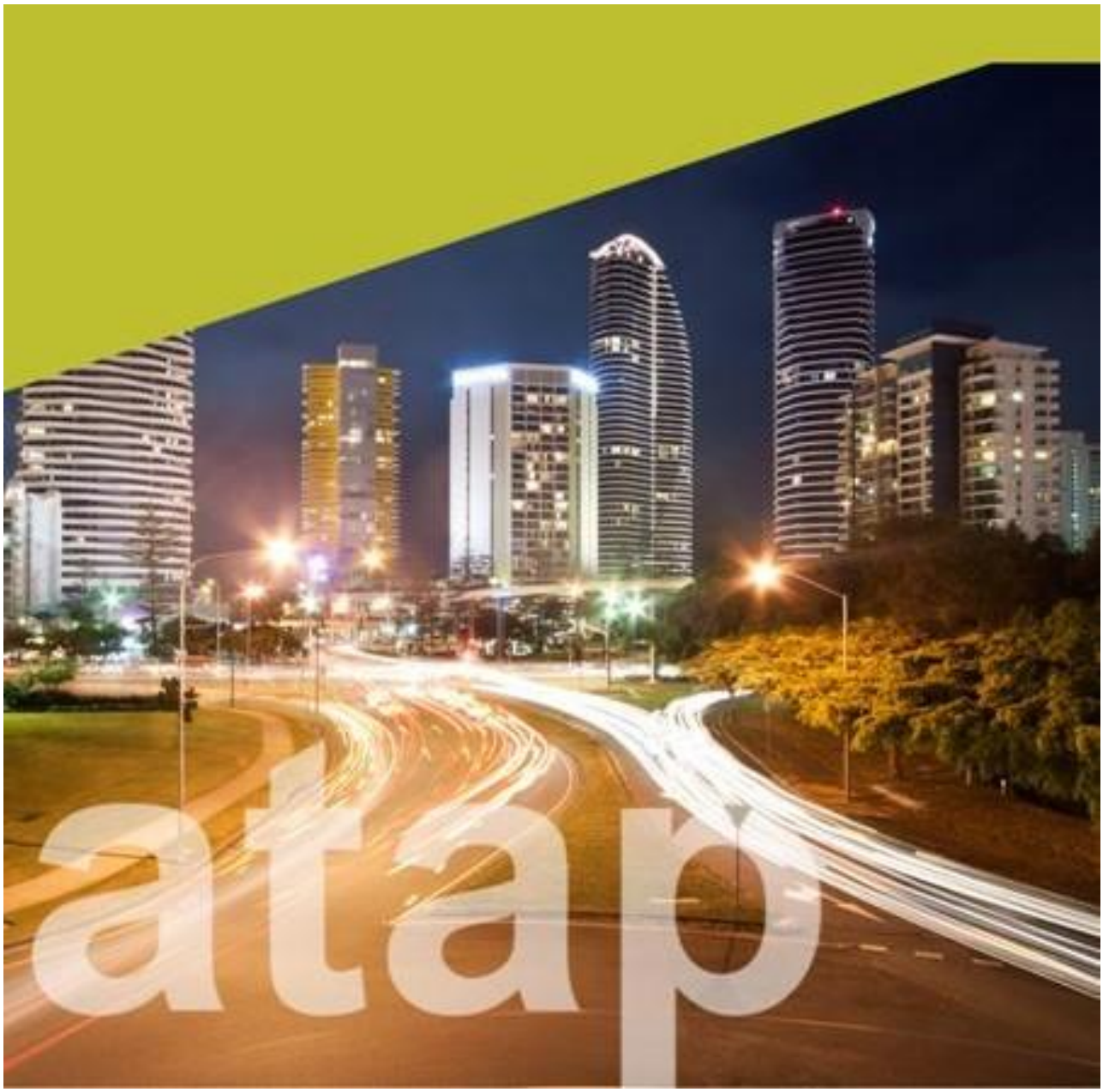
INFRASTRUCTURE AND TRANSPORT MINISTERS

Australian Transport Assessment and Planning Guidelines

Construction period impacts
Public Consultation Draft

February 2025



ISBN tba

February 2025

The contributions of the following people in the update of this report are acknowedged:

ATAP project team: Peter Tisato, Kieron Dauth, Mark Harvey, Callum Morgan, Baojin Wang, Hamish Barnet, Amy Naulls, Tim Bryant.

Reviewers of drafts

Members of the ATAP Steering Committee: Georgia O'Cianian, Marcia Keegan, Gilbert Ortiz, Mark Harvey, Andreas Bleich, (Australian Government), Hamish Barnet, Jennifer Jenkins, Mark O'Reilly, David Tucker (Infrastructure Australia), Alban Pinz, Josh Adams, Kieron Dauth (QLD), Matthew Jones, Baojin Wang (NSW), Tim Wyatt, Justinieta Balberona (ACT), Tim Bryant, Ed McGeehan (VIC), Danielle Hofman (TAS), Aaron Bell (SA), Des Lock, Yohana Adams (WA), Jo Cruickshank (NT), Sandy Fong (NZ), Amu Naulls (Austroads), Peter Tisato (Technical Coordinator).

Contact us

This publication was prepared by the Australian Transport Assessment and Planning (ATAP) Steering Committee and approved by the Transport and Infrastructure Senior Officials' Committee. The Committees cannot accept responsibility for any consequences arising from the use of this information. Readers should rely on their own skill and judgment when applying any information or analysis to particular issues or circumstances.

ATAP Steering Committee Secretariat

Australian Transport Assessment and Planning Guidelines

Department of Infrastructure, Transport, Regional Development, Communications and the Arts

GPO Box 594

Canberra ACT 2601

Australia

Email: atap@infrastructure.gov.au

Website: atap.gov.au

Contents

Tables

1. Introduction

This Part of the Guidelines presents guidance to assist practitioners to include construction period impacts in their project assessments in a manner consistent with the ATAP framework.

Project assessments typically:

- Include:
  - Construction/delivery costs of a transport initiative, including those required to manage the construction/delivery period.
  - Infrastructure operating costs, plus benefits and disbenefits to users and third parties, during the operational life of the initiative.
- Exclude:
  - Disbenefits that occur during the construction period.

This report provides guidance to allow all construction period impacts to be included in assessments.

Inclusion of construction period impacts makes project assessments more comprehensive. In addition, as construction period impacts occur right at the front of the appraisal period, impacts of even a relatively modest size can be significant in present value terms. So the inclusion of construction period impacts in an appraisal may have a relatively high impact.

Inclusion of construction period impacts in project assessments will favour options where these impacts are lowest relative to options with higher impacts. Their inclusion is an important part of the options assessment process.

As with other aspects of assessment, the level of detail required will vary with the scale and complexity of the initiative, and the stage of the assessment. This is noted throughput the guidance.

Chapter 2 provides a brief overview, setting up the ATAP appraisal context, introducing construction period impacts, and listing a proposed step-by-step process for including these in appraisals.

Chapter 3 provides supporting discussion of the steps listed in Chapter 2.

Readers are referred to Morgan (2023) for a summary of relevant background literature on this topic.

Note that detailed planning and design of the construction / delivery process is outside the scope here.

1.1 Links to other ATAP guidance

The guidance is consistent and integrated with other ATAP guidance, the key Parts being:

- F3 Options generation and assessment — How to assess transport initiatives
- T2 Cost–benefit analysis (CBA) — Undertaking CBA of transport initiatives.

2. Overview

2.1 Inclusion in the ATAP assessment process

Inclusion of construction period impacts into the assessment of an option merely involves an extension of the standard process. The process is otherwise unchanged. The ATAP assessment process (see F3, section 3.1) involves (discussed further in section 2.3 below):

- Assessing strategic alignment
- Rapid appraisal
- Detailed appraisal
- Where possible, monetising impacts in dollar units and including in the CBA
- Where monetisation is not possible, listing the impact as a non-monetised impact. It should be described in quantitative and qualitative terms and, if possible, provided a rating in terms of likely direction (e.g. +ve or –ve) and scale (e.g. small, medium or large)
- All benefits and costs are incremental from the Project Case compared to the Base Case (do minimum).

Appraisal sub-periods

The appraisal period consists of two sub-periods:

- **Construction period**, during which the option is constructed / implemented / delivered.
- **Operational period,** after the construction period, during which the completed initiative provides its intended services to users.

In the CBA, benefits and costs should be included as follows:

- In the construction period: Capital costs for the option, construction period activity costs, replacement transport services, and all construction period disbenefits.
- In the operational period: Benefits and recurrent costs associated with the completed option.

2.2 Construction period disbenefits and costs

The construction period involves both disbenefits and activity costs:

- **Disbenefits** — The negative impacts on transport users and the broader community arising during the construction period. These include:
  - **Increased user costs from travel disruptions** — These arise due to changes to transport during the period that disrupts travel. They include: travel changes (route, mode, time), delays, vehicle operating costs, and any other inconveniences experienced by transport users in the network.
  - **Broader community impact costs (externalities — non-user or third party costs):**
    - **Environmental:** Severance, noise, dust, emissions, local amenity impacts
    - **Social and business impacts:** Amenity impacts to the local area, the impact on businesses.

  These are discussed in steps 5, 8 and 9 in chapter 3.
- **Activity costs** — The resource costs associated with managing the construction period. These include

costs of: traffic management, construction management, associated land acquisition, temporary utility service disruption, and the net resource costs of providing replacement public transport services when the normal service has been suspended during the construction period.

These are discussed in step 4 in chapter 3.

2.3 Stages of the appraisal process

Table 1 summarises the three stages of the ATAP assessment model (see F3 section 3.1) and discusses addressing construction period impacts in each.

Table 1 Treatment in assessment stages

Assessment stage	Requirement
Strategic alignment (strategic merit test) Focus on whether the proposed option is aligned with the goals and transport system objectives of the jurisdiction.	Consideration of construction period impacts is only required when they are expected to be particularly large and burdensome for the community.
Rapid appraisal An initial indicative quantitative assessment of the scale of an option's benefits and costs (monetised and non-monetised).	Consideration of construction period impacts at this early stage of assessment is important. It allows major potential impacts to influence option assessment from early on. Any multi-criteria assessment of options at this stage should ensure construction period impacts that are likely to differ significantly between options should be considered. Monetisation of impacts then allows them to be included in the rapid CBA of options.
Detailed appraisal A detailed appraisal of the short list of options that have passed the rapid appraisal.	Refined estimates of construction period impacts, both monetised and non-monetised, are required.

The level of detail and accuracy required increases in two ways (see F3 section 3.1):

- As we progress through the stages
- As the scale and complexity of an option increases.

Benchmarking

A helpful approach to use early in the appraisal process is to use benchmarks — if available. A benchmark is a piece of information on the indicative nature and scale of an impact based on past assessments for similar situations. Benchmarks could, in principle, be developed for all construction period impacts.

Benchmarks would be developed by analysing traffic, speed and other data from historic projects of similar type/scale/location, or where the current project is a part of a program. This may help in identifying the scale and significance of the impact and inform later modelling and assessment effort.

Given construction period impacts have tended to be excluded from project CBAs, there is likely to be only limited benchmark information currently available. In future, benchmarking would be assisted by:

- Jurisdictions creating databases of construction period impact assessment for real projects, and progressively updating them for newly completed projects
- Summarising a range of benchmarks from those databases
- Giving project teams access to those benchmarks for use in construction period impact assessments.

2.4 Process steps summary

Table 2 provides recommended steps for practitioners to use for the assessment of each option, and lists the sections in the chapter 3 that provide supporting discussion.

The steps are grouped into two phases:

- **Pre-appraisal**. This preliminary stage sets things up for the appraisal.
- **Appraisal**. The standard appraisal process, expanded to include construction period impacts.

Table 2 Process steps summary

Steps	Section
Pre-appraisal	
Step 1. C**onfirm project options**. Confirm the options that have arisen in the Options Generation process to address the identified problem / opportunity.	3.1.1
Step 2. S**pecialist inputs**. Engage engineers and modellers for their specialist input.	3.1.2
Step 3. D**escribe the construction period. Define**, scope and describe the construction/delivery period, focusing on how construction and traffic will be managed, and the full list of associated assumptions. Involve construction and traffic management specialists in this process.	3.1.3
Step 4. **Confirm all construction period activity costs.** Confirm and/or estimate construction period activity costs.	3.1.4
Appraisal	
Step 5. **Construction period disbenefits listing.** Create a list of the construction period disbenefits that are expected to apply, with a brief description of each.	3.2.1
Step 6. **Assess materiality and level of assessment.** Assess the materiality of construction period impacts, and the level of detail required in the assessment.	3.2.2
Step 7. **Assess the impact on traffic and transport.** Undertake a**n assessment of the impact on** traffic **and** transport d**uring** the construction period to estimate: • Changes in travel demand during the construction period • Associated delays, route diversions, switches to other modes, etc.	3.2.3
Step 8. **Estimate environmental impacts.** Estimate any environmental impact costs resulting during the construction period.	3.2.4
Step 9. **Estimate social and business impacts.** Estimate any social and business impacts.	3.2.5
Step 10. **Consolidation.** Consolidate the outcomes of steps 5 to 9 into: • A profile of monetised disbenefits and activity costs o**ver** the construction period • Any non-monetised impact assessments.	3.2.6
Step 11. **Incorporate into the CBA and business case**. Incorporate all parts of the assessment of construction period impacts into the CBA, and report in the business case.	3.2.7

3. Process steps

This chapter provides additional notes on each of the steps listed in Table 1 above.

The steps need to be undertaken for each option being assessed.

3.1 Pre-appraisal

3.1.1 **Step 1.** Confirm project options

Confirm the options that have arisen in the Options Generation process to address the identified problem / opportunity.

ATAP Part F3 Chapter 2 outlines the process for identifying options to address an identified problem / opportunity.

Create a list of the options and provide it to the team assessing construction period impacts.

3.1.2 **Step 2.** Specialist inputs

Engage engineers and modellers for their specialist input.

Incorporating construction period impacts into an appraisal will require consideration of a number of engineering aspects: construction management, traffic management, traffic engineering and demand modelling.

Specialist engineering and modelling skills should be sought to provide inputs into the appraisal.

3.1.3 **Step 3.** Describe the construction period

Define, scope and describe the construction / delivery period, focusing on how construction and traffic will be managed, and the full list of associated assumptions. Involve construction and traffic management specialists in this process.

Having a clear, realistic and documented description of the construction period for each option is essential.

Development of the description needs to occur from early in the appraisal process, with the level of detail and accuracy of the description increasing as one progresses through the process.

The construction period description needs to cover:

- Construction staging
- The length of the construction period
- Location of construction sites/work areas
- The approach required for traffic management
- Replacement public transport services required
- Any other key construction period activities.

Development of a construction period description should be guided by two key inputs:

- Specialist construction and traffic management advisors
- Best practice guidance for construction management and traffic management planning.

These two inputs are critical elements in minimising overall construction period impacts.

For simpler and less complex options, and early in the assessment process, the experience of the advisors will likely be sufficient to create adequate construction period descriptions.

For larger and more complex projects, more significant disruptions can be expected, and a greater level of expert input will be required from the start to describe the construction period. An example is light rail projects in urban areas, where staged construction to manage traffic impacts is required. Working assumptions can be made early in the appraisal process, with those assumptions confirmed and refined as the appraisal process advances.

Multiple traffic management options

Sometimes, for a given option, multiple traffic management approaches will need to be assessed. Once assessed, the combined impacts of each approach can be compared.

For example, for a construction project on a two-lane rural road, two traffic management approaches are available:

1. A temporary side-track, or
2. A single-lane shuttle on the existing road, managed by temporary traffic signals and employees of a traffic management firm.

While the temporary side-track approach will be more expensive, it will have smaller traffic delay and safety disbenefits. Assessing both approaches, and comparing the results of total combined impacts, will allow the least cost traffic management approach to be identified.

Construction and traffic management

Construction management and traffic management planning are outside the scope of this guidance. Project teams should be guided by best practice guidance on planning those activities. For example, Austroads (2021):

- Refers to four principles to consider in the preparing a Traffic Management Plan (for roads):
  - Safety — the need to control the risks, for both workers and the general public, associated with work on or adjacent to the road (safety is identified as *"… of the highest priority."*)
  - Accessibility — ensure access to the road and essential goods and services is maintained for all road users.
  - Amenity — minimise delays to traffic (including pedestrians, cyclists and other vulnerable road users), maximise network efficiency, and, where practical, maintain the most direct and convenient route between destinations.
  - Asset — minimise damage and the risk of damage to the road asset including natural features such as landscaping and trees.
- Provides a hierarchy of control for how traffic should be managed at a construction site:
  - Traffic 'around' the work area — the preferred approach, it requires traffic to be guided around a work area using a detour on alternative roads or a specially constructed side-track.

- Traffic 'through' the work area — traffic through the work area requires traffic controls to be in place to safely guide traffic through the work area. This may include the use of Portable Traffic Control Devices or manual traffic control functions to slow traffic on the immediate approach to a work area, to stop traffic for short periods when required or to control single-line shuttling.
- Traffic 'past' the work area — traffic paths past the work area involve a combination of lateral separation, clear warning, and delineation when the complete elimination of traffic from the site is not practical.

3.1.4 **Step 4.** Confirm all construction period activity costs

Confirm and/or estimate construction period activity costs.

For a reliable appraisal of an option, all associated costs should be captured, including construction period activity costs.

As the planning of a project progresses, formal cost estimates are developed. Comprehensive cost estimates will normally take all construction period activity costs into account. Where that has not occurred, construction period activity costs need to be costed and included.

In the early stages of the appraisal process, a formal cost estimate won't be available. At this stage, it is important that any indicative cost estimates used in the appraisal account in some way for construction period activity costs.

Construction period activity costs can include:

- **Traffic management costs.** These are the labour and facility costs expended to manage traffic safely in a construction area.
- **Costs of local street network changes.** Traffic management during the construction period may sometimes require improvements and changes to the local street network infrastructure to accommodate traffic diversion.
- **Costs associated with replacement transport services.** For example, closure of a rail line will require the provision of replacement bus services. The assessment should include the cost of providing the replacement services, net of any cost savings from the deferred normal services.
- **Costs incurred by utility providers.** These are the costs of utility infrastructure and service changes. Only changes specifically required during construction should be categorised as construction period impacts. Permanent changes required for the project, e.g. permanently moving infrastructure, will already be captured in the project cost estimate and so should not also be categorised as construction impacts. A check is required to ensure there is no double counting of cost items.
- **Land acquisition costs.** Some land acquisition is specifically required to accommodate construction period activities, e.g. retaining equipment on site. If some or all of the land is sold at the end of the construction period, the sale proceeds should be counted as a benefit at the end of the construction period.
- **Other.** Any other construction management costs.

Avoiding double counting of costs

An important step is to check to what extent construction period impacts may already be captured either explicitly or implicitly in the cost estimate of an option/ project. For example, practitioners should check whether (and the extent to which) the cost estimate for the option/project includes scope elements designed to mitigate or eliminate construction period impacts, e.g.:

- Dust barriers and water spray systems may be used to reduce dust emissions at construction sites.
- Construction activities may be scheduled to only occur at off-peak times to minimise local traffic disruption.

Without this check, there is a risk of double-counting in costing.

Separating out construction period activity costs

Showing the construction period activity costs as a separate item in the overall cost estimate can be beneficial. The advantage of this is that construction period activity costs and can be combined with construction period disbenefits into an overall construction period total cost. This is the cost that needs to be minimised in order to find the least cost approach when assessing different construction period approaches.

3.2 Appraisal

As mentioned in section 2.1, inclusion of construction period impacts into the assessment of an option merely involves an extension of the standard process. Estimation of construction period disbenefits involve the same estimation and valuation approaches used for estimating benefits during the operational period of a completed project — travel time savings, vehicle operating costs, environmental costs, etc. Guidance on estimating those are contained elsewhere in the Guidelines and are cross-referenced from sections below.

3.2.1 **Step 5.** Construction period disbenefits listing

Create a list of the construction period disbenefits that are expected to apply, with a brief description of each.

Section 2.2 listed two categories of disbenefits that could arise in the construction period: increased user costs from travel disruption, and broader community impact costs. Step 5 involves identifying the individual disbenefits that will apply in each category. Create a summary listing of the expected disbenefits for each option, with a brief description for each.

Potential disbenefits include the following:

- **User cost increases to transport system users**. It includes impacts on all transport system users, including private and commercial users of roads, rail, public transport and active travel. These include delays, increased vehicle operating costs and other inconveniences to:
  - Users who do not change travel route, time or mode of travel during construction. They do not change their travel behaviour, but may be impacted while approaching and traversing the construction site in the form of delays due to speed restrictions, stops, delays or slow speeds, and increased operating costs.
  - Users who do change travel route, time or mode. These users will bear the costs associated with their behaviour change: longer travel time, higher operating costs, fares of alternative modes, etc
  - Other transport system users, impacted by changed travel patterns arising during the construction period. For example, increased route diversions during the construction period may increase road congestion elsewhere in the network. This also includes impacts on walkers and cyclists in the vicinity of the construction site. It also includes increased road network congestion due to the running of replacement buses.
- **Impact costs borne by the broader community (externalities — non-user or third party costs).** These include:

- **Environmental:**
  - Severance, noise, dust, and other amenity impacts to the local area.
  - Greenhouse gas emissions and air pollution from changed travel patterns and services.
- **Social and business impacts:**
  - Impacts on land owners and businesses whose operations are affected by the construction activity. In major centres, this would extend to impacts on tourism visitation and indirect flow on to business.
  - Impacts on businesses and communities resulting from any temporary utility service disruptions during the construction period.

Construction period disbenefits will vary based on the scale, type, location and construction approach of the option, and will vary considerably between projects. For example:

- Rural road upgrades are not expected to change traffic patterns or volumes but can lead to stops, delays or slow speeds for vehicles passing through the construction site. They would be expected to have limited impact on local businesses.
- Urban transport projects are more likely to require temporary network changes, change travel patterns including changes in route, time of travel, and mode chosen, and impact user costs. They will often impact local business.
- Like construction projects, maintenance works also involve a construction period. Although a CBA is not undertaken for proposed maintenance works, such works are assessed in terms of cost minimisation. Construction period impacts are relevant to finding the least cost approach to undertaking maintenance works and should be included in the assessment.

3.2.2 **Step 6.** Assess materiality and level of assessment

Assess the materiality of construction period impacts, and the level of detail required in the assessment.

The materiality of construction period impacts depends on both the nature of the option/project, and the stage of assessment. Section 2.3 listed the stages of the assessment process, and indicated that the level of assessment detail required would increase as we progressed through the appraisal process, and the larger and more complex the option.

Early in the appraisal process, during rapid appraisal:

- Where construction period impacts are considered likely to be small or immaterial, a qualitative assessment, may suffice. This would be the case for small, non-complex options/projects and/or not in sensitive areas.
- Conversely, if construction period impacts are expected to be large and material, start with a qualitative assessment, but proceed quickly to inclusion of quantitative information, and where feasible monetise the disbenefits and costs. This would be the case for large, complex projects, and/or in sensitive areas.

During detailed appraisal, construction period impacts should be monetised wherever possible, and included in the detailed CBA.

One would expect that the earlier one is in the appraisal process, the higher the degree of uncertainty associated with benefit and cost estimates.

Heuristics / rules-of-thumb

A screening process using a heuristic (rule-of-thumb) approach can be a useful tool for assessing the likely materiality of construction period impacts. For example, a minor road project in a regional area is likely to be less disruptive than a major highway upgrade through a highly urbanised and developed area.

While a heuristic approach is inherently less accurate than a detailed, project-specific assessment, it can be a useful aid when faced with data limitations during an early stage of the assessment process. Some factors that practitioners should consider when undertaking this approach include:

- **Location:** Brownfield locations tend to experience higher levels of construction period impacts than greenfield as the presence of existing infrastructure and development often adds to construction complexity.
- **Duration**: Construction period impacts are likely to be higher the longer the period. Options constructed over multiple years will likely impose greater disbenefits and activity costs than ones constructed over months.
- **Number of people impacted**: The more people impacted by construction activities, the larger construction period impacts are likely to be. For example, disruption to rail services with high passenger levels are likely to be more costly than disruption to services which are used less frequently.
- **Level of disruption**: Greater per person disruption costs are likely to lead to higher total disruption costs. For example, a construction site which requires traffic to undertake a long detour is likely to have greater impacts than ones which only requires a short detour.

Chapter 1 noted that, because construction period impacts occur at the start of the appraisal period, where the effect of discounting is smallest, they have a relatively high impact on CBA results. Even relatively modest costs can be significant in present value terms. So practitioners should err on the side of monetising these impacts. As such, if in doubt as to their materiality, it is advisable for practitioners to lean on the side of including construction period disbenefits and activity costs in the appraisal from early on in options assessment.

3.2.3 **Step 7.** Assess the impact on traffic and transport

Undertake an assessment of the impact on traffic and transport during the construction period to estimate:

- *Changes in travel demand during the construction period*
- *Associated delays, route diversions, switches to other modes, etc.*

The approach to assessing the impact on traffic and transport will vary with the scale and complexity of the option and its associated construction period. It will involve a combination of both modelling and non-modelling approaches, using professional judgement by relevant experts.

For smaller options, and early in the appraisal process, model runs will often not be required. In these cases, the general expertise and judgement of traffic engineers and modellers will be sufficient to suggest the scale of the impacts that can be expected. Table 3 below outlines several non-model approximation approaches to estimate impacts on traffic and transport for various construction period situations. It also lists the expected disbenefits in each of those situations.

Table 3 Non-model approaches to estimating the impact on traffic and transport

Approach	Description	Comments
Level of Service (LOS) reduction	Deteriorations in traffic conditions during the construction period can be proxied through a reduction in traffic conditions to LOS F. LOS F is characterised by high levels of congestion, delay, and extensive queuing with traffic flow at extremely low speeds of 30% or less of the Base Free Flow Speed (Austroads 2020).	The LOS reduction approach provides a standardised level of traffic performance which can be used to proxy for traffic disruptions. This approach may be appropriate where detailed information on the traffic management strategy is not available. It is important to ensure, however, that the LOS under the base case for the affected links is superior to LOS F otherwise the disruption may be immaterial. Relevant transport disbenefits include: • Travel time changes • Vehicle operating cost changes
Construction zone speed limit	Reduced speed limits around construction sites can be simulated by reducing average travel speeds to 40km/hr in line with construction zone speed limits.	Construction zone speed limit provide a standardised level of travel speed which can be used to proxy for traffic disruptions due to temporary traffic management systems. This approach is best suited for 'through' or 'past' the work area traffic management controls. Relevant transport disbenefits include: • Travel time changes • Vehicle operating cost changes
Additional interchange cycle	Traffic disruption associated with interchange upgrades/works can be proxied by assuming vehicles incur additional cycles to clear the junction.	Additional interchange cycles can be appropriate where construction activities reduce capacity at a key junction. The delay estimate should be based on the average cycle time of the interchange in question. Relevant transport disbenefits include: • Travel time changes • Vehicle operating cost changes
Traffic detour	For traffic management controls which involve moving traffic around the work area, the traffic disruption can be based on the additional time and distance associated with the alternative route.	Traffic detours should be based on the least cost (i.e. shortest and quickest) alternative route. This approach is best suited for 'past' the work area traffic management controls. Relevant transport disbenefits include: • Travel time changes • Vehicle operating cost changes • Road safety • Environmental externalities • Road damage costs
Service substitution	Disruption to public transport services may be managed through replacement services. For rail services, this may be an alternative rail service or a dedicated rail replacement bus service.	Service substitution should be based on the best viable alternative. Service substitution cost estimates should consider the alternative route and mode-specific costs. Relevant transport disbenefits include: • Travel time changes • Vehicle operating cost changes • Road safety • Environmental externalities • Road damage costs • Crowding • Farebox revenue

In more complex cases, and as the appraisal process advances, the use of traffic/transport models will be required.

Model runs will be required specifically for the construction period, over and above runs undertaken for the post-construction operational period.

The number of vehicles or transport users affected in the construction period can typically be sourced from the base case demand modelling for the project. Key considerations include the location where impacts are expected to occur, the time of day which is likely to be impacted (e.g. peak period or off-peak) and whether the disruption is likely to occur during the entire construction period or only a subset.

The requirement and challenge from a modelling perspective is to:

- Select the most suitable model type, or combination of models, for each assessment. This will require assessing the role played by strategic vs operational models (macro, meso and micro level), and bringing those together in the most suitable combination (where required). The best combination will vary with the scale of the option being assessed.
- Reflect in the models the transport network restriction/modifications stated in the construction period description, which may include reducing road network capacity, reducing speed limits, and/or changes to public transport services.
- Generate model outputs of the associated transport demand disruption effects, including changes in:
  - Traffic flows on/at relevant transport links and nodes
  - Traffic speeds and associated delays
  - Mode choice changes.

Other considerations when deciding how detailed modelling of the construction period should be include:

- Are the impacts likely to differentiate options under consideration?
- Do the impacts have reasonable potential to impact the decision as to whether to proceed with the investment.
  - If so, consider modelling in detail.
  - If not, the impacts would need to be planned for, managed and minimised during the procurement and delivery phases?

Decisions about the best modelling approach to use for a given assessment should be made by an experienced demand modeller.

3.2.4 **Step 8.** Estimate environmental impacts

Estimate any environmental impact costs resulting during the construction period.

Environmental costs consist of:

- Severance, noise, dust, and other additional amenity impacts to the local area. Severance may result not just in delays, but also increased[1] or decreased[2] trips.
- Net change in greenhouse gas emissions and other air pollution.

ATAP PV5 provides two areas of guidance:

- Unit environmental costs on a per distance travelled (per vehicle-km) basis for severance, noise, greenhouse gas emissions and air pollution. These can be used to determine the environmental costs associated with route diversion and replacement bus services during the construction period.

  Often, environmental impacts will require a bespoke location-specific assessment rather than application of per km travelled unit costs. These circumstances will require the engagement of specialist environmental impact resources to undertake detailed case-by-case assessments.
- The upfront carbon impacts associated with infrastructure construction.

3.2.5 **Step 9.** Estimate social and business impacts

Estimate any social and business impacts.

Safety costs

Disruption to road and active transport during the construction period may result in increased crashes, injuries and possibly deaths.

PV2 provides parameter values for assessing the cost of crashes, injuries and deaths.

Business impacts

The construction period can result in some negative impacts on local businesses, e.g. loss of revenue from reduced foot traffic. These should be discussed in the business case — possibly in the Distributional Impact Assessment.

In the CBA, the focus is on net disbenefits. Impacts on businesses (pecuniary externalities) would generally not give rise to net disbenefits. Customers will make their purchases elsewhere, so there will be little net impact on the customers across the whole jurisdiction. That is, losses to some businesses will be offset by gains to other businesses.

Amenity

The construction period can result in a temporary decline in local amenity. Be careful to avoid double-counting with environmental impacts.

3.2.6 **Step 10.** Consolidation

Consolidate the outcomes of appraisal steps 5 to 9 into:

---

[1] For example, when a major public transport corridor is constructed and splits the city in two, more trips may be required than before construction to undertake the same set of activities in a day or week.

[2] If the disruption during construction is significant enough, some discretionary trips may no longer be undertaken during the period.

- *A profile of annual monetised disbenefits and activity costs over the construction period*
- *Any non-monetised impact assessments.*

A summary of disbenefits (monetised and non-monetised) facilitates an understanding of the overall nature and scale of construction period impacts.

As required, redesign the construction period to minimise the overall impact during the period.

3.2.7 **Step 11.** Incorporate into the CBA and business case

Incorporate all parts of the assessment of construction period impacts into the CBA, and report in the business case.

Calculating the BCR

With respect to calculation the BCR, ATAP T2 advises:

> *"Costs of negative externalities caused by construction should be included in a CBA, but are not relevant for capital budgeting. They should therefore be treated as disbenefits." ATAP, T2 Cost Benefit Analysis (2022) p. 22*
>
> *"BCR1[3] puts operating and investment costs incurred by governments in the denominator and the consequences of incurring these costs (the benefits), in the numerator. BCR2 puts only the initial capital investment cost in the denominator and all other impacts in the numerator. In most cases, impacts that occur before completion of the initiative go in the denominator, and benefits and savings in costs that occur after completion of the initiative in the numerator. There are exceptions to the before–after rule such as construction externalities (e.g. traffic delays, diversion costs, noise, dust), which belong in the numerator because they are not paid out of budget-constrained funds." – ATAP, T2 Cost Benefit Analysis (2022) p. 63*

It is post-construction impacts on governments that give rise to the difference between BCR1 and BCR2. Construction period impacts are therefore treated the same way under both BCR definitions because, by definition, there are no construction period impacts incurred by governments after completion of the project.

Accordingly, construction period impacts should be included in the BCR calculation as follows:

- Include in the **top line** of the BCR equation:
  - All disbenefits (user costs and broader community costs).
- Include in the **bottom line** of the BCR equation:
  - All activity costs, including replacement transport service costs, net of savings in operating costs from not running the closed service during the period.

Construction period impacts need to be valued according to the rules of CBA:

[3] BCR1 = PVB / (PVOC + PVIC) and BCR2 = (PVB – PVOC) / PVIC, where PV is present value, B is benefits, OC is operating costs, IC is investment costs.

- Only changes in willingness-to-pay minus resource costs cause net benefits to change.
- Additional fares paid by passengers should not be counted (as they are transfers from users to operators) — but the net additional operating, time and crowding costs should be counted.

Construction period impacts should be reported as separate line items within the CBA.

References

ATAP 2021, F3 *Options generation and assessment*

ATAP 2016, F4 *Business case*

ATAP 2022, T2 *Cost–benefit analysis*

Austroads 2021, *Guide to Temporary Traffic Management*, Part 2

Morgan C 2023, *Construction disruption impacts: A preliminary guide*, Australasian Transport Research Forum

INFRASTRUCTURE AND
TRANSPORT MINISTERS