

# Australian Transport Assessment and Planning Guidelines

## O3 Urban Amenity and Liveability

May 2018



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ISBN: 978-1-925701-29-6      INFRA- 3578

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May 2018

For enquiries or feedback about this publication please contact:

ATAP Steering Committee Secretariat  
Australian Transport Assessment and Planning  
Guidelines  
Commonwealth Department of Infrastructure, Regional  
Development and Cities  
GPO Box 594 CANBERRA ACT 2601  
Email: [atap@infrastructure.gov.au](mailto:atap@infrastructure.gov.au)

This publication is available from the website [atap.gov.au](http://atap.gov.au)

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# Urban amenity and liveability

## At a glance

- This Part of the ATAP Guidelines provides guidance on the appraisal of the urban amenity and liveability of transport options and initiatives. The concept of urban amenity and liveability involves a wide range of aspects such as quality of a place, aesthetics, the physical and urban design, how the place is used, and the extent to which a place supports quality of life, health and the general well-being of residents.
- Definitions of urban amenity and liveability are provided, and examples of the effects of transport initiatives on them are described. Accounting for these effects (positive and negative) contributes to good decision-making in transport planning as well as the appraisal of transport initiatives.
- Amenity and liveability should be included through the ATAP appraisal approach as outlined in Part F3 Chapter 3. The approach consists of:
  - Clarification of relevant goals, transport system objectives and indicators
  - Consideration of strategic merit / alignment
  - Use of the ATAP triple bottom line appraisal elements of cost-benefit analysis (CBA) and the Appraisal Summary Table (AST). The AST provides the mechanism for presenting all the appraisal results—monetised and non-monetised—in a single location.
- The guidance presented here provides practical approaches and implementation guidance. It does this within the ATAP assessment model.
- The guidance:
  - Provides monetised parameter values for noise and urban separation
  - Points to a range of non-market approaches that could provide some assistance to infer values for amenity and liveability
  - Discusses a number of tools that can assist in assessing non-monetised amenity and liveability impacts.
- It is recognised there are considerable gaps in valuing and measuring urban amenity and liveability, and care needs to be taken in assigning project-specific values. Further research is required.

# 1. Introduction

In recent times, there has been increased policy focus on amenity and liveability across Australia. This has highlighted:

- The important linkages between productivity, liveability and sustainability
- The role that public transport, active transport and appropriate road transport planning may play in enhancing these objectives
- The relationship to social inclusion of disadvantaged groups.

This part of the ATAP Guidelines explores urban amenity and liveability and the effects of transport initiatives on them. Accounting for these effects (positive and negative) contributes to good practice in transport planning and the appraisal of transport initiatives.

The guidance here discusses practical approaches and provides implementation guidance. It does this within the ATAP assessment model (see ATAP Part F3) consisting of use of Cost-Benefit Analysis (CBA) and the Appraisal Summary Table (AST).

Chapter 2 considers definitions of amenity and liveability and the relationship between amenity and liveability and transport and urban design.

Chapter 3 addresses the inclusion of amenity and liveability in transport planning and assessment following the ATAP methodology outlined in Part F3 of the Guidelines. It notes the challenges faced in measuring amenity and liveability effects and discusses monetised and non-monetised approaches and tools for assessing amenity and liveability.



## 2. Urban amenity, liveability and transport

### 2.1 What is urban amenity and liveability?

Urban amenity and liveability have been defined in a wide range of contexts. Some of these are outlined below and illustrate the diversity of definitions and contexts.

- The extent to which a place supports the quality of life, health and general wellbeing of the residents. The key attributes of a place that contribute to the quality of life are location, transport facilities and services. The quality of life is further enhanced by environmental sustainability such as access to natural and built environment (amenity) and low levels of pollution (Department of Infrastructure and Transport 2011).
- The quality of a place, including the aesthetics, the physical design and how the place is used. This includes:
  - Transport amenity, which is classified into two broad categories:
    - Transport user amenity – which refers to the amenity experienced directly through the use of the transport network, such as public transport, road design and the presence of pathways (Handy 2002).
    - Community amenity – which refers to how accessibility and connectivity affect the community, particularly community cohesion (Handy 2002).
- Amenity is a term referring to ‘the pleasantness or attractiveness of a place’ or to ‘the desirable or useful features or facility of a place’. Areas with high levels of amenity are more ‘pleasant’ or ‘attractive’ places to live, work or visit. The concept of urban amenity includes not only the visual and aesthetic qualities of a place, but also a range of more functional considerations such as safety, comfort and convenience (Botanic Gardens of South Australia 2015).
- Amenity generally means access to shops and other services required for daily living, including access to employment, health care, educational services, transport, cultural and leisure services, and green spaces (Commonwealth of Australia 2017).

Urban amenity and liveability can also include the consideration of other factors such as:

1. Mobility – the ease of movement of goods and people through various transport networks using different modes (NZTA 2013).
2. Connectivity – the extent to which communities and activity centres are joined (or co-exist) to create communities with a human dimension whilst ensuring the efficient operation of (local,) regional and national economies (Parliament of Australia 2015).
3. Accessibility – the ease with which activities, either economic or social, can be reached or accessed by people. It is also a means for measuring and analysing (the quality and efficiency of) connectivity (NZTA 2013).

Whereas connectivity and accessibility are well understood in the context of urban planning, mobility also plays an important role as it aims to address efficient travel across networks, which could otherwise increase the (negative) impact of transport on amenity and liveability<sup>1</sup>.

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<sup>1</sup> Noting that active travel does not have such negative impacts

Additionally, a concept closely related to amenity is place-making, which can be defined as:

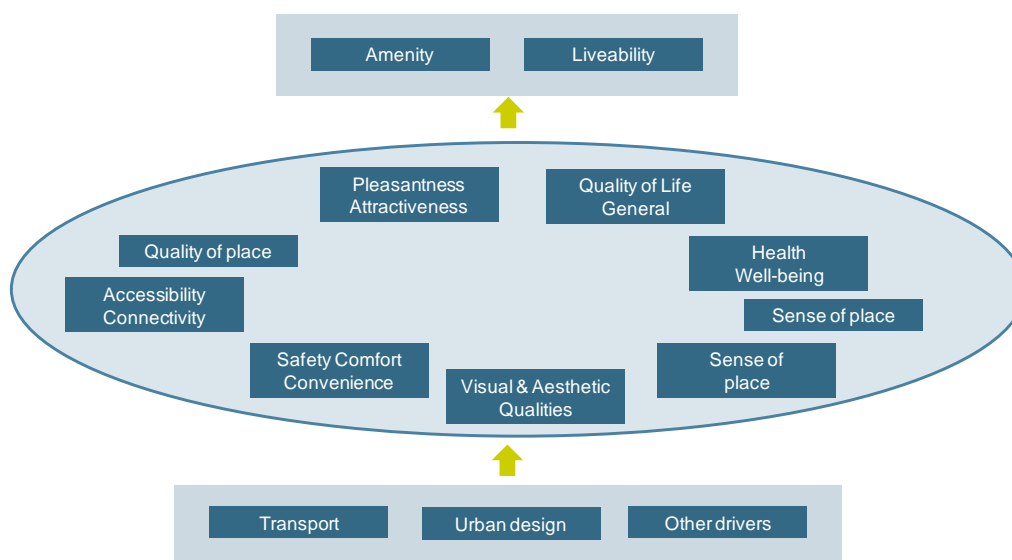
- A multi-faceted approach which capitalises on a local community's physical and human resources in order to create public spaces that promote health and wellbeing. Transport links are an essential adjunct to successful place-making.
- A strategy that focuses on improving people's quality of life and creating places which every person can enjoy every day (Geoworld7, in AGTA Conference 2015).

Finally, the concept of urban design is also often associated with amenity. The National Design Protocol (Australian Government 2011) suggests that:

- Urban amenity refers to the quality of public spaces and streetscapes from a human perspective, and is about the localities in which people live, engage with each other, and engage with the physical place around them
- Urban amenity can significantly influence the economic, environmental, social, health and cultural outcomes of a place
- Creating urban amenity and liveability is a long-term process that continues to evolve over time. It is this layering of building and infrastructure types, natural ecosystems, communities and cultures that gives places their unique characteristics and identities.

The above discussion illustrates the wide range of matters that can be interpreted as potentially falling under the banner of, and influencing, amenity and liveability. Some of the elements mentioned above are considered elsewhere in the Guidelines, and so for our purposes are not included in our consideration of amenity and liveability. These include: environmental effects, equity effects and mobility (in the sense of speed and convenience of travel). The elements included here under the category of amenity and liveability focus on the other elements listed above. Figure 1 attempts to broadly summarise these key determinants.

Figure 1 Key determinants of urban amenity and livability



Appendix A provides a more detailed breakdown of positive and negative aspects of liveability.



## 2.2 How does transport affect amenity / liveability?

Transport affects amenity and liveability directly (e.g. a road may act as a barrier) and indirectly (e.g. transport influences accessibility which in turn improves liveability).

Transport can have positive and negative effects on amenity and liveability. For example:

### *Positive:*

A bus network provides access and connectivity for the community

Well-designed transport infrastructure can add to the aesthetics of a place.

### *Negative:*

A major highway passing through an integrated community will act as a significant barrier to community interaction

Poorly designed transport infrastructure can detract from the aesthetics of a place.

The concept of 'transport amenity' provides a way of relating transport to amenity and liveability, and commonly involves consideration of three elements (Handy 2002):

#### 1. *Impact of the transport system on its users, such as:*

- a. For multi-users, the quality of stopping places and pathways, the design of the road and needed services and the design of parking facilities at the destination
- b. For transit users, the quality of public transport services, design of bus stops or railway stations, lighting, access for prams and wheelchairs, and provision of information such as signage and timetabling
- c. For cyclists and pedestrians, the design of pathways, pathway width, separation from traffic, availability of shade, adequacy of lighting, quality of footpaths, such as provision of kerb ramps for wheelchairs and prams, and cycleways
- d. Other users may also affect amenity, such as driver or public transport user behaviour, and speed.

#### 2. *Impact of development next to transport facilities on the transport users, such as:*

- a. The design of development affects the amenity of transport users by influencing the view from the road, bus, train, bikeway or walkway
- b. Other influencing factors including the size, design and placement of signs and structures relative to pathway, the amount and type of landscaping alongside the pathways
- c. Human activity such as graffiti, garbage also has negative effects on user amenity.

#### 3. *Impact of the transportation system on the community (which will also vary for each transportation mode within the same community), where the provision of transport facilities can have both positive and negative impacts on the amenity of a community, such as:*

- a. A pavement associated with parking facilities can be connected with increases in ambient temperatures

- b. Elevated structures can cast shadows on surrounding areas and high levels of activity can increase noise and air pollution, such as from large volumes of trucks or buses along a street (even where these facilities also add to the amenity of a community by improving accessibility and connectedness to users).

## 2.3 Consideration in transport planning and appraisal

Appropriately designed infrastructure can help to improve the liveability and quality of life in cities and urban neighbourhoods. They can contribute to community liveability through facilitating community cohesion and social capital, promoting the economic vitality of commercial centres, and creating more amenable urban environments. This set of related benefits can be grouped under a broad umbrella category of liveability (Botanic Gardens of South Australia 2015).

In the context of integrated transport planning, liveability focuses on how well the transport network supports the quality of life of citizens through the provision of a range of transport modes, enhancing mobility, connectivity and accessibility (Federal Highways Agency (FHWA) 2010). Specifically, measuring liveability is important for:

- Providing an integrated transport system, and its integration with land use
- Ensuring community wellbeing and health, economic development, connectivity and accessibility
- Providing equitable access
- Providing long-term measures of transport impacts on society.

Overall, inclusion of amenity and liveability effects in transport planning and appraisal can contribute to delivering a sustainable transport network and a basis for measuring the impact of transport on social welfare and wellbeing (Mendelsohn & Olmstead 2009, Mulley et al. 2016, Nahmias-Biran & Shiftan 2016, UK DfT 2014).

## 2.4 The role of urban design

While urban design is not the focus of this guidance, its importance for urban amenity and liveability (see section 2.2) should be noted given the strong interaction between transport and land use.

The prime national source of urban design guidance is the Australian Government's (2011) *Creating Places for People: An Urban Design Protocol for Australian Cities* — also referred to as the *National Urban Design Protocol*. The protocol was developed by the Major Cities Unit (Australian Government) and involved a collaboration between peak community and industry organisations, states, territories, local governments and the Australian Government. The Protocol has also been embedded into sustainability ratings tools such as the Green Building Council of Australia's Green Star – Communities, and the Infrastructure Sustainability Council's Infrastructure Sustainability rating tool.

The protocol comprises 12 key principles described in detail at <http://urbandesign.org.au/protocol-framework/principles/>:

- Design principles about **Place (productivity and sustainability)**:
  - Enhancing; connected; diverse; enduring
- Design principles for **People (liveability)**:
  - Comfortable; vibrant; safe; walkable

- Design principles about **Leadership and Governance**:
  - Context; engagement; excellence; custodianship.

The NACTO (2017) Street Design Guide from the USA provides another relevant reference.

Another relevant concept is the *human scale* that centres on the relationship between urban design and landscape architecture (i.e. the public realm) as well as placemaking and transport. Creating a human scale environment means ensuring the objects that people interact with in the urban realm every day are of a size and shape that is reasonable for an average person to use. Improving amenity and liveability of a place by engaging in placemaking may assist in defining the suitable human scale that is appropriate for the community whereby streets can be designed safely and comfortably for all road users including pedestrians, cyclists and drivers.

## 2.5 Link-Place concept

It is relevant to note at this point the Link-Place concept (Jones & Boujenko 2009). This concept recognises that roads and streets play two functions: as a *link* for moving traffic quickly and conveniently; and as a *place* where people are encouraged to spend time taking part in activities. The *place* component is strongly aligned with local amenity and liveability. By joining the parts into a single 'link-place' concept, the trade-offs faced in meeting the two functions are explicitly recognised. In doing so, the Link-Place approach can be useful for road network planning, with approaches such as a road network hierarchy proving a way of managing the trade-offs and optimising the level of amenity impacts.

The Austroads Guide to Traffic Management Part 4 Network Management (Austroads 2016) developed a framework that is interchangeably referred to as Link and Place Framework or Movement and Place Framework. The framework considers the road network hierarchy and generally considers the strategic significance of the road to provide opportunities for people to stop, walk or cycle around and enjoy the amenity of the area safely.

In addition, the Austroads Safe System Assessment Framework (Austroads 2016) aims to help road agencies to methodically consider Safe System objective in road infrastructure projects to ensure that all road users can travel safely. It addresses access and amenity concerns from road users and contributes positive and amenity outcomes for the community.

### 3. How can amenity and liveability be included in transport appraisal and planning?

Amenity and liveability should be included through the ATAP appraisal approach as outlined in Part F3 Chapter 3. The approach consists of:

- Clarification of relevant goals, transport system objectives and indicators
- Consideration of strategic merit and alignment
- Use of the ATAP triple bottom line appraisal elements of CBA and the Appraisal Summary Table (AST). The AST provides the mechanism for presenting all the appraisal results—monetised and non-monetised—in a single location.

#### 3.1 Developing goals, objectives and indicators

The Guidelines seek to have clear jurisdiction goals, transport system objectives and related indicators as drivers at the start of the ATAP Framework (see Part F1). It is therefore important to clarify early in the planning and assessment process the goals and transport system objectives that relate to amenity and liveability. That allows those objectives to be part of the identification of options, and for the amenity and liveability effects of an initiative to be related back to goals and objectives.

Goals and transport system objectives will vary from one jurisdiction to the next, so practitioners need to assess the situation in their particular setting. Appendix B provides an illustrative list of goals and objectives identified by Litman (2011) relating to sustainable development, many of which relate closely to amenity and liveability effects. Note that in the ATAP Framework, all economic, social and environmental goals and objectives are relevant, and so the Framework is consistent with the concepts of sustainability and sustainable development.

#### 3.2 Strategic merit and alignment

The degree of strategic alignment of a transport initiative or option should next be assessed with the identified goals and objectives, including those related to amenity and liveability. This can be done by undertaking the Strategic Merit Test – as discussed in Part F3 Chapter 3.

#### 3.3 Appraisal

The ATAP appraisal methodology recognises that all benefits and costs—monetised and non-monetised—are relevant to the appraisal of initiatives. It facilitates this through use of the AST in which monetised and non-monetised benefits and costs are presented side-by-side – see Part F3 Chapter 3.

This is particularly important where major impacts cannot be monetised. Infrastructure Victoria (2016) observes that monetisation of many impacts of initiatives is difficult, such as for many aspects of amenity and liveability. Use of the AST therefore allows amenity and liveability effects to be explicitly considered in the appraisal process through the AST, so the option delivering the greatest net economic benefit overall can be identified.

In that content, amenity and liveability should be included in the broader appraisal as follows:

- List the various amenity and liveability effects of the transport initiative being appraised
- Decide which ones can be monetised and those that must be expressed in non-monetised terms
- Identify those that can be measured in physical terms, and the methods and measures by which to report
- Proceed with the relevant measurements and assessments.
- Include the monetised results in the monetised component of the CBA
- Present any non-monetised effects in the AST alongside the monetised effects, and alongside all other assessed effects of the initiative
- Ensure that non-monetised items are not duplicating items that have been monetised (to avoid double-counting – see section 3.5 below)
- Undertake sensitivity testing (see section 3.6.3 below).

The above tasks can be undertaken in both rapid and detailed phases of the appraisal.

It is important to acknowledge that a transport initiative can have positive and negative impacts on aspects of amenity. The choice between options will therefore involve trade-offs between impacts. The AST provides the basis for presenting the trade-offs to the decision-maker. For example, improving the quality of access to a range of built environment features may reduce natural habitats and open places. The result is not an either/or but requires careful consideration of a range of competing outcomes (through the AST).

In some cases, the outcome of an appraisal depends on the significance of non-monetised benefits and costs. For example, the monetised benefits and costs may produce a net present value (NPV) of \$100 million, but the initiative has negative non-monetised net benefits. As discussed in Part F3 section 3.2, the initiative is economically justified if the decision-maker judges that the non-monetised net disbenefits are worth less than \$100 million — resulting in a positive combined (monetised and non-monetised) net benefit. To further assist the decision-maker, the threshold value (\$100 million in this case) could be expressed on a per person basis. Say 1,000 people are affected by the disbenefit, then the initiative is justified if the non-monetised disbenefit is considered to be less than \$100,000 per person ( $\$100,000,000 / 1,000$ ).

Consider, for example, the construction of a new road, with two options being considered that deliver the same user benefits (Infrastructure Victoria 2016):

- An at-grade alignment through a suburb or park – the lower cost option
- A tunnel solution under the suburb or park – a high cost option.

For the tunnel option, the large cost will be monetised – with the cost aspects therefore favouring the at-grade option. However, it is difficult to monetise the positive and negative impacts of preserving amenities in surrounding suburbs, and the exclusion of these effects could seriously hamper the selecting the preferred option. A balanced AST, with monetised and non-monetised effects presented side-by-side, would ensure that all major effects are presented to the decision-maker.

## 4. Challenges

### 4.1 The measurement challenge

Measuring and monetising urban amenity and liveability is crucial for creating an informative AST for the decision-maker. However, amenity and liveability are not easy to measure and/or monetise due to the multiple dimensions of amenity and liveability, the intangible nature of some aspects and the fact they are not bought and sold through markets (which reflect value through prices).

One illustration of this is the various global scales that exist to measure liveability, such as The Economist Intelligence Unit<sup>2</sup>, the Mercer Quality of Living Survey<sup>3</sup> and the Monocle Lifestyle Magazine<sup>4</sup>). The criteria used in these measurements are continually changing, and some criteria may be considered more important than others. Interpretation of what constitutes a 'liveable city' can therefore be a complex task.

Notwithstanding this measurement challenge, the principle of measurement does have significant merit, and further research is required.

Where measurement is possible, measures should be chosen based on their relevance. For example, they must have a direct influence on the output required from the initiative, and their reliability—they must be sufficiently accurate and have appropriate spatial or geographical coverage to represent the area of influence of the project, capturing before and after the implementation of the initiative, be as complete as possible and should be current so they detect any changes over time periods.

Where impacts are not easily measured, such impacts should not be simply dismissed. They should still be acknowledged and recognised in the appraisal as non-monetised effects, even if they can only be described in qualitative terms in the AST.

### 4.2 Avoiding double-counting

It is necessary to avoid double counting at all times in the appraisal of initiatives. Double-counting can arise when the full list of benefits of an initiative is generated. If two or more benefit components are expressed in different terms, but are effectively measuring the same overall effect, then double-counting will occur. It can also arise when overlapping measuring methods are used to measure two or more benefits (TfNSW 2016).

The example typically referred to in the CBA literature is of a transport improvement that leads to a travel time savings. The value of those time savings is in due course reflected in increased land and property values for locations that experience the time savings. To count the value of time savings (measured through a stated preference survey, or by estimation and monetisation of the time savings) as well as the increase in land value is a case of double-counting.

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<sup>2</sup> The Economist Intelligence Unit Criteria (in Chaffer 2015) covers 127 cities; stability, healthcare, culture, environment, education and infrastructure.

<sup>3</sup> Mercer Quality of Living Survey (in Chaffer 2015) covers 221 cities based on 39 criteria e.g. housing, recreation, schools and natural environment.

<sup>4</sup> Monocle Lifestyle Magazine covers 25 cities; safety, international links, climate, public transport, environmental issues and urban design (Macmillan Geoworld 7 p.236 in Chaffer 2015).



Similarly, amenity improvements will also be reflected in local property prices. If the improved amenity is valued through a stated preference survey, double-counting will occur if the increase in property values measured through hedonic pricing is also included.

TfNSW (2016) notes that double counting can arise from a failure to recognise an economic chain reaction and also from a failure to recognise overlapping measuring methods.

The risk of double-counting is reiterated in section 3.7.3.

## 4.3 Monetised parameter values

The Guidelines encourage the monetisation of impacts wherever feasible, maximising the coverage of impacts in the key CBA result metrics (NPV, BCR, etc). This approach is also recommended by Infrastructure Australia (2017). However, as noted in sections 3.4 and 3.5, in the case of amenity and liveability impacts, the review of literature undertaken for the development of this guidance has revealed that very few monetised values are available. Further research would clearly be helpful.

### 4.3.1 Noise and urban separation

Noise and urban barrier and separation effects are the two amenity impacts that are currently best supported by monetised parameter values in Australia. Unit parameter values for these for use in Australia have been published since 2003 (Austroads 2003, 2012; ATC 2006), as part of a broader set of environmental parameter values reported in Part PV5 of the ATAP Guidelines.

Current reported values are shown in Tables 1 and 2 below. Practitioners should continue to use these in their appraisals, although where robust evidence-based values are available for a specific initiative they should be used instead.

Users of these values should first read the practice notes and caveats provided in Austroads (2012) before using them.

Table 1 Noise and urban separation parameter values – Cars and buses (cents per vehicle kilometre)

Impact	Urban		Rural	
	Passenger cars	Buses	Passenger cars	Buses
Noise	0.82 (0.59 - 1.06)	2.00 (1.18 - 2.83)	0.00 (0.00)	0.00 (0.00)
Urban separation	0.59 (0.35 - 0.82)	1.89 (1.18 - 2.6)	0.00 (0.00)	0.00 (0.00)

*All values are in 2010 Australian dollars. For indexation use CPI for all groups,*

*Source: Austroads (2012)*

Table 2 Noise and urban separation parameter values – Freight vehicles (\$ per tonne-km)

Impact	Urban		Rural	
	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles
Noise	27.1 (18.86 - 37.71)	3.54 (2.36 - 4.71)	0.00 (0.00)	0.35 (0.24 - 0.49)
Urban separation	25.93 (15.32 - 36.53)	2.36 (1.18 - 3.54)	0.00 (0.00)	0.00 (0.00)

All values are in 2010 Australian dollars. For indexation use CPI for all groups,

Source: Austroads (2012)

### 4.3.2 Non-market approaches for monetising urban amenity / liveability

Monetisation of most amenity and liveability effects is difficult primarily because few of those aspects are revealed in market prices. In such cases, the use of non-market approaches to valuation can be considered in order to infer the monetised value of amenity and liveability impacts. Appendix C provides a discussion of the range of methods available, including: stated preference techniques; regression approaches; contingent valuation; cost-based approaches; revealed preference approaches; hedonic pricing and modelling.

### 4.3.3 Undertaking sensitivity analysis

Due to the diverse range of amenity and liveability impacts that need to be considered and valued, non-market valuations may result in a range of values being produced. The practitioner should therefore consider using the upper and lower bounds of these ranges in a CBA through sensitivity testing (see F3 Options Generation and Assessment and T2 Cost-Benefit Analysis for further information on sensitivity testing).

## 4.4 Non-monetised quantification

Where monetisation is not possible (even through non-market approaches) those aspects need to be expressed in non-monetised terms and presented in the AST. It is preferable they are expressed in quantitative terms (if possible) rather than just as qualitative information.

This section discusses available tools for assessing several aspects amenity and liveability.

### 4.4.1 Walk Score, Transit Score and Bike Score measures

Walk Score (2017) is a system of measuring local accessibility. It provides measures for walkability (Walk Score), transit access (Transit Score) and the quality of local biking (Bike Score). The Walk Score methodology could also be used in conjunction with other indicators such as: retail turnover; vacancy rates; foot traffic; speed of vehicles in kerbside lanes; waiting times for pedestrian traffic lights; and tree cover.

*Walk Score* measures the walkability of any address using a patented system. For each address, Walk Score analyses hundreds of walking routes to nearby amenities. Points are awarded based on the distance to amenities in each category. Amenities within a 5-minute walk are given maximum points. A decay function is used to give points to more distant amenities, with no points given after a 30-minute walk. Walk Score also measures pedestrian friendliness by analysing population density and road metrics such as block length and intersection density. Data sources include Google, Education.com, Open Street Map, the U.S. Census, Localeze, and places added by the Walk Score user community.

The levels of Walk Scores are shown in **Error! Reference source not found..**

Table 3 Walk Scores and descriptions

Walk Score	Description
90–100	Walker's Paradise Daily errands do not require a car
70–89	Very Walkable Most errands can be accomplished on foot
50–69	Somewhat Walkable Some errands can be accomplished on foot
25–49	Car-Dependent Most errands require a car
0–24	Car-Dependent Almost all errands require a car

Source: *Walk Score* (2017)

*Transit Score* is a patented measure of how well a location is served by public transit. Transit Score is based on data released in a standard format by public transit agencies. To calculate a Transit Score, a 'usefulness' value is assigned to nearby transit routes based on the frequency, type of route (rail, bus, etc.), and distance to the nearest stop on the route. The 'usefulness' of all nearby routes is summed and normalised to a score between 0 – 100. The levels of Transit Scores are shown in **Error! Reference source not found..**

Table 4 Transit Score and descriptions

Transit Score	Description
90–100	Rider's Paradise World-class public transportation
70–89	Excellent Transit Transit is convenient for most trips
50–69	Good Transit Many nearby public transportation options
25–49	Some Transit A few nearby public transportation options
0–24	Minimal Transit It is possible to get on a bus

Source: *Walk Score* (2017)

In the UK, a similar scoring approach in relation to public transport is PTAL (public transport accessibility level). It assesses the access level of geographic areas to public transport.

*Bike Score* measures whether an area is good for biking. For a given location, a Bike Score is calculated by measuring bike infrastructure (lanes, trails, etc.), hills, destinations and road connectivity, and the number of bike commuters. The levels of Bike Scores are shown in **Error! Reference source not found..**

Table 5 Bike Score and descriptions

Bike Score	Description
90–100	Biker's Paradise Daily errands can be accomplished on a bike.
70–89	Very Bikeable Biking is convenient for most trips.
50–69	Bikeable Some bike infrastructure.
25–49	Somewhat Bikeable Minimal bike infrastructure.

Source: *Walk Score (2017)*

#### 4.4.2 Social exclusion index

Social inclusion refers to people's ability to participate adequately in society, including education, employment, public service, social and recreational activities. Social exclusion describes the existence of barriers which make it difficult or impossible for people to participate fully in society (e.g. opportunities needed to create the life society desires, community poverty, a lack of suitable and affordable housing, illness, discrimination). Research indicates links between mobility, accessibility, and the prospect of a person being socially excluded, and social exclusion has not been widely accommodated in appraisal and planning processes in Australia.

TfNSW (2016) presents a quantified social exclusion index for comparing social exclusion in different locations and demographic groups. This could be used in two ways: in planning for assessing how resources to improve social inclusion are most effectively invested; and in appraisal to see the social exclusion effects of an initiative. A potential Transport Social Exclusion Index is described in Table 6. It uses six factors that represent various aspects of accessibility, rated from 0 to 5 using various indicators, giving a maximum rating of 30. An individual or group that rates low on this scale could be considered to face significant problems from social exclusion.

Table 6 Transport Social Exclusion index

Factor	Definition	Indicators	Rating
Mobility Need	Number of "essential" trips outside the home a person must make	From 5, subtract one point each for: <ul style="list-style-type: none"> <li>enrolled in school</li> <li>employed outside the home</li> <li>is a primary caregiver (responsible for children or disabled adults)</li> <li>has special medical requirements (such as dialysis)</li> <li>has other responsibilities that require frequent travel</li> </ul>	
Land Use Accessibility	Average travel distance to common destinations, based on land use clustering and mix, and roadway network connectivity	One point for each different type of public services within 0.8 kilometre of residences <ul style="list-style-type: none"> <li>food store, other retail shops</li> <li>post office / newsagency</li> <li>school</li> <li>park</li> </ul>	
Physical and Communication Ability	An individual's physical and communications ability	One point for being able to <ul style="list-style-type: none"> <li>walk one kilometre</li> <li>bicycle 3 kilometres</li> <li>speak and read the local language</li> <li>has residential telephone</li> <li>has residential internet service</li> </ul>	
Automobile Access	An individual's ability to use an automobile	One point for <ul style="list-style-type: none"> <li>having a drivers license</li> <li>having a vehicle rental within suburb</li> <li>living in a household that owns at least one motor vehicle</li> <li>owning a personal car</li> <li>having a major paved highway within 5 kilometres of home</li> </ul>	
Mobility Options	Number of non-automobile mobility options available to an individual for local travel	<ul style="list-style-type: none"> <li>Three points for accessing a train station</li> <li>Two points for access a bus stop or transitway station</li> </ul>	
Financial Wealth	Ability to pay for transport services.	One point for each income quintile # <ul style="list-style-type: none"> <li>Lowest quintile &lt;\$436 per week</li> <li>Second quintile \$436 - \$634 per week</li> <li>Third quintile \$635 - \$853 per week</li> <li>Fourth quintile \$854- \$1174 per week</li> <li>Highest quintile &gt;\$1174 per week</li> </ul>	
Total			

This index rates each factor from 0 (worst) to 5 (best), resulting in a total rating from 0 to 30. An individual or a group that rates low (0-10) could be considered facing significant problem of social exclusion. A rate between 10 and 20 could indicate certain social exclusion concerns. A rate between 20 and 30 could indicate no social exclusion issues  
# - based on ABS Household Income and Income Distribution in 2010/11 dollars

Source: TfNSW 2016

Note also that ATAP Part M1 section 4.11 reports research that monetises the benefit of an additional trips in cases of social exclusion.

### 4.4.3 Improvement in user amenity, community amenity and pedestrian safety

TfNSW (2016, pp. 41-42) discuss a number of other amenity benefits:

- Transport user amenity: Transport improvements can improve the amenity to users, such as improvements to public transport vehicles in terms of cleanliness, seating characteristics and comfort.

- Community amenity: Transport initiatives often result in improvements to surrounding infrastructure facilities such as shelter, CCTV and lighting, especially at interchanges of bus and rail stops.
- Both user and community amenity improvements are generally valued using an equivalent In Vehicle Time (IVT) minutes (IVT factor). The IVT factor is determined mostly by stated preference valuation surveys which represent passengers' willingness to pay under different scenarios and is an incremental value (difference between base case and the project case). Part M1 Chapter 5 of the Guidelines provides indicative IVT factors used in the valuation of amenity improvements for public transport vehicle and infrastructure initiatives.
- Pedestrian safety: Pedestrians are often involved in crashes. To the extent that an initiative affects pedestrian accident costs they should be counted as benefits or disbenefits. Benefits are calculated as the change in the number of pedestrian accidents multiplied by the unit cost per accident. Unit crash cost values are available from ATAP Part PV2 (see Table 20)
- It is important to note that user amenity, community amenity and pedestrian safety benefits can only be counted once in an appraisal. If some or all of these benefits have already been included in the calculation of user benefits of an initiative, they cannot also be included again as amenity benefits. To include them again would be double-counting (see section 3.5).

#### 4.4.4 Improvement in public realm

Another amenity benefit of a transport initiative is any improvement in public realm quality it may produce. TfNSW (2016) provides an approach called Pedestrian Environment Review System (PERS), a tool which allows quantification of the quality of the existing and proposed public areas (in terms of lighting, quality of service, obstructions, permeability, security, user conflict, overall quality of the environment).

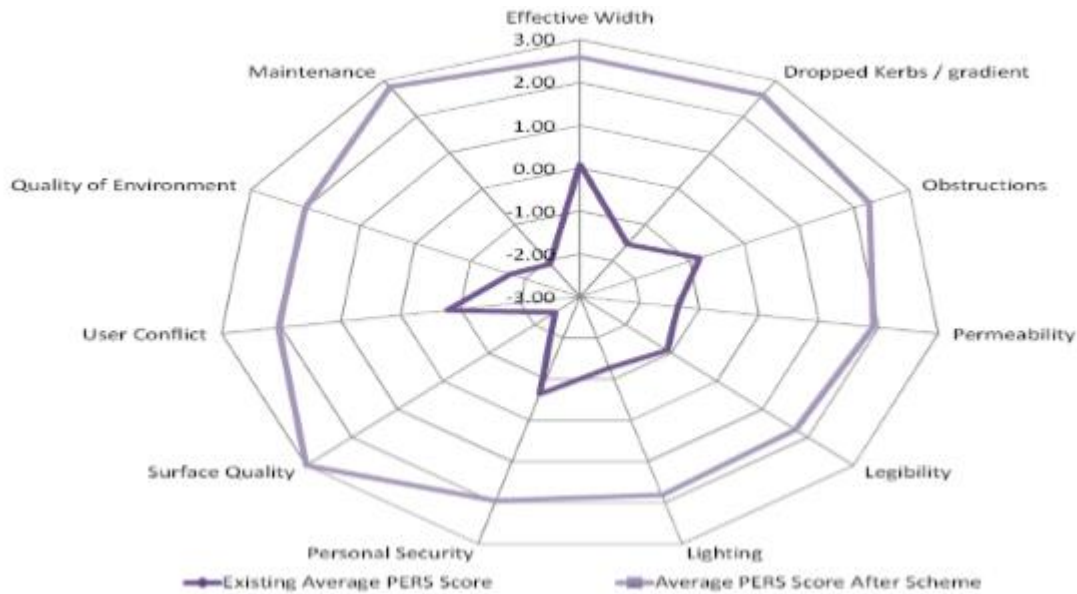
PERS assesses infrastructure provision of links and public spaces by placing scores (e.g. lowest score -3 (very poor) highest score +3 (very good) on a scale on a number of established characteristics such as:

- Lighting
- Quality of surface
- Effective width
- Obstructions
- Permeability
- Security
- User conflict
- Overall quality of environment (TfNSW 2016).

Figure 2 shows the improvement to the public realm generated by a proposed interchange or network hub improvement project. For link characteristics, the scheme proposals improve the PERS scores for surface quality and maintenance as well as the quality of environment within a study area. For public spaces, there is a dramatic improvement in all PERS characteristics, such as 'moving in the space' and 'feeling comfortable' attributable to the pedestrianisation of these areas and reduced dominance of road traffic, making the spaces accessible to all types of users (see TfNSW (2016) for further information).



Figure 2 Changes in PERS Scores for Link Characteristics



Source: TfNSW (2016)

#### 4.4.5 City Resilience Index

The City Resilience Index was developed as a partnership between the Rockefeller Foundation and Arup. It provides an indication of the resilience of a city to natural and man-made events, and enhances the ability to adapt to these challenges in the future. It measures a city's resilience profile against 12 goals (ranging from how essential needs are met to the level of law enforcement, economic participation to the competency of infrastructure management) and 52 indicators (a detailed array that ranges from sanitation to availability of financing, crime prevention measures to continuity plans for vital assets). Further information can be obtained from <http://www.cityresilienceindex.org>.

## 4.4.6 Aggregated index approach

Handy (2002) refers to using indicators individually or in combination to provide non-monetised guides to the amenity and liveability effects, providing the following as a simple measure of amenity that combines various aspects:

$$A = w_1C_1 + w_2C_2 + w_3C_3 + \dots$$

[EQ 1.1]

where:

A = Overall amenity

C<sub>i</sub> = a characteristic of a place that contributes to amenity

W<sub>i</sub> = a weight representing the relative importance of that characteristic

*Source: Handy (2002)*

Using this equation, transport planners would need to determine what characteristics to include and what weights to assign to them. This requires compiling a list of characteristics that may contribute to the amenity of a place. However, determining the relative importance of these characteristics is more subjective and can vary on the basis of opinion. This approach should therefore be used with caution, and with full documentation of all underlying assumptions.

## 4.5 Future monitoring

This chapter has stressed there are complexities and difficulties in measuring and monetising urban amenity and liveability effects. Research work continues throughout the world on how to better quantify and monetise amenity and liveability impacts, such as by applying techniques such as hedonic modelling, where amenity values are estimated by their contribution to lifting property prices (Infrastructure Victoria 2016). Further enhancement will assist future assessments, provided the impact is counted only once and therefore not double-counted (see section 3.5).

The Guidelines will continue to monitor the literature for new developments and update this Part as required.

## 4.6 Other approaches

Other methodologies that could be seen as having a broad link to amenity and liveability, namely those that focus on accessibility and equity, include:

- Activity based models (ABM)
- Equity Benefit Analysis (EBA) and the Subjective Value of Accessibility (SVOA)
- Travel demand and community effects modelling (Geographic Information System based approach)
- Benefit Incidence Tables (BIT).

Appendix D provides further brief information on these approaches. Some use multi-criteria analysis (MCA) and distributional weighting. Users should note that the ATAP Guidelines has reservations about such aspects, so their use should be considered cautiously — refer to related discussions in the following locations of the ATAP Guidelines: Part F3 section Chapter 3 and Part T5 appendix B.

# Appendix A Aspects of liveability

Liveability has been interpreted by some as incorporating a very broad range of aspects, positive and negative. Table 7 illustrates this.

Table 7 Positive and negative aspects of urban amenity and liveability

Positive effects	Negative effects
<b>Access and linkages</b>	
<ul style="list-style-type: none"> <li>• Connectedness to services and facilities</li> <li>• Access and linkages to services and facilities (educational, health, cultural, recreational)</li> <li>• Social connectedness</li> <li>• Convenient transit usage</li> <li>• Pedestrian activity and convenience</li> <li>• Cycleways and footpaths</li> <li>• Parking usage</li> <li>• Transport and communications</li> <li>• Mobility and access for impaired pedestrians (e.g. wheelchair, pram)</li> </ul>	<ul style="list-style-type: none"> <li>• Natural hazards and extreme events</li> <li>• Isolation</li> <li>• Lack of access to services and facilities</li> <li>• Low development</li> <li>• Poor service / facilities provision</li> <li>• Severance from services and facilities</li> </ul>
<b>Sociability</b>	
<ul style="list-style-type: none"> <li>• Streets as places for people to socialise and meet</li> <li>• Street life evening use of roads and public transport</li> <li>• Volunteerism</li> <li>• Welcoming community</li> <li>• Cooperative</li> </ul>	<ul style="list-style-type: none"> <li>• No infrastructure for communities to meet</li> <li>• Social cohesion</li> </ul>
<b>Uses and activities</b>	
<ul style="list-style-type: none"> <li>• Affordability</li> <li>• Property values</li> <li>• Land-use patterns</li> <li>• Business ownership</li> <li>• Availability of employment</li> <li>• Retail sales</li> <li>• Active</li> <li>• Incidental exercise through active travel (walking, cycling)</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of recreational facilities</li> <li>• No infrastructure or comfortable places for communities to meet</li> <li>• Gentrification reducing affordability</li> </ul>
<b>Comfort and image</b>	
<ul style="list-style-type: none"> <li>• Safe</li> <li>• Clean</li> <li>• Charm</li> <li>• Attractive / aesthetic</li> <li>• Historic</li> <li>• Cultural identity</li> <li>• Crime status</li> <li>• Building conditions</li> <li>• Environmental quality</li> <li>• Resources and recycling</li> </ul>	<ul style="list-style-type: none"> <li>• Violence, crime, conflict</li> <li>• Poor human rights</li> <li>• Poverty</li> <li>• Natural hazards and extreme events</li> <li>• Pollution, noise</li> <li>• Temperature (too hot or too cold)</li> <li>• Aging infrastructure and building conditions</li> <li>• Wind</li> <li>• Heat island effect</li> </ul>

Source: Chaffer, GTANSW (2015), Australian Government (2011)

Additionally, a range of factors influence perceptions of the liveability of places, which may change over time. These include age, gender, language, income, wealth, occupation, life stage, lifestyle, employment, aspirations, culture, interests, and location.

## Appendix B Links to sustainable transport

Goals, objectives and indicators related to the concept of sustainable transport can be closely related aspects of liveability. Table 8 provides an example published by Litman (2011).

Table 8 Sustainable Transport Goals

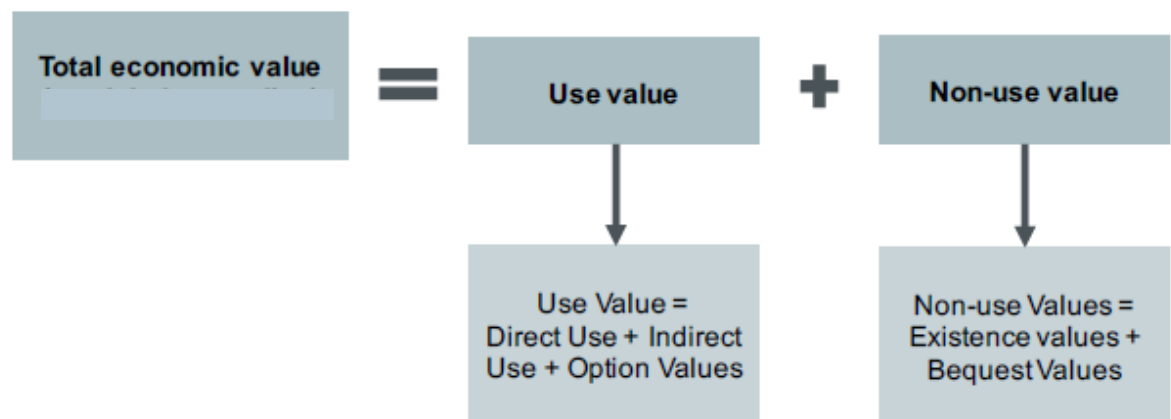
Goal	Definitions
<b>Economic</b>	
Efficient mobility	Fast and affordable transport of people and goods
Local economic development	Progress toward local economic goals, such as increased productivity, employment, business activity, income, property values and tax revenues
Operational efficiency	Maximise efficiency of providing transport facilities and services
<b>Social</b>	
Human safety and health	Increased travel safety, public fitness and health
Affordability	Ability of households to afford basic transport
Social equity	Supports equity objectives including fair distribution of impacts (benefits and costs), progressivity with respect to income and basic mobility
Community cohesion	Increased quantity and quality of interactions among community members
Cultural preservation	Preservation of artifact and activities valued by a community
<b>Environmental</b>	
Pollution reductions	Reduced air, noise and water pollution
Resource conservation	Reduced and more efficient use of resources such as petroleum and land
Open-space preservation	Preservation of farmlands, parks and natural habitats

# Appendix C      Measurement and valuation

## C.1      Non-market approaches to valuation

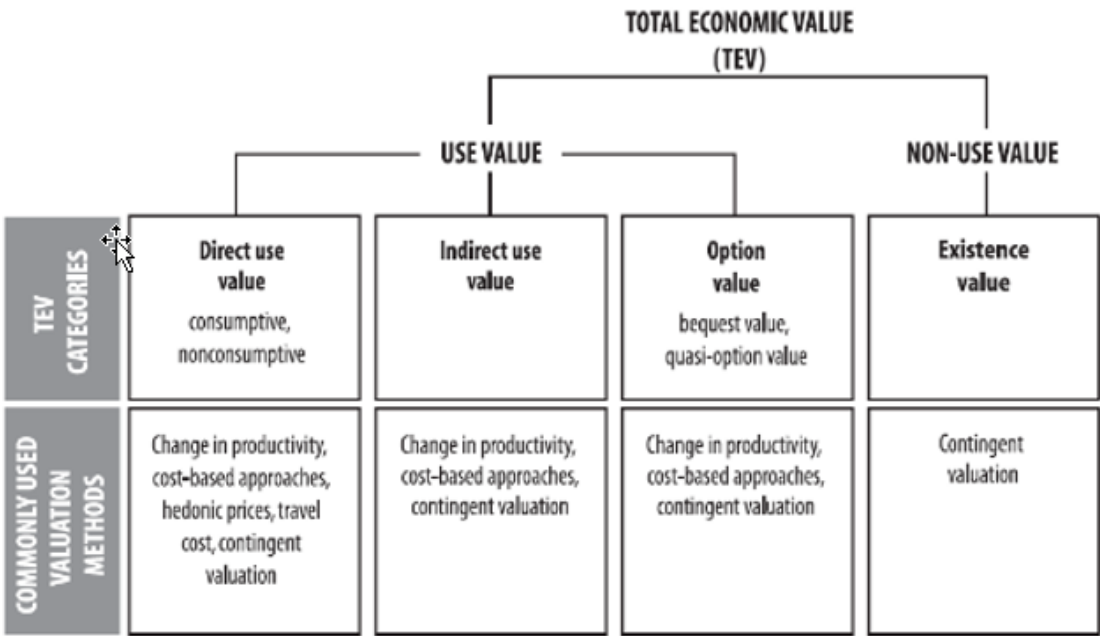
Where markets prices are not available to reveal the value of an aspect of amenity and liveability, non-market methods provide an approach to infer those values. For example, Total Economic Value Approach (TEV) (often referred to as Triple Bottom Line comprising social, environmental and economic costs and benefits) (Aither n.d), as illustrated in Figure 3 and Figure 4.

Figure 3      Total Economic Value



Source: Aither n.d.

Figure 4      Total Economic Value Framework



Source: Millennium Ecosystem Assessment 2003, p.132



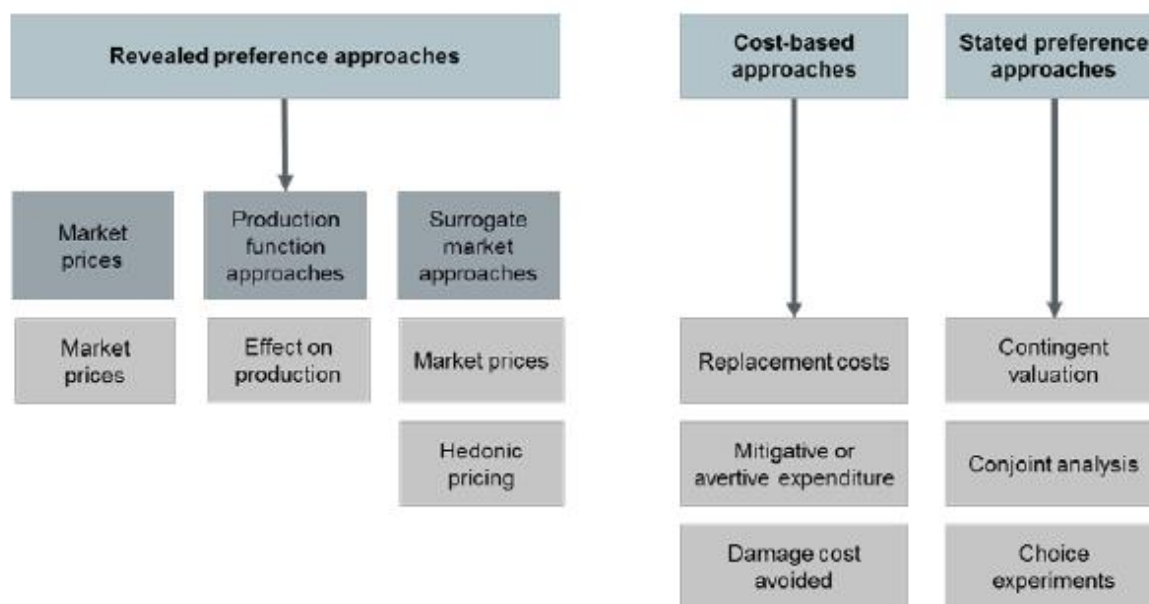
Figure 3 and Figure 4 show that:

- Use values comprise direct use values (direct benefits from the use of primary services such as the provision of food and cultural services e.g. recreation, tourism, education), indirect use values (benefits from secondary goods and services (including non-consumptive use) such as natural hazard regulation, scenery, recreation) and option values (benefits of preserving the option for future use).
- Non-use values comprise existence values (value of the existence of a service without its actual use) such as cultural services, cultural identity/integrity, wildlife/biodiversity, and bequest values (value for future generations) (Botanic Gardens of South Australia 2015).

The combination of use and non-use values is the TEV.

Additionally, Figure 5 shows the commonly used valuation methods for use and non-use values.

Figure 5 Approaches for economic evaluation of amenity and liveability



Source: Aither n.d.

Due to the diverse coverage of urban amenity and liveability, there is no one method for valuation. Methods currently used in Australia include:

- Stated preference techniques – involve asking people questions via surveys regarding the strength of their preferences of a specified amenity effects. For example, asking residents what they think of a place and how they would rate its amenity. Non-use values are often estimated through these approaches, whereas use values are estimated through revealed preference approaches (Aither n.d; Handy 2002). Rigorous stated preference surveys can be used to assess the probable response to proposed policies or projects using a series of scenarios. Participants are provided with two scenarios and asked how they would respond, to determine the relative value participants place on different variables and trade-offs they are willing to make between variables. The technique can be used to measure amenity and assess the response to changes in amenity (Handy 2002).

- Regression approaches – enables residents to rate the amenity of a sample of places representing a wide range of characteristics. These ratings are used as dependent variables in a regression model with characteristics of each place as the independent/explanatory variables. This indicates which characteristics are significantly correlated with amenity and the coefficients indicate their relative importance. The results measure the amenity in different places, at different times, under different conditions, and can be transformed into elasticities to indicate the change in amenity that results from a given change in a characteristic or factor (Handy 2002).
- Contingent valuation – is a stated preference technique that can be used in estimating the value of amenity, such as to measure the benefit of an improvement in amenity or the cost of a decline in amenity. It is not often used in transportation for amenity. However, it can indicate the willingness to pay for a public asset such as a traffic-free park, or uniquely designed bridge. While the cost of providing the asset can be weighed against the estimated monetary benefit to the community, the limitations are in the validity of results (Handy 2002).
- Cost-based approaches – requires the estimation of avoided costs associated with option(s). For example, the benefits of improved water quality can be quantified according to the avoided costs to deliver similar pollution abatement (Aither n.d). These are often applied to use-values with respect to direct-use values, indirect use values and options values.
- Revealed preference approaches – preferences are revealed by purchasing methods or observations of people's actions in buying and selling goods and services that have non-market impacts. For example, people's preferences for housing is reflected in the prices paid for property. This can reflect the values they hold for amenity and liveability which affects the house prices but which themselves are not marketed directly (Aither n.d). Mode choice models used in transportation planning are another form of this approach. These models use data from travel surveys and estimate the probability of choosing one mode over another based on the characteristics of different modes. However, amenity is not often incorporated into these models due to the unavailability of data on characteristics that influence amenity (Handy 2002).
- Hedonic pricing and modelling – is a revealed preference approach that can be used to estimate the economic benefits or costs associated with amenities such as aesthetic views, proximity to recreational sites, or the value of proximity to a transit station/freeway based on the characteristics of the housing unit and its location or price (Handy 2002). A recent body of research has aimed to quantify the impacts of Green Infrastructure on the economic vitality of commercial centres and on residential property values. Another extensive body of research is attempting to quantify the economic value of the ecological services provided to communities by Green Infrastructure (Botanic Gardens of South Australia 2015). Infrastructure Victoria is also developing a report on the valuation of natural and urban amenities through the application of hedonic modelling. Amenity values are by their contribution to lifting property prices across Victoria (Infrastructure Victoria 2016).
- Environmental accounting approach – to complement the hedonic pricing approach. Existing parameters on the value of economical services can be valued using this approach, such as non-use values of the asset or amenity which may not be fully captured in the monetisation of amenity benefits (Infrastructure Victoria 2016).
- Benefit transfer method – draws on existing non-market valuation studies to estimate non-market values and can be a cost-effective alternative to undertaking primary data analysis (Aither n.d). This is often not applied for assessment of amenity and liveability.

Most Australian studies use hedonic modelling for the valuation of natural and urban amenities. Currently Infrastructure Victoria are undertaking a study to estimate amenity values by assessing their contribution to lifting property prices across Victoria.

# Appendix D Other approaches for calculating urban amenity and liveability

Other approaches to measuring aspects of liveability and amenity are listed in Table 9 International and Australian approaches for measuring liveability and amenity

. It shows the different aspects of attribute measures, the jurisdictions or countries applied and a summary of the approach.

In the last decade several countries have introduced new appraisal approaches, such as the New Approach to Appraisal (NATA) in the UK; Overview of Effects of Infrastructure (OEI) in the Netherlands; the Federal Transport Infrastructure Plan (FTIP) in Germany, and the Benefit Index Table (BIT) in Japan (Thomopoulos et al. 2009). Like ATAP, these approaches use CBA as their main foundation.

Fewer countries have incorporated equity considerations into the evaluation process, mostly using Multi-Criteria Analysis (MCA). Only Spain, UK, Switzerland, Czech Republic, and Hungary, have been applying a variant of MCA for equity evaluation. UK applies this in a systematic way for each project. In Japan, a variant of MCA is applied, although CBA has been adopted as a basis with the exception of the using a Benefit Incidence Table (BIT) (Nahmias-Biran & Shiftan 2016).

As explained in Section 3, ATAP considers equity assessment in Part T5.

There are key gaps identified in valuing and measuring liveability for transport; and further research is required.

Table 9 International and Australian approaches for measuring liveability and amenity

Approach	Attribute measures	Jurisdictions applied	Description and use
Equity Benefit Analysis (EBA)	Wellbeing and accessibility	Singapore, Israel	Equity Benefit Analysis (EBA) is a combination of Cost Benefit Analysis (CBA) and Multi-Criteria Analysis (MCA). The approach focuses only on the advantages of the two approaches. The effectiveness measure developed as an accessibility and wellbeing indicator is called Subjective Value of Accessibility (SVOA) (Nahmias-Biran & Shiftan (2016).

<b>Travel demand and community effects modelling (Geographic Information System (GIS) based approach)</b>	Accessibility	New Zealand	A model for measuring accessibility in New Zealand. The performance indicators were determined using findings from international research, mainly from the UK, European research and to a lesser extent, the US and Australia. Similar to Nahmias-Biran and Shiftan (2016), the model considers different travel modes, travel behaviour, destinations, activities and multiple opportunities. The model uses geographic information systems and other valuation models (negative exponential equations) to measure accessibility. Other valuation methods include estimating the travel time distribution using traditional travel demand models for all modes and destination. The network creation indicators were estimated for the different road stereotypes. A pilot was conducted using Christchurch as the case study. While the model provides a measure for accessibility, the authors suggest further research to provide weightings for land use activities by age group, including network economic costs and other indicators for opportunity.
<b>GIS based approach</b>	Sustainability and community liveability	USA	This study by Wang et al., 2015 developed a GIS based method for assessing sustainability and liveability performance measures. Performance measures were grouped into four categories; network related, land use related, living condition related and system wide related measures. Living condition related measures were proxies for liveability and included per capita income, unemployment rate and health insurance coverage rate. This data was obtained from population censuses.
<b>Benefit Incidence Table (BIT)</b>	Quality of life	Japan	Morisgui (2000) developed a variant of MCA, although CBA has been adopted as a basis, called the Benefit Incidence Table (BIT). The BIT is a qualitative list of indicators that should be monetarily evaluated and accounted for as part of an investment. The indicators are divided by sectors and the equity balance between sectors is judged based on the net benefit distribution. Multiplying the distributional weight which reflects the social value judgement, could modify the net benefit for each sector.
<b>Activity based models</b>	Accessibility	USA	The models captures an individual's activities across the network, providing trade-offs against different activities and travel alternatives.

## Appendix E      Glossary

Term	Definition
<b>Accessibility</b>	The ease with which activities, either economic or social, can be reached or accessed by people'. It is also a means for measuring and analyzing (the quality and efficiency of) connectivity (NZTA 2013).
<b>Amenity</b>	Generally means access to shops and other services required for daily living, including access to employment, health care, educational services, transport, cultural and leisure services, and green spaces (Commonwealth of Australia 2017).
<b>Community amenity</b>	Refers to how accessibility and connectivity affect the community, particularly community cohesion (Handy 2002).
<b>Connectivity</b>	The extent to which communities and activity centers are joined (or co-exist) to create communities with a human dimension whilst ensuring the efficient operation of (local,) regional and national economies (Parliament of Australia 2015).
<b>Liveability</b>	The extent to which a place supports the quality of life, health and general wellbeing of the residents. The key attributes of a place that contribute to the quality of life are location, transport facilities and services. The quality of life is further enhanced by environmental sustainability e.g. access to natural and built environment (amenity) and low levels of pollution (Department of Infrastructure and Transport 2011).
<b>Mobility</b>	The ease of movement of goods and people through various transport networks using different modes (NZTA 2013).
<b>Placemaking</b>	A multi-faceted approach which capitalises on a local communities physical and human resources in order to create public spaces that promote health and well-being. Transport links are an essential adjunct to successful place-making.
<b>Transport user amenity</b>	The amenity experienced directly through the use of the transport network, e.g. public transport, road design and the presence of pathways (Handy 2002).
<b>Urban design</b>	Urban design involves the arrangement and design of buildings, public spaces, transport systems, services, and amenities. Urban design is the process of giving form, shape, and character to groups of buildings, to whole neighbourhoods, and the city (Urban Design 2018).

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