TRANSPORT AND INFRASTRUCTURE COUNCIL

Australian Transport Assessment and Planning Guidelines

F3 Options generation & assessment

Public consultation draft

November 2020

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The ATAP Guidelines currently publishes guidance on Options Generation and Assessment in Part F3 of the ATAP website: https://www.atap.gov.au/framework/options-generation-assessment/index

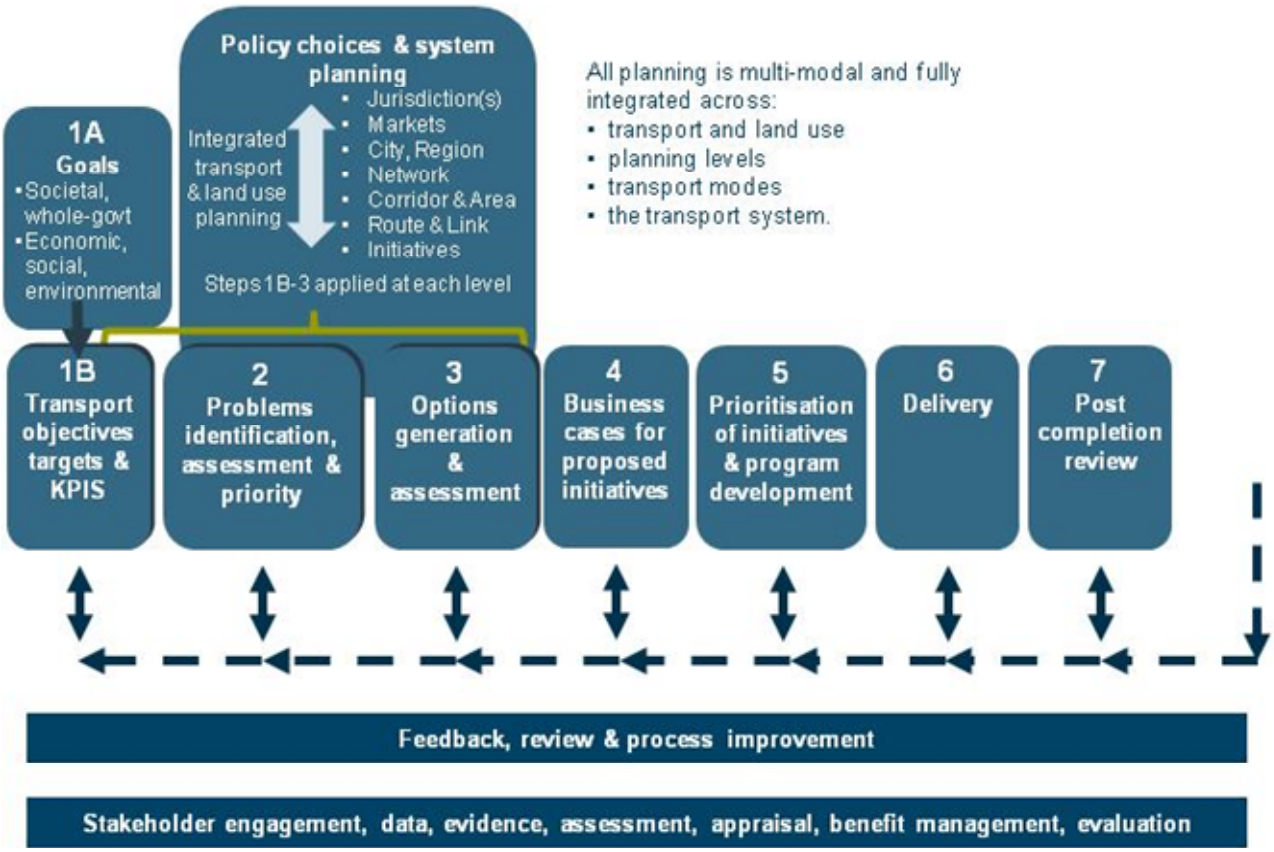
Several amendments are now proposed to the current guidance. Those amendments are set out in this document for public consultation.

In summary, the primary amendments consist of:

- Step 2 of the ATAP Framework consists of problem identification and assessment. Where referred to in this document, 'problem' has been replaced with 'problem and opportunity' as per the Infrastructure Australia Assessment Framework
- References to 'initiatives' have been altered to 'options'. Footnote 1 has been added 'In the rest of the Guidelines, the preferred option is referred to as an initiative.'
- The term 'reform' option has been replaced with 'non-capital' option throughout.
- Technology solutions has been added as a category of options.
- A new section (2.1.6) on relevant options has been added.
- Section 2.2.3 now refers to 'real options', with a reference to new ATAP Part T8 Real options Assessment.
- Section 2.2.7 has been expanded to emphasise the importance of combining top-down and bottom-up thinking and information.
- Clarification has been added that stage 1 of the assessment process considers 'strategic alignment', with the Strategic Merit Test being a tool for its assessment.
- Alignment with Government policy objectives have been added as a criterion in stage 1 of the assessment.
- Distributional impact assessment (DIA) has been added as an additional element of the assessment process.
- Footnote 4 details recent uptake of use of the Appraisal Summary Table.
- Chapter 2 discusses 'bringing the right team together' in options generation. New section 3.7 has been added to discuss the same issue for options assessment.

The amendments are highlighted using grey shading.

Step 3: Options generation and assessment



At a glance

- Step 3 of the Framework provides guidance on generating and assessing options to address the problems/opportunities identified and prioritised in Step 2.
- The purpose of this step is to:
  - Generate a full range of non-capital and capital investment options that consider supply and demand factors
  - Narrow down a long list of possible options to a preferred option, using a three–tiered assessment process: Strategic Merit Test (SMT), rapid appraisal and detailed appraisal.
- Recommended tools are provided for each tier of the options assessment process.
- This step should result in the selection of a preferred option (or package of options) that is supported by a rich set of information about its impacts, benefits and costs.
- Information about relationships between an option and proposals elsewhere in the network (independence, complementarity, substitutability) need to be explicitly recognised when assessing an option, and clearly explained and presented to decision-makers.

1. Introduction

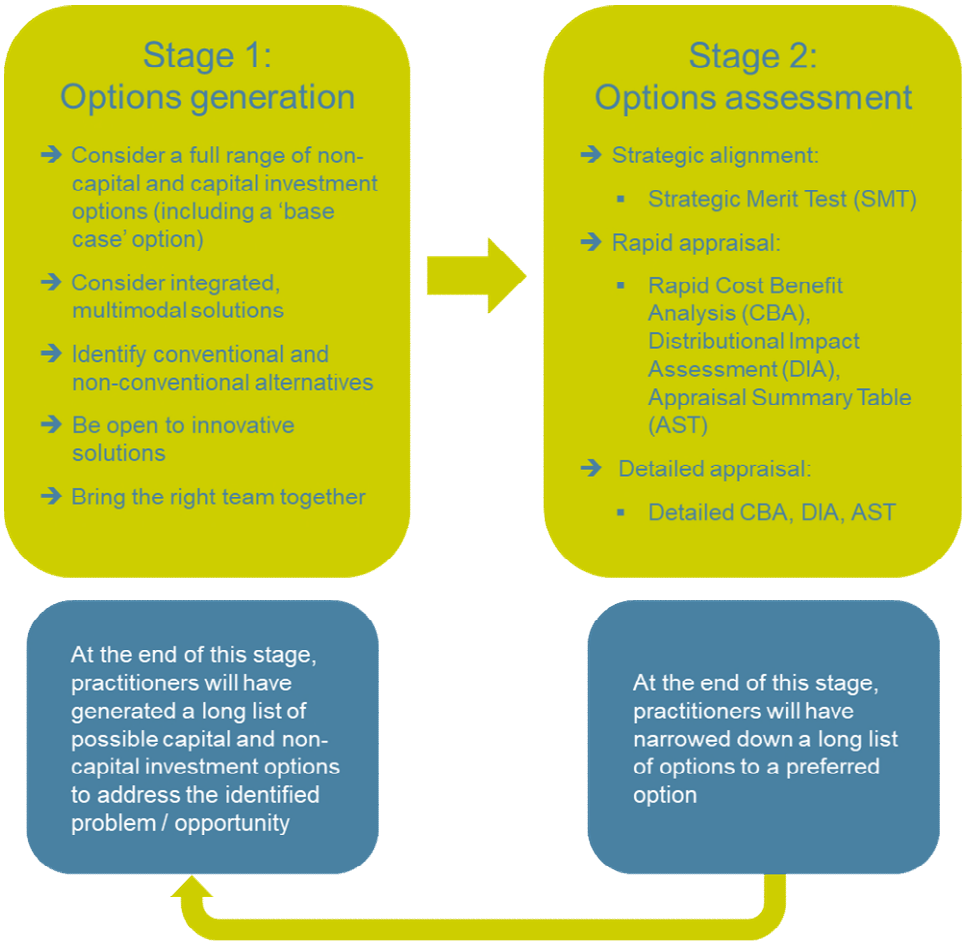
Step 1 of the Framework provides guidance on identifying jurisdictional goals and setting transport system objectives.

Step 2 explains how to identify, assess and prioritise problems and opportunities. Overcoming the problems, and pursuing the opportunities, contributes to the goals and transport system objectives from being achieved.

Step 3 involves generating a broad range of options, assessing the impact of each option on the identified problems / opportunities and weighing them up against alternatives. The final outcome of this step is to arrive at a preferred option (or package of options) that is supported by a rich set of information about its impacts and merits. This document provides guidance on step 3, which aligns closely with the Infrastructure Australia Assessment Framework (IA 2018).[1]

Step 3 of the framework can be broken down into two distinct stages; options generation and options assessment. These are depicted in Figure 1.

Figure 1 Step 3 of the Framework



[1] In the rest of the Guidelines, the preferred option is referred to as an initiative

An iterative process should be adopted to refine option generation and assessment as the detail and accuracy of data improves across the two stages. Feedback from stakeholders should be incorporated into this iterative process.

Box 1 Avoiding the pitfalls

Common pitfalls in options generation and assessment include:

- Failure to think broadly and consider a wide range of options including non-capital options, e.g. overlooking innovative, untested or technology-driven solutions
- 'Gold plating' investment options (i.e. adding on extra scope elements for little additional benefit) when lower cost solutions exist
- Failure to consider packaging and sequencing options
- Reluctance to abandon a favoured solution when it fails one of the assessment steps
- Lack of evidence to support the preferred solution.

2. Options generation

Once problem identification, assessment and prioritisation are completed, a broad spectrum of options should be generated to solve the prioritised problems and opportunities. Developing a range of non-capital and capital investment options is critical to addressing the problem effectively and achieving the best value from transport investment.

In generating options, the approach taken should include developing a full range of possible non-capital and capital investment options that consider supply and demand factors.

Options should address only the specific problems / opportunities identified in Step 2. If there are other problems / opportunities that could be addressed concurrently, these should not be considered when generating options. The focus of options generation is on identifying options that address the problems / opportunities identified.

2.1 Considering a range of options

Figure 2 shows the wide range of option types that should be considered when generating options. Checking through this list will help ensure that a full range of options is considered.

Figure 2 The range of non-capital and capital investment options

This approach adopts a strong focus on non-capital options, reflecting the potential of demand-side options to address many of the problems facing existing infrastructure networks. It is important that both non-capital options and supply side solutions are carefully considered in developing options. Non-capital options are discussed below.

2.1.1 Regulatory options

- Changes to the way both infrastructure and infrastructure services markets are regulated from a competition perspective – such as changes to regulatory regimes, access regimes, market structures and frameworks
- Changes to the regulations surrounding markets – such as safety and environmental regulations, technical standards and licensing.
- Changes to administrative and institutional frameworks – such as public service delivery processes, approval processes, coordination and cooperation processes, assurance processes, contractual provisions and funding agreements.

2.1.2 Better use options

- Technological innovations – including intelligent active management systems, intelligent transport systems, smartcards, smart metering and product technical standards (such as energy efficiency standards)
- Influencing the way people behave – through workplace practices (such as flexitime and teleworking), commuter travel planning (such as ride sharing and encouraging walking or cycling for part of the journey to work) and providing information (such as timetabling)
- Economic pricing and charging – such as the introduction of full economic pricing infrastructure, network charging and road tolls[2] and fare structures and levels.

2.1.3 Land use options

- Development planning controls – such as measures to encourage higher density development, limit car parking provided with new developments and require developments to include active travel facilities
- Changes to land use planning to provide a land use solution to infrastructure problems and better integrate land use and transport decisions.

[2] The Austroads Guide to Traffic Management provides complementary guidance on the efficient use and management of roads

2.1.4 Service options

- Increased services – through new routes, more frequent services and longer operating hours
- Improved integration between modes – such as better coordinated timetables and interchange arrangements
- Other options designed to improve services – such as priority measures for public transport and improved information for customers.

2.1.5Technology solutions

- Future automated vehicles
- Various other technology options.

Importantly, options should contribute to meeting the transport system objectives and targets defined in Step 1.

2.1.6 Relevant options

The options generated must be relevant to the geographical context and the problem being addressed. The following are examples of this:

- For a rural and remote road with a freight efficiency problem, short listing public transport options would not be appropriate.
- If the project is a dual carriageway upgrade or bridge replacement project to allow heavier PBS vehicles, then considering options like building a rapid bus service or light rail is not going to address the problem of freight efficiency.
- Towns outside capital cities typically do not have dedicated public transport services or networks. Therefore, for a project to duplicate a road leading from these towns into a nearby town that doesn't have public transport, options such as light rail or bus lanes would not be relevant.
- Consider the case of an urban route that is declared a dedicated freight road, with access controlled, and 90 km/hr to 100km/hr speed zone. A project to grade separate an intersection on the highway, or add an extra lane, is proposed. Shortlisting a bus transit system isn't appropriate because the road has been declared a strategic freight route. Having people stand on the road waiting for a bus is not compatible with a freight route. Options to consider would include – freight rail upgrade, other road upgrades that seek to remove commuter traffic from the freight route, etc.

This discussion illustrates the importance of options generation being linked to, and driven by, the identified transport system objectives and problems.

2.2 Thinking broadly

It is important to think broadly in developing options to solve transport problems.

2.2.1 Consider non-capital and capital investment solutions

Increasingly, many Australian jurisdictions are focusing on non-capital solutions as a core element in transport planning. This aims to achieve a better balance between non-capital and investment solutions and focus on low cost solutions to deliver better transport outcomes.

For example, as shown in Figure 3, options to reduce congestion along a particular road corridor may include making better use of the existing network through smarter traffic management or changes to the adjoining road hierarchy, promoting ride sharing in workplaces along the corridor, providing facilities to encourage bus travel and changing future land uses near or along the corridor.

When working through the options generation process, the real risk of 'gold plating' capital investment options (i.e. adding on extra scope elements for little additional benefit) should be acknowledged.

2.2.2 Pricing

Pricing is an effective tool for managing demand on transport networks. Practitioners need to genuinely consider pricing and the full range of potential benefits it can deliver.

For example, tolls can lead to more efficient allocation of road space. Tolls also maximise the value for money for both new and existing transport capacity by allocating scarce road space to the highest value use.

Prices could also be made lower in off-peak periods than in peak periods to encourage peak spreading — which results in better use of existing capacity and reduces the scale of the problem.

Pricing can also attract private sector investment in transport infrastructure through generating revenue streams.

2.2.3 Consider packaging and sequencing

A critical element in options generation is to consider how individual options can be packaged together or sequenced or better coordinated for a more efficient and effective outcome.

Practitioners need to be open to the idea that the most suitable option may include a combination of different options: for example, user charges coupled with introducing bus lanes.

Practitioners should also consider the sequencing of options, which can also be thought of as a program of work. In some instances, capital investment should only take place after non-capital options are in place. To avoid large capital investments in the short-term, it may be possible to adopt non-capital measures or low cost capital investment options to delay larger scale investments.

The sequencing of options can also be an effective approach when faced with considerable future uncertainty. Uncertainty about the future can make a decision to proceed with an expensive capital investment highly costly if the future turns out to be significantly different to what was expected in the assessment and decision-making stages. ATAP Part T8 Real Options Assessment discusses how 'real options' involving timing options and scale changes can provide flexibility in the face of future uncertainty.

2.2.4 Focus on integrated solutions

The integrated nature of the transport system should also be considered. Options with a narrow focus are less likely to be effective. When developing options, practitioners should be alert to solutions that:

- Incorporate different modes of transport
- Encourage active travel
- Improve transport connectivity and accessibility
- Support or drive desired land use changes.

Practitioners should also recognise that an option that solves a particular problem on one part of the transport system may cause or exacerbate problems in other parts of the system.

2.2.5 Be open to innovative solutions and new ideas

The understandable tendency to concentrate on types of solutions that have been adopted in the past should be resisted, as it can lead to potentially successful new options being dismissed or overlooked at an early stage.

The range of potential options is continually expanding due to new technologies, a better and broader understanding of the impacts of different solutions, and the ability to disseminate highly customised data to users of the transport system.

Tightly targeted road pricing, monitoring and enforcement of high occupancy vehicle lanes, real-time public transport arrival information and smartcard ticketing are just a few of the options that have emerged in recent years. Practitioners should be open to innovative options, even if these options are untested.

Crowdsourcing, where ideas are collected from people via the internet, social media and smart phones is a new approach that may also play a role.

2.2.6 Think outside the transport system

In some instances, solutions may be outside the transport system. For example:

- Offering shopping vouchers or free grocery delivery for people who use public transport to travel to their local shops may encourage more people to visit the centre by bus or train.
- Changes in land use that lead to increase in residential areas and shops may change the number and direction of people movements within and between precincts.
- Landscaping a park to make it safer and more pleasant for pedestrians may increase the number of people walking between their homes and a train station.

Understanding the root causes of problems (see ATAP F2) is critical to thinking outside the transport system. This may require casting the analytical net wider to obtain additional evidence and a wider range of data and information.

Practitioners should also consider packaging these kinds of options with ones focused directly on the transport system.

Turning these options into effective solutions may require collaboration with private sector partners or government agencies outside the transport portfolio.

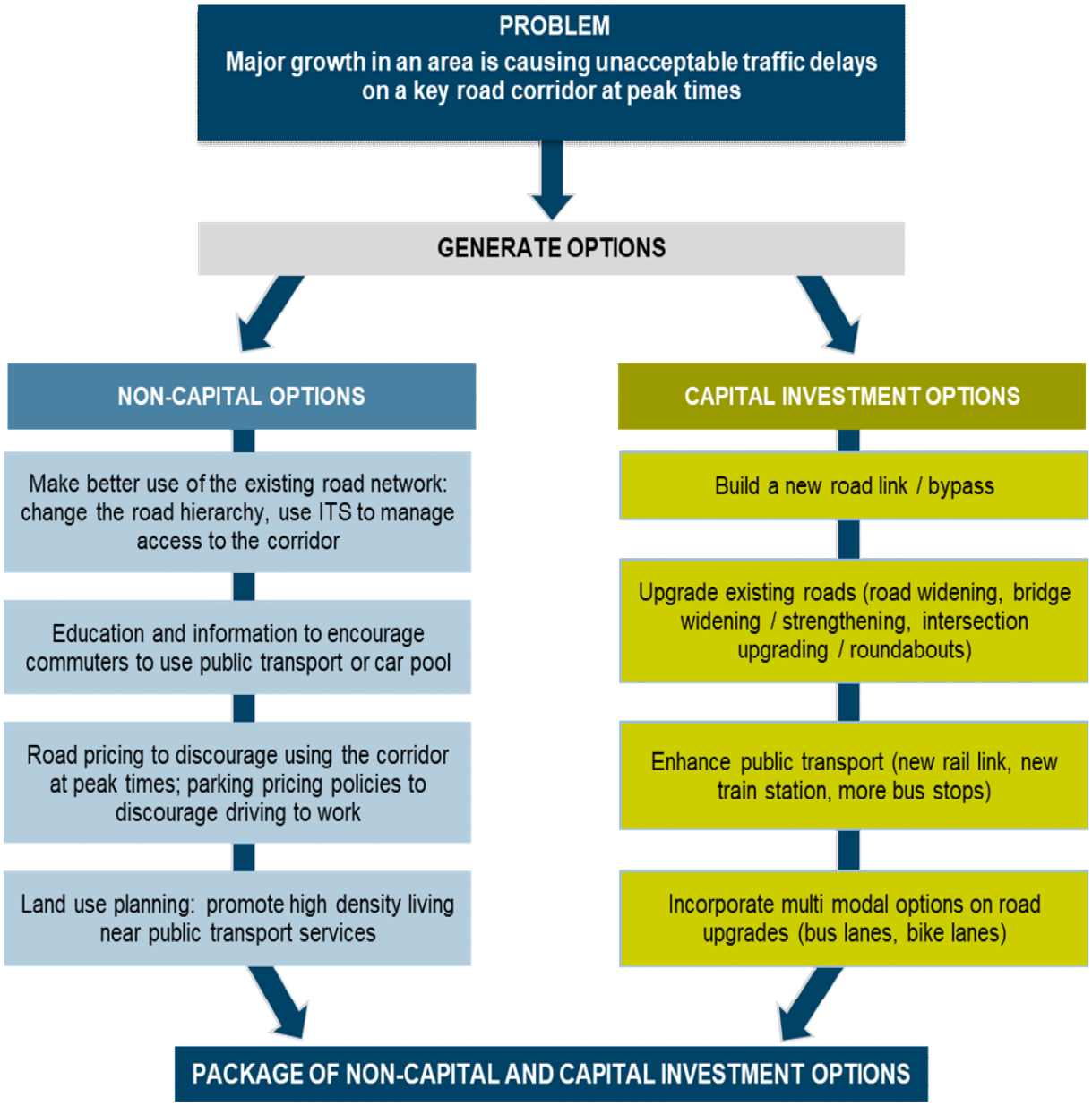
2.2.7 Bring the right team together

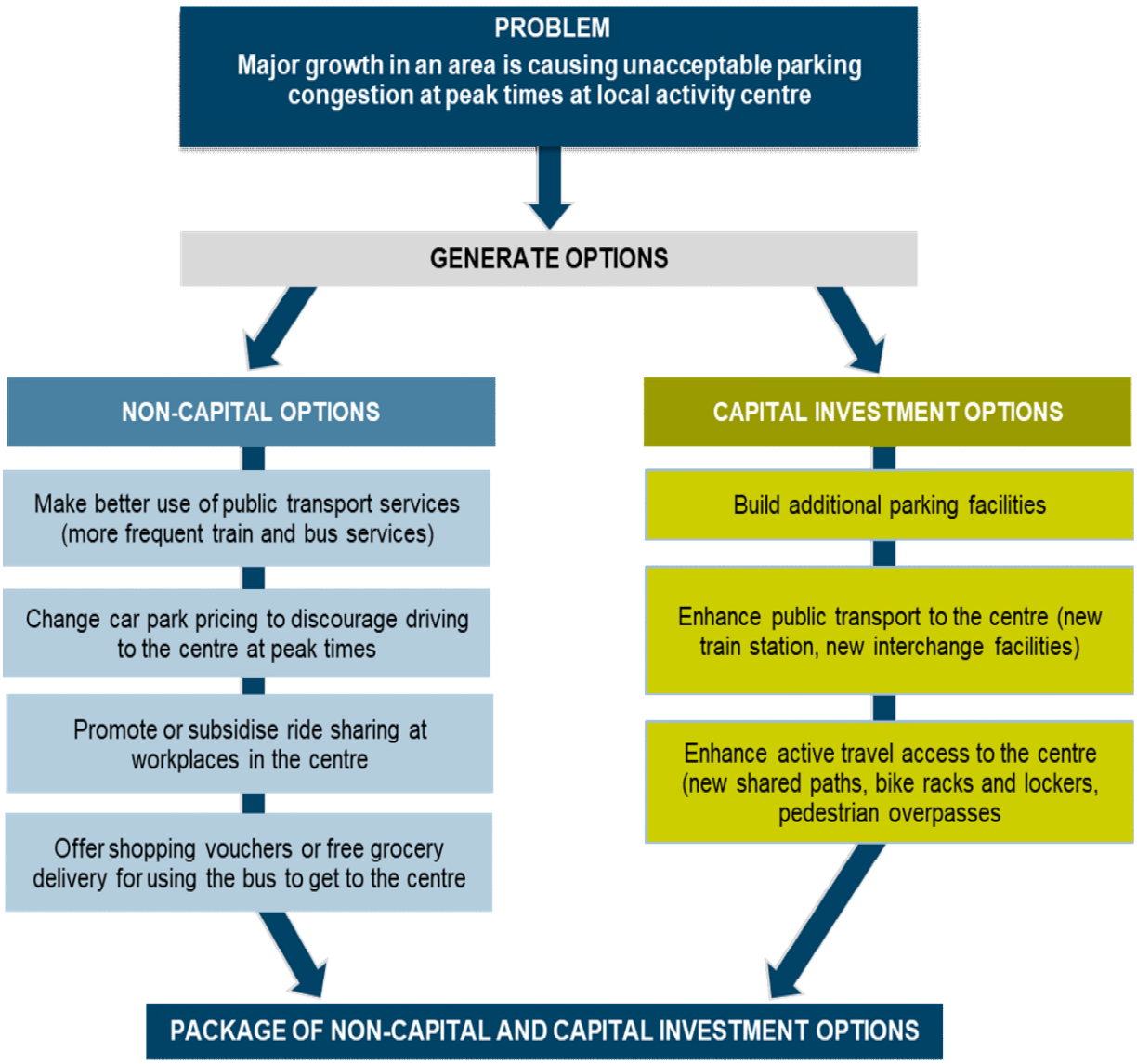
Having the right people involved in the options generation process is important. The people present must have both the capability and the authority to think broadly about potential solutions to the identified problem/opportunity. Options generation can benefit from the:

- Top-down thinking of strategic planners that consider wider transport strategic plans, options arising from them, and the network effect of options, and
- Bottom-up views, information and understanding of users, operational representatives (e.g. rail station managers and commuter reps from a public transport / rail project) and project planning experts.

The following figures illustrate possible non-capital and capital investment options for two transport problems.

Figure 3 Generating options - two examples




PROBLEM
Major growth in an area is causing unacceptable parking congestion at peak times at local activity centre
GENERATE OPTIONS
NON-CAPITAL OPTIONS
Make better use of public transport services (more frequent train and bus services)
Change car park pricing to discourage driving to the centre at peak times
Promote or subsidise ride sharing at workplaces in the centre
Offer shopping vouchers or free grocery delivery for using the bus to get to the centre
CAPITAL INVESTMENT OPTIONS
Build additional parking facilities
Enhance public transport to the centre (new train station, new interchange facilities)
Enhance active travel access to the centre (new shared paths, bike racks and lockers, pedestrian overpasses
PACKAGE OF NON-CAPITAL AND CAPITAL INVESTMENT OPTIONS

3. Options assessment

Once a range of options has been identified, a structured process should be used to assess those options and move from a longer list of options to a shorter list of options and, finally, to a preferred option.

3.1 The assessment process

At the start of the options assessment process, a long list of options exists. A priority problem has been identified and the best option is sought to solve the problem. At this stage, which option is best has not yet been determined. The assessment process aims to determine the best option in terms of:

- Strategic alignment with goals, objectives, policies and policy objectives
- The overall economic, social and environmental merit of options, including net benefits (benefits less costs — both monetised and non-monetised), and distributional (equity) effects.

The process of narrowing down the list of options involves a 'filtering' or 'screening' process. It should be structured, objective, and evidence-based. Options should not be ruled out on the basis of personal preferences, perceived political difficulties or in any way that precludes genuine consideration of certain options. Options should be judged purely on their merits and ruled out only on the basis that they do not address the problem or opportunity in an efficient and effective way. In reality, however, governments do sometimes rule out some options early in the planning process[3].

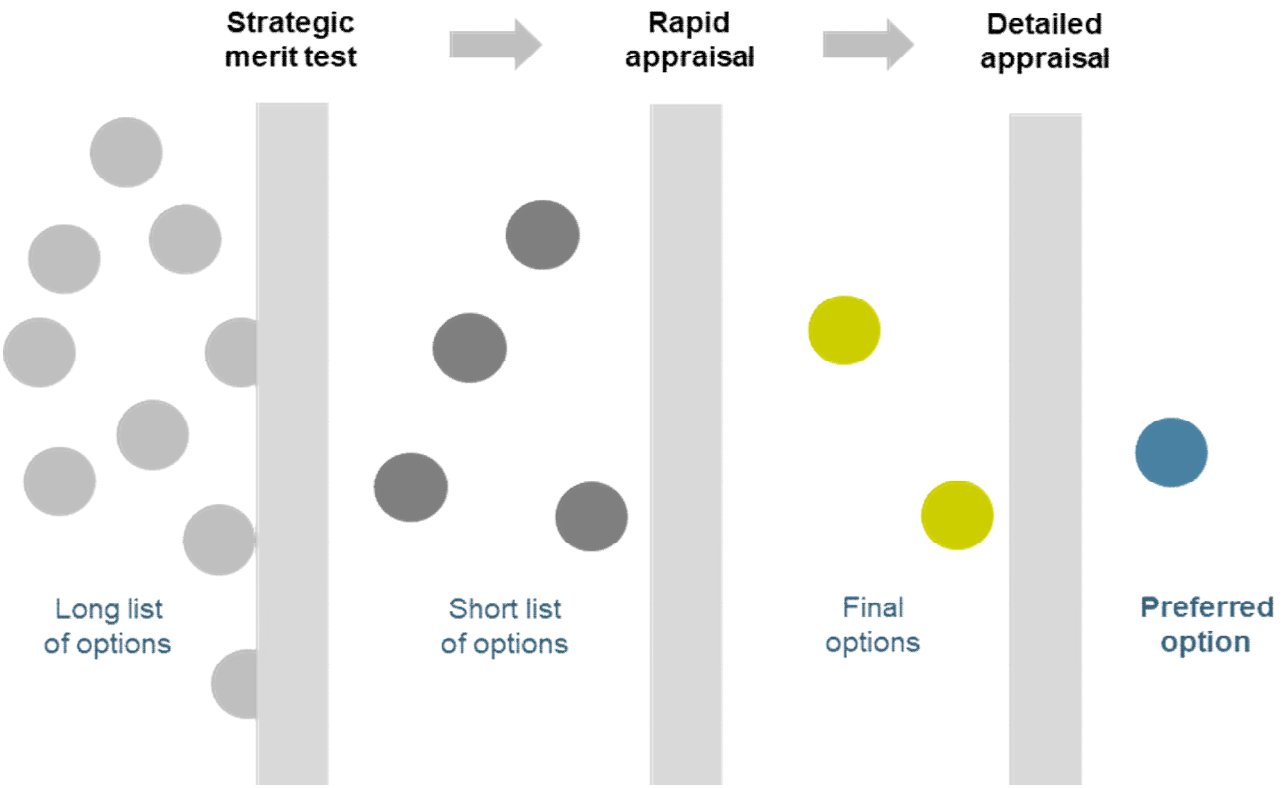
A three-tiered approach is recommended to assess and narrow down options:

- Stage 1: **Strategic alignment — Strategic Merit Test (SMT)**
  - Consideration of an option's alignment with goals, transport system objectives, strategic plans, policies or policy objectives of the government
- Stage 2: **Rapid appraisal**
  - An initial indicative quantitative assessment of the scale of an option's benefits and costs
- Stage 3**: Detailed appraisal**
  - A detailed assessment of an option's benefits and costs, and other impacts.

The process is shown in Figure 4, and can be viewed as a series of filters.

[3] For example, the position of individual jurisdictions may differ on the use of road charging or pricing options, such as the use of road tolls.

Figure 4 Moving from a long list to a preferred option



In this filtering process:

- Each filter removes some options.
- An increasing number of options are rejected as the process progresses.
- The level of effort required for each filter increases as the number of options that require testing goes down.
- Options that clearly fail the SMT and/or rapid appraisal stage can be rejected early.
- In cases where multiple options cannot be eliminated easily after rapid appraisal, they should each be subjected to detailed appraisal.
- The best or preferred option is the one that passes through all filters.

The assessment process focuses on determining:

- Whether an option has strategic alignment with transport system objectives, strategies, plans, policies or policy objectives of government (stage 1)
- Whether an option will deliver net benefits, i.e. benefits greater than costs (stages 2 and 3)
- The option that delivers the largest net benefits (stage 3)
- An understanding of other impacts such as distributional (equity) impacts or other specific impacts that may be required by a jurisdiction (stage 3).

The final outcome is the identification of a preferred option, supported by a rich set of information about its merits.

The results of the entire options generation and assessment process are then fully documented in the Business Case (ATAP Part F4). The business case is the mechanism by which the merit of the best option, as revealed by the options assessment, is communicated. All required supporting information should also be provided either in the business case or separate reports.

An important consideration in the assessment of an option is the level of inter-dependence between the option being assessed and other improvements in the rest of the network. The relationships may one of independence, complementarity or substitutability. These relationships should be identified early in the assessment process. A full discussion on these inter-relationships can be found in Appendix A.

3.2 Assessment tools and information types

3.2.1 Recommended tools

A number of tools are recommended for use in the options assessment process, listed in Figure 5.

Figure 5: Option assessment tools

Options assessment stage	Recommended tools
Strategic Merit Test	• Multi-criteria assessment (MCA) e.g. Objective Impact Table (OIT))
Rapid appraisal	• Rapid Cost-Benefit Analysis (CBA) • Rapid distributional (equity) impact assessment (DIA) • Rapid Appraisal Summary Table (AST)
Detailed appraisal	• Detailed CBA • Detailed distributional (equity) impact assessment (DIA) • Detailed AST

These tools are described in detail in sections 3.3 to3.5 below (and in other parts of the Guidelines). In brief, their main features are:

- An **MCA** is an approach that scores an option against several different criteria (which may or may not be weighted and aggregated into a single score)
- A **CBA** is an economic analysis tool for calculating the net benefits (benefits less costs) of an option expressed in money units
- A **DIA** is an assessment of the distributional (equity) impacts (who gains and who loses) of an option

- An **AST** is a format for summarising the results of an appraisal process, including non-monetised benefits and costs. It can form part of the summary material in the business case.[4]

The core of the assessment process consists of using CBA complemented by the AST. These tools are used in the critical second half of the appraisal process to assess short-listed options and to identify the preferred option.

In the ATAP Guidelines, MCA is only recommended for use in the first stage of assessment to facilitate reducing the initial long list of options to a short list (- consistent with the role for MCA proposed by IA (2018)). It should not play a role in selecting the preferred option(s) in rapid and detailed appraisal presented in the final business case.

Of course, CBA can also be used in the first stage to complement an MCA and doing so can only improve the quality of the assessment. However, there are usually insufficient resources to undertake a CBA for the full list of options, with the simpler MCA providing a more realistic tool for stage 1.

An adjusted-CBA is another tool that could be used. It is discussed in Chapter 12 of T2 as an 'optional' tool.

CBA is one of a range of economic analyses discussed throughout the Guidelines. Appendix E provides a brief overview of the various types of economic analysis.

Types of appraisal information

Decision-makers have the task of making choices using the information presented to them. This is a complex task, especially given that they need to absorb several different types of information generated in the appraisal:

- **Monetised** benefits and costs – these are benefits and costs that can be expressed in dollar units. Where a benefit or cost can be monetised, it is desirable to do so
- **Non-monetised** benefits and costs – these are benefits and costs that cannot easily or reliably be monetised. They are as important as monetised benefits and costs and should be presented alongside those. The use of a rating to describe the nature of the non-monetised impact (e.g. +ve or –ve, small or large) can play an important role in assisting the decision-maker
- **Quantitative** and **qualitative** impact descriptions – these are necessary inputs to calculating monetised and non-monetised benefits, costs and impacts. Presentation of these inputs can also be of assistance to the decision-maker. Non-monetised impacts that are non-quantifiable can only be described in qualitative terms.

[4] The Appraisal Summary Table (AST) concept originated in the UK about 20 years ago. ISCA, the Infrastructure Sustainability Council of Australia, has similarly adopted the AST concept in their business case guidelines (ISCA 2020). The appraisal process outlined in the ISCA guidelines align closely with the ATAP Guidelines. The New Zealand Transport Agency is also trialing the use of the AST. NZTA (2019, 2020) states that *"[The AST] … is widely used internationally …. and provides decision-makers with a consistent and transparent overview of costs and monetised, quantitative and qualitative benefits and costs".*

Importantly, ***net benefit***, the key indicator of the merit of an option, is measured as combined benefits less combined costs, both monetised and non-monetised. Monetised and non-monetised items cannot be directly added in a mathematical sense because they have different units, so a three-step process is recommended:

- First, monetised net benefits should be calculated. This is the only step required if there are no non-monetised benefits or costs involved
- Second, compare non-monetised benefits with non-monetised costs, and assess broadly which is larger and by what extent. This may involve comparing effects with different units, and will require some subjective judgement
- Third, conclude whether the net effect in step two negates or reinforces the monetised net benefit calculated in step 1.

Where monetised net benefits and non-monetised net benefits oppose each other, it is helpful to ask whether the non-monetised net benefit component would be valuable enough to change the decision from justified to not justified (or the reverse). For example:

- If an option has a monetised net benefit of $100 million, but non-monetised net disbenefits, ask whether the non-monetised net disbenefits would be worth more than $100 million. This is a subjective question, but the correct question to ask regarding whether the option is justified from a cost-benefit analysis (economic efficiency) perspective.

3.3 Stage 1: Strategic alignment — Strategic Merit Test

The purpose of the strategic merit test (SMT) in options assessment is to check how well the identified options align with the economic, environmental and social goals and transport system objectives defined in Step 1, and approved strategies and policies. This enables an initial filtering of the long lit of options before further assessment and development.

The SMT is not intended to be comprehensive. It is intended to be an initial check for strategic alignment/merit that:

- Rules an option in or out at an early stage of the assessment process
- Identifies those options that should proceed to the next stage of appraisal, options that require further work and those that should be abandoned because they are inconsistent with the jurisdiction's objectives and strategies.

The SMT is a useful mechanism because it:

- Requires a clear early explanation of how an option will meet higher-level objectives
- Provides an efficient means to filter options before considerable resources are spent on further appraisal and development.

Box 2 discusses tools for undertaking an SMT.

Box 2 Recommended tools: Strategic Merit Test

For an SMT, a number of multi objective/criteria techniques could be used, as described below.

Whichever tool is used, a decision needs to be made about the strategic merit of each option using a simple 'yes/no' or 'pass/fail' system or via a more detailed ranking scale.

a) An Objective Impact Table (OIT) is a matrix that provides high level information about an option's impacts and how it contributes to achieving the objectives defined in Step 1. The OIT aligns impact types against relevant government objectives and then describes these impacts. It is most effective when it contains quantitative information. Where that is not possible, impacts should be described in qualitative terms.

A basic OIT template is provided in Appendix C, along with a sample qualitative rating scale.

Multi Criteria Analysis (MCA)

b) A Multi-Score MCA is an extension of the OIT. Rather than the qualitative rating scale used in the OIT, a quantitative scale is used to 'score' options for each objective/impact type. The scores are then used to assess the relative performance of the options in each objective/impact type.

c) A Single Score MCA is an extension of (b). Weights are introduced to represent the relative importance of the objectives. Weighted scores are then calculated, with the sum providing an overall weighted single numeric score for each option. This contrasts with approach (b) which produces a score for each objective for each option.

It should be noted that MCA techniques have received strong criticisms (e.g. BTE 1999, Dobes & Bennett 2009, Ergas 2009, Australian Government 2014). Infrastructure Australia (2018, section D2.6) also highlights a range of concerns about MCA approaches:

- Weighted scores have no units and no meaning beyond the analysis
- While the method avoids explicit monetary values, it assigns such values implicitly – in contrast to CBA where monetary valuations are explicit
- The method is open to influence by interest groups and likely to be biased in favour of the proposal
- The selection of criteria is likely to be biased
- The method is likely to have a local focus and therefore overlook system wide effects.

Approach (c) using a single weighted score is particularly problematic and can be highly misleading. The weights are necessarily arbitrary and subjective, opening MCA up to the criticism of lacking methodological rigour, being a largely subjective assessment and making the technique open to manipulation. In addition, the weights tend to be obscured by the process of combining into an overall weighted score.

The overall conclusion is that the OIT approach is preferred to MCA approaches. If, however, MCA is used:

- Its use should be limited to the early stages of assessment (SMT) where its simplicity is often appropriate for shortlisting from a large number of options
- Approach (b) is preferred to (c), ensuring that subjective judgments are not obscured

- Approach (c) is not recommended and preferably avoided
- Where practitioners opt to use approach (c), they can minimise the risk of inappropriate bias by linking the assigned weightings back to the ranked objectives established in Step 1.

Practitioners also need to be clear and transparent in selecting the most appropriate tool and any details of their application. Completing this before commencing the analysis is critical to managing the risks associated with the tools.

Finally note that the Goal Achievement Matrix (GAM) approach is sometimes used at the SMT stage of assessment and in post-completion reviews. GAM is similar to MCA, using scores and weights, with a focus on goals rather than criteria. It is therefore considered an 'MCA-type' approach. TfNSW (2017) notes its attraction is its ease of use, and also notes its limitations, whilst BTE (1999) is strongly critical of it.

As jurisdictions are likely to differ in how they assess strategic merit, it is important for each jurisdiction to design a process that is best suited to its circumstances. The process could be as simple as a checklist for consideration by decision-makers/ministers that aligns options against government goals, objectives, policies and strategies. Alternatively, a more formal process, such as an Objective Impact Table (OIT), could be used (see Box 2).

Regardless of the approach to the SMT it is important that the analysis:

- Adopts a logical and consistent approach for all options

Is objective and evidence based to avoid subjective judgments.

At the end of Stage 1, the best performing options move forward to Stage 2.

By the end of the assessment process, the strategic merit of the preferred option (as assessed through the SMT) becomes the strategic merit of the proposed initiative.

The results of the SMT also play an important role later in the Framework during prioritisation across a number of proposed initiatives (see F5).

3.4 Stage 2: Rapid appraisal

Stage 2[5] in the options assessment process is a rapid appraisal of the short list of options that have passed the Strategic Merit Test.

The methodology used in a rapid appraisal is the same as for a detailed appraisal, however, the estimates of benefits, costs and impacts are less precise in a rapid appraisal.

[5] A complementary discussion of the appraisal process can be found in a paper by the Australian Government (2014). That paper was written in close collaboration with the ATAP Guidelines revision project.

Rapid appraisal screens out options that have passed the SMT but are unlikely to pass more detailed assessment. It involves an initial indicative assessment of the main benefits and costs, with a lower level of accuracy than in a detailed appraisal.

Rapid appraisal is a cost-effective way of gauging whether an option is likely to pass a detailed appraisal. The resources required for a detailed appraisal can then be expended only on solutions that have a good chance of succeeding.

Options that appear to yield net benefits should proceed to a detailed appraisal. If all options perform poorly in the rapid appraisal, practitioners need to consider whether any option to solve the problem should be progressed at all.

It is recommended that use of MCA scoring techniques not be continued into stage 2.

As discussed in section 3.2.1, the recommended tools for this stage of the assessment process are:

- A rapid CBA
- A rapid DIA
- A rapid AST.

Box 3 provides a brief introduction to CBA, DIA and the AST. Further details are then provided in ATAP T2, T5 and Appendix D here respectively.

Where possible, benefits and costs should be monetised and expressed in dollar units. This is the primary focus of the CBA. The remaining non-monetised benefits and costs should be listed, 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).

With a rapid CBA being an indicative 'first-cut' of the CBA, only the main monetised benefits and costs are taken into account and any benefits and costs that are small, or difficult to estimate, can be omitted altogether. Appendix B provides a template for setting out the results of a rapid CBA.

The AST provides a tool, as part of the business case, for summarising both monetised and non-monetised results side-by-side.

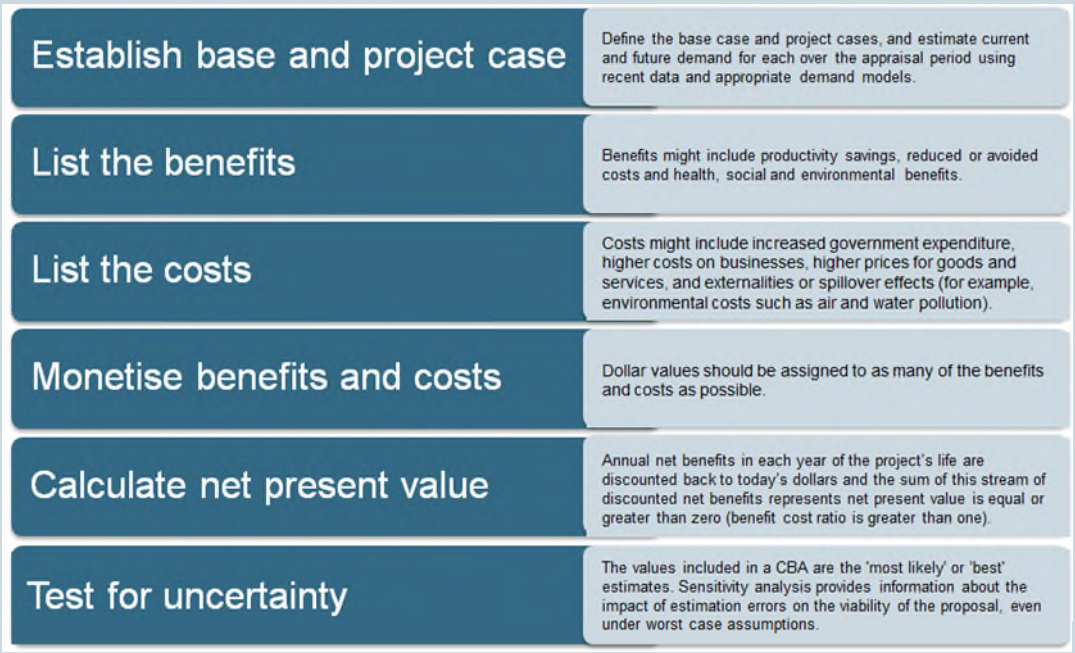
At the end of Stage 2, the best performing options move forward to Stage 3.

Box 3 Recommended appraisal tools

Cost-Benefit Analysis (CBA)

A CBA is a form of economic analysis that assesses the benefits and costs of a proposed option that can be expressed in money units. It expresses them in terms of today's money ('present values'), providing a common metric for comparing options. Benefits and costs for use in the CBA are estimated by comparing changes between the Base Case (without the option) and the Project Case (with the option improvement). Further information on CBA can be found in ATAP Part T2.

Outline of key steps in a CBA



Distribution (Equity) Impact Assessment (DIA)

A DIA determines how benefits and costs are distributed, by assessing who gains and who loses, and their scale and timing. Further information on DIA can be found in ATAP Part T5.

Appraisal Summary Table (AST)

The AST is a form of presentation developed by the UK Department for Transport. It is a decision-support tool that can be included in the business case to summarise the various strands of assessment. It addresses the same question as CBA: is an option likely to produce a net benefit? Its key features are:

- It presents a summary of all monetised and non-monetised economic, social and environmental benefits and costs on a single page, in a user-friendly format.
- Monetised benefits and costs are presented in present value dollar units, with net present value and the benefit cost ratio from the CBA also recorded.
- A qualitative non-monetised rating system is used that describes impacts as being either positive or negative, and whether the scale of the impact is neutral, small, moderate or large. It also allows for inclusion of a level of confidence for the non-monetised rating
- Quantitative and qualitative descriptions of the associated impacts can also be recorded.
- The AST does not indicate the relative importance of the objectives and their associated impacts, leaving that to the decision-maker.
- The AST enables decision-makers to understand the economic, social and environmental components of the appraisal and to make a subjective judgement about whether the combined monetised and non-monetised impacts suggest the option will produce a net benefit.

An example of an AST and instructions for designing an AST are provided in Appendix D. Further resources to assist in preparing an AST are listed in the *References* section at the end of this chapter.

3.5 Stage 3: Detailed appraisal

Stage 3 in the options assessment process is a detailed appraisal of the final options using:

- A detailed CBA
- A detailed DIA, and
- An updated AST,

reporting monetised and non-monetised benefits and costs. The CBA and AST should be updated and refined versions of those presented in the stage 2 rapid appraisal.

The detailed CBA should be the primary tool in the detailed appraisal. It should include:

- A robust and objective analysis supported by strong evidence
- Consideration of as many monetised benefits and costs as possible
- Presentation of standard CBA outputs (NPV, BCR, etc — see Box 3 and T2 Chapter 10)
- Consideration of non-monetised benefits and costs as well alongside the monetised results
- Consideration of issues of risk and uncertainty (usually provided through sensitivity testing).

A complementary detailed DIA on the option's distributional (equity) impacts should be presented alongside the CBA.

The assessment undertaken for this stage should be of sufficient detail to understand and assess:[6]

- *Economic, social and environmental value/viability* – how the lifetime benefits of the preferred option compare with its lifetime costs to society; that is, whether there are *net benefits*, and how large those net benefits are
- *Project delivery and benefit management / realisation plan* – the preferred option must have a clear and robust plan to ensure the benefits can be realised successfully. This should include considering the following questions:
  - Is the risk being managed appropriately?
  - Does the preferred option's governance model provide confidence that claimed benefits will be delivered?
  - Does the delivery strategy provide confidence that the preferred option's benefits will be delivered?

This detailed appraisal, combined with the results of the SMT (stage 1), should lead to the selection of a preferred option.

[6] This terminology aligns closely with that used by Infrastructure Australia.

At the end of stage 3, the best performing option becomes the preferred option. This option moves forward as a specific and justified proposed initiative.

Practitioners should check whether, in addition to the assessment process outlined above, their jurisdiction requires any additional assessments.

Benefits

As discussed above, benefits play a central role in the appraisal of options. The identification and assessment of benefits is discussed in Box 5, including an explanation of the relationship with the broader process of benefits management (see T6).

Box 5 Benefit identification, assessment and management

Benefits result from implementing a transport option. A benefit is a measurable improvement in an outcome, perceived as positive by stakeholders, and contributes towards one or more transport system objectives.

Benefit assessment is the process of quantifying and monetising the nature, scale and cost of the benefits associated with an option. Benefit assessment includes:

- Benefit appraisal: undertaken to determine whether an option has sufficient merit to justify implementation (*ex ante*) — through the processes discussed in chapter 3 above
- Benefit evaluation: undertaken after an option has been implemented (*ex post*) to monitor whether the expected benefits have actually occurred — see ATAP Part F7 on post completion evaluation.

Benefit management is the process of properly identifying, defining, measuring, evaluating and reporting benefits in order to determine whether an initiative has achieved its intended outcomes and objectives once it is delivered. It occurs over the whole assessment process, and is an important process in the ATAP Framework (see T6 for a full discussion).

Benefit identification is a step in the benefit management process that occurs during appraisal (as discussed in this guidance) and benefits management (where it is the first step of a multi-step process). It seeks to identify and define potential benefits arising from addressing an identified problem / opportunity.

In appraisal, good benefit identification and assessment, along with good cost assessment, provides a strong foundation for a robust analysis to determine the merit of options.

In appraisal, benefit identification involves identifying, defining and describing all the benefits that arise from an option. This is followed by benefit assessment, which involves quantifying each benefit (where feasible) and expressing benefits in monetised (where feasible) or non-monetised terms. Benefit identification usually involves careful considerations of the option and the underlying problem / opportunity it is addressing. This can occur through desk-top investigations and stakeholder engagement. Techniques such as Investment Logic Mapping and Benefit Dependency Mapping (see sections 2.2.1 and 2.2.2 of T6) also provide useful mechanisms for exploring benefits early in the planning and assessment process.

In the benefit management process, benefit planning follows benefit identification. It selects a sub-set of the full list of benefits to monitor and evaluate throughout the remainder of the assessment process. The monitoring and evaluation of these is then implemented through use of a Benefit Management Plan (see T6). Benefits profiles can be started in benefit planning as part of developing a Benefit Management Plan. Benefits profiles will also help in informing the business case and are further refined in Step 4.

The final step in the benefit management comes after the project is delivered, with consideration of whether benefits materialized as expected. This occurs in step 7 of the ATAP Framework, post-completion review (Part F7).

3.6 How deep should options assessment go?

Obtaining and analysing information for a CBA, MCA or AST incurs costs. This means that choices need to be made about the level or depth to which options assessment is conducted.

Generally, the effort and cost associated with assessing options should be proportional to the scale and complexity of the options involved. This was outlined under the ‘fit-for-purpose’ principle in the ‘ATAP Overview’ section of the Guidelines.

The more significant an option, and the greater the likely impacts, the more expenditure and effort can be justified on options assessment.

In making a decision about the level of assessment effort, practitioners need to consider whether the option warrants detailed appraisal. Small scale options with an estimated cost below a certain threshold (say $10 million) may not warrant a detailed CBA, although the SMT and rapid appraisal stages should still be followed.

3.7 Bring the right team together

Section 2.2.7 discussed the importance of bringing the right people together when options are being generated. Assembling a team of the right people is equally important in options assessment. The team should include people who possess knowledge and skills in areas relevant to the ATAP assessment model. These may include economists, planners, policy analysts, social scientists, engineers and other relevant professionals. The mix of people for any given assessment will depend on the nature, scale and complexity of the policy or options being assessed.

4. Engaging stakeholders

Transport planning and development is conducted in a complex environment in which the views of government and community stakeholders need to be understood. Engaging stakeholders and listening to their concerns is a key component of best practice transport planning.

Engaging stakeholders and the community in options generation helps to ensure that the full range of options is considered. It can provide direct information about people's travel behaviour, experiences and concerns, identify customer preferences and set appropriate criteria for the appraisal of options. There are also significant advantages of obtaining community endorsement and acceptance of the preferred solution.

A process that does not engage with transport system users runs the risk of overlooking less obvious or relatively minor options. For example, a government department may have a perspective on larger scale options to improve transport accessibility, such as investing in new infrastructure or expanding existing services. Local users may point to small scale improvements - such as better lighting at a train station or filling in potholes and installing a handrail along a shared path - that could significantly enhance transport accessibility.

Gaining a better knowledge of people's travel habits may also lead to an improved understanding of how transport modes integrate with each other in particular locations, generating options that will improve connections.

The purpose of engagement during this step of the Framework is to ensure that a broad spectrum of options is considered across all planning levels and that the impacts on a range of stakeholders are captured in any CBA.

TOOLKIT Tools for engagement

Many tools can be used to identify and engage stakeholders, and ensure their views and experiences are considered in generating options. These include:

- *Stakeholder mapping* - to identify all key stakeholders with an interest in a particular issue (and the information they may hold) and to capture all potential impacts of an option on the full range of stakeholders
- *Strategic workshops with government stakeholders* - to develop and test options in a broader strategic context and understand government preferences and priorities
- *Stakeholder inclusion in MCA* - to give stakeholders a say in setting the criteria against which options are assessed
- *Feedback from transport system users* - to understand the experiences, concerns and preferences of users
- *Surveys, community forums, online engagement and social media* - to seek community views on options to solve particular problems and to ensure that the results of community engagement inform the iterative process of generating options.

5. Bringing together the results

All the assessment results (SMT, CBA, DIA, AST and other assessments) are brought together in a single document called the ‘business case’, which presents all the necessary information to make a recommendation to the decision-maker. The business case is discussed in F4.

Appendix A Inter-relationships between network improvements

As mentioned in section 3.1, an important consideration in the assessment of an option is the level of inter-dependence between the option being assessed and other improvements in the rest of the network. The relationship may one of independence, complementarity or substitutability. The relationships can significantly affect the appraisal process and its results. Accordingly, before the appraisal commences, key relationships should be identified and understood.

The same knowledge about inter-relationship between modes, or different parts of a network, is also important for a proper understanding of problems / opportunities and their causes (ATAP Framework Step 2).

A.1 Independence

Two improvements are classified as independent when the implementation of one has no effect on the benefits or costs of the other. Physical separation (e.g. urban vs rural locations) is often (but not always) a good indicator of independence.

Improvements are frequently treated as independent in the system planning process if their relationship is weak. This is a reasonable approach because the degree of dependence may be impossible to estimate accurately or estimation may require excessive resources.

Despite physical separation, apparently unrelated parts of the transport system may be dependent. For example, proposed improvements at two widely separated ports may be related if they cater for the same traffic (i.e. movements between the two ports) or the same markets (e.g. export grain).

A.2 Complementarity

Complementarity exists when implementing one improvement increases the benefits or reduces the costs of another improvement. In other words, implementation of one improvement will increase the need for the other improvement. This can occur where one improvement is upstream or downstream of the other.

Complementary relationships are common in transport. For example, a highway upgrade that generates new traffic may increase traffic along other sections of the same highway, increasing the benefits of subsequent upgrading on those sections. Similarly, upgrading a rail line may result in greater truck traffic along roads leading to rail terminals, increasing the benefits from improvements to upgrade feeder roads. There can also be complementarity between regulation and infrastructure provision (e.g. increases in gross vehicle mass limits and associated requirements for bridge strengthening).

The most extreme cases of complementary relationships occur when the benefits from one improvement are zero unless a complementary improvement is implemented. For example, raising bridge clearances on a route will provide benefits to rail traffic only if the clearances are raised on all bridges on the route. Similarly, all passing loops on a rail route must be lengthened for the benefits to be achieved. In these circumstances, it is often preferable to bundle the improvements together and treat them as a single improvement.

A.3 Substitutability

Substitutability exists when one improvement reduces the benefits or increases the costs of another improvement. In other words, the existence of one improvement reduces the need for the other improvement.

This can occur if one improvement is on an alternative route or involves an alternative mode. For example, a railway upgrade that causes freight to shift from road to rail will reduce the benefits of, and delay the need for, upgrading of the road.

Non-infrastructure improvements that reduce the demand for transport reduce the benefits for upstream and downstream infrastructure improvements. However, they may increase the benefits of other improvements when traffic is diverted to alternative routes or modes, which may then require upgrading.

A.4 Identifying the relationships

It is important to have a structured approach to identifying significant relationships between improvements.

For example, the Sydney–Brisbane corridor has two road routes, the Pacific Highway and the New England Highway, and one rail route, the interstate mainline. A corridor study identifies a series of investment and demand management improvements for both modes along the corridor. The need for improvements can be identified via deficiency analysis, with reference to network objectives and from consultation with stakeholders.

On the demand side, there is a requirement for information about the corridor users and their origins and destinations. Ideally, data would be obtained for origin–destination matrixes for cars and different types of freight. Demand equations could be derived, or inferred, incorporating assumptions about how much traffic would shift from one route or mode to another in response to changes in costs, trip times, reliability and other indicators of service quality[7]. Sensitivity analysis should then be undertaken to determine the combination of improvements, and their timing sequence, that would best achieve objectives within long-term funding constraints.

[7] See NGTSM06 Volume 5 for details of how to estimate demand shift between modes.

Appendix B Strategic Merit Test and rapid CBA template

This template provides a guide for stages 1 and 2 of the options assessment process.

TITLE AND TYPE OF OPTION
Identify the option by title. Identify whether it is a non-capital or capital investment option. Identify type of non-capital (such as regulatory or licensing change, demand management measure, development planning control) or investment (such as new capital investment, extension of existing infrastructure, asset renewal)
PROPONENT (CONTACT NAME AND ORGANISATION)

Part A - Description of option

1. DESCRIBE THE PROBLEMS THE OPTION ADDRESSES
Problems, issues or needs
1. 2.

2. DESCRIBE THE OPTION
At what stage of development is the option? What key issues are outstanding?
Describe the option in terms of: • Location • The nature of the option, including the estimated cost • Consequential works • The main benefits and costs of the option.
Is this the first time the option has been proposed? If not, provide details.
Does the option fall into the ‘small-scale options’ category (i.e. investment cost of $10 million or less)?
4. DESCRIBE THE BASE CASE OPTION

What major capital and maintenance works will be needed in the future if the option does not proceed?
Are there other consequences from not implementing the option?
What assumptions are made about future developments that will affect the success of the option? (e.g. other improvements being implemented elsewhere in the network, development of new industries or conurbations)

Part B - Strategic Merit Test

1. HOW DOES THE OPTION IMPROVE TRANSPORT WITHIN THE JURISDICTION?
2. WHAT GOVERNMENT GOALS AND OBJECTIVES WILLTHE OPTION PROMOTE?
The answer to this question should be consistent with the goals and objectives defined in Step 1. A proposal should show that the option contributes to achieving government objectives, using as much detail about the objectives as is available. The Objective Impact Table (OIT) in Appendix C provides a formal means to address this question.
3. ARE THERE ANY MAJOR RISKS OR CONSTRAINTS ON THE OPTION?
For example, are there potential technical problems with construction and operation, could the mprovement cause serious damage to an environmentally sensitive area or are there potential negative social impacts?
4. DOES THE SUCCESS OF THE OPTION DEPEND ON OTHER ACTIONS BEING TAKEN?
It is possible that the benefits of an option may not be realised without other actions being undertaken. In this situation, options may be bundled together to assess as a single option. Where the related action is not dependent on the appraisal process, the Base Case should include an assumption about whether or not a related action proceeds and the issue should be fully addressed in the risk assessment.
5. HAS THERE BEEN ADEQUATE CONSIDERATION OF ALTERNATE SOLUTIONS?
Other modes and non-infrastructure solutions may need to be considered. A proposal should show that alternative options were considered (see Part C). The grounds for rejecting particular options are reviewed as part of the SMT.

Part C – Options assessment

1. OPTIONS GENERATION AND ASSESSMENT
Document the process and results of the options generation and assessment process that has been used. Provide a high level summary of the options and results, and indicate where detailed supporting documentation can be accessed.

Part D – Rapid CBA

1. LIST THE BENEFITS AND COSTS OF THE INITIATVE IN THE TABLE BELOW		
Identify the present value, in dollar terms, and the percentages of total benefits and costs, as estimated from the CBA. If no CBA has been undertaken as yet, provide rough cost estimates of the percentage of total benefits and costs (e.g. 40% savings in road-user costs).		
Benefits	**Value ($)**	**Percentage (%)**
Benefits for existing users (savings in social generalised costs)		
Benefits for diverted and generated traffic (willingness-to-pay minus social generalised costs)		
Benefits (disbenefits) on related infrastructure associated with diverted and generated traffic		
Savings in (additional) infrastructure operating costs including maintenance		
Benefits (disbenefits) derived from positive (negative) externalities)		
Safety benefits (disbenefits)		
Other benefits (disbenefits)		
Total benefits		100
	Note: Impacts that are benefits should be positive. Impacts that are disbenefits should be negative.	*Note: Impact percentage figures for disbenefits should be negative*
Investment costs		NA
Are the values in this table first estimates or expected values derived via a risk analysis		

2. CHECK THAT THE BASE CASE COSTS ARE PROPERLY ADDRESSED		
Have infrastructure costs (including asset renewal costs) in the Base Case been estimated?		
Provide the amount as a present value		
3. PROVIDE CBA RESULTS (INCLUDE CBA SPREADSHEET)		
Year discounted to:		
Net present value ($)	Benefit-cost ratio	First-year rate of return (%)
Internal rate of return (%)	Discount rate used (%)	Option life used (years)
4. DESCRIBE THE NON-MONETISED IMPACTS OF THE OPTION		
Describe other benefits and costs that have not been quantified in the CBA?		
5. IDENTIFY THE GAINERS AND LOSERS		
Discuss how the benefits and costs of the option are distributed throughout society, taking into account of secondary impacts. Who are the gainers and losers from the option?		

Part E – Stakeholder consultation

1. DESCRIBE STAKEHOLDER CONSULTATION
List the key stakeholders and indicate the degree of consultation that has taken place to date and the level of support received
What stakeholder sign-offs are required?
What potential exists for part, or full, private sector funding of the option?
How the potential for part, or full, private sector funding was assessed?
Is there an intention to seek co-funding from beneficiaries (e.g. other agencies or the private sector)? If not, why? If yes, what is the status of negotiations or commitments to date?

Part F - Risk assessment

1. IDENTIFY THE MAJOR RISKS
Identify major risks prior to commencing construction (e.g. approvals not granted, legal challenges, technical problems).
What are the indicative timelines for the resolution of key issues likely to arise prior to commencement of construction?
Describe the major risks to delivery and ongoing success of the option. e.g. Does the option rely on new or untested technology? • Is the timing or are the benefits dependent on the actions of other parties or government actions? • Are there external factors beyond government control that could inhibit the achievement of the desired outcomes?
Describe the major risks on the cost side (e.g. excess costs) and benefit side (e.g. where benefits are not realised).
Can these risks be mitigated? If so, describe proposed risk mitigation measures.
If a risk assessment has already been undertaken, provide the indicative impacts on costs, benefits and option timing.

Source: ATC (2006)

Appendix C Sample tool: OIT

A basic OIT template is shown below in Table 1. Table 2 provides an explanation of how to populate the table. Table 3 provides a sample rating scale.

The final decision about strategic merit is made by looking down the list of ratings in 'Rating' column, keeping in mind the relative importance of each objective.

As the OIT is a basic check for strategic merit, impacts that do not fit under any of the objectives listed should not be included in the table. For example, a smoother road may result in a more comfortable ride for road users; but if there is no explicit government strategic objective that covers ride comfort, the impact should not be included. Impacts that do not affect strategic objectives are irrelevant for assessing strategic merit.

Table 1 Objective Impacts Table (OIT) for a given option

GOVERNMENT OBJECTIVE	IMPACT TYPE	QUALITATIVE DESCRIPTION	QUANTITATIVE DESCRIPTION*	RATING**
1				
2				
3				
4				
5				
6				
7				
8				

* Specify units—PVB$ or PVC$ or physical quantity
** See Tables 2 and 3 for an explanation of this table and a sample ratings scale.

Source: ATC (2006)

Table 2 OIT template for a given option

Objective	Impact type	Qualitative description	Quantitative description	Rating
List each government objective relevant to the option. Objectives listed here should be those established in Step 1.	**List the impact types under each objective.** These impacts may be single or multidimensional. For example, if the objective is to 'improve the environmental performance of the transport system', impact types could include noise, air quality, biodiversity and water quality. Impacts may be different for different locations or planning levels. Some impacts may appear more than once, against different objectives.	**For each impact type, describe the impact in qualitative terms.**	**For each impact type, specify the impact in quantitative terms.** This may include physical impacts (such as a reduction in tonnes of CO_2 equivalents per annum) calculated over the life of the option. It may also include monetised benefits and costs. These should be expressed as present values measured over the life of the option, with :PVB $ …' and 'PVC $ …' denoting the present value of a benefit and cost respectively.	**Rate the strategic merit of the option.** Strategic merit can be rated using a simple 'yes/no' or 'pass/fail' system or via a more detailed scale that assigns positive and negative ratings to against each objective. A sample scale is set out in Table C.2 below.

Table 3 OIT options rating scale

RATING LEVEL	DESCRIPTION
Large -ve	Major negative impacts with serious, long-term and possibly irreversible effects leading to serious damage, degradation or deterioration of the physical, economic or social environment. Requires a major re-scope of concept, design, location and justification, or requires major commitment to extensive management strategies to mitigate the effect.
Moderate -ve	Moderate negative impact. Impacts may be short-, medium- or long-term and impacts will most likely respond to management actions.
Slight -ve	Minimal negative impact, probably short-term, able to be managed or mitigated, and will not cause substantial detrimental effects. May be confined to a small area.
Neutral	Neutral - no discernible or predicted positive or negative impact.
Slight +ve	Minimal positive impact, possibly only lasting over the short-term. May be confined to a limited area.
Moderate +ve	Moderate positive impact, possibly of short-, medium- or long-term duration. Positive outcome may be in terms of new opportunities and outcomes of enhancement or improvement.
Large +ve	Major positive impacts resulting in substantial and long-term improvements or enhancements of the existing environment.

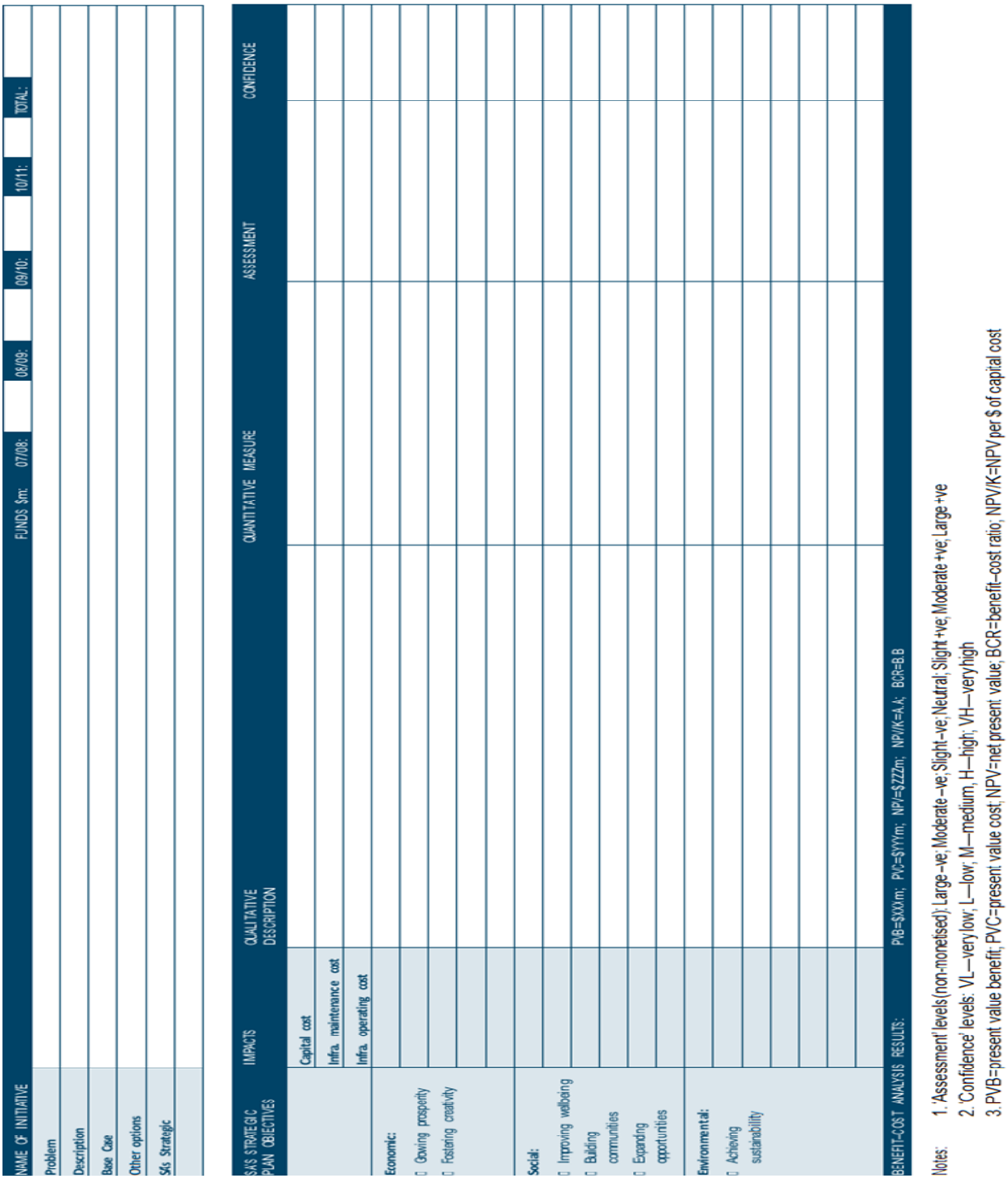
Source: ATC (2006)

Note that there is no hard or fast definition of short, medium and long terms, the following is an indicative guide: short 1–5 years; medium 6–10 years; long – beyond 10 years.

Appendix D Sample tool: AST

This Appendix outlines generic instructions for designing and completing an AST based on this format.

Figure 6 An generic AST template example



D.1 Designing an AST

1. Commence with the generic template in Figure 6. Consistent use of the same template across options will allow consistency in appraisal within a jurisdiction. However, in some situations, there may be a need to vary the AST template between options.
2. Use the top rows to describe the option being appraised, the problem it addresses and whether other options have been considered.
3. Column 1 should list the high level strategic objectives for the jurisdiction or transport system, grouped under the triple bottom line (TBL) categories: economic, social and environmental.
4. Column 2 should list the impact types relevant to the option. Each impact type should be listed only once, aligned with the most relevant TBL category in Column 1.
   In compiling this column, double-counting should be avoided by checking that when a new impact type is added, it does not represent another impact type that is already listed. Defining each impact type (see point 5 below) will greatly assist this process. For example, assume 'journey time' is listed as an impact type in Part D of the template provided in Appendix B. Any increases in land values resulting from reduced journey time should not be listed as an impact elsewhere in the AST. The former is a capitalisation of the latter.
5. Develop (as an attachment to the AST) a description of the meaning of each impact type. Example descriptions of impact types relevant for transport proposals are provided in Table 4 below.
6. In the AST, the list of economic impact types should generally be limited to the *direct* or *primary* economic impacts of proposals. Secondary economic impacts, such as economic activity flow-on expenditure effects in the rest of the economy, are generally excluded from the AST. There are two reasons for this:
   - Counting flow-on effects is often double-counting the same benefit passed on to other economic agents.
   - The Base Case option consists of spending the funds in an alternative manner (either within the same sector or within another sector) that will also generate flow-on effects.
     The relevant measure in the AST is the net effect: that is, Project Case minus Base Case. While detailed analysis can be undertaken of the net effect, the rule of thumb is usually to assume the two sets of effects cancel each other out. Detailed analysis to test this is usually only undertaken, as an exception, for very large options or where there are expectations that the net effect will be significant.

D.2 Completing an AST

1. Row 1: Insert the name of the proposal.
2. Row 2: Clearly describe the challenge being addressed.
3. Identify the range of options that can be pursued to address the challenge. Ideally, an AST should be completed for each alternative option, with the full set of tables presented to the decision maker. The AST template presented here is for the preferred option, with a row to list other options considered.

4. Row 3: Provide a brief description of the preferred option, denoted here as the 'Project Case' or the 'with project' case.
5. Row 4: Clearly specify the Base Case against which the proposal is being compared. The Base Case is also referred to as the 'without project' case. This usually consists of 'business as usual': that is, maintaining sufficient expenditure to ensure a continuation of the existing, or minimum, level of service.
6. Row 5: Briefly describe the other options for addressing the challenge, and why they are inferior to the preferred option.
7. Row 6: This row contains a number of blank boxes. List any key jurisdictional targets to which this option makes a significant contribution. List only the most relevant and significant targets.
8. For each impact type (Column 2), briefly express in Column 3 the impact of the proposal in qualitative terms. Attach to the AST a page of referenced footnotes as required (as illustrated in Figure 8).
9. For each impact type, where possible, briefly express in Column 4 the impact in quantitative terms in natural units. For example:
   - For greenhouse gas emissions, natural units are tonnes of CO_2.
   - For safety, natural units are reductions in accidents, lives saved, injuries avoided, etc.
10. Decide which impacts can be monetised and those that can only be expressed in non-monetised terms.
11. For each impact type, make an assessment in Column 5 of the size or scale of the impact using the following approaches:
   - *Monetised impacts:* Determine the present value (PV) of each impact over the appraisal period. The PV of impacts that are benefits should be denoted by PVB $x million (present value benefits). The PV of impacts that are costs should be denoted by PVC $y million (present value costs). The sum of all PVBs and the sum of all PVCs should be recorded in the bottom row of the AST, along with standard CBA results (such as NPV and BCR). Where a specific computer model has been used to determine monetised discounted results for benefits and costs, the name of the model should be stated, and details of the model made available.
   - *Non-monetised impacts:* Each non-monetised impact should be assigned a 'rating' level between Large –ve to Large +ve from the scale provided in Table 3 in Appendix C. The UK Department for Transport (2006, Unit 1.1) provides detailed guidance for selecting a rating for a large number of impact types. Detailed guidance does not exist in Australian jurisdictions. If the UK reference is used, relevance to Australian conditions should be carefully assessed.
12. For each assessment rating in Column 5, assign a 'confidence' level rating in Column 6 (see Table 5).

Table 4 AST: Description of impact types

IMPACT TYPE	DESCRIPTION
Capital cost	Up-front investment, plus any non-recurrent expenditure elsewhere in the evaluation period.
Infrastructure maintenance costs	Effect on infrastructure maintenance costs.
Infrastructure operating costs	Effect on infrastructure operating costs.
Journey time	Effect on time involved in transport: walk (access) time, wait time at public transport stops, in-vehicle time.
Reliability/quality	Effect on service reliability, journey time variability and journey quality (e.g. comfort).
Vehicle/bus/train/etc operating costs	Effect on vehicle/bus/train/etc. operating costs: fuel, tyre wear, lubricants, repairs and maintenance, etc.
Regeneration	Extent to which the option assists regeneration of areas the government has designated for regeneration.
Public security	Effect on the number and severity of crashes/accidents and the impact on people, including deaths, serious injuries, minor injuries, property damage.
Access to public transport	The extent the option increases the number of people or locations that fall within minimum standards for access to public transport, e.g. within 500 metres of a public transport stop. Any improvements in journey quality should be captured under the reliability/quality impact category above.
Severance	The degree to which infrastructure and transport services act as a physical barrier to non-users of these facilities to access people and services elsewhere in the community.
Mobility impaired	Extent to which access to public transport is improved for people who are mobility impaired.
Passengers and cyclists	Extent to which the option impacts on pedestrians and cyclists.
Greenhouse	Effect on greenhouse gas emissions and the impact on society.
Noise	Effect on noise and the impact on the community.
Local air quality	Effect of various emissions on local air quality.
Biodiversity	Effect on biodiversity
Heritage	Effect on local heritage - buildings and other items with heritage value.
Water	Effect on level of water pollution and the impacts.

Table 5 AST: Assessment confidence levels

CONFIDENCE LEVEL	DESCRIPTION
Very Low (VL)	Best guess of professional assessing outside area of expertise, gut feel, no relevant studies or data. Not suitable basis for 'rating' greater than 'slight +ve' or less than 'slight –ve'.
Low (L)	Professional judgment within area of expertise. However, no relevant studies or data available. Not suitable for score greater than 'slight +ve' or less than 'slight –ve'.
Medium (M)	Some background information, but either dated, lacking appropriate detail or lacking accuracy to form the basis for a firm assessment. Not suitable for a score greater than 'moderate +ve' or less than 'moderate –ve'.
High (H)	Substantial information, perhaps patchy in parts (date, accuracy, detail) but sufficient to provide an accurate assessment with a fair degree of confidence.
Very High (VH)	Recent, relevant and accurate studies with appropriate detail and analysis to form a rigorous and defensible basis for the assessment. Assessment has a very high degree of confidence

Source: ATC (2006)

D.3 AST examples

Figure 7 provides a completed AST for a generic road transport example and Figure 8 shows the accompanying footnotes.

Figure 9 provides a UK example of a completed AST.

Figure 7 AST - road transport example

Name of initiative	BYPASS OF OUTER EASTERN REGION OF METROPOLIS	FUNDS $M:	07/08:	08/09:	09/10:	10/11:	TOTAL:
Problem	Increased congestion and delays on the Eastern Arterial Road into Metropolis. Affects its suitability as a declared National Highway, with significant impact on freight transport movements of exports to the Port of Metropolis.						
Description	Involves the construction of a new high speed, high standard, and controlled access road to bypass the Eastern Region and draw traffic off the Eastern Arterial. The new bypass would become the National Highway and the Eastern Arterial would revert to a state arterial road.						
Base Case	Traffic coordination to maximise capacity on the Eastern Arterial, at grade flaring of intersections where cost is low, banning certain movements on the Eastern Arterial and certain types of traffic.						
Other options	Three other options were assessed: (a) upgrading the Eastern Arterial to a high standard road, with road widening and grade separation of major intersections (b) the introduction of a toll on the Eastern Arterial to limit traffic growth (c) upgrading services in the parallel rail corridor. Each of these options were considered inferior to the bypass option (1).						
Metropolis State's Strategic Plan targets							

STRATEGIC PLAN OBJECTIVES	IMPACTS	QUALITATIVE DESCRIPTION	QUANTITATIVE MEASURE	ASSESSMENT	CONFIDENCE
	Capital cost			PVC $252m	H
	Infra. maintenance cost	New asset provided, hence increased maintenance cost (2)		PVC $10m	H
	Infra. operating cost	Mainly lighting costs		Slight –ve	H
Economic:	Journey times	Substantial travel time savings	10 minute saving	PVB $423m	H
	Vehicle operating cost	Greater travel distance		PVB -$15m	H
	Journey quality, reliability	Smoother flow, fewer stops, reduced driver frustration (3)	Bypasses 24 sets of traffic lights	Large +ve	H
	Regeneration	Some induced demand in local rural area (4)		Mod –ve	M
Social:	Crashes	Reduced crash outcome overall (5)		PVB $45m	H
	Public security	Little change from base case (6)		Neutral	H
	Access to public transport	Principal bus corridor remains Eastern Arterial, little change (7)		Slight +ve	L
	Severance	Moderate on new road (8)		Mod –ve	M
	Pedestrians & cyclists	Generally longer length of travel for pedestrians to cross (9)		Slight – ve	M
Environmental:	Greenhouse	Increased efficiency on Eastern Arterial, offset by extra traffic generation (10)		Mod –ve	L
	Noise	Lower on Eastern Arterial, higher on new route (11)		Slight –ve	M
	Local air quality	(12)		Mod +ve	M
	Landscape	Impacts on existing landscape offset by project landscaping (13)		Slight +ve	M
	Biodiversity	New road will be used to maximise +ve's, but some loss likely (14)		Slight +ve	M
	Heritage	Some impact on aboriginal heritage, minimal other heritage impact (15)		Slight –ve	L
	Water	Stormwater retention basins required (16)		Slight +ve	M
BENEFIT–COST ANALYSIS RESULTS:		PVB=$453m; PVC=$262m; NPV=$191m; NPV/K=0.8; BCR=1.8			

Notes:
1. 'Assessment' levels (non-monetised): Large –ve; Moderate –ve; Slight –ve; Neutral; Slight +ve; Moderate +ve; Large +ve
2. 'Confidence' levels: VL—very low; L—low; M—medium, H—high; VH—very high
3. PVB=present value benefit; PVC=present value cost; NPV=net present value; BCR=benefit–cost ratio; NPV/K=NPV per $ of capital cost
4. See Table B.6 for notes/assumptions.

Figure 8 AST- road transport example - footnotes

Reference	Notes/assumptions
(1)	See Attachment X for a report comparing the 4 options
(2)	Additional maintenance will result from the expanded infrastructure, with the project resulting in an additional 18km of new expressway standard facility.
(3)	The bypass will be more reliable, with no signalised intersections, and higher speed of travel.
(4)	The new expressway bypass could lead to induced demand for residential and commercial development both along the route and in small townships in the peri-urban areas to the north east of the Eastern Region. This will put pressures on the important existing agricultural and mining industries in those areas. Unless government land use policy can prevent such development, there could be significant cost in terms of lost economic output.
(5)	The bypass will significantly reduce longer distance traffic along the Eastern Arterial. Reduced congestion on the Eastern Arterial should lead to reduced crashes on that road. The expressway standard of the new bypass will ensure a relatively low crash frequency on that road.
(6)	The situation along the Eastern Arterial is not expected to change significantly, and there will be limited pedestrian activity along and adjacent to the new bypass.
(7)	As congestion on the Eastern Arterial decreases, public transport travel times and reliability should improve. On the other hand, lower congestion will also make car travel more attractive. The net impact on public transport patronage is uncertain.
(8)	Land use on new bypass consists of multiple and single owner allotments, and a nearby small township. Opportunities for pedestrians, cyclists and vehicle movements across the bypass route will exist at a few specific locations only, and be designed for minimal severance. Some inconvenience due to indirectness of accessibility. Little change on Eastern Arterial.
(9)	Along the new bypass, pedestrian movements and stopping buses will not be allowed. No significant change on the Eastern Arterial.
(10)	Greenhouse impacts are complex and difficult to assess. Further research required in this area. However the following overview is considered a subjective assessment of the outcome. Reduced traffic on the Eastern Arterial (compared to base case), implies improved operational efficiencies and decreased delays, with consequent decrease in greenhouse gases. However, this may be a short term result, with the potential of lower congestion resulting in induced/latent car demand. On the new bypass, the traffic that transferred from the Eastern Arterial will experience smoother flow, but have to travel a longer distance. There will also be an increase in traffic volumes over time. Any induced demand from accelerated urban development outside the designated urban area (e.g. in rural townships) will add to this –ve impact.
(11)	Expect lower noise levels on the Eastern Arterial once the new bypass is built. On new bypass, the expected high volumes will result in noise levels much higher than existing levels. Given the rural type environment, and the relatively lower background noise count, and conditions that will not restrict noise travel, the impact could be expected to be greater, even if noise suppressing features are engineered into the design.
(12)	Similar comments to (10). The difference is that the Eastern Arterial has residential land use adjacent to the road, and hence a high exposure. The improvement above the base case could be interpreted as a greater +ve impact. On the new bypass, where residential land use is sparser, there will be less exposure (or diffused exposure due to separation distance from the highway) to the –ve impacts of air quality from increased traffic.
(13)	The new bypass will cross a number of rural land-uses and will have a significant visual impact on the broader landscape. The bypass corridor will have a landscape design developed and implemented to minimise the impact on amenity of the corridor. This will be centred on the use of locally indigenous species, potentially significantly increasing the amount of indigenous vegetation in the region. Some opportunity to upgrade landscaping on sections of the Eastern Arterial.
(14)	A small amount of remnant native vegetation may be removed on the new bypass route at a couple of locations. This may also result in some habitat loss for fauna species. Any vegetation removed will be replaced at an appropriate replacement rate as part of the landscape design (as outlined above). Opportunities exist to use the new bypass route to provide an improved length of corridor to support fauna and flora habitat. No biodiversity impact expected along the Eastern Arterial.
(15)	There are various Non-Aboriginal heritage sites along the new bypass route. Aboriginal heritage is an issue. There are a number of Aboriginal skeletal remains along the bypass route. An Aboriginal Heritage Survey will be undertaken in consultation with the local Aboriginal Community. There is a risk that Aboriginal Heritage sites may be encountered along the alignment. There are no known sites along the likely alignment options at this stage. No European or Aboriginal heritage issues are anticipated along the Eastern Arterial.
(16)	There will be a significant increase in the amount of stormwater coming off the new bypass. This will require the installation of stormwater detention devices, with a potential for aquifer recharge. The high speed nature of route will reduce the pollution per vehicle km. On the Eastern Arterial, the improved traffic conditions should provide improved (less volume) run off.

Figure 9 AST - UK example

A23 COULSDON (GOL)		1996 SCHEME—1.7KM D2 BYPASS	COST £39.9m	
Problems		High flows (31,000 vpd) on A23 through Coulsdon town centre cause delays, diversion onto local roads, high accident rates and disruption of bus and coach movements. Associated pollution in the town centre.		
Other options		Traffic management was considered in very early assessments. Transport 2000 suggested a smaller scale scheme at the Public Inquiry. Option of single carriageway has been considered, but would offer little cost saving		
CRITERIA	SUB-CRITERIA	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE	ASSESSMENT
Environmental impact	Noise		No. properties experiencing (w/s): ▯ Increase in noise 48 ▯ Decrease in noise 179	
CO_2 Tonnes added 0–2000	Local air quality	Air quality improves as traffic removed from Coulsdon town centre.	No. properties experiencing: ▯ improved air quality 129 ▯ worse air quality 3	-130PM$_{10}$ -772 NO_2
	Landscape	Line of route is in urban setting and closely parallels the existing railway line.	–	Neutral
	Biodiversity	Adversely affects important chalk grassland habitat forming part of site of local conservation importance.	–	Moderate -ve
	Heritage	Slight impact on one listed building and archaeological area of potential, but mitigation agreed.	–	Neutral
	Water	There are particular concerns with this scheme regarding the impact of contaminated land on the underlying aquifer, which is used for public water supply. Further investigations will be required to determine whether or not an acceptable solution can be identified.	–	Large -ve
Safety	–	Accident rates in Coulsdon town centre are currently above national average.	Accidents Deaths Serious Slight 760 8 184 590	PVB £8.1m 36% of PVC
Economy	Journey times & VOCs	Town centre flows fall to 20% of pre-opening levels, but total traffic (on both old/new routes) would increase by over 20%.	peak inter-peak N/A N/A	PVB £154m 690% of PVC
	Cost	–	–	PVC £22.4m
	Reliability	Currently highly congested and forecast to get worse.	Route stress Before: 130% — After: 48%	Moderate Mod rel. to PVC
	Regeneration		Serves regeneration priority area?	No
Accessibility	Public transport	Increased reliability of public transport journey times in Coulsdon town centre.	–	Moderate +ve
	Severance	Over 7 000 people experience substantial relief from community severance.	–	Large +ve
	Pedestrians and others	Facilities for pedestrians would be improved in town centre.	–	Large +ve
Integration		Croydon UDP[b] supports use of strategic network by longer distance traffic and improving conditions for cyclists and pedestrians.	–	+ve
COBA[a]			PVB £160m PVC £22 NPV £140m BCR 7.2	

Source: UK Department for Transport (1998), Chapter 12, http://www.webtag.org.uk/archive/nata/understanding/12.htm#tables

a. Cost Benefit Analysis. Method/software for calculating transport economic efficiency figures

b. Unitary Development Plan

Appendix E Economic analysis overview

At a glance

- Several types of economic analysis are recognised and discussed throughout the ATAP Guidelines.
- This part of the Guidelines provides a brief overview of those types of analysis and recommends when they should be used in transport planning and assessment.
- The primary type of economic analysis discussed in the Guidelines is cost-benefit analysis (CBA).
- A range of other types of economic analysis that complement CBA are briefly discussed here.

E.1 Introduction and definitions

Several types of economic analysis are recognised and discussed throughout the ATAP Guidelines. The notes below provide a brief overview of those types of analysis and recommends when they should be used in transport planning and assessment.

It is important to distinguish from the start the different types of focus considered in the economic analyses:

- *Economic efficiency effects* – relate to the changes in the overall level of national wealth/social welfare/wellbeing[8] resulting from an option
- *Distributional effects* – relate to how the changes are distributed (geographically, across sectors of the economy, across groups of people and organisations, and the associated equity outcomes)
- *Effects on economic activity indicators* – relate to changes in specific measures of the state of the economy (Local, State/Territory, National), and typically include gross domestic product, gross state product, employment, wages and profits.

Each of these considerations are important in decision-making.

The types of economic analysis discussed in ATAP are as follows:

- **Cost-benefit analysis (CBA):** Assesses all the benefits and costs of an option, and the resulting net benefit/cost (benefits less costs). It is a type of economic efficiency analysis. CBA is widely recognised by government bodies around the world as the most relevant type of economic analysis for determining the net worth of an option—that is, does it increase or decrease our national wellbeing overall. See ATAP Part T2 of the Guidelines.

[8] Where national wealth/social welfare/wellbeing include all aspects of life—economic, social and environmental.

- **Wider economic benefits (WEBs):** A more recent type of economic efficiency assessment that is an extension of conventional CBA. It estimates benefits that can, in-principle, be legitimately included in a CBA (in addition to the standard benefits) because they represent changes in economic efficiency. However, until recent times, they have been excluded from CBA practice because of difficulties in estimation (parameter values not based on Australian data, and poor implementation by practitioners). Note that these effects can sometimes be negative (wider economic disbenefits)[9]. See ATAP Part T3 of the Guidelines.
- **Partial equilibrium analysis:** Most transport CBAs and WEB assessments are undertaken (appropriately) as partial equilibrium analyses. A partial equilibrium analysis is an economic analysis that treats the sector of the economy or market or infrastructure of immediate interest as operating in isolation from the rest of the economy, omitting the economy-wide effects (in contrast to economic impact assessment and CGE analysis – see below). It is therefore a 'partial' or 'limited' or 'bound' analysis of the problem. For the vast majority of transport assessments, partial equilibrium analysis is considered suitable because it is a good approximation of the results that would be obtained if an economy-wide assessment was undertaken. In transport, examples of partial equilibrium analyses are assessments of effects of an option on an individual transport mode, or two modes and their interaction such as car and public transport.
- **Economic impact analysis:** A form of economy-wide analysis that traces the effects of an option throughout the economy. It considers the gains and losses by industry sector, region and factor markets (labour and capital), and the effects on employment and gross domestic, state and regional product. It uses input-output (I-O) analysis as its foundation. It treats labour and capital costs as stimuli rather than opportunity costs (as in CBA) so does not indicate the net benefit/gain of an option. It also does not reflect the demand and supply constraints that exist in an economy. I-O models are available at the national level and for many states and territories. Speaking to Treasury Departments is a good starting point.
- **Computable general equilibrium (CGE) analysis:** Another form of economy-wide analysis that traces the effects of an option throughout the economy. CGE analysis and associated modeling is the most technical and complex analysis of those discussed here and is more sophisticated than economic impact analysis. Taking input-output data as its foundation, it builds in demand and supply relationships and constraints, plus representation of all sectors, resources and players in the economy. Its use is only required for assessing a transport option that is of such a scale that it will influence prices (of goods, services and factors of production) in the rest of the economy. In those circumstances, it is wise for the CGE analysis to be a complement to a partial equilibrium CBA. CGE models are available at the national level and for many states and territories. Speaking to Treasury Departments is a good starting point. CGE assessment is considerably more expensive and complex to undertake than partial equilibrium analysis. The ATAP Guidelines will develop guidance on using CGE assessment in 2018.

[9] Which has led the UK DfT recently switching to the term wider economic 'impacts' to account for both positive and negative WEBs. The ATAP Guidelines have retained the word 'benefits' because it has now become accepted in domestic practice.

- **Productivity metrics:** Productivity metrics highlights the subset of components of the CBA that specifically quantify productivity effects of a transport option, such as savings in travel time and vehicle operating costs and reliability improvements that accrue to business cars and freight vehicles. See ATAP Part T4 of the Guidelines for further details.
- **Equity effects:** This assessment focuses on the identification of the gainers and losers from an option. It complements a CBA, with equity effects being reported separately to the CBA results (which indicate economic efficiency). See ATAP Part T5.[10]
- **Cost effectiveness analysis:** Cost-effectiveness analysis compares the relative costs of alternative courses of action for achieving a given outcome. It is applicable to situations where the analyst is unable or otherwise constrained to monetise the major benefit(s). This is often the case in the areas of health and defence. A transport example is the case where a decision is taken to replace a bridge without formally estimating the associated benefits. Instead a comparison of the associated costs is used to indicate the least costly solution.
- **Strategic economic assessment:** This assessment is undertaken in the 'policy choices and system planning' phase of the ATAP Framework (see Part F0.1) and may be applied at any of the planning levels (jurisdiction, market, network, corridor, area, route, link). It can involve deficiency assessments, economic warrant assessments, and may involve the use of CBA applied at network, corridor or areas levels.
- **Problem economic assessment:** Step 2 of the ATAP Framework consists of problem identification and assessment. Economic analysis can form a key part of that assessment, allowing the economic costs of the identified problems to be documented and used in justification and prioritisation across problems.

[10] Technically, equity effects can be combined into the CBA results by weighting benefits and costs in accordance with how they impact on people (for example see section 7.3 of DFA (2006)). This is a form of adjusted CBA (see ATAP Part T2 Chapter 12). Such an approach is, however, rarely used in practice and is not advocated here. The ATAP guidelines prefer CBA and equity results be presented side by side rather than being combined by 'equity' weights (see section 7.5 of DFA (2006)). There are exceptions. One way in which judgements about equity are incorporated into CBAs are use of equity values of time whereby the same value of travel time savings are attributed to all members of the society regardless of the fact that the values vary with peoples' income levels. Productivity metrics assigns a zero weight to benefits that do not enter to GDP.

Table 6 provides a quick visual summary.

Table 6 Features of types of economic analysis

Relevant effects	Component	Type of analysis
Net benefit/efficiency of project	CBA (including use of productivity measures)	Partial equilibrium analysis
Distributional (equity) effects on stakeholders/sectors/regions	Distributional / equity assessment, CGE	Partial or general equilibrium analysis
Agglomeration benefits	WEBs (CBA subset)	Partial equilibrium analysis
Whole-of-economy measure of project stimulus impact. Impacts on sectors and regions.	Economic Impact Analysis	Input-output analysis
Whole-of-economy impacts. Impacts on sectors and regions.	CGE	General equilibrium analysis
Primary benefits can't be monetised	Cost effectiveness assessment	Cost analysis

E.2 Which form of analysis to use

The recommended approach is as follows:

- Undertake strategic and problem economic assessments as part of the strategic planning stage (see ATAP Part F0.1 for guidance)
- Undertake a CBA based on partial equilibrium analysis to estimate the net benefit/gain of the option (see ATAP Part T2 for guidance)
- Include WEBs in the CBA only for the type of options where WEBs are likely to be of relevance and of sufficient scale (see ATAP Part T3 for guidance, including instructions for how WEBs should be reported separately from conventional benefits).

A CBA undertaken in this manner is considered the primary indicator of the net worth and value for money of an option.

The CBA should be complemented by the other economic analyses as and when deemed necessary:

- Equity impacts assessment to highlight who gains and loses
- Productivity metrics assessment to highlight the productivity effects within the CBA
- Economic impact assessment to highlight the impacts and stimuli across the economy by industry sectors, and labour and capital, including employment effects.

Where an option is so large that CGE assessment is considered worthwhile, the CGE assessment should complement the partial equilibrium-based CBA. Judgment by economic specialists is required to determine when a CGE assessment is required. Note that the CGE assessment does not identify and estimate additional benefits not already covered by the CBA and WEBs assessments. A CGE assessment would only identify additional benefits or disbenefits in situations where large economic distortions existed in other sectors of the economy (e.g. large tariffs, quotas, subsidies). That is not the case in Australia. As discussed above, distortions within the transport sector, such as lack of congestion pricing and subsidised public transport, are accounted for within a rigorous partial-equilibrium-based CBA.

Once all the relevant types of economic analysis have been undertaken, they should be consolidated into a Business Case with other required information (see ATAP Part F4).

E.3 Land use – transport interaction

Where a major interaction occurs between transport and land use as a result of an option, integrated transport and land use interaction models should ideally be used. ATAP Part T1 Section 3.5 discusses such models, and Part F0.2 Section 6.5 discusses the need for integrated assessments, including economic analyses. Infrastructure Australia (2018) section D3.9 discusses the assessment of land use impacts.

Research is also starting to consider how elements of CGE models can be adapted to model complex urban systems, including interactions between transport and land use, location decisions by households and firms. However, this type of assessment and models are complex and their use is still limited in practice. While they have the potential to add further rigour to the CBA of urban transport and land use options in future, these developments are currently outside the scope of the ATAP Guidelines.

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