand income. Agencies should do sensitivity analysis, if using WELLBYs.

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2 Wellbeing Frameworks

Agencies can use the Treasury’s Living Standards Framework (LSF) and He Ara Waiora wellbeing frameworks as part of CBA, wellbeing analysis and value for money assessments.

These frameworks can sit alongside agency and sector specific wellbeing frameworks. They can help agencies think about the multidimensional and longer-term wellbeing impacts for New Zealanders (and beyond). The He Kāhui Waiora discussion paper illustrates how wellbeing frameworks can be used, for example to consider the covid-19 impacts on wellbeing.

CBAx can assist you to undertake analysis of the initiative’s wellbeing impacts and show how the initiative contributes to the multidimensional LSF and other wellbeing domains.

He Ara Waiora

He Ara Waiora presents a holistic, intergenerational approach to wellbeing. The term ‘waiora’ speaks to a broad conception of human wellbeing, grounded in wai (water) as the source of ora (life). While its principles are derived from mātauranga Māori, many of its elements are relevant to lifting the intergenerational wellbeing of all New Zealanders.

He Ara Waiora gives an indigenous and uniquely Aotearoa New Zealand perspective by taking a tikanga-based approach to wellbeing. He Ara Waiora articulates both the ends, or what are important elements in Māori perceptions of wellbeing, and the means, or the tikanga values or principles that help us achieve the ends.

Figure 2: He Ara Waiora

* Under discussion for inclusion in the framework
When considering wellbeing impacts in CBAX, it may be useful to consider wellbeing impacts from a te ao Māori perspective, or from the perspective of affected communities. This can help develop and build practice experience for applying He Ara Waiora through CBAX. Consider for example:

- Tikanga: whether the initiative has been designed, developed and/or delivered in partnership with iwi and Māori, and with other affected communities and groups.

- Manaakitanga: understanding of the potential impact of the initiative on iwi and Māori, and on other affected communities and groups, and how well this aligns with what they value and aspire to.

See Appendix 1 for a fuller explanation of the framework and suggestions for further reading.

**The Living Standards Framework**

The Living Standards Framework (LSF) was refreshed in 2021. You can read about the concepts and complex inter-relationships between them in: The Living Standards Framework (LSF) 2021. As illustrated in Figure 3, and in Appendix 2, the LSF includes three levels:

- Our Individual and Collective Wellbeing.

- Our Institutions and Governance.

- The Wealth of Aotearoa New Zealand.

**Our Individual and Collective Wellbeing**

This level captures 12 resources and aspects of our lives that have been identified by research or public engagement as important for our wellbeing as individuals, families, whānau and communities.

Most investments or policy proposals can be expected to affect one or more of these wellbeing domains, directly or indirectly, and identifying the impact of investment on these domains is an important part of cost-benefit analysis.

**Our Institutions and Governance**

This level captures the role our institutions and organisations play in facilitating the wellbeing of individuals and collectives, as well as safeguarding and building our national wealth.

Some investments may look to strengthen our institutional arrangements.

Other investments will rely on an effective institutional context for delivery and value management, and so understanding the institutional context will help inform an assessment of the riskiness of a proposal.

**The Wealth of Aotearoa New Zealand**

This captures how wealthy we are overall, including aspects of wealth not fully captured in the system of national accounts such as human capability and the natural environment.

Some investments may require drawing upon our wealth (such as our financial capital) to achieve other outcomes, but we need to ensure that we are safeguarding our wealth for future generations.
The framework also includes analytical prompts that are the key lenses we use to analyse wellbeing across the three levels of the framework.

- The distribution prompt encourages us to consider more than averages in wellbeing. In an investment context, it is important to understand who is likely to be affected, where they current sit on the distribution of wellbeing across the 12 domains, and what the distributional impacts of the investment are likely to be.

- The resilience prompt invites consideration of how well individuals, communities, institutions and our wealth are placed to absorb and adapt to future stresses and shocks such as economic downturns and natural disasters. Certain investments may provide benefits by increasing resilience.

- The productivity prompt encourages us to consider whether the mix and use of our wealth is allowing for optimal economic growth. Certain investments, such as in research and development, might be expected to increase productivity.

- The sustainability prompt encourages us to consider whether we are using our national wealth sustainably, ie, whether we are bequeathing sufficient wealth to our ancestors to empower them to choose lives of value to them. Investments may increase or decrease sustainability, depending on whether they build up or draw down our wealth.
Policy analysis and the relationship between the LSF and CBA

In policy analysis, you can use the LSF at several levels (illustrated in Figure 4 below):

- **Macro** – Analyse high level indicators and trends, eg, Living Standards Dashboard
- **Meso** – Inform government wellbeing objectives, eg, priorities in the budget strategy
- **Micro** – Agency policy options analysis and advice on impacts, eg, budget initiatives. CBA/CBAx fits in at the micro level, informing wellbeing analysis of policy options.

**Figure 4:** Living Standards Framework at different levels (illustrative example)

You can use the LSF as a tool for high level indicators to inform policy priorities. The LSF framework provides a way to measure wellbeing, through the use of indicators for each of the 12 domains and the four capitals. By measuring wellbeing, we can see where we are doing well and where we most need to improve. The LSF Dashboard was first published in 2018. By measuring the wealth, we begin to understand whether our wellbeing is sustainable over the long term, and this provides insights for intergenerational wellbeing.

We can also use LSF at the micro level for policy analysis of specific policy proposals and options. When we use the LSF to analyse a policy option it means that we think about how the policy impacts on wellbeing over time for different people.

Consistent with the public sector system changes, it is intended that thinking widely across domains will help to break down silos, and that the focus on future wellbeing and intergenerational wellbeing will encourage long-term thinking. However, doing this in practice can be complex, because wellbeing is multidimensional, distributed over groups, and distributed over time.

This is where CBA and CBAx are helpful. CBAx helps you to think, in a robust and rigorous way, about how a policy affects the twelve wellbeing domains, encourages thinking across silos, and encourages long-term thinking with 50-year horizon. CBA helps inform trade-offs across the different domains. Each of the impacts in the CBAx database are mapped to a domain of wellbeing. See the CBAx model. Assign a wellbeing domain to impacts that are added. This allows analysts to quantify, how an initiative affects each domain of wellbeing.
Distributional Analysis

Distribution is a key consideration that is often not explicitly covered as part of undertaking cost-benefit analysis. This relates to how wellbeing impacts are distributed across people – eg, the income distribution, the distribution of health, and the distribution of housing outcomes – but also across space (like the regions of New Zealand) and across groups of people – eg, ethnicity, gender, and age.

Agencies are developing tools to support analysis. For example, the Ministry for Women launched the "Bringing Gender In" gender analysis tool – see https://women.govt.nz/gender-tool. The Child Impact Assessment Tool enables agencies to identify, analyse and assess the impacts of any proposed law or policy on the rights and wellbeing of children and young people – see https://www.msd.govt.nz/about-msd-and-our-work/publications-resources/resources/child-impact-assessment.html.

A cost-benefit analysis should as a minimum set out significant positive or negative impacts for particular (sub-)groups. This answers the question: Who gains and who bears the costs of the proposal? (Step 2 of CBA refers). Where there are important distributional implications, further distributional analysis may be appropriate. Quantitative distributional analysis can provide information on the nature and magnitude of the impacts for different (sub-)groups. If some impacts are given higher weighting due to distributional considerations, this is best done as a separate step and sensitivity analysis with transparent assumptions and reasoning.

The CBAX has a field for agencies to explicitly state who is affected by each specific impact in the CBAX model. Be as specific as possible, rather than identifying broad population groups (such as ethnic groups). Identify the characteristics of the people most significantly impacted by the different impacts.

The Treasury is publishing the first Wellbeing Report in 2022. Agencies might find the Wellbeing Report, and supporting background papers, valuable to inform distributional analysis. Here are some prompts for considering the distributional impacts of policy options:

- Is there any empirical evidence of the distributional impacts of the proposal, either positive or negative? How accurate is that evidence/data?
- Is the proposal targeted specifically at a particular population group? How would you define that group? Why is this group targeted? What will be the impacts on people outside the target group?
- If a proposal is not designed to target a specific group, will a proposal have different impacts on different individuals and groups? What groups might be disadvantaged by (face the costs of) the proposals (including any possible unintended consequences)? What groups might be advantaged (receive the benefits)?
- What factors could make a distribution of wellbeing outcomes equitable (in the sense of fair or just)?
- Think about the extent to which the following questions might be relevant, and what they might imply for the ‘equity’ of the proposal:
  - To what extent – or in what ways - does the distribution matter?
  - Do differences in outcomes reflect different choices or levels of effort, or is there some degree of good or bad luck? If so, does this matter?
  - Is there a group of people that has particularly low outcomes? To what extent does the policy proposal reinforce existing patterns, or address these?
3 The Cost Benefit Analysis (CBA) Steps

The Treasury’s *Guide to Social Cost Benefit Analysis* provides a detailed explanation of the seven CBA steps, including how CBA fits into the generic policy development process.

### 3.1 Summary of the CBA steps

CBA fits under the evaluation stage of the policy development process. It is a tool for completing an economic evaluation of options that have been developed in response to a policy problem.

![CBA Steps Diagram](image)

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<thead>
<tr>
<th>Policy evaluation using CBA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undertake CBA on each of the feasible policy options</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inputs to CBAX</th>
<th>Analysis in CBAX</th>
<th>Outputs from CBAX</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1:</strong> Define policy and counterfactual</td>
<td><strong>Step 4:</strong> Quantify the benefits and costs within ranges</td>
<td><strong>Step 6:</strong> Is the result clear enough? If not, consider whether it is worth investing in more research, and repeat above steps</td>
</tr>
<tr>
<td><strong>Step 2:</strong> Identify the people who gain and those who lose</td>
<td><strong>Step 5:</strong> Discount to a common period, compare benefits and costs</td>
<td><strong>Step 7:</strong> Write report</td>
</tr>
<tr>
<td><strong>Step 3:</strong> Identify the benefits and costs; allocate to time periods</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

We recommend checking these steps frequently while completing the policy work and the CBA. In situations where you may be struggling with compiling the information to complete a CBA or input into CBAX, consider whether it is worth (even briefly) revisiting some of the earlier steps in the policy process. For example, if you are struggling to capture pre and post intervention levels of change as a result of an intervention, it may be worth going back to step 1 and considering the counterfactual.
3.2 Inputs for CBAx – CBA steps 1 - 3

To make it easy to undertake analysis, before filling in the CBAx spreadsheet model, you should establish the evidence base, and work through the assumptions and set these out in the budget initiative template. It can be useful to check out the CBAx database before research to help understand the types of metrics and impacts to look out for when researching. If your agency has a dedicated research team, it is highly recommended that you engage with them early on to assist with gathering evidence, as this can be the most time consuming but also most fundamental activity in completing a CBAx. Also consider whether there are external organisations that could help, such as the Social Wellbeing Agency, where applicable.

The budget initiative template is a word document where analysts set the wider considerations for a funding proposal, such as the problem definition and the details of the intervention.

**Step 1: Define policy alternatives and counterfactual**

From stages one and two of the policy development process, you have first defined the problem, and identified several potential solutions. It is useful to set this out on one page in an intervention logic map. You should undertake CBA on each of these potential solutions. Doing a draft quick CBAx can clarify the main impacts, provide initial evaluation of the potential options and focus the policy and evidence efforts.

Before filling in CBAx, do CBA steps 1 - 3 to generate the information that you need to put into the CBAx spreadsheet model. This information is called the inputs. In practice, it is an iterative process, where CBAx inputs and results informs further options and evidence development. The first step is to define the counterfactual of the initiative. CBAx, and CBA in general, requires a clear counterfactual in order to calculate the marginal impact of the intervention over time.

The ‘counterfactual’ is the situation that would exist if the intervention does not go ahead. The counterfactual needs to be realistic. In many situations, as status quo of ‘Doing nothing’ is not a realistic counterfactual. You should consider questions like:

- What is the status quo? What are the current impacts of ‘business as usual’?
- Would an intervention for the same problem be provided by someone else?
- Would other factors already affect the impacts?

**Example: Reconsidering earlier parts of the policy process**

Suppose you are working on a policy proposal to fund a programme of nurses in schools, to prevent skin infections and subsequent hospital admissions. In researching the intervention, you come across an alternative solution, which involves funding nurses to do home visits. This has a higher success rate than school-based nurses but is more costly. In this situation, it might be worthwhile going back to steps 1 and 2 of the policy process, to reconsider the policy problem, and the specific cohort that the problem relates to, to see if this sheds any light on which option might be worth pursuing. It could also be worthwhile completing CBAXs for both options.
• What would you actually do, if you did not undertake the proposed intervention? What is the next best alternative?

• Are there other things that might influence the situation? If we weren’t to fund the proposal, would the problem remain the same, or decline over time, or get better?

**Example: Counterfactuals**

Counterfactuals depend on the specifics of a situation. You will need to have a good sense of the problem, and the target group for the intervention. Here is a table with some examples:

<table>
<thead>
<tr>
<th>Fund a vaccine to prevent the outbreak of an infectious disease</th>
<th>Vs</th>
<th>Do nothing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fund New Zealand’s participation at the Dubai 2020 World Expo</td>
<td>Vs</td>
<td>Benefits at risk (such as the early implementation of the Gold Coast Free Trade Agreement, and improved business connections)</td>
</tr>
</tbody>
</table>

If you think that there is more than one probable counterfactual you have the option of doing a CBA under both, this is often called ‘sensitivity’ or ‘scenario’ analysis. See step 6 for sensitivity analysis. For more guidance on step 1 see page 9 of the Treasury’s *Guide to Social Cost Benefit Analysis*.

**Step 2: Identify who gains and who loses**

The next step in the CBA process is identifying who is going to be impacted, both positively and negatively, by the initiative.

An intervention can have numerous positive and negative impacts (benefits or costs) occurring at different years into the future, and each of these might apply to a different group of people. There may be primary, or direct immediate impacts, as well as flow-on secondary impacts. Note that the losses to taxpayers from the tax revenue to finance the costs are specified separately in the initiative costs.

CBAx analysis distinguishes government and non-government impacts, and all impacts should be considered as part of the analysis. It is useful to understand how different groups are affected and who they are. For each impact, CBAx includes a field for “who is affected”. While this does not affect the calculations (eg, CBAx does not apply weightings), it can help interpretation of the results and distributional analysis. Agencies are encouraged to be as specific as possible for each impact. The field is not pre-defined.

Think broadly about the impacts. We strongly encourage you to think broadly about the impacts of a proposal. Who might gain? Who might lose? Who might be affected, and in what way? A good way to do this is to gather together some stakeholders, or subject matter experts, and brainstorm the potential impacts. As your analysis progresses, and your understanding of the problem deepens, you may find that other impacts come to mind.

Include people who gain and lose outside the immediate organisation and sector. Endeavour to capture all people affected by the intervention. Note that some impacts might be easier to monetise than others.
In later steps, you might exclude some impacts from the CBAX which have limited value, in order to prioritise impacts with greater value. However, ‘casting the net’ wide early on can help to identify impacts that aren’t immediately obvious, but which may change the pitch of the funding proposal and those you need to engage with.

**Example: Identifying who gains and who loses**

Consider a proposal to fund a vaccine for all the six-year olds in New Zealand. Here is a list of those who might be impacted:

- The children themselves (in that their wellbeing is positively impacted)
- Parents
- Employers of parents
- Schools and teachers
- Wider community (benefits from herd immunity)
- Fewer hospital admissions and GP visits

Some of these might be easier to quantify than others. Take for example the wellbeing impacts on children. To the extent that this is about their own subjective wellbeing, this might be hard to precisely quantify. However, it is still an important impact, and should be included in the analysis.

To figure out who will be impacted and how, a good place to start is to consider the intervention group, or the CBAX cohort. Bear in mind that people or organisations outside the intervention group might be affected by an intervention, and these people will also need to be included in the analysis.

Identifying cohorts of the policy intervention group is important. For example, if the intervention group is 25-year olds, the number of 25-year olds each year forms a cohort. The cohorts identified are entered into CBAX. If an initiative’s intervention group is 100, the spread across years determines the number of cohorts.

<table>
<thead>
<tr>
<th>Individuals receive the intervention in year</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 cohort</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5 cohorts</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

For more guidance on this step see page 10 of the Treasury’s Guide to Social Cost Benefit Analysis.

**Step 3: Identify the costs and benefits; allocate to time periods**

After completing step three you should have the following information:

- The costs of the initiative (up front and ongoing, including both operating and capital)
- The impacts of the initiative (either negative or positive)
- An estimate of when each impact will start and how long each impact will last for
- An estimate of the part of the policy intervention cohort impacted per year (or segment), as well as how they might be affected.
- An estimate of the success rate (ie, the probability of success for the number of attempts) of each impact occurring for those impacted.
It can be handy to keep track of the information that you use for making assumptions and developing the input for your CBAX modelling.

The yellow Assumptions tab enables you to include the underlying information that you are using for the assumptions in the CBAX model. This does not affect the calculations, though you could link some of your inputs to this tab.

**Initiative costs**

Costs include all one-off setup costs (including any operating and capital expenditure), evaluation costs and ongoing costs (operating expenditure) incurred through the lifetime of the initiative. This is a Whole of Life Costs approach.

You only need to include the total operating and capital expenditure in the CBAX initiative costs, however these should be included for the entire length that funding would be made available, not just the budget year and outyears, up to 25 or 50 years. For example, if the funding is a Multi-Year Appropriation for a fixed term of five years, the costs should be input for those five years. If the funding would be incorporated into baselines after outyears, these costs should also be included in the inputs.

The initiative costs should be supported by and sourced from detailed financial calculations outside the CBAX model. This should cover the details of the fixed costs that do not change with the scale of the initiative, and the variable costs and the drivers of the variable costs. For example, doubling the number of people that are covered by the intervention may only increase the initiative costs by half, and improve the initiative’s return on investment and value for money. Care should be taken to ensure that impacts and costs are entered for the same initiative scale.

All costs and values are in real terms (ie, in today’s dollars). Costs are in the base year prices and measured in base year dollars, eg, you do not adjust for inflation. If your costings are not in real terms, use the adjusters in row 6 (hidden) in the Cost Input tab to adjust to real terms. The CBAX applies discount rates automatically and you do not need to discount the costs, or the impacts, that you input.

The fiscal or wellbeing losses arising due to the initiative, outside the direct initiative costs, are treated as dis-benefits or negative impacts in the CBAX model, not as the costs of the initiative.

**Impacts, positive and negative**

The CBAX model focuses on estimating a monetary value of impacts ie, monetising impacts. Some of the impacts you have identified may be given a monetary value (monetised) using values in the CBAX Impacts Database. You can add values relevant for your initiative as appropriate to the database.

Currently, there are around 200 monetised impacts in the CBAX Impacts Database. These range from things like the cost of a GP visit, to the cost of the Jobseeker Support benefit.

If you can give an impact a monetary value, you can easily add it into the Impacts Database if it is not listed already.
You might find it helpful to initially summarise impacts in a table as set out below. You can think about the impacts within government – often changes in governmental costs against changes in governmental revenues (fiscal impacts) and society more broadly (wellbeing from use and non-use). Be as comprehensive as possible. Consider both gains/positive impacts and losses/negative impacts. Consider impacts across wellbeing domains and time.

<table>
<thead>
<tr>
<th>Illustrative examples</th>
<th>Government (often fiscal)</th>
<th>Wider Societal (wellbeing, non-government)</th>
</tr>
</thead>
</table>
| **Gains / Positive impacts** | • Reduced costs  
• Resilience  
• Response capability | • Increased health / Lives saved  
• Increased income  
• Cleaner water / Protected birds  
• Safer communities |
| **Losses / Negative impacts** | • Increased costs  
• Inefficiencies  
• Risks | • Pollution  
• Compliance or user costs  
• Time delays |

The costs and benefits to government tend to be the easiest impacts to quantify because they are often already measured in monetary terms. Costs and impacts of government provided or funded services (whether positive or negative) should generally be prepared on a marginal rather than average basis.

You can also identify the impacts from the perspectives of total economic value for society. CBA is interested in the impacts from a New Zealand societal perspective. This goes beyond the fiscal impacts for government. In CBAs we cover the total economic value that is being created, or destroyed, for society. Elements are set out below covering use values for New Zealanders and non-use values where others’ benefits are valued.

Government impacts, eg, fiscal impacts, are collective impacts and can proxy wellbeing impacts eg, through committing or freeing up resources that impact on people’s lives. Analysis includes impacts for people outside New Zealand, eg, Pacific Island nations, where this matters to New Zealand and is valued by New Zealanders.

<table>
<thead>
<tr>
<th>Type</th>
<th>Who is affected?</th>
<th>Elements of value</th>
</tr>
</thead>
</table>
| Use values | Individual/self benefits or bears the costs | • Direct use – Actual use  
• Indirect use – Flow-on effects  
• Option value – Option to use |
| Non-use values | Others benefit or bear the costs | • Existence value – Knowing it exists  
• Bequest value – Future generations benefit  
• Altruistic value – Others benefit |

Many of these impacts are included in the CBAx values database for easy use. If a value is not currently included, it is easy to add values to the database for specific CBAx analysis.

Focus on quantifying and monetising the significant impacts, rather than all impacts. It will not be possible, or sensible, to quantify or monetise all impacts. When information is limited, consider using a proxy value or make a reasonable assumption for quantifying the impact. You can do this by thinking about the incidence, the size and the likelihood of the impact occurring. Impacts that cannot be monetised should be listed in the impact summary, including the direction of the impact (positive or negative) and the magnitude (large, medium or small). Use the monetised values within the initiative as reference point for the magnitude of unmonetised impacts, to provide consistency within the initiative.
The cost of deadweight loss of tax funding is often taken into account in CBA by multiplying costs by a factor of 1.2. For simplicity, consistency and comparability, organisations are in general advised not to include the cost of deadweight loss in CBAx. However, there may be cases where it is best to factor it in to provide comparability.

Timing

There are three dimensions to understanding timing. An impact will apply to a cohort:

- in a particular year
- with a certain length, and
- it will then recur as a new cohort is impacted in future years.

*Impact time lag* – this identifies how long after the intervention has begun the impact will come into effect for each cohort. For example, the benefits from formal education come into effect after the fact. In the illustrative example below the time lag is one year.

*Impact time length* – the impact can last from one to several years per cohort. For example, an impact from an intervention increases income. For the 25-year olds in 2020, does this increase to their income last one year, two, or longer? At what point does the achievement of the impact have to do with other factors, such as their own skills or experience? In the illustrative example below the time length is three years. Based on experience as a rule of thumb, a reasonable time period for length of impact is 2-5 years. There will be exceptions to this. In some cases, the impacts can change over the time period, for example impacts may taper.

*Cohort time period* – this identifies the cohort years which will cause impacts. For example, the programme only lasts five years from 2020 and the impacts are not expected to continue without it. So, 25-year olds in 2025 miss out. The cohorts only run from 2020 to 2024.

Consider ramp up and churn when setting cohort sizes. If it will take some time for the programme to reach its projected long-term capacity through a ramp up period, this should be considered when setting the cohort sizes. In the example ramping up from 20,000 to 40,000 in 2021. If the programme is a service that people can participate in, leave, and then return to, then the degree of churn should be considered when setting the cohort sizes.

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Timing of impact $million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
<td>2020</td>
</tr>
<tr>
<td>2020</td>
<td>20,000</td>
</tr>
<tr>
<td>2021</td>
<td>40,000</td>
</tr>
<tr>
<td>2022</td>
<td>40,000</td>
</tr>
<tr>
<td>2023</td>
<td>40,000</td>
</tr>
<tr>
<td>2024</td>
<td>40,000</td>
</tr>
<tr>
<td>2025</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>
Segment of policy intervention cohort impacted

A specific part (or segment) of the policy intervention cohort may have specific impacts. Identify what percentage of the policy intervention cohort that an impact relates to. Different populations may have different segments. For example, an impact may relate to only a segment of 25-year olds. Assuming that the employed make up 80% of 25-year olds, you record 80% as the ‘segment’.

Example: Thinking about the segments of a cohort

Consider a proposal to fund a programme to prevent family violence in New Zealand. Suppose that the programme includes a range of interventions, such as a social media campaign that will apply to the whole 40,000 strong cohort, as well as more intensive and costly interventions (such as family therapy), that will apply to a much smaller sub-group of the cohort.

In this case, it would make sense to carefully segment the impacts as they relate to the cohort. The social media campaign might apply to the full 100% of the cohort, whereas the family therapy might only apply to the 10%. This may affect the way in which the impacts are modelled, since the specific intervention might result in a different impact.

If the costs of a programme differ between segments, then the impacts may also differ.

Probability / success rate

When identifying the possible impacts of the initiative, think about the likelihood of it occurring for the cohort segment. This can be thought of as the ‘success rate’. Using the example from the previous page, 25-year olds are the group which could receive an increase income, but not all are guaranteed to. The proportion of those that do determines the success rate of that impact.

For more guidance on this step see pages 13-16 of the Treasury’s Guide to Social Cost Benefit Analysis.

Evidence rating

All proposals for spending should be supported by evidence. You will also need to give your evidence a rating of low, medium or high. This should also be presented in the intervention logic for the proposal.

Establishing this rating is a judgement call on your behalf. Here is a list of things to consider:

- Have there has been any previous evaluations undertaken on the proposal elsewhere?
- What information is there on how successful previous similar proposals have been in realising benefits?
- How applicable is the evidence to the local New Zealand context? For example, for proposals that are imported from overseas, what evidence or information exists to suggest that it can be successfully delivered in New Zealand? How confident are you that the evidence might apply in the same way in New Zealand?
• Evidence on effectiveness will be limited for pilots. You should look at other ways of showing confidence in the initiative, such as performing sensitivity analysis, or through the views of independent experts and stakeholders. There should also be a commitment to collect evidence of impact of the pilot in the future (as should be the case for non-pilot initiatives), as such evidence will help to support any potential extension of the piloted initiative in the future.

• Where assumptions have been made about the evidence, these should be clearly documented.

There are some helpful resources for guiding your thinking:


• Refer to the practical tool for rating evidence called *An evidence rating scale for New Zealand* (available here: https://thehub.swa.govt.nz/resources/evidence-rating-scale/).
3.3 Analysis in CBAx – CBA steps 4 - 5

Step 4: Quantify the costs and benefits

This step involves putting the analysis completed in steps 1-3 into the CBAx model itself. CBAx is designed specifically to help with completing steps 4 and 5 of a CBA. A list of different impacts with values attached to them is built into CBAx, in the impact inputs worksheet. This provides consistency between interventions listing the same impacts. Users can also input their own impacts that they have identified through the policy development process and CBA steps 1 – 3. See the discussion on impact above.

Completing this step is conditional upon having worked through the previous three steps of the cost benefit analysis, as well as general policy analysis (that is, considering the problem definition, and options for addressing the problem or opportunity). This will involve research and iteration. See section 2.2 for advice on how to tackle the earlier steps of policy and cost benefit analysis.

Some impacts may not be easily quantified. More research might help to quantify these impacts, but there are some that do not naturally lend themselves to this step. There are many options for how to address situations such as these, including reverse analysis (see the tips section), or ensuring that the unmonetised impacts are included in the advice. The impact summary table in the Wellbeing Impacts tab can be used to set out all impacts, whether monetised or not.

It may also be worthwhile checking through the list of quantified wellbeing values that are available through Treasury’s licence arrangements with the Australian Social Value Bank. These are listed in Appendix 4.

For more guidance on completing step 4 see pages 16-33 of the Treasury’s Guide to Social Cost Benefit Analysis, and the worked example in section 3.

Step 5: Discount to a common period, compare with costs and benefits

CBAx automatically completes this step, once all of the information has been input into the model. The Outputs Summary sheet of the model presents a range of different calculations and graphs. The outputs that may be of most interest:

- Lifetime net present value (NPV) of the initiative.
- Lifetime net present value (NPV) of individual impacts.
- Return on investment to society and to the government. The Return on Investment Societal Total is the same as the benefit cost ratio, unless there are negative impacts. If there are negative impacts, then the benefit cost ratio will be different.
- CBAx has two Outputs Summary sheets: ‘Outputs Summary’ and ‘Outputs Summary Alt’. Both sheets have identical outputs. The difference between the two is the discount rate used in the calculations for the purpose of completing sensitivity analysis. The ‘Outputs Summary’ sheet uses a 6% real discount rate and the ‘Outputs Summary Alt’ uses a 3% real discount rate.

Pages 33-38 of the Treasury’s Guide to Social Cost Benefit Analysis explain the reasoning behind discounting and why it is important.
3.4 Outputs from CBAX – CBA steps 6 - 7

Step 6: Is the result clear enough?

If not, consider whether it is worth investing in more research and analysis, and repeat the above steps

The CBAX results might not be clear enough. To overcome this, you can run different scenarios to test the sensitivity to assumptions and consider obtaining additional information. You will need to make a decision as to whether it is worth investing in more research to produce better information to improve the quality of the CBA.

Be mindful of unmonetised impacts. For example, a proposal may have a return on investment of 0.5, but also include large unmonetised impacts that would in all likelihood increase the total return on investment above 1. In such cases, the interpretation of the CBAX results hinges on the unmonetised impacts. Sensitivity analysis can be helpful to test the assumptions for the unmonetised impacts, in order for the initiative to break-even.

It is important to weigh up the importance of improved information and more research. CBAX should be approached in a fit-for-purpose way, having regard to the suitability of the tool to the proposal, and the value that the CBAX analysis might bring to the decision of whether to fund the proposal or not. The value of obtaining additional information should outweigh the cost.

Page 39 of the Treasury’s Guide to Social Cost Benefit Analysis discusses this trade off and how to think about investing in obtaining additional information.

Sensitivity analysis may be warranted

Depending on the proposal, it may be worthwhile to work through some sensitivity analysis.

Sensitivity analysis involves working through some alternative scenarios. This could be as simple as considering the impact of different discount rates. The CBAX model produces two output sheets, one with the standard discount rate, and one with the alternative lower discount rate.

Sensitivity analysis could also take the form of working through alternative assumptions for a given intervention. Consider those assumptions which have the greatest influence on the CBAX results. For example, you could develop a base case, and from there develop an optimistic case, and a conservative case. This means that you will then be able to express the return on investment as a range. Preparing this analysis can help to support the overall case for change. Examples of sensitivity analysis can be found in among the CBAXs that have been proactively released on the Treasury website.

Sensitivity analysis should be approached in a fit-for-purpose way. That is to say, it may be more appropriate for larger or more intensive interventions, than for smaller or less-discretionary proposals. You can prioritise efforts to focus on impacts and assumptions that have significant influence on the overall result and where there might be most uncertainty.

CBAX has an automatic built in sensitivity analysis of the discount rate. You find the results in the alternative output. It is easy to change the assumptions in CBAX to do sensitivity analysis, for example changing the segment, success rate or length of impacts. This can also be useful early in the policy process, to help focus evidence effort where it matters most.
The CBAX yellow Sensitivity Analysis tab makes it easy to capture the sensitivity analysis. You can copy and paste the results of different model runs with different assumptions into the cases and scenarios. This does not affect the CBAX calculations, rather it is a way to capture the different results so you can give a sense of the range.

You can highlight the key assumptions that are driving the results in the different cases and scenarios. You can also add in the information on impacts, if that is useful.

**Step 7: Write report – provide advice and complete the relevant template**

This step involves providing advice, eg, completing the relevant template and including the results of the CBAX. The report should:

- Contain a problem definition the initiative is addressing
- Describe the initiative, including the intervention logic
- Summarise any assumptions made
- Contain any scenario/options analysis
- List the identified non-quantified, quantified, and monetised impacts
- Provide summary measures for example net present value (NPV), benefit cost ratio and return on investment (RoI).

Agencies should refer to the budget templates and guidance available on CFISnet.

The CBAX output includes 50-year headline numbers, including wellbeing domain impacts. The CBA wellbeing impacts table in the Wellbeing Impacts can be copied into relevant reports, alongside the summary chart and summary metrics, which is in the Outputs Summary. In some cases, it is also worth including the information from the yellow Sensitivity Analysis tab.
Summary Metrics provided in the CBAx Model

| Initiative costs / investment present value $m | A | (88) | (153) | High |
| Government impacts present value $m | B | 81 | 143 | Low |
| Wider societal impacts present value $m | C | 37 | 566 | Medium |
| Total societal impacts, net present value $m | = A + B + C | 30 | 57 | Medium |
| Un-monetised impacts | Magnitude | Low (+) | Low (+) | Low |

Benefit cost ratio, Societal Total (50y)

$BCR = \frac{\text{Positive impacts } B + C}{A + \text{Negative impacts } B + C}$

= 1.3 1.4 Low

Return on Investment, Societal Total (50y)

= \frac{(B + C)}{A}

= 1.3 1.4 Low

Return on Investment, Government only (50y)

= \frac{B}{A}

= 0.9 0.9 Low
The yellow *Wellbeing Impacts* tab provides a place to summarise the monetised and non-monetised impacts. It gives a fuller picture of the impacts, so that all impacts can be considered whether these are monetised or not. The impact summary in the green *Outputs Summary* tab may be too detailed and disaggregated. The information is available below to make it easier to aggregate, so both tables need not be copied into reports. In some cases, the monetised values from the CBAX modelling may be all that is needed. Use the impact summary table that is most appropriate.

**CBA Wellbeing Impacts Summary**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Impact description</th>
<th>Affected</th>
<th>Timeframe</th>
<th>Wellbeing domain</th>
<th>Magnitude / present value</th>
<th>Quantification, assumptions and evidence</th>
<th>Evidence quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact 1</td>
<td>Prevented hospitalisations</td>
<td>Health sector savings - reduced welfare for older patients</td>
<td>Short term (0-5 years)</td>
<td>Health</td>
<td>$75m p.a. 10% effective at preventing 15% of all hospital stays for 75-year-olds</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Impact 2</td>
<td>Health gain - Quality-adjusted life years (QALYs)</td>
<td>Health sector savings and savings from reduced number of years of life lost</td>
<td>Short term (0-5 years)</td>
<td>Health</td>
<td>$37m; $31m p.a. The QALY value based on Framingham data; low; an alternative estimate using the value of statistical life is non-comparable with values used internationally</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Impact 3</td>
<td>Prevented OP visits</td>
<td>Health sector savings and savings for patient co-payments; About 50% of QALYs</td>
<td>Short term (0-5 years)</td>
<td>Health</td>
<td>$39m; 7% effective at preventing 85% of OP visits for 26-34% of children</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Impact 4</td>
<td>Prevented time off work for parents</td>
<td>Parents of sick children</td>
<td>Short term (0-5 years)</td>
<td>Health</td>
<td>moderate; one parent (or another caregiver) may need to stay home to care for sick children</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Impact 5</td>
<td>Prevented school disruption from parents closures to stop the disease spread</td>
<td>Schools - teachers and children</td>
<td>Short term (0-5 years)</td>
<td>Health</td>
<td>In some cases, schools have had to close for up to 4 weeks, to get an outbreak under control</td>
<td>Low</td>
<td></td>
</tr>
</tbody>
</table>

**Evaluation and ex-post CBAs post implementation**

The impact information can inform the evaluation following implementation (for example, identify the assumptions that it is most important to test or provide evidence for). While CBAX is designed for ex-ante CBA, it could also be used for ex-post evaluation of already implemented policies and interventions. As agencies increase the focus on the value for money of current spending, ex-post CBAs may become more common.

**Where your CBAX analysis fits into the budget initiative**

In step 1, you outlined the problem definition, defined the policy options and the counterfactual (showing what happens if the intervention does not go ahead) for specific options. This will help you fill out the section covering the problem definition or opportunity and options analysis of the alternative options. Agencies are expected to identify options rather than just the initiative and do nothing, consistent with the approach taken in the regulatory impact statement process.

In steps 2 and 3, you identified the people who gain and lose, and the costs and benefits. Use this information to fill in the sections on wellbeing impacts and distributional analysis in the budget initiative template, describing the costs and benefits that you identified, who they affect, in what way, to what extent and when. You can talk about the information in CBAX that you drew from in order to monetise these impacts.

---

4 As an example, Nathaniel Hendren and colleagues have calculated the “marginal value of public funds” (MVPF) for more than 100 US policies implemented over the last 50 years. In CBAX, the MVPF metric would be = (non-government impacts) / (government impacts - initiative costs). Some interventions pay for themselves long term, such as policies affecting children and increasing their human capital. See [www.policyinsights.org](http://www.policyinsights.org).
In steps 4 and 5, you quantified and monetised the results and discounted them to a common period. We encourage the use of ranges where there is greater uncertainty and weaker evidence base.

Discuss the assumptions that you used in CBAx to generate these results (for instance, the success rate and why you think this is a reasonable assumption). Treasury does not expect to see a CBAx for all options considered, but for each option under active consideration where appropriate. CBAx can help agencies to prioritise key options for active consideration, and to prioritise resources for policy and evidence efforts accordingly.

It can be helpful for report readers if the initiative costs and impacts are also presented on a per-intervention unit basis. For example, if the intervention unit is families, the report might talk about intervening with 1,500 families over three years, at an expected cost of $ per family per annum, and with expected impacts per family per annum of: x, y, z.

<table>
<thead>
<tr>
<th>CBAx/CBA Guide Steps</th>
<th>Budget initiative templates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Define Policy Alternatives and Counterfactual</td>
<td>Section on the investment proposal, including problem definition and options</td>
</tr>
<tr>
<td>2. Identify the people who gain and lose</td>
<td>Section on the wellbeing impacts and analysis including the intervention logic map and distributional analysis</td>
</tr>
<tr>
<td>3. Identify the costs and benefits</td>
<td>Section on the wellbeing impacts</td>
</tr>
<tr>
<td>4. Quantify the costs and benefits</td>
<td></td>
</tr>
<tr>
<td>5. Discount to a common period, compare with costs and benefits</td>
<td></td>
</tr>
</tbody>
</table>
4  Worked Example – Lurgi Vaccination

This is a straightforward example to give new users an idea of how to go through CBAX if everything is tidy and organised. In practice, identifying impacts and generating these inputs is more complex, requiring evidence and iteration.

The section after the example sets out common questions and ways to deal with them. If you cannot see how to make CBAX work for your intervention, please contact the Treasury for support.

Fictional example: lurgi is rampant for kids aged seven to nine. This is detrimental to health and wellbeing. A possible solution is to fund a recently developed vaccine. We will first go through steps 1-3 to generate inputs for CBAX. Then we will go through where to enter this information into CBAX. See the CBAX Model - Illustrative Example Lurgi.

4.1 Inputs for CBAX – CBA steps 1 - 3

**Step 1 – Define policy and counterfactual**

For simplicity’s sake, the counterfactual is ‘no change to current practice’. Note that this may differ in many situations. In this case we will assume that the health impacts of lurgi will persist.

**Step 2 – Identify the people who gain and those who lose**

In this example, the main group that stands to gain are the lurgi afflicted kids. The vaccine would be administered to six-year-olds, a year before they potentially become vulnerable to lurgi at the age of seven. This means that the cohort is made up of all the six-year-olds in New Zealand in a particular year.

We will assume there are 62,000 six-year-olds each year and that there is still 62,000 of them by the time they are all nine years old. Therefore, there is a yearly cohort of 62,000 children.

<table>
<thead>
<tr>
<th></th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>2026</th>
<th>Outyears</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six-year-olds</td>
<td>62,000</td>
<td>62,000</td>
<td>62,000</td>
<td>62,000</td>
<td>62,000</td>
</tr>
</tbody>
</table>

There may be other people who are impacted on, for example the parents of the six-year-olds. However, the impacts for other people can be linked backed to the six-year-olds. The cohort is the group that drives the impacts. In this example, it is the group of six-year-olds, who would be eligible for the vaccine that drives the impacts. The impacts for the six-year-olds can be considered the primary impacts, and the impacts for the parents considered the secondary or flow-on impacts.

When identifying the people who are impacted, think about the people who may experience loses or negative impacts as well as those who gain. In this example, it is assumed that the negative impacts of immunisation are negligible as there are no adverse reactions.
Step 3 – Identify the benefits and costs, allocate to time periods

Here we generate all the inputs for the CBAx model. You will find CBAx much easier to use if you have done the thinking up front. Refining a CBAx by going between steps is inevitable, adding more impacts, removing others. For simplicity, we treat CBA steps 1 - 3 as generating the inputs for CBAx.

Intervention Logic Map (ILM)

We recommend you set out the impacts in an intervention logic map (ILM), or any other simple and logical way of setting out the way in which the intervention results in a specific set of impacts. Below is an example ILM for the lurgi proposals.

Impacts

There are likely to be many impacts resulting from this intervention, both for the government and for society more widely. For the sake of simplicity in this example we will focus on the two main impacts for the health system, reduced inpatient hospital visits and reduced GP visits, and one wellbeing benefit, improved quality of life.

1. Inpatient hospital visits reduce. The pre-intervention level is 0.3 hospital visits per child per annum, and we will assume that the post-intervention level is 0.27 after the vaccine. Around 10% of inpatient hospital visits are due to lurgi, and we will assume that if we fund the vaccine, these hospital visits will cease.

2. GP visits reduce. The pre-intervention level is 6 GP visits per child per annum and we will assume that the post-intervention level is 5.7 after the vaccine. Around 5% of GP visits are due to lurgi, and we will assume that if we fund the vaccine, these GP visits will cease.

3. Quality of life improves with greater health, and we can measure this in quality adjusted life years (QALYs). A way to understand the QALY gain is that, without lurgi a child is in perfect health (ie, their quality of life is 1.0 and each year of life is 1.0 QALYs). Mild cases of the illness have a reduction in average utility of 0.03 for the period of the illness, ie, if a child is otherwise in perfect health and they have the illness for one week, they lose QALYs = (0.03 * 1/52). We assume that pre-intervention level is 0 QALY gain per child per annum as without the vaccine we will not prevent the QALY loss. We assume that the post-intervention level is 0.03 QALY gain, as the QALY gain is 0.03 when preventing a child getting sick from lurgi.

The values of these three impacts are built into the CBAx model in the impacts database worksheet.

However, it is important to know the extent of the reduction resulting from this intervention. This is the pre and post intervention level listed above. In practice, arriving at a number for these assumptions requires evidence.

Now that we have identified these impacts, for each we need to establish timing details, the segment affected, and the success rate. These details could be different for each impact.
Timing

- Time lag – the vaccine is administered at age six, but Lurgi only starts to affect seven-year-olds, so the impact begins after a year. Lag for all three impacts is one year.

- Length – firstly, remember that Lurgi afflicts 7-9-year-olds. Once they turn 10-years old they are unaffected. This means there is a maximum length of impact of 3 years covering children aged 7, 8 or nine years. However, since they won’t get sick more than once, the maximum length of impact is one year.

  - Inpatient hospital visits reduction: only seven-year-olds get lurgi bad enough to be sent to hospital. Once they are eight Lurgi can be fixed from a trip to the doctor. Therefore, the **length for this hospital visit impact is one year**.

  - GP visits reduce: GP visits will reduce for kids 7-9-year-olds. We will also assume that the reduction happens for eight-year-olds. This is a **lag of two years for GP visits**.

  - Health and quality of life gains: children with lurgi experience a 0.03 QALY reduction for two weeks, which is avoided by taking the vaccine. The **length of Quality Adjusted Life Years (QALY) gain is 0.04 years**, i.e., 2 weeks / 52 weeks.

- Time period – Based on our evidence base, we will assume that without this vaccine Lurgi related health problems will return. This proposal is to have the vaccination programme continue indefinitely. We assume that the vaccine stays effective and that there is no tapering in the vaccine effectiveness over time. The **period is the maximum 50 years**.

Segment of policy intervention cohort

There is 62,000 six-year-olds each year but not all will take the vaccine. Some parents will choose not to. Some children might not be able to get it for health or other reasons. We will assume that of all six-year-olds a **segment of 80%** receive the vaccine.

An 80% vaccination rate is expected for six-year-olds as the central scenario. The vaccine is particularly effective (95%) at preventing hospitalisation for the 10% most vulnerable. It is also very effective (80%) at preventing hospitalisation in a further 30% of cases. For the remaining 40% vaccinated, the vaccine prevents GP visits (70% effective).

Probability

The vaccine is highly effective but will not work for all those who receive it. We assume 1% of those who get the vaccine will have the same chance of getting lurgi and need for the doctor or hospital. **The success rate varies from 70-85%, for different segments and impacts.**

Evidence rating

You will need to rate the evidence quality as either low, medium or high. In this example, we will assume that the evidence quality for the impact relating to hospital admissions is low, and the evidence quality for the impacts relating to GP visits and QALY gain is medium.

Initiative costs

There is a dedicated worksheet for initiative cost inputs including operating and capital expenditure incurred for each year. The vaccine can be administered at the same time as others, so there are no additional administering operating costs. The vaccine costs $100 per child. Since we assumed 80% of the group of six-year-olds would get the vaccine, **this cost is $4.960 million per year ($100 * 0.8 * 62,000).**
Intervention logic

**Intervention**

- Vaccine to prevent lurgi in 7–9-year-olds.

- Vaccinate six-year-olds, 62,000 per year.

- Costs $100 per vaccination per child, $4.960 million per year

**What is intended to be achieved? Outputs**

- 80% of six-year-olds get vaccinated

- 20% not vaccinated

**Immediately and medium/longer term Outcomes / impacts**

- **More QALY gains / more health**
  - 7-9 years only
  - Time lag 1 year, Length of impact 2 weeks
  - 80% successful, medium evidence
  - QALY gains per year 0 (pre) to 0.03 (post)

- ** Fewer hospital visits / reduced health costs**
  - 7-year-olds only
  - Time lag 1 year, Length of impact 1 year
  - 95% successful for 10% and 80% effective for 30%; High evidence
  - Visits reduced by 10% from 0.30 (pre) to 0.27 (post) visits per year

**Wellbeing Impacts Relative to counterfactual**

- $37.55 million PV

- $76 million PV

- $9 million PV

**Primary intention:** prevent children getting sick with lurgi. It is known to be a highly effective vaccine from overseas experience.

**Significant flow on health sector savings, freeing up resources for meeting other health needs (i.e., not cashable savings). Limited flow-on preventing disruptions for parents and schools. The vaccine would be added to the vaccination schedule. Due to evidence implementation is nationwide, rather than pilot. The Ministry of Health will monitor vaccination coverage and hospitalisation. Coverage could exceed 80%, which would increase the costs and the health benefits.

**CBAx outputs**

- Total NPV $30.55 million
- Societal ROI / BCR 1.3
4.2 Analysis in CBAx – CBA steps 4 - 5
Step 4 – Quantifying the benefits and costs within ranges

Here we enter all the information gathered in steps 1 to 3 into the CBAx model.

In the model, the boxes that are coloured orange indicate those boxes that you need to input numbers or information, or check. The boxes that are not coloured can be left.

Action point 1 (Primary Inputs tab)

Inputs: information about the proposal (including the CFISnet number, the title and description of the proposal, the unit of analysis, and the description of the policy intervention cohort).

Click on the Primary Inputs tab.

![Primary Inputs (Year Ending June 30th)](image)

We have entered in the information about the proposal and have got the CFISnet number of the proposal from our finance team. We have a cohort made up of 62,000 six-year-olds per year. The time period is fifty years (the max for CBAx), so we enter in this number in each yearly cell with final year that CBAx represents.

We assume no delay in implementing this proposal.

Action point 2 (Cost Inputs tab)

Inputs: the annual costs to the government of the programme. Now you need to click on the next worksheet, titled Cost Inputs.

![Cost Inputs in 2023($)](image)

We have no capital expenditure. We have calculated the operating costs as $4,960,000. The time period is fifty years (the max for the CBAx model), as we are proposing that this programme of vaccination be kept ongoing. So, we enter the number in each cell.

These costs are the real costs, based on prices in the base year.
Action point 3 (Impacts Database tab)

Click on the next tab along, which is the Impacts Database tab.

This tab contains a collection of publicly available quantified impacts. Each impact has a link with source information. You can add in your own quantified impacts, if you have impacts that are not in the database. See the tips section for more information on how to do this.

There are no inputs for you to make in the model in this tab, as the three impacts we are modelling are already contained in the database. You can filter the database by wellbeing domain. In this case we are modelling the health impacts.

<table>
<thead>
<tr>
<th>Wellbeing Domain</th>
<th>Description</th>
<th>Value (2023)</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>Inpatient hospital visit</td>
<td>7.259</td>
<td>Health 2023</td>
</tr>
<tr>
<td>Health</td>
<td>GP visit (5 visits)</td>
<td>0.914</td>
<td>Health 2023</td>
</tr>
<tr>
<td>Health</td>
<td>QALY gain (10 years)</td>
<td>0.176</td>
<td>Health 2023</td>
</tr>
</tbody>
</table>

The impacts we identified in our research were inpatient hospital visits, GP visits and QALY gains. These are rows 143, 155/156 and 160/161 respectively.
### Impact Inputs Tab Overview

All remaining inputs are entered into the Impact Inputs tab. Below is an overview of the whole tab, where you can see the inputs and where to enter them on one page. We will then work through each of these inputs in more detail.

<table>
<thead>
<tr>
<th>Row Number</th>
<th>Impact</th>
<th>Wellbeing Domain</th>
<th>Sector</th>
<th>Adjusted Value</th>
<th>Unit</th>
<th>Type</th>
<th>Affected?</th>
<th>Evidence Quality</th>
<th>Time lag before impact occurrence (years)</th>
<th>Length of impact (years)</th>
<th>End year</th>
<th>Segment of policy intervention cohort per year (percentage)</th>
<th>Success rate (Percentage)</th>
<th>Impact type</th>
<th>Units per person / cohort</th>
<th>Impact per annum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>143</td>
<td>Health</td>
<td>Health</td>
<td>(1,234.40)</td>
<td>Per visit</td>
<td>Government</td>
<td>Health sector, patients</td>
<td>High</td>
<td>1.0</td>
<td>1.0</td>
<td>2.0</td>
<td>30%</td>
<td>60%</td>
<td>Pre intervention level</td>
<td>0.50</td>
<td>Post intervention level</td>
</tr>
<tr>
<td>2</td>
<td>143</td>
<td>Health</td>
<td>Health</td>
<td>(1,234.40)</td>
<td>Per visit</td>
<td>Government</td>
<td>Health sector, patients</td>
<td>High</td>
<td>1.0</td>
<td>1.0</td>
<td>2.0</td>
<td>10%</td>
<td>90%</td>
<td>Pre intervention level</td>
<td>0.50</td>
<td>Post intervention level</td>
</tr>
<tr>
<td>3</td>
<td>155</td>
<td>Health</td>
<td>Health</td>
<td>(61.12)</td>
<td>Per visit</td>
<td>Government</td>
<td>Health sector, patients</td>
<td>Low</td>
<td>2.0</td>
<td>1.0</td>
<td>3.0</td>
<td>40%</td>
<td>70%</td>
<td>Marginal impact</td>
<td>0.50</td>
<td>Post intervention level</td>
</tr>
<tr>
<td>4</td>
<td>155</td>
<td>Health</td>
<td>Health</td>
<td>(47.53)</td>
<td>Per visit</td>
<td>Government</td>
<td>Parent of 7-9 year olds</td>
<td>Low</td>
<td>2.0</td>
<td>1.0</td>
<td>3.0</td>
<td>40%</td>
<td>70%</td>
<td>Pre intervention level</td>
<td>0.50</td>
<td>Post intervention level</td>
</tr>
<tr>
<td>5</td>
<td>160</td>
<td>Health</td>
<td>Health</td>
<td>41,755.84</td>
<td>Per year</td>
<td>Non-Government</td>
<td>7-9 year olds</td>
<td>Medium</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>80%</td>
<td>20%</td>
<td>Pre intervention level</td>
<td>0.50</td>
<td>Post intervention level</td>
</tr>
<tr>
<td>6</td>
<td>161</td>
<td>Health</td>
<td>Health</td>
<td>6,300.79</td>
<td>Per year</td>
<td>Non-Government</td>
<td>7-9 year olds</td>
<td>Medium</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>80%</td>
<td>20%</td>
<td>Pre intervention level</td>
<td>0.50</td>
<td>Post intervention level</td>
</tr>
</tbody>
</table>
Action point 4 (Impact Inputs tab)

The Impact Inputs tab is where all remaining inputs need to go. First, we need to enter in the row numbers of the impacts we are modelling: 143, 155/156 and 160/161. Enter these numbers into the orange boxes for Impacts 1 to 6 in column B.

Once you have done this, you will see several columns auto-fill: the outcome area, the value, the unit, and the type.

We have included a patient co-payment, though it may be lower or not exist for children’s GP visits. This will show up as a non-Government impact, rather than a Government impact. This distinction can be useful when analysing the results.

You might notice that your spreadsheet looks different to ours above, with the boxes in column C showing as red and with ‘EXCLUDED’. This is a simple check to show whether all the inputs have been added into the model. If they haven’t, it will show as ‘EXCLUDED’, which means that they are not flowing through to the Output Summary sheet.

In our case, we have included two different values for Quality-adjusted life years (QALYs). This makes it quick and easy to undertake sensitivity analysis. We must make sure that only one of the QALY values are included at a time. It is easy to “turn impacts on/off” by leaving out one of the input data, eg, the length of impact, to exclude that impact.
Action point 5 (Impact Inputs tab continued)

The next set of inputs we need to enter is who is affected, the evidence quality, the time lag, and the length of impact.

<table>
<thead>
<tr>
<th>Who (or what) is affected?</th>
<th>Evidence Quality</th>
<th>Time lag before impact occurrence (years)</th>
<th>Length of impact (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>health sector, patients</td>
<td>High</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>health sector, patients</td>
<td>High</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>health sector, patients</td>
<td>Low</td>
<td>2.0</td>
<td>1.0</td>
</tr>
<tr>
<td>parents of 7-9 year olds</td>
<td>Low</td>
<td>2.0</td>
<td>1.0</td>
</tr>
<tr>
<td>7-9 year olds</td>
<td>Medium</td>
<td>1.0</td>
<td>0.04</td>
</tr>
<tr>
<td>7-9 year olds</td>
<td>Medium</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

For Impact 1 and 2 (Inpatient hospital visits) we have assumed that it affects the health sector costs and that resources will be re-allocated within health, benefiting other patients. The evidence quality is high. For Impacts 3 and 4 (GP visits), we have assumed that cost is split with some co-payment from parents and that evidence is low. For Impacts 5 and 6 (QALY gains) children are affected, and we have assumed that evidence is medium.

Be as specific as possible on who is affected. Click on the orange box in column I and you will see that there is a drop-down box for evidence with low, medium and high. Select the appropriate value. In practice, the evidence quality is relevant at the end of the process, when understanding which impacts contribute most to the benefit cost ratio and other indicators. If these impacts have high (low) quality evidence, then this increases (reduces) the confidence and reliability of these results.

We now need to enter the time lag and length of each impact. The three impacts have a time lag of one or two years. This is because the proposal is to vaccinate six-year-olds, one year in advance of the time when they would become susceptible to lurgi. Impact 1 - 4 (Inpatient hospital visits and GP visits) have a length of impact of 1 year. Impacts 5 and 6 (QALY gains) has a length of impact of 0.04 years. Once you have entered these details in, the CBAx model will then auto-fill a column with the end year for these impacts.
The final inputs in this tab are the segment of the policy intervention cohort, the success rate, and the pre and post intervention levels.

We vary the segmentation and success rate across the different impacts. We model the segment of the policy intervention cohort per year as totalling 80%. This represents the proportion of the cohort who will receive the vaccination. The success rate of the vaccine, based on the evidence, varies from 70% to 95% as the vaccine is more effective at preventing hospitalisation (especially for the most vulnerable children) than preventing GP visits.

For Impacts 1 and 2, the pre and post intervention levels were 0.3 and 0.27 respectively. For Impact 3 and 4, the pre and post intervention levels were 6 and 5.7 respectively. For Impact 5 and 6, the pre and post intervention levels were 0 and 0.03 respectively. Once these are entered, we have completed almost all the information that we need to put into CBAX.

CBAX then calculates the marginal impact (that is, pre intervention level minus post intervention level). This is the difference that the intervention causes (the marginal impact).
The screenshot above shows the other automatic calculations within the ‘Impact Inputs’ tab. It shows the value per cohort member, for each child.

The stream of benefits will apply to each cohort member and cohort year of our policy intervention cohort entered in the ‘Primary Inputs’ tab. Note the lag of one year until 2024 (for 2023 cohort which is zero in this case), before there is any value to the first group of six-year-olds. This is because of the time lag of 1 year. The value for Impact 3 and 4 only appears in 2025, as they only have a duration of less than one year. If impacts were longer than 1 year, the value would appear for several years.
Step 5 – Discount to a common period, compare benefits and costs

Action point 7 – Outputs Summary tab

Click on the ‘Outputs Summary’ tab, where you will see that the model has calculated several things. Of particular interest is the present values for impacts, charts and headline numbers. You enter information about the type of analysis, unmonetised impacts, VFM and strategic alignment scores, explanatory information and the evidence quality for the headline numbers. Copy charts and headline numbers into advice as appropriate.

Enter drop down information (not affecting calculations)
- Type of analysis (standard or reverse)
- Un-monetised impacts (magnitude)
- VFM and strategic alignment scores

Explanatory information. Set out key assumptions.

Copy headline numbers and Evidence quality for headline numbers

Copy present value charts across the wellbeing domains and time
Output Summary chart interpretation

**Return on Investment (RoI)**

<table>
<thead>
<tr>
<th>Metric</th>
<th>Societal Total (50y)</th>
<th>50y with high evidence quality only</th>
</tr>
</thead>
<tbody>
<tr>
<td>RoI</td>
<td>1.3</td>
<td>0.9</td>
</tr>
<tr>
<td>RoI</td>
<td>0.9</td>
<td>0.9</td>
</tr>
</tbody>
</table>

The return on investment shows the impact on New Zealand per dollar that the government spends on an initiative. In this example, for every dollar that the government spends on the vaccine, New Zealanders receive about $1.2 worth of benefits.

The outputs summary presents two Rols – a societal total, and a government only.

The societal total RoI is the overall RoI, taking into account all the impacts that have been modelled. The government only RoI only uses the government-specific impacts.

**VFM and strategic alignment scores**

<table>
<thead>
<tr>
<th>Agency assessment</th>
<th>Value for money</th>
<th>Strategic alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 - Medium Returns - Likely</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 - Limited Alignment</td>
<td></td>
</tr>
</tbody>
</table>

**Net present value over time**

This chart displays the profile of the impacts (net positive and negative impacts), the cost of the initiative, and the net present value over time. It also shows the cumulative net present value. Due to the lags between vaccinating and getting the impacts, the first five-year period has a net loss. Due to the discounting, impacts in later years are valued less.
Present values of impacts across domains

This chart displays the 50-year present value of the marginal impact by wellbeing domains. This means that it shows what the total value is over the 50-year timeframe but adjusted to present day dollars.

This graph illustrates where the impact falls according to which wellbeing domain. This can help users identify surprising or significant results at a glance.

Impact summary chart

This chart shows the breakdown of the NPVs, according to the particular impact and how they contribute to the overall NPV. It also shows the evidence rating for each impact.

It is very useful for getting a quick sense of which impact is driving the bulk of the NPV (and therefore the overall RoI). Here we can see that it is the hospital visits that has the highest NPV ($54 and $21 million over 50 years compared with less for other impacts). We can also see from the chart that the evidence quality for this impact is rated as high, which might mean that we can have some confidence in the results.
4.3 Outputs from CBAx – CBA steps 6 - 7

Steps 6 and 7 – Finalise and report the results

You now have the information that you need to review the results. It is common that you might need to do iterations of the CBAx modelling before finalising it. You may find that the results are different to what you might have expected. For example, you might get a negative impact value when you expected a positive net present value.

Policy analysis is often an iterative process. As you get deeper into work, you might do more research, talk to more stakeholders or subject matter experts, or discover other evidence. You could consider doing sensitivity analysis. Any of these elements might make you adjust your assumptions or revise things like the problem definition or the intervention itself.

It is easy to adjust the assumptions you have input into the CBAx model. It is usually just a matter of changing some of the numbers that you have used. As always, you should make sure that your analysis is supported by evidence, and that assumptions are clearly documented.

Once you have finalised the CBAx analysis, you should incorporate your findings into your advice. You can incorporate the monetised net present values for impacts and the overall results into the budget initiative template. Please see Step 7 in the previous section of this guidance for more information.
5 Tips for Common Questions

This section contains common questions encountered by CBAx users, and possible solutions. CBAx has flexibility in its application and functionality that can help you address questions. You can refer to the tips as needed. Some of the explanations relate to the worked example, so please read through it for context.

We are very interested in the experiences and challenges of people who are using the CBAx model. We encourage you to raise issues and any solutions with Treasury. This helps us to make ongoing improvements to the CBAx model and the guidance, and to share your tips and solutions with other users.

Support is available

Use this document as your first point of call for guidance on how to use CBAx.

If you have questions that are not covered by the tips below, you can seek Treasury support. The Treasury can provide support on specific issues and review draft CBAx models. Please contact your Vote Team or CBAx@treasury.govt.nz. A range of support is available, as set out in the table below.

<table>
<thead>
<tr>
<th>Type of support</th>
<th>Description</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treasury Vote Analyst engagement</td>
<td>Vote Analysts can engage with policy, research and finance teams and discuss approaches to work through issues in applying CBAx.</td>
<td>Agencies can engage with their Treasury Vote Analyst at any time. We encourage agencies to engage early and raise potential challenges.</td>
</tr>
<tr>
<td>Treasury CBAx helpline</td>
<td>General enquiries about the information contained in this guidance can be directed to <a href="mailto:CBAx@treasury.govt.nz">CBAx@treasury.govt.nz</a>.</td>
<td>At any time.</td>
</tr>
<tr>
<td>CBAx Community of Practice for all users with extensive or limited experience</td>
<td>Treasury runs workshops for CBAx users to learn and share experiences about CBA steps, the inputs to CBAx, the analysis and the outputs. Contact <a href="mailto:CBAx@treasury.govt.nz">CBAx@treasury.govt.nz</a>.</td>
<td>Treasury runs these workshops mainly in the July-December period to support agencies and advisors in their budget preparation.</td>
</tr>
<tr>
<td>Tailored CBAx workshop</td>
<td>If you are interested in a workshop tailored for your agency, please contact the Treasury Vote Analyst.</td>
<td>Workshops can be tailored on an ad hoc basis depending on the specific needs.</td>
</tr>
<tr>
<td>Government Economics Network (GEN) CBA course</td>
<td>The Government Economics Network provides training, including CBA. The course “Introduction to Cost Benefit Analysis” provides a good CBA introduction, and it includes some CBAx training. See Upcoming GEN Training</td>
<td>The “Introduction to Cost Benefit Analysis” runs once or twice a year.</td>
</tr>
</tbody>
</table>
Key messages

Based on experience, we have a set of CBAx key messages that we often share.

- **We are all learning as we go.** CBAx has been deliberately approached in the spirit of trying things, learning and refining as we go. At any given point, things may not be perfect. We are always open to learning from our experiences.

- **Intervention logic and who is the initiative affecting?** A critical step of a CBA is working out the intervention logic. Key questions that this covers, and which are input into the CBAx model include:

  - **Who or what are you intervening with?** This is the CBAx cohort and may be individuals, families, schools, regions, rivers etc.

  - **Who is the initiative impacting on or affecting?** This will be wider than who or what the initiative intervenes with. This will inform number of impacts and segmentation in CBAx. It will also cover unmonetised impacts that are not in CBAx but should be included in the wellbeing domains template (Appendix 3).

Analysis of who is affected can inform and draw on **distributional analysis.** Agencies are developing tools to support analysis. For example, the Ministry for Women developed Bringing Gender In, a gender analysis tool – see [https://women.govt.nz/gender-tool](https://women.govt.nz/gender-tool).

- **What is the nature, magnitude and timing of the impacts relative to the counter factual?** This includes assumptions about: what are the positive and negative impacts? For whom? When? For how long? This informs the assumptions about the individual impacts modelled in CBAx.

- **What is the evidence?** Focus on providing good evidence for the impacts that are significant overall. More weight can be placed on impacts that have a stronger evidence base. You can do quick modelling of assumptions in CBAx as part of the policy development process, but you can focus the final CBAx on the impacts that a stronger evidence base.

- **It is about lifting the quality.** The 2018 review by New Zealand Institute of Economic Research (NZIER) showed a significant improvement in the quality of agency CBA advice in budget initiatives since the introduction of CBAx. While there are capability and resourcing issues with completing and assessing CBAx, it has led to more robust analysis. The improvement can be seen in Figure 4 below.

*Figure 4: Mean quality scores and percentage meeting quality criteria across budgets*
• **Think broadly about the impacts but be conservative in the extent to which they apply.** We encourage analysts to think broadly about the impact of their proposals. Who might be affected? In what way? Think outside the immediate sector and consider primary and flow on impacts. Consider long term as well as short term impacts. Consider fiscal and wider wellbeing impacts, government and non-government impacts. Be conservative and do not over-claim impacts. Consider: how confident are you that there is a causal link between the intervention and this impact? At what point do other factors help with the ongoing achievement of the impact?

• **Prepare your best estimate, with sensitivity and ranges.** The best estimate when quantifying impacts is in line with best practices in fields such as accounting and liability valuation. In preparing the best estimate err on conservative rather than over-optimistic assumptions. This makes it easier to have confidence in the results. For assumptions that are particularly critical for the overall result, it is good practice to provide sensitivity analysis with your best and conservative estimate to inform decisions. The Treasury encourages the use of ranges, where evidence is weak.

• **What’s the counterfactual?** Often agencies are uncomfortable with developing cost benefit advice. They typically have a lot of information about the impact of their proposals, but they are often less comfortable when it comes to quantifying these impacts. In this situation it is important to consider what is the counterfactual? Where there is an absence of information on the counterfactual, it is best practice to advise decision-makers up front rather than overpromise on the proposal. There is an opportunity cost with funding something, as it means that another proposal, which may have been more worthwhile, will go unfunded.

• **What does the evidence tell us?** When considering the CBAx model and how to fill it in, many of the inputs will need to be gleaned from the evidence. Evidence should be your first port of call for developing funding proposals.

• **Transparency is key.** Monetising impacts requires a level of precision. It might be logical to infer that a job mentoring scheme for young people might result in some of those young people being employed. However, in order to establish that New Zealand is truly better off for investing in this particular intervention, we need to be able to specify how many young people will be employed, for how long, and so on. Depending on the evidence, part of this may involve making assumptions. Although it can be uncomfortable to make assumptions, it at least provides transparency, and a base from which to evaluate and learn. Transparent assumptions, which can be challenged and honed over time, are generally better than no quantification.

• **Fit to the proposal.** The answer to many questions we get asked is dependent on the nature of the proposal, the counterfactual and what the evidence tells us. Often there is not a prescriptive answer or ‘one size fits all’ approach. Instead, the answer to problems will have much to do with the facts and specifics of an initiative.
Table for quick access to tips on specific issues.

<table>
<thead>
<tr>
<th><strong>Question</strong></th>
<th><strong>Tips</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Use of CBAx tool and results</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Using CBAx in decision-making | • Initiatives are not evaluated on CBAx results alone.  
• CBAx results together with unmonetised impacts, evidence base and assumptions inform value for money (VFM) advice.  
• VFM is considered alongside the wider case eg, strategic alignment. |
| People involved in completing a CBAx | • Key people: initiative lead (policy/budget) and excel experience.  
• Involve different perspectives and use specialist capabilities: subject matter experts, policy, finance, actuaries, service delivery and evaluation.  
• Involve other agencies with shared outcomes or policy intervention group. |
| Prioritising CBAx efforts | • Prioritise efforts on those impacts with the greatest influence on the RoI.  
• Gathering evidence is often the most time-consuming part, but crucial. |
| Reverse break-even analysis | • Reverse analysis enables you to see what you would have to assume to for example break even. |

| **Fundamental elements** |  |
| Intervention is not about people | • The policy intervention group does not have to be people. It can be for example businesses, areas, society/New Zealand, houses or rivers. |
| Determining cohort unit | • Try different units to see what works the best.  
• Keep the analysis as simple as possible and as flexible as possible. |
| No appropriate impact value in CBAx database | • It is easy to add values to the database for a specific intervention. Analysis then flows like any other value.  
• Can add values to explore “what if” or “what would it take”. |
| Pre and post intervention levels | • Specify pre and post intervention levels in one of three ways: binary, frequency or proportional.  
• It relates to the unit of the impact. Check that it makes sense. |
| Cost pressure | • Counterfactual is key for appropriate CBAx analysis, or exemption. |

| **Information / evidence** |  |
| Poor information base | • Use judgement and available information for reasonable assumptions.  
• Undertake sensitivity analysis for varying assumptions.  
• Provide ranges and interpret your results in light of the evidence base. |
| Assumptions | • Make on best information available and make transparent. |
| Intervention evaluation | • CBAx supports an improved evidence base for decision-making and provides a basis for an evaluation plan. |
| Australian Social Value Bank (ASVB) | • Contact Treasury re purchasing ASVB sub-licence, if interested in using the Australian Social Value Bank wellbeing impacts. |
| Multiple entries of the same impact | • You can include the same impact multiple times to address variation in impacts, for example across time and segments of the intervention population.  
• Ensure not to double count impacts. |

| **Adjusted** |  |
| Affected people differ over time | • Use multiple impact entries for each time period and vary assumptions. |
| Impacts vary over time | • Use multiple impact entries for each time period and vary assumptions about success rates or pre and post intervention levels. |
| Affected differently | • Use multiple impact entries for each segment and vary assumptions. |
| Non-flat impact profile | • You can input an impact profile for pre- and post- intervention that varies across time. This may be results from separate modelling.  
• Consult Treasury and do not re-use the model (changes formulae). |
| Labour market impacts | • Adjust labour market impacts such as income, tax/ACC and income benefits for displacement effects and opportunity cost. |
| QALYs | • Have sound evidence base for QALY assumptions. |
5.1 Tips – Use of CBAX Tool and Results

How is cost benefit information used in budget decision-making?

**Tips**

- Initiatives are not evaluated on CBAX results alone.
- CBAX results together with unmonetised impacts, evidence base and assumptions inform value for money (VFM) advice.
- VFM is considered alongside wider case and factors e.g., strategic alignment with Government priorities, fiscal constraints and implementation risks.

CBA informs value for money advice when considering different options for investment. The initiatives are not ranked and prioritised exclusively on the Return on Investment (RoI) figures. Many factors are considered in the decision-making process, including but not limited to unmonetised impacts, strategic alignment with Government priorities, fiscal constraints, the comparative value of competing proposals and the risks involved.

The RoIs are considered in the context of the assumptions and the evidence base, as well as unmonetised impacts. For example, an initiative with a lower RoI and a solid evidence base may be considered better value for money than a high RoI initiative with optimistic assumptions and limited evidence base.

In the budget context, the CBAX analysis is used primarily by the Treasury vote team in developing value for money advice. As the capability and confidence in the analysis improves over time, ministers are expected to gain greater visibility and use of the analysis.

**Who should be involved in completing a CBAX?**

**Tips**

- Key people: initiative lead (policy/budget) and excel experience.
- Involve different perspectives and use specialist capabilities e.g., subject matter experts, policy, finance, actuaries, service delivery and evaluation.
- Think about who is best placed to cost an initiative, who is best to identify the counterfactual, etc.
- Involve other agencies with shared outcomes or intervention group.
- Make contact with them early on – you might be working on a similar proposal that would benefit from a cross-agency approach.

Policy analysts, subject matter and sector experts, evaluation and research teams, finance and actuarial teams should all work together in completing CBAX. Including a wide range of expertise early on is recommended, as drawing different perspectives together can help to identify potential impacts which might be missed if CBAX were done in isolation. It can also help to identify alternative options previously unconsidered.

Draw on specialist teams within your agency. Research and analysis teams are likely to prove helpful in the evidence gathering stage, and those with statistical, costing and/or modelling experience are likely to be helpful in navigating the CBAX tool.

Consider where different areas of expertise sit across government. Are there identified impacts which the CBAX database doesn’t include a value for but which an agency might hold? Are other agencies working with the same intervention group? Are other agencies working towards the same outcome? Would the proposal benefit from a cross-agency approach? Making contact early with external agencies is advised.
Also consider whether there are parties outside of government which could help, for example, universities or research institutes which may have subject matter knowledge to support your evidence base.

Communicate with the relevant Treasury vote team, especially if you’re unsure about the process, or even if you just want to test assumptions. You can contact the CBAx team on CBAx@treasury.govt.nz to answer questions, provide advice on how to approach CBAx modelling for a given proposal, and review draft CBAx. We also offer training.

**Which parts of the CBAx analysis should be prioritised?**

<table>
<thead>
<tr>
<th>Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Prioritise efforts on those impacts with the greatest influence on the RoI.</td>
</tr>
<tr>
<td>• Gathering evidence is often the most time-consuming part of the process, but crucial.</td>
</tr>
</tbody>
</table>

We appreciate that the CBAx process can be resource intensive, and prioritisation decisions may need to be made in which parts of the CBAx to focus the most on. Generally, the gathering evidence is the most time-consuming part of the process, but the most crucial, as it underpins the assumptions, you’re inputting into the CBAx model. Honing how assumptions are applied within the CBAx model is generally easier to do later in the process than it is finding the supporting evidence.

While it is advised to initially identify as broad a range of impacts as possible, some impacts may have a negligible influence on the outputs produced by the model. Test how impact assumptions affect the RoI early on and prioritise efforts on those impacts with the greatest influence on the RoI.

Consider whether time spent is proportionate to the effect it has on the CBAx results and make the analysis fit-for-purpose to inform decision-making.

**Reverse analysis – what would it take to break even?**

<table>
<thead>
<tr>
<th>Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Reverse analysis enables you to see what you would have to assume to (for example) break even.</td>
</tr>
<tr>
<td>• This can be a good option for completing a simple CBAx in situations where the impacts are known, but hard to monetise.</td>
</tr>
</tbody>
</table>

While CBAx is a tool for calculating the impact NPVs and overall return of an intervention, the CBAx model can be used to vary assumptions to see what would have to be assumed for it to break even. This process is called reverse analysis. It is a simple way of testing some assumptions, in order to provide a helpful (although limited) analysis.

Reverse analysis is most useful if you have a view of the costs, and a sense of what the impacts are, but no idea about the monetised value of one or more impacts. You can add the cost information and a single impact, or more, and work iteratively, changing the impact assumptions until you have a return on investment of one.

This will give you an idea of the assumptions you would need to make for the intervention to break even. It is often easier to make professional judgements about how reasonable those specific assumptions are. Having specific transparent assumptions enables evaluation plans
to assess whether those assumptions are achieved. We can test an example with the following details. It is an intervention to boost learning outcomes for children in Northland.

**Initiative costs**

- Capital: $500,000 in the first year and $200,000 in the second year.
- Operating: $100,000 each year, and it will last 50 years.

**Action point 1 (Primary Inputs tab)**

Inputs: the yearly policy intervention cohort and the first financial year the intervention begins.

We will test our assumptions on a policy intervention cohort of 31,000 as the number of school children in the region. The time period is fifty years (the max for CBAx). The first financial year will be 2023, as we will assume no delay in implementing the programme.

**Action point 2 (Cost Inputs tab)**

Inputs: the annual costs to the government of the programme.

We input the information that we have on costs. There are capital costs of $500,000 in 2022 and $200,000 in 2023. The operating costs are $100,000 per year ongoing (that is, each year for 50 years). The costs start before the implementation.
Action point 3 (Impacts Database tab)

Inputs: we have to create a new impact. This follows the process for adding an impact value to the Impacts Database explained in this guide.

This is where we later vary the value of the impact to see how high it would have to be to break even.

Action point 4 (Impact Inputs tab)

Inputs: all the usual inputs required for an impact, firstly the row number

We will only enter one impact in this example to test the assumptions we have to make in order to break even.

Action point 5 (Impact Inputs tab)

Inputs: who is affected, evidence quality, time lag, time length, segment of policy intervention cohort, pre and post intervention levels.

We have begun with an assumption of length of impact of one year, a time lag of one year, and 100% for both the segment and the success rate.

The pre intervention level is zero and the post intervention level is one, giving a marginal impact of one. This is the binary version of pre/post intervention levels. We are effectively saying ‘pre the intervention, this impact was not achieved. Post the intervention, the impact was achieved’.

We can now make changes to see how the NPV varies, but to keep things simple, we will leave the pre and post intervention levels as they currently are, with the marginal impact of 1. This way we can focus on changing the value of the impact in the Impact Database tab, in order to keep our assumptions simple and clear.
We see that our return on investment (RoI) is 6.0. The RoI of 6 tells us that a total benefit of $30 per year per student is more than is needed for this initiative to break even.

We can now repeat the process and change the value of the impact to see what it would have to be for the RoI to reach 1 (which is the point where the initiative breaks even). We could also change other assumptions, for example the segmentation and the success rate. Making these both 80%, ie, reach 80% of the students and have the positive effect for 80% of them. Making these more realistic assumptions reduces the RoI to 3.8

Going back to the Impacts Database tab, we change the value of the impact per student to $10, reduces the RoI further to 1.3. Then reducing the value per student further to $8 gives an RoI of 1. This means that the initiative would break even, if it was successful in delivering $8 value to 80% of the 80% of the kids that it reaches. This is $8 per child for around 20,000 children in Northland.

The value of the impact of $8 per child results in the RoI being 1, and therefore breaking even. This is a highly simplified way of doing reverse analysis. A judgement can then be made on whether it seems reasonable, or too high or too low. Is it going to reach 80% of the children? Is it going to be effective for 80% for these children? You could also compare this to other educational values to make a judgement about how reasonable the assumed value would be.
5.2 Tips – Fundamental Elements

What if the intervention or initiative is not about people?

<table>
<thead>
<tr>
<th>Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Include an appropriate unit for the intervention cohort.</td>
</tr>
<tr>
<td>• The unit does not have to be people. It can be, for example, firms, areas, animals, schools, society or New Zealand as a whole, houses, rivers.</td>
</tr>
</tbody>
</table>

CBAx intuitively works for interventions with people, for example in the social sector. However, the CBAx model works with any unit that changes the impacts for New Zealanders. While CBAx is interested in the impacts for people (that is, New Zealanders), the impact analysis covers intervention changes to people or any other appropriate unit. The unit (or CBAx cohort) does not have to be people. It can be anything that makes sense for the intervention, such as firms, areas, animals, society/New Zealand, houses or rivers. The unit can be identified at the appropriate level, for example: individual, family, business, community, city or country.

How is the intervention unit determined?

<table>
<thead>
<tr>
<th>Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Try different units to see what works best.</td>
</tr>
<tr>
<td>• Our advice - keep the analysis as simple as possible and as flexible as possible.</td>
</tr>
</tbody>
</table>

User experiences indicate that defining the intervention cohorts takes lots of analysis, research and discussion. Try different units to see what works the best. The unit is entered into the ‘Primary Inputs’ tab as the policy intervention cohorts. All impacts are applied to this unit. Impact assumptions and calculations must relate back to the cohorts.

Keep the analysis as simple as possible and as flexible as possible. Choose a unit that makes it easy to understand what is going on in the model, and easy to vary the assumptions. As a starting point, think about:

• Who or what is this about? Who or what are you investing in or intervening with?

• What is the intervention/investment logic? See the start of the intervention logic.

• What are the (possible) impacts? What unit can you relate these impacts to?

• What changes the variable costs? This can also be a driver of changes to impacts.

• What are the primary and secondary / flow-on impacts?

Start with considering what the intervention is about and the intervention logic. Initially we focus on the main aim of the intervention, which in the lurgi example is to prevent lurgi for children. Then we will consider how easy it is to update the analysis for changes. For example, it may be that particular schools are the focus of the intervention.

It could work to use something other than people as the intervention unit, eg, schools. This means that each impact value is expressed in per school terms. The analysis can work with a cohort of six-year olds or schools. The intervention context and options will determine what makes the most sense. Consider an intervention unit that gives you flexibility to add other impacts. Check whether it makes sense to tell the story for each impact along the lines: the intervention affects x number of six-year olds or schools and has y and z impacts.
### What if there is no appropriate value in the database?

<table>
<thead>
<tr>
<th>Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>• It is easy to add values to the database for a specific intervention. Analysis then flows like any other value.</td>
</tr>
<tr>
<td>• One or more values may not be available in the CBAX database. This is to be expected.</td>
</tr>
<tr>
<td>• The evidence base for a new value may vary, and judgement is needed to decide whether to add a value and what value to use.</td>
</tr>
<tr>
<td>• New values should be based on solid evidence where possible</td>
</tr>
<tr>
<td>• Can add values to explore ‘what if’ or ‘what would it take to...’</td>
</tr>
<tr>
<td>• Over time, values can be incorporated into the standard CBAX database.</td>
</tr>
</tbody>
</table>

If there is an appropriate value in the Impacts Database, you can use that. However, the value you seek may not be in the database. You can easily add a value into the database for your analysis. CBAX works with or without using current database values (largely social sector). Over time, we expect that the CBAX database will evolve and become more comprehensive. You can include values from other sources and studies, eg, the Transport Monetised benefits and costs manual [Monetised benefits and costs manual | Waka Kotahi NZ Transport Agency (cwp.govt.nz)], Environmental Valuation Reference Inventory [http://evri.ca/en](http://evri.ca/en) and Washington State Institute for Public Policy [http://www.wsipp.wa.gov/BenefitCost](http://www.wsipp.wa.gov/BenefitCost).

This section covers how to enter a new impact value into CBAX, if you want to list an impact and cannot find anything appropriate in the ‘Impacts Database’ tab. You can bypass the Impacts Database and enter an impact directly. This is most useful when you have an impact which has varying values across the duration of that impact. This information is likely to have come from separate analysis outside of the modelling you have done in CBAX.

If you have a monetised impact that you want to include in a CBAX, but which is not present in the ‘Impact Database’ tab, all you have to do is add it to the list. The action point below demonstrates how.

This CBAX functionality can also be used when you have a very poor evidence base, and you want to test or do reverse analysis to see what a value would need to be to break even. That can provide insights for the policy development and give a sense of magnitude and how reasonable that value would be.

**Action point 1 (Impact Database tab)**

<table>
<thead>
<tr>
<th>Inputs: wellbeing domain, description, value, unit, government/non-government, sector, year of data (note: the options in the drop-down box may not reflect the impact you’re adding. The option you select does not impact the RoI calculation, therefore select the closest option).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety and security</td>
</tr>
</tbody>
</table>

In this example, we have entered information into each of the orange tabs for an impact relating to Safety. Once this is here, we treat it the same as any other impact. We take the row number ‘255’ and enter that into the Impact Inputs tab to continue our analysis.

Note the column reading ‘value adjusted to 2022’. The $100 we entered in the ‘value’ column is current for a particular year; in this case, 2016. The ‘value adjusted to 2022’ column automatically adjusts this to bring impact values on a common year basis. This is the value that will be used in CBAX calculations.
# How are pre and post intervention levels set out?

## Tips
- Specify pre and post intervention levels in one of three ways: binary, frequency, or proportional.
- It relates to the unit of the impact. Check that it makes sense.

There are three ways in which you can specify the pre and post intervention levels. The way you specify the level links back to the type of unit for the value impacts that you have chosen.

<table>
<thead>
<tr>
<th>Use when</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binary</td>
</tr>
<tr>
<td>Something happens or does not happen</td>
</tr>
<tr>
<td>Unit type: per year, incident, event</td>
</tr>
<tr>
<td>0 (pre-intervention) and 1 (post-intervention) OR 1 (pre-intervention) and 0 (post-intervention)</td>
</tr>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>Something happens less or more often</td>
</tr>
<tr>
<td>Unit type: per day, hour, event, visit, incident</td>
</tr>
<tr>
<td>For example, 6 (pre-intervention) and 5.7 (post-intervention) as in the worked example</td>
</tr>
<tr>
<td>Proportional</td>
</tr>
<tr>
<td>The pre- or post-intervention level is a reference point</td>
</tr>
<tr>
<td>Unit type: per year</td>
</tr>
<tr>
<td>For example, 0.8 (pre-intervention Job Seeker benefit is 80% of new income) and 1 (post-intervention new income level)</td>
</tr>
</tbody>
</table>

## What if the proposal relates to a cost pressure?

## Tips
- A clear counterfactual is a crucial piece of analysis for a cost pressure proposal and will tell us a lot about whether a CBAX is appropriate.
- If a CBAX is required, consider ways in which you might do this (such as a reverse analysis).
- In some instances, an exemption to the CBAX requirements might be warranted.

Cost pressure initiatives cover a very wide range of proposals that the government might fund. In our experience, CBAX works well for some cost pressure initiatives, but provides less insight for others. It depends on the initiative and the information at hand.

A well-considered and reasonable counterfactual is crucial for developing a CBAX for a cost pressure proposal. Many cost pressure proposals will have a complicated counterfactual, reflecting that the alternative includes a range of actions.

If a CBAX is required for the proposal, consider how you might complete this requirement in a way that is appropriate for the level of information that you have, and the insight that the analysis might give to a decision of whether to fund something or not. For example, for some cost pressure proposals, reverse analysis (that is, establishing what level of impact is needed in order for the proposal to break even) might be sufficient.

If, once you have considered these options, it still appears that a CBAX would be difficult to complete and not shed much light on the decision to fund or not fund, then you could consider seeking an exemption from the CBAX requirements. For more information on exemptions, please refer to the budget guidance and contact your vote team.
5.3 Tips – Information and Evidence

What if the information is poor or uncertain?

<table>
<thead>
<tr>
<th>Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Use professional judgement and available information to best estimate assumptions that are reasonable and err on conservative.</td>
</tr>
<tr>
<td>• Undertake sensitivity analysis for varying assumptions.</td>
</tr>
<tr>
<td>• Provide ranges of potential NPVs. These ranges are likely to be wider where there is greater uncertainty.</td>
</tr>
<tr>
<td>• Interpret your results in light of the evidence base.</td>
</tr>
</tbody>
</table>

Even if you have poor information on assumptions and impacts, you can still gain useful insights from CBAx. It is not uncommon that there is a weak evidence base for assumptions relating to one or more impacts in your analysis. If the impact is:

- **unlikely** to have a material impact on the results, then you can leave the impact out of the CBAx analysis, and cover it as an unmonetised impact in your advice

- **likely** to have a material effect on the overall results then you are best to include the impact in the analysis and do sensitivity analysis using your best professional judgement about reasonable assumptions.

You can present overall advice in light of your evidence base and do sensitivity analysis. For example, set out the societal return on investment for (a) high evidence base impacts and (b) all impacts, respectively. You can explain the key assumptions and judgements in the budget initiative templates and the Outputs Summary text box, which is an area to explain key modelling assumptions or anything important in understanding the results.

How do you make assumptions?

<table>
<thead>
<tr>
<th>Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>• As in the section above – assemble the best information you can to make judgements based on your experience.</td>
</tr>
<tr>
<td>• Make sure that you are explicit about your assumptions, and that they are clearly documented in your advice.</td>
</tr>
<tr>
<td>• Break big assumptions down into smaller components, and then focus on evidencing and quantifying these.</td>
</tr>
<tr>
<td>• Assess your assumptions against your evaluation plan, eg, are the key assumptions evaluated?</td>
</tr>
</tbody>
</table>

Sometimes the evidence for an intervention is weak. This might especially be true in instances where the intervention is a pilot programme, or an innovative solution that has not yet been fully tested.

In situations like these, CBAx modelling can still be useful. It might mean, however, that you need to make assumptions around the level of impact that the intervention might achieve.

Although it can be uncomfortable to make assumptions in situations with little evidence, it might still be appropriate for a number of reasons:

- Consider: what is the counterfactual? If no attempt is made to quantify the level of impacts, can we be sure that New Zealand is truly better off for having invested in the proposal?
• What about other options for addressing the funding? If there are other options with better
evidence that can demonstrate a reasonable return on investment, then these might be
more appropriate than the un-tested proposal. However, there might be other reasons for
choosing a more innovative approach.

• Making some assumptions at least provides a platform for future evaluations.

Here are some practical tips for making assumptions:

• Always start with the evidence. More research might shed more light on the issues. See
page 39 of the Guide to Social Cost Benefit Analysis for guidance on whether it is worth
investing in more research.

• Professional judgements can sometimes be quite useful. Consider: who are the subject
matter experts in a given field? Could these experts assist with making assumptions?

• When making assumptions, it is crucial that they are documented. Make sure that they are
set out in the Outputs Summary sheet and in the relevant template.

• Assumptions can be easier to support when there is a clear plan for evaluation. Although
they might be wrong, if they will be evaluated longer-term, then we will have learned
something. See the following question for more information on evaluation.

How does intervention evaluation fit in?

<table>
<thead>
<tr>
<th>Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBAx supports an improved evidence base for decision-making and provides a basis for an evaluation plan.</td>
</tr>
</tbody>
</table>

Intervention evaluation includes ex-ante evaluation to inform decisions and ex-post
evaluation feedback loops. CBAx supports improved evidence base for decision-making.
Ex-ante evaluation informs the CBAx assumptions, including intervention logic, intervention
effectiveness and “what works”. CBAx requires a rating of the quality of evidence for each
impact. The ratings do not change the calculations. The evidence base forms part of the
overall judgements and interpretation of the results.

Ex-post evaluation gives confidence that the assumed impacts are achieved and enables
feedback loops and adjustments in light of experienced impacts. Over time, the ability to
demonstrate delivered impacts will increase confidence in future analysis and advice, for
example as part of an investor confidence rating.

For resources see:

• Superu 2016 Standards of evidence for understanding what works: International
experiences and prospects for Aotearoa New Zealand. See also their Evidence Rating
Scale. Both are available at https://thehub.swa.govt.nz/.

• Justice sector evidence briefs – such as Evidence brief: Alcohol and drug treatment

• The Social Wellbeing Agency Hub for New Zealand government social science research
https://thehub.swa.govt.nz/ and guide on How to produce a social investment evidence
brief
• **Integrated Data Infrastructure (IDI)** a large research database containing microdata about New Zealand people and households. Researchers use the IDI to answer complex questions to improve outcomes for New Zealanders.

• The UK [what works centre’s modified Maryland scale](#) provides a good summary of different impact methodologies and the degree of evidence they provide.

• [Google scholar search](#). Google Scholar provides a simple way to broadly search for scholarly literature. You can search across disciplines and sources.

The CBAx impacts and assumptions can inform an *evaluation plan*, for example, whether the assumed success rates are achieved. Focus ex-post evaluation on significant and uncertain impacts, or on areas where new knowledge can generalise to inform other programmes, for example by evaluating a theory of change.

A strong ex-post evaluation plan provides greater confidence that we will later know how well the intervention is working. An initiative may include funding for evaluation. Early considerations around built in data collection, staggered roll-out, the possibility of randomisation of treatment, and the structure of review and report back, increases the likeliness of robust evidence.

At a minimum, data collection should include legal name, date of birth, and residential address for both intervention participants and those in the comparison groups who were unsuccessful in gaining entry to the intervention (if applicable). Previously this has allowed about 95% of people to be linked to the IDI. Via the IDI, researchers can access a wide range of existing data. This supports service mapping (working out which services are provided to what types of clients at what times) and measurement of a range of existing outcomes already collected by government. If relevant outcomes are currently not in the IDI, (and cannot be put into the IDI) then collection of these data should also be considered.

**How can agencies access the Australian Social Value Bank values?**

<table>
<thead>
<tr>
<th>Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Consider using Australian Social Value Bank (ASVB) wellbeing values. See Appendix 4.</td>
</tr>
<tr>
<td>• The ASVB values are developed by international experts using robust econometric analysis and adjusted for New Zealand purposes.</td>
</tr>
<tr>
<td>• Contact the Treasury regarding purchasing an ASVB sub-licence.</td>
</tr>
<tr>
<td>• ASVB values can be used in CBAx modelling in accordance with the licence agreement.</td>
</tr>
</tbody>
</table>

Values using wellbeing data to estimate the value of impacts are starting to be developed. Developing wellbeing values is a new field internationally. The ASVB values have been developed by international experts using Australian wellbeing survey data. The values involved robust econometric modelling and testing of the values. The values are comparable with similar UK values, and Treasury is confident that these are applicable for New Zealand purposes. The monetary value for the New Zealand licence has been based on New Zealand income levels.
In 2017, Treasury purchased a licence to use about 60 social wellbeing values compiled by the Australian Social Value Bank. The agreement gives Treasury the use of about 60 non-fiscal wellbeing impact values, with the ability to sub-licence to the New Zealand government sector. The values include monetised impacts for wellbeing outcomes like ‘housing is no longer overcrowded’ and ‘increased hope for the future’ (see Appendix 4). The values are particularly relevant for housing and social sector initiatives.

Over time, agencies in New Zealand can develop values using a consistent methodology with New Zealand survey data sets. This would be particularly relevant for New Zealand specific wellbeing estimates for example for Māori.

We have limited experience in using subjective wellbeing values, including the ASVB values. Users should therefore proceed with caution and take care to ensure that the impacts are not overstated. Be cautious about the assumptions you make in relation to these measures. One way is to include only one subjective wellbeing impact. Fiscal impacts for the government can be included in addition to subjective wellbeing impacts.

If you or your agency is interested in using these values for your CBAx modelling, please get in touch with the CBAx team at Treasury about setting up a sub-licence. The ASVB calculator is not part of the New Zealand sub-licence, as values are used in the CBAx tool.

The ASVB user guidance and methodology is available from the ASVB at https://asvb-media.s3.amazonaws.com/uploads/2017/08/20170803-ASVB_UserGuide-compressed.pdf. The ASVB guidance includes further information on the outcome measures, the underlying survey questions and methodology. The technique is illustrated below. An introduction to the methodology is available in Daniel Fujiwara’s Treasury guest lecture on social impact values. See http://www.treasury.govt.nz/publications/media-speeches/guestlectures/fujiwara-aug16

5 Housing New Zealand (2018) *Wellbeing Valuation of Social Housing Provision by Housing New Zealand.*
5.4 Tips – Multiple Entries of Impacts

Can there be multiple entries of the same impact?

<table>
<thead>
<tr>
<th>Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>• You can include the same impact multiple times to address variations in impact, for example, across time and segments of the policy intervention cohorts.</td>
</tr>
<tr>
<td>• Be careful not to double count impacts.</td>
</tr>
</tbody>
</table>

A common solution to a number of challenges is to include the same impact several times with varying assumptions and impact profiles. It is possible to do this using the CBAx model.

**Warning**: Check that there is no double counting, if using the same impact several times.

CBAx calculates the NPVs for each impact entry separately. Impacts would be double counted if for example the same segment and period was covered in both impact entries. Ensure that there is no overlap and that for example the combined segments total less than 100%. Users can manually add up NPVs relating to the same impact to summarise results.

This flexibility also enables users to calculate NPVs for several scenarios of an impact in one CBAx model. In that case, the user can use the NPVs for each individual impact entry, but not the overall results, for example return on investment, as these would include double counted impacts. This flexibility can be useful for quick “what if” sensitivity analysis and development of ranges.

What if the number of people affected differs over time?

<table>
<thead>
<tr>
<th>Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Use multiple impact entries for each time period and vary the assumptions.</td>
</tr>
</tbody>
</table>

The cohort might change over time or segments. Using the lurgi example, the starting point was that 7-9-year olds were affected by lurgi for hospitalisation, and model this by a one year lag (assuming they will all occur at seven-year olds). In the example, hospitalisation impacts were modelled through two impacts that reflected higher success rate for the most vulnerable children (10% of the children) and 30% of the children with lower success rate.

Instead, if the 30% comprised of 10% of hospitalisations affect nine-year olds only and 20% affect seven-year olds only then we would enter a new impact line reflecting this, representing the nine-year olds as a different segment. To input this requires:

• Adding another line listing the same impact, for example hospital visits, again with the following details

  - **Time lag becomes three years** (until the six-year olds receiving the vaccine turn nine and first impact entry ends)

  - **Segment affected reduces to 20%**. 20% of children would not be affected by hospitalisation until they are nine years old, so 20% captures this segment

  - **Length of impact is one year** (until the children turn ten and would no longer be affected by lurgi).
Action Point 1 – Impacts Inputs tab

Inputs: impact number, time lag, segment and length of impact.

Add in impact 143 again, but this time lag becomes three years, segment becomes 20% and length of impact becomes one year.

In this way, we have varied the impact analysis to demonstrate the way in which the number of people affected by one impact (inpatient hospital visits) will vary over time.

What if the impact incidence varies over time?

Tips

- Use multiple impact entries for each time period and vary the assumptions.

An impact might be stronger or more likely to occur in one year over another for the same cohort. For example, the reduction in inpatient hospital visits might be of a greater order of magnitude, or more likely for seven, eight, or nine-year olds. To account for this, you can make a separate impact entry.

Considering different success rates, we have said the success rate of the vaccine is 80%, although it might actually be 80% for seven year olds, and rise to 95% for eight and nine year olds (since, if they’ve been unaffected till age eight then the chance of getting affected by lurgi reduces).

To input this requires:

- Changing the first impact
  - Duration to only one year (because the new impact will take over once they are eight)
  - Success rate of 80%.

- Adding another line listing the impact again with the following details
  - Time lag becomes two years (now two years since receiving the vaccine at age six)
  - Success rate is 95%
  - Length of impact is one year
Action point 1 (Impact Inputs tab)

Inputs: impact number, time lag, segment and length of impact.

Add in impact 143 again, but this time make the time lag two years, the length of impact one year, and the success rate 95%.

Vary the first iteration of impact 143 by changing the success rate to 80%.

In this way, we have modelled the impact according to the different way in which it affects the cohort at different points in time.

What if the segments are affected differently?

Tips

• Use multiple impact entries for each time period and vary the assumptions.

One impact might affect different segments of the cohort to different extents. In our lurgi example there are two segments:

• 80% who receive the vaccine. We have said that 80% of six-year olds each year are likely to receive the vaccine and then considered the resulting reduction in health visits for this cohort when they are 7, 8 and 9 years old.

• 20% who do not receive the vaccine. It may be that those who do not receive the vaccine will be less likely to visit the GP or hospital since there will be less of the virus across society generally. To capture this impact, we will add another GP and hospital visit impact.

The segment will be 20%. This is the remaining number of six-year olds. We then add the success rate and post-intervention level for this cohort. We can assume that this segment will be sicker and use more services than for children receiving the vaccine. Note that the lag and duration will be the same for this impact entry and the original impact entry, since they cover two different segments concurrently, the six-year olds of the same year who either do or do not get the vaccine.
5.5 Tips – Adjusted Impacts

How can a non-flat impact profile be included?

Tips

- You can input an impact profile for pre and post intervention that varies across time. This may be a result of separate modelling.

The default approach is for the value of an impact to be the same each year that the impact lasts. The Impacts Database makes it simple to use this approach. Through segmentation and use of different lags, you can use different values for different periods. This is the simplest way to incorporate variation across time.

However, you can bypass the Impacts Database, if the profile of values for an impact varies across time and you have this information available from other analysis. For this example, we will input a time profile which has a pre-intervention level of zero and a post-intervention level value of $1000 for the first year, and the value increases $200 each year for five years.

**Warning:** Using this functionality involves changing formulae in Excel and may break CBAx model functionality outlined in the user guide. Do not re-use a CBAx workbook which has a manually entered time profile.

**Action point 1 (Impact Inputs tab)**

First, we input the details of the impact which CBAx would normally auto-populate after entering the row number from the Impacts Database. These are: name, wellbeing domain, sector, unit and type.

In this example, we have the name as ‘Fictional example’, it is in the wellbeing domain area of ‘Health’, the ‘Health’ sector, the unit is ‘Per thing’, and it is a ‘Government’ impact.

**Action point 2 (Impact Inputs tab)**

Normally, you would enter the information for an impact into the various orange cells below. In this case, you only have to update the evidence quality. You do not touch any of these other cells. You add the values for the impact directly, as shown in Action point 3.
Action point 3 (Impact Inputs tab)

For the next set of inputs, we add the pre and post intervention values for the impact across future years.

In our example, this is a pre intervention level of zero, and a post intervention value of 1,000 for the first year in 2018, increasing by 200 each year for five years. We input this information directly. As you overwrite the formulae in the CBAx model, it is good practice to shade the affected cells a different colour and insert a comment to warn other users of the CBAx model that this has been done. The duration of the impact is six years, so in 2024 we do not input anything.

CBAx calculates the marginal impact automatically and fills this in below.

Action point 4 (Outputs Summary tab)

The Outputs Summary records the impact like any other. Remember, what you input for the values will apply to each year of the policy intervention cohort entered into the ‘Primary Inputs’ tab.

What are the appropriate labour market impacts?

Tips

- Labour market impacts such as income, tax/ACC and income benefits such as Jobseeker Support need to be adjusted for displacement effects and opportunity cost (see below).
- Consider how large the displacement effect and opportunity cost of labour impact is, and therefore how large the value adjustment should be.
- The impacts database has 25% adjusted values for a conservative scenario.

Where an intervention has some impact on the labour market, people moving in and out of jobs, consider the following points. The effects will be different for different interventions, so reflect in your analysis that these effects have been considered and taken appropriately into account.
Displacement effect and opportunity cost

CBAx impacts include 100% and adjusted 25% of the increase in income or tax for a conservative scenario. The 25% incorporates two adjustments accounting for displacement effect and the opportunity cost of labour. Each adjustment is 50% (50% multiplied by 50% gives 25%).

Displacement effect

The displacement effect accounts for the fact that if an intervention moves an individual from unemployment into employment, the individual may take a job someone else would have otherwise filled.

In other words, in the absence of the intervention, someone else would have taken the vacant job and the unemployment rate would be no higher or lower. Because in CBA we only want to measure the marginal impact, for example tax revenue, the benefit generated from a worker who merely displaces another worker should not be included.

There are examples of where the displacement effect is zero. For example, if an initiative trains up individuals to fill a specialist position that would not otherwise be filled the displacement effect will be zero. Another example is if an intervention creates jobs that would not have otherwise been created and fills the positions with unemployed workers the displacement effect will be zero.

Opportunity cost

Opportunity cost accounts for the fact that a person going into a job does not necessarily see their welfare increase by their increase in income. While unemployed, a person can utilise their time and gain satisfaction from this.

Consider whether or not relevant impact values should be revised downward to account for opportunity cost.


Tax and labour income

You need to list two, or sometimes more such as Job Seeker Benefit, impacts to include the benefit of people moving into a job:

1. Wage income impact. This is the after-tax income capturing the benefit to the individual, the non-government impact.

2. Tax impact. This is the tax component the wage income, capturing government impact.

We split out government and non-government impacts because this can be useful in the analysis.
Pre and post intervention levels of income and tax

Ensure that pre-intervention levels are appropriate. For example, before moving to a minimum wage job, someone may be receiving the Jobseeker Support benefit. You must therefore list this as the pre-intervention level in the 'wage income impact'. The same applies if someone is moving from a low paid job to a higher paid one, you list these after-tax incomes in the pre and post intervention cells.

The other side to this is the impact for the government. If people are moving from Jobseeker Support the government saves this amount, and so an impact should be listed to factor this in. The government still receives tax income from the Jobseeker Support benefit which needs to be accounted for. If people are moving into a higher paid job (rather than from the Jobseeker Support to the minimum wage) the pre-intervention level in the 'tax impact' should reflect what the government received beforehand.

How to use Quality Adjusted Life Years impacts (QALYs)

Tips

- These impacts can drive a significant proportion of the NPV; therefore, it is important to have good evidence and best estimate assumptions in support of the analysis.

The Quality Adjusted Life Year Saved (QALY) is a measure of health benefits. It combines an intervention’s impact on quality of life with its impact on life expectancy. One QALY is set to be the value of a year of life in perfect health. A person in perfect health with a life expectancy of 25 years has 25 QALYs, as does a person with low health status (valued at half of perfect health) with a life expectancy of 50 years.

For the purposes of CBAX, we seek to identify the additional QALYs associated with an intervention. For example, a person with a life expectancy of 25 years, who receives a treatment expected to improve the value of their health status by 10%, gains a total of 0.1 * 25 = 2.5 QALYs (before discounting) over their lifetime. PHARMAC guidance provides useful information about using QALYs, including suggestions for where to obtain evidence about the QALYs associated with different health states and/or interventions.

The CBAX model includes two values for a QALY, one based on Pharmac data and a higher estimate based on the statistical value of life. Agencies can undertake sensitivity analysis.

- Quality-adjusted life year (QALY) gained (central) based on Pharmac. CBAX has assumed the highest $ per QALY over the years, which is more aligned internationally. Pharmac funded proposals with an NPV of 31 QALYs per $ million spent in 2019/20, which gives $32,258 per QALY. Other years had more QALYs per $million and therefore would result in lower QALY values. In 2021/22: 57 QALYs; in 2020/21: 177; in 2019/18 118 QALYs; in 2017/18 238 QALYs; in 2016/17 37 QALYs; and in 2015/16 52 QALYs.

- Quality-adjusted life year (QALY) gained (high) based on Value of Statistical Life (VoSL). VOSL = $4,423,800 and the average length of life is 81.6 years. $4,423,800 / 81.8 years = $54,080 per QALY.

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Appendix 1: He Ara Waiora

He Ara Waiora gives an indigenous and uniquely Aotearoa New Zealand response to these questions by taking a tikanga-based approach to wellbeing.

**What is He Ara Waiora?**

The term ‘waiora’ speaks to a broad conception of human wellbeing, grounded in wai (water) as the source of ora (life). He Ara Waiora presents a holistic, intergenerational approach to wellbeing. While its principles are derived from mātauranga Māori, many of its elements are relevant to lifting the intergenerational wellbeing of all New Zealanders.

He Ara Waiora articulates both the ends, or what are important elements in Māori perceptions of wellbeing, and the means, or the tikanga values or principles that help us achieve the ends.

**How to read the following diagram**

He Ara Waiora talks about ENDS (what outcome domains are important) and MEANS (what approaches and processes we need to follow to achieve the ends).

* Under discussion for inclusion in the framework
The ENDS – what is important for waiora

- **Wairua** (spirit) is at the centre to reflect that it is the foundation or source of wellbeing. Values, beliefs and practices related to wairua are essential to Māori conceptions of waiora.

- **Te Taiao** (the natural world – the environment), is paramount and inextricably linked with human wellbeing. Humans have responsibilities and obligations to sustain and maintain the wellbeing of Te Taiao.

- **Te Ira Tangata** (the human domain) encapsulates human activities and relationships, including the relationships between generations. The concept of mana (power, authority) is seen as key to wellbeing. People (tangata) and collectives (kainga) thrive when they:
  - Have a strong sense of identity and belonging (mana tuku iho)
  - Participate and connect within their communities, including fulfilling their rights and obligations (mana tautuutu)
  - Have the capability to decide on their aspirations and realise them in the context of their own unique circumstances (mana āheinga)
  - Have the power to grow sustainable, intergenerational prosperity (mana whanake).

The MEANS – principles for how to approach the creation of waiora (wellbeing)

- **Kotahitanga** – working in an aligned, coordinated way across the system and in partnership with business, communities, iwi and whānau.

- **Tikanga** – making decisions in accordance with the right values and processes, including in partnership with the Treaty partner.

- **Whanaungatanga** – fostering strong relationships and networks through kinship and/or shared experience that provide a shared sense of wellbeing

- **Manaakitanga** – enhancing the mana of others through a process of showing proper care and respect. It means supporting each other and demonstrating an ethic of care for our fellow New Zealanders. Distributional analysis is important to identify and address inequities.

- **Tiakitanga** – guardianship, stewardship (eg, of the environment, particular taonga or other important processes and systems).

* Under discussion for inclusion in the framework

Further reading

See [He Ara Waiora (treasury.govt.nz)](https://treasury.govt.nz) for more resources, including [He Kāhui Waiora](https://treasury.govt.nz), a review undertaken in 2020 of Covid-19 impacts, using both the LSF and He Ara Waiora.
Appendix 2: Living Standards Framework

Our Individual and Collective Wellbeing

Human wellbeing can be understood as being about the lives of individuals, collectives, or both. People in our country have different values, with some being more individualistic and others more collectivist in outlook. We are taking a pluralist approach to wellbeing that encompasses these various approaches.

A definition of each wellbeing domain is outlined below.

<table>
<thead>
<tr>
<th>Wellbeing Domain</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>Being in good mental and physical health and exhibiting health-related behaviours and lifestyles that reduce morbidity and mortality, such as eating well and keeping active.</td>
</tr>
<tr>
<td>Knowledge and skills</td>
<td>Having knowledge and skills appropriate to one’s life stage and continuing to learn through formal and informal channels.</td>
</tr>
<tr>
<td>Cultural capability and belonging</td>
<td>Having the language, knowledge, connection and sense of belonging necessary to participate fully in one’s culture or cultures, and helping others grow their cultural capability and feel a sense of belonging.</td>
</tr>
<tr>
<td>Work, care and volunteering</td>
<td>Directly or indirectly producing goods and services for the benefit of others, with or without compensation.</td>
</tr>
<tr>
<td>Engagement and voice</td>
<td>Participating in democratic debate and governance at a national, regional or local level, such as through membership of a charitable society, political party or school board.</td>
</tr>
</tbody>
</table>
### Wellbeing Domain

<table>
<thead>
<tr>
<th>Wellbeing Domain</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income, consumption and wealth</td>
<td>Using income or in-kind transfers to meet today’s needs and save for future needs, as well as being protected from future shocks by adequate wealth, private insurance and public insurance (the social safety net).</td>
</tr>
<tr>
<td>Housing</td>
<td>Having a place to call home that is healthy, suitable, affordable and stable.</td>
</tr>
<tr>
<td>Environmental amenity</td>
<td>Having access to and benefiting from a quality natural and built environment, including clean air and water, green space, forests and parks, wild fish and game stocks, recreational facilities and transport networks.</td>
</tr>
<tr>
<td>Leisure and play</td>
<td>Using free time to rest, recharge and engage in personal or shared pursuits.</td>
</tr>
<tr>
<td>Family and friends</td>
<td>Loving and supporting close friends, family and community members, and being loved and supported in turn.</td>
</tr>
<tr>
<td>Safety</td>
<td>Being safe from harm and the fear of harm and keeping oneself and others safe from harm.</td>
</tr>
<tr>
<td>Subjective wellbeing</td>
<td>Being satisfied with one’s life overall, having a sense of meaning and purpose, feeling positive emotions, such as happiness and contentment, and not feeling negative emotions.</td>
</tr>
</tbody>
</table>

### Our Institutions and Governance

The term ‘institutions’ refers to formal rules, informal norms, and the formal and informal organisations those rules and norms are embedded within. Government institutions are just one type of institution. ‘Governance’ is the function these institutions perform. Institutions shape the exercise of agency of individuals and collectives. Governance is likewise distributed across society. New Zealand’s organisations, laws and social norms govern how we may use our collective wealth and influence what levels of wellbeing we achieve. They also influence the extent to which we draw down our wealth, protect it or reinvest it for the future.

<table>
<thead>
<tr>
<th>Institutional sphere</th>
<th>Definition of organisations in this sphere</th>
<th>Characteristic rules and norms in this sphere</th>
</tr>
</thead>
<tbody>
<tr>
<td>Families and households</td>
<td>People who either live together or identify as family. These are generally groups who care for, nurture and support one another, and manage shared resources at a personal or household level.</td>
<td>Informal family rules and norms, often unspoken.</td>
</tr>
<tr>
<td>Whānau, hapū and iwi</td>
<td>Tangata whenua groups connected by whakapapa. Iwi and hapū usually refer to extended kinship groups with a distinct territory. Whānau often means an extended family and in modern usage can include non-kin friends and associates.</td>
<td>Kawa and tikanga in their many manifestations.</td>
</tr>
<tr>
<td>Firms and markets</td>
<td>For-profit entities and the various markets they are involved in, such as product markets, capital markets, the housing market and the labour market.</td>
<td>Internal company policies, contracts and cultural norms for business, as shaped and regulated by civil law, competition law, employment law etc.</td>
</tr>
</tbody>
</table>
Institutional sphere | Definition of organisations in this sphere | Characteristic rules and norms in this sphere
--- | --- | ---
Central and local government | The legislature, executive and judiciary, as well as entities constituted under the Public Service Act 2020, Crown Entities Act 2014, State Owned Enterprises Act 1986, Local Government Act 2002 etc. | Primary and secondary legislation, local bylaws, and more detailed rules and enforcement by administrative bodies.
Civil society | Non-profit entities such as charitable trusts, professional associations and unions, political parties, clubs and religious bodies. | Trust charters, professional codes of conduct, club rules etc.
International connections | Foreign governments, firms and other organisations with whom we trade and cooperate to achieve shared goals or compete when our interests are not aligned. | International treaties and arrangements.

The Wealth of Aotearoa New Zealand

This level captures how wealthy we are in aggregate as a country, including sources of wealth not fully captured in the system of national accounts, such as human capability and the natural environment. Our wealth is divided into four categories along with culture, which underpins all the others.

This level of the framework is designed to support the monitoring and analysis of our overall wealth as a country, particularly whether that wealth is being sustained for future generations. The focus is on the aggregate level and trend of each aspect of wealth, but their distribution is also important in the microeconomic contexts of the two other levels of the framework.

<table>
<thead>
<tr>
<th>Aspect of wealth</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural environment</td>
<td>All aspects of the natural environment which support life and human activity, whether valued for spiritual, cultural or economic reasons.</td>
</tr>
<tr>
<td>Human capability</td>
<td>People’s knowledge, physical and mental health, including cultural capability.</td>
</tr>
<tr>
<td>Social cohesion</td>
<td>The willingness of diverse individuals and groups to trust and cooperate with each other in the interests of all, supported by shared intercultural norms and values.</td>
</tr>
<tr>
<td>Financial and physical capital</td>
<td>Tangible, human-made assets, such as buildings, machinery and infrastructure, including physical taonga, such as marae. Intangible, knowledge-based assets, such as research and development, software and databases, and arts and literature. Financial assets minus liabilities, including currency, bank deposits, loans and equity.</td>
</tr>
<tr>
<td>Culture</td>
<td>Our accumulated heritage from our ancestors, including knowledge systems, values and beliefs, and their manifestations in objects, practices and concepts. Culture is present in all the other aspects of our wealth.</td>
</tr>
</tbody>
</table>
Appendix 3: Wellbeing Impacts Template

Cost benefit analysis (CBA) summary metrics, such as the net present value (NPV), benefit/cost ratio (BCR) and return on investment (RoI), provide high level information on monetised impacts. This can be illustrated by charts, such as the present values across wellbeing domains and over time. The CBAx Outputs Summary tab includes all of this summary CBA information.

The summary information needs to be supplemented by information on the main impacts, covering both monetised and non-monetised impacts. The purpose of the Wellbeing Impacts table (next page and separate word template) is to summarise key information for each for the wellbeing impacts, whether these are monetised or not. Provide the following information for each wellbeing impacts, being specific and quantify where possible. List the most significant impacts first.

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
</table>
| Impact description                   | • Identify the impacts, including any negative impacts.  
  • The effects and consequences that the results have on people’s lives.  
  • There can be different people affected positively or negatively.  
  • There can be more than one impact for each wellbeing domain.  
  • For example, if the initiative increases the number of social houses (outputs) which reduces overcrowding (outcome), then specific health domain impacts could include: (a) improved health and (b) reduced health care costs. |
| Affected                             | • Who is affected? Identify and quantify who will be affected by this impact. This could be eg, individuals, families, businesses or the government.  
  • Are different groups impacted differently, and why? Eg, different age-groups and location/regions. Cover distributional aspects and the impact for different groups.  
  • Quantify how many will be impacted and put the number in context (eg, proportion of people affected in relation to the population size). |
| Timeframes                           | • The estimated timeframes in which the impact will be realised.  
  • Short term (<5 years), Medium term (5 - 10 years), Long term (10+ years) |
| Wellbeing domain                     | • List the Living Standards Framework domain this impact relates to.  
  • You can also use other relevant wellbeing domains, eg, from He Ara Waiora |
| Magnitude / Present Value            | • Present value (PV) for that particular impact. Use CBAx 50-year PV.  
  • You can aggregate CBAX impacts, eg, if you have segmented modelling.  
  • For non-monetised impacts, provide qualitative assessment: high, moderate, low. |
| Quantification, assumptions and evidence | • Set out supporting quantification and the explicit assumptions, including ranges where appropriate. Set out the expected marginal changes from the counterfactual.  
  • For example, if there is an increase in social housing what is the expected (percentage) decrease in overcrowding across population groups and the flow on health gains and reduced health costs from this?  
  • What evidence underpins the information provided on impacts, timeframes and the magnitude of the impact? For example, what is the evidence around reduction in overcrowding and avoided health costs?  
  • Make qualitative assessment, if quantification is not possible (high, moderate, low). |
| Evidence quality                     | • High / Medium / Low |
## Wellbeing impacts - Summary of monetised and non-monetised impacts

<table>
<thead>
<tr>
<th>Reference</th>
<th>Impact description</th>
<th>Affected</th>
<th>Timeframe</th>
<th>Wellbeing domain</th>
<th>Magnitude / Present value</th>
<th>Quantification, assumptions, and evidence</th>
<th>Evidence quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 4: Australian Social Value Bank

OUTCOMES

Health
- Improved overall health
- No longer obese
- Increased levels of walking
- Feels in control of life
- Accessed free meal programs
- Relief from depression/anxiety
- Increased hope for the future
- Reduced parental stress
- Improved diet
- Relief from Type 2 Diabetes
- Free from Sleeping problems
- Improved self-esteem/confidence
- Accessed Family Violence services
- Accessed Gambling Support services
- Participates in frequent moderate exercise
- Accessed support for people who were sexually assaulted as an adult
- Increased sense of trust in other people
- Relief from Post Traumatic Stress Disorder (PTSD)

Education
- Qualification Obtained - Certificate levels III and IV
- Completed Year 12
- Improved numeracy
- Adequate computer skills
- Improved English language skills for non-native speakers
- Commenced education - Certificate level I or II
- Commenced education - Certificate level III or IV

Home
- Housing Quality - Reduced impact of noise
- Able to make ends meet
- Housing is no longer overcrowded
- Homelessness to temporary accommodation
- Homelessness to secure accommodation
- Homelessness to Social Housing
- Temporary accommodation to Social Housing
- Temporary accommodation to secure accommodation
- Improved condition of Social Housing property

Social and Community
- Increased involvement in decision making
- Improved condition of neighbourhood homes and gardens
- Reduced litter problem
- Meets friends regularly
- Joined a social group
- Volunteers
- Talks to neighbours regularly
- Adequate contact with a non-resident child
- Good neighbourhood (a) Neighbours do things together
  (b) Neighbours help each other

Drugs and Alcohol
- Freedom from alcohol problems
- Ceased using Cannabis
- Ceased injecting illegal street drugs
- Treated for drug and alcohol problems in last year
- Ceased smoking (a) Social Smoker
  (b) Full time Smoker

Crime
- Reduced problems with anti-social behaviour
- Reduced problems with teenagers hanging around
- Reduced problems with vandalism/graffiti
- Increased sense of personal safety
- Prevented neo-nailing

Employment
- People with injuries, illness or disability moving into employment
- Obtained casual employment - equivalent full-time hours
- Obtained casual employment - equivalent part-time hours
- Obtained full-time employment
- Obtained part-time employment
- Became self-employed
- Improved job readiness

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Appendix 5: Assessing climate change and environmental impacts

This appendix supports the use of values for climate change and other environmental impacts included in CBAx.

Climate change impacts (by the Treasury)

This section sets out the recommended values for emissions valuation and explains how that can be used in CBAx. Agencies should note that this guidance is for monetisation of emissions impacts only. Quantification of emissions impacts is outside the scope; agencies should contact the CIPA team at the Ministry for the Environment for guidance on this.

Why consider greenhouse gas emissions?

The New Zealand government has committed to greenhouse gas emission reduction targets out to 2050 (Zero Carbon Act 2019) and for the period 2021 – 2030 (National Determined Contribution under the Paris Agreement)⁷. The commitment to reach these targets has implications for evaluating new central government policies or investment decisions in cost-benefit analyses (CBA).

New policies or investments that significantly increase greenhouse gas emissions (‘emissions’) imply an economic or fiscal cost in that an equivalent volume of emissions will have to be reduced elsewhere in order to achieve our targets. Likewise, decisions that result in significantly reduced emissions imply a benefit in the form of the avoided cost of reducing an equivalent volume of emissions elsewhere. These costs and benefits of emissions (or avoided emissions) should be included when central government agencies are monetising costs and benefits, including in CBAx. Agencies should note:

- The emissions values provided here (‘shadow emissions values’) are broadly based on estimates of the anticipated future costs of emissions reductions (abatement) required to reach New Zealand’s domestic emissions targets, as reflected in the Climate Change Commission’s final advice. These values will be updated annually as knowledge improves on New Zealand’s anticipated future costs of abatement.

- There is no specified threshold for applying shadow emission values within CBAx. However, applying shadow emissions values will add extra value to the assessment of initiatives with significant emissions volumes or where abatement is a specific objective.

- The shadow emission values provided are recommended for use in central government CBAx, to improve consistency and comparability of analysis. These numbers make no claims to represent the specific abatement costs that may be faced by non-central government entities in meeting their own emissions reduction targets. Non-central government entities wishing to use shadow emissions values may therefore find other values to be more appropriate to their context.

---

• Agencies may apply their own values alongside those recommended here, so long as the Agency very clearly indicates what these values are and is transparent about their rationale for choosing them.

• Shadow emissions values are different from forecast prices in the Emissions Trading Scheme (ETS). Agencies may draw on estimates of future ETS prices separately in CBAx, for example when developing baseline emission forecasts. ETS price paths for analytical purposes are available on request from cipa@mfe.govt.nz.

**Recommended values for emissions valuation**

Agencies should use the recommended target-consistent shadow emissions value range in the table below to monetise the impact of emissions or avoided emissions. Agencies are recommended to apply the values over the economic lifetime of the policy or investment in question. There is no restriction on particular sectors using the values, however the values represent emissions impacts faced by central government only.

Treasury has selected its ‘central’ recommended values based on the emissions values used by the Climate Change Commission to support its analysis of domestic mitigation paths towards our targets. A ‘low’ and ‘high’ path have also been provided to capture the uncertainty around future abatement costs (eg, through new or different technologies or inherent future technology cost uncertainty).

Importantly, as we look out further, the uncertainty around abatement costs increases. For those policies and investments with emissions impacts expected to occur beyond 2050, we recommend applying a 3% per annum increase from our recommended value for 2050. For the ‘high’ case, we recommend a 5% increase and for the ‘low’ case we recommend a 1% increase. These recommendations reflect the increase in uncertainty over time.

### Table 1: Recommended Shadow Emission Values, NZD$ (2022) per tonne of CO₂-equivalent

<table>
<thead>
<tr>
<th>Year (cont.)</th>
<th>2051</th>
<th>2052</th>
<th>2053</th>
<th>2054</th>
<th>2055</th>
<th>2056</th>
<th>2057</th>
<th>2058</th>
<th>2059</th>
<th>2060</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>188</td>
<td>189</td>
<td>191</td>
<td>193</td>
<td>195</td>
<td>197</td>
<td>199</td>
<td>201</td>
<td>203</td>
<td>205</td>
</tr>
<tr>
<td>Central</td>
<td>286</td>
<td>294</td>
<td>303</td>
<td>312</td>
<td>321</td>
<td>331</td>
<td>341</td>
<td>351</td>
<td>362</td>
<td>373</td>
</tr>
<tr>
<td>High</td>
<td>387</td>
<td>407</td>
<td>427</td>
<td>448</td>
<td>471</td>
<td>494</td>
<td>519</td>
<td>545</td>
<td>572</td>
<td>601</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year (cont.)</th>
<th>2061</th>
<th>2062</th>
<th>2063</th>
<th>2064</th>
<th>2065</th>
<th>2066</th>
<th>2067</th>
<th>2068</th>
<th>2069</th>
<th>2070</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>207</td>
<td>209</td>
<td>211</td>
<td>214</td>
<td>216</td>
<td>218</td>
<td>220</td>
<td>222</td>
<td>224</td>
<td>227</td>
</tr>
<tr>
<td>Central</td>
<td>384</td>
<td>395</td>
<td>407</td>
<td>419</td>
<td>432</td>
<td>445</td>
<td>458</td>
<td>472</td>
<td>486</td>
<td>501</td>
</tr>
<tr>
<td>High</td>
<td>631</td>
<td>662</td>
<td>695</td>
<td>730</td>
<td>767</td>
<td>805</td>
<td>845</td>
<td>887</td>
<td>932</td>
<td>978</td>
</tr>
</tbody>
</table>
How do I apply the shadow emissions values in the CBAx tool?

Agencies can choose to incorporate these values in the CBAx tool in two ways:

- **1 – Segmenting into three time periods** and using the relevant values in the CBAx database (easier as it uses standard CBAx functionality).

- **2 – Full yearly time series** by overriding the CBAx calculations with separate calculations (NB more risk of wrong calculations).

Agencies may also apply the recommended shadow emissions values within other CBA monetisation tools where this is used to inform central government policy and investment decision making and where it is transparently applied alongside other costs and benefits.

**Segmenting into three time periods**

Agencies can use emissions values included directly in the *Impacts Database* within the CBAx tool. To do this, we have simplified the consideration of emissions values to reflect the following time periods:

- Present – 2030
- 2031 – 2050
- Beyond 2050

Agencies can choose to segment their emissions impacts across these time periods and apply the central, low or high emissions value within their analysis. The CBAx database values are set out in Table 2 for the segmented periods. The values below represent the final year value in Table 1 for the time periods considered.

<table>
<thead>
<tr>
<th>Time period</th>
<th>Sensitivity</th>
<th>$/tonne (2022)</th>
<th>CBAx database row</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present – 2030</td>
<td>Low</td>
<td>104</td>
<td>205</td>
</tr>
<tr>
<td></td>
<td>Central</td>
<td>155</td>
<td>206</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>230</td>
<td>207</td>
</tr>
<tr>
<td>2031 – 2050</td>
<td>Low</td>
<td>186</td>
<td>208</td>
</tr>
<tr>
<td></td>
<td>Central</td>
<td>277</td>
<td>209</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>369</td>
<td>210</td>
</tr>
<tr>
<td>2050 – onwards</td>
<td>Low</td>
<td>227</td>
<td>211</td>
</tr>
<tr>
<td></td>
<td>Central</td>
<td>501</td>
<td>212</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>978</td>
<td>213</td>
</tr>
</tbody>
</table>

Box 1 below sets out the detailed steps for using the updated shadow emissions value functionality within the CBAx tool.
Box 1: Steps for shadow emissions period values within the CBAx tool

1. Decide upon the timeframe that the bulk of the emissions impacts occur within (Present – 2030, 2031 – 2050, or Beyond 2050). If desired, Agencies may choose to segment their emissions impact across these time periods and value them separately as several impacts.

2. Add the emissions impact to the “Impact Inputs” sheet like any other impact, selecting the relevant time period scenario (for each considered segmentation, if applicable). The Impact row numbers for these can be found in the “Impacts Database” sheet.

3. Complete the other information required by CBAx: The rest of the exercise is the same as any other CBAx impact. The Ministry for the Environment’s guidance for Climate Implications of Policy Assessment (CIPA) is useful.

4. Output: The overall CBAx results will be recorded in “Output Summary” using the standard public sector discount rate and “Output Summary Alt” using an alternative discount rate.

5. Undertake sensitivity analysis under different price paths. You can “include” and “exclude” relevant impacts to make it quick to remodel.

Full yearly time series

Agencies who wish to utilise the entire time-series for emissions values may do so through the creation of an additional tab within their workbook and following the steps below in Box 2.

Box 2: Steps for shadow emissions annual values within the CBAx tool

1. Calculate the volume of emissions or avoided emissions in metric tonnes of CO₂-equivalent (CO₂-e), resulting from the policy or investment, for each year of its economic lifetime. The Ministry for the Environment’s guidance for Climate Implications of Policy Assessment (CIPA) is useful for this exercise. Notes:
   - This calculation is done outside of CBAx.
   - The volume of emissions should be expressed as the change relative to a counterfactual or baseline level.

2. Create a new worksheet in the CBAx spreadsheet.

3. Copy across the “central,” “high” and “low” shadow emission values for each year from Table 1 into the new worksheet.

4. Copy across your emission volume estimates from Step 1 for each year into the new worksheet.

5. Multiply the emissions volume estimates by the shadow emission values to produce monetized costs or benefits for each year.

6. Check the signs. Ensure that the dollar values representing increases in emissions are negative values, while values representing decreases in emissions are positive values.

7. Divide the emissions valuations for each year by the size of the cohort for each year as set out in the “Primary Inputs” worksheet.
   - Note: This is required because, at the next step, CBAx records impacts on a per unit basis. The impacts are aggregated later in the “Outputs Summary” worksheet.

Box 2: Steps for shadow emissions annual values within the CBAx tool

8. **Unprotect** the “Impact Inputs” sheet. This is done within the *Protect Workbook* section of the *File* menu.

9. **Copy** the monetized values across into the “Impact Inputs” worksheet.

<table>
<thead>
<tr>
<th>Year Ending June</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>2026</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Impact type</strong></td>
<td>Units per person per annum</td>
<td>Annual value ($) Per cohort member</td>
<td><strong>End of year counter</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pre intervention level</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Post intervention level</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Marginal impact</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

- See example above. The shaded values were pasted in (overrides CBAx formula).
- Use the “Paste Values” command to ensure the correct numbers copy across and place the values in the “Post intervention level” row.
- Insert in the word ‘Government’ in the column titled ‘Type’ – this is because the emissions costs or benefits are assumed to accrue to central government as owner of emissions targets (state clearly if you use a different assumption).
- You will need to complete sensitivity analysis using the high price path and low price path for comparison. You will need to paste over the values, as you cannot easily “include” or “exclude” impacts that bypass CBAx functionality.

10. **Output:** The overall CBAx results will be recorded in “Output Summary” using the standard public sector discount rate and “Output Summary Alt” using an alternative discount rate.

**Sensitivity analysis – using a range of values**

A range is provided for sensitivity analysis because of uncertainties over future abatement costs in New Zealand, including:

- The impact of future technologies on abatement costs.
- The nature of international trading arrangements and prices.
- Uncertainties over future government policy choices such as the relative mix of ETS, complementary policies, or international emissions trading.

The low, central and high price path enables agencies to undertake sensitivity analysis for new policies and investments, analyse the difference in results and provide range around the central value (see Section 3.4 on sensitivity analysis). Agencies can use the *Sensitivity Analysis* tab to capture the different results.

Undertaking sensitivity analysis allows agencies to consider the impact of changing key assumptions, such as the shadow price of emissions, on the viability of the investment. A sensitivity analysis worksheet has been provided to allow agencies to copy and paste results when different assumptions have been run through the model.

Sensitivity analysis tests the figures by using the low, central and high price paths. The results of each scenario can be recorded in the “Sensitivity Analysis” sheet. For ease of modelling, a central, low and a high path can be included in an “Impact Inputs” worksheet,
and the relevant row “included” or “excluded” (column C). Exclude impacts by leaving out one of the required fields e.g., the length of impact.

Interpretation of the emissions results should be included within the overall narrative on costs and benefits of the policy or investment. For example:

- investments with a positive net present value at both the high and low shadow price ranges suggest a positive investment proposition regardless of the emissions impact
- an investment that requires the highest shadow price values to be viable suggests that the emissions reductions are core to the overall monetised value proposition
- an investment that is only viable with the lowest shadow price value may create risk if emissions or climate ambitions are high.

Managing other uncertainties

While this guidance offers recommended monetary values, agencies will still face uncertainties that will require judgements or assumptions to be made (for example when estimating the future volume of emissions impacts).

Section 5 of this guidance provides tips, for example on choice of unit, dealing with uncertain evidence, and multiple entries of impacts. Agencies are encouraged to make their judgements and assumptions clear.

Wider environmental values (by the Ministry for the Environment)

<table>
<thead>
<tr>
<th>Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your choice of policy options may change when environmental values are included.</td>
</tr>
<tr>
<td>Environmental impacts may not be obvious – effects can arise through a chain of causes.</td>
</tr>
<tr>
<td>Environmental impacts are often not quantified through observable market or other direct prices, requiring other approaches such as revealed or stated preference studies to estimate impacts.</td>
</tr>
<tr>
<td>Other resources are available to quantify environmental impacts not yet in CBAX.</td>
</tr>
</tbody>
</table>

Environment-related impact values were added in the 2020 CBAX update. The Ministry for the Environment will expand and refine these environmental values over time. The magnitude of these impacts is sizeable. The environmental values cover:

- Waste – landfill costs
- Wetland ecosystem services – cost of replacement
- Urban development – benefits of agglomeration (productivity) and costs from congestion and water pollution
- Freshwater quality – benefits from cleaner water.

Most values relate to the Living Standards Framework’s (LSF) Environment wellbeing domain, with one relating to Health (infection risk from freshwater quality). All are primarily tied to the benefit of preserving and improving natural capital, though the cost of further wetland loss is expressed as replacing degraded natural capital with physical capital (infrastructure).
Though not a complete list, these new values will help you consider a broader range of wellbeing impacts, including intergenerational effects. Accounting for these environmental impacts can identify where proposals with otherwise apparently similar net benefits (eg, in job creation) have very different long-term outcomes for sustainability.9

**Impacts on the environment can be indirect**

Some environmental impacts will be reasonably obvious, like physical flows of waste to landfill or housing and infrastructure developments directly reducing open space in urban areas. Others are indirect and can be harder to discern, as they occur through a chain of causes. For example, pollutants in urban waterways enter through storm and wastewater networks, with concentrations affected by how much land is covered in hard surfaces like roofs, roads, and concrete.10

**Using the environmental impact values**

<table>
<thead>
<tr>
<th>Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Some impacts use observable or directly estimated market values, such as the charge per tonne for sending waste to various types of landfill.</td>
</tr>
<tr>
<td>• Many are derived by statistical and econometric analysis of choice surveys to determine a willingness-to-pay for environmental outcomes.</td>
</tr>
</tbody>
</table>

The cost for **waste flows** to four landfill types incorporates the Government’s decision to increase and expand the national waste disposal levy.11 The CBAX impact values are the estimated total charges at the landfill gate, including the levy. Please note these four types use the intended national levy price in July 2024 as a steady-state value.

The cost of further **wetland loss** reflects the estimated annual cost per hectare of replacing valuable ecosystem services for flood protection with new physical infrastructure for that purpose.

The other environmental impacts use non-market valuation approaches, such as preference surveys. These monetised values should be regarded as indicative estimates, not exact numbers. They allow evaluation of different policy settings by comparing these non-market benefits and costs against those more readily identifiable in financial terms. Note, in some cases the values were also selected from multiple possible options. For example, the freshwater values are the estimated marginal benefit for a 1% improvement in ‘good outcomes’ for the three selected indicators.

Two studies from Lincoln University’s Agribusiness and Economics Research Unit (AERU) explain in detail the careful steps required to arrive at these monetised values.12 Challenges to be navigated include framing the choices to survey respondents, how the outcome would be paid for, and accounting for the importance of spatial effects. The approaches adopted

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are widely applied internationally, and their results are consistent with the established body of literature in New Zealand.

The wider costs and benefits arising from **urban development** are explained in more detail in MRCagnéy’s 2019 report.\(^\text{13}\) It gives a comprehensive inventory of the academic literature quantifying the wider impacts of urban development, including agglomeration benefits and the costs of congestion, overcrowding, infrastructure and impacts on fresh and coastal water. Tables 4 to 7 in the report provide a useful overview on the where the costs and benefit fall, and their monetised values.

**The CBAx values are not exhaustive**

Other important environmental domains are not yet covered by the new environmental impact values, such as biodiversity and habitat loss, the value of recycling materials, or our marine resources. Please consider whether other domains are also relevant to your proposal. The Ministry for Environment can provide advice on possible environmental costs and benefits to include. Additional impact values can also be obtained from sources like Lincoln University’s environmental non-market valuation database, the Environmental Value Reference Inventory,\(^\text{14, 15}\) or related survey studies such as those on the willingness to pay for greater biodiversity like Tait et al, 2017.\(^\text{16}\)

**Parliamentary Commissioner for the Environment Report**

The Parliamentary Commissioner for the Environment released the report “**Wellbeing Budgets and the Environment: the promised land?**” in December 2021. The report proposes several questions to guide analysis of the impacts on natural capital and sustainability. Agencies might find them to be a useful reference prompt for impact analysis.


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\(^\text{13}\) The costs and benefits of urban development | Ministry for the Environment

\(^\text{14}\) https://evri.ca/en

\(^\text{15}\) http://selfservice.lincoln.ac.nz/nonmarketvaluation/

\(^\text{16}\) https://researcharchive.lincoln.ac.nz/handle/10182/11970
Appendix 6: How to navigate the CBAX Spreadsheet

The CBAX spreadsheet model contains a number of worksheets to help with CBA analysis. This section explains the purpose of each worksheets and how the worksheets are related.

Introduction

- **Purpose**: This is an introduction and overview for the CBAX model. The model is available under a creative commons licence.

- **Provides inputs to these worksheets**: None.

- **Uses outputs from these worksheets**: None.

Guide to Model

- **Purpose**: Explains how various sheets in the model interact.

- **Provides inputs to these worksheets**: None.

- **Uses outputs from these worksheets**: None.

Primary Inputs

- **Purpose**: In this sheet you will input data on the policy intervention cohort across years. The sheet also contains some automatic assumptions about discount rates.

- **Provides inputs to these worksheets**: The policy intervention cohort information you input is used as a basis for calculating impacts in the Impact Inputs sheet. The default time period is 50 years, but the user can choose to shorten this time period. The discount rates calculated in this tab are used in the Outputs Summary worksheets.

- **Uses outputs from these worksheets**: None. The user should calculate the appropriate policy intervention cohort based on evidence modelling prior to completing this.

Cost Inputs

- **Purpose**: In this sheet you will input summary operating and capital costs of the initiative or intervention.

- **Provides inputs to these worksheets**: The cost inputs you enter in this sheet will be used to calculate the CBAX return on investment in the Output Summary worksheets.

- **Uses outputs from these worksheets**: None. The user should calculate costs and enter them into this sheet.
Impacts Database

- **Purpose:** In this sheet you do not input any data. This sheet contains a number of publicly available values. The values are primarily sourced from agencies outside the Treasury, with the source listed in column J. The values were all produced outside the model itself, and those values from past years are adjusted forward so they are all on a common year basis.

- **Provides inputs to these worksheets:** The values in this sheet are used to calculate impact values in the Impact Inputs worksheet. You should use this sheet as a reference to look up and select relevant impact values and then “plug-in” the relevant impact value row number into the Impact Inputs sheet. The values in this database make it easy to estimate impacts. The user can also add new values to the database and use those new values as inputs to the impact inputs sheet.

- **Uses outputs from these worksheets:** This sheet uses the start year specified in Primary Inputs to adjust the values forward to a common year basis (using GDP data calculations). For consistency all values are adjusted using GDP adjusters.

Impact Inputs

- **Purpose:** In this sheet for each impact you will enter the impact value row number that affects a cohort of individuals (a subset of the policy intervention cohort), and also any assumptions about the impact on that cohort. The user specifies the assumptions about the counterfactual (pre-intervention level) and the intervention (post-intervention level) for each impact, and the model calculates the marginal impact. Assumptions also include the start and length of the impacts, as well as the percentage of the policy intervention cohort impacted and the probability of success. You should be explicit and transparent where there is variation in the evidence bases used for assumptions. Further clarification on evidence and assumptions can be explained in the accompanying documentation.

- **Provides inputs to these worksheets:** Used in the Outputs Summary worksheets.

- **Uses outputs from these worksheets:** This sheet uses the Primary Inputs sheet, and impact value row numbers from the Impacts Database as input by the user.

Outputs Summary

- **Purpose:** In this sheet you input contextual information such as the type of analysis. This sheet displays the summary output of the calculations, based on the impacts and assumptions selected by the user. The 5% real default discount rate is used.

- **Provides inputs to these worksheets:** None. The outputs from this sheet, such as the net present values for impacts, can be used for templates. Note that the Return on Investment Societal Total is the same as the Benefit Cost Ratio (BCR), unless there are negative impacts.

- **Uses outputs from these worksheets:** This sheet makes use of the Primary, Costs and Impact Inputs sheets, as well as some hidden sheets that calculate totals.
### Output Summary Alt

- **Purpose**: This sheet is the same as the Outputs Summary sheet, except that it uses the 2% real discount rate to provide the user with sensitivity analysis.

- **Provides inputs to these worksheets**: same as for the Outputs Summary sheet.

- **Uses outputs from these worksheets**: same as for the Outputs Summary sheet.

### Assumptions

- **Purpose**: This sheet provides a place for you to do any calculations required to generate Impact inputs, for example, information on your counterfactual.

- **Provides inputs to these worksheets**: The results from the calculations can be used as input for the blue Primary Inputs, Cost Inputs, Impacts Database or Impacts Inputs worksheets. Key assumptions can be listed in the yellow box on the Output Summary sheet.

- **Uses outputs from these worksheets**: None.

### Wellbeing Impacts

- **Purpose**: The Wellbeing Analysis table covers monetised and non-monetised wellbeing impacts. The first table allows you to list all significant impacts, whether these are identified, quantified or monetised. The monetised values can be based on the CBAX modelling and aggregated as appropriate. The second table auto-populates monetised impacts in CBAX. Some fields will need to be manually entered.

- **Provides inputs to these worksheets**: None. The Wellbeing Impacts can be used to support a policy proposal.

- **Uses outputs from these worksheets**: Makes use of the results in the Output Summary, as well as Impact Inputs.

### Sensitivity Analysis

- **Purpose**: This sheet allows you to easily capture results when you run the CBAX model under different assumptions and scenarios. Run the model with the relevant assumptions, then copy and paste them in the relevant scenario.

- **Provides inputs to these worksheets**: None.

- **Uses outputs from these worksheets**: Users can copy results run under different scenarios. These are populated from the Output Summary worksheet.

### Hidden Worksheets

- **Purpose**: To make the model simple and easily accessible for a wide range of users, the CBAX tool performs calculations automatically. The formulas and macros for these calculations are contained on a number of hidden worksheets. If users want to see these worksheets, for example GDP and CPI adjusters, unhide the worksheets.

- **Provides inputs to these worksheets**: Used in the Primary, Costs and Impact Inputs worksheets as well as the Outputs Summary worksheets.

- **Uses outputs from these worksheets**: None.
Appendix 7: Glossary and Acronyms

This appendix provides a glossary of terms and acronyms used in this document.

**Adjusted value:** The adjusted value uses the start year specified in Primary Inputs sheet to adjust the values in the Impacts Database forward to a common year basis using the nominal GDP data in the GDP inflator hidden worksheet. For consistency all values in the Impacts Database have been adjusted forward using GDP adjusters, even though some values could potentially be adjusted using CPI adjusters.

**BCR:** See benefit cost ratio.

**Benefit cost ratio (BCR):** The BCR is the ratio of total discounted benefits to the total discounted costs. A proposal with a BCR greater than 1.0 has a positive impact, because the benefits exceed the costs.

**Cohort:** A group that experiences an intervention in a particular year. A cohort is made up of members from the policy intervention group / population.

**CBA:** See cost benefit analysis.

**CBAx:** CBAx is the Treasury’s cost benefit spreadsheet model. The tool helps users monetise impacts for cost benefit analysis. The CBAx results are considered as part of the CBA and wider case for the policy intervention. Together with unmonetised impacts, evidence base and confidence in assumptions, CBAx results inform value for money advice.

**CFISnet:** Crown's Financial and Information System, which is used by the Crown for financial reporting and budget purposes.

**Cost benefit analysis (CBA):** A systematic approach to evaluating different options to improve decision making. CBA evaluates different options against a single welfare criterion: 'societal net benefit'.

**Counterfactual:** The counterfactual is the situation that would exist in the absence of an intervention (ie, what would happen if the intervention is not implemented). In many cases this will be different from 'do-nothing'.

**Dis-benefit:** This is an impact which has a negative effect and is a wellbeing loss. An intervention might on the whole be positive for society, but certain groups can be negatively impacted. This is different from costs incurred in setting up and operating an intervention.

**Discount rate:** The discount rate is used to discount impacts, costs and benefits that occur in the future. The discounted value is known as the present value.

**IDI:** The Integrated Data Infrastructure is a large research database containing microdata about people and households. Data is from a range of government agencies, Statistics NZ surveys including the 2013 Census, and non-government organisations.

**ILM:** Intervention (or Investment) Logic Map. An intervention or investment logic map is a single page depiction of the logic that underpins an investment.

**Initiative:** An initiative is a funding or investment proposal for decision makers to consider.
**Intervention:** An intervention targets a specific group of people/things/places and is designed to have a marginal impact. An initiative may be centred on an intervention, or a combination of interventions within or across sectors.

**Marginal impact:** Marginal impact refers to the specific change in an impact. Rather than focusing on the overall impact CBA focuses on the marginal change in an impact from an intervention, relative to the counterfactual.

**Net present value (NPV):** The NPV is the sum of the discounted benefits, less the sum of the discounted costs (relative to the counterfactual). This gives a dollar value representing the marginal impact on the collective living standards of all New Zealanders of the initiative, in today’s dollar terms.

**Nominal value:** A nominal value is a value that is expressed in its nominal price level (ie, the price level at the time). A nominal value has not been adjusted for inflation.

**NPV:** See net present value.

**Policy intervention cohort:** The policy intervention cohort is the group that an intervention targets and intervenes with. The target group may be individuals or other units. The unit can be identified at the appropriate level of aggregation, for example: individual, family, business, rivers, animals, community, city or country.

**Probability:** The likelihood of the benefit or cost materialising. The likelihood of a benefit or cost materialising can be thought of as the ‘success rate’ or effectiveness of an intervention.

**Proxy:** A proxy is an indirect measure that serves in place of an unobservable measure. A good proxy must have a close correlation with the measure of interest.

**Real value:** A real value is a value that has been adjusted from a nominal value to remove the effects of inflation.

**Return on investment (RoI):** Calculate the return on investment by dividing the discounted net change in wider societal impact, including benefits to government, by the discounted cost of the initiative. This can be interpreted as the impact on New Zealanders per dollar the government spends on the initiative.

**RoI:** See return on investment.

**Segment:** A segment is a part of the cohort for the policy intervention group or population. The cohort segments total 100%.

**Sensitivity analysis:** Sensitivity analysis is a technique used to determine how independent variables such as assumptions and values of impacts will affect the overall results. Sensitivity analysis is important as it can reveal how important different assumptions are to the overall result. Carrying out sensitivity analysis helps determine how robust the results are.

**Success rate:** See probability.

**Target group:** See policy intervention cohort.

**Whole of life costs (WoLC):** The present value of total cash costs of the investment over its life. This excludes dis-benefits, because they are not a cash cost. WoLC also excludes depreciation. Only include the initial cost of procuring the asset. Capital charge is excluded.