TRANSPORT AND INFRASTRUCTURE COUNCIL

Australian Transport Assessment and Planning Guidelines

F0.2 Integrated Transport and Land Use Planning

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For enquiries or feedback about this publication please contact:

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

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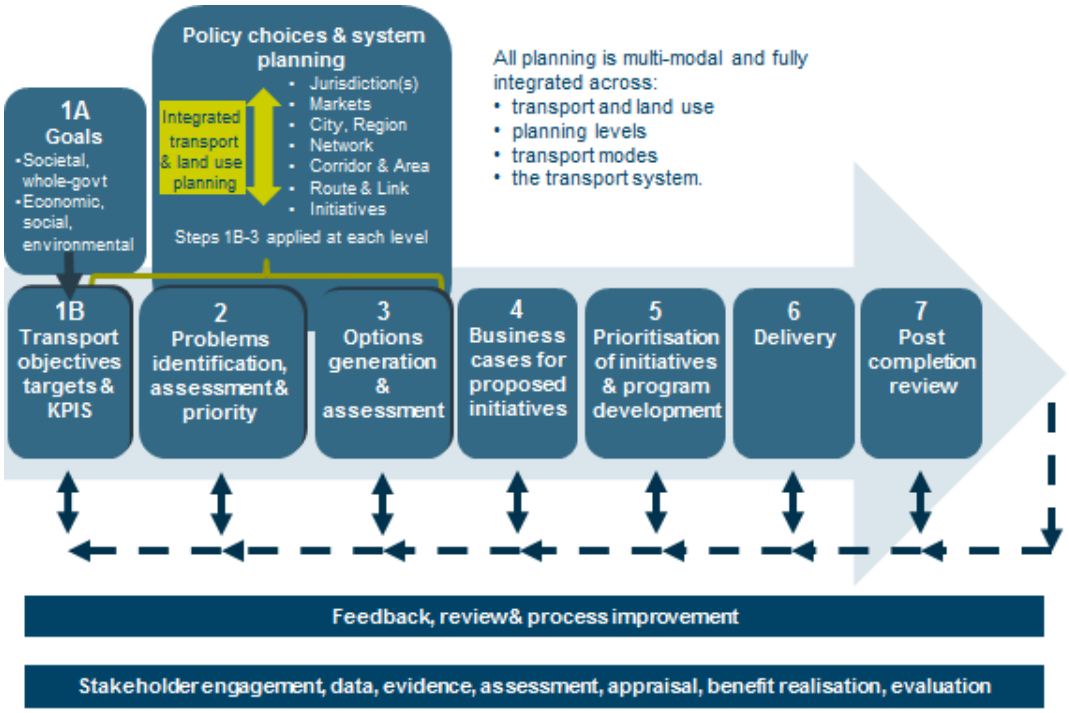


At a glance

This Part of the Guidelines contains fit-for-purpose guidance for Australian practitioners of integrated transport and land use planning (ITLUP), a central feature of good planning. ITLUP addresses a city or region's longer-term challenges, working to a shared vision of what a city or region aspires to be in the future, and coordinating investments and policy decisions to achieve that vision in an optimal manner.

The central focus of the Guidelines is on:

- Acknowledging the traditional 'cluster and connect' model of ITLUP, which achieves integration at the district, corridor and local (suburb and neighbourhood) levels. This approach is already subject to significant guidance across urban design and structure planning, with relevant references provided here (chapter 7)
- Explaining the emerging best practice approach to ITLUP in which 'cluster and connect' is complemented by a formal explicit recognition of the city shaping impact of some major transport infrastructure, and the harnessing of that impact and power (chapters 3, 6 and 7)
- Distinguishing between strategic (that is, city shaping) structural/district and local/follower transport infrastructure (chapter 4) and explaining why a good understanding of their different influences on land use is essential to the new ITLUP approach.

The enhanced approach to ITLUP presented in this Part of the Guidelines aims to achieve:

- Optimal urban structure (such as influencing the overall extent of the city and densities within it) through harnessing the city shaping power of strategic transport infrastructure to influence urban development
- Optimal urban form at the district, corridor and local (suburb and neighbourhood) levels through use of the 'cluster and connect' planning model.

The starting point for best practice ITLUP is a clear and compelling vision for the future structure of a city. This can include traditional metropolitan planning elements – spatial visioning and developing regulations relating to the location, type and density of development – in line with the vision. It should also include support for wider policy levers outside traditional town planning and clear and aligned governance arrangements, including inter-jurisdictional relations. It should consist of a trilogy of plan making, wide-ranging implementation elements and governance to achieve a strategic vision of metropolitan planning.

The accessibility effects of strategic/city shaping transport initiatives can change a city's development patterns and growth trajectory. This can change the decisions people and businesses make about where to locate, setting a new geography of land values. The market then signals where new and/or intensified urban development is warranted, creating a shift in urban form and, sometimes, structure. This means that strategic transport initiatives need to be conceptualised within the context of a preferred urban structure rather than a traditional approach where transport investment simply responds to demonstrated demand.

The Guidelines provide principles, processes, key questions and examples to guide effective ITLUP for strategic/city shaping transport initiatives as well as for structural and local infrastructure.

Rigorous assessment is particularly important for strategic/city shaping initiatives. Having demonstrated the city shaping impact of a transport initiative, practitioners need to measure whether this impact will help or hinder achievement of metropolitan settlement pattern objectives as set out in the spatial vision and/or strategic plan for the city.

One approach is to apply historically observed locational elasticities – the measured sensitivity of employment or population growth to changes in past levels of relative accessibility. The impacts of an initiative can also be quantified in relation to specific metropolitan objectives. This may include assessing trends such as land consolidation versus urban sprawl or the level of assistance offered by government to key metropolitan industry clusters and economic nodes to reinforce agglomeration economies. This Part provides guidance on assessing the impacts on housing densities and types, and land use transport interaction models.

Another important aspect of the assessment process is the appraisal of transport initiatives, particularly strategic initiatives. The key appraisal tool is cost benefit analysis (CBA). For a strategic transport initiative, a comprehensive 'fully evolved' CBA, while ideal, faces a range of challenges. If such an appraisal is not feasible, the iterative application of rapid and detailed CBA using land use impact scenario analysis is a useful alternative. The more qualitative multi-criteria analysis (MCA) can be a useful supporting tool that can be used prior to a CBA, at early stages of assessment when limited quantitative data is available for even a rapid CBA.

Various actions are required to optimise the city shaping power of transport infrastructure. The Guidelines discuss how they differ in brownfield and greenfield areas.

Effective coordination plays a particularly crucial role in ITLUP. Successful ITLUP requires coordination between planning for the three transport infrastructure types, and coordination in institutional settings and governance.

1. Introduction

This Part of the ATAP Guidelines contains guidance for integrated transport and land use planning (ITLUP).

As noted in Part F0.1, integrated transport and land use planning is a central feature of good planning, and should occur at all planning levels (see Figure 1 of F0.1). To help achieve this, integrated transport and land use planning forms a central element of System Planning in the ATAP Framework (see figure above).

This guidance is designed to be fit-for-purpose for Australian practitioners to improve integrated transport and land use planning across Australia. The guidance is informed by a review of existing guidelines, consultation with jurisdictions[1] and a review of case studies.

Integrated transport and land use planning addresses a city or region's longer term challenges, working to a shared vision of what a city or region aspires to be in the future and coordinating investments and policy decisions to achieve that vision in an optimal manner.

ITLUP guides strategic decisions regarding growth corridors, designated centres, major transport and other infrastructure that influence how a place works – where jobs, housing and transport connections will be located, how they connect across the existing transport network and how local places function.

These decisions have a long legacy and reversing them takes a long time and is often costly. Strong integration between land use and transport can avoid these issues, while also creating an efficient transport and land use system that can generate a range of economic, social and environmental benefits. These benefits must be adequately understood and captured during the integrated planning and appraisal process and maximised after an initiative opens to reach its full potential.

Central to these Guidelines is a focus on:

- Explaining the shift from the traditional cluster and connect model of ITLUP to an emerging approach that also formally recognises the city shaping impact of some transport infrastructure
- Distinguishing between strategic (city shaping), structural and local transport infrastructure and explaining why a good understanding of their different influences on land use is essential to the new ITLUP approach.

The enhanced approach, and supporting guidance, provided in this Part of the ATAP Guidelines aims to achieve:

- Optimal urban structure (such as influencing the overall extent of the city and densities within it) through harnessing the city shaping power of strategic transport infrastructure to influence urban development

[1] Seven out of the eight state/territory governments were consulted as well as Infrastructure Australia

- Optimal urban form at the district, corridor and local (suburb and neighbourhood) levels through use of the cluster and connect planning model.

Good coordination and governance are also promoted as central elements for achieving optimal economic, social and environmental outcomes from ITLUP.

Box 1 A note on terminology

Geographical levels

Various terms are used in planning to refer to geographic scales. The following terms are used here, going from largest to smallest scale:

- City or region – where the term city is used here to mean the overall metropolitan area
- Corridor or district – the sub-regional scale
- Local – suburb or neighbourhood.

Urban structure and urban form

The distinction between urban structure and urban form is helpful. Troy (2004) suggests:

- *Urban structure* is the spatial relationships between cities and their services and activities; that is, whether the activities are arranged in linear relationships and are highly centralised or whether the city is structured as an interconnected set of nodes around which development is arranged.
- *Urban form* is the nature or density of development. All major cities in Australia are essentially low density, especially in their residential areas, although recently the city centres have been developed to high density.

As used here, urban structure is a more macro concept than urban form. Urban structure refers to the overall settlement/development pattern of the entire city, while urban form refers to the spatial characteristics, particularly at a local level.

Infrastructure types

A distinction between three types of transport infrastructure is also used (see section 4) to reflect their relative influence on land use decisions:

- Strategic or city shaping
- Structural or district
- Local or follower.

By definition, only the first is city shaping; that is, it influences urban structure (and form). The latter two only influence urban form.

2. Gaps in current literature

2.1 The need for integration has long been recognised

The notion of integrated transport and land use planning has been proposed for a long time and the need for better integration of transport and land use planning is a long-standing issue in the literature.

Something of a breakthrough came in the early 2000s when the Commonwealth sponsored the production of a National Charter for Integrated Transport and Land Use Planning (Australian Transport Council 2003). The passage below from these Guidelines sums up the conceptual foundation for the integration imperative, at least as it was resolved at that time.

"Land use and transport planning has a key role to play in delivering social, economic, and environmental sustainability. Roads will continue to dominate as the means of movement for the majority of people and freight in Australia in the foreseeable future. However, by shaping the pattern of development and influencing the location, scale, density, design, and mix of land uses, planning can help to facilitate an efficient transport and land use system by:

- reducing the need to travel;
- reducing the length of journeys;
- making it safer and easier for people to access services;
- reducing the impact of transport on communities;
- improving freight access to key terminals and improved freight flows;
- providing for the efficient distribution of goods and services to business and community;
- providing a choice of travel modes; and
- ensuring flexibility to meet the demands of a changing economy and market environments".

While the National Charter for Integrated Transport and Land Use Planning was welcome, the ATAP Guidelines for ITLUP enhance the Charter by adopting two approaches:

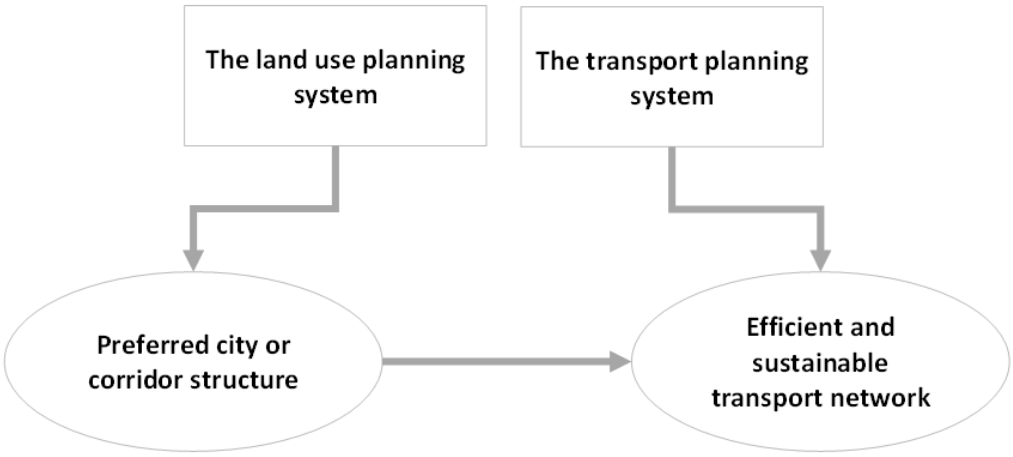
- The traditional approach – cluster and connect
- The emerging approach – recognising the potential city shaping impact of transport.

These ATAP Guidelines for ITLUP introduce the city shaping impact of transport and provide a first step in developing an awareness, capability and practice in this important aspect of integrated planning. In time, more depth should be added to the guidance on city shaping impacts as knowledge and practice in this area evolve.

3. Understanding the impact of strategic city shaping infrastructure

The traditional idea of integrated transport and land use planning sees the urban planning system as a means to reshape a city at the district and corridor levels to facilitate efficient and more sustainable transport operations. This suggests an urban planning approach directed at increased densities around high capacity public transport links or striving to balance land for local jobs and housing to reduce the need for travel (see Figure 1).

Figure 1 'Traditional' concept of transport and land use planning integration



Source: SGS Economics and Planning Pty Ltd

This cluster and connect model plays an important role at local and district levels, and contributes to the overall structure of the metropolitan area. For example, at the neighbourhood level, the cluster and connect approach generally has a strong place-making focus by consolidating important community facilities around public transport and, occasionally, using some forms of public transport such as light rail to calm traffic and promote local development activity.

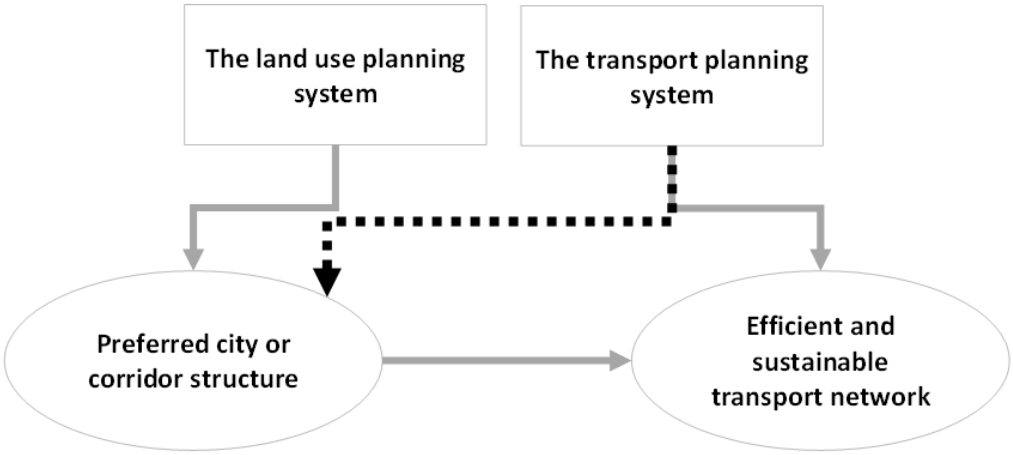
This approach, while reasonable, underplays, the crucial fact that the transport network is more than a servant of a city structure; it can be the principal shaper of that city structure through the city shaping power of some major transport investments. Full integration of transport and land use planning must also recognise and harness the city shaping power of some transport investment decisions. This is an important new consideration in ITLUP.

This relationship is depicted in Figure 2.

This guidance acknowledges the traditional cluster and connect model and extends beyond that model by also recognising the emerging approach that harnesses the city shaping power of some transport investments. The guidance acknowledges that the city shaping approach and the cluster and connect approach are not in competition with each other; rather, they are complementary and should be coordinated.

Spiller et al (2012) have noted that failure to recognise the city shaping effects of strategic transport infrastructure will lead to sub-optimal urban outcomes, which then become 'locked-in' because of long gestation periods and reinforced planning efforts. To avoid this, practitioners should fully integrate transport and land use planning in a way that recognises the city shaping power of some transport investment decisions and take on a systematic approach to harnessing this power.

Figure 2 Emerging concept of transport and land use planning integration



Source: SGS Economics and Planning Pty Ltd

Once it is recognised that major transport decisions can redirect the pattern of urban development, or change its density and use mix, transport planning can become a proactive agent as a city's vision is formed. This goes a step further than the traditional land use planning approach where optional land use futures are tested for transport efficiency, and transport investment largely responds to a cluster and connect framework.

This city shaping power is increasingly evident in a range of recent major initiatives in Australia. However, it is not well understood by practitioners and harnessing this power through integrated planning to achieve optimal urban outcomes is not yet mainstream practice. For example, Infrastructure Australia's Urban Transport Strategy (2013) observes that:

"Large infrastructure projects are not the only issue in urban transport, but can be very influential on system performance and on land use over time." (p8)

…and that…

An urban transport infrastructure strategy should aim for the best use of land and of transport via complementary land use and transport planning. This would include planning that considers the impact on the location of households, employment and industry" (p9).

The criteria adopted by the COAG Reform Council for its assessment of capital city planning systems in 2010 and 2011 allude to the need to better integrate transport and land use planning. Amongst other tests of the efficacy of metropolitan planning arrangements, the COAG Reform Council argued that these systems should:

1. Be integrated:
    - across functions, including land-use and transport planning, economic and infrastructure development, environmental assessment and urban development, and
    - across government agencies; and
1. Provide for a consistent hierarchy of future oriented and publicly available plans, including:
    - long term (for example, 15-30 year) integrated strategic plans,
    - medium term (for example, 5-15 year) prioritised infrastructure and land-use plans, and
    - near term prioritised infrastructure project pipeline backed by appropriately detailed project plans.

In applying these criteria to form ratings of planning systems across the country, it appears that the deliberations were based mainly upon qualitative evidence.

The cluster and connect model is already subject to significant guidance in terms of urban design and structure planning to achieve better integration at the district, corridor, suburb and neighbourhood levels. As a result, these ATAP Guidelines do not provide detailed guidance for applying the cluster and connect model, although a range of references are provided in Section 7.2. Instead, the main focus of these ATAP guidelines is on the emerging aspect of planning for strategic or city shaping transport infrastructure.

These Guidelines will help practitioners to identify the different levels of transport infrastructure investment and, by understanding the impacts on land use, will enable a stronger ability to implement the most effective plans.

4. Types of transport infrastructure investment

Differentiating transport initiatives according to their impacts on household and business location decisions - and therefore on the pattern, structure and density of urban development - underpins the improved approach to planning. These Guidelines adopt the following typology of infrastructure initiatives or assets to achieve this differentiation:

- Strategic (or city shaping) infrastructure
- Structural (or district) infrastructure
- Local (or follower) infrastructure.

4.1 Strategic infrastructure

Strategic or city shaping infrastructure is almost exclusively in the transport domain and has the power to alter relative accessibility across the metropolis. Examples of such infrastructure include the Sydney Harbour Bridge, the Melbourne Underground Rail Loop or the Sydney M7 Motorway. These investments drive where people choose to live and where businesses decide to locate. They create new agglomeration economies, boosting productivity and taxation revenues.

Only a relatively small number of initiatives can be classed as strategic infrastructure, as few have the capacity to significantly shift transport movements across a metropolitan area. Generally, the smaller the city, the more likely a greater range of transport initiatives are considered strategic infrastructure, because existing accessibility contours will be more subject to change (Spiller et al. 2012).

4.2 Structural infrastructure

Structural or district infrastructure represents higher-order or trunk facilities and networks and nodes (excluding strategic infrastructure) that form a region's urban framework. It includes arterial roads and district public transport connections. These items are distinguished by their district level service catchments and their cost.

4.3 Local infrastructure

Local or follower infrastructure includes services and facilities with localised service catchments. While vital to community wellbeing and business efficiency, and for place making, local infrastructure neither shapes development patterns nor provides an overarching structure for settlement and industry development. It provides services into a suburb or neighbourhood once the area has been enabled by investment in higher order infrastructure initiatives.

Neither structural nor local infrastructure has a sufficiently significant impact on relative accessibility to influence the shape of the city.

These three infrastructure categories are summarised in Table 1.

Table 1 Overview of transport infrastructure investment

Strategic or city shaping infrastructure Shifts relative accessibility across a city area, influencing location decisions of households and businesses and shaping settlement patterns. Examples: Sydney Harbour Bridge, Melbourne Underground Rail Loop and the Sydney M7 Motorway.	
Structural or district infrastructure The high level network elements and nodes that form the structure of a subregion or district. Examples: Sydney CBD and South East light rail and Gold Coast light rail.	
Local or follower infrastructure The local services that flesh out a city's urban structure. Examples: suburban and neighbourhood bus routes and cycling infrastructure.	

Source: SGS Economics and Planning Pty Ltd

5. Developing a strategic vision

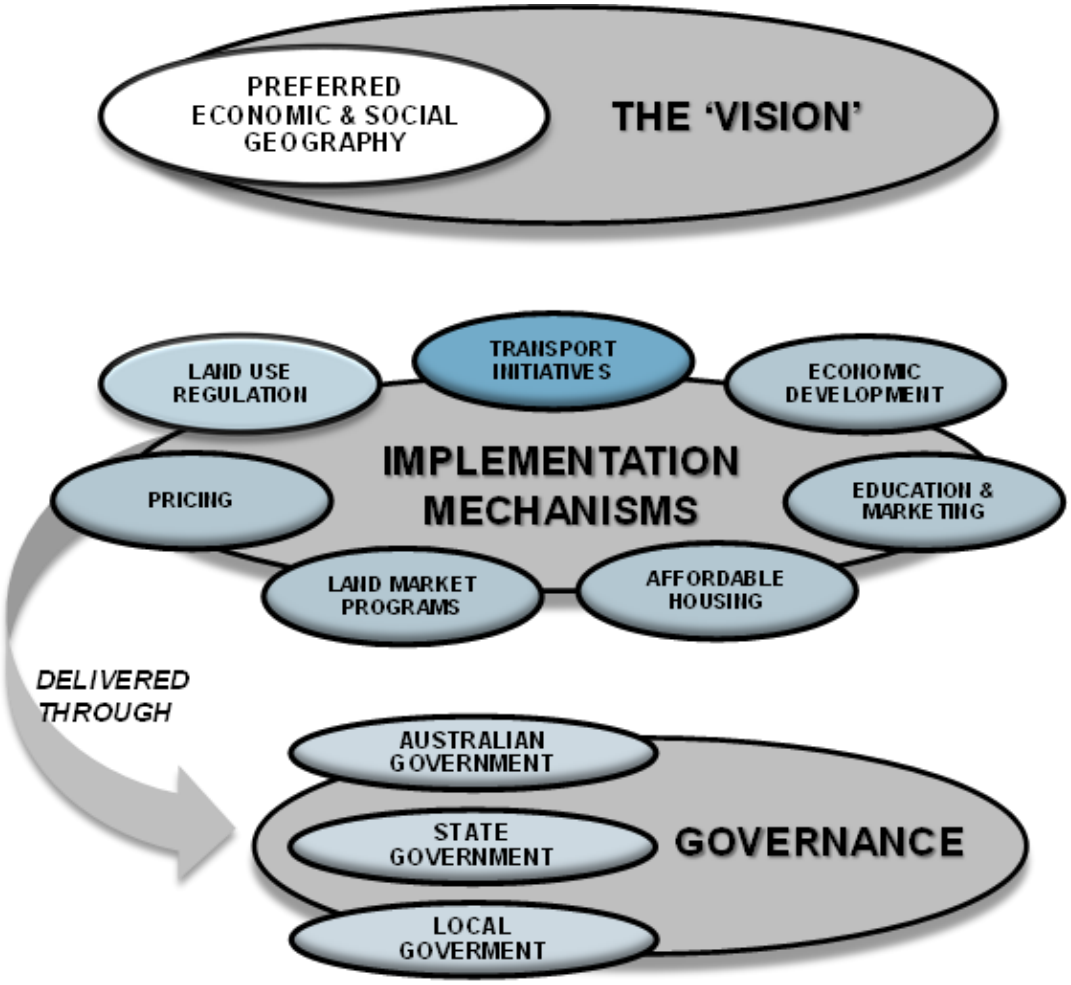
The starting point for best practice ITLUP is stating a clear and compelling vision for the future structure of a city. This can guide land use and transport planning decision making, galvanise private and government investment activity, and provide the wider community with a degree of certainty and purpose as a city evolves. The vision can include traditional metropolitan planning elements – spatial visioning and developing regulations around the location, type and density of development – in line with the vision. Best practice ITLUP goes beyond these elements to also include supporting wider policy levers outside traditional town planning and clear and aligned governance arrangements, including inter-jurisdictional relations.

This best practice approach consists of a trilogy of plan making, implementation elements and governance (see Figure 3) to achieve a strategic vision of metropolitan planning, drawing from the perspective of Australian, state and local governments. Implicit in this model is the essential 'buy in' of the private sector and the general community.

The transport initiatives that form part of the implementation mechanisms illustrated below include the full range of both investment and non-investment options and initiatives (see Part F3 of the Guidelines). Best practice planning involves adopting the optimal mix and balance between:

- Investment and non-investment transport initiatives
- Transport initiatives and other implementation mechanisms.

Figure 3 Essential elements in best practice metropolitan planning



Source: SGS Economics and Planning Pty Ltd

5.1 The vision

The vision should reflect up-to-date planning principles and focus on sustainable development across economic, social and environmental dimensions.

The vision should also be practical, but able to achieve shifts from the trend-based development scenario for a city in terms of housing location and mix, employment distribution and travel efficiency, among other parameters of urban performance.

The scope of metropolitan plans varies but the vision is likely to cover:

- Where and how housing and employment requirements will be accommodated
- No-go areas for urban development
- The hierarchy and distribution of activity centres
- Areas targeted for accelerated regeneration and intensification

- Metropolitan open space corridors and facilities
- Major infrastructure corridors
- The clustering within, and connections between, particular business areas
- Inter-regional connectivity
- The staging or sequencing of development.

The vision must be expressed in a form that enables monitoring and evaluation, allowing third party assessment of whether the plans to deliver the vision are being implemented and whether the anticipated benefits are being achieved.

5.2 Transport initiatives as implementation mechanisms

Figure 3 identifies various implementation mechanisms to support the metropolitan vision, including transport initiatives. Transport initiatives can set a city towards the vision or inadvertently steer it elsewhere. The metropolitan planning process needs a reliable and consistent mechanism for identifying and appraising transport initiatives, including those with city shaping power.

5.3 City structure

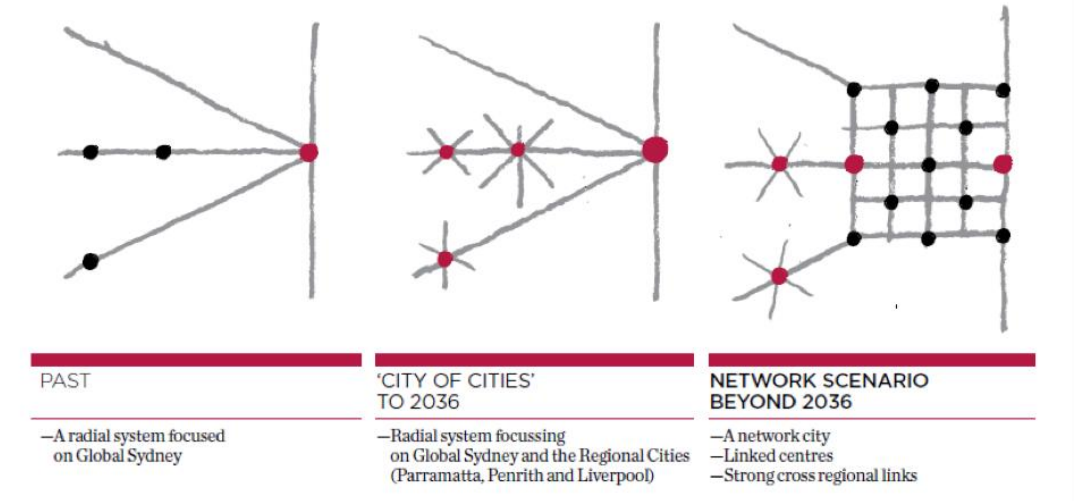
Urban or city structure is defined by the distribution and relationships of the dominant land uses and the networks that serve them (Westerman, 1998). City structure is concerned with how land uses are arranged and all aspects of how a city functions. The structure and economic geography influences the social, economic and environmental characteristics of the city. City structure has a strong influence on the opportunities and constraints shaping future land use and infrastructure investment decisions.

A clear and compelling vision for the future structure of a city is necessary to guide land use planning decision making, guide private investment activity and provide the wider community with a degree of certainty and purpose as a city grows or evolves. Investments in transport can set a city towards the vision or inadvertently steer it elsewhere.

The optimal vision for the future structure of a city will depend upon the city under consideration, its geographical context and scale, and its history and stage of growth and development. Figures 4 and 5 provide some illustrative city structure concepts (drawn from work in 2010 and 2012 in NSW).

Figure Figure 4 shows a possible vision of Sydney developing into “a more compact, connected and increasingly networked city that supports a wider range of prospects for urban renewal and employment growth in areas that have potential for sustainable growth networked city” (NSW Department of Planning, 2010, p. 26).

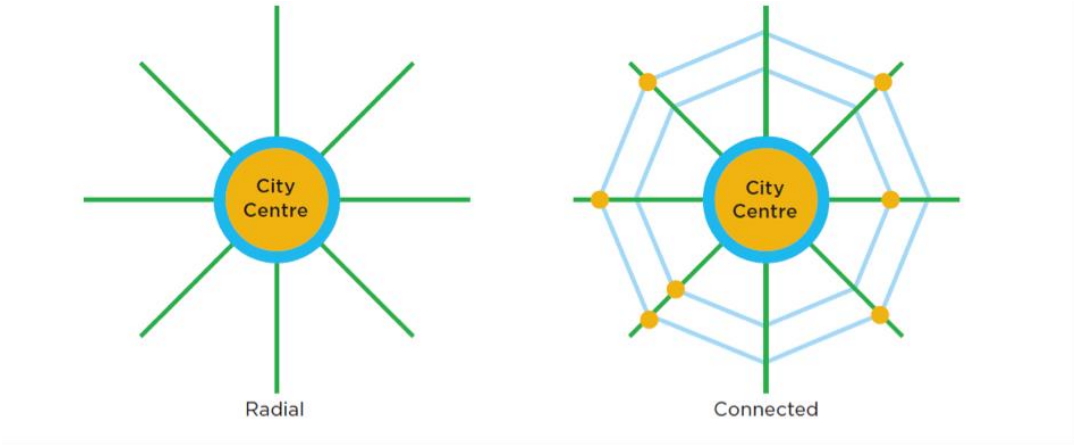
Figure 4 Towards a networked city, vision for the city structure of Sydney



Source: NSW Department of Planning, 2010

Figure 5 (from the 2012 NSW Long Term Transport Master Plan) illustrates connections between regional and strategic centres across a city with two approaches: a radial network and a connected network. This approach is closely aligned with the concept of city shaping infrastructure presented within these guidelines.

Figure 5 Radial versus connected network



Source: Transport for NSW, 2012

Once the optimal vision for city structure has been identified, integrated planning can work towards achieving that vision (to which city shaping transport infrastructure can contribute).

6. Strategic or city-shaping infrastructure

The accessibility effects of strategic transport initiatives can change a city's development patterns and growth trajectory. This can change the decisions people and businesses make about where to locate, setting a new geography of land values. The market then signals where new and/or intensified urban development is warranted, creating a shift in urban form and, sometimes, structure.

A shift in urban form could include higher density residential, mixed use or commercial development around a railway station in response to an increase in accessibility. For example, the density of development in Chatswood (Sydney) has significantly shifted with an increase in density associated with the completion of the Epping to Chatswood rail line and associated redevelopment of the railway station. Precinct planning is generally undertaken to identify where an intensification of urban development is warranted. The Sydenham to Bankstown Urban Renewal Corridor Strategy identifies opportunities where the density of development can be accommodated through rezoning precincts that are expected to experience increased accessibility associated with the Sydney Metro City and South West project. This project is discussed in more detail below.

In terms of a shift in urban structure, this is likely to occur more gradually as travel patterns shift and may result in the identification of new centres for growth or the elevation of the role of existing centres. For example, the proposed second airport at Badgerys Creek in south west Sydney provides an opportunity to reshape the urban structure of Sydney, particularly outer Western Sydney if adequate connections are provided between the airport and major centres such as Parramatta. This will significantly shift travel patterns and increase accessibility to employment for residents in western Sydney and further support the role of Parramatta as Sydney's second CBD. The need for strong coordination to achieve this is discussed in more detail below.

These processes are understood intuitively by people as they see and experience - for example - the nexus between highway development and increasing land values and housing development in peri-urban regions.

Clearly, strategic transport investments can be a powerful policy lever for determining a city's structure, with land use regulation playing a supplementary role in managing urban development. This means that strategic transport initiatives need to be conceptualised within the context of a preferred urban structure rather than a traditional approach where transport investment simply responds to demonstrated demand.

In some instances, it may make more economic sense to prioritise strategic transport infrastructure that will reshape the city in permanently advantageous ways over initiatives that solve evident congestion problems.

This section outlines the principles for identifying, appraising and optimising city shaping infrastructure to maximise land use and transport benefits.

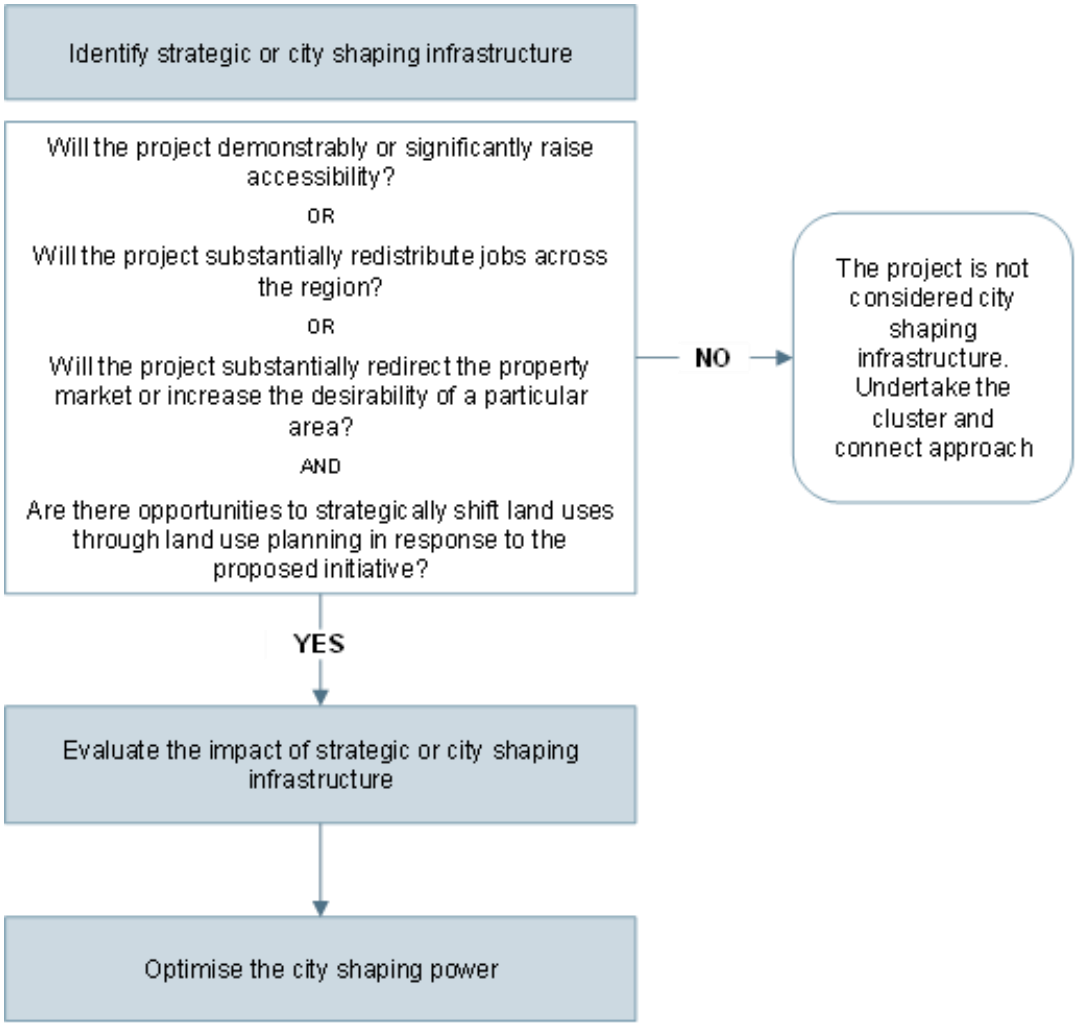
6.1 Principles

- Respond to the strategic vision by identifying strategic or city shaping infrastructure.
- Understand, and then take advantage of, the impacts that strategic or city shaping infrastructure have on the city's structure.

6.2 Process

The ITLUP process in relation to strategic or city shaping infrastructure is summarised in Figure 6 and further detailed below.

Figure 6 ITLUP process for strategic or city shaping infrastructure



Source: SGS Economics and Planning Pty Ltd

6.3 Identifying strategic transport infrastructure

Identifying strategic initiatives requires a suitable land use and transportation simulation model that measures shifts in relative accessibility across a city, given the addition or withdrawal of strategic links and/or the spatial reallocation of substantial numbers of jobs through other policy interventions. Only initiatives that can demonstrably and significantly raise or lower the relative accessibility of a particular area of the city would merit strategic designation (Spiller et al., 2012).

Questions to consider when identifying whether infrastructure is strategic include:

- Will the initiative demonstrably and significantly raise accessibility?
- Will the initiative substantially redistribute jobs across the region?
- Will the initiative substantially redirect the property market or increase desirability of a particular area?
- Are there opportunities to strategically shift land uses through land use planning in response to the proposed initiative?

To properly assess if there are realistic (rather than theoretical) opportunities for land use change following an increase in accessibility, the land use context must be closely considered. For example, the Sydney Metro City and South West initiative (see below) is expected to substantially increase accessibility to jobs within the Sydenham to Bankstown corridor. But, hypothetically, if there are too many constraints within the corridor - such as fragmented land ownership or substantial redevelopment having already taken place - then the opportunities for significant change and therefore city shaping may be limited.

The task of answering the above questions is assisted by using quantitative measures such as effective job density[2] and the simpler measure of jobs accessible within 30 minutes. The change in these measures produced by the transport initiative indicates the scale of their impact.

Note that projects that result in a significant shift in mode share rather than land use are not considered strategic. For example, while the Gold Coast light rail is an important transport project for the city and has resulted in an increase in public transport use, it is considered to be structural infrastructure rather than strategic infrastructure because it has not significantly shifted the way land is used.

As there is no precise benchmark or threshold to identify strategic or city shaping infrastructure, the discussion below highlights examples showing the variation in levels of impact, as well as the process involved in measuring the impact.

[2] Effective Job Density is a statistical index of agglomeration in economic activity; it comprises the number of jobs in a locality plus all the jobs situated elsewhere that can be reached from that locality, divided by the travel time involved in reaching them

Box 1: Measuring the impact of strategic infrastructure using effective job density

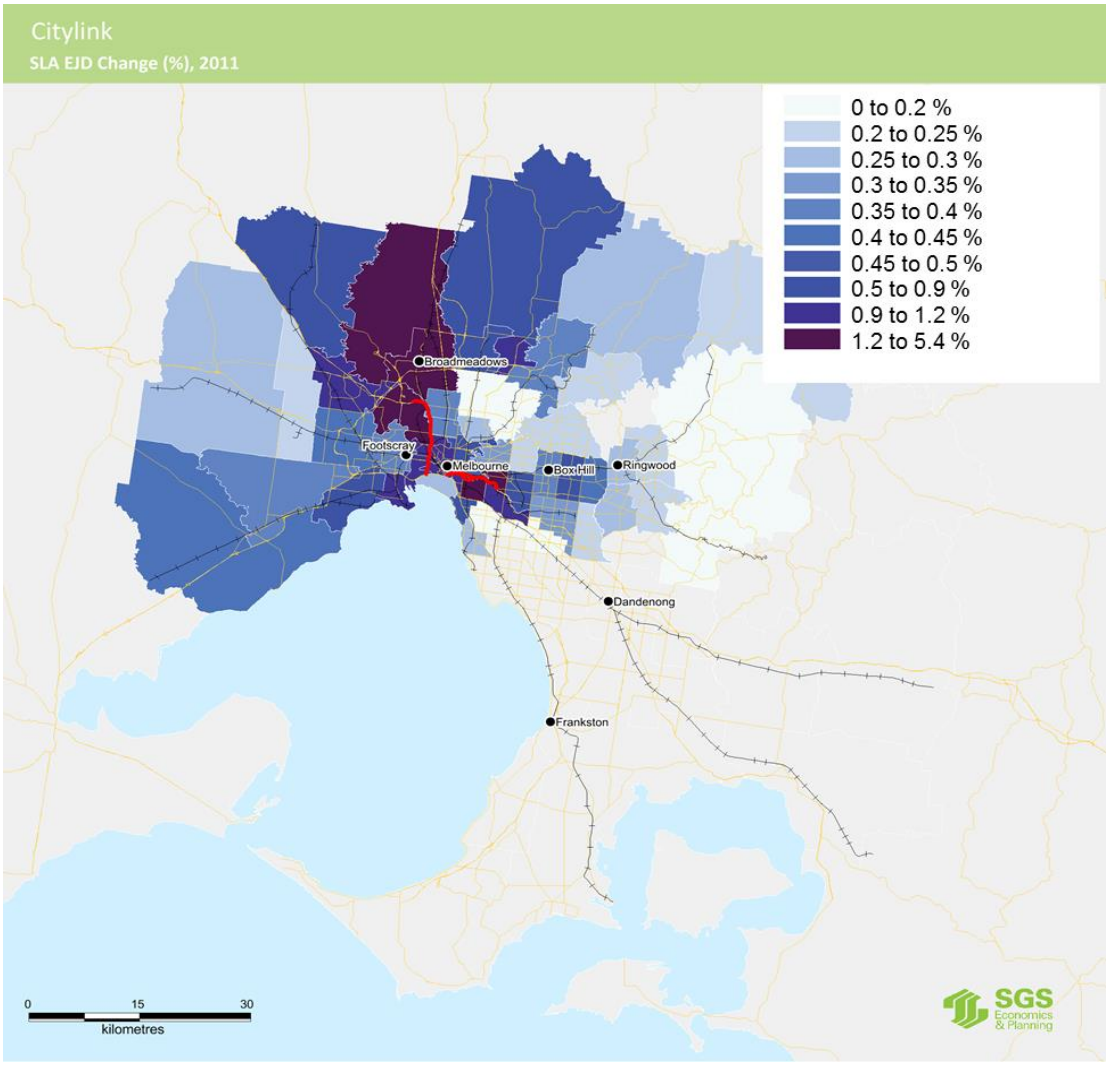
Measuring the impact of strategic infrastructure requires a calculation of EJD within a small area under a base case scenario. By inputting a travel time matrix and employment at a small area level, the change in EJD brought about by a specific infrastructure and/or land use initiative can be established in the same way the base case EJD is estimated.

Inputs will differ in terms of a changed travel time matrix or employment numbers in response to projected changes or uplifts in employment in different locations across the region and changes in travel times associated with the infrastructure initiative.

6.3.1 Effective job density - CityLink and Western Ring Road in Melbourne

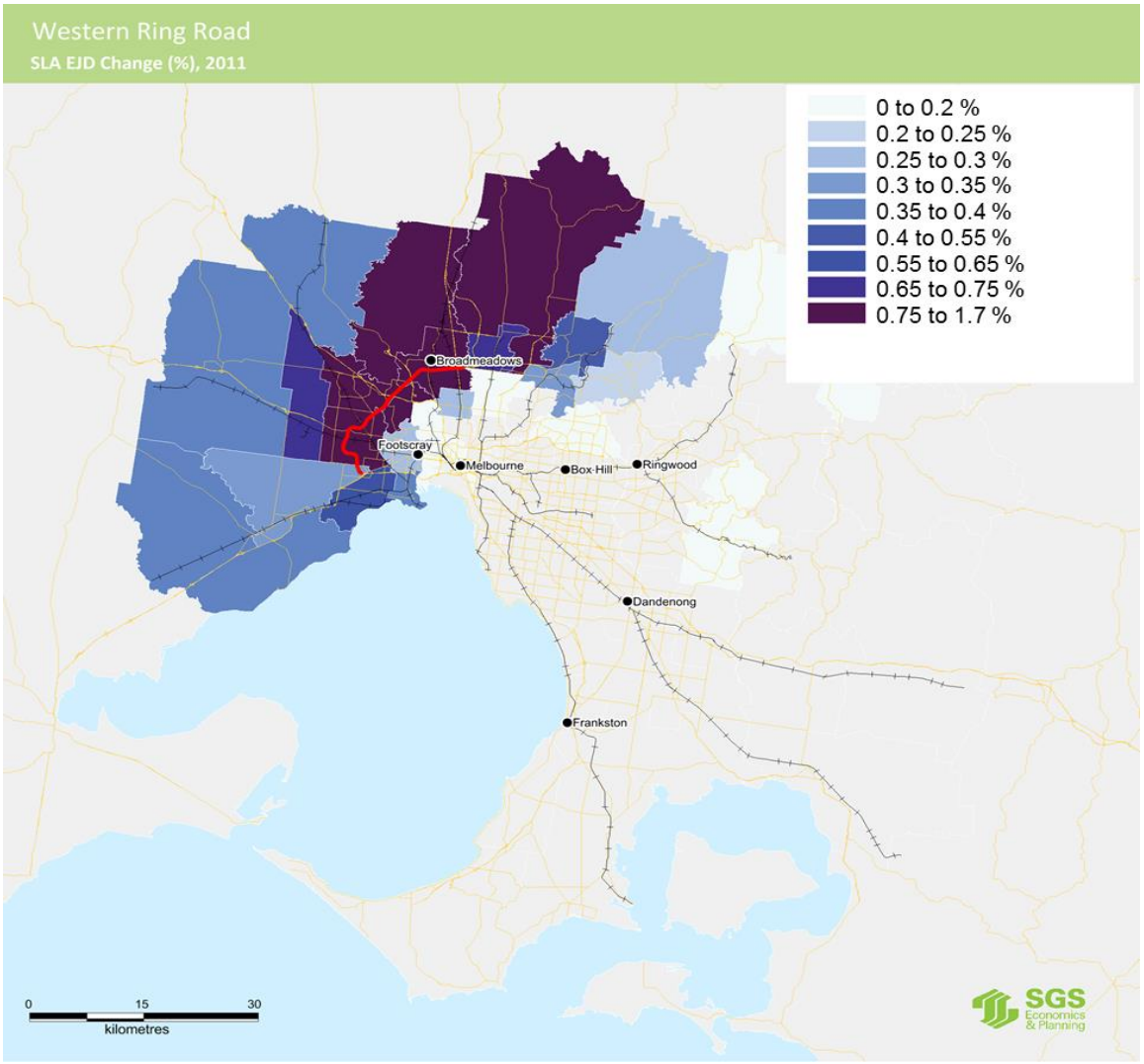
Melbourne's CityLink had a maximum EJD increase of 5.4% (Figure 7), while the Western Ring Road initiative had an EJD change of 1.7% (Figure 8) - suggesting the CityLink initiative has a more significant impact on Melbourne's structure.

Figure 7 EJD change for CityLink



Source: SGS Economics and Planning Pty Ltd

Figure 8 EJD change for Western Ring Road



Source: SGS Economics and Planning Pty Ltd

6.4 Examples of strategic or city shaping infrastructure

6.4.1 Sydney Metro City and South West (NSW)

The proposed Sydney Metro City and South West infrastructure initiative will extend the Sydney Metro North West from Chatswood to Bankstown with a new metro line between Chatswood and Sydenham and conversion of the existing railway line between Sydenham and Bankstown to metro operations. It is intended to increase the number of trains travelling through the CBD during peak hour. A number of new stations are proposed along the new rail line between Chatswood and Sydenham including a station at Barangaroo and Waterloo (refer to Figure 9).

Figure 9 Sydney Metro City and South West alignment

Source: Transport for NSW, 2015

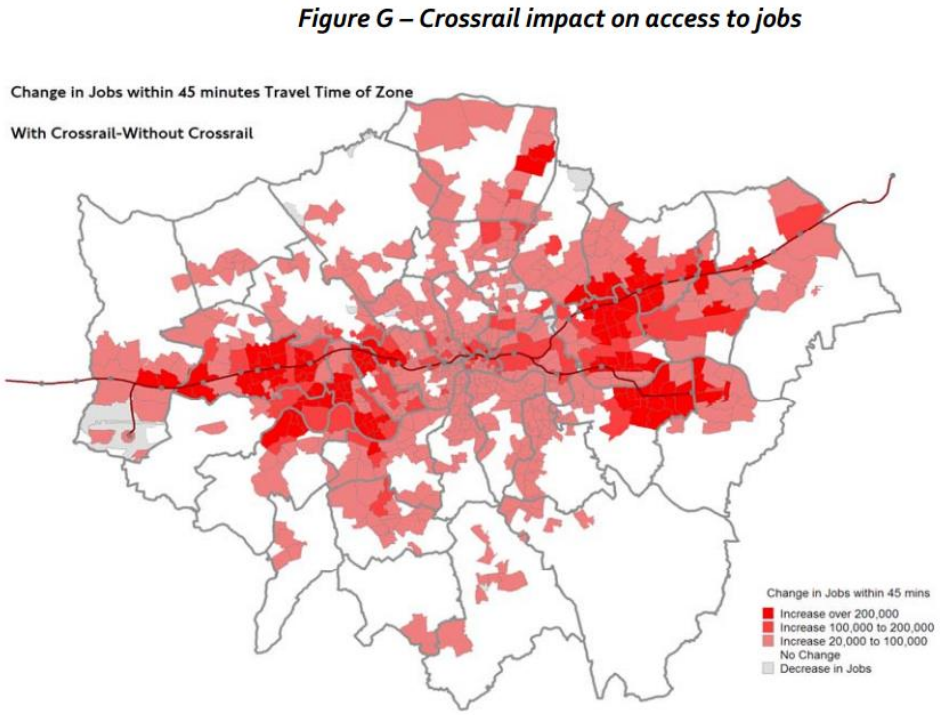
The Sydney Metro City and South West is expected to substantially increase accessibility from the corridor to employment opportunities concentrated across Sydney CBD. The initiative is considered to be city shaping because of this substantial shift in accessibility for residents within the Sydenham to Bankstown corridor, as well as its impact on the property market and opportunities to strategically shift land uses.

The station at Waterloo is expected not only to increase the proportion of jobs accessible within 30 minutes for existing residents, but also to shape land use near the railway station The NSW Government-owned land (social housing) was marked for redevelopment as a mixed housing estate with the station at Waterloo driving the future redevelopment. This highlights that land use considerations, such as redevelopment opportunities, should be incorporated into the detailed alignment of a transport infrastructure initiative. Similarly, structure planning along the Sydenham to Bankstown section of the corridor has identified opportunities for increasing housing supply and improving amenity.

6.4.2Crossrail (London, United Kingdom)

Crossrail is currently under construction in London and will link Heathrow Airport, the West End, the City of London and Canary Wharf through an underground tunnel under central and south east London. The initiative is expected to improve access for 750,000 workers who currently commute into London (Crossrail 2015). Figure 10 highlights the projected impact on accessibility to jobs.

Figure 10 Crossrail impact on access to jobs



Source: Crossrail 2011

Crossrail is also expected to impact London's economic structure, particularly the finance and business services market. Potential new jobs expected as a result of Crossrail are likely to be internationally mobile jobs; that is, if they were to locate elsewhere, they would likely locate in other major global cities such as Paris or Frankfurt rather than other areas of the UK (Meeks et al., 2002). This demonstrates the significant structural shift and city shaping potential of Crossrail.

6.4.3Mandurah railway line (Western Australia)

Investment in modern heavy rail commuter infrastructure is transforming Perth's urban structure. The Mandurah railway line opened in 2007. It is a suburban railway line that runs through the south western suburbs of Perth, connecting Perth with Mandurah via Rockingham. While operating conditions in the new suburban rail system are not always ideal - for example, some train services run down the centre of freeways (see Figure 11) - the community has flocked to the network. It has influenced more compact forms of satellite development in the northern growth areas of Perth while improving accessibility to the Perth CBD.

More recently, investment in a new southern line linking to Mandurah has established the potential for a string of transit oriented developments that are actively being pursued by the WA Government in line with the vision set out in successive metropolitan strategies.

Figure 11 Mandurah Line - clockwise from left: stops and feeder bus routes; park and ride facilities and new hospital; Murdoch station

Source: McIntosh et al, 2015

6.5 Assessing the impact of strategic transport infrastructure on urban structure

Rigorous assessment is particularly important for strategic/city shaping initiatives. Having demonstrated the city shaping impact of a transport initiative (influencing location decisions of households and firms), practitioners need to measure whether this impact will help or hinder achievement of metropolitan settlement pattern objectives, as set out in spatial vision and/or strategic plan for the city.

One approach is to apply historically observed locational elasticities (the measured sensitivity of employment or population growth at the travel zone[3] level to changes in past levels of relative accessibility). Locational elasticity will be sector-specific. Some industries, particularly high value added sectors like financial and professional services, require and are prepared to pay for, premium accessibility.

6.5.1 Rationale behind the location of different land use activities

Businesses

Well established economic theory[4] indicates that over time, firms will tend to locate closer to areas that deliver the greatest economic benefits to them. These benefits can be in the form of the most efficient land use for the firm. In addition, locating in areas with superior accessibility reduces transaction costs through ease of contact with suppliers and customers, while increasing access to a skilled labour force.

While all firms prefer locations with high levels of accessibility their ability and willingness to pay for locational advantages will differ, as will their aggregate land use demands. Land use demands between industries and the type of workers generally differ based on the functioning of their industries.

Land use demands from service industries are small relative to industries such as manufacturing and wholesale trade, which require large amounts of land. Land rents for service industries can be shared across multiple firms as office towers adopt the relatively cheaper option of expanding vertically rather than requiring large parcels of land. This contributes to the ability of service firms to locate within the confines of a dense area of employment and population such as a CBD, whereas manufacturing and wholesale trade tend to locate further away from dense areas.

[3] A travel zone (TZ) is a geographic unit of data collection, transport modelling and analysis. TZs allow for detailed spatial analysis as they are smaller than Statistical Local Areas (SLA), but generally larger than an Australian Bureau of Statistics Collection District (CD) or Mesh Block (MB).

[4] Location theory has developed from ideas introduced by Johann Heinrich von Thünen in 1826.

Ways to improve business accessibility differ across industries based on their customer and supplier base. Generally, manufacturing firms require quality road infrastructure and tend to locate closer to areas with access to major road networks. Both their suppliers and customers also tend to have similar accessibility requirements. Efficiencies can be gained for these industries when they locate closer to points of road infrastructure.

In contrast, while service industries require timely access to their suppliers, employees and customers, their ability to access those people differs based on the function of their business models.

Households

Opportunities for access to employment apply in a similar way to households as they do for industries. People, over time, will adjust where they live due to many factors, including access to employment, education, essential services and recreation. However, the literature indicates these choices tend to be constrained due to factors such as family and historical ties to a region or corridor.

For these reasons, many people and families that do relocate tend to move within corridors (or within housing submarkets) rather than across town. When cross-town moves are made, the relative accessibility of the two areas is a key consideration.

6.5.2Assessment process and techniques

Conventional practice often assumes no change in demographics or industry types between the Base Case and Project Case (without and with the strategic transport investment). However, it is possible to quantify the impacts of such initiatives in relation to specific metropolitan objectives, when households and businesses adjust their location in response to a change in an area's accessibility. This may include assessing trends such as land consolidation versus urban sprawl, or the level of assistance offered by the government to key metropolitan industry clusters and economic nodes to reinforce agglomeration economies (Spiller et al., 2012).

Modelling impact on housing densities

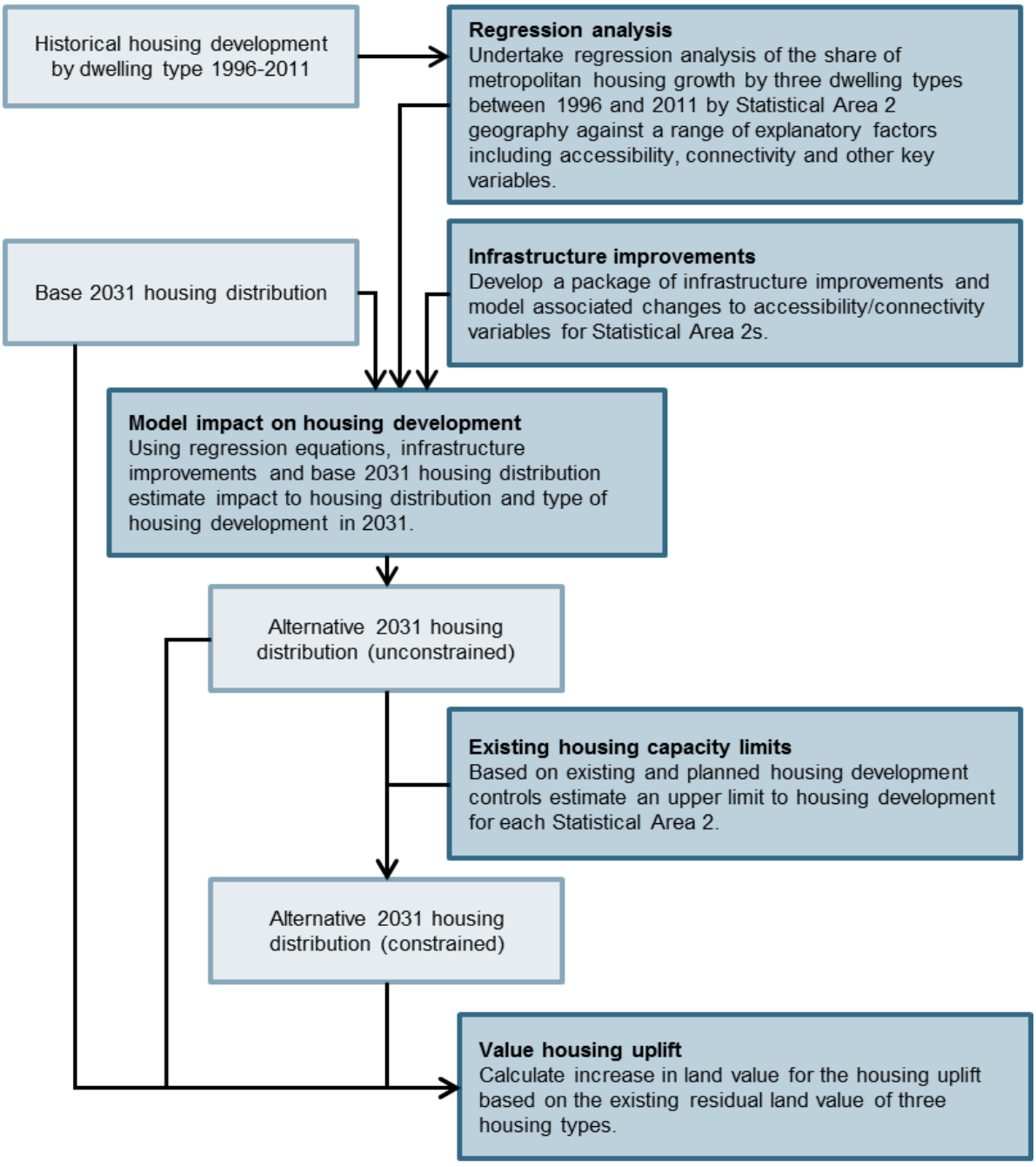
The Commonwealth Treasury published a report by SGS Economics and Planning (2013) prepared for the former National Housing Supply Council that demonstrated methods to model the impact of strategic initiatives on housing densities across metropolitan areas, using Sydney and Melbourne as case studies.

The analysis sought to estimate the extent to which infrastructure investment improves connectivity, as well as the extent to which accessibility influences housing development. The model operated at a metropolitan level given that an increase in supply in one location is likely to impact supply in another.

Figure 12 provides an overview of the approach adopted within the study, the key inputs/outputs and analytical tasks competed as part of the analysis.

First, statistical relationships between housing development and accessibility were developed based on historical data. These outputs were fed into a model that redistributes housing development across the metropolitan area from one area to another and between housing types based on accessibility profiles of locations. This compared the level of EJD under the Base Case with that expected under the Project Case. All other variables were assumed to be constant across both the Base Case and Project Case. If there was no impact to EJD, then the location's housing development remained as per the Base Case. If EJD increased/decreased, then the amount and mix of housing was adjusted in line with the regression coefficients.

Figure 12 Example of housing analysis process



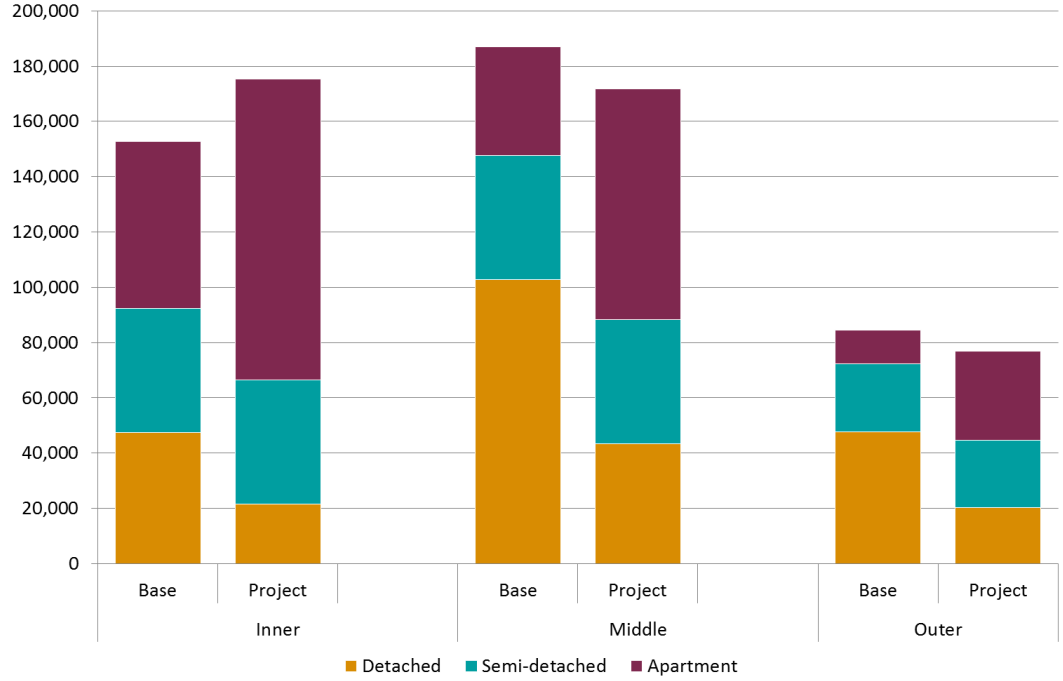
SGS Economics and Planning Pty Ltd

Impact of infrastructure on housing types in Melbourne

An assumed percentage uplift in relative EJD was applied to the inner, middle and outer rings of Melbourne, based on previous work completed by SGS on major transport infrastructure projects (14% for inner, 7% for middle and 2% for outer rings). These are hypothetical scenarios, devised for analytical purposes only.

Figure 13 shows the Base Case and Project Case growth in the number of dwellings (by detached, semi-detached and apartments) in 2031 for the inner, middle and outer rings of Melbourne using a Melbourne EJD coefficient. Under these scenarios, the number of apartments across Melbourne would increase, especially in the inner and middle rings. The number of semi-detached houses was not expected to change between the Base and Project Cases, and the number of detached houses fell between the Base and Project Cases, especially in the middle ring, which was projected to contain the greatest proportion of dwellings in 2031.

Figure 13 Summary results by ring and dwelling type for Melbourne



Source: SGS Economics and Planning Pty Ltd

These results reflect the strong statistical relationship between accessibility (EJD) and higher density housing development in Melbourne. With an increase in accessibility, there is a strong increase in the number of apartments in a location. This has the impact of reducing the amount of land required on the urban fringe for detached housing.

While major transport investment may generate the potential for housing intensification, the extent of this potential will depend on a range of factors. including the appropriateness of the planning controls affecting the areas in question. It should also be noted that underlying housing development potential may not find expression because of market failures such as fragmented land holdings. Similarly, key brownfield sites for housing construction may be constrained by unknown contamination risk or lack of coordinated asset management among institutional owners.

Land use transport interaction model

A key input to strategic transport models is land use information, with the interaction between transport and land use within those models being increasingly seen as highly important in integrated planning. There is still some uncertainty, however, as to the most appropriate method of implementing land use transport interaction (LUTI) models with reoccurring tension between theoretical preferred options and practical implementation including issues associated with induced demand. Further discussion relating to LUTI modelling and induced demand is contained in ATAP Guidelines Part T1 Travel Demand Modelling.

Investment appraisal tools

Another important aspect of the assessment process is the appraisal of transport initiatives, particularly strategic initiatives.

As highlighted elsewhere in the ATAP Guidelines (see Parts F3 and T2), the key investment appraisal tool is a cost benefit analysis (CBA), which determines whether an initiative's economic benefits (including reductions in maintenance, operating and external costs) justify the capital costs, especially when the same resources could be deployed to other socially productive uses. In the ATAP Guidelines (see Part F4), the CBA is a key requirement of the comprehensive business case.

CBAs, as applied to major transport investments, cover a range of impacts, primarily user benefits, but also non-user benefits such as emissions, safety and externalities. CBAs are evolving to include less tangible impacts such as neighbourhood disruption and amenity. Important equity issues are not included in CBAs, but are considered separately alongside them.

In addition, agglomeration economies are increasingly being considered in CBAs as a 'wider economic benefit' (or WEB). These agglomeration WEBs are productivity gains resulting from economic agents (businesses and households) having better connections to each other so they can better meet one another's needs and share information (see Part T3 of the ATAP Guidelines for a discussion on WEBs). CBAs are increasingly being applied to active travel, recognising the health and decongestion benefits from increased cycling and walking. (see Table 2).

Table 2 Scope of benefits in (transport) infrastructure Cost Benefit Analyses (CBAs)

Potential benefits generated by a new transport link	Traditional CBA	Traditional CBA + WEBs	Traditional CBA + WEBs + Human Capital Effects
Reduced business transport costs, enabling expanded production	✓	✓	✓
Reduced household travel costs	✓	✓	✓
Agglomeration economies improve business to business synergies	✗	✓	✓
Less transport constraints expand high value added industries in propitious locations, allowing a shift to more productive jobs	✓✗	✓	✓
Better labour matching improve labour participation and productivity	✗	✓	✓
Enriched human capital thanks to expanded formal and tacit learning opportunities	✓✗	✓✗	✓
Expanded households choice (consumption, learning, employment)	✓✗	✓	✓

Source: SGS Economics and Planning

Ideally, CBAs will cover these broad benefits. However, even if analyses identify a broader range of impacts, they still face analytical restrictions that limit their efficacy in the context of strategic initiatives.

For example, CBAs conventionally restrict measured impacts to the first round effects of initiatives. These may be subject to lags, but have a direct cause and effect link with the initiative under appraisal. Indirect and feedback effects are usually excluded from CBAs for two reasons:

- First, if the indirect effects merely reflect passing on of direct impacts throughout the urban economy, then it is correct to exclude them. To do otherwise would lead to double counting of benefits. CBA avoids potential double counting by measuring benefits directly at their sources (as time and cost savings to transport users).
- Secondly, for practical reasons, considering second and subsequent round effects requires complex assessment of the urban economy as many linked decisions and feedback loops come into play with strategic transport infrastructure. This assessment would require the application of dynamic general equilibrium modelling to an urban context, tracking feedback effects and linking them to land use outcomes. While such modelling may enhance understanding of the full impacts of strategic initiatives, the associated modelling costs need to be considered. Extensive data gathering is required and the process is open to challenge as multiple judgements are required throughout the process. Nevertheless, use of such models would allow fully evolved CBAs to be undertaken.

Given the dynamic nature of transport and land use interactions, defining the Base Case land use for CBAs can also be challenging.

An alternative to this fully evolved CBA approach is the iterative application of rapid and detailed CBAs using land use impact scenario analysis. In this approach, scenario analysis is used to investigate the potential major land use impacts of strategic transport initiatives. Testing the effect of different land use impact outcomes on a CBA determines the sensitivity of the CBA results.

Another alternative is to use multi-criteria analysis (MCA) — a more qualitative assessment option. An MCA can be used prior to a CBA, at early stages of options assessment when limited quantitative data is available for even a rapid CBA. An MCA requires specification of criteria on which to rate options and consideration of how each option measures up against each criterion. The criteria can also be weighted to account for their relative importance. Each option's rating can be compared to other options based on the sum of its performance against the weighted criteria (Prosser et al., 2015). However, an MCA can involve risks of bias, lack of transparency and ease of manipulation to obtain a predetermined result (see discussion in Part F3, Sections 3.2 and 3.3, especially Box 1 of the ATAP Guidelines). Transparent use of MCA, and limiting its use to early comparison of options prior to a CBA, will help mitigate those risks.

Jurisdictional goals, transport system objectives and government policies can be used to formulate the criteria for an MCA. This allows for initiatives or transport corridors to be assessed against the achievement of government policies. Upfront identification of objectives helps avoid bias during the assessment process. This is similar to the Strategic Merit Test, or Objectives Impact Table tools discussed in Part F3 of the ATAP Guidelines.

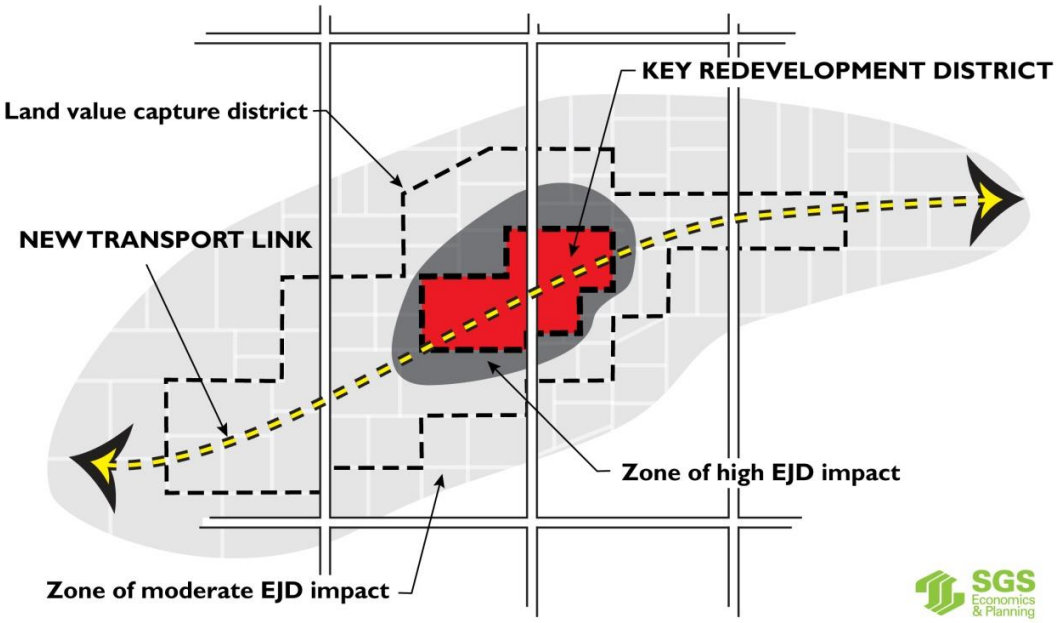
An MCA is flexible — it can be applied to the identification of high-level strategic transport corridors across a city as well as the comparison of specific routes for a transport initiative. An MCA's objectives and criteria can be altered and amended during the process if they are considered to be inappropriate or irrelevant (Prosser et al., 2015). Again, this must be done with rigour, scrutiny and transparency to ensure an unbiased assessment.

6.6 Optimising city shaping power

Strong coordination of actions is required to optimise the city shaping power of transport infrastructure. Those actions will differ between brownfield and greenfield areas.

In brownfield areas, the focus will generally need to be on consolidating land uses to unlock potential. SGS Economics and Planning (2013) suggests that the area of influence of key transport investments can be broken down into a number of components (refer to Figure 14) including key redevelopment districts, high and moderate impact areas and a value capture district. An explanation of principles to optimise land use opportunities within these areas is detailed below. This approach may vary for road infrastructure initiatives.

Figure 14 Schematic of impact areas within a transport corridor



Source: SGS Economics and Planning Pty Ltd

In greenfield areas, the focus will likely be on coordinating complementary investments to support the growing population including local infrastructure such as water and sewage and social infrastructure such as hospitals and education facilities. Strong coordination between government and the private sector will optimise city shaping power, particularly the sequencing and staging of infrastructure in relation to land use development. See Section 8 for more details.

6.6.1Unlocking land use potential

Key redevelopment districts demonstrate greater potential for transport-induced housing intensification. Their potential can be unlocked by commissioning state development corporations[5] to overcome barriers to private sector investment in housing and related regeneration initiatives. These barriers or market failures include land fragmentation, land contamination, local infrastructure gaps and poor coordination between government land holders.

In the wider area of impact, unlocking land use potential may require a stronger, de-politicised planning system that applies subsidiarity to the allocation of plan-making roles across the different levels of governance, and that ensures greater transparency and conceptual clarity in the application of upfront infrastructure development contributions.

[5] Acknowledging that the involvement of state development corporations are not the only model for redevelopment.

The land use potential will vary by type of transport infrastructure. Aviation infrastructure can have a significant impact on existing and proposed land uses due to aircraft noise. The National Airports Safeguarding Framework provides guidance relating to land use planning around airports to maximise aviation and community safety and minimise aircraft noise impacts on communities.

Potential for land value capture

Land value capture districts are the areas that benefit from the transport initiative and could be a candidate for strategies to raise funds for reinvestment in infrastructure by linking to the uplift in land value enjoyed by constituent properties. A range of mechanisms can be used to capture a portion of this land value uplift, including area-wide infrastructure contributions.

6.6.2Affordable housing

Investment in strategic transport initiatives can effectively expand the supply of land available for housing development, which may place downward pressure on housing prices. Spatially, this affordability benefit is likely to be felt most in outer urban and in less well connected parts of a city, which will have to compete more strenuously on price to attract buyers and tenants.

However, areas enjoying a boost in connectivity and therefore higher housing activity can be expected to maintain a price premium. Community sustainability and local economic functionality such as access to key workers warrant the reservation of some housing for lower and middle income groups in areas of high uplift. This can occur by either or both of:

- Dedicating a proportion of the proceeds from any tax on broad area value uplift to the provision of social housing
- Applying area-wide inclusionary zoning so that all development in the advantaged areas must incorporate a proportion of affordable housing or make cash in lieu contributions so that this obligation might be met elsewhere within the same broad district.

6.6.3Social impacts

Transport infrastructure can improve access to employment for low socio-economic areas within a city, particularly by increasing the proportion of jobs accessible within 30 minutes. This can occur if the transport initiative specifically improves direct access to an existing employment area or if new employment opportunities are created near lower socioeconomic areas. This occurred in Melbourne when Tullamarine Airport created significant employment opportunities in the north west growth corridor. The impact of a transport infrastructure initiative on lower socio-economic areas can be measured by calculating the uplift in the number of jobs accessible within 30 minutes for particular target regions of the metropolitan area.

Transport infrastructure, through an uplift in the value of land impacted by the increase in accessibility, may price low income earners out of the market. This impact can be considered and addressed by incorporating affordable housing into redevelopment areas.

6.6.4 Indirect effects

Infrastructure initiatives can also have indirect impacts on land use where land is made available for alternate and often higher value uses where an infrastructure initiative shifts land uses. This often includes the shifting of industrial land out of the inner city waterfront to free up land for residential or other higher value uses.

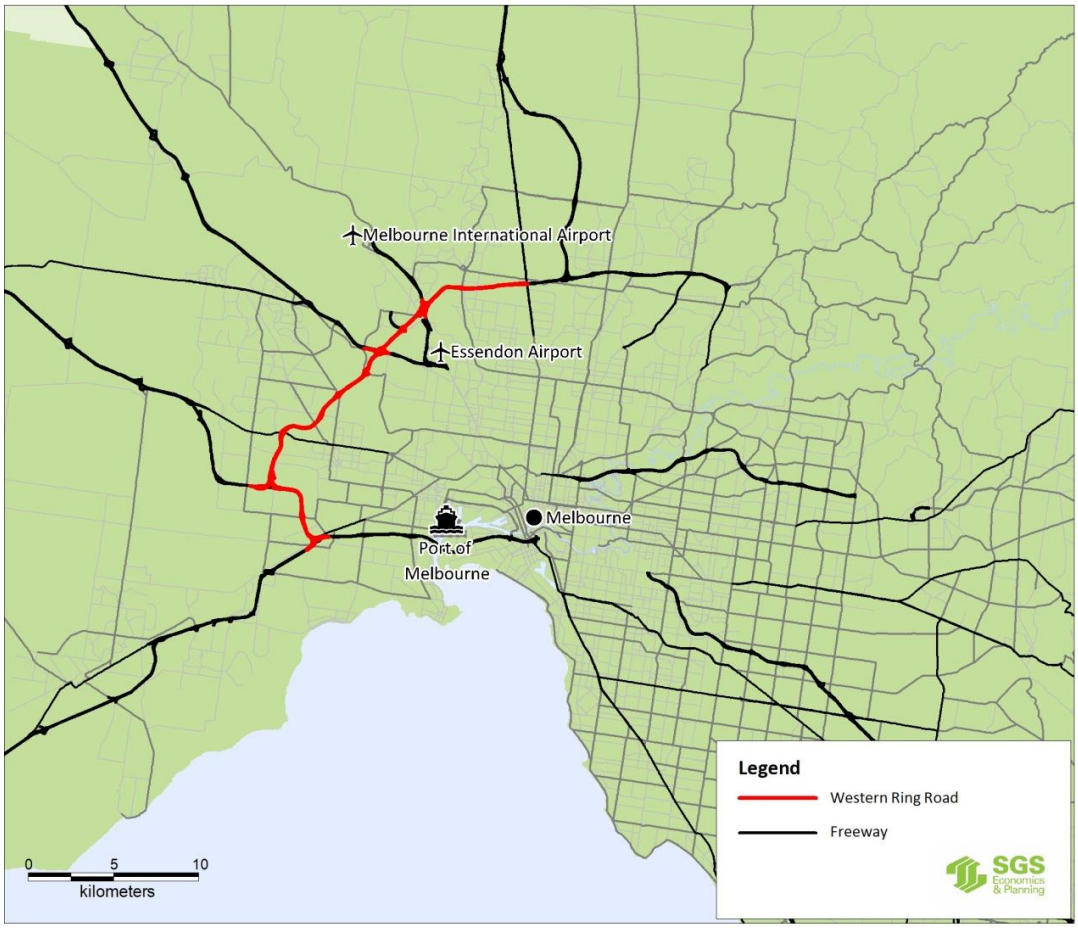
An example of this includes the Western Ring Road in Melbourne (see case study below). Other examples include:

- The Brighton transport hub in Hobart, an inland intermodal hub that allowed for the redevelopment of The Hobart Railyards, a former inner city intermodal terminal
- Barangaroo in Sydney, made possible when port facilities relocated to Port Botany
- The Bowden Clipsal factory redevelopment in Adelaide, made possible when the factory relocated to Gepps Cross.

Case study: The Western Ring Road

The Western Ring Road extends 28 kilometres from the junction of the Princes and West Gate Freeways in Laverton to Sydney Road/Hume Highway in Fawkner. Through this section the Ring Road connects to all of Melbourne's western and northern highways: the West Gate, Princes, Western, Calder, Tullamarine and Hume freeways (see Figure 15).

Figure 15 Western Ring Road Connectivity



Source: SGS Economics & Planning Pty Ltd

The Western Ring Road was anticipated to deliver major economic benefits to Victoria by linking up the national freight corridors with the Port of Melbourne and Melbourne Airport (VicRoads, 1994). As it connects the individual freeways that service Melbourne's sea and airports, the movement of freight is one of the road's primary functions. It also relieves freight traffic from Sydney Road, Pascoe Vale Road and Geelong Road.

The heavy freight use has spurred industrial growth along the Ring Road, resulting in a redistribution of Melbourne's industry. In the late 1980s, a decision was made not to rebuild the wharves that now house the Docklands development, which subsequently allowed for the area's regeneration.

The road's construction in the 1990s allowed the existing industries in the Docklands to relocate to cheap industrial land with good access to the port. This freed up suburbs like the Docklands, Richmond and Brunswick for residential and commercial redevelopment.

7. Structural and local infrastructure

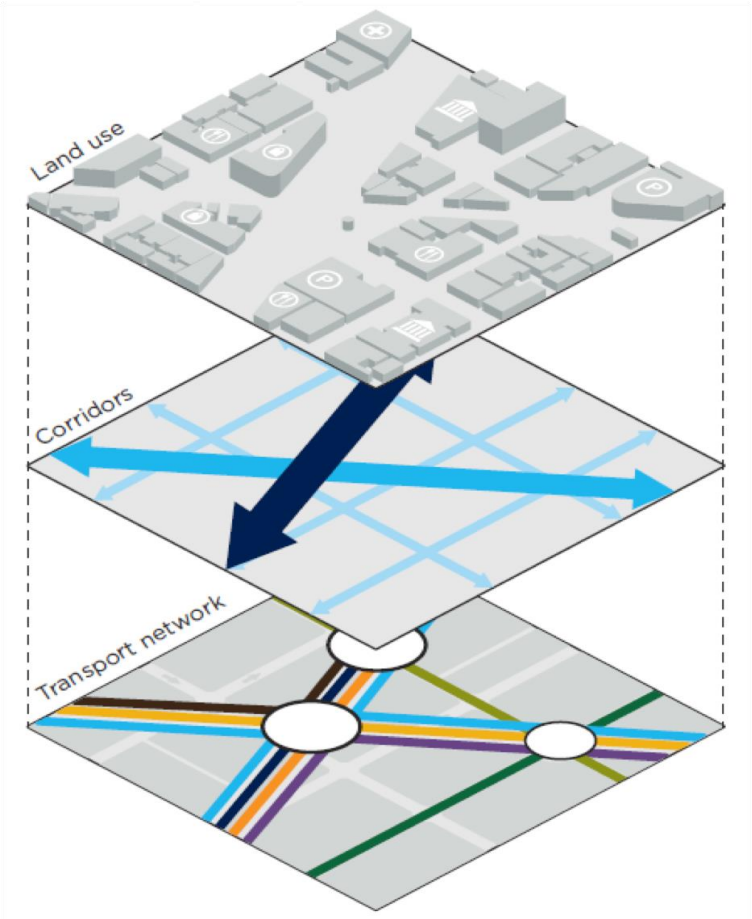
Structural and local infrastructure sits at the district, corridor, suburb and neighbourhood level to support and respond to strategic or city shaping infrastructure. Structural and local infrastructure is generally planned using the cluster and connect model.

As discussed in Chapter 1, the cluster and connect model reflects the more traditional approach to ITLUP. There is significant published guidance on the cluster and connect aspects of transport and land use planning integration, including the comprehensive, and still largely relevant, Austroads publication *Cities for Tomorrow* (Westerman, 1998).

Many jurisdictions have issued guidelines that address various aspects of this approach, such as the *NSW Long Term Transport Master Plan* (Transport for NSW 2012) which describes a four step process of ITLUP (illustrated in **Error! Reference source not found.**):

- Step 1 - integrating transport with land use planning
- Step 2 - identifying corridors of demand
- Step 3 - defining the performance required from the transport network
- Step 4 - moving towards a connected and integrated system.

Figure 16 Cluster and connect model: relationship between land use, corridors and network planning



Source: Transport for NSW

As noted in Chapter 1, the cluster and connect approach generally has a strong place-making focus at the neighbourhood level. This is achieved by:

- Consolidating community facilities around public transport or introducing public transport such as light rail[6] to improve local connectivity, calm traffic and promote local development
- Introducing complementary road network policies to keep longer distance traffic on the state and national road network.

This section provides a best-practice approach to the cluster and connect model for application at the corridor, district and local levels. The specific chosen approach will vary within the context of each state or territory, local area and initiative.

7.1 Principles

Cities for Tomorrow (Westerman, 1998) provides an extensive guidance regarding the cluster and connect process and despite having a focus on road infrastructure, the principles and process can be applied to the ITLUP for structural and local transport infrastructure.

State and local governments generally produce guidance in the form of key principles, objectives and frameworks. For example, *A Plan for Growing Sydney*, the metropolitan plan for Greater Sydney, identifies an action to deliver guidelines for a healthy built environment. *Plan Melbourne*, the metropolitan plan for Greater Melbourne, promotes the concept of a 20 minute city with the objective that everyday services and jobs will be accessible to residents in a short commute of 20 minutes.

However, the key principles can be constrained because they have only an initiative-specific basis. In contrast, the principles identified below provide a broader guide for fully integrated ITLUP.

7.1.1 District and corridor level

According to Westerman (1998), corridors are defined as transport routes and their associated environments. Planning at a district[7] and corridor level should involve:

- Planning, designing, developing and managing transport infrastructure and its environments as integrated facilities, with provision for at least one transport mode
- Recognising the relationship between the corridor and the adjoining communities, land uses, built form, amenity and environment
- Planning for integration of development controls and traffic management

[6] Light rail has the ability to calm traffic more so than buses because of the priority given to light rail over cars on the road.

[7] The district level is considered to be at a smaller scale than the metropolitan level, but at a greater scale than a local government area (LGA). In some jurisdictions, this is referred to as the subregional level.

- Considering the impact of traffic on the safety of pedestrians and cyclists, parking, local businesses and activities, and environmental assets.

7.1.2Suburb and neighbourhood level

ITLUP at the suburb and neighbourhood level should address issues such as:

- Local urban form with opportunities for more sustainable development
- Integration between local land use and transport to maximise accessibility
- Planning for choice in transport mode
- Ensuring access to public transport
- Precincts for environmental protection and enhancement
- Pedestrian-friendly and safe environments, and centres containing mutually supporting activities
- Transport corridors and facilities that enhance, rather than detract from, the local environment (Westerman, 1998).

7.2 Process

As discussed in Chapter 1, the integrated cluster and connect planning process for transport corridors should align with the strategic vision for the region. *Cities for Tomorrow* (Westerman, 1998) identifies the development of urban structure and form as core issues of integrated planning. It focuses on the need to integrate land use, transport, the environment, economic and financial resources, the private and public sector and different levels of government. It identifies eight stages to achieve integrated cluster and connect planning at the corridor and local level. This process is summarised in

Table 3.

Table 3 Overview of ITLUP process for 'cluster and connect' planning at the corridor and local level

Stage	Overview
Set objectives	This stage encourages and facilitates approaches that contribute to a region's development. These should be comprehensive, specific, achievable and measurable and link to the metropolitan, subregional or local vision for the area. The objectives should reflect integrated outcomes. Long-term and short-term objectives should be clearly identified. Agreement will need to be sought with the appropriate stakeholders.
Problem definition	This stage recognises that there is an issue or problem that needs to be addressed through an integrated approach. This includes developing an understanding of the context and what is needed to address the problem. The main outcome of this stage should be a shared commitment to proceed with a study, strategy or plan and securing funding to undertake this process.
Institutional setting	This stage clarifies which public agencies are involved in the process, their roles and contributions and who has primary responsibility. An appropriate model should be developed and high-level commitment from both the public and private sectors should be sought.
Determine the desired outcomes	This stage determines the desired outcomes and setting priorities. This should account for the roles and responsibilities of stakeholders, relationships with existing strategies and actions, and options for different approaches.
Define the scope	This stage identifies the area of application, which may include a region, metropolitan area, local area, a combination of adjoining local areas or the relationship between metropolitan and local areas. Alternatively, this could include a particular land use, transport or environmental interaction, such as the relationship between activity and accessibility. At a district level, the focus will be on the structuring and adaption of urban regions, providing for growth and change while moving towards more sustainable, efficient and equitable urban areas. This may relate to land use and infrastructure planning, travel demand management, managing accessibility and activity and protecting the district environment. At a local level, issues may involve establishing a local land use transport system with a closer fit between housing, local land use and the transport system with other housing, local employment and services. Key issues relate to making activity centres more pedestrian friendly with a range of facilities and services.
Select and develop a package of tools/options	This stage explores the range of tools/options available to determine those that are relevant. The outcome will involve selecting and developing a package of tools/options that will contribute to greater integration. Examples of these tools are detailed in the following section.
Determine the required actions	This stage ensures agreement on the final outputs and required actions. Targets should be practical, achievable and measurable. Outputs may include a strategy or policy, development plans and designs, the implementation of integrated programs, or specific initiatives (investment and non-investment).
Monitoring and feedback	This stage ensures actions are producing the desired outputs and outcomes and, if circumstances change, that the plan or initiative can adapt.

Source: adapted from Westerman, 1998, including ordering stages to align with ATAP

This approach is not definitive and is considered to be flexible depending on the context.

7.3 Other relevant guidelines

The following guidelines are also considered useful references for the cluster and connect model.

- **Principles for Strategic Planning**
  Produced by Austroads (1998)
  Principles for Strategic Planning assists professionals, particularly those working in land use and transport, to conduct sound, methodical and effective strategic planning. It explains the principles of strategic planning and provides a model of the strategic planning process. It conveys the concepts involved in clear strategic thinking (concepts that can be applied to issues that arise day-to-day in any busy office), as well as the steps involved in undertaking formal strategic planning exercises.
  While not specifically tailored to ITLUP, the document provides principles and a process to guide the wider strategic planning process and reflects some of the elements of the best practice guidance discussed above.
- **Improving Transport Choice – Guidelines for Planning and Development Policy**
  Produced by NSW Department of Urban Affairs and Planning (2001)
  These guidelines are part of the Integrating Land Use and Transport policy package. They provide advice on how local councils, the development industry, state agencies, other transport providers and the community can better integrate land use and transport planning and development and provide transport choice and manage travel demand to improve the environment, accessibility and liveability. They focus on creating areas, land uses and development designs that support more sustainable transport outcomes. In particular, they provide principles, initiatives and best practice examples for locating land uses and designing development that encourages viable and more sustainable transport modes than the private car, such as public transport, walking and cycling.
- **The Right Place for Business and Services – Planning Policy**
  Produced by NSW Department of Urban Affairs and Planning (2001)
- Integrated Transport Planning Framework for Queensland
  Produced by Queensland Government (2003)
- **Planning Guidelines for Walking and Cycling**
  Produced by NSW Department of Infrastructure, Planning and Natural Resources (2004)
  The *Planning guidelines for walking and cycling* assist land use planners and related professionals to better consider walking and cycling in their work and consequently create more opportunities for people to live in places with easy walking and cycling access to urban services and public transport.
- **Developing a Local Cycle Strategy and Local Cycle Network Plan**
  Produced by Queensland Transport (2006)
  This series of notes assists planners and engineers to provide for cycling in their local area.
- **Precinct Structure Planning Guidelines**
  Produced by Victorian Growth Areas Authority (2009)
  Of most relevance are the Guidelines Notes – Our Roads: Connecting People. This document provides guidance and direction about the road network hierarchy and road cross sections in Melbourne's growth areas. It complements Growth Area Framework Plans, which identify basic arterial road networks in growth areas.

- **Guidelines for Preparation of Integrated Transport Plans**
  Produced by Western Australian Planning Commission (2012)
  The guidelines provide guidance to local governments to develop and implement integrated transport plans and enable an effective approach to local transport planning and transport infrastructure, maintenance and service delivery (where local government is a core player). While the focus is on preparing plans rather than guiding initiatives, these guidelines remain a relevant source for ITLUP.
- **Hume Integrated Land Use and Transport Strategy**
  Produced by Hume City Council (2013)
  The *Hume Integrated Transport and Land Use Strategy* covers public transport, walking, cycling, traffic and parking management initiatives to improve transport options for Hume residents. It aims to create more accessible, liveable and sustainable communities, giving residents full access to jobs, education, and shopping and community facilities by expanding the range of transport choices and modes.
  This example of a tailored local council strategy may be useful for other local governments.
- **Regional Integrated Transport Strategy 2014-2016**
  Produced by Eastern Metropolitan Regional Council
  The *Regional Integrated Transport Strategy 2014-2016* sets out the strategic plan for developing an integrated transport network in Perth's Eastern Region. The strategy focuses on integrated planning, TravelSmart, public and active transport.

7.4 Tools for implementation

Cities for Tomorrow outlines a range of tools for implementation of ITLUP which vary based on whether the initiative is district, corridor or local (see

Table 4).

Type I corridors are defined as primary transport routes and their environments, where the through transport function is dominant and adjoining areas are planned, designed and managed to reduce or eliminate friction and impact.

Type II corridors are defined as secondary transport routes and their environments, where both the transport function and frontage function are important.

Additionally, jurisdictions often classify transport corridors based on a functional hierarchy. A functional hierarchy identifies which transport corridors are important for different modes of transport (such as public transport, freight and so on). Similar corridors and locations can be identified for public transport, freight, pedestrians and commuter traffic. Overlapping functions do not mean that one function is more important than another, but rather that the transport corridor needs to cater for more than one function (South Australian Department of Planning, Transport and Infrastructure, 2013).

Table 4 Implementation tools

District	Corridor	Local
Urban structure and form	Corridor categorisation	Activity/accessibility zoning
Urban density	Planning new Type I corridors	Transit-friendly land use
The right activity in the right location	Planning new Type II corridors	Increasing choices in transport
A hierarchy of multi-purpose centres	Adapting Type I corridors	Increasing choices in land use
Key district and transit centres	Adapting Type II corridors	Cycle networks and land use
Public transport and land use	Access to roads	Pedestrians and land use
Freight movement and land use	The right transport task on the right mode	Parking standards and management
Road systems and land use	Congestion management	Corridors and precincts
Integrated development areas	Transport pricing and tolls	Centres as precincts
Integrating investment	Intelligent Transport Systems	Residential precincts
Air quality and traffic noise	Reducing noise exposure through design	Traffic calming
District parking policies	Maintaining community cohesion	Safety
Travel demand management	Visual enhancement	Visibility
Commuter planning	Urban corridor management	Incentives and contributions
Travel blending	Rural corridor management	Performance-based development control
Keeping options open	Roadside services	

Source: Adapted from Westerman, 1998

The hierarchy adopted by the South Australian Department of Planning, Transport and Infrastructure (2013) comprises:

- Public transport corridors
- Cycling routes
- Pedestrian access areas
- Major traffic routes
- Freight routes
- Peak hour routes
- Tourist routes
- Key outback routes.

For further detail refer to *A Functional Hierarchy for South Australia's Land Transport Network* (South Australian Department of Planning, Transport and Infrastructure, 2013)

For further detail on the implementation tools identified above refer to *Cities for Tomorrow* (Westerman, 1998).

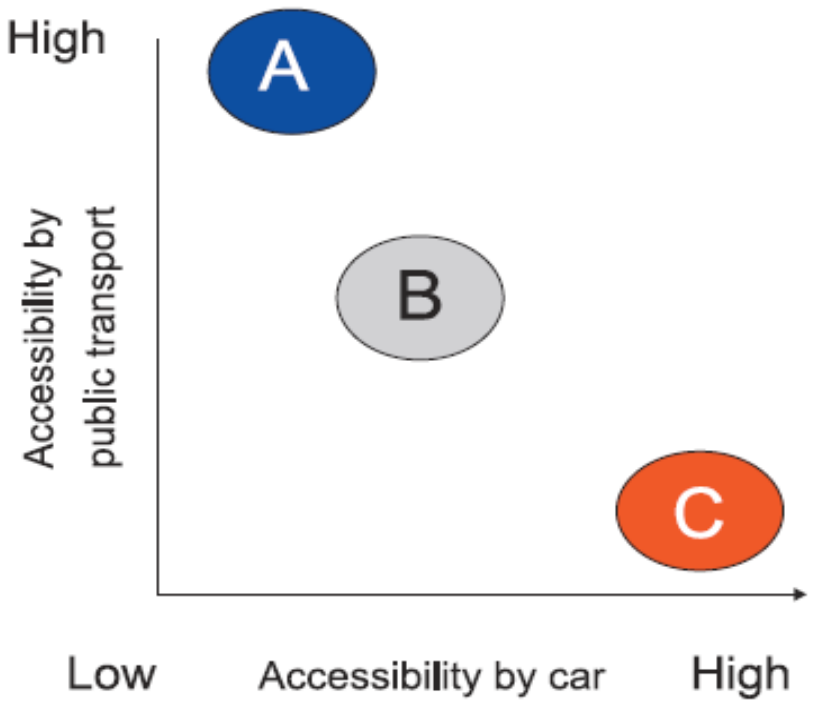
7.4.1 The right activity in the right location

The location of activities should be based on their mobility needs and the accessibility provided by the transport infrastructure. Private investment should be linked to public investment in transport infrastructure to maximise the benefits of the investment.

This can be achieved by establishing accessibility criteria for different types of locations, setting targets for public transport use and preparing development and implementation plans for existing locations. District planning instruments and local strategies can also be adopted to implement the right activity in the right location.

Figure 17 illustrates the concept of establishing criteria for three different locations and highlights the need to understand the suitability of particular land uses for locations with high accessibility by public transport or by car. For example, high density residential uses are suitable for locations with high accessibility by public transport (for example location B) and industrial uses, such as freight, are suitable for locations with road access (for example location C).

Figure 17 Land use activity by location and accessibility type



Source: Westerman, 1998

7.4.2Integrated development areas

Cities for Tomorrow provides guidance on achieving integrated outcomes for defined development areas including both growth and established areas. This implementation tool is focused on co-ordinating development and infrastructure provision to provide a framework and context for integrated programming and budgeting. This process includes:

- Identifying development areas
- Analysing opportunities and constraints
- Addressing measures needed to overcome constraints
- Establishing management structures
- Preparing development plans
- Preparing phasing plans
- Preparing funding plans
- Developing integrated budgets

For further detail refer to R-9 Integrated development areas in *Cities for Tomorrow* (Westerman, 1998).

7.5 Case studies

A number of case studies across Australia demonstrate best practice applications of cluster and connect planning.

7.5.1Sydney CBD and South East light rail (NSW)

The NSW Government announced its commitment to the CBD and South East Light Rail in 2012. The light rail line will connect Circular Quay with Randwick via Town Hall and Central railway stations. George Street, between Hunter and Bathurst Streets, will become pedestrianised as part of the initiative. The City of Sydney is working with the NSW Government to integrate the light rail initiative with surrounding land uses, particularly by improving the public domain for people who live, shop, visit and work in the City of Sydney. The City has released a concept design that sets out the principles including creating a safe shared environment for light rail and pedestrians and minimising the visual impact of light rail infrastructure (see Figure 18).

Figure 18 Principles for light rail as part of the concept plan

Source: City of Sydney 2015

The concept plan is supported by the *George Street 2020: A Public Domain Activation Strategy* which provides landowners and tenants with a vision for how George Street will become a pedestrian boulevard with light rail running through it and how future developments can make the most of this vision (City of Sydney, 2015). This highlights a coordinated approach between state and local government in terms of ITLUP.

7.5.2Gold Coast light rail (Qld)

The 13-kilometre Gold Coast Light Rail contains 16 stations between Gold Coast University Hospital and Broadbeach. It was delivered by the Queensland Government and City of Gold Coast. The City's Gold Coast Rapid Transit Corridor Study provided recommendations for the 2,000 hectares of land surrounding the light rail line.

The study aligns the City's vision towards a bold future that can sustain growth and economic development while retaining a lifestyle that is uniquely Gold Coast. This focuses on providing better buildings, better streets and better places (City of Gold Coast 2011). The urban design framework developed through the study is detailed in Figure 19.

The urban design framework incorporates the following elements:

- Progress the concept of the network city by reinforcing the Gold Coast's traditional beachside villages into a polycentric city form, with the greatest development intensity and heights at the key activity centres of Southport, Surfers Paradise, and Broadbeach
- Establish major east-west movement corridors as future conduits for rapid public and active transport modes that preserve road capacity and support transit oriented development outcomes
- Recognise, preserve and enhance character areas through improved public transport connections and street environments
- Target investment and support within key clusters of economic growth to diversify the Gold Coast's economic base
- Investigate appropriate locations for affordable infill residential development to support housing diversity and intensification, boosting housing affordability for key workers and a range of household types
- Create new local community quarters within the coastal strip supported by open space and community facilities to attract permanent residents and families back to urban spine with an emphasis on areas adjoining the cores of Southport, Surfers Paradise and Broadbeach
- Advance an integrated mesh of pedestrian and cycle links connecting across the Nerang River and canal networks to integrate communities and centres
- Create ten great streets or green spines by giving priority to improving the environmental and visual quality of the key movement corridors through the introduction of significant street tree planting and pedestrian facilities.

Figure 19 Gold Coast Rapid Transit Corridor Urban Design Framework

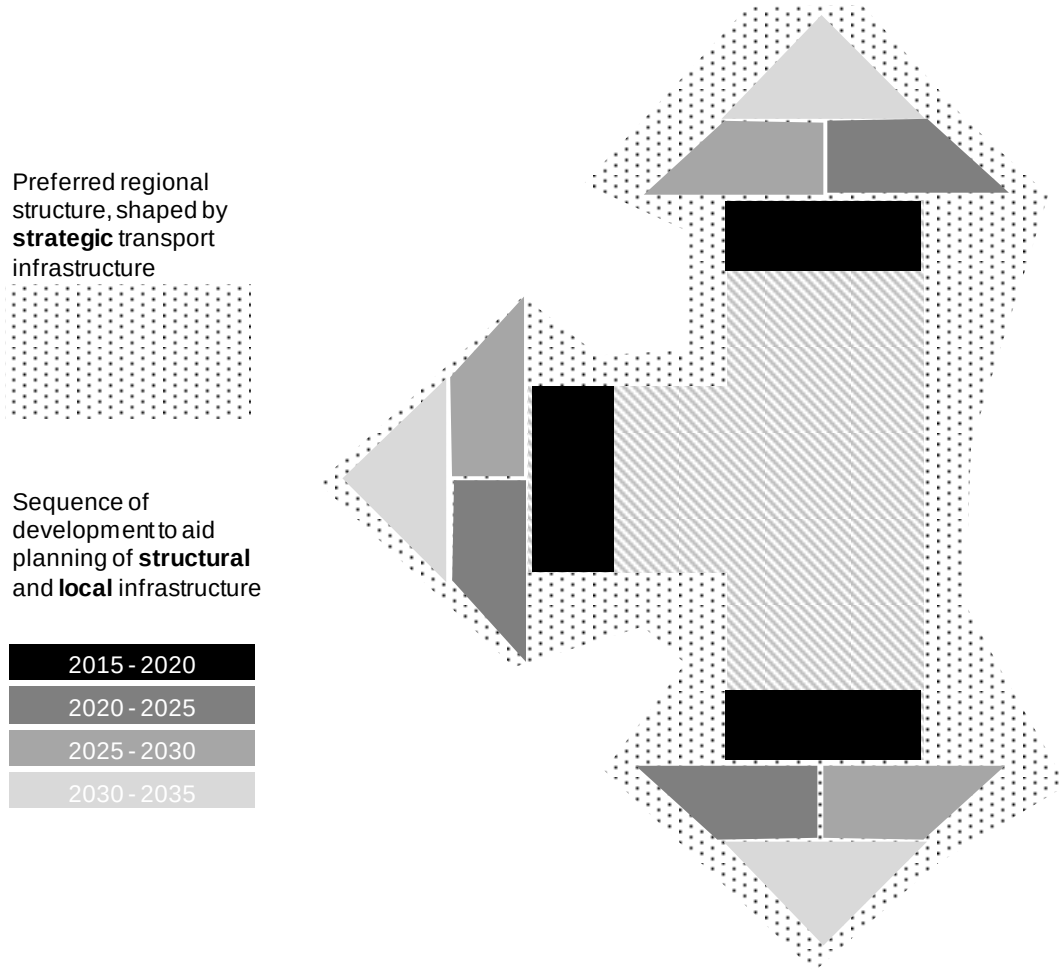
Source: City of Gold Coast, 2011

8. Coordination

Coordination is one of the key ATAP Framework principles (see Part A1 Overview, Section 3). In ITLUP, coordination plays a particularly crucial role. It requires coordination between planning for the three transport infrastructure types and coordination in institutional settings and governance.

Infrastructure coordination will maximise the combined potential benefits of both land use and transport. Figure 20 illustrates the relationship between the phasing of strategic infrastructure versus structural/local infrastructure in an effective coordination system. Strategic infrastructure is leveraged to help bring about a metropolitan settlement pattern for optimal economic, social and environmental outcomes. Structural and local infrastructure is then managed via a spatial sequencing process that addresses the risks associated with fragmented or out of sequence development.

Figure 20 Relationship between 'Strategic' 'Structural and Local' Infrastructure in city planning



Source: SGS Economics and Planning Pty Ltd

Nowadays, development is generally encouraged to occur in a manner that leads to consolidated urban growth and is coordinated with the provision of infrastructure being delivered.

Some jurisdictions specifically do not allow out-of-sequence developments at all. Other jurisdictions may, in some cases, allow developers to undertake out-of-sequence initiatives. In such cases, developers should ideally meet the cost of advancing infrastructure. This would send a higher price signal for that development compared with more consolidated urban growth. The strongest signal would be sent if developers had to face the full cost of advancing infrastructure that is required as a result of out-of-sequence development.

8.1 Principles

An effective cross sector coordination system should address institutional arrangements to:

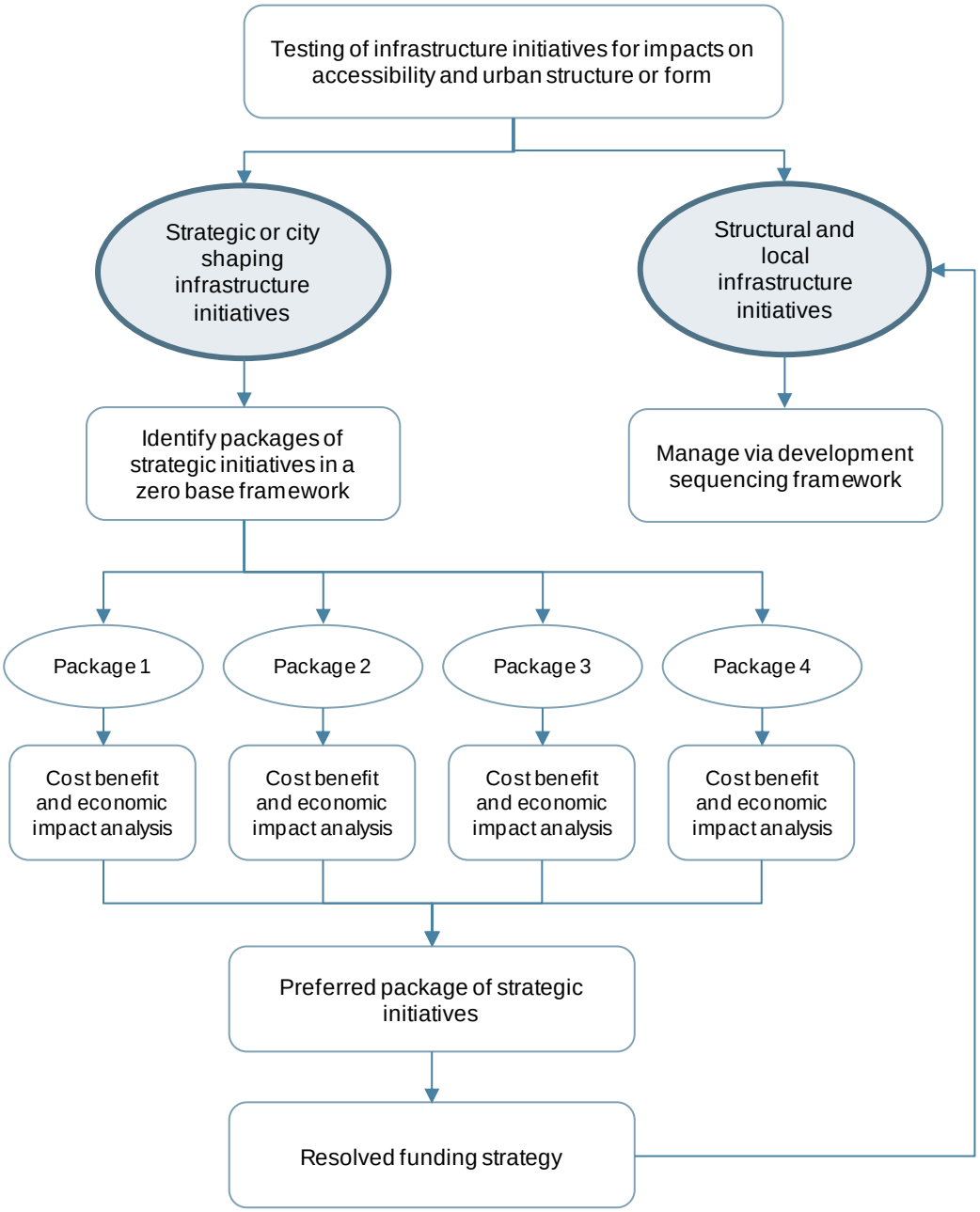
- Harness the city shaping power of key transport initiatives to ensure the city gets the most advantageous strategic infrastructure package (rather than unduly reflecting inertia in initiative planning and funding streams)
- Facilitate coordination of structural and local infrastructure to contain inventory costs by, in effect, fostering a just-in-time approach.

8.2 Strategic infrastructure

Once metropolitan governance resolves tensions in the first iteration of a plan for strategic initiatives (the strategic plan), a similar process should be repeated to test the merits of subsequent strategic infrastructure identified after the strategic plan is finalised. On the other hand, local infrastructure is managed via a development sequencing framework.

The rationale behind these ongoing appraisals should be broadly consistent with that for the initial version of a strategic infrastructure plan. Figure 21 outlines the principles and processes involved in the ongoing coordination of strategic infrastructure.

Figure 21 A model for coordinating strategic infrastructure



Source: Adapted from Spiller et al 2012

The additional economic scrutiny placed on strategic infrastructure initiatives could involve the creation of a range of investment scenarios or packages.

The CBA process will ultimately produce a preferred package of strategic infrastructure initiatives that, among other things, best supports the metropolitan planning framework for the city.

The process outlined in Figure 21 can be affected through centralised coordination institutions or agencies responsible for infrastructure planning. However, as discussed earlier, clarity and authority about the desired city structure at the metropolitan level is essential and requires strong metropolitan planning governance. In the case of distributed investment planning, all proponents of potentially strategic initiatives would be encouraged to undertake a self-assessment of their plans under this logic. This would then be appraised and debated within an appropriate metropolitan governance framework.

The funding and financing of infrastructure is a significant consideration in relation to the coordination of strategic infrastructure and an important area for future potential expansion of the ATAP Guidelines.

8.3 Structural or local infrastructure

The main objective for structural or local infrastructure is to coordinate the timing and delivery of transport and land use. This requires some form of market-based development sequencing that identifies a preferred pathway for development in a planning district, based on minimising the total cost of social and economic infrastructure.

Although most obviously applicable in greenfield growth areas, the concept of a preferred pathway for development is equally relevant in established urban areas undergoing progressive redevelopment or wholesale regeneration. The idea is for the appropriate state or local authority to make a reasonable forecast of the pattern and timing of development (and, implicitly, the pattern and timing of demand for infrastructure services) and then adopt this as the notional benchmark for services planning by all infrastructure and service delivery agencies.

The benchmark sequence of development would be reviewed regularly (for example, every year) and as required, particularly if new information comes to hand on land demand or as out-of-sequence development approvals alter a district's geography or infrastructure capacity.

There are several examples across Australia where an out-of-sequence developer fully funded accelerated infrastructure, with the local authority either buying back the facility at the relevant time or collecting contributions from intervening developments and passing these back to the original developer without interest. The innovation in the context of an effective cross-portfolio coordination system would be to codify these practices to ensure consistency across the city and across all infrastructure providers.

8.4 Governance

Coordination within and across levels of government, and between government and the private sector, is an important requirement for achieving effective outcomes in all areas of economic, social and environmental activity. Effective governance is a central element in those processes.

Governance arrangements can have a significant impact on the coordination of ITLUP. Governance arrangements are critical to linking all parties together, developing a shared vision and, most importantly, providing infrastructure to enable the vision to become a reality. Delivering successful ITLUP requires a detailed understanding of the existing governance arrangements that operate in the relevant state or territory.

The experience across Australia varies, with some states and territories combining the planning and transport infrastructure agencies into one department - for example, the South Australian Department of Planning, Transport and Infrastructure. In most jurisdictions, planning and transport departments remain separate, which can restrict the ability to coordinate strategies as well as initiatives. This is particularly apparent when considering that the South Australian Government has released an integrated transport and land use plan (see box below), while most other states and territories have separate planning and transport strategies.

Coordination is also required between and with health and education departments, as these authorities can help to identify the appropriate sites for new facilities, particularly in greenfield areas.

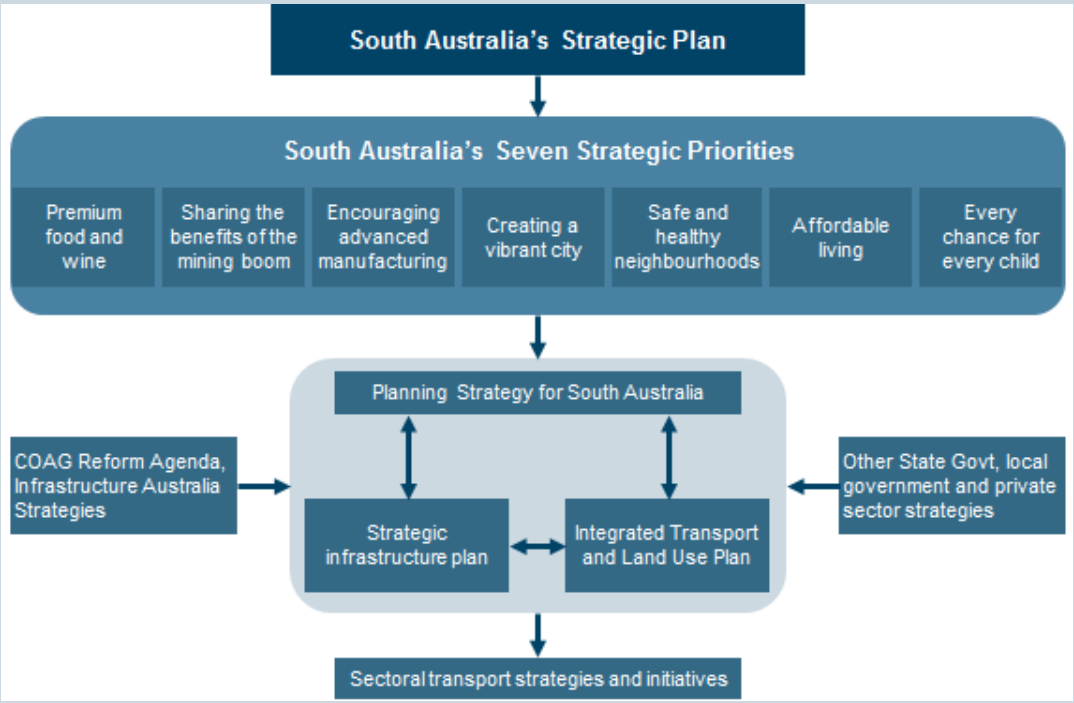
Vertical coordination between the Australian Government, state/territory governments and local governments is an important driver of ITLUP. State/territory and local governments are often heavily involved in the land use planning process and are critical to integrating local and corridor level infrastructure into the public domain and identifying opportunities to support the infrastructure initiatives through zoning and other land use controls.

The Australian Government has a role in ITLUP through the funding of infrastructure initiatives and in relation to the management of ports and airports, alongside responsibilities for setting the framework for investment in a number of sectors that impact on ITLUP. Badgerys Creek Airport is an example of a strategic initiative that requires coordination from all three levels of government.

Box 2: South Australia Draft Integrated Land use and Transport Plan

The emphasis on integration and the role of land use planning is (intentionally) evident from the front page and title: 'Integrated Transport and Land Use Plan' (ITLUP), not 'Transport Masterplan' or 'Transport Plan'. There is a clear focus on aligning the South Australian Government's land use vision and transport plan.

Integration occurs at the highest state-wide strategic planning level. Readers are immediately guided to read ITLUP alongside the SA Planning Strategy and the SA Infrastructure Plan (see diagram below), placing the Plan's initiatives within a clear strategic context.



The integration of land use planning was a fundamental principle adopted in the development of the Plan. Land use planning was recognised as a key input and given a dedicated workstream within the development process. This ensured that land use planning objectives were captured in every aspect of the Plan's development: from setting goals and objectives through to defining the challenges and solutions and drafting and presenting the document. The dedicated team appointed to draft the ITLUP also included experienced land use planners.

Importantly, the Plan is intended to also inform subsequent revisions of the Planning Strategy, creating a feedback loop to ensure integration between land use and transport specific plans.

The delivery of the Plan focuses on putting in place the right regulatory framework. Subject to the consideration of an Expert Panel undertaking a review of South Australia's planning legislation, this framework proposes to bind the Plan to the South Australian Planning Strategy. The Plan also proposes improved governance arrangements that align multiple levels of government planning with the delivery of land use/transport outcomes.

8.4.1Badgerys Creek (NSW)

In April 2014 the Australian Government announced that Badgerys Creek would be the site for the proposed Western Sydney Airport. A new airport along with supportive land use changes, transport and other infrastructure investment will be a major generator of economic activity for the region, providing employment opportunities closer to home for Western Sydney's growing population and catering for increasing aviation demand. Effective coordination across all levels of government (Australian, NSW and local governments) will be required to ensure the benefits of Western Sydney Airport can be achieved. This provides the opportunity to reshape and strengthen the economy of outer Western Sydney and better connect it into the global economy.

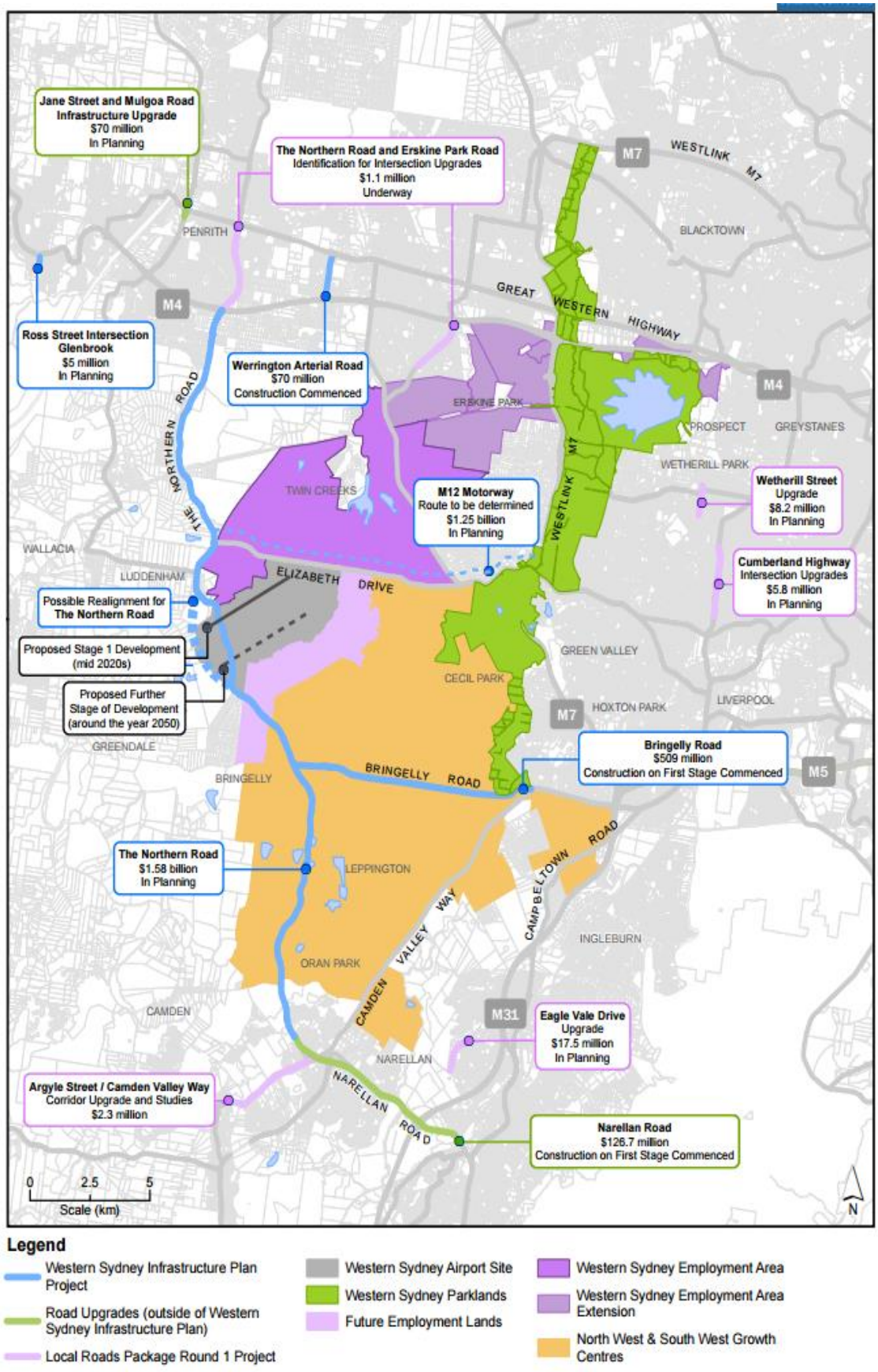
In terms of supporting infrastructure, the Australian and NSW governments have committed over $3.6 billion to road upgrades to connect the Western Sydney Airport site to Sydney's road network. The Western Sydney Infrastructure Plan (see Figure 22) will improve road transport capacity and will be completed before airport operations are anticipated to commence in the mid-2020s. Roads are one part of the transport solution; the other is rail.

The Australian and NSW governments have identified that the integration of the future rail network in Western Sydney and effective transport connections to a Western Sydney Airport are essential to accommodate planned growth in the area and to facilitate connectivity within the region and with Greater Sydney. Further, the early planning for the Western Sydney Airport site has allowed for the future integration of rail on the airport site to service the transport needs of people visiting Western Sydney Airport and those working at the airport.

The Australian Government is working closely with the NSW Government to ensure the Western Sydney Airport project is coordinated with state and local government planning. The Greater Sydney Commission and NSW Department of Planning and Environment are coordinating land use development in surrounding precincts, particularly the Western Sydney Priority Growth Area, Western Sydney Employment Area and South West Priority Land release area (see Figure 22).

The Western Sydney Airport development and its associated surface transport linkages have the power to shape Sydney and transform the economic trajectory of Western Sydney. Realising the full social and economic benefits of this development will be conditional on the willingness and capacity of all three levels of government to develop a shared vision and clear priorities around land use planning and infrastructure investment. In this respect, it will be critical that the land use strategies complement the operation of the airport and avoid developments that would be incompatible with the expansion of the airport in the decades ahead.

Figure 22 Western Sydney airport site and infrastructure



Source: Department of Infrastructure and Regional Development, 2015

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