ECONOMIC EVALUATIONS

Key lessons learnt	Be clear about the purpose for undertaking a cost benefit analysis (CBA), as different stages of the project lifecycle may require different approaches. Consider whether other forms of economic evaluation may be useful for decision makers. Consult early and often in developing a Reference Case and Scenarios, implementing CBA guidance and developing sensitivity and scenario analysis.
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Introduction

Economic evaluations as part of business case development are a critical element within the decision-making process for the NSW Government.

A range of material has been developed by the NSW Government to support the efficient and effective delivery of best practice business case documentation. This source material includes, guidelines, templates and supporting notes.

Key considerations

All Economic evaluations developed for NSW Government should be undertaken in strict accordance to the NSW Treasury Business Case and Economic Evaluation Guidelines as well as any applicable departmental business case and/or economic/financial evaluation guidelines.

These can be viewed as frameworks to assist stakeholders with the delivery of best practice business cases. There may be reasons as to why a specific department, program or project may wish to alter the generic templates to better inform the decision-making process.

Economic evaluation and NSW requirements

For most business cases the economic evaluation is an Economic Cost Benefit Analysis (CBA), as NSW Treasury requires a CBA to be submitted for capital expenditure >$10 million, or as required for recurrent expenditure[1].

CBA is primarily used for investment decisions to assess whether the value of a project's economic, social and environmental benefits exceed its costs i.e. is the project expected to have a Benefit Cost Ratio (BCR) greater than 1? However, CBA can be used for a number of purposes throughout the project lifecycle including:

- Options assessment and value management
- Communicating costs, benefits and trade-offs of initiatives
- Ranking and prioritising investment across initiatives

While CBA is mandated for most business cases in NSW, proponents and decision makers may also find other forms of economic evaluation useful as supplements to CBA, and these are briefly discussed.

1 TPP17-03 NSW Government Guide to Cost-Benefit Analysis, NSW Treasury Policy and Guidelines Paper, March 2017

1. Be clear about the purpose of a Cost Benefit Analysis

CBA can be used for many purposes throughout the project lifecycle, which may have different technical requirements, and produce different types of information about an initiative. Common purposes for undertaking a CBA are summarised in the following table.

Table 1 Key features of CBAs undertaken for different purposes

TYPE OF EVALUATION	PURPOSE	KEY FEATURES (DETAIL, FOCUS, DECISION CRITERIA)
Option assessment	Compare and assess options for an initiative, to determine which creates the most net economic value and who benefits (or whether the initiatives are economically equivalent). Can also be used to identify where initiatives can be improved. Economic principle is to invest in initiatives which deliver the most value.	▶ Typically, a rapid or partial CBA ▶ Focus on costs/benefits which distinguish between options, are of significant magnitude, and align with project objectives ▶ Appropriate decision criteria may be Incremental NPV/ BCR or First Year Rate of Return (FYRR)
Threshold investment decision	Assess the economic viability of an initiative, to determine whether it creates economic value greater than its economic costs, and who benefits. In general, it is economically efficient to invest in all projects which deliver benefits greater than costs (assuming they are not substitutes).	▶ Detailed CBA ▶ Should attempt to value all material economic, social and environmental impacts of the initiative. In practice, it may be pragmatic to only value key benefits sufficient to exceed costs ▶ Decision criteria is typically NPV > 0 and BCR > 1.0, however investment decision typically has regard to material unvalued costs/benefits which should be noted in economic evaluation
Capital prioritisation	Ranking or comparison across initiatives to prioritise scarce funding to projects that deliver the most economic value.	▶ Comparison of CBA results across initiatives ▶ Requires alignment of key parameters, assumptions, method and type of benefits of quantified across initiatives ▶ Decision criteria is typically ranking of BCRs (noting that BCRs should never be used to compare mutually exclusive initiatives, and consideration may need to be given to how BCRs are constructed'[2]).

Given the different features of these CBAs, it is important for funding agencies, business case reviewers and proponents to be clear about the purpose for preparing or requiring a CBA as part of the business case process.

2 e.g. Australian Transport Assessment and Planning Guidelines T2 Cost Benefit Analysis, page 56, Transport and Infrastructure Council May 2018

2. Consider whether other forms of economic evaluation may be useful

CBA is, the most common form of economic evaluation, but there may be other forms of economic evaluation that provide useful information for decision makers when considering the merits of an initiative.

An economic cost benefit analysis assesses a very specific measure of economic welfare. The Net Social Benefit of an initiative which can be defined as:

- the change in consumer and producer surplus, less changes in government taxes
- considering only whether the project improves the allocation of scarce resources to market uses (e.g. goods and services that can be bought and sold) and non-market uses (e.g. social or environment value that doesn't necessarily have a market price)
- which are specific, tangible, monetisable and can be clearly attributed to the initiative

The strength of CBA is that it is intended to systematically value all costs and benefits to society, to promote selection of the projects which create the most net benefit. However, in practice there are number of limitations which users should have regard to:

- CBA only includes those benefits which can be reliably and robustly monetised
- CBA typically assumes that the economy is in full employment, and all resources are being used effectively
- Equity of value distribution is not considered, whether a project's value is given to a single person/area or across the many/large people/area
- Projections for population and technological change are usually conservative and based off historical trends (i.e. are not forward looking).

To address these shortcomings, Other types of economic evaluation can be used to supplement the CBA:

- **Cost Effectiveness Analysis:** where all or some benefits are not able to be valued, CEA can be used to compare outcomes delivered relative to costs
- **Benefits assessment:** where all or some benefits not able to be valued a qualitative benefits assessment can be used to document or compare options. Professional judgement, benchmarks or case studies are typically used as evidence
- **Economic contribution or economic impact:** analysis of the impacts of an initiative using input-output analysis or a Computable General Equilibrium model may help decision makers to understand how and where economic gains are distributed
- **Real options analysis:** where projects create option value (e.g. opportunities for future growth, options to abandon or stage investment), conventional economic appraisal approaches may understate economic merits of an investment decision or lead to different prioritisation of options. Real options can be used as part of a conventional CBA (i.e. to include the value of optionality in benefits in investment decisions), and/or in combination with conventional CBA to undertake options assessment and capital prioritisation

Further discussion of these techniques is included in Appendix 8 to NSW Treasury guidelines (TPP17-03).

3. Reference Case and Scenario definition

It is important to define the Reference Case (Base Case)[3] in developing a robust and defensible CBA. As noted in NSW Treasury guidelines this should generally be a realistic 'do minimum' scenario. Common sources of debate around a 'do minimum' scenario include:

- Developing a 'do minimum' which implies unfunded recurrent costs, or contains unquantifiable impacts (e.g. low probability, high consequence such as catastrophic events)
- Infrastructure Australia recommends that only funded and committed projects are included in the Reference Case[4]. While there is merit in this view, care needs to be taken in how it is implemented to avoid overstated forecast costs of no-intervention[5], and violations of the partial equilibrium principal adopted in CBA[6]

Scenario definition is equally important, and key pitfalls to consider include:

- Consideration of realistic alternative options (such as no-build), which may need to be considered at business case level, well before economic evaluation is undertaken
- Interaction with other related initiatives and projects, which should typically be documented in a project assumptions book

4. Typical approach to implementing key elements of CBA guidance

NSW Government and agency guidelines detail steps to undertaking a CBA, including requirements for the key elements of CBA. The following table summarises the typical approach adopted in implementing this guidance in practice.

Table 2 Typical approach to key elements of a cost-benefit analysis

KEY ITEMS	TYPICAL APPROACH
Appraisal period	▶ Appraisal period should cover the delivery phase and the economic life of the initiative. i.e. Total appraisal period = delivery phase + economic operations period ▶ Suitable economic operations periods for different types of initiatives are typically provided in NSW Treasury or agency guidelines
Residual value	▶ Typically straight-line amortisation of the value of project assets over their economic life, either using economic life estimates for specific assets, or a weighted average economic life ▶ Contingency and indirect project cost can, pragmatically, be included in the amortisation as these costs would need to be incurred if replacing the asset ▶ This approach is conservative, in that it assumes project benefits beyond the appraisal period are only equal to costs in perpetuity. Alternative methods may be appropriate for some initiatives.
Discount rate	▶ 7% real per annum, with sensitivities at 3% and 10%
Costs	▶ Cost should reflect the expected value of up-front and recurrent costs over the life of the initiative i.e. mean estimate, noting that P50 (real, base year dollar) cost estimates are typically used as a proxy where available ▶ Costs are typically the direct costs of the initiative to government, however there may be a requirement to consider important private costs (e.g. to citizens or businesses) ▶ Ideally base and project case costs calculated and discussed in the appraisal, noting that this may not always be practical and that incremental costs are typically acceptable

3 Reference Case is typically preferred to Base Case to avoid ambiguity or confusion of projected conditions without the project in future years, with existing, base year conditions
4 Infrastructure Australia – Infrastructure Priority List 2017
5 This is particularly the case where network or system modelling is undertaken to estimate costs and benefits of the initiative, such as for transport and utilities networks, as demand may dramatically outstrip supply
6 CBA is typically undertaken on the basis that impacts are considered for a single market only

KEY ITEMS	TYPICAL APPROACH
Benefits	▶ Benefits should reflect their expected value i.e. mean estimate ▶ Some initiatives will require careful analysis and consultation from CBA professionals. Examples of red flags for further consultation include: initiatives with changes in government taxes or subsidies; changes in the number of users; cross-border or international impacts; non-marginal impacts on supply, demand or prices. ▶ Ideally base and project case benefits are calculated and discussed in the appraisal, noting it may not always be practical and so incremental costs are typically acceptable
Escalation of costs and benefits	▶ Typically, no real escalation is applied after the base year to costs or benefits to avoid introducing additional sources of error (e.g. error in forecasting future prices or the real value of travel time), and to simplify the analysis ▶ However inclusion of real escalation may be warranted for some initiatives or as part of sensitivity testing, if applied to both costs and benefits
BCR specification	NSW Treasury recommends the following BCR specification for investment decision BCR1 = $\sum_{t=1}^{n} = \frac{b_t}{(1+r)^t} / \frac{(K+c)_t}{(1+r)^t}$ Where b_t is benefits flow in year t, K is capital costs, c is recurrent costs, r is the discount rate, and n is the number of years in the appraisal period Alternative construction may be acceptable for different purposes (such as options assessment or capital prioritisation), or for some types of initiatives. For example, the Australian Transport Assessment and Planning Guidelines recommend the following specification (which estimates the return on capital invested) for capital prioritisation with a short-term budget constraint[7] BCR2 = $\sum_{t=1}^{n} = \frac{b_t - c_t}{(1+r)^t} / \frac{(K)_t}{(1+r)^t}$
BCR/NPV threshold	A BCR > 1 or NPV > 0 is generally considered to indicate that a project can deliver economic value greater than economic costs Some funding sources specify a threshold that needs to be met by CBA decision criteria to be considered In general though, an investment decision will typically have regard to the BCR and NPV, as well as other quantitative or qualitative factors

5. Economic evaluation of initiatives that don't fit neatly with standard guidance

The IIAF and NSW government guidance on economic evaluation is typically geared to guiding capital investment decisions. However from time to time it may be necessary to evaluate initiatives under this framework that don't fit neatly. Common examples include:

- Initiatives with large recurrent savings
- Enabling initiatives
- Initiatives which required staged capex (either growth or sustaining)
- Initiatives with limited government investment
- Initiatives where benefits accrue to non-NSW residents

7 Australian Transport Assessment and Planning Guidelines T2 Cost Benefit Analysis, page 56, Transport and Infrastructure Council May 2018

For these initiatives early consultation with funding and reviewing agencies is important to agree on suitable approaches. The table below notes typical responses, however there may be legitimate reasons to adopt different approaches for different initiatives.

Table 3 Economic evaluation of initiatives that don't fit neatly with guidance

TYPE OF INITIATIVE	POTENTIAL ISSUES	TYPICAL RESPONSES
O&M savings initiatives	▶ O&M liabilities may not be budgeted, or not budgeted for beyond the forward estimates period creating an 'unfunded base case' ▶ O&M savings may exceed capital investment resulting in negative BCRs[8]	▶ Agree with funding agencies that economic savings exist, but may not be realised as financial saving relative to agency budgets ▶ Alternative BCR construction or alternative decision criteria such as NPV
Enabling initiatives, or initiatives which require staged capex (either growth or sustaining)	▶ When seeking early funding (e.g. systems development or corridor protection) the initiative for investment decision may have only costs, but is required to enable future benefits ▶ Ongoing capex injections or downstream impacts may be an impact of the project, but not the subject of the investment decision (e.g. known requirement to acquire new maintenance facilities in 10 years' time in order to continue to realise initiative benefits over 20 year appraisal period)	▶ Consider a Program CBA and Benefits Realisation Strategy ▶ Treatment of growth capex as sustaining capex in a Whole of Life costing ▶ Alternative decision criteria (such as Equivalent Annual Annuity method) ▶ Note and remove later years capex and treat as a separate project ▶ Options value of enabling investment and potential for avoided costs
Initiatives with limited government investment	▶ Initiatives with no or small government investment can result in a leveraged BCR	▶ It may be relevant to consider all private costs and benefits to society. ▶ Alternative decision criteria such as cost effectiveness to government may also be needed
Initiatives where benefits accrue to non-NSW residents	▶ NSW Treasury guidelines recommend that only cost and benefits which accrue to NSW residents should be considered, which may understate the economic merits of initiatives which have large benefits for overseas or interstate residents	▶ Undertake CBA and present results for all users, separately identifying NSW resident impacts where possible ▶ Consider supplementing CBA with alternative economic evaluation methods (such as contribution analysis) which may more be more parsimonious to the objectives of the initiative

8 see discussion

6. Sensitivity and alternative scenario analysis

NSW Government guidelines recommend that sensitivity and scenario analysis be undertaken as part of developing a CBA. The following section outlines the key steps undertaken in practice.

Sensitivity analysis

Sensitivity analysis is typically used to understand the sensitivity of the CBA results to changes in key parameters, such as costs, rates of escalation, and discount rates. Typically this includes the following sensitivities.

- Costs +/- 10 or 20%
- Benefits +/- 10 or 20%
- P90 rather than P50 costs (where available)
- (No) real escalation of costs and benefits
- Discount rate sensitives at 3% and 10%

Importantly, sensitivity analysis should not just state the revised BCR and NPV results, but should also provide commentary on how sensitive the results are to a change in parameter assumptions.

Scenario analysis

By contrast, scenario analysis is typically used to evaluate the impact of alternative futures, opportunities and risks to the viability of the initiative, and/or the ordering of options (also known as switching analysis). The scenarios to be considered should be developed in consultation with key stakeholders, and have regard to key assumptions which drive the analysis. Common scenarios that are considered include:

- Impact of planned but uncommitted/unfunded projects
- Impact of changes in assumptions about technology, customer behaviour or demographic trends
- Impact of higher (lower) demand or prices
- Delay, deferral or different ramp up of project benefits

Scenario analysis for capital prioritisation

When adopting a program or portfolio view on capital prioritisation it may be worth considering a standard set of alternative scenarios to test initiatives against as a way of dealing with uncertainty. Doing so provides decision makers with information about:

- Identifying no-regrets initiatives that are viable under multiple future scenarios
- Identifying trigger points where investment becomes viable

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