Project Assessment Framework

Cost-benefit analysis

July 2015

Queensland Government

Component of the Project Assessment Framework (PAF)

This document forms part of the Project Assessment Framework, as outlined below.

Overarching policy document	
	Policy overview
Guidance material	
	Strategic assessment of service requirement
	Preliminary evaluation
	Business case development
	Supply strategy development
	Source supplier/s
	Establish service capability
	Deliver service
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Supplementary guidance material	
✓	**Cost-benefit analysis**
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	Queensland public private partnership supporting guidelines
	Guidelines for the assessment of market-led proposals

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Overview

The *Cost-benefit analysis* guidelines, released as supplementary guidance material available under the Project Assessment Framework (PAF), provide practical guidance regarding the range of issues to consider when conducting a financial and economic analysis of project options at either the *Preliminary evaluation* or *Business case development* stages of the project lifecycle.

Agencies should refer to the PAF *Policy Overview* for further information about the PAF's application and the roles and responsibilities that may apply.

1.1 Purpose of cost-benefit analysis: value for money

The Government provides services to the community in an increasingly complex and challenging fiscal and economic environment. In order to provide the highest quality outcomes, the Government seeks to optimise value for money in its use of resources.

The Government's decision makers, primarily Cabinet, the Cabinet Budget Review Committee (CBRC) and the Ministers and Chief Executive Officers of Departments, require consistent, transparent and accurate information to:

- align agencies' policies, projects, programs and activities to the Government's stated priorities
- prioritise individual projects within programs
- ensure that their project procurement and resource allocation decisions achieve maximum value for money benefit for the State.

Rigorous and robust project evaluation will materially help in delivering on these requirements. In this context, the purpose of the Cost-benefit analysis guidelines is to assist analysts, across the whole of the Queensland Government, by providing:

- a standard methodology and approach for cost-benefit analysis
- a guide to undertaking the analysis.

1.2 Application of the guidelines

The *Cost-benefit analysis* guidelines have broad application to a range of project types, including: information, communication and technology (ICT); policy development; business change; and construction projects. While the specific application of these guidelines is a matter for each agency's Chief Executive Officer, agencies are encouraged to adopt the guidelines as appropriate for projects under consideration.

These guidelines may be used as the benchmark against which the Treasurer, Cabinet and CBRC measure the quality, appropriateness and robustness of information provided by agencies on projects under consideration by the Government. Adherence to the Cost-benefit analysis guidelines will assist agencies in this process.

However, in the case of small projects, the resources required to undertake a full cost benefit analysis (refer to section 2) may be disproportionate to the cost of the project and difficult to justify in the context of the net benefits expected to accrue from project implementation.

Depending on the circumstances, the scope of a project assessment could comprise:

- broad financial and economic analyses
- comprehensive financial and a broad economic analysis
- comprehensive financial and economic analyses.

Agencies should determine on a case-by-case basis the level of analysis required for the particular project having regard to the scope, cost, complexity, level of risk and sensitivity of the project. Assessments and the resources allocated should be proportionate to the size and nature of the project.

1.3 Cost-benefit analysis: roles and responsibilities

In preparing an evaluation, the roles and responsibilities of the various contributors need to be well defined and clearly understood. Refer to the PAF Policy Overview document for further information about roles and responsibilities regarding the application of the PAF.

Sufficient resources should be allocated by agencies to undertake the work required in evaluating options. In this regard, the resources allocated to an evaluation should be commensurate with the size and likely impact of the project being evaluated.

1.4 More information

In addition to the *Cost-benefit analysis* guidelines, there are many publications which may be useful for agencies undertaking a project evaluation. The first step in the process should be the PAF. Details of some of the other publications are contained in *Appendix C*.

These additional guidelines comprise a valuable technical resource complementary to the *Cost-benefit analysis* guidelines.

2 Cost-benefit analysis in the overall project cycle

The *Cost-benefit analysis* guidelines are designed primarily to support the evaluation of options and can be used in the *Preliminary evaluation* and the *Business case development* stages of the project lifecycle.

While the primary application of the *Cost-benefit analysis* guidelines occurs early in the project life cycle, the resulting evaluation (particularly in relation to the selected option) should be regularly confirmed throughout the life of the project. This is essential to enable project decision makers to assess the ongoing viability of the project throughout its life.

To be complete and effective, cost-benefit analysis should:

- follow the process outlined in the PAF
- contain concise and relevant information on which to base a decision about whether or not to implement the project
- use well defined and consistent terminology
- include appropriate self-contained quantitative and qualitative analyses of financial, economic and social risks and impacts, along with any other identified risks/ impacts associated with the project
- state the assumptions on which of the analyses are based, as well as the basis for those assumptions
- specify clearly referenced data sources for validation purposes
- indicate clearly the range of assumptions used in sensitivity testing of options
- provide detailed, clear and logical arguments to substantiate any conclusions and recommendations.

While all cost-benefit analyses have these common characteristics, the level of analysis required will differ depending on the project's complexity, risk profile and sensitivity and the level of financial and economic resources required to implement the project.

The decision making process for the application of these Cost-benefit analysis guidelines are listed in *Table 1* and are outlined in greater detail in the following sub-sections of this document.

Table 1: Five steps in delivering a cost-benefit analysis

Step 1	Identify the outcome sought	Refer to the *Strategic assessment of service requirement* guidance material of the PAF
Step 2	Develop project and policy options	Refer to the *Strategic assessment of service requirement* guidance material of the PAF
Step 3	Undertake a preliminary evaluation of options	Refer to the *Preliminary evaluation* guidance material of the PAF
Step 4	Evaluate project options in detail	Refer to the *Business case development* guidance material of the PAF
Step 5	Select preferred option	Refer to the *Business case development* guidance material of the PAF

2.1 Identify the outcome sought (Step 1)

To commence a cost-benefit analysis, it is essential to clarify the following:

- what outcome is the Government seeking from the project?
- why does the Government need to be involved in achieving this objective?

This initial process identifies the outcome sought for a project, and validates it as a government priority. The project is the means of addressing the outcome sought.

Government intervention or activity is justifiable on two fundamental grounds – efficiency and equity:

- efficiency — the existence and operation of private sector markets normally comprise the efficient process by which goods and services are produced, distributed and consumed. Government can intervene in a marketplace either by regulating behaviour or by investing in a project which creates infrastructure or services.

  Such government action should be reserved for those instances where markets are failing to deliver efficient outcomes. Market failures usually fit into the following categories:

  — the exercise of market power through limited competition
  — the non-existence of markets for public goods
  — market prices or input costs which do not incorporate the complete costs or benefits of the relevant activity, resulting in externalities
  — information failures such as asymmetric information occur if consumers cannot obtain adequate information on which to base their decisions to buy and consume.
- equity – government may intervene on equity or distributional grounds. The outcome sought should clearly state the nature of the inequity to be redressed, its extent and the reasons for its occurring.

However, government intervention is not costless. Therefore, intervention is justified only where the net benefits (benefits of avoided market failure net of the costs of government failure, including the deadweight costs of taxation) of government activity are positive.

To assist with the future evaluation of outcomes, new performance indicators and targets need to be formulated, or the impact on the agency's existing performance indicators and targets need to be established. These performance indicators, targets and the proposed methodology of measurement should be set out clearly (a pro forma is provided in *Appendix A*).

Guidance material relating to the *Strategic assessment of service* requirement stage of the project lifecycle provides further information on identifying the outcome sought by a particular project. Additional documents and guidelines that will assist in this step are identified in *Appendix A*.

2.2 Develop the project and policy options (Step 2)

Having clearly defined the outcome sought, the next step is to develop in detail a range of solutions (project options) that have the potential to achieve the outcome.

Guidance material relating to the Strategic assessment of service requirement stage of the project lifecycle provides further information to support the identification of a broad range of project options.

The option analysis is not a risk analysis, but the process of developing options may usefully bring up high level identification of risks. For information on risk analysis, which is a critical part of the cost-benefit analysis process (refer to section *2.4 Evaluate project options in detail (Step 4)*). This step should produce a clear statement describing the detailed options, including a rationale for each option assessed against the project's objectives.

2.2.1 STATUS QUO

Analysis of the status quo is essential, as it is the benchmark against which all other options should be compared. Consequently, it is important that the status quo is carefully specified and modelled on a whole-of-life basis. It is, quite simply, a description of what will occur should the proposed project not proceed.

The status quo is not (usually) a "spend nothing" or a "do nothing" scenario, as it will reflect any essential changes resulting from changes in demand or regulations. When a service is already provided, the status quo needs to show the impact of continuing the existing situation, with all the associated costs and benefits.

It is important that the status quo is not used as a "dummy" option. That is, one which is presented to make the "preferred" option look attractive. Decision makers need to be advised of what situation will exist in the absence of the project being approved. The status quo may indeed prove to be a viable alternative based on affordability or value for money considerations.

2.2.2 OTHER OPTIONS

The status quo and all potentially viable options (typically more than one practical alternatives would exist) should be analysed in detail. As noted above, the status quo should be presented as accurately as possible and be considered as a potentially viable option.

To further assist agencies with the development of innovative options, the Western Australian Treasury's *Strategic Asset Management Framework* identifies the following questions that may be useful:

- Are different sizes or quality of operation possible (e.g. could the operation be scaled down, or is asset replacement justified)?
- What is the sensitivity of demand to the level and structure of pricing?
- Is varying the pricing structure a realistic alternative to increased expenditure?
- What is the effect of varying the design life or timing of the scheme?
- Could the operation be contracted out?
- What alternative locations are available?
- Are there choices of technique involving a trade-off between labour and capital, or capital and maintenance costs?
- Are there different materials, which would cost less or need less maintenance?
- Would better training of staff reduce manpower requirements?
- Are all elements of the operation equally justified?
- Would removing some of them increase the net present value?
- Could the operation be combined with another or divided into parts to advantage?

Developing options involves lateral thinking about the outcome being sought and a clear understanding about the objectives and outcomes of the project.

2.3 Undertake a preliminary evaluation of the options (Step 3)

Having identified in *Develop the project and policy options (step 2)* a range of options assessed (technically) as having the potential to deliver the outcome sought, it is necessary to undertake appropriately detailed risk, financial, economic (including social and environmental), and budget analyses of each of the options. Such analyses should facilitate an initial ranking of alternative options in terms of cost and risk and their ability to meet the identified outcome sought (refer to section 2.1. *Identify the outcome sought (Step 1)*). The preliminary evaluation will enable decision makers to determine if action to achieve an outcome that is consistent with government priorities is justified, given the likely resourcing requirements or other implications of identified options to achieve the outcome.

It is appropriate to limit the assessment to a preliminary analysis at this stage. Undertaking a detailed evaluation of project options (refer to section *2.4 Evaluate project options in detail (Step 4)*) for a relatively small, simple and low risk project could involve significant costs. Similarly, for projects that are of significant scale, are complex or high risk, it is appropriate to undertake an initial, lower cost assessment to determine if the costs associated with a detailed evaluation of project options (refer to section *2.4 Evaluate project options in detail (Step 4)*) are justified.

The level of analysis should recognise the size, complexity and risk of a project, and whether a business case will be undertaken.

If a project is deemed to be a priority and affordable, it will proceed to *Step 4*: *Evaluate project options in detail*. However, if the project is sufficiently small, simple and low risk to not require detailed assessment, the project would skip *Step 4* and move to *Step 5: Select preferred option*.

It is important to note for any analysis, that there is no clear way to explain the difference between what constitutes preliminary or detailed analysis. However, when developing a scoping paper or estimates for preliminary analysis the PAF suggests some level of statistical confidence in guiding the level of detail.

In addition, it should be assumed that more detailed information is required for the business case. As a result, agencies should ensure that estimates used in the earlier stages of evaluation are not accepted without rigorous re-evaluation at each stage of the project's progress. Doubts about the reliability of estimates of key variables can be reflected in the sensitivity analysis, or variables could be reported using a range to reflect their uncertainty (refer to section 2.4. *Evaluate project options in detail (Step4)*).

2.4 Evaluate project options in detail (Step 4)

Having undertaken a preliminary assessment of a range of options, it is necessary to undertake more detailed risk, financial, economic, budget, social and environmental analyses of each of the options. Such analyses should facilitate a ranking of alternative options in terms of both costs and risks and their comparative ability to meet the outcome sought. Key elements of the process are outlined in *Table 2*.

It should be noted that while the analyses contained in a cost-benefit analysis can be prepared sequentially, they are interrelated and it will be necessary to return to earlier analyses in order to make adjustments for information that becomes apparent throughout the process.

These analyses are brought together in the form of a business case to allow a decision on whether the project should be undertaken and, if so, which option represents best value for money.

Table 2: Key analyses in a cost-benefit analysis

Analysis	Description
Risk	A risk analysis should identify, document and analyse the risks involved with each project option, and outline the strategies for allocating and mitigating risks associated with implementing each option.
Financial	A financial analysis, conducted on a cash basis, determines (from the government's perspective) whether projected revenues will be sufficient to cover cost, including an appropriate return on the capital invested. Where a project does not generate a revenue stream, or the revenue is inadequate to cover all the costs, the financial analysis will show a least cost / net cost option.
Cost-benefit including: • financial • social • environmental	A cost-benefit analysis involves a comprehensive economic evaluation of all the costs and benefits associated with each proposed project option, including financial, environmental and social. The objective is to determine the most economic use of resources. Costs and benefits are valued in dollar terms and adjusted for market distortions or imputed where the market does not exist. Identifying the costs and benefits associated with social impacts in areas such as education, health, family services, crime, sport, art and culture or community services is an input to a cost-benefit analysis. Identifying the costs and benefits associated with the impacts the project options may have on: • air, water, or soil quality • noise levels within a community • biodiversity • townscape or heritage • recreational or forestry areas • the State's natural capital and primary resources. Cost effectiveness analysis, an alternative to cost-benefit analysis, is used where benefits can be identified but it is impracticable to place a monetary value on a major proportion of them. Benefits are expressed in physical units such as number of species saved. Costs are measured in dollar terms and, as in cost-benefit analysis, are adjusted for market distortions or imputed where the market does not exist. Project options are compared in terms of their relative effectiveness and their relative costs. While a cost effectiveness analysis will facilitate identification of a least cost option, it will not show whether benefits outweigh costs.
Budget	A budget analysis, conducted on an accruals basis, provides detailed information on revenues and other funding sources and expenses to show the estimated impact on agencies' budgets.
Regulatory	There will be instances where analyses undertaken in accordance with these guidelines will relate to proposals which include one or more options which have the potential to regulate economic or other activity in the community. Potential regulatory impacts should be identified and addressed through the development of a Regulatory Impact Statement (RIS).

2.4.1 THE IMPORTANCE OF DISCOUNTING, ISOLATING PROJECT IMPACTS AND SENSITIVITY ANALYSIS

Cost-benefit analysis involves comparing projects and project options with different flows of financial or economic costs and benefits occurring in different time periods. Discounting recognises that the use of money has a value. A dollar today is worth more than a dollar in five years' time. This concept is known as the time value of money.

The time value of money means that cash inflows and outflows occurring in different time periods cannot simply be added together to determine the overall net cost or net benefit of a project. It is necessary to remove the effect of the time value of money (i.e. discount back) to enable all values to be compared equally (i.e. the present value). Different projects and project options have different market risk profiles. In this regard, a future revenue or benefit stream which may be highly risky should not be valued as highly as an alternative, less risky, stream with the same nominal value. A higher discount rate for the riskier benefit stream would be appropriate.

In the above manner, a single unit measure of net benefit or net cost is derived to enable meaningful comparison of options to be made.

The process of discounting future financial cash flows (or economic costs and benefits) of a project is used to derive key decision indicators such as net present value (NPV), net present cost (NPC) or benefit-cost ratio.

The discounting factor, known as the discount rate, comprises two components:

- a component to adjust periodic cash flows for the time value of money (the risk free rate)
- a component to reflect the fact that investors need to be compensated not only for the time value of money, but also for taking on "economy-wide" or "market" risk by investing in the project (the systematic risk premium).

Cost-benefit analysis requires familiarity with discounting and capital budgeting techniques. Some of the issues to be considered include:

- Whether to use nominal (includes inflation) or real values (excludes inflation)[1]. A key concern is that consistency is ensured. For example, if nominal values are used, a nominal discount rate must be used. This produces the same answer as applying a real discount rate to real values in the analysis, assuming that adjustments for inflation are consistent. Agencies should carefully consider and fully explain their rationale for their choice of nominal or real values.
- For ease of understanding, financial analyses are typically undertaken in nominal terms (given that prices observed in the marketplace are nominal values that is, in dollars of the day). However, there may be a rationale for using real values in cost-benefit analysis. For example, it can be easier and more intuitive to use real values if the analysis needs to concentrate on physical volumes (e.g. tonnes of material transported) as differences in these volumes can be confused if nominal values are used.
- How values are estimated. Revenues and costs should be expressed in expected value terms. To determine the expected value, each (reasonably) expected outcome is identified, and a value and the probability of occurrence of that value are attributed to that outcome. The expected value is then the sum of each value outcome multiplied by the probability of its occurrence. For example, if there are four reasonably expected outcomes, the expected value outcome would be the sum of four products of the value of each outcome and the probability of its occurrence. Assessment of the expected value should consider project-specific risks. Systematic risks are accommodated through the use of a risk-adjusted discount rate.
- Timing of benefits and costs. This refers to the choice of whether periodic benefits and costs occur at the beginning, during or at the end of the period. Assumptions made about such timings can make a difference to the NPV.
- Residual values. A cost-benefit analysis will incorporate analysis covering a discrete period of time, even though in practice the benefits of the project may continue for many years beyond the period of analysis. While, in theory, these long run benefits (and costs) should be included in the analysis, it can be problematic and in most cases impracticable to estimate them (as an extreme example, in some parts of Europe, Roman roads are still being used – more pertinent to today, benefits from training and education can persist across generations).

However, to ignore future long-term benefits and costs can understate the project's net present benefit or NPC (noting that discounting values back over long timeframes yields small present values). Accordingly, the project can be assigned a residual value at the end of the analysis period, which represents an estimate of the residual long run benefits (and costs). Where the project is a significant piece of infrastructure (e.g. a building) the residual value would be its estimated market value at the end of the analysis period, which could be positive or negative depending on whether the asset could be sold or if there were significant costs associated with decommissioning. Determining residual values in other cases (e.g. a new service) can be far more problematic. As the NPV will vary with the choice of residual value, this choice must be determined carefully.

[1] The consumer price index (CPI) is generally considered to be a representative indication of general price inflation. Agencies should consult with QT regarding choice of inflation rates.

2.4.2 ISOLATING THE IMPACTS OF A PROJECT

For both the financial analysis and the cost-benefit analysis of a project, costs and benefits (or revenues) to be included should comprise only those which are a result of the project. The costs and benefits for each project option should be measured against those which occur in the status quo.

Care needs to be taken in defining the scope of the costs and benefits to be included in the project to ensure that there are no omissions or double counting when comparing the project against the status quo. This consideration is relevant whether the analysis concentrates only on incremental costs and benefits, or assesses total costs and benefits.

If the assessment is being undertaken on an incremental basis, only costs and benefits incremental to continuing with the status quo would be included. The incremental net benefit or net cost is compared with a zero base, as the benefits and costs of the status quo have already been accounted for in estimating the incremental benefits and costs.

If the assessment is being undertaken on a total cost-benefit basis, all costs and benefits associated with the project would be included. The total costs and benefits for the project are then compared to the total costs and benefits under the status quo.

While the two approaches should yield an identical result, the total cost-benefit approach is less likely to result in omissions or double counting of costs and/or benefits, and is likely to be simpler for third party decision makers to follow.

2.4.3 TESTING FOR SENSITIVITY TO ALTERNATIVE ASSUMPTIONS

A range of factors can lead to significant variations in costs and benefits of a project from the levels assumed in the financial and economic analysis of a project option.

Project analysts can address this uncertainty by undertaking a sensitivity analysis, which enables an examination of how sensitive the financial and economic outcomes are to specific assumptions in the evaluation. The analysis would be focused on the key variable or else those that are so uncertain that their variation could upset the project's outcome.

Sensitivity analysis involves the following actions:

- identifying the variables which can have a significant impact on the outcomes of the project
- identifying a likely range for these variables, centred on the most likely assumed values
- calculating the impact of different combinations of worst and best case assumptions for these variables
- identifying the minimum set of changes in key assumptions which would reduce the net financial or economic benefit to zero, and assess the likelihood of these events occurring (also known as break-even analysis).

This process can lead to the development of several case scenarios for each project option (refer to the summary of analysis table set out in *Appendix A.4*):

- the optimistic case, which is a combination of the highest level in the range of probable benefits with the lowest level in the range of probable costs
- the most likely case, which is a combination of the benefits and costs with the highest probability of being realised. This case would differ from the base case, which presents expected values, rather than the most likely values
- the pessimistic case, which is a combination of the lowest level in the range of probable benefits, and the highest level in the range of probable costs.

Appendix B.1 contains further information on assigning probabilities to particular outcomes, and *Appendix B.4* provides further detail on conducting sensitivity analysis around the base case.

2.4.4 RISK ANALYSIS

Cost-benefit analysis must take into account the fact that circumstances may occur which result in future (actual) benefit and cost outcomes being different from expected values. This potential variance in outcomes (termed "risk") is a function of the chance that an actual value will differ from an expected value, and the associated consequences.

Risks should be quantified (where possible) as the product of:

- the likelihood of the risk impacting upon estimated project costs or benefits
- the consequence (i.e. the quantum difference between estimated and risk-adjusted values).

Risk analysis should be commenced immediately in this evaluation step (and updated as new information comes to hand), as this assists in framing the scope of the information required for the analyses that follow. A risk analysis will need to be undertaken for the status quo and each alternative project option.

2.4.4.1 Risk identification

Risk identification involves determining what, why, where, when and how events could prevent, degrade, delay or enhance the project outcome. The key risks to which the project will be exposed should be identified. Major generic risk categories and common project risks are outlined in *Table 3*.

Examination of common risks within generic categories may be useful to help determine a range of potential risks to which the project may be exposed. Identification of these generic risks, as well as risks that are more specific to the type of project being considered, should involve personnel with relevant technical or operational experience in detailed analysis of the project.

2.4.4.2 Risk assessment (qualification and quantification)

Risk assessment involves determining, for each identified project risk: the sources of project risk; their positive and negative consequences; and the likelihood that those consequences will occur. The combination of the likelihood of risks occurring and their consequences determines the materiality of the risk, and hence the level of risk analysis undertaken, including the need for mitigating strategies.

2.4.4.3 Risk allocation

Where the implementation of a project is expected to involve a number of parties (including non-government parties), efficient risk management dictates the allocation of each specific risk to the party best able to manage the occurrence and/or consequences of that risk.

2.4.4.4 Risk mitigation

Risk mitigation is any action that can be taken to reduce the likelihood of the risk eventuating or the consequences if it does eventuate. Mitigation strategies can either seek to prevent the occurrence of the risk (e.g. through specific project structuring) or deal with the risk once it has materialised (e.g. appropriate contingency planning). Mitigation strategies need to seek a balance between the potential cost of the risk occurring and the cost incurred in preventing it or preparing for it.

A comparative analysis of the different risks and mitigating strategies appropriate for each of the project options should be prepared. Project options cannot be properly ranked until a full risk assessment has been undertaken and appropriate adjustments made for relative risk.

Possible risk mitigation approaches for the key categories of risks identified above are set out in *Table 4*.

The allocation, consequences, likelihood and appropriate mitigating strategies should be outlined in a risk matrix. The format of a risk matrix and examples of mitigation strategies are set out in *Table 5*.

Additional information on risk management is available through publications of Standards Australia, including: *Risk Management – Principles and Guidelines (AS/NZS ISO 31000:2009)*; *A Basic Introduction to Managing Risk (SAA HB142-2004)*; and *Risk Financing (SAA HB141:2011)*.

Table 3: Examples of major risks

Risk Category	Description
Site	The project site may be unavailable or unable to be used at the required time, or in the manner or cost anticipated. Risks associated with the site can include: land interests and acquisition; statutory approvals; environmental issues; Indigenous matters; and suitability of the site. These risks may require action to make the site suitable for use, or an alternative site to be located, which could increase project costs.
Design, construction and commissioning risk	The design, construction or commissioning of the project facility may result in adverse cost and/or service delivery consequences. Risks associated with construction could include faults in design; actual construction; commissioning; and technical obsolescence.
Contractor / sponsor	A contractor may be unable to fulfill its obligations and the government may be unable to enforce those obligations on the contractor or parent organisation. Risks associated with the contractor or sponsor can include financing risk, change in ownership, and potential insolvency of the firm. Failure of the sponsor, and failure to achieve project objectives, also involves a reputation risk for the government.
Operating	The process for delivering the required services may be affected in a way that impacts on delivery. Risks associated with operations will include variation in input cost, volume or quality and failure of operations to deliver the required outputs.
Market / demand	Demand volume or price may vary from expectations. This may occur because of factors such as a general economic downturn, competition pressures and demographic change.
Network	The network that supports the project is changed in a way which impacts the delivery (quantum and/or quality) of the project outputs and/or the project viability.
Industrial relations	Industrial action may adversely affect project delivery.
Force majeure	An event beyond the control or influence of government, such as an act of God or superior force (e.g. an earthquake), may affect the project.
Asset ownership	Events, technological change, construction of competing facilities or premature obsolescence may impact on the value of the project.
Timing	Poor timing, such as a change in the economic cycle, may affect the outcome of the project.
Technology	Using hardware and software that may be superseded during the process and affecting the outcome of the project.

Table 4: Risk mitigation strategies

Risk Category	Description
Site	Action to reduce site risk includes investigation into site contamination, searches for Native Title claims and public consultation on proposed uses of a site. Identifying alternative suitable sites at an early stage would also assist in estimating costs and benefits of alternative sites.
Design, construction and commissioning risk	Initially, government can reduce design and construction risk by a clear specification of the outcomes and outputs it is seeking. Linking progress payments for contracted services to achievement of performance indicators also reduces risks.
Contractor / sponsor	Project agreements can specify the government would have the ability to consent to ownership changes for a contractor. Financial risks could be reduced by examining the financial strength of any party considered as a contractor.
Operating	Setting clear outputs and service standards would reduce the risk of a failure or cost overrun in outputs. Contracts with suppliers could be set for short periods with review provisions to allow for changes in suppliers or conditions.
Market / demand	Government can mitigate risks by making realistic estimates of its demands for the relevant outputs, and therefore avoid having to pay more to a service provider than is necessary. Price risk can be reduced by including indexation arrangements in service charges, and periodic market testing (and adjustment) of charges.
Network	The network dependencies critical to a project can be identified at the specification stage. The network risks the government would assume would also be agreed at an early stage.
Industrial relations	Project specifications can include productivity incentives for suppliers, and support for early mediation on industrial disputes.
Force majeure	Adopting appropriate insurance arrangements can reduce the impact of events beyond the control of the government or service provider.

Risk Category	Description
Asset ownership	Appropriate arrangements for maintenance and refurbishment of assets in agreements with a service provider reduce risks of erosion of asset values.
Timing	Adopting adequate awareness of upcoming economic, social and environmental trends.
Technology	Flexibility in system, project and infrastructure design to enable the inclusion of recent developments in technology.

Table 5: Example of a risk matrix

Risk Category	Description	Consequence and Likelihood	Mitigation Strategies
Site			
Site conditions	Unanticipated adverse ground conditions are discovered.	Additional construction cost and/or time. Low likelihood, as similar construction has been undertaken successfully nearby. (Where possible, impacts would be quantified or given a rating, such as high, medium or low).	Allocate the risk to the construction company as it is best placed to manage it (e.g. through expert testing and due diligence assessments).
Operating			
Contractor failure	Contractor may fail financially or fail to continue to provide services to the required specification.	Failure may result in disruption to government services. High likelihood, as no contractor has had any previous experience in providing these services in this way.	Government to carry out due diligence on contractors regarding probity and financial capacity. Contingency plans to be put in place for alternative delivery of services. Contracts to include performance clauses and suitable security for non-performance.

2.4.5 FINANCIAL ANALYSIS

A key element of any financial analysis is the determination of the financial impact of the proposal on the Government.

The financial analysis in itself cannot present sufficient information for a decision on whether or not to proceed with a particular project. Many government projects, particularly those of a social nature, will not be financially viable in the sense that the project does not generate sufficient revenues (if any) to offset its costs. Even if a project's revenues do cover its costs, this is not in itself a sufficient reason to decide to proceed. For example, a project might generate revenue greater than its financial costs but cause a significant community detriment which does not have direct financial cost (e.g. environmental damage costs). Such a case may create a loss of economic welfare, despite the project itself being financially viable. A cost-benefit analysis will include consideration of such factors.

2.4.5.1 Purpose of financial analysis

It is important to understand the distinction between financial analysis and an economic or cost-benefit analysis. Financial analysis considers the project options from an internal, financial perspective while the cost-benefit analysis looks at the overall impact of the project options on the economic welfare of the community. The financial model also forms the basis for determining the net budget impact associated with the proposal. The cost-benefit analysis builds on the financial analysis, with the addition of other impacts and benefits not directly captured or incurred by the Government. Cost-benefit analysis and budget analysis are described below.

The depth of assessment should be made according to the scope, cost, complexity, riskiness and sensitivity of the project.

2.4.5.2 Undertaking the financial analysis

There are four stages in the financial analysis.

Stage 1: Determine key assumptions

Before the financial model is prepared, it is essential to identify the key factors which will determine a project's financial viability, and understand any interdependencies between those factors. Economic variables which can affect the financial analysis include labour costs, energy costs and demand growth. It is important to clearly identify and document all assumptions associated with the project at this early stage so that the effects of movements in key variables are understood, and potential risks can be quantified and management strategies developed.

Key parameters for a financial model may include, but are not limited to:

- inflation rates (general and factor-specific)
- discount rate
- demand forecasts and revenue impacts
- capital cost estimates, including: land acquisition; construction; ICT; and life cycle maintenance (e.g. refurbishment, replacement)
- operating cost forecasts, including: annual maintenance; rent; staffing; ongoing training; and support
- appropriate timeframe. The financial analysis should consider the entire duration of the project (e.g. the expected useful economic life of the project assets)
- residual values
- treatment of GST and other relevant taxes
- foreign exchange rates (if relevant).

The development of the financial model must consider how the key factors identified in the model relate to and impact upon one another. This will be particularly important where a project is substantial, or is the first of its kind. There are often trade-offs in these relationships which need to be carefully identified and included.

For example, if capital expenditure required to design and construct an asset is not adequate, consequent operating and maintenance expenditure in using the asset is likely to be higher in the future.

As well, it is possible that throughout a project's life the existing relationships underpinning a financial model will change. For example, the construction of a hospital may influence the expected population growth in the hospital's vicinity leading to greater demand for the hospital's services.

Stage 2: Identify cash flows

The financial analysis of a project is concerned (almost) exclusively with the monetary transactions which make up the project cash flows. That is, the current and future cash flows of costs and revenues that are expected to be encountered as a direct result of having undertaken a particular project.

Some key issues in the determination of cash flows for input into financial analyses are:

- Non-cash accrual accounting information (e.g. depreciation and provisions) is not used in cash flow analysis, as the inclusion of depreciation would involve double counting (the initial capital cost of assets is included in the analysis).
- Accrual accounting reflects transactions (and balances) when they accrue or are incurred, rather than when the underlying cash transactions take place. Accrual entries are not used in financial analysis but will be relevant to the budget analysis.
- Assets (e.g. land, buildings and equipment) already on hand which will be inputs to the project should not be considered as free of cost to the project. These assets have an opportunity cost that must be factored into the analysis (even though this cost does not strictly fit within the definition of a "monetary transaction").
- Cash flows should be modelled from the State's perspective. Tax costs incurred by the project which result in revenue inflows to the State Government are not a cost to the State. Tax costs incurred by the project which are paid to the Australian Government are a cost to the State.
- Revenues (and costs) which would exist whether or not the project proceeds cannot be attributed to the project.

- In assessing the values of cash flows, it is important to ensure that the financial modelling is based on expected values, rather than best (most optimistic), worst (most pessimistic), most likely (modal) or simple average (non-probability weighted) values. The impact of more optimistic and pessimistic values should be considered during sensitivity testing of the financial evaluation.
- The value of broader economic or social benefits and costs that may arise from the project are not included in this analysis (these benefits and costs will be addressed in the cost-benefit analysis).
- Sunk costs should not be included in cash flows (i.e. non-recoverable costs expended before the assessment is conducted). Additional operating costs of more intensive use of existing infrastructure or assets would be included in cash flows.

Estimating project cash flows is not always straightforward. Some common approaches to identifying cash flows are discussed in *Appendix B.2*.

Stage 3: Calculate the net present financial value (or net present cost)

In this stage, the cash flows are discounted to present values, to arrive at the net present financial value (NPFV).

Total revenues and total costs (or net revenues) for each period are divided by the factor $(1+r_d)^n$ where r_d is the discount rate, and n is the number of the period in which the revenue is received or cost is borne (e.g. in year 3, n=3). Spreadsheet programs, such as Microsoft Excel, have pre-established formulae to calculate present values of cash flows (although care should be exercised with the assumption of timing of cash flows).

The project NPFV is calculated as either the sum of the discounted revenues less the sum of the discounted costs or the sum of the discounted net revenues. An NPFV of at least zero indicates that a project is intrinsically financially viable, and:

- the project should be pursued, subject to there being:
- no significant funding constraints
- no significant negative net economic or social impacts (taking account of distributional impacts)
- sensitivity analysis should be undertaken to identify the range of possible financial outcomes and confirm the robustness of the project's expected financial outcome.

The choice of discount rates requires consideration of individual project's characteristics. The discount rate for a project will include the risk free rate (based on an average of long-term bond rates) and an allowance for systematic, or economy-wide, risks. *Appendix B. 3* sets out principles used in setting project discount rates. Queensland Treasury should be consulted in the determination of the appropriate discount rate to apply.

Stage 4: Undertake sensitivity analysis

As cash flows may vary from expected values, especially for projects with costs and revenues extending over long periods, it is important to consider the implications for the project of such variations in assumptions.

Sensitivity analysis allows an analyst to identify the variables that have the greatest impact on financial viability and the areas which may require additional investigative work to ensure the validity and robustness of assumptions and of the outcomes of the financial analysis. It may also assist in identifying key areas of project risk which may require proactive risk management. It is therefore a key element in the financial evaluation of a project.

More detailed information on undertaking a sensitivity analysis is contained in *Appendix B.4*.

2.4.6 COST-BENEFIT ANALYSIS

Consultation should occur on all issues associated with economic analyses, including issues of scope, use of external consultants, interpretation of results and reviewing draft reports.

2.4.6.1 Purpose and nature of cost-benefit analysis

The primary method of economic evaluation of public sector policies and projects is cost-benefit analysis. Input-output methodology (or the use of multipliers) is not an acceptable methodology for economic evaluations.

Cost-benefit analysis is a method used to make decisions about alternative courses of action based on the net welfare gain to the community as measured by criteria such as net present economic value (NPEV) and benefit cost ratio (BCR). Benefits and costs are 'social' in that they are measured irrespective of how they are distributed and they are not limited to actual market transactions. Cost-benefit analysis is particularly relevant to public sector decision making where the costs and benefits of a project are often not reflected in market transactions.

By comprehensively identifying and estimating as many costs and benefits of a project as can reasonably be measured, including those which can be thought of as social and environmental, it is possible to rank project options according to their net economic benefit.

In theory, costs and benefits are valued at their true economic value. Economic valuation of costs and benefits involves adjustments for market distortions (e.g. tax and subsidies) and the estimated valuation of inputs and outputs not traded in the market (e.g. pollution or lives saved).

These economic values of costs and benefits are forecast over the life of the project, costs are subtracted from benefits, and the sum of the resulting net benefits are discounted to give the net present economic value (NPEV) of the project. The NPEV allows project options to be compared on the same basis and hence allows the determination of the greatest net benefit to the community or the most economic use of resources.

A subsidiary analysis to cost-benefit analysis is cost-effectiveness analysis, which determines the minimum cost solution to achieve a project's objectives when it is impracticable to estimate the value of benefits.

Consistency between analyses is important:

- in a cost-benefit analysis, the financial analysis forms the key foundation to which economic benefits and costs are added
- therefore, there should be no inconsistency between the financial analysis and the financial components (i.e. costs and revenues) of the cost-benefit analysis. The financial costs for the Government associated with each option, quantified to a P-90 confidence level, will then be consistent between the analyses
- other analyses (e.g. environmental, social) generate critical information which should be input into the cost-benefit analysis without altering the assumptions or values underpinning those analyses
- internal consistency is important. For example, if there are good reasons for using real values (i.e. constant prices) in the analysis, care must be taken that appropriate deflation is applied throughout the analysis to the nominal values.

Sources for further info
A comparison of the main differences between a financial analysis and social cost–benefit analysis is available in the *Handbook of Cost–Benefit Analysis*, 2006 Commonwealth of Australia (Table 10.1, p98).

2.4.6.2 Undertaking the cost-benefit analysis

There are four stages in a cost-benefit analysis.

Stage 1: Determine key assumptions

An essential part of the evaluation process, to clarify understanding by readers not involved in preparation of the analysis, is to document the assumptions used in the analysis and the reasons for choosing them.

A cost-benefit analysis should therefore contain:

- textually and numerically explicit explanations of the assumptions underlying all capital and recurrent estimates regarding: labour costs; energy costs; demand growth; charges; etc.
- clear and referenced data sources for validation purposes.

Before costs and benefits can be appropriately identified, the spatial reference area of the analysis needs to be determined. Do the project costs and benefits fall within the state, national or global area? The identification of the spatial area of the analysis will set the boundary for which costs and benefits are included in the analysis. Generally, for Queensland Government projects, the appropriate spatial area would be the State of Queensland. However, if it is considered that significant costs and benefits fall within the national or global area, then these costs and benefits should be identified clearly and included in the analysis. Whatever the choice, the analysis should be consistent.

Stage 2: Identify and estimate the expected economic benefits and costs of the project

In a cost-benefit analysis, costs and benefits are "social", rather than private or individual, as they are:

- measured irrespective of how the costs and benefits are distributed (i.e. the analysis is conducted from the perspective of the economy or society as a whole)
- valued in dollar terms at their "true" economic worth, or the value after adjusting for market distortions identified on a comprehensive basis and are not confined to transactions in the market:
- costs and benefits are imputed in situations where a market does not exist. Imputed prices (or adjusted market prices) are known as "shadow prices". The resources required to develop a set of shadow prices need to be commensurate with the magnitude of the project
- where market prices inadequately reflect the opportunity cost of the resources used, the value of a cost or benefit is valued (shadow price) by imputation or by appropriate adjustment of a market price[2].

Consultation with stakeholders will assist in identifying the range of costs and benefits to be incorporated in the analysis.

The cost-benefit analysis report should clearly and concisely state how market prices for inputs and outputs have been adjusted for market distortions, or where input and output values have been imputed where a market does not exist.

There are a number of techniques for determining values of costs and benefits when there are no market prices available. Benefit valuation techniques include:

- revealed preference – prices are inferred from observing consumer behaviour
- stated preference – willingness-to-pay is estimated by asking consumers what they would be willing to pay for the benefit.

For cost valuation, estimates of willingness-to-accept can be obtained by identifying how much compensation consumers would demand in order to accept the cost[3].

In identifying the benefits, consideration should be given to:

- avoided costs – costs which are unavoidable if nothing is done, but can be avoided if action is taken
- cost savings – measurable reductions in existing levels of expenditure if a project proceeds
- revenues – revenues which result directly or indirectly from the project (revenues which would have occurred regardless of the project must not be included as an incremental benefit to the project). It is important that the approach is congruent with the financial analysis
- benefits to consumers and to the community as a whole
- residual value of assets (if any) — the value of which is sourced from the financial analysis.

[2] The opportunity cost of resources used in a project is the value of those resources in their highest valued alternative use. Generally, current market prices of resources will reflect their opportunity cost. Hence, market prices should be used in the cost-benefit analysis unless otherwise stated in these guidelines.

[3] These methods are outlined in a number of complementary references, for example the Western Australian Options Analysis guidance, Part 2.

To enable meaningful comparisons to be made between competing options and projects, it is important that estimates of costs be undertaken on a consistent basis. Valuation of costs should be on the same basis as benefits. However, for consistency with the financial analyses, financial costs for the Government associated with each option, quantified to a P-90 confidence level should be used. In addition, the assessment should be made according to the scope, cost, complexity, riskiness and sensitivity of the project.

Stage 3: Calculate the net present economic value

The difference between the discounted streams of benefits and costs of each project option is the NPEV of the project option. A project is economically viable if this NPEV is greater than zero (i.e. the total discounted value of the benefits is greater than the total discounted costs). This NPEV should be carefully distinguished from the financial NPV.

The discount rate(s) to be used in a cost-benefit analysis should be agreed between the agency and Queensland Treasury.

Stage 4: Assess risks and sensitivities

As for financial analysis, while the base case economic analysis should be based on the expected value of individual costs and benefits, an assessment should be made of the realistic range of all key variables (e.g. revenues, growth in demand, charges, etc.) and of the sensitivity of the NPEV to changes to variables within these ranges.

A particular issue to be addressed with sensitivity analysis is "optimism bias". That is, the tendency of public sector projects to underestimate costs and overestimate benefits. While there are a number of mitigation strategies for this bias, sensitivity testing (including break-even analysis) can answer key questions such as:

- how much can expected benefits be reduced and the project remain economically viable?
- how much can costs increase while the project is still economically viable?
- what happens to the expected benefits when costs are limited (e.g. by a government budget constraint)?

2.4.7 COST-EFFECTIVENESS ANALYSIS

Cost-effectiveness analysis is a tool applicable to projects where benefits can be identified but where it is not possible to value them in monetary terms. Instead, benefits are expressed in outcome statistics (e.g. number of hospital beds, lower biodiversity, increased literacy rate, decrease in public assault incidents and so on).

Some social and environmental issues (e.g. community morale, biodiversity) can be difficult to measure, but measurement of others is not necessarily impossible. There are well established methodologies of valuation of benefits (e.g. stated preference and revealed preference methods). Generally, cost-effectiveness analysis should be regarded as possibly relevant for projects with a predominantly social or environmental focus.

In a cost-effectiveness analysis, only one benefit can be used as a measure of effectiveness. That is, the predominant benefit of the project needs to be identified. Present value should be estimated for costs only and this NPV is used as the key decision criterion to rank projects, or options, on the basis of cost and to identify the lowest cost alternative.

As with a cost-benefit analysis, the status quo and project options that achieve the same benefit need to be identified and compared in terms of their relative costs for achieving the benefit. For example, different project options (e.g. increase in police numbers or installation of video cameras) would have different costs in achieving a benefit outcome (e.g. a decrease in public assault incidents).

While a cost-effectiveness analysis will show the least cost option for achieving a particular outcome, it will not show whether benefits outweigh costs. A cost-effectiveness analysis therefore cannot rank projects on their most economic use of resources. The decision measure for a cost-effectiveness analysis is the lowest ratio of costs to a particular benefit for the status quo and each project option.

2.4.8 ENVIRONMENTAL AND SOCIAL COSTS AND BENEFITS

A cost-benefit analysis will incorporate those environmental and social impacts which can be valued as costs and benefits. Where environmental or social impacts are likely to be significant, but could not be valued effectively, it would be appropriate to supplement the cost-benefit analysis with some quantitative measures (e.g. impacts on the number of people with access to a service) and qualitative measures (e.g. impacts of a measure on social participation or on access to open space).

Where significant social or environmental impacts cannot be valued, a cost-effectiveness analysis can assess the relative costs of project options in contributing to environmental or social objectives.

The "social impacts" of a project consider the non-economic and non-financial benefits, costs and risks to the community which would otherwise not have occurred in the absence of the project. Since all projects, including those which might be thought to be purely "social," incur economic costs, social analysis cannot replace or substitute for financial, cost-benefit or budget analyses. Many social impacts are quantifiable in cost-benefit terms. For example, the value of human lives and the costs of crime have been quantified in many analyses (refer to *Appendix B.5*).

An analysis of the social impacts of a project should: identify any significant social issues or opportunities associated with the project; outline the extent to which these issues may affect the project; and develop strategies and options to deal with these issues.

The types of issues that may be considered in a social analysis include:

- history, heritage, Indigenous matters, the arts and culture
- quality of life (e.g. access to recreational facilities, beautification of surroundings)
- health
- welfare
- ecological sustainability (over the time period being assessed)
- public safety (e.g. road safety, workplace safety)
- law and order (e.g. crime rates, recidivism)
- unemployment (e.g. morale, business confidence)
- education (e.g. literacy).

Social analysis should be included with the cost-benefit analysis if it is likely that a project will:

- result in significant distributional shifts in costs and benefits among and within communities
- substantially affect unemployment
- cause disproportionate disadvantage or advantage to a particular sector
- provoke significant community concern
- require changes in government policy and direction.

An environmental analysis, which provides decision makers with information about the environmental issues associated with a project, is required for all capital projects to ensure that they meet the requirements of the *Environmental Protection Act 1994* and other relevant legislation.

The environmental analysis may include a preliminary review to determine the extent and nature of the environmental issues and whether further investigation is needed (e.g. a detailed environmental impact assessment, commensurate with the significance of the environmental issues and the project).

The types of environmental costs and benefits that could be included in an environmental analysis include: air, water, land and noise pollution; biodiversity degradation or enhancements; land, townscape and heritage degradation or enhancements; recreational and forestry degradation or enhancements; and impacts on the State's primary resources.

The initial assessment should include:

- the extent and nature of both on-site and off-site environmental consequences
- the short-term and long-term environmental effects from the project
- opportunities to improve environmental benefits from the project (e.g. through the incorporation of conservation initiatives)
- consideration of whether environmental considerations associated with the project are likely to be of significant community concern.

Where an assessment confirms areas of significant environmental concern, strategies and options should be developed, where feasible, to address these issues. The costs and benefits associated with these strategies should then be identified and valued to supplement the information supplied by the cost-benefit analysis.

This stage of analysis will include:

- the environmental costs and benefits included in the cost-benefit analysis
- the unquantifiable environmental costs and benefits, and the result of any cost effectiveness analysis undertaken
- the findings of any Environmental Impact Assessment (EIA) undertaken or the proposed timing for the EIA
- identification of distribution of the environmental costs and benefits
- assumptions made regarding the inclusion or exclusion of certain costs and benefits.

An additional process, stipulated in legislation, is to undertake an EIA to assess the environmental impact of implementing a project. An EIA is undertaken under the following Queensland legislation administered by the Department of Environment and Heritage Protection and the Department of National Parks, Sport and Racing:

- *Environmental Protection Act 1994*
- *Nature Conservation Act 1992*
- *Marine Parks Act 1982*.

An EIA could also be undertaken under the following legislation administered by other State Government agencies or the Australian Government including:

- *Environment Protection and Biodiversity Conservation Act 1999* (Cth), administered by the Australian Government
- *State Development and Public Works Organisation Act 1971* (Qld), administered by the Department of State Development
- *Sustainable Planning Act 2009* (Qld), administered by the Department of Infrastructure, Local Government and Planning.

An EIA will assist in identifying costs and benefits that will need to be valued and included in the cost-benefit analysis. Generally, most environmental costs and benefits will be non-marketed goods or externalities (refer to *Appendix B.5*).

The inclusion of non-marketed or external environmental costs in the cost-benefit analysis provides an indication of the true costs of the project to the economy.

2.4.9 ECONOMIC IMPACT ANALYSIS

Cost-benefit analysis should not be confused with economic impact analysis which typically measures the impact of a project on the volume of economic activity in a region (e.g. on gross state product or employment), or a measure of welfare (e.g. changes in household consumption). For individual projects, economic impact analysis based on input-output modelling does not account for the impact of alternative projects which will also lead to increased output for a region.

Benefits identified in economic impact analysis using an input-output approach should not be included in cost-benefit analysis for several reasons including:

- although any project will generate economic activity, directly and indirectly, these effects could also be generated by an alternative use of the resources
- typically, in impact models based on input-output relationships, increased expenditure leads to increased output, and therefore benefits. Alternatively, in cost-benefit analysis, increased expenditure represents increased costs
- a local project can have a positive economic impact on a small region(at the expense of other regions) but this represents a distributional effect and does not usually create an increase in economic welfare for the overall community, unless the project activates otherwise idle economic resources
- analysis using input-output multipliers assume that a new project can obtain unrestricted quantities of goods and labour without altering the pre-project market prices for these inputs, which would not be realistic in many cases
- while increases in gross state product may enhance economic welfare, gross state product in itself is not a satisfactory measure of social welfare for evaluation of public sector projects, as it does not allow for the measurement of: externalities; non-market goods; and consumer surplus.

Economic impact analysis should generally be restricted to the evaluation of impacts of changes in economic policy (e.g. regulation or tax reform) on economic activity indicators. In these cases, a general equilibrium approach rather than an input-output approach should be used.

2.4.10 BUDGET ANALYSIS

A budget (impact) analysis needs to be prepared for all project options, including the status quo. A budget analysis comprises identification of funding sources for the project and assessment of how the project will affect an agency's budget.

2.4.10.1 Identification of funding sources for the project

Funding sources may include using current resources; output funding; equity injections; revenue generated by the project (through user charges); grants from the Australian Government; new borrowings; leasing; local government contributions; or joint venture arrangements.

2.4.10.2 Assessment of how the project will affect an agency's budget

Assessment should include:

- an operating statement which details the project's operating expenses and revenues
- a statement of financial position which details the impact of the project on assets, liabilities and equity
- impact on outputs
- impact on agency budget (e.g. staffing, corporate overheads)
- the effect of proposed financing arrangements
- savings generated
- impact on non-financial outputs and performance measures.

Details of how these budget estimates were derived need to be provided. As a general principle, the cash cost components of budget estimates should be consistent with costs and revenues in the financial analysis.

Estimates should be provided at the detailed level, along with the assumptions made in deriving the estimates and any significant risks associated with the estimates.

For initial infrastructure costs involving plant and equipment, allowance should be made for the possible escalation of the costs of buildings, land and other capital costs, by making reference to similar projects and their final actual costs.

Estimates in the budget analysis need to be expressed in nominal value terms. That is, they should include the impact of price inflation as measured by the consumer price index (or alternative price index for the relevant category of expenditure).

Forecasts of the consumer price index to be used in this cost-benefit analysis process, and assistance with techniques for inflation adjustment, can be obtained from Queensland Treasury.

2.4.11 REGULATORY ANALYSIS

There will be instances where analyses undertaken in accordance with these guidelines will relate to proposals which include one or more options that have the potential to influence market competition, or the potential to regulate economic and/or other activity in the community.

[4] The term economic NPV includes environmental and social costs and benefits identified in the cost-benefit analysis.

2.4.11.1 Potential market impacts

All proposals should be assessed in terms of whether they have the potential to unreasonably restrict competition.

The *Competition and Consumer Act 2010* encourages efficient business and promotes competition in markets by outlawing practices that may unreasonably restrict competition. In situations where any aspect of a project (or project option) may contravene provisions of the *Competition and Consumer Act 2010*, agencies must consult with Queensland Treasury immediately.

2.4.11.2 Potential regulatory impacts

Where a project may be associated with changes to legislation, subordinate legislation, or some types of quasi regulation it will need to be evaluated in accordance with Queensland's RIS system.

The RIS system includes minimum requirements for stakeholder consultation and impact analysis for new, amending or remade regulation (including legislation and some types of quasi regulation). The RIS system has two levels of impact analysis, proportional to the significance of the regulatory proposal: a Preliminary Impact Assessment (PIA), required for all proposals not excluded from the RIS system; and a RIS, required for proposals likely to have significant impacts. In practice, the preparation of a RIS is meant to include most or all of the elements of analyses covered by these guidelines. Further guidance on the need for, preparation and assessment of a RIS should be sought from the Office of Best Practice Regulation in the Queensland Competition Authority.

2.5 Select preferred option (Step 5)

2.5.1 COST-BENEFIT ANALYSIS CONCLUSION, RECOMMENDATIONS AND CHECKLIST

A summary of all analyses conducted as part of the evaluation, together with appropriate recommendations, is required to allow a conclusion to be reached by the responsible and accountable decision makers on whether the Government should proceed with the project and, if so, which option should be approved.

For each project option, the results of the different analyses (i.e. risk, financial, cost-benefit, budget) should be summarised. A suggested format to present this information is provided in *Appendix A.4*.

The following questions provide a useful checklist for assessing the quality and rigour of a cost-benefit analysis:

- Does the structure and quality of the information contained in the cost-benefit analysis comply with these guidelines?
- Has the status quo and a reasonable set of project options been included in the cost- benefit analysis?
- Does the structure and presentation of the cost-benefit analysis allow easy interpretation and validation of the information and data provided?
- Are the information and data provided in the cost-benefit analysis internally consistent?
- For each project option analysed, is the NPFV calculation as accurate as possible, that is:
  - capital expenditure estimates are reasonable and accurate
  - all legitimate costs and benefits have been included
  - no invalid costs and benefits (e.g. multiplier effects) have been included
  - all costs and benefits have been valued at their market value or economic value where appropriate and are based on reasonable and verifiable assumptions
  - an appropriate timeframe has been used for the project, and costs and benefits have been forecast reasonably and transparently over the life of the project?
- For the status quo and project options, has a sensitivity analysis as prescribed in these guidelines been (a) undertaken on the valuation of the costs and benefits and on the discount rate and (b) rigorously assessed?
- Does the analysis develop a logical argument towards substantiated conclusions?

Even where the NPFV is negative, there may still be a compelling case on economic grounds for undertaking the project as a public sector initiative. In such cases, the expected net economic benefits determined through a cost-benefit (or cost-effectiveness) analysis would need to be sufficient to at least compensate for the net financial impost of the project.

There are many ways of presenting the information from a cost-benefit analysis. In particular, the Internal Rate of Return (IRR) or the benefit-cost ratio are methods often used to present analysis to assist with decision making. However, these should be used in conjunction with the NPFV and not in isolation.

The IRR is the discount rate which results in benefits and costs being equal. A higher IRR usually indicates that a project would produce higher net benefits. However, the shortcomings of the IRR as a basis for selecting a project option are:

The IRR depends substantially on the length of the project's life and the timing of benefits. Projects with a shorter lifespan and commencement of benefits at an earlier stage are more likely to produce higher IRRs, even if their net benefits in NPFV terms would be lower than for alternative projects.

As the IRR does not provide an absolute value of net benefits, it is difficult based on the IRR to invest in a combination of projects to produce the highest overall net benefit.

Projects with smaller initial capital costs tend to produce higher IRRs, even if their net benefits are lower than larger scale projects.

The benefit-cost ratio divides the present value of estimated benefits by the present value of estimated costs. A ratio of more than 1 would indicate a project is viable. Generally, a project with a higher benefit-cost ratio would be preferred. However, the benefit-cost ratio tends to be biased towards projects with lower initial capital costs, so it would also need to be considered with the NPFV in making project decisions.

Given the above shortcomings, the NPFV approach is used as the primary method for valuing project benefits. The below table summarises the choice on combinations of financial and economic benefits.

Table 6: Benefit–Cost outcome matrix

NPFV NPEV	Positive	Negative
Positive	Could proceed with project option, as it is economically and financially viable	Could proceed with project option, if economic NPV sufficiently large
Negative	Should not proceed, except with action to mitigate net economic cost	Should not proceed

A project with a negative NPFV, but a positive NPEV, could be justified by the Government as producing a net benefit to the State's economy (taking account of social and environmental impacts). In particular, where the economic benefit far outweighs the net financial cost, such a project would generally not be pursued by the private sector.

A project with a positive NPFV, but a negative NPEV (e.g. because of significant environmental impacts which would not be a direct financial impost on the project) would generally not be justifiable for government delivery (unless the financial benefit was large, the economic cost small and sensitivity analysis indicated potential for a positive net economic outcome).

All things being equal, a project with a positive NPFV and a positive NPEV should be pursued (unless there is capital rationing). A project with both negative NPVs should not be progressed further. If a project after analysis is not considered viable then some additional work will be required in terms of managing community expectations about a project through the development of an exit strategy. This should be included as part of the early stages of the planning process and reinforces the importance of developing viable alternative options when undertaking the analysis.

Appendix A – Cost-benefit analysis sample formats

A1. Financial analysis

a. Project option (status quo, option name 1, name 2, etc)

b. Case (optimistic case, most likely case or pessimistic case)

c. Discount rate (preferred, high or low rate) – x%

COSTS	Year 0 $'000	Year 1 $'000	Year 2 $'000	Year 3 $'000	...	Year n $'000	Notes, data sources and assumptions
Capital Costs							
Agencies' Capital Costs							1
Plant and Equipment							2
Buildings							3 etc
Land							
Total Agencies' Capital Costs							
Operating Costs							
Agencies' Operating Costs							
Employee Expenses							
Supplies and Services							
Grants and Subsidies							
Other Costs							
Industry Termination Costs							
Total Agencies' Operating Costs							
REVENUES							
Agencies' Revenues							
User Charges							
Grants and Other Contributions							
Asset Sales							
Other Revenues							
Total Agencies' Revenues							
NET REVENUE (Revenues – Total Costs)							
NET PRESENT FINANCIAL VALUE							

Year n refers to final year of project.

Notes:

1. ...
2. ...
3. ...

A2. Cost-benefit analysis

a. Project option (status quo, option name 1, name 2, etc)

b. Case (optimistic case, most likely case or pessimistic case)

c. Discount rate (preferred, high or low rate) – x%

COSTS	Year 0 $'000	Year 1 $'000	Year 2 $'000	Year 3 $'000	...	Year n $'000	Notes, data sources and assumptions
Capital Costs							
Agencies' Capital Costs							1
Plant and Equipment							2
Buildings							3 etc
Land							
Total Agencies' Capital Costs							
Other Parties' Capital Costs							
Plant and Equipment							
Buildings							
Land							
Total Other Parties' Capital Costs							
Operating Costs							
Agencies' Operating Costs							
Employee Expenses							
Supplies and Services							
Grants and Subsidies							
Other Costs							
Industry Termination Costs							
Total Agencies' Operating Costs							
Other Parties' Operating Costs							
Employee Expenses							
Supplies and Services							
Grants and Subsidies							
Other Costs							
Industry Termination Costs							
Total Other Parties' Operating Costs							
Non-traded Goods or Imputed Values							
Environmental Costs (for example, additional emissions, noise)							
Social Costs (for example, loss of jobs, required relocations)							
Other Economic Costs (for example, price increases)							
TOTAL COSTS							

BENEFITS	Year 0 $'000	Year 1 $'000	Year 2 $'000	Year 3 $'000	...	Year n $'000	Notes, data sources and assumptions
Agencies' Benefits							
User Charges							
Other Revenue							
Asset Sales							
Cost Savings							
Total Agencies' Benefits							
Other Parties' Benefits							
User Charges							
Other Revenue							
Asset Sales							
Cost Savings							
Total Other Parties' Benefits							
Non-traded Goods or Imputed Values							
Environmental Benefits (for example, reduced emissions, noise)							
Social Benefits (for example, additional jobs, participation)							
Other Economic Benefits (for example, exports, reduced consumer costs)							
TOTAL BENEFITS							

A3. Budget analysis

Option (status quo, option name 1, name 2, etc)

Operating Statement

Current Year		Forward Estimates Period				
	Year 0 $'000	Year 1 $'000	Year 2 $'000	Year 3 $'000	Total $'000	Notes, data sources and assumptions
Operating Expenses						
Employee Expenses						
Salaries, wages and related costs						1
Superannuation						2
Payroll tax						...
Supplies and services						
Item 1						
Item 2						
Grants and subsidies						
Item 1						
Item 2						
Depreciation						
Item						
Other Expenses						
Item						
Total Operating Expenses						
Operating Revenues						

Current Year		Forward Estimates Period				
	Year 0 $'000	Year 1 $'000	Year 2 $'000	Year 3 $'000	Total $'000	Notes, data sources and assumptions
User charges						
Item						
Grants and other contributions						
Item						
Other Revenues						
Item						
Total operating revenues						
OPERATING RESULT (operating revenues – operating expenses)						

Statement of Financial Position

	Year 0 $'000	Year 1 $'000	Year 2 $'000	Year 3 $'000	Total $'000	Notes, data sources and assumptions
Assets						
Plant and Equipment						
Buildings						
Land						

Funding Sources

	Year 0 $'000	Year 1 $'000	Year 2 $'000	Year 3 $'000	Total $'000	Notes, data sources and assumptions
Total cash outflows (d)						
Total cash inflows (e)						
Net cashflow (d – e)						
Asset sales proceeds (f)						
Accumulated depreciation funding (g)						
Other sources of funds (h)						
Net Project Funding (f + g + h) = (d – e)						

Impact of project options on outputs (linked with the MPS and any CBRC decision)

Status quo

- Describe briefly (100 – 200 words) the impact of maintaining the status quo on each of the relevant agency outputs. For example, indicate if the status quo would allow the output performance to be maintained or improved.

Option name 1

- Describe briefly (100 – 200 words) the impact of this option on each of the relevant agency outputs. For example, indicate if this option would increase output performance.

Option name 2

- Describe briefly (100-200 words) the impact of this option on each of the relevant agency outputs. For example, indicate if this option would increase output performance.

Notes

1. …
2. …
3. …

A4 Cost-benefit analysis conclusion and recommendations

The headings outlined below provide a sample structure for a report on the cost-benefit analysis process and conclusions which may be prepared for project decision makers.

Executive summary

The executive summary provides:

- an outline of the outcome sought
- a summary of options considered
- details of the recommended option, with the key supporting findings.

Description of the outcome sought

This section summarises the nature of the project, including:

- the outcomes which are desired, and the project's objectives and outputs
- the consistency of the project with the government priorities and with the agency's roles and responsibilities
- reasons for government intervention to achieve the objective (i.e. why the market is not providing the goods or services at the desired cost or quantity, and how this restriction can be addressed).

Summary of options

This section summarises the options considered in detail, and describes briefly additional options which were identified but which did not progress to detailed consideration:

- each option assessed in detail, including how each option would address the outcome sought
- key assumptions common to all options, or specific to an individual option.

Summary of evaluation

This section summarises the key results of the financial, cost-benefit and budget analyses of each option, including some text outlining positive and negative factors in each option:

- the summary tables in *Appendices A.1* to *A.3* are included in this section
- the impact of sensitivity analysis on the results for economic and financial analysis for each option
- the risks associated with each option, measures to address these risks, and how the risks have been reflected in the values of the costs and benefits considered in the financial and economic analyses.

Conclusion and recommendation

This section identifies, from the evaluation, the option/s which would meet the outcome sought, and achieve positive economic and financial NPVs. The reasons for recommending the preferred option are also set out in this section.

To support the recommendation of a particular option, a summary of the financial, economic and budget analyses could be completed in the following format.

	Project option Status quo	**Project Option *Name 1***	**Project Option *Name 2***	**Project Option *Name 3***
Financial Analysis – Pessimistic Case				
NPFV – low discount rate				
NPFV – base case discount rate				
NPFV – high discount rate				
Financial Analysis – Most Likely Case				
NPFV – low discount rate				
NPFV – base case discount rate				
NPFV – high discount rate				
Financial Analysis – Optimistic Case				
NPFV – low discount rate				
NPFV – base case discount rate				
NPFV – high discount rate				

	Project option Status quo	Project Option *Name 1*	Project Option *Name 2*	Project Option *Name 3*
Cost-benefit Analysis – Pessimistic Case				
NPFV – low discount rate				
NPFV – base case discount rate				
NPFV – high discount rate				
Cost-benefit Analysis – Most Likely Case				
NPFV – low discount rate				
NPFV – base case discount rate				
NPFV – high discount rate				
Cost-benefit Analysis – Optimistic Case				
NPFV – low discount rate				
NPFV – base case discount rate				
NPFV – high discount rate				
Budget Analysis – Most Likely Case				
Total Operating Expenses				
Total Operating Revenues				
Total Assets				
Total Budget Impact				

Appendix B – Common cost-benefit techniques

B1 Risk assessment

Two issues to be addressed in estimating costs, benefits and probabilities are:

- correcting for a bias towards optimism in estimates of benefits and costs
- assigning probabilities to particular outcomes.

Correcting optimism bias

Capital costs

The following process would adjust for optimism in estimates of capital costs:

- estimate the capital costs for each option
- apply adjustments to these estimates, based on empirical evidence relevant to the type of project (e.g. based on experience in the relevant sector, current market conditions)
- reduce these adjustments according to: the degree of confidence in the capital costs estimates; the management of generic risks in the project; and the amount of work undertaken to identify and mitigate specific project risks.

In many cases, agencies would have information about market conditions, or comparable projects on which they can base adjustments to cost estimates.

Capital project duration

A similar process would adjust for optimism in estimates of capital project duration:

- estimate the time taken to complete the capital works
- apply adjustments to these estimates, based on empirical evidence relevant to the type of project (e.g. based on experience in the relevant sector, current market conditions)
- reduce these adjustments according to the degree of confidence in the capital duration
- estimate the management of generic risks in the project and the amount of work undertaken to identify and mitigate specific project risks.

An extension of time for completion of the project would delay the commencement of the flow of benefits, and therefore affect the NPV of benefits for the project option.

Operating costs and benefits

Adjustments for optimism in estimating operating costs can be made for known market factors (e.g. rates of wage increase; rents) and experience in similar projects. These adjustments could be made within the sensitivity analysis for a project. That is, building in a range of assumptions for wages growth, changes in rentals, changes in fees and charges and achievement of operating savings.

Assessing probabilities – Monte Carlo analysis

Monte Carlo analysis involves replacing single entries for key inputs to a financial or cost-benefit analysis with probability distributions of values for these inputs. The range of possible values would be based on sensitivity testing.

A calculation of costs and benefits is carried out many times randomly using a computer program, to combine different input values selected from the probability distributions for the inputs. The results consist of a set of probability distributions showing how changes in key inputs are likely to affect project outcomes.

A Monte Carlo analysis can show the percentage chance of the cost of a project being below an acceptable maximum, or the benefits exceeding a minimum level.

Note that this is not the only way of making these estimates. Other methods are acceptable but should be discussed with Queensland Treasury before they are used.

B2 Identifying cash flows

Cash flow analysis includes both initial and ongoing costs, and ensuring the full range of relevant costs and their timing that have a significant impact on the NPV outcome are incorporated.

Initial and periodic costs

All initial development expenditures required to achieve project benefits would be included in capital costs. Relevant costs are:

- construction costs
- furniture and fittings
- equipment purchases
- legal and consulting fees
- contingencies
- working capital.

Two types of costs often not included are contingencies and working capital. Contingent costs include factors which arise in circumstances not planned at the outset (e.g. loan guarantees if a project fails; or environmental protection measures). Working capital is required for the development of inventories (where a project will have an output which can generate revenue) and to allow for prompt payments to suppliers during project development.

Recurrent costs

The relevant operating costs for a project are:

- labour costs (e.g. salaries, leave loading, long service leave, payroll and fringe benefit taxes, superannuation and workers compensation contributions)
- additional administrative costs (e.g. changes in corporate overheads)
- provision for escalation
- consultant and legal fees
- lease costs
- goods and services used in achieving project objectives.

Where cash flows are expressed in current prices, using appropriate escalation factors is important:

- salaries and related costs should be adjusted at the rate of increase set out in any current enterprise agreements applicable to project staff for the life of the agreement. Beyond the life of the agreement, the average annual change in the Wage Price Index for Queensland, published by the Australian Bureau of Statistics, would be a suitable basis for adjustment
- administrative costs or purchases of goods and services would be adjusted (where appropriate) by the average annual increase in the Consumer Price Index, or a price index relevant for the category of inputs.

Non cash-flow items which appear in financial statements, but not in financial analysis are:

- depreciation
- asset revaluation provisions
- accounting adjustments.

Inclusion of taxes

Two factors affect the incorporation of taxes in the estimates of cash flows:

- competitive neutrality: whether inputs and outputs for a project would be additional to existing economic activity, or would substitute for other activity
- incremental output: whether different project options involve supply of goods and services by entities with a different tax status.

Competitive neutrality

The tax status of the entity providing goods and services for a project may be relevant where the project options involve a choice between procurement from public sector and private sector providers. For example, two options may be to use an internal government business unit (which may be exempt from company tax) or contract to a private service provider (subject to company tax). To ensure the different tax status of the two options did not distort the choice, a tax equivalent would be applied to the estimates of the costs of purchasing from the government business unit.

Incremental output

In most cases, the inputs or outputs for a government project could be regarded as substitutes for other economic activity (as the expenditure by government on the project is an alternative to expenditure on other projects or to private expenditure). Where this is the case, it is appropriate to include taxes on inputs to the project in cash flows, as this would be the price that other users of the inputs would pay. Therefore, taxes such as payroll tax, goods and services tax or transfer duties would be included in estimated expenses.

In the economic appraisal, the project output would be valued with the effects of taxes and subsidies removed, as this would be the value of resources used in the project to other users. Where a project would result in additional activity (which may be the case where the primary objective of the project is to increase overall capital expenditure or increase employment) the reverse approach would apply – inputs would be valued net of tax (as this represents the alternative value of resources used) and outputs would be valued including taxes (which would be the value consumers would place on additional output). The Commonwealth handbook on cost benefit analysis contains extensive guidance on this.

B3 Determining discount rates

Queensland Treasury will advise on the appropriate discount rate and/or discount rate methodology to use for each project. This section provides some guidance on factors which influence the discount rate.

Use of nominal or real discount rates

The choice of discount rate should be consistent with the basis for valuing costs and benefits in the analysis of project options:

- where the flow of costs and benefits is expressed in real (constant dollar) terms, a real discount rate should be used
- where the flow of costs and benefits is expressed in nominal (current dollar) terms, a nominal discount rate (including an allowance for inflation) should be used.

Reference rates for discount rates

The following reference points may be used when using the Capital Asset Pricing Model (CAPM) approach to determine the discount rates for projects:

- the interest rate for government borrowings for a term relevant to the expected duration of the project (e.g. for Queensland, this would be the QTC 10 year bond yield averaged over a rolling 5 year period for Business Case purposes only). An allowance for inflation can be deducted from this rate if costs and benefits are expressed in real terms
- the long-term average real economic growth rate, with an additional allowance for major risks and time preference for current consumption[5]. As this is a real discount rate, an allowance for inflation would need to be added to discount flows of costs and benefits expressed in nominal terms
- the rate of return on debt and equity for comparable private sector projects (as a public sector project would be competing with other activities for debt and equity capital).

Regardless of the discount rate used, sensitivity testing with higher or lower variations on the chosen rate should be used to allow for a margin for error, and the possibility of the project having unique characteristics which would limit the relevance of rates of return for other projects as a benchmark.

A ready reference on discount rates is included in Volume 5 (Discount Rate Methodology Guidance) of the National PPP Guidelines. These guidelines cover development of discount rates for government-funded projects and for public private partnerships.

B4 Sensitivity analysis

In determining the range of variations on the base case for estimating costs and benefits, the following techniques can be adopted.

Single variable sensitivity testing

This approach involves testing the impact of several different values for a key variable, which is likely to affect the outcomes for the project. For example, the impact of changes in the discount rate for the project on the NPV can be calculated.

This method tests the impact of changes in each variable separately, and therefore may not capture the interactions between different variables. It would enable analysts to determine which changes in individual inputs are likely to have the largest impact on project outcomes.

[5] UK Government, HM Treasury, *The Green Book*, *Appraisal and Evaluation in Central Government*, 2003

Scenario analysis

Conducting scenario analysis involves considering several alternative situations in which different combinations of changes to inputs would occur and how these combinations would affect project outcomes.

For example, several variations on the base case analysis could include:

- higher output prices combined with increased input costs
- a higher discount rate combined with earlier realisation of some benefits.

The advantage of scenario analysis is that it allows for the relationships between different variables to be explored.

Break even analysis

A break even analysis involves testing the amount of changes in key variables required to achieve a NPV of zero. If the analysis of the status quo or a project indicates the NPV is positive, a breakeven analysis will indicate by how much costs would need to increase and/or benefits to decline (or the timing of benefits delayed) to achieve a NPV of zero.

An analyst can then assess whether the variations in costs and benefits which lead to a zero NPV would fall within the likely range for these variables.

Monte Carlo simulations

As noted in *B.1 – Risk Assessment*, a Monte Carlo simulation requires the input of the full range of possible outcomes for each input variable and the probability of each outcome. By simulating a range of trials of a project based on these probabilities (determined on a random basis using a random number generator), this approach produces a probability distribution of all possible project outcomes.

As this technique requires larger volumes of data, it is most suitable for application to larger projects for which assessing the widest range of risks is essential.

B5 Shadow pricing and valuing non-monetary benefits

Shadow pricing

Where costs and benefits for a project do not have market prices, the following are several possible options for determining shadow prices are available.

Surrogate market approach (hedonic pricing)

This approach is based on the principle that the price of a product or service incorporates the value of the ranging characteristics of the product or service. These characteristics include factors which do not themselves have a market value, such as product safety or environmental impacts. If one of these characteristics changes the price of the product or service will change. Therefore, the benefits or costs of a policy change, or change in environmental conditions, which affects the characteristics of a product or service can be identified through changes in the relevant price.

For example, property values in a particular area reflect factors such as the size and construction standard of a property; proximity to transport and other services; and environmental aspects including air pollution, traffic noise or access to park land. A change in policy, or a new project, which affects environmental factors in the area could be valued by identifying changes in property values which could be attributed to the changes in environmental factors.

The challenge with the surrogate market approach is to separate the impact of the policy change or project from other influences in the relevant market.

Contingent value approach

This approach involves conducting a survey of how much money members of the public would pay to obtain a particular benefit, or would be willing to accept as a cost, if a market existed for the relevant benefit or service. This approach is used most often in valuing benefits from environmental policies and projects.

This approach relies on the validity of survey techniques. In a survey, the following points should be described clearly:

- an explanation of the change in environmental conditions being valued, to indicate to respondents the situation in the absence of policy action
- details of the nature of the policy change or project being assessed, and its likely impacts on the environmental objective
- the form in which payment for the benefit would be made (e.g. through taxes and charges).

The dose-response approach

Where valuations of benefits are difficult to make, an alternative is to measure the impact of changes in the production of a product or service (the dose) on relevant conditions or behaviour (the response). This is often used to measure environmental impacts.

Valuing non-monetary benefits

When valuing non-monetary benefits for a project, the following items should be considered.

- Value of human lives – for projects or policies related to areas such as road safety, occupational safety, medical research or health regulation, the value of lives saved can be an important indicator of benefits. Several techniques are available to value loss of life:
  - the most common method is forgone income, which calculates the present value of earnings over the remainder of a person's life expectancy. This method would not cover factors such as intrinsic value to the individual of living longer, grief of family members, and the value of lives of people involved in non-market activity
  - contingent valuation methods involve a survey asking how much people would be willing to pay to reduce the risk of death
  - studies of averting behaviour estimate the amounts people spend on safety devices, as a way of reducing risks. This method has the limitation that the investment in safety may be to reduce risks of injury as well as death, resulting in the overvaluation of a life.
- Value of health benefits - where a project or policy would lead to improved health standards, the following measures of the benefits are available:
  - the cost of illness approach measures actual costs for the incidence of illness. That is: diagnosis; treatment; rehabilitation and accommodation; and loss of work time
  - contingent valuation seeks information on how much members of the public would pay to reduce the prospect of illness or injury
  - studies of averting behaviour, including expenditures to improve health (e.g. use of filtered water, or vitamins and supplements) can lead to estimates of the value of improved health. As these expenditures can address a number of health goals, it can be difficult to assign a value to a particular health risk based on averting behaviour.
- Value of time savings - for transport projects and policies, the value of time savings in travel can be a significant component of benefits. Two methods for valuing time savings are:
  - behavioural assessment is based on responses to surveys by consumers, indicating the value of time saved (usually expressed as a proportion of hourly wages). Austroads recommends this approach.
  - the opportunity cost of travel, which is based on additions to either leisure or work time from travel time savings. This method requires allocating time savings between work and leisure, and placing an appropriate value on both. Savings allocated to work time can be valued at the cost of employing people per hour (including on-costs), while leisure time can be valued based on after-tax wage rates, or expenditure on leisure activities.
- Estimating ecological benefits - in addition to health benefits, policies or projects contributing to environmental objectives may have benefits which can be valued with the following approaches:
  - changes in the value of production in the primary sector resulting from improved soil or water conditions
  - the value of alternative approaches to achieving the objective (e.g. the cost of water treatment infrastructure as an alternative to natural filtration by wetlands)
  - the surrogate market approach in which property values can indicate the benefits of changes in environmental conditions
  - the value of recreation demand for benefits such as preservation of national parks or cleaner waterways. This can be estimated from the cost of travel to visit environmentally sensitive sites
  - contingent valuation, in which people surveyed place a value on the preservation or enhancement of environmental benefits.

B6 Presenting quantitative and qualitative benefits

Some economic impacts may have an additional intangible dimension. For example, changes in trade relations or removal of red and green tape may also have a bearing on business confidence. Business confidence cannot be directly translated into monetary changes, but it is a good leading indicator of the well-being of the economy. A positive or negative impact on business confidence, for instance, would be an important inclusion in the analysis.

There is a natural bias in favour of measurable outputs when it comes to assessing costs and benefits. Quantitative measures are easy to grasp for the evaluator and simple to understand for those receiving the report. However, many projects increasingly have to include qualitative costs and benefits that are somewhat more difficult to include in a cost-benefit analysis, which by its nature seeks to produce a measurable outcome. However, the quantification of various social, health or environmental impacts normally requires an alternative approach to valuation. As discussed in *B.5: Shadow pricing and valuing non-monetary benefits* there are a variety of methods that can be used to estimate 'willingness to pay' or 'willingness to accept' a project's outputs or outcomes.

In terms of presenting qualitative benefits, it is important for agencies to clearly present them from the early stages of the project being developed. This is where an agency describes the outcome sought by elaborating the issue(s) that need to be addressed.

This includes the context and background, its strategic objectives and the nature of the market failure or inequity justifying government action. For example, important cultural projects (e.g. a festival or sporting event) seek to promote Queensland and should not be assessed by using possible economic and employment benefits. Rather, it may be better to rank options by their ability to deliver a return on investment. Therefore, it is more appropriate to assess cultural projects against the performance criterion of delivering a marginal improvement in promotional success, rather than their gross economic impact.

Valuation is difficult as many non-market goods cannot be estimated. It is advisable to always make clear the margin for error in any estimates being used in 'difficult to quantify' values, and to make clear the assumptions on which the estimates are based. It is useful to consider that if qualitative issues are highlighted, they need to be material to the project and they have not been included in the cost-benefit analysis.

Appendix C – References

C1 Other government guidelines

The following references may be of use:

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C2 Other references

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