

Guideline for the use of Cost Benefit Analysis in mining and coal seam gas proposals

INTRODUCTION

Strategic Regional Land Use Plans

The NSW Government is introducing Strategic Regional Land Use Plans (SRLUPs) to balance resource development with the protection of strategic agricultural land. SRLUPs have been prepared for the Upper Hunter and New England North West regions, with SRLUPs for the Central West, Southern Highlands, Murrumbidgee, Alpine and Western regions to follow.

Gateway Process

The SRLUPs outline a new upfront assessment of certain mining and coal seam gas proposals by an independent panel. This process, known as the Gateway process, applies to State significant mining and coal seam gas proposals that require a new or extended mining lease and are located on strategic agricultural land. The independent Mining and Coal Seam Gas Gateway Panel assess and advise on the agricultural impacts of proposals on land and water before a development application (DA) can be lodged.

Applicants for proposals that have passed the Gateway have the option to submit a Cost Benefit Analysis (CBA) with their DA.

The CBA will then be considered through the merit assessment and determination process.

Cost Benefit Analysis

A CBA framework is a widely used tool for deciding between alternative development options. It allows decision-makers to consider trade-offs and decide whether the community as a whole is better or worse off as a result of the proposal.

A CBA framework is focused on the aggregate social welfare of the community. It should take account of the full range of

potential benefits and costs of particular actions, including environmental, health and other social impacts as well as economic impacts of particular proposals. It is not appropriate to examine only some types of impacts in isolation.

Only when benefits exceed costs, is there a net public benefit.

Cost benefit analysis is a comprehensive form of evaluation. It assesses the economic, social and environmental impacts based on well-developed, objective and democratic principles of valuation, and provides transparent and testable results that are open to empirical validation. It is also a practical instrument recommended for evaluation purposes by most multinational agencies and most governments in developed economies.

This guideline has been prepared to assist applicants and the independent Planning Assessment Commission (PAC) in preparing and assessing a CBA.

This guideline also explains how a regional study can assist with cumulative impacts. It is feasible to conduct CBA to assess the changes in net public benefits of both individual project level decisions and regional decisions involving land uses over broader geographic areas. However, the primary focus of this guideline is on the project level CBA.

KEY FEATURES OF CBA

A CBA should have the following key features:

- **Scope** – A CBA should include all first round (primary) impacts both direct and indirect but not secondary impacts.
- **Estimating costs and benefits** – A net public benefit or cost of a project can be calculated through the net benefit of a project less any associated public expenditure and any negative social, health or environmental impacts.
- **Discount rate** - A discount rate of 7 per cent per annum with sensitivity testing at 4 per cent and 10 per cent per annum.
- **Timeframe** - A term that reflects the time horizon of the impacts of a proposal. Long-term projects should use a 50 year timeframe and a residual value where applicable, but this does not preclude a longer time-frame if impacts are predictable.
- **Risk and Uncertainty** - A 'risk neutral' approach to expected costs and benefits.
- **Unquantified factors** - Decisions based on the quantified expected net benefits in conjunction with information on any impacts that cannot be valued.

WHEN A COST BENEFIT ANALYSIS IS REQUIRED

The Strategic Regional Land Use Policy provides that an optional cost benefit analysis can be undertaken for State Significant Development proposals for mining or petroleum (including coal seam gas) that have passed the Gateway process.

A proponent will have the option to submit a CBA with their development application, following receipt of a Gateway certificate

The cost benefit analysis is a tool to help inform decision making. The overall net public benefit is a matter for the consent authority which, based on the Minister for Planning and Infrastructure's delegations, is typically the Planning Assessment Commission (PAC) for State significant mining and coal seam gas proposals.

The PAC will consider whether the proposal will provide a net public benefit, informed by a CBA undertaken by suitably qualified economic professionals. The CBA will need to be consistent with these Guidelines and other supporting material published by the Government.

The cost benefit analysis will be independently peer reviewed as part of the PAC determination process.

The PAC will consider as part of its assessment, advice from the Gateway Panel set out in the Gateway certificate, any submissions received from relevant agencies, local government and the community, an assessment report from the Department of Planning and Infrastructure and any advice received from the Commonwealth Independent Expert Scientific Committee.

WHO SHOULD UNDERTAKE A CBA

The CBA must be prepared by a suitably qualified independent economic professional or professional firm that is registered for undertaking CBA on the list of pre-qualified consultants. The PAC will review the robustness of the CBA against this guideline and will obtain an independent third party peer review of the CBA.

HOW TO UNDERTAKE A COST BENEFIT ANALYSIS

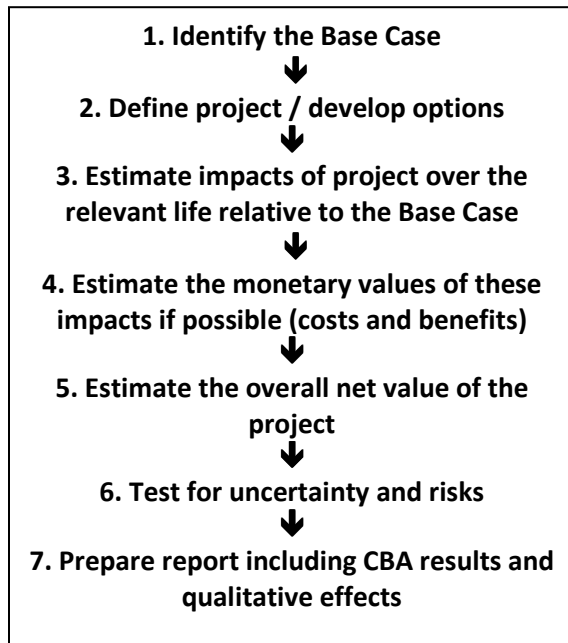
CBA estimates and compares the total benefits and costs of a project or policy to the members of a specified community. In order to do this, a CBA:

- Lists all groups in the community affected by a policy or project and values the effects on their welfare in monetary terms *as the effects would be valued by the parties themselves*.
- Aggregates these benefits and costs over the whole community and estimates the net social benefit or cost (the total benefit less total cost) to the community.

Benefits and costs are generally different in nature and, to be compared, need to be converted into a comparable unit. This requires that wherever possible, benefits and costs are valued in dollars, at current day prices.

The steps in undertaking a CBA are outlined as follows:

Generic steps in undertaking a cost benefit analysis



1. Identify the Base Case

The 'base case' is typically a projection of the current land use case including current and committed policy settings. The base case effectively describes a *business as usual* scenario.

2. Define Project and Develop Options

Any proposal should be compared to the base case. The CBA estimates all substantive benefits and costs of the project including, for example, long-term environmental costs after the project ceases operation. All impacts need to be identified in the report, whether or not they have been quantified or valued in dollars. The project definition can also include options or scenarios for mitigation programs that can be assessed.

3. Estimate the Impacts of the Project

Identify and forecast all significant impacts of the project, i.e. due to both outputs and inputs. The net impact should be determined

relative to the base case. This means the costs and benefits of the base case which will be foregone if the project proceeds should be netted off against the costs and benefits of the project case.

4. Estimate the Monetary Value of these Impacts

Where market prices exist, these are a starting point for valuations of both output produced and the inputs used for production. In exceptional cases, where market prices do not reflect real values or costs, adjustments may be made to reflect the real value of output and of input resources.

Where market prices do not exist, as for many environmental impacts, the aim is to value the forecast impacts as they would be valued in money terms by the individuals who experience them. These issues are discussed in further detail below.

5. Estimate the Overall Net Value of the Project

In order to include all effects of a project, all estimated individual benefits and costs that have been valued are summed into an overall measure of net public benefit, i.e. the Net Present Value.

To allow for costs and benefits occurring at different times, all costs and benefits are converted into present value equivalents via a discounting process.

6. Test for Uncertainty and Risk

Most forecasts of costs and benefits are to some extent uncertain. Sometimes, some impacts cannot be reliably forecast or valued. The CBA should include sensitivity tests to show how the outcome of a project may vary with plausible alternative estimates of the quantified costs and benefits. Results of the analysis would report any significant variations in potential outcomes from sensitivity tests, so that these may be considered by the PAC in its deliberations (see section on risk and uncertainty below).

The report should also be explicit about any limitations. This should include a discussion of the uncertainties and, where applicable, a

discussion of any major qualitative (unquantified) impacts.

7. Prepare Report Including CBA Results and Qualitative Impacts

The report should be objective, transparent, include verifiable information and be comprehensive but not of excessive length. The report should describe all of the options, the evaluation method, the quantified impacts and the estimated Net Present Value (NPV) of quantified data and discuss any significant aspects that cannot be quantified.

Projects with a positive NPV (assuming there are not significant costs and benefits that cannot be valued) are worthwhile. However if there is a high level of uncertainty about some variables, the PAC will either seek additional information within a reasonable timeframe or determine the project based on the information available.

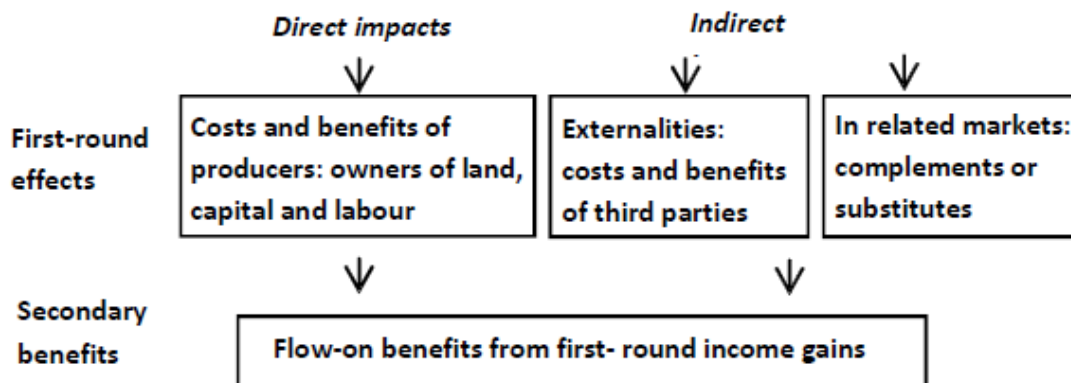
SCOPE OF A CBA

The scope of CBA includes all first round (primary) impacts - both direct and indirect. The *direct* effects are the impacts on the land use in question, for example, additional revenue that can be derived from the site in its new use. The indirect impacts are impacts on third parties, including all the environmental, social and health costs and benefits, and impacts in related markets. For example, impacts on aquifers or air pollution are considered indirect impacts.

All first round primary impacts are included in a CBA, regardless of whether they are the prime aim of the proposal or a third party effect.

Secondary effects are flow-on impacts from first-round impacts, such as the spending associated with income gains. These effects are not usually included in a CBA.

First and second- round effects of projects and policies



ESTIMATING COSTS AND BENEFITS

The net public benefit or cost of a project or policy can be calculated through the net benefit of mining or coal seam gas (CSG) compared with the other land uses, less any associated public expenditure (not paid for by

the mining company) and any negative social, health or environmental impacts. There may also be other economic impacts on local business that may be positive or negative.

$$\begin{array}{ccccccc}
 \boxed{\text{Net Public Benefit/Cost}} & = & \boxed{\text{Net Benefit or Cost from project}} & - & \boxed{\text{Net Public Infrastructure costs}} & - & \boxed{\text{Net Social \& Environmental Costs}} & + & \boxed{\text{Net Other Economic Impacts}}
 \end{array}$$

The key elements that determine the net public benefit of a major project are:

- A. The value of using land for mining or CSG production rather than for an alternative use in the base-case:
 - Gross mining revenue *less*
 - Mining/CSG exploration costs
 - Mining/CSG capital investment costs
 - Mining/CSG operating costs
 - Rehabilitation expenses
 - Foregone agricultural and other revenue less costs assumed in the base case

- B. The changed cost of any related major public expenditure that is not internalised in the economics of the mining or CSG project, (e.g. water, sewerage, drainage transport, roads) relative to the base case.

- C. The changed environmental and social impacts of various kinds, compared to the base case, including:
 - water quality impacts
 - any impact on streams, alluvial aquifers or alluvial soils, including subsidence
 - air pollution
 - noise pollution
 - visual amenity
 - carbon emissions
 - traffic congestion
 - biodiversity (flora and fauna)
 - conservation
 - quality of open space
 - rural amenity and culture
 - heritage (Aboriginal and European)
 - any other environmental impacts.

- D. Other economic effects compared to the base case not captured in the mining economics or environmental effects or impacts on other local industries such as tourism.
 - increases in mine worker wages
 - profits of mine suppliers
 - impacts on farmers not elsewhere included
 - impacts on labour supply
 - local tourism effects
 - any other economic effects.

These benefits and costs should be estimated where possible as those that accrue for New South Wales. In the first instance, it will generally be most practical to assess all major costs and benefits to whoever they accrue and then adjust to estimate the proportion of these attributable to residents of the State.

In estimating these benefits and costs, there is the practical principle of materiality — costs and benefits that will not have a material bearing on the decision do not need to be included in a CBA.

Many small costs and benefits may have no material impact on the overall net value of a major project. For example, if the gross costs and benefits are around \$100 million and the estimated NPV is say \$20 million, costs or benefits valued at less than \$1 million are unlikely to be material.

Estimating the net benefit from a proposal

Estimating the net benefit or cost from the project can utilise much of the data that may have been derived for financial evaluation.

The robustness of forecasts of output and costs will depend on the reliability of the estimates from sample exploration data and the availability of data on capital and operating costs. Also, mean (average) forecasts of coal and energy prices will be needed.

The evaluation must also allow for the value of rural output and residential amenity given up or forgone. This may be estimated either by the present capital value of the property involved or by estimates of net revenue foregone from rural output.

Current land prices are generally an appropriate indicator of the 'present value' of future output, housing and lifestyle uses associated with land in its current use.

Care should be taken to exclude any part of the land price that may reflect the impact of mining, positive and negative. Thus it should exclude, for example, any element of mining profit that is capitalised into the land price which is part of the net benefit of mining. It

should also ignore any discount in the land price that could be related to the threat of mining having a negative impact on amenity.

When a mining or coal seam gas operation is compatible with a continuing mix of agricultural and residential land uses, the fall in the value of the non-mining land would reflect the present value of output, housing and lifestyle forgone.

Estimating the change in public infrastructure expenditure

The cost of economic services, including utilities (water, sewerage, drainage, power and communication expenditures) and transport infrastructure that are required for any major development should be included in a CBA of major industry projects. Where these services provide a community benefit to other users, the costs of provision should be pro-rated approximately with benefits provided.

The provision of social infrastructure associated with employment and population growth (such as housing and land development, community services, schools and hospitals) should generally not be included as a cost against an economic development. There are two reasons for this.

Firstly, some of the services, such as housing, land and community services should be self-financing from any new housing development and should not require a subsidy from existing communities.

Secondly, schools and hospitals will be needed generally across NSW to accommodate population growth irrespective of its location. This means that expense in one area is generally transferred from expense in another.

However, if there are demonstrated exceptional public expenses on social services associated with a project (or regional development), due to above average costs of service provision, they should be counted as a cost against such a development.

Estimating environmental impacts

Estimating environmental impacts involves three stages:

1. estimating the physical impacts, for example, impacts on water quality,
2. estimating the effects of these impacts on business (for example, on agricultural productivity) and on households (for example, on health) and
3. valuing these impacts.

Some impacts such as effects on water supply and quality, air quality, traffic congestion and noise are likely to have quantifiable impacts on identifiable businesses and/or households. Relevant experts should be able to advise on and quantify material environmental changes in most of these cases. However, in some cases, as with the impacts of CSG mining on water quality, the impacts may be less certain at least until more information is available.

The physical environmental impacts may translate into three main kinds of effects — on productivity, health and household amenity. For example, a change in water quantity or quality may have significant effects on agricultural productivity. A change in water or air quality may have adverse effects on population health. A change in water quality may also affect recreational amenity and health if drinking water is impacted.

The second step is to translate the forecast physical environmental changes into impacts on business output or costs and on household health. Such estimates are generally feasible, albeit with some uncertainty about precise impacts. For example, industry can advise on the productivity effects and epidemiologists on health effects.

Third, the estimated impacts on business productivity, health and amenity need to be valued. This is quite straightforward in the case of business. What matters here is any loss of economic surplus that would result from the environmental changes. This is the loss of revenue or increases in costs (less any savings associated with lower output).

Likewise for health, there is substantial material available on how to estimate the costs of health impacts accrued to government (health care costs), business (loss of output) and households (lifestyle costs).

The valuation of general environmental impacts and amenity, such as loss of quality open space or biodiversity or a change from a wholly rural/agricultural environment to a mixed rural/mining environment is more complex. Property price changes may provide valuations, but household surveys may be required. These effects may therefore have to be viewed as an unvalued effect and possibly even an unquantified effect. (see section below on Unquantified Factors)

Estimating other economic impacts

In this category, three possible impacts have been identified — increased wages for workers who choose to work in the mining sector, increased profits for suppliers to the mining sector and changes in incomes in tourism or other local businesses.

Workers who transfer to the mining sector and earn higher wages are in effect increasing their productivity. The value of their output for given work hours is increasing. The real benefit for the worker is the difference between the wage that workers are paid in mining and their minimum reservation wage (i.e. the minimum wage they would accept) for working in the mining sector (which reflects their relative occupational preference).

An alternative approach would be to include the 'reservation wage' rather than the actual wage as the real cost of workers in mining. Under this approach, any worker surplus above this (benefits) becomes directly part of the surplus of the project. If there is a worker surplus, it does not matter where this is accounted for.

Likewise, suppliers to the mining sector may achieve higher surpluses. This arises where suppliers have fixed costs and can achieve some economies of scale. Plausibly, the surplus might be in the order of 20 to 30 per

cent on increased sales (but this would require some validation).

On the other hand, suppliers of tourism-related services may suffer a loss of net income as a result of an expansion of mining. However, this may be a short-run impact as investment in facilities will adjust to tourism levels and tourism operators will not carry excess capacity with its associated costs in the long run.

It should be noted that some businesses, including accommodation businesses, may *gain* as a result of extra mining workers.

Overall, only limited other economic effects, should be considered. Many economic effects are changes in prices that are gains to some people and losses to others—i.e. they are transfers between communities or areas, and have no net impacts. In general, indirect economic effects rarely turn a project with a negative net present value to a project with a positive net present value (and vice versa).

The Table at Annexure 1 summarises each element and provides some examples of valuation methods and data sources that can be used. Annexure 2 provides an example of a spread sheet for evaluating mining projects. Annexure 3 summarises typical methods of valuation for non-market impacts.

DISCOUNT RATE

Benefits and costs are generally different in nature and, to be directly compared, need to be converted into a comparable unit. The preferred measure is the Australian dollar in current day prices.

The CBA framework considers the timing of impacts by converting them into today's terms so that they can be meaningfully compared.

A discount rate of 7% should be used and tested at 4% and 10%. All costs and benefits should be discounted by the same rate.

TIMEFRAME

The costs and benefits should be estimated over the timescale of the impacts of a project. Where a project has environmental impacts (positive or negative), the impacts may continue well after the productive life of the project under consideration. It is recommended that long-term projects should use a 50 year time-frame and where applicable a residual value for impacts beyond that time-period. However, where predictable and material, a longer time-frame can be adopted.

RISK AND UNCERTAINTY

Most forecasts of costs and benefits are somewhat uncertain. Sometimes, some impacts cannot be reliably forecast or valued with confidence. The evaluation must then assess whether to attempt to quantify these factors very approximately or to treat them as unquantified items. Most CBA studies have some unquantified items. These should be described and an indication given of their likely relative significance.

With regard to the quantified impacts, the general principle in CBA is to estimate the average expected values of the factor. This risk neutral approach means that the estimated net present value should reflect the expected (mean) net present value.

The CBA should also provide sensitivity tests that show how the outcome of a project may vary with plausible alternative estimates of the main uncertain quantified costs and benefits and for a range of discount rates.

Sensitivity tests show how the estimated outcomes may vary with variations in key assumptions. To be useful, these tests should indicate how likely the tested scenarios are. Sensitivity tests are useful if there is a plausible likelihood of the alternative estimates being correct.

Importantly, if there is a high level of uncertainty about some variables, or the valuation of certain economic, social or environmental impacts, then options include seeking additional information prior to a

decision or making a decision on the available information. This will be particularly important when long term damage is a possibility as a consequence of a land use decision (e.g. through the indefinite loss of an aquifer). In such circumstances a decision rule may need to be qualified.

LIMITATIONS OF CBA

Cost benefit analysis should incorporate all relevant economic, social (including health) and environmental impacts. It is not appropriate to examine only some types of impacts in isolation.

The commonly argued limitations of CBA are data availability, uncertainty, valuing unpriced assets, timing and the value of waiting, and distribution and social equity.

These limitations are also relevant for all other evaluation approaches. One of the strengths of CBA over other approaches is its systematic approach to quantifying and valuing impacts. This is particularly important in the context of evaluating land use decisions given the potential for double-counting of impacts without a systematic framework.

UNQUANTIFIED FACTORS

As has been stressed, some impacts may not be quantified. For example it may be very hard to quantify the amenity effects of a change in land use from a traditional rural use to a mining one.

Unquantified impacts should be discussed in the CBA report. However it should be stressed that these impacts should be viewed in the context of the quantified net public benefit or cost. If there is an estimated net public benefit, do these factors offset this benefit? It would be inappropriate to set up an arbitrary point scoring system as an alternative measure of the net public benefit or cost.

The preparation of a CBA report should be explicit regarding assumptions and include discussion of any qualitative impacts.

DISTRIBUTION EFFECTS

While the main objective is to estimate the impacts on NSW, in the first instance, it will generally be most practical to assess all major costs and benefits to whoever they accrue.

Most public expenditure, environmental impacts and other economic effects are likely to be NSW costs or benefits. Carbon emissions are a major exception. Also, some local businesses, in the mining, agricultural and equine sectors for example, may involve non-local ownership. Most of the other economic impacts will also affect mainly NSW workers or businesses, with some benefits accruing to non-NSW interests.

Thus a critical factor will be the distribution of any net financial surplus from mining – the surplus being the excess profit over and above the normal rate of return that reflects the investment risk. Economic theory suggests that most of the surplus should accrue to the existing owner of the mineral rights (i.e. the state government) or to governments (Commonwealth and state) that have the power to tax the surplus. Investors may obtain a normal return on capital (which meets the cost of capital) but not an economic surplus from finite mineral resources.

In practice, part of any mining surplus is likely to accrue to existing and new landowners, to the Commonwealth via taxation and corporate profits, state royalties and to providers of capital, mining employees who receive higher wages than in other occupations, and suppliers of goods and services to the mining business.

COST BENEFIT ANALYSIS AT THE REGIONAL OR CATCHMENT LEVEL

CBA is also a useful tool to assess possible future pathways when making land use decisions at the regional or catchment level.

Importantly, CBA can help assess the *cumulative* impacts of land use changes over

multiple projects and over time. While it may not be feasible to assess all possible land use permutations at a regional or catchment level, for plausible defined scenarios, CBA can indicate whether there is the potential for greater overall community benefits from a change in land use, compared to the base case.

Such an evaluation could include multiple mines having an impact on an aquifer or a community's health.

The appropriate regional area to choose will depend on the expected magnitude of different types of benefits and costs and the variation expected from cumulative assessment versus project level assessment. For example, where there are likely to be thresholds at which physical assets (such as water) become degraded, and the value of these changes is likely to be large in the context of other costs and benefits, then the area for which these impacts accumulate across projects would be a suitable region for CBA.

The method of evaluation of land uses across sub-regions or catchments is principally the same as for project evaluation.

Regional or catchment level studies could be initiated in the following ways:

1. The Planning Assessment Commission may recommend a net public benefit study of a particular region or catchment with defined scenarios, or
2. The NSW Government may undertake/commission a regional or catchment level analysis as part of a review or ongoing development of strategic regional land use plans.

The primary purpose of this guideline is to explain what is required in a cost benefit analysis for the PAC. Hence, the focus on project level CBA.

FURTHER WORK AND INFORMATION

There are a number of information-gathering steps that can improve the measurement of

CBA for the purposes of Strategic Regional Land Use Planning:

- Improved information on base case environmental conditions will assist project level CBAs to consider changes relative to this base case.
- Benchmarking work on the impact of mining activities on surrounding area land values will improve the measurement of the costs and benefits associated with new or expanded mines.
- Benchmarking work on the likely impact of additional mining activity on wages and employment in the New England North West and Hunter regions will improve the measurement of the benefits accruing to NSW from mining activity.
- Improved understanding of the biophysical impacts associated with coal seam gas will allow for more informed CBA.

This knowledge will be developed over time as the Gateway process and Strategic Regional Land Use Plans are implemented.

If you would like further information relating to the preparation of cost benefit analysis, or the strategic regional land use plans, you can contact the Department of Planning & Infrastructure: www.planning.nsw.gov.au
NSW Treasury: www.treasury.nsw.gov.au
or the NSW Treasury Guidelines on Cost Benefit Analysis:

http://www.treasury.nsw.gov.au/_data/assets/pdf_file/0016/7414/tpp07-5.pdf

© State of NSW through NSW Department of Planning & Infrastructure
23–33 Bridge Street, Sydney NSW 2000. GPO Box 39, Sydney NSW 2001
T 02 9228 6333 F 02 9228 6555 E information@planning.nsw.gov.au
www.planning.nsw.gov.au

Disclaimer: While every reasonable effort has been made to ensure that this document is correct at the time of publication, the State of New South Wales, its agencies and employees, disclaim any and all liability to any person in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this document.

Annexure 1: Summary Table of Indicative Costs and Benefits, Methods of Valuation and Examples of Data Sources.

INDICATIVE BENEFITS AND COSTS	METHODS OF ESTIMATING VALUE	EXAMPLES OF DATA SOURCES
A Estimating the Net Benefit from Mining or Coal Seam Gas		
Revenues from mining or CSG per annum and any other revenues from the land use during or after mining. Costs include capital expenses, exploration expenses, infrastructure contributions, operating expenses per annum and remedial costs post mining.	Project financial evaluation. Forecast coal and energy prices.	Proponent. Production forward price curves. Exchange rate assumptions Operational and maintenance costs Land costs Wages
Evaluation must allow for the value of rural output and residential amenity forgone.	Property prices or estimates of net revenue from rural output foregone.	Property prices without mining effects or revenues foregone to rural land over the lifetime of the project and the potentially reduced agricultural output after rehabilitation.
B Estimating the Cost of Changes in Infrastructure		
Utilities (water, sewerage, drainage, power and communication expenditures) and transport infrastructure.	Costs that are not internalised to the project. Where these services provide a community benefit to other users, the costs should be pro-rated approximately with benefits provided.	Suppliers of infrastructure
C Estimating Environmental Impacts		
First estimate the physical impacts on productivity, health and household amenity. Second, estimate the effects of these impacts on business (for example, on agricultural productivity) and on households (for example, on health) and third, value these impacts. Some types of environmental impacts are below for illustrative purposes. They may not represent a comprehensive list for individual projects.	Revealed preference techniques such as hedonic pricing, including examining property values. Loss of business revenue or increase in costs.	Market data should be used where they exist. If significant environmental issues cannot be quantified by accepted methods, descriptive material should be provided.
Air quality	Environmental Impact Assessment	Ashton Coal: South East Open Cut (SEOC) Environmental Assessment National Health and Medical Research Council Office of Environment and Heritage
Health	There is a great deal of material on how to estimate the costs of ill health to government (health care costs), business (loss of output) and households (lifestyle costs).	Julaludin et al (2009) <i>A Methodology for Cost Benefit Analysis of Ambient Air Pollution Health Impacts</i> Workcover NSW 2010 NSW Workers Compensation Statistical Bulletin Kunzli, N. et al (2000) <i>Public-health impact of outdoor and traffic-related air pollution: a European assessment</i> The Lancet, Vol 356(9232), Institute for Social and Preventative Medicine, Switzerland, September, pp.795-801. Spix et al (1998) <i>Short term effects of air pollution on hospital admissions of respiratory diseases in Europe: a quantitative summary of APHEA study results.</i> Arch Environ Health, Vol 53(1), pp. 54-64.

INDICATIVE BENEFITS AND COSTS	METHODS OF ESTIMATING VALUE	EXAMPLES OF DATA SOURCES
Groundwater	Estimate effects on productivity of other businesses and potential health effects.	Market data should be used where they exist. Centennial Coal Company: Awaba Coal Project groundwater assessment. Lake Coal: Chain Valley Colliery EIS Whitehaven Coal: Rocglen Coal Extension Xstrata: Ulan Mine Continued Operation EIS Wyang areas Coal Joint Venture: Wallarah 2 Ashton Mine South East Open Cut Namoi Catchment Water Study Santos Water Portal SKM & Sustainable Mineral Institute (2011) <i>Framework for Assessing Potential Local and Cumulative Effect of Mining on Groundwater Resources</i> Waterline Series No59 Oct 2011
Noise	Property valuation techniques including hedonic pricing and willingness to pay.	Eg: Centre for International Economics 2012 appendix D.
Biodiversity	Use of valuation techniques such as hedonic pricing, and willingness to pay.	Eg: Centre for International Economics 2012 appendix D.
Heritage (Aboriginal and European)	Valuation techniques including time travel costs and stated preference techniques.	Aboriginal Heritage Information Management System (AHIMS)
D Estimating Other Economic Impacts		
Other economic impacts includes increased wages for workers who choose to work in the mining sector, increased profits for suppliers to the mining sector and changes in incomes in tourism or other local businesses. On the other hand, suppliers of tourism-related services may suffer a loss of net income as a result of an expansion of mining if visitors to an area decline. It should also be noted that some businesses, including accommodation businesses, may gain income a result of extra mining workers.	Only limited other economic effects, if any, are generally considered because many of these economic effects are simply changes in prices that are gains to some people and losses to others—i.e. they are transfers between communities or areas with no net impacts. In general, indirect economic effects rarely turn a poor project into a good one and, conversely, they rarely turn a good economic project into a poor one.	
E Estimating the net benefits to NSW		
The community of interest is the NSW community.	In the first instance assess all relevant costs and benefits to whomsoever they accrue. In general, most public expenditure, environmental impacts and other economic effects are likely to be predominantly NSW costs or benefits. Make explicit adjustment to estimate NSW share of appropriate costs and benefits.	Company information. NSW population share.

Annexure 2: Example of Summary Spreadsheet Output for Evaluation of Mining or Coal Seam Gas Project

Example of Spread Sheet for Evaluation of a Mining Project (\$'000s, 2012 prices)																			
This is only an example of the type of impacts to be estimated. Any cost benefit analysis will need to be tailored to the specific project.																			
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031-60
Net mining benefit																			
Revenues from mining				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	As needed
Revenue from land uses post mining																			As needed
Value of land taken (a)	X																		
Exploration expenses	X																		
Capital expenses	X	X	X																
Infrastructure contributions	X	X																	
Operating expenses				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	As needed
Remedial expenses																			As needed
Net mining benefit	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	As needed
Public infrastructure expenses (b)	X	X																	
Quantified environmental impacts (c)																			
Water impacts		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	As needed
Air quality impacts		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	As needed
Carbon emissions		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	As needed
Traffic congestion		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	As needed
Noise		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	As needed
Any other quantified impacts		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	As needed
Total environmental impacts		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	As needed
Other economic impacts (d)																			
Increased wages of mining workers				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	As needed
Increased profits of mining suppliers				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	As needed
Other changes in local business incomes				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	As needed
Total other economic effects				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	As needed
Net public benefit	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	As needed
Net Present Value (NPV) @ 7 %	X																		
Scenario test @ 4%	X																		
Scenario test @ 10%	X																		
Notes (see text for more explanation)																			
(a) Alternatively the evaluation could include a model of the forgone returns to rural/agricultural land over time, up to say 50 years.																			
(b) Public infrastructure not funded by mining company.																			
(c) Where possible environmental impacts should be valued, but some impacts like loss of biodiversity may not be quantified.																			
(d) These impacts should be included only when there is clear evidence for them																			

Annexure 3 Summary of Methods of Valuation Techniques

To estimate monetary values, where market prices exist these prices can be taken as a starting point for valuations. In some circumstances, where market prices do not reflect real values or costs, adjustments may be made to reflect the real value.

Where market prices do not exist, as for many environmental impacts, the aim is to value the forecast outcomes as they would be valued in money terms by the individuals who experience the impacts. The main methods are revealed preference methods like hedonic pricing, travel time costs, defensive expenditure or lost output methods, and stated preference methods like willingness to pay or choice modelling.

Hedonic Pricing

Some market goods contain bundles of characteristics, some of which are unpriced. When these goods are traded, consumers express their values for the intangible good (or bad) which can be uncovered through the use of statistical methods like multiple regression analysis. One of the most useful data sources is land and property prices. Electronic databases make this process far easier than it once was. Although two properties are never exactly the same, an unpriced asset – like a view or noise – can be isolated when sufficient transactions are analysed. This process can be difficult when there are numerous characteristics which can be collinear– such as ‘amenity’ which is a difficult parameter to isolate.

Travel Time Costs

The purchase of market goods and services is sometimes required to access an unpriced good. People have to spend time and money travelling to recreational facilities, some of which have fees. The number of trips combined with differences in travel time costs provide some indication of the value of the recreational experience.

It can be complicated by the fact that people travel to more than one such site on one journey and that the travel time itself has value that is hard to quantify accurately.

Defensive Expenditure

Another ‘revealed preference’ technique to value intangible costs, is to examine what people pay to avoid a cost. Spending more to mitigate noise impacts or buying safety equipment can reveal how much people value quietness and safety.

Similarly, this method is complicated by the fact that these goods and services may have more than one benefit. For instance, noise insulation also reduces energy consumption.

Lost Output

The increased costs of healthcare and lost productivity due to, say, air pollution, have measurable economic consequences. Epidemiological studies of community health attempt to isolate various factors but with a mobile population and with incremental costs over a long period of time, these are difficult to measure. For example, air pollution in a metropolitan area has a number of causes and changes occur incrementally. Also, there may be thresholds that trigger reactions when breached.

Stated Preference Techniques - Willingness to Pay and Choice Modelling

Questionnaires are undertaken that either ask directly what someone is willing to pay, or ask people to choose between different bundles of characteristics, from which analysts can infer willingness to pay (or willingness to accept).

These surveys are also referred to as ‘stated preference’ whereas the other methods are referred to as ‘revealed preferences’. Stated preference surveys can be costly but benchmarks can be developed over time and are particularly useful when revealed preferences are difficult to ascertain, or stated preferences can be used to validate the reliability of other methods.