National Guidelines for Transport System Management in Australia
Stage 2 content for stakeholder consultation

F0.2 – Integrated Transport and Land Use Planning
Providing Feedback

This draft document has been published for stakeholder feedback.

Submissions are due: 5pm, Thursday 31 March 2016

All submissions should be in writing and preferably emailed to: NGTSM2016@infrastructure.gov.au

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Integrated transport and land use planning

At a glance

- Major infrastructure initiatives can change a city’s development patterns and growth trajectory. This can change the decisions people make about where to live and that businesses make about where to locate, setting a new geography of land values.

- Optimising the city shaping power of transport investment is increasingly evident in a range of recent major initiatives in Australia although it is not yet mainstream nor necessarily well understood by practitioners.

- The cluster and connect model reflects the more traditional approach to integrated transport and land use planning (ITLUP) and is already subject to significant guidance across urban design and structure planning to achieve better integration at the district, corridor, suburb and neighbourhood levels.

- Infrastructure coordination will maximise the potential of the infrastructure investment and realise the land use benefits. An effective cross sector coordination system must address the institutional arrangements to ensure the city gets the most advantageous strategic infrastructure package which harnesses the city shaping power of key initiatives and facilitates the coordination of structural and follower 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.
Overview

Introduction

Integrated transport and land use plans address 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.

These guidelines provide fit-for-purpose guidance for Australian practitioners to improve integrated transport and land use planning (ITLUP) across Australia.

The traditional idea of integrated transport and land use planning sees the urban planning system as a means to reshape city structure 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 local job stock and housing to reduce the need for travel. This ‘cluster and connect’ model of integrated transport and land use planning plays an important role at local and district levels, and contributes to the overall structure of the metropolitan area.

The cluster and connect model is already subject to significant guidance across urban design and structure planning to achieve better integration at the district, corridor, suburb and neighbourhood levels. This guidance, however, goes beyond the role of cluster and connect and differentiates between the traditional model and recognises the city shaping power of some transport investments.

Optimising the city shaping power of transport investment is increasingly evident in a range of recent major initiatives in Australia although it is not yet mainstream nor necessarily well understood by practitioners.

The city shaping approach and the cluster and connect approach are not in competition with each other but rather should be coordinated. 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.

Types of transport infrastructure investments

These guidelines use the following typology of infrastructure initiatives or assets:

- **Strategic or city-shaping transport infrastructure**: shifts relative accessibility across a city area, influencing location decisions of households and businesses and shaping settlement patterns.

- **Structural infrastructure**: the high level district network elements and nodes which form the structure of a city. Structural infrastructure is distinguished by its subregional service catchments.

- **Follower infrastructure**: with more local catchments that flesh out a city’s urban structure. They are vital to place making, business and community well-being. They provide services into a suburb or neighbourhood once the development of these areas has been enabled by investment in higher order infrastructure initiatives.
The focus of these guidelines is developing a hierarchical approach to ITLUP and this typology is important in facilitating this.

Developing a strategic vision

Metropolitan planning goes beyond spatial visioning or developing regulations around the location, type and density of development in line with this vision. These elements must be supported by wider policy levers outside traditional town planning as well as clear and aligned governance arrangements, including inter-jurisdictional relations.

A clear and compelling vision for the future structure of a city can guide land-use planning decision making, galvanise private investment activity and provide the wider community with a degree of certainty and purpose as a city evolves.

Investments in transport infrastructure can set a city towards the vision, or inadvertently steer it elsewhere. The metropolitan planning process needs to feature a reliable and consistent mechanism for identifying and appraising transport initiatives with city-shaping power.

Strategic or city shaping infrastructure

Major infrastructure initiatives can change a city’s development patterns and growth trajectory. This can change the decisions people make about where to live and that businesses make about where to locate, setting a new geography of land values. The market will then signal where new and/or intensified urban development is warranted, creating a shift in urban form and, sometimes, structure.

This means that major 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 following principles will guide effective ITLUP:

- Respond to the strategic vision by identifying strategic or city shaping infrastructure.
- Understand and build on the impacts that strategic or city shaping infrastructure have on the city’s form.

Identifying strategic transport infrastructure

Questions to consider when identifying if infrastructure is strategic or city shaping include:

- Will the initiative demonstrably and significantly raise accessibility?1?
- Will the initiative substantially redistribute jobs across the region?
- Will the initiative substantially redirect the property market or increase desirability of a particular area?

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1 In terms of access to jobs and services for residents
• Are there opportunities to strategically shift land uses through land use planning in response to the proposed initiative?

Answers to these questions can be measured in terms of access to jobs. The land use context must be considered to understand if there are opportunities for land use development associated with the shift in accessibility.

**Evaluating the impact of strategic transport infrastructure on urban structure**

Having demonstrated that a particular initiative will have a significant effect on the locational decisions of households and businesses, an evaluation process is required to measure whether this impact will help or hinder achievement of metropolitan settlement pattern objectives, as set out in spatial vision for the city.

One approach to evaluate the prospective city shaping effect of an initiative is to apply historically observed locational elasticities (i.e. measuring the sensitivity of employment or population to changes in the 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.

It is possible to quantify the impacts of such initiatives in relation to specific metropolitan objectives, if new initiatives result in households and businesses adjusting their location in response to a change in an area’s relative or absolute 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).

**Investment appraisal tools**

Understanding the city shaping effects of strategic transport initiatives requires planning and infrastructure agencies to assess the merits of competing investment opportunities.

The key investment appraisal tool is a cost benefit analysis (CBA). CBA determines whether an initiative’s economic benefits justify the capital, maintenance, operating and external costs, especially when the same resources could be deployed to other socially productive uses.

In this case, practitioners must understand that the profound city shaping power of major initiatives is affected by many linked decisions where feedback loops are crucial. A comprehensive assessment of these initiatives requires a fully evolved CBA that moves towards dynamic general equilibrium modelling in terms of tracking feedback effects and linking these to land use outcomes. If modelling along these lines cannot be applied, the logic should at least be applied through more qualitative assessments of bona fide city shaping initiatives. Multi-criteria analysis (MCA) can assist with qualitative assessments. MCA requires specification of criteria on which to rate initiative options and consideration of how each option measures up again each criterion. Rapid and detailed CBAs combined with land impact scenario analysis may be an intermediate appraisal tool between MCA and fully evolved CBA.
Optimising city shaping power

Optimising the city shaping power of infrastructure investments will differ in brownfield and greenfield areas.

In brownfield areas, the focus will generally be on consolidating land to unlock potential. The area of influence of key transport investments can be broken down into a number of components including key redevelopment districts, high and moderate impact areas and a value capture districts.

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

Structural and follower infrastructure

Structural and follower infrastructure sits at the district, corridor, suburb and neighbourhood level to support and respond to strategic or city shaping infrastructure. Structural and following infrastructure is generally planned using a more traditional approach to ITLUP, a cluster and connect model. There is already significant guidance in terms of urban design and structure planning to achieve better integration at the district, corridor, suburb and neighbourhood levels.

This approach generally involves four steps, as outlined in the *NSW Long Term Transport Master Plan* (Transport for NSW 2012):

- 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

The cluster and connect approach generally has a strong place-making focus at the neighbourhood level by consolidating community facilities around public transport or perhaps introducing public transport, such as light rail[^2], to improve local connectivity, calm traffic and promote local development.

Principles

Planning at a district and corridor level should involve:

- planning, designing, developing and managing transport infrastructure and its environments as integrated facilities, with provision for more than one transport mode

[^2]: 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.
• recognising the relationship between the region or corridor and the adjoining communities, land uses, built form, amenity and environment
• planning for integration of development controls and traffic management
• considering traffic impacts on the safety of pedestrians and cyclists, parking, local businesses and activities, and environmental assets.

Planning at a suburb and neighbourhood level should address:
• local urban structure 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
• centres containing mutually supporting activities
• transport corridors and facilities which enhance, rather than detract from, the local environment.

Coordination

Coordination will maximise the potential of the infrastructure investment and realise the land use benefits. Strategic infrastructure is leveraged to bring about a metropolitan settlement pattern that draws out economic, social and environmental benefits. Structural and follower infrastructure is then managed through a spatial sequencing process that ensures providers can externalise the risks associated with fragmented or out of sequence development.

An effective cross sector coordination system must address:
• the institutional arrangements to ensure the city gets the most advantageous strategic infrastructure package which harnesses the city shaping power of key initiatives rather than settling for an outcome which unduly reflects inertia in initiative planning and funding streams
• the institutional arrangements required to facilitate coordination of structural or follower infrastructure, to contain inventory costs by, in effect, fostering a just-in-time approach.

City shaping infrastructure

Initiatives of strategic significance should be streamed into a further evaluation process within the coordination model, while follower infrastructure is managed via a development sequencing framework.

The additional economic scrutiny placed on strategic infrastructure initiatives could involve the creation of a range of investment scenarios or packages that would ideally be formulated on the assumption that capital funds can be redirected from other initiatives which may be in the pipeline due to historic or organic planning processes.
The CBA process will ultimately produce a preferred package of strategic infrastructure initiatives which, among other things, best supports the metropolitan planning framework for the city.

**Structural or follower infrastructure**

The coordination of structural or follower infrastructure requires some form of market-based development sequencing which identifies a preferred pathway for development in a planning district based on minimisation of the total cost of social and economic infrastructure.

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 of infrastructure capacity.

**Governance**

Governance arrangements can have a significant impact on the coordination of ITLUP. The experience across Australia differs with some states and territories combining the planning and transport infrastructure agencies into one department. In most jurisdictions, planning and transport departments remain separate, which often restricts the ability to coordinate strategies as well as initiatives.

Vertical coordination between the Australian Government, state and local governments is an important driver of ITLUP. State and local governments are often heavily involved in the land use planning process and are critical to integrating metropolitan and local 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, not only through the funding of infrastructure initiatives but also in relation to the management of ports and airports.
1 Introduction

This chapter 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 as a central element of System Planning in the NGTSM 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 and a review of case studies.

Integrated transport and land use plans address 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.

These plans guide the 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 and how they connect across the existing network.

These decisions have a long legacy; 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 system that can generate a range of economic and social benefits. These benefits must be adequately understood and captured during the infrastructure planning and appraisal process and maximised after an initiative opens to ensure the initiative reaches its full potential.

These improved guidelines provide an enhanced and improved approach for integrated transport and land use planning by:

- Explaining the need to move from the traditional ‘cluster and connect’ model of ITLUP to an ‘emerging’ approach that also formally recognises the ‘city shaping’ impact of transport infrastructure.
- Distinguishing between three types of transport infrastructure – strategic; structural; follower – and explaining how a good understanding of this distinction is important for undertaking the new ITLUP approach.

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3 Seven out of the eight state/territory governments were consulted as well as Infrastructure Australia
2 Gaps in current literature

2.1 The need for integration has long been recognised

The need for better integration of transport and land use planning is a long-standing issue in the literature.

Something of a ‘break through’ 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”.

As welcome as the National Charter for Integrated Transport and Land Use Planning was, it is now clear that it was founded on an incomplete conceptual base. These improved guidelines enhances the Framework by using two approaches:

- the traditional approach – ‘cluster and connect’
- the emerging approach – addition of recognition of ‘city shaping’ impact of transport.

These NGTSM ITLUP guidelines provide an introduction to the important issue of the city shaping impact of transport. In the absence of such coverage in published guidelines, they provide an important 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 city shaping infrastructure

The traditional idea of integrated transport and land use planning sees the urban planning system as a means to reshape city structure 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 local job stock and housing to reduce the need for travel (see Figure 1).

Figure 1 ‘Traditional’ concept of transport and land use planning integration

This ‘cluster and connect’ model of integrated transport and land use planning 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.

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.

This ‘cluster and connect’ approach is reasonable as far as it goes. However, it overlooks, or underplays, the crucial fact that the transport network is not merely a servant of a city structure that is exogenously set; it can be the principal shaper of that city structure. Full integration of transport and land use planning requires recognition of this city shaping power of some transport investment decisions and a systematic approach to harnessing this power.

This relationship is depicted in Figure 2.
This guidance, goes beyond the role of cluster and connect and differentiates between the traditional model and recognises the emerging approach that harnesses the city shaping power of some transport investments. Further, this guidance notes that as these major investment decisions can become locked in –because of long gestation periods and reinforced planning efforts - it is difficult to break out of this cycle when designing infrastructure coordination systems (Spiller et al. 2012).

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 must be 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.

Optimising the city shaping power of transport investment is increasingly evident in a range of recent major initiatives in Australia although it is not yet mainstream nor necessarily well understood.

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 during 2010 and 2011 allude to the need for better integration between 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

2. 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 on qualitative evidence.

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

It is necessary to differentiate transport initiatives according to their impacts on household and business location decisions and therefore on the pattern, structure and density of urban development. This differentiation is needed to implement the improved approach to planning discussed in the previous section. In these guidelines, this is achieved by using, the following typology of infrastructure initiatives or assets:

- Strategic (or city-shaping infrastructure)
- Structural infrastructure
- Follower infrastructure.

4.1 Strategic infrastructure

Strategic, or city-shaping infrastructure includes works that are almost exclusively in the transport domain and have the power to alter relative accessibility across the metropolis (for example, Sydney Harbour Bridge, Melbourne Underground Rail Loop or the Sydney M7 motorway). These investments drive where people live and where businesses locate. They create new agglomeration economies, boosting productivity and taxation revenues.

Only a smaller number of initiatives could 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 infrastructure represents higher-order or trunk facilities and networks (excluding strategic infrastructure) that form a region’s urban framework. It includes arterial roads, district public transport connections. These items are distinguished by their districts service catchments and their cost.

4.3 Follower infrastructure

Follower infrastructure includes services and facilities with localised service catchments. While vital to community wellbeing and business efficiency, follower 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.

Structural or follower infrastructure are not significant in terms of their impact on relative accessibility to influence the shape of the city.

These three infrastructure categories are summarised in Figure 3.
Figure 3  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 infrastructure
The high level network elements and nodes which form the structure of a subregion or district.

Examples: Sydney CBD and South East light rail and Gold Coast light rail.

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

Traditional metropolitan planning usually includes spatial visioning or developing regulations around the location, type and density of development in line with the vision. The best practice ITLUP outlined here goes beyond these elements to also include supporting wider policy levers (normally outside traditional town planning), as well as clear and aligned governance arrangements, including inter-jurisdictional relations.

Such a best practice approach consists of a ‘trilogy’ of plan making and implementation elements (refer to Figure 4), drawing from the perspective of the Australian, state and local governments. Implicit in this model is the essential buy in of the private sector and the general community.

Figure 4 Essential elements in best practice metropolitan planning

Source: SGS Economics and Planning Pty Ltd
5.1 The vision

A clear and compelling vision for the future structure of a city can guide land-use planning decision making, galvanise private investment activity and provide the wider community with a degree of certainty and purpose as a city evolves.

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 4 identifies various implementation mechanisms to support the metropolitan vision including transport initiatives. Investments in transport can set a city towards the vision, or inadvertently steer it elsewhere. The metropolitan planning process needs to feature a reliable and consistent mechanism for identifying and appraising transport initiatives with city-shaping power.
6 Strategic or city-shaping infrastructure

Major transport initiatives can change a city’s development patterns and growth trajectory. This can change the decisions people make about where to live and that businesses make about where to locate, setting a new geography of land values. The market will then signal where new and/or intensified urban development is warranted, creating a shift in urban form and, sometimes, structure⁴.

These processes have been intuitively understood by policy makers and within the wider community for many years – people see, for example, the nexus between highway development and increasing land values and housing development in peri-urban regions.

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

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

This section outlines the principles for identifying, evaluating and optimising city shaping infrastructure to better implement ITLUP in a way that maximises the combination of 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 form.

6.2 Process

The ITLUP process in relation to strategic or city shaping infrastructure is summarised in Figure 5 and further detailed below.

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⁴ Urban structure is defined by the distribution and relationships of the dominant land uses, and the networks that serve them. Urban form refers to the configuration and spatial characteristics of cities (Westerman 1998).
6.2.1 Identifying strategic transport infrastructure

Identifying city shaping 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 city shaping 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?
The land use context must be considered to understand if there are in reality opportunities for land use development associated with the shift in accessibility, as opposed to theoretical capacity.

Projects which result in a significant shift in mode share rather than land use would not be considered city shaping. An example of this is the Gold Coast light rail which whilst it is an important transport project for the city and has resulted in an increase in public transport usage, it would not be considered city shaping but rather structural infrastructure.

Answers to these questions can be measured by looking at effective job density (EJD)\(^5\) or access to jobs. An initiative with a big impact is city shaping infrastructure initiative. As there is no precise benchmark or threshold that can indicate whether an initiative is strategic or city shaping, these guidelines highlight a number of examples showing the variation in levels of impact, as well as the process involved in measuring the impact.

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**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.

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\(^5\) Effective Job Density is 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.
Citylink and Western Ring Road in Melbourne

The Citylink initiative in Melbourne had a maximum EJD change of 5.4% (Figure 6) while the Western Ring Road initiative had an EJD change of 1.7% (Figure 7), suggesting the Citylink initiative has a more significant impact on Melbourne’s structure.

Figure 6   EJD change for Citylink

![Citylink EJD change map](source)

Source: SGS Economics and Planning Pty Ltd
Other measures and considerations

A more simple measure involves calculating the jobs accessible within 30 minutes with and without a transport infrastructure initiative to understand the scale of the impact.
The land use context must be considered to understand if there are opportunities for land use development associated with the shift in accessibility. For example, while the Sydney Metro City and South West is expected to substantially increase accessibility to jobs within the Sydenham to Bankstown corridor, if, hypothetically, there are too many constraints within the corridor such as fragmented land ownership, or substantial redevelopment has already taken place, then the opportunities for significant change and therefore city shaping may be limited. Further examples of city shaping infrastructure are detailed below.

Examples of strategic or city shaping infrastructure

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. The initiative 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 8).

Figure 8 Sydney Metro City and South West alignment

Source: Transport for NSW, 2015
The station at Waterloo is expected to not only increase the proportion of jobs accessible within 30 minutes for existing residents but also shape land use near the railway station. The NSW Government-owned land (social housing) was marked for redevelopment as a mixed housing estate and the announcement of a station at Waterloo has been considered to be 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.

Crossrail (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 9 highlights the projected impact on accessibility to jobs.

Figure 9 Crossrail impact on access to jobs

Crossrail is also expected to impact London’s economic structure, particularly the finance and business services market. Potential new jobs which are expected to be created as a result of the Crossrail initiative 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 highlights the significant structural shift that is expected as a result of the initiative, demonstrating the city shaping potential of Crossrail.
Mandurah railway line (Western Australia)

Investment in modern heavy rail commuter infrastructure is transforming Perth’s urban structure. The Mandurah railway line opened in 2007 and is a suburban railway line which runs through the south western suburbs of Perth. The line connects 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 (refer to Figure 10) - 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.

Figure 10  Mandurah Line (clockwise from left: stops and feeder bus routes; park and ride facilities and new hospital; Murdoch station)

Source: McIntosh et al. 2015

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.
6.2.2 Assessing the impact of strategic transport infrastructure on urban form

Having demonstrated that a particular initiative will have a significant effect on the locational decisions of households and businesses, an assessment process is required 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 to evaluate the prospective city shaping effect of an initiative is to apply historically observed locational elasticities (i.e. measured sensitivity of employment or population growth at the travel zone 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.

Rationale behind the location of different land use activities

Businesses

Well established economic theory indicates that over time, firms will tend to locate closer to areas that improve their land use efficiency, that is, where there are the greatest economic benefits. Locating in areas with superior accessibility reduces transaction costs through ease of contact with suppliers and customers. This also increases 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 do 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 other 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 having large parcels of land. This contributes to the ability of service firms to locate within the confines of a heavily dense area of employment and population such as the CBD, whereas manufacturing and wholesale trade tend to locate further away from highly dense areas.

Ways to improve business accessibility differ across industries based on their customer and supplier base. Generally, manufacturing requires 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 a similar accessibility requirement. Therefore efficiencies can be gained for those industries when they locate closer to points of road infrastructure.

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6 A travel zone (TZ) is a geographic units 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).

7 Location theory has developed from ideas introduced by Johann Heinrich von Thünen in 1826.
However, this is not necessarily the case for service industries. While all firms require timely access to their suppliers, employees and customers, their strategic ability to access those people differ 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 their residential location due to many factors, including access to employment, education, essential services and recreation. However, the literature does indicate 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, if they do relocate, tend to move within corridors (or within housing submarkets) rather than moving across town. However, when moves are made within this context, the relative accessibility of the two areas is a key consideration.

**Assessment 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 investment). However, it is possible to quantify the impacts of such initiatives in relation to specific metropolitan objectives, where the tendency for households and businesses to adjust their location in response to a change in an area’s accessibility carries over to new initiatives. This may include 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 city shaping 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-wide level given that an increase in supply in one location is likely to impact supply in another.

Figure 11 provides an overview of the approach adopted within the study, the key inputs/outputs and analytical tasks competed as part of the analysis.

Firstly, statistical relationships between housing development and accessibility were developed based on historical data. These outputs were fed into a model developed to redistribute housing development across the metropolitan areas 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 and proposed an alternative scenario based on the impact of the infrastructure initiative on accessibility within that particular area. All other variables were assumed to be constant across both the base case and proposed alternative scenario. If there is no impact to EJD then the location’s housing development remains as per the base case. If EJD is increased/decreased then the amount and mix of housing is adjusted in line with the regression coefficients.
Impact of infrastructure on housing types in Melbourne

The inner, middle and outer rings in Melbourne were applied an assumed percentage uplift in relative EJD which were based on previous work completed by SGS on major transport infrastructure projects (14% for inner, 7% for middle and 2% for outer rings). These should be interpreted as hypothetical scenarios, devised for analytical purposes only.
Figure 12 shows the base 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. This highlights that 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 initiative case, and the number of detached houses falls between the base and initiative case, especially in the middle ring which was projected to contain the greatest proportion of dwellings in 2031.

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 location. This has the impact of reducing the amount of land required on the urban fringe for detached housing.

Whilst major transport investment may generate the potential for housing intensification, the extent to which this potential is realised will depend on a range of factors. The appropriateness of the planning controls affecting the areas in question will be uppermost amongst these. Also of relevance is the fact that underlying housing development potential may not find expression because of ‘market failures’. For example, fragmented land holdings may hamper the market from undertaking housing projects of sufficient scale. Similarly, key brownfield sites for housing construction may be constrained by unknown contamination risk or lack of co-ordinated asset management amongst 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 NGTSM Part T1 Travel Demand Modelling.

Investment appraisal tools

Understanding of the city shaping effects of strategic transport initiatives will impact the tools used by planning and infrastructure agencies to assess the merits of competing investment opportunities.

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

CBAs, as applied to major transport investments, covers 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 the CBA, but are considered separately alongside the CBA.

In addition, agglomeration economies are increasingly being considered in CBAs under the heading of ‘wider economic benefits’. These agglomeration wider economic benefits 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 for a discussion on WEBs). CBA is also increasingly being applied to active travel, giving greater recognition to the health and decongestion benefits from increased cycling walking. (see Table 1).
Table 1. Scope of Benefits in (Transport) Infrastructure Cost Benefit Analyses (CBAs)

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

Source: SGS Economics and Planning

Ideally, the CBA will cover these broad benefits. However, even if the analysis identifies a broader range of impacts, it still faces analytical restrictions that limit its efficacy in the context of city shaping 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 the CBA for two reasons:

- First, if the indirect effects merely reflect the direct impacts being passed on 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).
- Second, for practical reasons, if second and subsequent round effects are to be considered, complex assessment of the urban economy is required. This is due to the profound city shaping power of major initiatives, where many linked decisions and feedback loops come into play. Such assessment is complex, and would require the use of dynamic general equilibrium modelling applied to an urban context, tracking feedback effects and linking them to land use outcomes. While such modelling may enhance our understanding of the full impacts of city shaping initiatives, we must also consider the associated modelling costs. 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.

Also given the dynamic nature of transport and land use interactions, defining the base case land use for the CBA can also be challenging.
An alternative to the fully evolved CBA approach mentioned above is the iterative application of rapid and detailed CBA using land use impact scenario analysis. In this approach, scenario analysis is used to investigate the potential major land use impacts of city shaping transport initiatives. Testing the effect of different land use impact outcomes on the CBA results allows the sensitivity of CBA results to be determined.

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). Note, however, that use of MCA can involve risks of bias, lack of transparency and ease of manipulation to obtain a predetermined result (see discussion in NGTSM Part F3, sections 3.2 and 3.3, especially Box 1). Transparent use of MCA, and limiting its use to early comparison of options prior to a CBA, will help mitigate those risks.

The MCA can be linked to jurisdictional goals, transport system objectives, and government policies through their use in formulating 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 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.

6.2.3 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 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 13) 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.
In greenfield areas, the focus will likely need to 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 below for more details.

Some key themes are discussed below. These may be relevant to both brownfield and greenfield areas.

**Unlock land use potential**

The land use potential in key redevelopment districts that demonstrate greater potential for transport-induced housing intensification can be unlocked by commissioning state development corporations to overcome barriers to private sector investment in housing and related regeneration initiatives. However, it is acknowledged that this is not the only approach. 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 planning system – one that can be depoliticised by applying subsidiarity to the allocation of plan making roles across the different levels of governance, and one that ensures greater transparency and conceptual clarity in the application of upfront infrastructure development contributions.
Potential for land value capture

Land value capture districts should be identified around the transport corridor. These 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.

Affordable housing

Investment in city shaping 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.

Social impacts

Transport infrastructure can improve access to employment for low socioeconomic 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 socioeconomic 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.

Indirect effects

Infrastructure initiatives can also have indirect impacts on land use. This occurs 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, which allowed for the redevelopment of The Hobart Rail Yards, a former inner city intermodal terminal
- Barangaroo in Sydney which was made possible when port facilities were relocated to Port Botany
- The Bowden Clipsal factory redevelopment in Adelaide which was 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 (refer to Figure 14).

Figure 14  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). It connects the individual freeways that service Melbourne’s sea and air ports, and, as such, 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 follower infrastructure

Structural and follower infrastructure sits at the district, corridor, suburb and neighbourhood level to support and respond to strategic or city shaping infrastructure. Structural and follower infrastructure is generally planned using a more traditional approach to ITLUP, a cluster and connect model.

As discussed in Section 1, the cluster and connect model reflects the more traditional approach to ITLUP. There is already 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 Figure 15) involving:

- 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 15  ‘Cluster and connect’ model: relationship between land use, corridors and network planning*

Source: Transport for NSW, 2012
As noted in Section 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 perhaps introducing public transport such as light rail to calm traffic and promote local development, and
- complementary road network policies to ensure longer distance traffic remains on the state and national road network.

This section provides a best-practice approach to ITLUP at the corridor and local level by application of the cluster and connect model. The principles are intended to guide the ITLUP process which is expected to 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 follower 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 within the objective that everyday services and jobs will be accessible to residents in a short commute of 20 minutes.

However, often the principles developed are constrained because they have only an initiative-specific basis. In contrast, the principles identified below take a much broader focus, providing 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\(^8\) 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
- considering the impact of traffic on the safety of pedestrians and cyclists, parking, local businesses and activities, and environmental assets.

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\(^8\) 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. In some jurisdictions this is referred to as the subregional level.
7.1.2 Suburb and neighbourhood level

ITLUP at the suburb and neighbourhood level should address issues such as (Westerman 1998):

- local urban structure with opportunities for more sustainable development
- integration between local land use and transport to maximise accessibility
- choice in transport mode
- 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 which enhance, rather than detract from, the local environment.

7.2 Process

As discussed in Section 1, the integrated cluster and connect planning process for transport corridors should be aligned 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 2.

Table 2 Overview of ITLUP process for ‘cluster and connect’ planning at the corridor and local level

<table>
<thead>
<tr>
<th>Stage</th>
<th>Overview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set objectives</td>
<td>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.</td>
</tr>
<tr>
<td>Problem definition</td>
<td>This stage recognises that there is an issue or problem which 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.</td>
</tr>
<tr>
<td>Institutional setting</td>
<td>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.</td>
</tr>
<tr>
<td>Determine the desired outcomes</td>
<td>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.</td>
</tr>
</tbody>
</table>
Stage | Overview
--- | ---
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 which are relevant. The outcome will involve selecting and developing a package of tools/options which 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 NGTSM

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

Other relevant guidelines

The following guidelines are also considered useful references for Australian practitioners to implement ITLUP in relation to the cluster and connect model.

- **Principles for Strategic Planning**
  Produced by Austroads (1998)

Principles for Strategic Planning is designed to assist professionals, particularly those working in the fields of 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 aims to convey 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.

Whilst 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**

• **Planning Guidelines for Walking and Cycling**
  Produced by NSW Department of Infrastructure, Planning and Natural Resources (2004)
  The *Planning guidelines for walking and cycling* aim to assist land–use planners and related professionals to improve consideration of walking and cycling in their work. It is anticipated that improving practice in planning for walking and cycling provide will create more opportunities for people to live in places with easy walking and cycling access to urban services and public transport. This will help reduce car use and create healthier neighbourhoods and cities.

• **Developing a Local Cycle Strategy and Local Cycle Network Plan**
  Produced by Queensland Transport (2006)
  This series of notes aims to assist 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 is complementary to 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 were prepared to provide guidance to local governments to develop and implement integrated transport plans will enable an effective approach to local transport planning and transport infrastructure, maintenance and service delivery (where local government is a core player).
  The focus is on preparing plans rather than guiding initiatives, however 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 in order to provide improved 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 is an example of a tailored local council strategy that may be useful for other local governments.

**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 (refer to Table 3).

**Table 3  Implementation tools**

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

Source: Adapted from Westerman, 1998
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 (e.g. public transport, freight etc). 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).

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 please refer to *Cities for Tomorrow* (Westerman 1998).

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 16 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).
Integrated 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).

**Case studies**

A number of case studies across Australia demonstrate a best practice approach to ITLUP using the cluster and connect model.
Sydney 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 which sets out the principles including creating a safe shared environment for light rail and pedestrians and minimising the visual impact of light rail infrastructure (refer to Figure 17).

Figure 17  Principles for light rail as part of the concept plan

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.
Gold 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 18.

The urban design framework reflects 10 principles identified in the study:

- 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 18  Gold Coast Rapid Transit Corridor Urban Design Framework

High rise areas

These areas are to be the focus for renewal activity and where the tallest buildings and highest order uses are concentrated. Building heights of 15-30 storeys are supported, with some areas of unlimited height.

Medium rise areas

These areas include the frame areas of key city nodes, and the core of lower order centres. High intensity, compact buildings of up to 15 storeys are supported to reduce tower crowding, shadowing and view impacts.

Low to medium rise areas

These areas aim to accommodate compact lower rise buildings of up to 8 storeys that promote greater building diversity, affordability and better streetscape outcomes.

Low rise and transition areas

These areas support wider renewal and infill and manage the interface between higher density areas. Buildings of up to 3 storeys are supported, with opportunities for fourth floors where appropriate.

Legend

- Steady corridor
- Precinct boundary
- Gold Coast Rapid Transit route
- Gold Coast Rapid Transit station
- 400m Rapid Transit Station catchment
- Potential green bridge or crossing
- Proposed green bridge or crossing
- Primary active edge
- Secondary active edge
- Cross block km
- Key vehicular route
- Key pedestrian route
- Primary “green spine”
- Secondary “green spine”
- Public boat parking
- Gold Coast Health & Knowledge Precinct
- Existing open space

Source: City of Gold Coast 2011
8  Coordination

Infrastructure coordination will maximise the combined potential benefits of both land use and transport. Figure 19 illustrates the relationship between the phasing of strategic infrastructure versus structural/follower infrastructure in an effective coordination system. Strategic infrastructure is leveraged to help bring about a metropolitan settlement pattern that draws out economic, social and environmental benefits. Structural and follower infrastructure is then managed via a spatial sequencing process that ensures providers can externalise the risks associated with fragmented or out of sequence development.

Figure 19  Relationship between ‘Strategic’ and ‘structural and follower’ Infrastructure in city planning

Nowadays development is generally encouraged to provide consolidated urban growth and be coordinated with the provision of infrastructure being delivered.

Source: SGS Economics and Planning Pty Ltd
Some jurisdictions specifically do not support allowing ‘out of sequence’ developments at all. Other jurisdictions may, in some cases, allow developers to undertake out of sequence initiatives. Ideally, however, they should meet the cost of advancing infrastructure. This would send a higher price signal for that development compared with more consolidated urban growth.

### 8.1 Principles

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

- harness the city shaping power of key initiatives to ensure the city gets the most advantageous strategic infrastructure package.
- facilitate coordination of structural and follower infrastructure, to contain inventory costs by, in effect, fostering a just-in-time approach.

### 8.2 City shaping 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 city shaping infrastructure. The rationale behind these ongoing appraisals should be broadly consistent with that for the initial version of a strategic infrastructure plan. Figure 20 outlines the principles and processes involved in the ongoing coordination of Strategic Infrastructure.
Figure 20 A model for coordinating strategic infrastructure

Testing of infrastructure initiatives for impacts on accessibility and urban form

Strategic or city shaping infrastructure initiatives
  Identify packages of strategic initiatives in a zero base framework
    Package 1
    Package 2
    Package 3
    Package 4
      Cost benefit and economic impact analysis

Structural or follower infrastructure initiatives
  Manage via development sequencing framework

Preferred package of strategic initiatives
  Resolved funding strategy

Source: Adapted from Spiller et al 2012

Initiatives of strategic significance should be streamed into a further evaluation process within the coordination model, while follower infrastructure is managed via a development sequencing framework.

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 which, among other things, best supports the metropolitan planning framework for the city.
The process outlined in Figure 20 can be affected through centralised coordination institutions or agencies responsible for infrastructure planning. However, as discussed earlier, clarity and authority about the desired urban form 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 using the logic outlined. 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 guidelines.

### 8.3 Structural or follower infrastructure

The main objective for structural or follower infrastructure is to ensure that the timing and delivery of transport and land use is coordinated. The coordination of structural or follower infrastructure requires some form of market-based development sequencing which identifies a preferred pathway for development in a planning district based on minimisation of 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 alters a district’s geography of infrastructure capacity.

There are several examples across Australia where an out-of-sequence developer fully funded the 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

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 (Australian Transport Council 2010).
The experience across Australia differs 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 often restricts 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 play a key role in identifying the appropriate sites for new facilities, particularly in greenfield areas.

Vertical coordination between the Australian Government and local governments is an important driver of ITLUP. 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, not only through the funding of infrastructure initiatives but also in relation to the management of ports and airports, alongside a number of other responsibilities in setting the framework for investment in a number of sectors that impact on ITLUP. Badgerys Creek Airport presents an example of a city shaping initiative which requires coordination from all three levels of government.
Case study: 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 statewide 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.
Badgerys Creek (NSW)

In April 2014 the Australian Government announced Badgerys Creek as the preferred site for a second airport for Sydney. This provides the opportunity to reshape and fundamentally strengthen the economy of outer western Sydney through effective coordination, particularly between the Australian and NSW Governments due to the varying responsibilities that each level of government holds.

In terms of support infrastructure, the Australian Government initially announced a package of road infrastructure initiatives to support the development (refer to Figure 21). Transport for NSW has announced a potential corridor for the extension to the South West Rail Link that would service the airport at Badgerys Creek. The alignment and staging of the rail initiative is yet to be confirmed.

According to the draft Airport Plan (Department of Infrastructure and Regional Development 2015), Stage 1 does not include the rail service because the road network upgrades is seen as adequate to support the anticipated demand for the first 10 years of operation (2025-2035). The draft Airport Plan states that the timing of the rail connection is to be based on the cumulative demand from the airport and surrounding growth and development (Department of Infrastructure and Regional Development 2015). This highlights a potential lack of consideration of the opportunities for growth that the rail connection could create during the first decade of operation.

From a land use perspective, the NSW Department of Planning and Environment is coordinating land use development in surrounding precincts, particularly the Western Sydney Employment Area and South West Growth Centre (refer to Figure 21).

To optimise the city shaping power of the airport, the staging of land release and the timing of major redevelopment areas, particularly the Western Sydney Employment Area, will be crucial and this will be subject to strong coordination between governments.
Figure 21  Western Sydney airport site and infrastructure

Source: Department of Infrastructure and Regional Development, 2015
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