Principles and Standard Parameters for Cost-Benefit Analysis of Investment Attraction Proposals

Investment Appraisal

January 2025

CONTENTS

1. Executive Summary

1.1   Purpose

The "*Principles and Standard Parameters for Cost-Benefit Analysis of Investment Attraction Proposals*" (Parameters paper) outlines the principles, methodology, and parameters used in conducting cost-benefit analysis (CBA) for investment attraction proposals. Additional investment attraction proposals aim to stimulate investment, create jobs, and foster innovation within a specific region.

Examples include projects that encourage businesses to establish or expand their operations in NSW, particularly in sectors aligned with the NSW Government's economic growth strategy. Projects may involve foreign direct investment or locally funded investment but only to the extent that the investment is additional and the result of the NSW Government initiative.

The purpose of this paper is to support practitioners in undertaking analyses on investment attraction proposals consistent with the NSW government guidance (TPG23-08).

1.2   Benefits considered

The new framework considers the economic implications of investment attraction proposals from four perspectives:

    a)   net benefits to local workers

    b)   net benefits to local owners of NSW businesses

    c)   net benefits to NSW consumers

    d)   net benefits to Government finances

These parameters should not be viewed as a constraint on the range of scenarios or assumptions an analysis can consider. Rather, they represent an agreed set of central assumptions sufficient to give decision makers a conservative estimate of the benefits and costs associated with a proposal. Analysts remain free to assess the implications of alternative assumptions in parallel with these central estimates.

1.3   Background

In January 2012, the NSW Government adopted a new CBA framework for assessing investment attraction proposals. This 'parameters paper' was jointly developed by NSW Treasury and the Investment Appraisal (IA) team of the then Department of Trade, Investment, Regional Infrastructure and Services. Investment Appraisal now operates within the Premier's Department.

This paper was updated in 2017 when IA completed the labour parameter survey, to capture primary researched-backed labour surplus data, and to better align to the then NSW Government Guide to Cost-Benefit Analysis (TPP17-03).

In 2022 the labour parameters survey was conducted again with an updated methodology. This parameters paper is an updated version of the 2017 parameters paper. It reflects the new labour parameters survey, the new NSW Government Guide to Cost-Benefit Analysis (TPG23-08), and improvements in practices since 2017.

2. Net Benefits to Local Workers

Theoretically, the net benefit of a project to an individual worker reflects the difference between:

- the income and non-income amenity derived from their work with the project

- their income and non-income amenity in the absence of the project.

Figure 1 is representative of impacts on an individual worker, and an aggregated group of workers.

In Figure 1, the areas D and E represent local worker total income before tax with the project, with A and B representing local worker total income before tax in the absence of the project.

The areas D and F represent local worker welfare with the project, with A and C representing local worker welfare in the absence of the project. The net benefits of the project for local workers can be represented as [(D+F) – (A+C)]. However, given the difficulty determining amenity outcomes [F and C] and the direction in TPG23-08 on income tax, net benefits of the project for local workers can be estimated by considering the before-tax income [(D+E) – (A+B)].

Figure 1: Net Benefits to Local Workers: After Tax Incomes, Non-Income Amenity and Income Tax Leakages
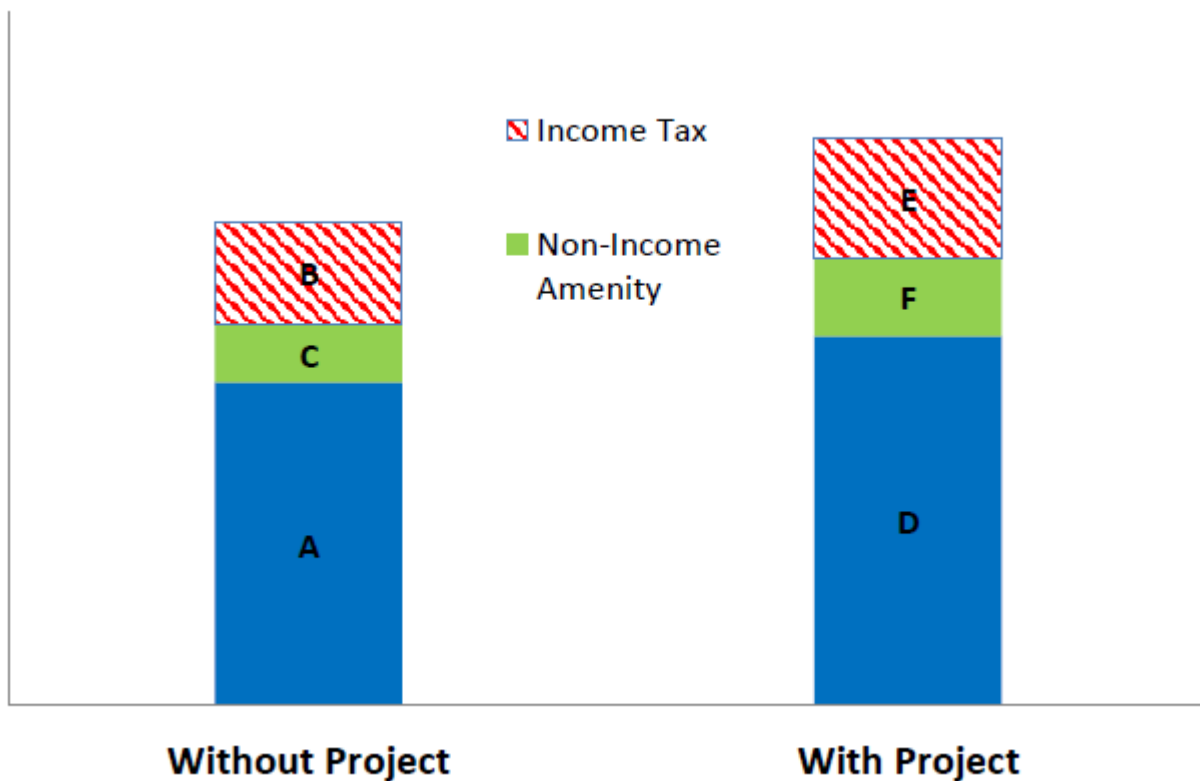
While income is a narrow and straightforward concept, 'non-income amenity' (items C and F) is not. Non-income amenity is a net figure taking into account both:

- benefits including learning on-the-job skill acquisition and transfers, greater self-esteem, friendships and social networks and health benefits;

- costs incurred by workers in the course of employment, including transportation costs to the workplace and the loss of leisure time, as well as the transaction costs associated with moving between jobs or into employment.

If the change in net non-income amenity associated with moving into project employment differs from workers' non-income amenity in the absence of the project, the cost-benefit analysis should account for that difference.

Additionally, while items C and F are represented in Figure 1 as positive figures that add to local workers' welfare gains, in principle the net figure could be negative if non-income amenity costs exceed non-income amenity benefits.

In practice, it will usually be difficult to identify and account for differences between with-project and without-project non-income amenity outcomes. Possible exceptions could be benefits unemployed workers gain through project employment, and the transaction costs all workers face in moving between jobs. However, even where these aspects are identifiable, they will usually remain difficult to quantify in a satisfactory way.

Items E and B of Figure 1 are the income taxes payable on income earned both with and without the project.

Income taxes accrue to the Commonwealth, so the difference between E and B is not a welfare gain or loss from the perspective of the local worker. From the workers' perspective, these items represent a 'leakage' of income to an external party.

However, these taxes will likely be returned (in part) to the people of NSW through the provision of Commonwealth funded public services. Consistent with TPG23-08, the impact cannot be estimated accurately so analysis should be undertaken on a pre-income tax basis.[1]

Framework principles for estimating the net benefits are outlined below. Standard parameters for estimating benefits are at *Appendix 1: Standard Parameters for Net Benefits to Local Workers*.

In circumstances, for example where the project is highly productive and operating significantly closer to the global production possibility frontier compared to existing NSW industry, attraction of the project may result in additional benefits through skill spillovers. These benefits accrue from increased skills and productivity in NSW from employment in cutting-edge firms and industries. These benefits may be included in a sensitivity analysis.

2.1   Labour principles

Theoretically, estimating net benefits to local workers requires that the analysis identify:

   a)   **the number of relevant local workers affected by a project**;

   b)   **the value of the net welfare gain to each of those workers, taking into account**;

   c)   **the income tax effects on those workers**.

2.2   The number of relevant local workers affect by the project

The maximum number of relevant local workers affected by a project will consist of:

   a)   the full-time equivalent (FTE) directly employed (contracted) by the project; and

   b)   the FTE directly employed (contracted) by a contractor or subcontractor in the construction phase of a project.

To be considered a relevant local worker, a person needs to be a current resident of NSW at the time the Government makes its decision on whether to offer assistance. Project employment set to be filled by non-NSW residents will not contribute to the central estimate of net benefits

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[1] TPG23-08 NSW Government Guide to Cost-Benefit Analysis, page 71.

to local workers. Some proportion of those positions may be included because they are expected to be partly or wholly filled by residents in the long-term.

For example, where a new category of business is being established specialised residents may be required to fill places initially but likely only for some places and likely only for a period of time before NSW residents step in to those roles.

The number of relevant local workers will therefore be calculated as:

FTE positions directly employed (or contracted and subcontracted) by the project

less

FTE positions expected to be filled by non-NSW residents
(where non-NSW residents will not reside in NSW in the long term)

The welfare gain across relevant local workers depend on a number of subcategories related to the employment status. Subcategories of relevant local worker will include:

a)   presently unemployed workers

b)   presently underemployed workers

c)   presently fully employed workers

Alternative assumptions about relevant local workers, such as the number of positions filled by locals and the representation across the categories of relevant worker, can be explored through sensitivity analysis.

2.3   Net welfare gains to relevant local workers

In theory, the actual changes in relevant local workers' welfare due to the project will depend on:

a)   the gross wages they would earn from the project;

b)   the 'reservation wage' they would demand to be willing to work on the project;

c)   the taxes applicable to their project and reservation wages.

However, for practical reasons local workers' prospective net welfare gains from a project will be estimated as:

[Sum of] Expected Before Tax Project Wages

less

[Sum of] Expected Before Tax Project Reservation Wages

Reservation wages are a function of an individual's:

- 'opportunity cost' – the monetary and non-monetary benefits they forgo by working on the project.

  For example, this might include the current income, welfare payments and/or leisure value they presently receive or have available to them.

- 'transaction costs' – costs incurred in the process of identifying and moving to a new job.

For example, this includes the time and effort of searching for a new job, the administrative hassle of transitioning to a new job, and the risks and uncertainties a new employer represents.

An individual's project reservation wage would equal their current income if:

a) transaction costs are zero; and

b) the non-monetary net benefits of an individual's current job and project employment are equivalent – this would be the case where changing jobs doesn't affect concerns like leisure time and travel times, or these concerns have zero value.

Under these conditions, an individuals' welfare gain is equal to the before tax 'wage premium' they stand to earn – that is, how much better off they are financially after moving jobs.

Box 1 – How much do employed local workers benefit?

Assume a new medical facility requiring 150 workers will be opened and operated in NSW to replace an existing medical facility which employed 50 NSW workers.

This leaves a total of 100 new positions which are assumed to attract relevant local workers. Some workers were previously fully employed, but some were previously unemployed or underemployed. Let us assume that 90 full-time equivalent positions came from the employed and the remaining from the unemployed and underemployed working more hours.

The wage premium for the workers is equal to the difference between their reservation wage and their new wage. If the average wage is $90,000 then the total wages would be $8.1 million (90 workers × $90,000). The reservation wage calculates an average wage of $79,279 (($90,000 - $2,000)/1.11) with each worker receiving an average premium of $10,721 ($90,000 - $79,279) and the total surplus for the 90 workers adding to $964,865 (90 workers × $10,721).

2.3.1 Labour surplus survey

A survey of workers[2] have been used to estimate wage premiums. Based on the results of that survey, workers require a wage premium of 11% of their current wage plus $2,000 to move to similar employment. This premium facilitates the movement of a currently employed worker to another job and is used to estimate the surplus.

The wage previously received by the worker is the reservation wage because once the worker has changed employer, they would be prepared to carry out this similar employer for their previous wage. Transaction costs to the worker from switching jobs are minimal and hence are assumed to be zero. Therefore, the whole wage premium is assumed to be a surplus.

The recommended reservation wage for unemployed workers is $42,300 per FTE[3] position. This is the national minimum wage ($42,255) rounded to the nearest hundred. This is the same as the indexed value from the previous 2017 parameters paper and is between the average and the median of the 2022 labour parameters survey. This reservation wage is applied to the positions expected to be filled by the unemployed and underemployed.

2.3.2 Calculating labour surplus

In most cases, the total wages and the number of positions being filled by the unemployed and underemployed will be obtained by multiplying the number of FTEs by the volume measure of labour underutilisation available from the ABS. The remainder of the positions are assumed to be filled by workers that are employed in the base case. Proponents should provide a breakdown of the positions into occupation groups. This may be used to estimate different levels of underutilisation for different occupation groups.

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[2] IA Labour Parameters Survey
[3] As at October 2022.

> **Box 2 – How much do unemployed persons and underemployed workers benefit?**
>
> The reservation wage for unemployed and underemployed persons represents many factors, including the loss of government benefits and the loss of amenity from additional hours spent working.
>
> Continuing the example from Box 1 with the unemployed and underemployed, their reservation wage is estimated at $42,300 per FTE instead of $79,279 per FTE. If their average project wage is also $90,000, then each FTE position would have a surplus of $47,700.

To estimate the surplus from the new level of wages paid to previously employed workers[4]:

$$\textit{Labour surplus to employed workers}$$
$$= \left(\textit{Project wage bill for all workers otherwise employed} \times \left(\frac{10\%}{111\%} \right) + \left(\frac{\$2,000}{111\%} \right) \right)$$
$$\times (\textit{Number of FTE positions filled by employed})$$

To estimate the surplus to the unemployed and underemployed:

$$\textit{Labour surplus to employed workers}$$
$$= (\textit{Average project wage} - \textit{reservation wage})$$
$$\times (\textit{Number of FTE positions filled by unemployed/underemployed})$$

In cases where a project wage is below the reservation wage plus the wage premium ($42,300 + $42,300 x 11% +$2,000) = $48,953, the premium should be limited to the project wage minus the reservation wage. This could be described as the "reservation wage breakeven" because it is the point at which the two methods give the same result. (For example, for a $45,000 project wage the premium would be $45,000 - $42,300 = $2,700):

$$\textit{Labour surplus to low paid employees} \ (below \ \$48,953)$$
$$= (\textit{Reservation wage breakeven} - \textit{reservation wage})$$
$$\times (\textit{Number of FTE positions paid under} \ \$48,953)$$

Project wages below this point at which the reservation wage breakeven are not common but may occur. Positions in projects where this has occurred do appear to be filled. It has not so far as Investment Appraisal is aware been evaluated whether they are filled by a higher proportion of underutilised workers or whether they are filled by some workers requiring lower than usual wage premiums. It is likely some mix and in practice the mix is not relevant for the analysis.

More information on the calculation of the reservation wage is provided in Appendix 4: Employee Wage Premium Survey.

If better information about the transaction costs, reservation wages or wage premiums is available, it may be appropriate to use that data. An example may be where bespoke research about the employment in that occupation or industry has been carried out. In the film and television industry there has been research over a number of years demonstrating employment patterns are different to most industries and the economy as a whole. The research shows variations even between occupations within that industry. Given the level of specific research it is appropriate to use that information to inform the base case in a central estimate.

Generally, the proponent's estimate of project wages should be used to estimate the reservation wage using the functions derived from the labour parameters survey. In some

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[4] A close estimate can also be obtained by multiplying 10% by the project wage and adding $1,818 for each FTE (this should be within 0.1% of the principles-based formula).

circumstances, it may be appropriate to use industry average wages or wages paid by another employer from whom project employees are expected to be drawn to better represent the surplus that will arise in the circumstances.

Other assumptions as to reservation wages may be explored through sensitivity analysis. A level of displacement should be applied to the labour surplus if the proponent will be competing with locally based firms.

The approach to the application of displacement to labour surplus is the same as for displacement of producer surplus discussed in Displacement below, except that the primary consideration is whether industries are NSW based (employing NSW workers) instead of whether they are NSW owned. An example is in Box 3.

Whether the market is local or national is also important. If the end product market is one where the buyers and sellers are all in the same region, then there would usually be 100% displacement. If it is a national or international end product market with part of the market NSW based and part non-NSW based, then the displacement will generally be the proportion of the market that is NSW based. This is because the project's displacement of NSW-based firms in markets outside of NSW could generally be considered negligible due to the presence of many other competitors (unless there is evidence to the contrary).

Box 3 – The impact of displacement on labour surplus

Assume the project is for a new factory to open in NSW. The factory will employ 100 new staff and the labour surplus is estimated to be $1.5 million ($15,000 per employee).

Assume also that this factory is a manufacturer producing farm machinery which competes against imports into NSW. If there are no competitors manufacturing in NSW there will be minimal labour displacement from the project.

Now assume there is a national market and NSW based competitors make up 40% of that market. The project is likely to displace competitors and take market share. This business activity will lead competitors to likely reduce staff (or grow staff more slowly). Displacement can be estimated to be 40%, equal to the NSW based competitors' market share. The labour surplus attributed to the project would therefore be reduced by the end product displacement of 40% to $900,000.

2.4   Effects of income taxation

The impact on NSW of additional tax revenue paid to the Commonwealth Government cannot be estimated accurately. Generally, this revenue is considered to not accrue to the NSW referent group and therefore not represent benefits in CBA. For practical purposes, surpluses in CBA should be undertaken on a pre-income tax basis (personal and corporate income tax).[5]

3. Net Benefits to Local Owners (Producer Surplus)

Both framework principles and standard parameters for estimating net benefits to local owners of NSW businesses are outlined below. Market related components will be influenced by the effect that a project has on the price and quantity of a product, and its impact on competing and complementary goods.

Producer surplus is the amount that producers benefit by selling at a market price that is higher than the lowest price that they would be willing to accept to supply the good.

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[5] TPG23-08 NSW Government Guide to Cost-Benefit Analysis

Precise estimation of producer surplus requires specification of the demand function – a long-term research task that is inconsistent with the time frames required for investment attraction project appraisal.

Where pricing and quantity information is available for a project and the relevant industry, an estimate of the change in producer surplus could be determined by applying the formula explained in Appendix 3: Estimating Producer and Consumer Surplus.

However, in many instances it is likely that information on price and quantity will be absent or difficult to establish. In such cases, a default position, based on financial profit as a proxy for producer surplus, is required to estimate the producer surplus.

In investment attraction projects there are generally four main impacts. They are:

a) Producer surplus impact on the project owners.

b) Producer surplus impact on suppliers for the operational phase of the project.

c) Producer surplus for the suppliers of the capital/construction phase of the project.

d) Producer surplus impact on competitors and other industry participants.

Wherever they exist, the first three of these will be gross benefits. Where there are impacts on competitors and other industry participants, the most common will be costs to firms who see their share of their market displaced by the project. Where applicable, these reduce the net benefits and could also be referred to as dis-benefits as the net benefits will be the sum of the gross benefits less the impact on competitors and other participants. After adjusting for the referent group ownership, the net benefit can be negative in some cases.

These are discussed below in order of their most common level of significance to the analysis.

3.1   Producer Surplus Impact on the Project Owners

The profits associated with the project will generally be specified by the proponent.

Profits that accrue to NSW owners of the project can be estimated by apportioning the project's anticipated profits based on the NSW versus non-NSW ownership of the proponent. All non-NSW profits are assumed to be expatriated.

A profit rate for the applicable industry or the most similar industry for which data is available should be applied where the proponent estimate is not available or appears too optimistic. It may be applied either as the central assumption or as a sensitivity test depending, on the judgement of the analyst. An industry rate should not be applied if it is higher than the rate provided by the proponent.

> **Box 4 – Local businesses gaining from investment attraction**
>
> First, take the example of a new food processing plant project in NSW which will add value to a product that is now exported as a commodity. Its only competitors are interstate or overseas. The production will replace imports and some of the production is expected to be exported to other states or countries.
>
> The project's profit is used as a proxy for the producer surplus, but only the portion owned by NSW residents represents a benefit to the referent group. Therefore, if the proponent is 100% NSW owned, the whole profit represents a surplus. If it is 50% NSW owned, then the surplus is 50% of the profits.

Where a project is not in a clearly defined industry, it may be appropriate to consider a rate that averages rates applicable to many industries that together represent the industry of the project. For example, a default broad industry average[6] (currently 8.4%) or an average of the proponent's past profit rates may also be applied if no other estimate of profits can be established.

Sensitivity analysis or proponent data moderation should be considered where the profits appear too optimistic. Sensitivity analysis or moderation can include a lower rate of profit on sales (which may include an industry average rate), a lower rate of growth of sales, or higher costs. This is not an exhaustive list and the analyst needs to consider the individual project and the data provided to determine the appropriate sensitivity analyses.

In cases where the proponent is NSW owned, all capital expenditure borne by the proponent should be included as a cost to the referent group and the residual value (if any) should be included as a benefit (producer surplus). Treasury guidelines[7] provide that in general, the analysis period should be set to match the economic life of the key assets delivered but recognise that there are circumstances where there remains a value to be counted at the end of the analysis period. However, in appraisal of investment attraction projects an analysis period matching the main costs and benefit flows is more appropriate than the asset life itself.

The main costs of investment attraction usually relate to capital expenditure and the main benefits are usually producer surpluses and labour surpluses. These are only included for a conservative period after the investment.

Therefore, a residual value of capital assets may be appropriate and failing to include a residual value will underestimate the project's benefits. A high proportion of investment attraction projects involve assets reasonably likely to be resaleable (often as a going concern or to a competitor) as opposed to most government infrastructure. Any residual value will be a return to the proponent and should be included as a producer surplus in the final year.

Where an asset has not reached the end of its useful life a residual value may exist and is usually based on straight-line depreciation to the asset's lifespan. Analysts should ensure realistic assumptions on asset lifespans are used. Supporting information on the effective life of assets may be found using Australian Tax Office (ATO) rulings or official guidance from agency corporate finance teams.[8]

Where relevant to the project, land purchased should be given a residual value equal to the purchase price (resulting in a present value well below the purchase cost). Capital equipment with a life longer than the analysis period may have a straight-line depreciation rate applied to estimate the residual value of capital equipment at the end of the analysis period. An appropriate ready reckoner will be the ATO depreciation schedule.

Some proponents will have accounted for depreciation in their estimates of operating costs. Where the proponent has included depreciation in the operating costs, the portion of investment in assets that would have a residual value can be given the nominal value of the capital cost. This effectively removes the impact of the depreciation to avoid double counting capital cost as per the CBA Guidelines.[9]

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[6] IBISWorld All Industries profit margin. "All Industries" is the average profit margin for every IBISWorld's as modelled on the ABS ANZSIC classification.
[7] TPG23-08 NSW Government Guide to Cost-Benefit Analysis Appendix 3.1 page 58.
[8] TPG23-08 NSW Government Guide to Cost-Benefit Analysis Appendix 3.1 page 59.
[9] TPG23-08 NSW Government Guide to Cost-Benefit Analysis Appendix 3.5 page 69.

3.1.1   Displacement

In most instances a project is likely to result in some transfer of profits from 'competitors' to the project proponent via the proponent's capture of market share. This is referred to as final product displacement.

When estimating the levels of displacement analysts need to consider all relevant factors including:

    a)   the size of the project;

    b)   the size of the market;

    c)   whether the proponent will compete in an international market, a national market, or local market (takes place wholly or primarily in NSW or in the local region);

    d)   the structure of the market and particularly the level of concentration and how new producers will impact the existing NSW owned competitors.

A project can be completely additional or have full displacement. For example, if the final product is sold within NSW and the industry is primarily composed of many 'local' businesses, the project's competitors may be reasonably assumed to be 100% NSW owned. If the final product is one in which the proponent will be exporting and the level of exports by existing NSW owned businesses is likely to be unaffected, the displacement may be reasonably assumed to be zero.

When the project involves displacement, the NSW ownership of the competitors being displaced will determine the impact on producer surplus. The higher the level of NSW ownership of competitors, the higher the displacement. If the level of NSW ownership in the proponent is lower than the level of NSW ownership in the displaced competitors, then the project's displacement outweighs its benefits and result in a net negative producer surplus.

The NSW ownership of the competitors may be known or estimated from information provided by the proponent or from information obtained through government program, industry, or regional specialists or through desktop research. If the industry is highly concentrated, then the NSW ownership may be estimated by the ownership of the largest players in accordance with their market share. Where the industry is not concentrated, information on the NSW share of revenues is preferred but the NSW share of enterprises in an industry will be sufficient where it is the best available information.

The base case may involve the project proceeding in another jurisdiction. In most cases the NSW suppliers will be impacted as supplies will be sourced from interstate. However, in some cases the suppliers will still supply to the project if it proceeds interstate. In those circumstances the returns to the suppliers will not be additional to those in the base case and will not be counted. Also, there may be circumstances where some competitors may be more impacted than others (less efficient competitors may close down for instance) but these should only be treated differently where there is evidence for a different assumption.

Taking into account the above, the displacement is usually expressed as a percentage that is used to estimate the producer surplus in the base case. This percentage will usually be estimated based on NSW market share. This rate will usually be applied as a base case amount of producer surplus.

In other circumstances an appropriate profit rate (usually the industry average) may be applied to the revenues being displaced and the estimated loss in competitor's profits included in the costs of the project. See Box 5 for an example application.

Generally, a base case producer surplus will represent the profits displaced by reference to the proponents' profits because:

a) Industry averages may not be appropriate as firms compete in sub-industries which may have substantially different profit margins to the average for the industry.

b) If estimated on revenue an extreme or perverse result can arise. For example, a very high level of project profit margin forecast combined with complete displacement could result in a large producer surplus. That could exaggerate the impact of overly optimistic forecasts. Alternately, a low profit margin with partial displacement could result in a negative producer surplus even though it is the product of conservative forecasts of the project.

c) This method is less impacted by the profit rate forecast by the proponent.

d) This method will result in greater consistency.

> **Box 5 – How local businesses can lose from investment attraction – proponent displacement**
>
> Following the same example of a food processing factory. Now assume that the proponent of the project is 33% owned by NSW residents and will be directly competing with a firm that is 100% owned by NSW residents.
>
> If the end-product market will absorb the extra supply with no price impact (such as a large international export market) then the surplus will not need to be adjusted. However, if the market is likely to stay the same size, then the success of the new project will be at the expense of its NSW competitor. This implies 100% displacement.
>
> If there is $10 million of the NSW competitors' production displaced and both have a profit rate of 10%, the gain to NSW from the proponent is $330,000 (33% of $1 million profit).
>
> However, the loss of returns to the NSW competitor is greater, at $1 million. This results in a net producer loss of $670,000.

3.2 Producer Surplus for the Capital/Construction Phase of the Project

The producer surplus for capital/construction phase of the project can be estimated by considering the revenues to NSW suppliers of 'capital' materials as specified by the proponent less the opportunity cost to those suppliers (that is, the revenue that would have been earned by the suppliers if the project did not proceed).

The profit of the nearest applicable sub-industry should be used. It may be appropriate to apportion costs to different industries in some cases. Where the industry is in doubt and cannot be apportioned, the more conservative estimate should be used.

The analyst should then attempt to estimate an appropriate level of displacement between 0% and 100% to represent forgone surpluses from taking on the work for this project and include this as a cost of the project.

Most projects will have low level of displacement as most projects are not large enough to affect the spare capacity of the industry.

For construction, it is reasonable to assume zero displacement for construction expenditure under $100 million dollars over four years or $50 million dollars in any one year, this level of activity representing approximately 0.1% of annual NSW construction output. Noting the majority of projects with this level of expenditure will be over multiple years.

Factors to consider (for project involving more than $100 million dollars over four years or $50 million in any one year in construction) in estimating the level of construction capacity utilisation and therefore displacement include:

a)   The size of the project – larger projects are more likely to impact the market and more likely to prevent or delay other construction projects which are only marginally less profitable. Small projects are only likely to affect projects that are well below average profitability in markets that are already constrained and are then more likely to result in only a short delay.

b)   The location of the project – Large projects in smaller areas being more likely to prevent or delay other construction projects.

c)   The level of capacity utilisation in the construction industry as measured by construction indices – The construction industry grows and contracts but if activity is very high the market may be constrained and other projects may be prevented or delayed. In most cases the industry is able to meet the capacity and the project has little displacement.

d)   The nature of the capital expenditure – Expenditure on land or specialised equipment will have different costs and opportunity costs to construction.

For simplicity, in most cases the appropriate industry profit margin will be applied to non-displaced construction and capital expenditure as a proxy for the producer surplus generated.

Where the project capital expenditure is large relative to the industry size, profit margin could be impacted by the effect of additional costs to the supplier (such as overtime).[10] However, in a tight market it might also be possible for the producer to increase their margin on the additional business and potentially even existing business and generate producer surplus in that way. The effects of these and the level at which one impact might outweigh another are very hard to estimate.

Consistent with CBA Guide guidance, analysts should use the best available evidence and focus their efforts on collecting evidence proportional to the significance of the cost or benefit stream to the project. If construction displacement is sufficiently significant relative to other project costs and benefits then additional analysis of the market is preferable and, as a minimum, the reasoning for applying the selected rate of producer surplus should be provided.

3.3   Producer Surplus Impact for the Operational Phase of the Project

This can be estimated by considering the revenues to NSW suppliers of 'operational' materials as specified by the proponent and applying the likely level of profit (as a proxy for surplus), less the base case profits.

The proponent is generally required to specify the main material inputs from NSW suppliers in the 'operational' phase of the project. Where possible the industry profit rates for the supplying industries will be used to estimate the returns to those suppliers. A broad industry rate (e.g., 8.4%[11]) may be applied to estimate the producer surplus of suppliers if the operational costs for a project have not been specified or the industries are not known.

The level of displacement in the final product market will generally be applied as the displacement of NSW competitors. If a NSW competitor is displaced their supplier is likely to either begin supplying the proponent or be displaced by a one who does.

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[10] That is, a construction firm may agree to take on the additional work, with no displacement of other projects, knowing that the marginal benefit of doing so will be declining (due to higher per unit costs) but still positive.
[11] IBISWorld All Industries profit margin.

In some cases, the base case may be that the project proceeds in another state. If the NSW supplier acts in a national market, it may continue supplying the project, resulting in no net gain from attracting the project to NSW. In most cases however it can be assumed that surpluses accruing to suppliers 'follow' the project interstate.

Box 6 – How local businesses can lose from investment attraction – supplier displacement

Following the same example further, the suppliers to the project make a profit based on the purchases made by the project. If the suppliers of an input receive $500,000 as the result of a project and their profit rate is 10%, the surplus is $50,000 if the suppliers are NSW owned. The NSW ownership will be relevant as discussed previously. In most cases it will be inferred from the NSW share of the market as a whole.

However, if there is final product market displacement then to the extent of the displacement, the suppliers are not supplying anything extra and there will be no surplus. For example, if there is $500,000 extra being spent on stationery but the final product displacement is 50%, the surpluses will only be on $250,000. If the profit margin is 10% it will be a surplus of $25,000 instead of $50,000.

It could be that market for the input itself is constrained. For example, if the project intends to spend $1 million on agricultural products, there will usually be displacement in the supplier market as agricultural commodities are constrained by land and climate and are unable to expand output significantly except at the expense of another output. In some cases, the supplier will receive a higher price as a result of a project, but it is only the difference between the two profit margins that will constitute a surplus. In most cases there will be insufficient data to support a significant increase in price or profit for an agricultural supplier and no producer surplus will be assumed to such suppliers.

The level of displacement in the supplier market resulting from the additional demand will then be considered. A displacement of zero will be applied where it is deemed that production levels (or profit from the production) for that line item would be fully additional in NSW. A displacement of 100% will be applied where it is deemed that overall production levels for that line item would not change in NSW.

Values between zero and 100% may apply but should only be applied where there is some evidence or data on which to base the assumption. The effort necessary to make a further estimate and whether it is proportionate to the size of the project and the size of the impact of the estimate relative to the other costs and benefits in the project should be considered in deciding whether to estimate and apply a value between zero and 100%.

Therefore, a range of considerations need to be taken into account to estimate to what extent NSW businesses supplying the operations will be impacted. Factors to be considered include:

   a)   whether the suppliers will be impacted by the project or whether production will be the same as the base case;

   b)   the level of final product displacement;

   c)   the impact of final product displacement on the suppliers;

   d)   the NSW ownership of suppliers;

   e)   whether the NSW ownership of displaced suppliers differs from the NSW ownership of suppliers to the project;

   f)   whether additional expenditure by the proponent will lead to additional output in the supplier market; and

g) the industry rate of profit for the suppliers.

These considerations can be applied to the expenses on a line-by-line basis.[12]

3.4 Impact of NSW and non-NSW ownership of businesses

Many projects involve co-funding of the project by private industry or another level of government.

In the case of funding of capital expenditure by a non-NSW owned business the assumption can usually be made that without the project the expenditure will not have occurred in NSW.

However, where the business is NSW owned, investment funding is a flow from a member of the referent group and therefore should be included as a cost. The increased profits (or other benefits) and/or the residual value of the capital investment flowing from the investment are included as benefits.

4. Net Benefits to NSW Consumers

For the purposes of economic analysis, benefits to consumers are less straightforward than is commonly understood.

While consumers derive benefits from goods and services they pay for, they also benefit from those they do not, as well as those they contribute to indirectly. Finally, consumers may derive option values from potential future consumption, or even 'non-use' values.

Some forms of consumer benefits potentially relevant to investment attraction analysis are outlined in Box 7.

4.1 Consumer Surplus

Consumer surplus is an element of value obtained by consumers in their purchases of goods and services. Specifically, consumer surplus relates to the difference between the price a consumer pays for a good, and the highest price they would be willing to pay.

Box 7 – What is the value of a good or service to a consumer?

Take the example of attracting investment from a Queensland medical supplier. The Queensland firm plans to manufacture and supply niche medical products to NSW as well as other Australian states. This market currently operates under oligopolistic conditions with two international firms controlling 90% of the Australian market. Given that there are few (if any) medical manufacturers of these products in NSW, the attraction of a manufacturer may significantly increase the supply and competition.

NSW consumers (individuals) may be willing to pay a fair amount of money for the medical product (as evident by the current oligopolistic conditions). If the price that the Queensland firm charges for its products is less than a NSW consumer's willingness to pay, then a consumer surplus is generated. For example, Bill may have been willing to pay $100 for the medical product, but the Queensland firm set prices at $60. As a result, Bill generates $40 of consumer surplus from purchasing the products. This is the value of the good to Bill (the consumer). This would also represent a transfer of producer surplus (from non-NSW oligopolistic firms) to the NSW consumer.

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[12] Only inputs in the first order production function should be considered – that is, input suppliers to the project. Suppliers to the suppliers of the project should be excluded from the analysis as these are second order effects.

The need to calculate consumer surplus for a project under consideration would be the exception rather than the rule. The default position of nil will be applied to consumer surplus unless project information clearly suggests otherwise.

Where applicable, a shift in the supply curve to the right will result in prices decreasing and demand for the product increasing, leading to an increase in consumer surplus. Precise estimation of supply curve shifts is time intensive and will generally be at odds with the time frames required for investment attraction project appraisal. Approximations for consumer surplus changes are available (see Appendix 3: Estimating Producer and Consumer Surplus).

A complicating factor is that NSW consumers could still benefit even if the project did not proceed in NSW. In this case, the project may proceed in another jurisdiction, yet still sell into the NSW market, making isolating the effects of a NSW based project on NSW consumers versus a non-NSW based project difficult.

In addition to market related consumer surplus, a project may generate non-market related consumer surplus. This may include aspects such as improved product quality or improved travel or delivery times which may not be directly evident in the market price.

4.2   Environmental Surplus

While they are not typically paid for directly, NSW residents are consumers of the State's environment. It is possible a project under consideration could have a significant impact on the State's environment.

> **Box 8 – Can investment attraction have an environmental benefit?**
>
> Take the example of attracting investment from a Swedish firm in a technology production plant in NSW. Let us assume that the plant currently operates in NSW, but the activities of the plant create smog that wafts over the nearby residential area.
>
> Let's also assume that the Swedish firm is expected to alter the production process in a manner that would eliminate the smog biproduct. This improvement in air quality can benefit the health of NSW households that live in the nearby residential area. The environmental surplus could be captured in terms of the improved health outcomes of NSW households in the nearby residential area.

Quantifying environmental benefits and costs may be difficult due to the absence of data, and the impact of project relative to its surrounding environment and other users. A default position of nil will be applied to environmental surplus unless project information suggests otherwise.

Whether positive or negative, these impacts should be considered in the economic analysis where appropriate.

Determining whether it is appropriate is generally a matter of application of the proportionality principle. All reasonable efforts should be made if there is likely to be a significant impact on the outcome of the analysis or it is likely to be perceived that the impact would be significant.

More effort is also appropriate where it relates to an important output or outcome of the project. A good indicator of the significance might be how it is addressed in program logic supporting the project or related program.

If the impact meets the above criteria but is unable to be quantified then it would be appropriate to deal with qualitatively, and it may be appropriate to carry out a partial estimate that supports whether the impact is likely to be significant.

Conversely, some environmental impacts may be less significant but more easily calculated. For example, there may be data relating to transport being used for cost savings which might be easily applied to environmental benefits or there may already be a study applicable or transferable from another source.

4.3   Other Benefits

A project may generate social surpluses through externalities. For instance, workforce participation can provide society with benefits beyond those the worker derives for themselves. Similarly, employing trainees and apprentices, up-skilling the workforce, or establishing linkages with educational and research centres can lead to broader social gains.

Where data permits all benefits should be quantified. However, where not possible, unquantifiable benefits should be discussed qualitatively, and a sensitivity analysis undertaken (data permitting). Analyst effort should be proportionate to the funds involved and the outcomes at stake. This principle can be applied both to the overall analysis and to the estimation of individual costs and benefits.

5.   Government Funding

Government surplus components will be influenced by the effect that a project has on State taxes and funding costs.

5.1   Taxes

These can be estimated by considering the revenues to the NSW Government as specified by the proponent less the taxes associated with the base case (i.e., the revenue that would have to be earned by the Government if the project did not proceed). NSW taxes relate to payroll tax, stamp duty and land tax which are directly generated by the investment project. In most instances, the proponent will provide estimates of these taxes.

As discussed in relation to benefits, potential impacts on NSW from additional Commonwealth tax are highly uncertain and likely minimal and should therefore not be included as stipulated in the NSW Treasury guidelines.[13]

It will be assumed that 62.4% of employed labour associated with the base case would have been subject to payroll tax in the absence of the project[14] (based on NSW Treasury data from Commonwealth Grants Commission). It will be assumed that 0% of unemployed labour would be subject to payroll tax in the absence of the project.

5.2   NSW Government Funding

NSW Government assistance may be estimated by considering the "opportunity cost" of supporting the project to be located in NSW less the "opportunity cost" of not supporting the project and utilising funds elsewhere.

This represents the 'opportunity cost' of providing 'upfront' or "rebate" Government assistance. That is, the next best alternative that the NSW Government could utilise for the funds, in the absence of the project proceeding in NSW.

It will be assumed that the opportunity costs of upfront Government assistance will be 100%, or a factor of 1.0.

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[13] TPG 23-08 NSW Government Guide to Cost-Benefit Analysis
[14] 2021-22 taxable proportion provided by the Commonwealth Grants Commission in email 24 July 2023.

The default for the base case will be assumed to be 0 (that is, no funding would be provided in the alternative), unless project information suggests otherwise (e.g., not supporting a project may result in other government action being required).

Where the assistance is in the form of a rebate, there may be an adjustment made to reflect the probability that the rebate may not be required, provided that the outcomes are also adjusted for the delivery risk. For example, if the probability of a project continuing in year five is considered 50%, the cost of rebates available for that year can be reduced by 50% provided that benefits derived from the project in that year are also adjusted.

In circumstances where the assistance vehicle is a loan from the Government, and the project outcomes are assumed to reflect this vehicle, the opportunity cost to the Government is estimated to be 100% of the loan amount less the future loan repayment amounts, adjusted for the probability of the repayments not occurring. If estimated loan repayments in any particular period are reduced for risk of business failure, it will usually be necessary to reduce other outcomes in the same proportion for the period.

5.3   NSW Local Government

NSW local governments are part of the reference group. Therefore, funding from NSW local governments should be treated in the same manner as funding from NSW owned businesses.

5.4   Commonwealth Government funding costs

When a project receives funding from the Commonwealth Government, the treatment of this funding depends on the competitive status of the Commonwealth funding in the base case. There are three common treatments.

1.   When the funding is competitive between states.

Commonwealth Government funding for an initiative can be competitive with other states where if the project is not funded the assistance is likely to go to another state. For example, defence or industry funding of a specific project to bring production to Australia. In this case, the funding should be treated as an injection of resources into NSW relative to the base case. The funds carry no opportunity cost and therefore do not represent a cost.

2.   When the funding is not competitive between states.

For example, an infrastructure project has attracted Commonwealth Government funding from a fund stipulating that funds would be allocated proportional to the population of each state (or some other measure) would be non-competitive.

In this case the funding is not competitive between states, and the opportunity cost of the funding for the project is the funding of another project in NSW. In this case the funds allocated for the project represent a cost to NSW.

3.   When the funding would have been spent in an otherwise unknown manner.

Where funding is not tied to either competition with another state or competition within the state, the effect is not known. It will generally be reasonable to assume that other spending decisions by the Commonwealth will not change as a result of this project. Therefore, any additional spending on a project may be assumed to impact the financial position of the Commonwealth by that amount.

TPG23-08 page 66 refers to the principle that the marginal cost of Commonwealth Government spending is not clear but may have an impact on NSW given "New South Wales constitutes around a third of Australia".

In line with the principles of this paragraph and the guidelines overall, the best estimate of the impact on NSW is therefore to estimate that marginal impact with a reasonable assumption to attribute a proportion of the cost approximately equal to the NSW share of the Commonwealth population.

Sensitivity testing is recommended, particularly if there is a significant difference in the results depending on the treatment of the Commonwealth cost.

6. Key metrics

The impact of investment projects is best summarised by Net Present Value (NPV), Benefit Cost Ratio (BCR) and Net Present Value/ Investment (NPV/I). Table 1 explains each metric, how to calculate it and an example.

Table 1: Calculation of key summary metrics

Metric	Calculation	Example
NPV	Benefits – Costs	If the present value of a projects net benefits equal $100 and the present value of its net costs equal $80 then the NPV will be $20.
BCR	Benefits ÷ Costs	Only project "resource costs" are to be considered costs in the denominator. Generally, this is the costs to NSW Government in present value terms. It can include private NSW costs where those costs are implementation costs such as project infrastructure spend. If a projects net benefits equal $100 and net costs equal $80 the BCR will be 1.25.
NPV/I	NPV ÷ Investment* * where the investment is NSW Government assistance	If a project's NPV is $20 and its investment is $40, its NPV/I will be 0.5. NPV/I is useful for decision makers in a fund constrained environment. For example, in a grant program that is oversubscribed. This is because it ranks projects only against NSW Government costs to maximise benefits to NSW.

7. Appendices

7.1 Appendix 1: Standard Parameters for Net Benefits to Local Workers

In applying the above principles, consideration needs to be given on estimating:

    a)   relevant local workers;

    b)   categories of relevant workers;

    c)   net welfare gains to relevant local workers.

7.1.1 Relevant local workers

Full-time equivalent estimates of relevant local workers will normally be based on information directly provided by project proponents. However, the proponent's data will be subject to revision if considered unrealistic (excessively optimistic).

Where applicable, employment FTEs and information about the capital phase will continue to be a standard aspect of the data request from potential recipients of financial assistance. The number of FTE positions expected to be filled by non-NSW workers will also continue to be a standard aspect of the data request from potential recipients of financial assistance.

7.1.2 Categories of relevant local workers

Welfare gains will vary with differences in workers' present employment status and the strength of their negotiating power. An analysis of welfare gains to local workers needs to be based on subcategories or classifications that reflect these differences.

The subcategories of relevant local worker will be determined by considering the following:

    a)   Project proponent advice;

    b)   Australian Bureau of Statistics (ABS) measures of unemployment.

Project proponents will also be asked to indicate the distribution of their FTE estimates across the broad occupational categories used by the ABS:

    a)   Managers;

    b)   Professionals;

    c)   Technicians and Trades Workers;

    d)   Community and Personal Service Workers;

    e)   Clerical and Administrative Workers;

    f)   Sales Workers;

    g)   Machinery Operators and Drivers;

    h)   Labourers.

The distribution provided by the proponent may need to be amended if there is reason to believe it is unrealistic.

In determining whether the proponents' estimate of unemployment is realistic and adjusting the level of unemployment the analyst may take into consideration:

- ABS NSW underutilisation rate quarterly trend rate (ABS 6291.0.55.001 Labour Force, Australia, Detailed, Table 23a Volume measure of underutilisation by State, Territory and Sex).

- Australian Government National Skills Commission Small Area Labour Markets Australia quarterly research.

- NSW occupational unemployment rates, as indicated by the most recent ABS quarterly release of detailed labour force data (6291.0.55.001 - UQ3b - Unemployed persons by Occupation major group of last job (ANZSCO), State and Territory, February 1991 onwards).

- NSW industry unemployment rates, as indicated by the most recent ABS quarterly release (6291.0.55.001 - UQ2b - Unemployed persons by Industry division of last job (ANZSIC), State and Territory, February 1991 onwards).

In circumstances where the unemployment assumptions provided for the project are considered unrealistic or are unknown, a conservative estimate should be sought from the above sources. This should be the basis from which an underutilisation proportion of the labour employed on the project is estimated.

7.1.3 Net welfare gains to relevant local workers

Proponents will continue to provide information about project wages as part of the standard data request. The proponent's project wage estimates should be amended if they are considered to be unreasonable.

Based on Investment Appraisal's survey results (see Appendix 4: Employee Wage Premium Survey for further details), the central estimate of net benefits for fully employed workers will be based on before tax wage premiums of 11% of the wage plus $2,000 per FTE premium (FTE when calculating the surplus from the wages paid). For unemployed workers, the reservation wage is $42,300.

7.2 Appendix 2: Other Local Labour Related Considerations

7.2.1 Assessment of projects presently operating in NSW considering other locations

Projects relating to operations not yet in NSW are presumed to benefit through higher wages through workers moving from other employment or from being underutilised.

Appraisal of projects relating to retaining operations in NSW face additional complications. In some projects, some or all workers will continue to work for the relocated business if the project proceeds. The primary requirement is always to determine the appropriate base case, compared to that base case, and sensitivity test when necessary.

The method of labour surplus used for additional workers may be used in reference to retained workers. However, this is only the case where in the project case those workers would be NSW workers and in the base case, they would be interstate or overseas workers, who have not relocated from NSW and are not remotely working from NSW.

Relocation within NSW has similar issues as to whether the overall impact will be a benefit or a cost and therefore either exclusion or basing estimation on an avoided costs (e.g., avoided removalist costs) basis is appropriate.

7.2.2 Multiplier effects (flow-on impacts) to local workers

The definition of relevant local workers adopted above only contemplates directly employed workers and not multiplier effects. Yet investment proposals attracted to NSW could benefit local workers 'directly' and have 'multiplier effects':

- direct benefits are those flowing to local workers directly employed (or subcontracted) by the project proponent
- multiplier effects could relate to opportunities opened up by:
  - the directly employed local workers vacating their previous jobs;
  - the change in purchasing power of the directly employed workers;
  - the consequences of a change in the occupational and geographic dimensions of demand within the labour market.

However, there are important differences between direct and multiplier effects to local workers. Important distinctions are:

- the certainty of the benefits;
- the timing of benefits;
- available information allowing the quantification of benefits and costs.

For investment proposals relating to mature businesses, direct benefits can be viewed as relatively certain. Data collected from the proponent provides a clear indication of how many people they expect to hire, and what they will pay them.

If there is confidence that the proposal is genuinely footloose,[15] and the data provided is accurate, those benefits can be quantified with a reasonable degree of certainty.

It can be expected to have a clear understanding of when local workers will start to see those benefits. And to the extent that the assistance takes the form of payroll tax rebates, Government contributions are tied to the employment creating the benefits, which may add some degree of certainty to direct benefits.

By comparison, the multiplier effects from any project will be relatively uncertain. This is primarily because those benefits are contingent on the behaviour of parties that can neither be identified, nor sought information from.

For the purposes of decision making, analysis should focus on relatively certain benefits and to exclude speculative and uncertain aspects. This provides the Government with a conservative estimate of the merits of a project.

7.2.3   Benefits to external workers moving to NSW

In addition to local workers, a project attracted to NSW may deliver benefits to non-local (external) workers who move to NSW to take up project employment.

The agreed framework only incorporates impacts on 'local' workers. In these circumstances, analysts should interpret 'local workers' conservatively, and reflect only those who are obviously 'local' at the time of the decision:

- it is clearly the case that welfare effects for those presently living in NSW are relevant to the NSW Government
- it does not obviously follow that the welfare of external workers should be considered relevant to NSW Government decision making.

Where there are positions initially potentially filled by external workers such as in an office relocation, some proportion of those positions may be included because they are expected to be partly or wholly filled by residents in the long-term.

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[15] Footloose is a base case scenario where without the assistance the project would proceed, but outside of NSW.

For example, where a new category of business is being established specialised residents may be required to fill places initially but likely only for some places and likely only for a period of time before NSW residents step in to those roles.

Analysts retain the discretion to separately identify and consider welfare impacts for external workers where they believe it may be relevant to Cabinet's decision making.

Where analysts separately consider impacts on external workers, net benefits to local workers should be clearly distinguished from those flowing to external workers. The analysis should not include benefits to external workers in the central estimate and also identify and take into account that:

- External workers' migration (and their families) will involve costs to NSW residents. For example, congestion will tend to increase, demand for public services will tend to rise, and prices for housing and other goods will tend to be higher. These factors should be acknowledged qualitatively, if not quantitatively.

- External workers' net benefits from project employment tend to be different in nature to that for local workers:
  - if they are already employed by the project, their wage may not change;
  - moving involves costs, some of which may (or may not) be met by the project proponent;

- if the external worker would move with the project wherever it located, their incremental benefit from locating in NSW relative to other locations is hard to assess. Notably, if the project might have opted for an external workers' present location, moving to NSW may be detrimental relative to remaining in that location;

- hiring of external workers will tend to reduce the potential indirect effects of a project for local workers, as no local job will be vacated.

7.3 Appendix 3: Estimating Producer and Consumer Surplus

7.3.1 Producer Surplus

In estimating the net benefits of a project, the change in producer surplus is required to be estimated. This change in producer surplus (for any of the affected producers) is equal to[16]:

$$\Delta PS_t = p_{t1}q_{t1} - p_{t0}q_{t0} + c_{t0}(q_{t0}) - c_{t1}(q_{t1})$$

Where:

- $c_{t0}(q_{t0})$ and $c_{t1}(q_{t1})$ denote total project costs without the project and with the project;
- $p_{t0}q_{t0}$ and $p_{t1}q_{t1}$ denote total revenue without the project and with the project;
- q_{t0} and q_{t1} are the quantity demanded before and after a change in supply;
- p_{t0} and p_{t1} are the prices before and after a change in supply.

Changes in producer surplus require an estimation of incremental revenues and costs for the project and other companies affected by the project (both capital and operating).

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[16] An alternative formula to estimate the change in producer surplus (as outlined in "*ABARE Conference Paper 05.2 - Approximating supply response of a commodity with limited input data*") is: $\Delta PS_t = (K + p_{t1} - p_{t0})[q_{t0} + 0.5(q_{t1} - q_{t0})]$. Where K represents the vertical shift in the supply curve and can be approximated by: $K = k \times (p_{t0} / e)$, where k is defined as the percentage shift in supply quantity and e is the elasticity of supply.

Who will be the final beneficiary from potential cost saving or increased profits will be determined by the degree of market power in the industry and other economic activities directly affected by the project. A relatively small project is likely to have a small impact on total producer surplus. There may be exceptions to this like where a company introduces a product that is revolutionary or a gamechanger. Although the ability of analysts to correctly anticipate this is questionable.

The total change in producer surplus will generally comprise the following:

- the producer surplus impact on the owners of the project;

- the producer surplus impact on the owners of materials required for the capital/construction phase of the project;

- the producer surplus impact on the owners of materials required for the operational phase of the project;

- the producer surplus impact on competitors and other industry participants.

7.3.2 Consumer Surplus

If a project is considered to have a significant impact on a product market, then the potential change in consumer surplus may be estimated based on applying the rule of one-half.

The rule of one-half estimates the change in consumer surplus for small changes in supply with a constant demand curve. In this special case where the consumer demand curve is linear, and the consumer surplus is the area of a triangle, the change in consumer surplus can be estimated as:

$$\Delta CS_t = \frac{1}{2}(p_{t0} - p_{t1})(q_{t0} + q_{t1})$$

Where:

- q_{t0} and q_{t1} denote the quantity demanded before and after a change in supply (that is, without the project and with the project);

- p_{t0} and p_{t1} denote the price before and after a change in supply (that is, without the project and with the project).

Figure 2: Consumer surplus
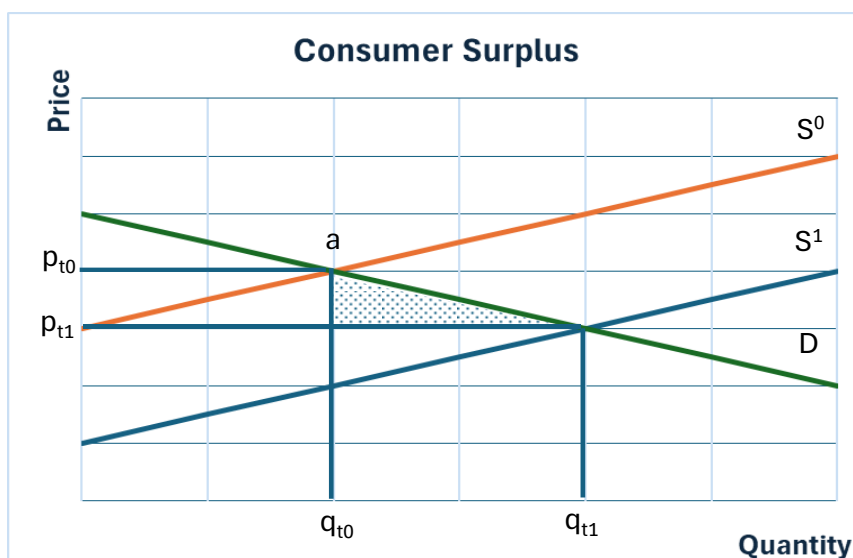
It is noted that the net change in consumer surplus will vary based on assumed factors, such as:

- the project's market share of the industry;

- NSW share of the industry;

- the current price;

- the current quantity;

- the percentage of shift in the supply curve;

- the change in price;

- the elasticity of demand.

7.4 Appendix 4: Employee Wage Premium Survey

7.4.1 Survey of employees as to Wage Premium

In June 2016 and October 2022 Investment Appraisal conducted a survey of NSW residents in relation to current wages and the wages that would be required for respondents to change their employment or enter the workforce.

The 2022 survey used a dichotomous high/low big tree to present bid questions to respondents.[17] Bids to enter the workforce or accept additional hours were based on dollar amounts (e.g., $10, $50, $70 – all hourly) and presented to respondents this way. Bids to accept new employment were based on percentages of current income (e.g., 6%, 17%, 24%) and presented to respondents as a portion of their income (e.g., 6% for a respondent with a $100,000 annual income would be presented as $6,000). The 2016 survey didn't use this method. It asked if respondents would accept new employment at higher pay (yes/no), and if yes, specify at what pay.

Responses from the 2022 survey were received from 3,003 employed respondents. Of these, 2,501 specified a wage premium they would require to move to a position like their current employment. Responses were also obtained from 500 persons that were unemployed but seeking employment. Persons not seeking employment were excluded from the survey as they are not in the labour force.

An analysis of the results of the survey suggests that the wage premium sought was primarily dependent on the current wage of the employee but the increase sought by lower paid employees was a greater percentage of their wage than the increase sought by higher earners as a percentage of their wage. However, the relationship revealed is adequately represented by a coefficient if a constant term is included.

This could represent a tendency of many workers to seek a dollar amount rather than a percentage of their income and for that dollar amount to vary less than the wage of the employee. This could be a result of a cognitive bias arising from the preference of individuals to deal in actual numbers rather than mathematical calculations. It could also represent a type of inertia, with workers hesitant to change employment (even to a similar job) without a significant benefit.

The data from the survey conducted suggests a best fit function to calculate the wage premium sought would be 11% of the present wage plus $2,000 for a full-time employee. The formula should be applied to part-time and casual workers on a pro-rata basis allowing the premium to

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[17] This design was used on advice from Investment NSW Data Science and Visualisation team.

be calculated as 10% of the full-time equivalent wages plus $2,000 per full-time equivalent employee.

These results are similar to those of the 2016 survey results which suggested a best fit function for the wage premium would be 9% of present wage plus $6,000 for a full-time employee.

7.4.2 Reservation wage for unemployed and underemployed

The survey included 500 respondents that were unemployed but seeking employment. The same dichotomous high/low big methodology was used with unemployed respondents. However, instead of asking for the percentage pay increase they would accept, respondents were asked by bids to enter the workforce or accept additional hours based on dollar amounts (e.g., $10, $50, $70 – all hourly) wage they would accept.

The survey found that the additional welfare required by an unemployed person to move into employment is close to the additional welfare required by an employed person to change to a similar position, then a reservation wage for unemployed persons can be estimated at $42,300. This is significantly higher than the Centrelink single person Newstart allowance ($18,021). It is also near to the current minimum wage of $42,255.

The reservation wage that should be used is therefore $42,300. In practice this means that when the project wage is below $48,953,[18] the wage premium is the project wage less $42,300.

The volume underutilisation rate should be used to estimate the labour surplus to both unemployed and underemployed workers to calculate the proportion of employment being filled by unemployed and underemployed workers. This assumes that the reservation wage of the underemployed for their additional hours is the same as that of the unemployed.

Given that the method for calculating reservation wages includes constants, the value of the constants will need to be adjusted over time. Wage expectations are likely to be most closely linked to the wages of others and therefore inflation with the Wage Price Index the most appropriate adjustment to the constants.

Given the importance of labour surplus to CBA results, research to update the estimates of wage premiums should be conducted on a regular basis (no less than every five years).

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[18] This being the figure at which the premium using this fixed reservation wage equals the premium using the survey formula: $48,953 = $42,300 × 1.11 + $2,000.