

**BEDP ENVIRONMENT DESIGN GUIDE****PLANNING FOR TRANSIT-ORIENTED DEVELOPMENT IN AUSTRALIAN CITIES****Peter Newman****Summary of****Actions Towards Sustainable Outcomes****Environmental Issues / Principal Impacts**

- The car dependence of modern cities has significant environmental impact.
- Considerable reductions in car travel can be achieved through urban design based around TODs.
- This links to green buildings by showing how design context cannot be overlooked.

**Basic Strategies**

*In many design situations boundaries and constraints limit the application of cutting EDGe actions. In these circumstances designers should at least consider the following:*

- TODs are essential to building a sustainable city.
- TODs cannot happen unless they are part of a strategic plan for centres, have a rapid transit base (at least in planning stage), have a statutory mechanism for their creation, and are developed with private and public owned partnerships (at least for land development incorporated in them).
- This paper examines each Australian city to see how it fits these criteria.

**Cutting EDGe Strategies**

- The missing link in TODs in Australia is mostly through the lack of a statutory mechanism and facilitation by government, as well as a lack of public-private partnerships around TODs.
- Most Australian cities can see the value of TODs and have broad strategies in place.
- The outer suburbs of Australian cities need more rail extensions to make them suitable for TODs.
- TODs are failing in many cities due to a lack of support to overcome anti-density resident protest movements.
- Unless a TOD can have a minimum of 10,000 residents and jobs within 1km of its centre they will not be dense enough to overcome car dependence.

**Synergies & references**

- <http://www.patrec.org/conferences/TODJuly2005/TODJuly2005.html>
- *BEDP Environment Design Guide:*
  - GEN 17 Urban Planning for Sustainability
  - GEN 62 Sustainable Communities
  - GEN 70 Liveable Communities – Fostering Sustainable Cities and Regions
  - GEN 72 Planning the Green City
  - GEN 74 Metropolitan Planning – Balancing Place and Sustainability

# BEDP ENVIRONMENT DESIGN GUIDE

## PLANNING FOR TRANSIT ORIENTED DEVELOPMENT IN AUSTRALIAN CITIES

**Peter Newman**

*Transit oriented development is a way of redeveloping a city to reduce car dependence. This paper outlines its basic tenets by examining four strategic policy questions: why we need centres throughout the city and of what kind of density and mix; why we need a rapid transit base (usually electric rail) to link these centres; why we need a statutory planning process requiring TODs and how governments can facilitate them; and why public-private partnerships can make them work better. It illustrates these four strategy areas by examining how they are being applied in Australian cities.*

### Keywords

*Density, mixed-use, pedshed, public transport, rail, TOD, Transit Oriented Development, urban planning*

### 1.0 INTRODUCTION

Transit Oriented Development (TOD) is now a core strategic focus in urban planning. TOD planning requires a commitment to 'centres' and to transit as its core ingredients – together. Building urban centres linked to transit enables cities to respond to the simultaneous need to be focused into centres, to achieve greater viability of services and at the same time shift away from the highly centralised CBD-dominant structure for city employment and services. At its heart transit oriented development is a way to reverse car-oriented planning which has created the car dependence of modern cities. It enables all forms of public transport to be upgraded in relevance and viability and perhaps most importantly, it creates opportunities for 'walkable' cities to be implemented.

Transit oriented development requires a strategic planning framework that has a set of policy tools to help implement TODs. This paper sets out four strategic planning tools for implementing TODs. The model is applicable anywhere but is applied in this paper to Australian cities to demonstrate their application.

The four strategic planning tools for TODs are:

1. A strategic policy framework that asserts where centres need to occur and at what kind of density and mix;
2. A strategic policy framework that links centres with a rapid transit base, almost invariably electric rail;
3. A statutory planning base that requires development to occur at the necessary density and design in each centre, preferably facilitated by a specialised government development agency; and
4. A public-private funding mechanism that enables the transit to be built or refurbished through a linkage to the centres it will service. The private involvement can be just in the land development or can also be in the transit system.

### 2.0 FOUR STRATEGIC PLANNING TOOLS FOR TODS

#### 2.1 A Strategic Policy Framework that Asserts Where Centres Need to Occur and at What Kind of Density and Mix

Why do we need centres in a strategic plan?

##### 2.1.1 Centres Provide Services and Amenity Based on Economies of Scale and Density

Most urban services and amenities cannot be provided unless a certain minimum number of people are there to make them viable. This has been understood for centuries as the basis of the existence of cities as distinct from rural areas (Jacobs, 1984; Mumford, 1961). However in the era of the automobile where transport to services and amenity could be assumed to be by car, the provision of centres of activity has been downplayed or decried (Troy, 1996). The UK Town and Country Planning Association's motto was "nothing gained by overcrowding" (King, 1980). This became the signal in many Anglo cities for the planning of car dependent suburbs and the denial of the need for centres.

Car dependence has reached its limits (Newman and Kenworthy, 1999) both environmentally and physically. See the box below explaining why limits are being experienced, especially in sprawling car dependent cities.

Cities are now breaking down because of car dependence and the problems of climate change and peak oil production are beginning to further undermine the extremities of cities built this way. Governments and the market cannot provide the services and amenities of centres in any kind of viable system if houses and jobs are scattered and spaced without focus (see below for data on this). In particular they cannot provide an appropriate public transport system and hence households are increasingly vulnerable to the cost of car travel, especially fuel prices. Thus centres are being reinvented in car dependent cities such as Australia and North America, to help create viable dense nodes required within these cities (Newman et al, 2003).

**Are there limits to city growth? Marchetti suggests yes...**

Planners have suggested for 50 years that cities may have an optimum size beyond which they begin to become dysfunctional. However no such size limit has been found based on social, health, economic or environmental factors. The Mega cities of the world have continued to grow by becoming more and more dense. In recent years the outward growth of some cities have begun to slow. If they do not increase in density these cities begin to slow in population growth. This may be explained by the 'travel time budget'. The Marchetti travel time budget suggests that every city has an average travel time of around 1 hour total a day (Marchetti, 1994). This constant means that when a city grows beyond its 'one hour wide' size it will begin to become dysfunctional in transport and human terms. Road rage is just one of these symptoms. The limit depends on a combination of travel speeds and densities. Based on this understanding, a city with an average speed of 40 kms per hour and 100 people per hectare would become dysfunctional after 12 million; a city of 10 people per hectare and 50 kms per hour average speed will become dysfunctional after 2 million people. Sydney has a density of nearly 20 persons per ha and Perth is closer to 10. (Newman and Kenworthy 1999). Such limits to growth in sprawling car-based cities are beginning to be seen. No obvious technological changes are going to change this, though fast rail is a possible solution for traffic-congested cities to break their dysfunctional transport system. Electronic communication is not changing the need for human contact in cities. City limits are one of the driving forces behind the move to build fast rail systems in over 100 cities in the USA, with rail and bus rapid transit (BRT) to be built in many developing cities.

(Marchetti, 1994)

The question that then follows is: what kind of density and mix of activity can give rise to urban services such as shops, jobs, cinemas and adequate public transport services in centres? Data from a series of studies have been collected to provide a basis for this (Newman and Kenworthy, 2006). Jeff Kenworthy and the author's research has shown an exponential increase in transport fuel use per capita as cities become less dense. In more recent studies this research has shown that the same pattern can be found within a city whether it is Paris, Baltimore or Melbourne. In Figure 1 the data for Sydney illustrates how transport and density are linked. The measure for 'Activity Intensity' is the combined number of jobs and residents per hectare.

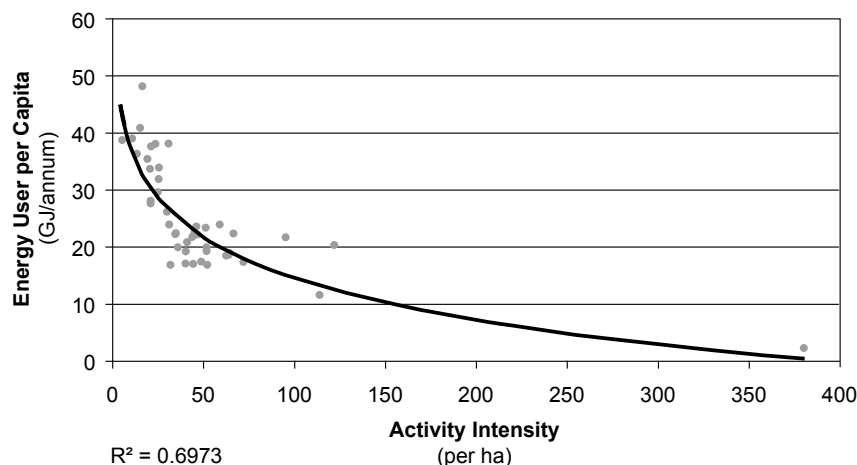
The curve above is found to be the same shape in every city and suggests a critical density at which car use increases dramatically. The combination of residents and jobs is important as both generate transport. The data from global and Australian cities by local government area suggests:

- A minimum of 35 people and jobs/ha of urban land is required before transit, walking/cycling and short car trips combine to reduce the need for driving.
- This kind of density is associated with a minimum range of urban services and amenity in a local centre.
- If established within the limits of a 1 km radius, a local centre can be created with about 10,000 people and jobs.
- If within a 3 km radius, then a town centre can be created with around 100,000 population and jobs.



**Figure 1. Joyce-Collingwood Station precinct in Vancouver**

An example of the kind of centres required around transit to reduce car dependence. These are contemporary "walking cities" linked to transit.



**Figure 2. The link between private transport energy and the density of the combined number of residents and jobs by local government area, Sydney 2002.**

(The tipping point at 35 resident/jobs per hectare is discussed in detail in the source: Newman and Kenworthy, 2006)

In effect, established city Central Business Districts (CBDs) are TODs, generally with a greater radius than 3km and where intensities of job/residents exceed 100,000. Planning for TOD is understood to create small 'CBDs' throughout the metropolitan area, but with a maximum size of a 1km radius. This measure is considered the 'pedshed' or maximum distance people are prepared to walk.

Thus the data from this research suggests that for a TOD there should be a minimum density of residents and jobs of around 10,000 in a 1 km radius. Some centres will have more residents than jobs and others the reverse; the importance of a mix is increasingly being found to ensure more walkable, local destinations (Cervero, 1988).

### 2.1.2 Centres Enable Car Dependence to be Reversed Without Destroying the Character of Suburbs

The kind of TOD strategy outlined here suggests that if centres of an appropriate density and mix can be created then not only are viable centres created but the pressure on suburbs for unpopular infill (i.e. 3 storey or higher development) is considerably reduced as it enables development to be focussed where it is needed. Many suburbs will continue to be redeveloped, especially those where populations and services are declining, however the wholesale rebuilding of suburbs can be avoided if centres are the focus of development. This rebuilding is a major political issue in all Australian cities and increasingly TODs are being seen as a resolution to the conflict between developers and 'save-our-suburbs' movements (Newman, 2005).

The kind of city envisaged by a TOD oriented future can build on the character of many suburbs yet still provide the services and amenity contemporary city residents are demanding, particularly a viable transit system. Central to this is the building of viable centres.

Electric rail and TODs make a sustainable lifestyle possible, like Vauban in Frieberg which is an eco-TOD with car-free neighbourhoods.



**Figure 3. Vauban in Frieberg, Germany**

## 2.2 A Strategic Policy Framework that Links Centres With a Rapid Transit Base, Almost Invariably Electric Rail

Why do we need rapid transit in a strategic plan?

Rapid transit is being built or proposed for the following reasons:

### 2.2.1 It Assists Cities in Their Wealth Creation

Car dependence is expensive. The link between the wealth of a city and its car use is very weak, it is certainly not statistically significant (only 18 per cent of the variation is explained, Newman and Kenworthy, 1999). European cities tend to be the wealthiest in the world yet have half the car use of US cities. Wealthy Asian cities like Hong Kong, Tokyo and Singapore have ten times the per capita wealth of Bangkok, Jakarta, Kuala Lumpur, Manila, Surabaya, Seoul and Beijing, but per capita car use is less. Many wealthy cities have put their wealth into good transit infrastructure. The result is not a city that is poorer because it wastes money on public transport as suggested by many economists (particularly Treasury officials). Indeed the data suggest that the more a city has committed itself to public transport infrastructure the less the

city spends overall on transport; and the more a city has built itself around car dependence the more of the city's wealth is wasted on just getting around (Newman and Kenworthy, 1999). Car travel is estimated to cost around 85¢ per pass.km compared to 50-60¢ per pass.km in public transport (House of Representatives, 2005).

There is an equity argument here too as the poor in Australian and American cities are increasingly moving out to car dependent areas where they save money on housing but lose heavily on transport, with some families spending up to 40 per cent of their income on transport (see STPP and Centre for Neighbourhood Technology, 2005). Households in car dependent cities in the US are now spending more on transport than on their mortgages which helps explain why oil price increases contributed to the sub-prime mortgage meltdown in late 2007. Continuing non-viability of such car dependent urban sprawl threatens the abandonment of whole suburbs similar to the kind of inner city abandonment found in US cities in the 1960's.

TODs can offer cities economic advantages whilst removing this vulnerability. Much of the marketing benefit of TODs has been outlined by a Centre for Transit Oriented Development (2005) study which showed that people living in TODs in the US had the same age and income as those not living in TODs but had one less car per household (0.9 if in a TOD compared to 1.7 if not). This was found to lead to a 20 per cent increase in their available household wealth. This benefit aids the promotion of TODs. These savings are not just of value to households, but also local governments, who soon find that this extra available wealth is largely spent locally on local goods and services. Buying a car would not do the same thing. Hence TODs are a means of helping to create local economic development.

### 2.2.2 It Reduces the External Costs of Car Dependence

It has been well documented that car dependence is costly in terms of environmental, social and economic externalities; e.g. McGlynn and Andrews (1991) suggest an extra 20¢ per pass.km would be needed to pay these costs. Government costs due to accidents, pollution, noise etc have been estimated and compared to the government revenue benefits of the road system in Australia and there was an overall "road deficit" of \$8 billion in the late 1990s (Laird et al, 2002). The biggest looming problem of car dependence is oil vulnerability and here the 'coalition of the willing' is US and Australian cities which have by far the biggest vulnerability to the looming global oil production peak (Newman, 2007).

US cities average around 2000 litres per person per year and Australian, Canadian and New Zealand cities average around 1000 litres; while European cities are closer to 450 litres; and Asian cities are 275 litres per person per year on average. Electric rail systems (with TOD built around stations) will withstand this crisis far better than urban areas with extensive car dependence.

Electric rail continues to be the most efficient form of motorised transport as it alone does not have to carry its own fuel. The data from the Kenworthy and the author's *Global Cities Database* are outlined in Table 1.

Transportation mode	MJ per passenger Km (average all cities)	Measured average vehicle occupancy (average all cities)
Car	2.91	1.52
Bus	1.56	13.83
Heavy rail (electric)	0.44	30.96
Heavy rail (diesel)	1.44	27.97
Light rail/tram	0.79	29.73

**Table 1. Fuel efficiency and occupancy by mode in global cities, 1990.**

**Note: heavy rail occupancy is per carriage**  
(Source: Newman and Kenworthy, 1999)

### 2.2.3 It Saves Time

As discussed above, people do not want to travel more than an hour a day. This has become known as the **Marchetti Principle** (Marchetti, 1994). The switch to more sustainable modes of transport will not occur if it means people go beyond their travel time budget. Thus a city will only be truly moving towards a less car dependent future if it can:

- build a rapid transit system down every corridor faster than road traffic; and
- build centres where walking, cycling or a short bus or car trip, become the means of reaching local urban services as they are quick to reach.

TOD can be used to save time for local and long distance travel, however TOD centres only attract the necessary development potential around them if they are linked by fast transit. Almost invariably this is electric rail due to its speed (acceleration/deceleration, cruising speeds and egress/ingress speeds which are all significantly better than buses, even in busways). Bus cities have transit speeds of around 20-25 kph while rail cities have transit speeds of 35-40 kph which are competitive with overall traffic speeds (Kenworthy and Laube, 1999). Rail gives transit an edge in speed which is crucial to being competitive. In the cities of many developing countries and in some corridors where rail is not available, bus rapid transit is providing the extra speed required over road traffic, though rarely as fast or with the capacity advantages of rail. Buses provide the necessary flexibility around suburbs, but work best at this local role rather than at line haul functions which require speed, capacity and certainty.

### 2.2.4 It Saves Space

The reason that many cities switch from buses to rail is that their city centres can get completely jammed with very slow buses. The Bangkok effect or **bus bunching** is due to a capacity factor that is even more obvious with cars. Table 2 shows the relative capacities of modes.

Mode	Carrying capacity (people per hour)
Freeway lane	2,500
Bus lane	5,000 to 7,000
Light rail	10,000 to 20,000
Heavy rail line	500,000

**Table 2. Modal capacities**

(Source: Vuchic, 2005)

Thus the space requirements of car dependence are 20 times those of rail. The costs of such space are considerable and help to explain why most central cities cannot function without rail access. If the 200,000 people/day who access central Sydney had to get there by car it would mean an extra 65 freeway lanes and 782 ha for car parks. Rail makes spatially constrained cities work.



**Figure 4. Rail lines along roads**

Germany has shown how TODs can be built linking a station across a highway containing a rail line. This will be needed as more and more highways are converted to include a train system

### **2.2.5 It Creates City Spaces Suitable for the Knowledge/Services Economy**

The key to the new economy based on transactions between knowledge/services professionals is the ability to meet and interact. Electronic communication can be used to follow up the creative interactions that occur face to face. As the distinguished planner Sir Peter Hall said after assessing what it is in cities that creates economic innovation: "The new world will depend as the old world did on creativity and creativity flourishes where people come together face to face" (Hall, 1997). This explains why car dependent shopping centres are not attracting the new economy jobs and the older centres are. Cities therefore need centres in old and new suburbs which are dense, mixed and walkable, to create such interactions. This is the philosophy of the New Urbanists (Calthorpe, 1993) and although their human-oriented urban designs are critical, so is the role of rail in creating spaces where bitumen is not the dominant land use.

### **2.2.6 It Creates Certainty for Investment**

Transit, especially rail, is fixed and it lasts a long time, certainly beyond the period which most investors need to get their investment back. Bus routes change, even bus lanes and busways are flexible though major rail and bus rapid transit (BRT) systems cannot easily be moved. Transport planners have been heavily oriented to flexibility but nothing can compete with the flexibility of cars if road space is sufficient - certainly no bus system can. But once road space is constrained the existence of fixed rail and BRT systems becomes critical. If built they provide the certainty investors need. Rail and BRT thus offer both a real transport solution and a real land investment opportunity. Cervero (2003) has shown in over 30 studies in the US, that access to rail station land provided proven land value premiums. An Australian developer has created a fund for creating TOD in Perth as its rail projects offer potential for at least 15 per cent higher return in the areas around stations due to the attraction of the new rail system.

## **2.3 A Statutory Planning Base that Requires Development to Occur at the Necessary Density and Design in Each Centre, Preferably Facilitated by a Specialised Government Development Agency**

Why do we need a statutory planning process to require development in centres?

### **2.3.1 TODs Cannot be Left to Local Politics**

Strategic planning is necessary but not sufficient. It needs to be translated into a statutory planning mechanism that requires density and a mix of use in centres. This requires clear zoning and an urban design and planning system that can facilitate TODs. This is generally the result of a partnership between local and state governments as invariably if it is left just to local governments the regional perspectives are lost. TODs are part of a metropolitan-wide network which is usually established within that planning framework. However when they come to be built TODs always face local issues by which they can be undermined unless regional government (in Australia this is usually state government) can facilitate a regional perspective.

#### **Local government**

Local government is usually closely tied into local politics and there are often groups opposed to redevelopment and density increases that undermine many TOD projects. Australian and American cities are littered with examples of unrealised TODs. The rationale for the local reaction is often that density is socially dangerous and unhealthy though the evidence for this is not found in the research literature (Newman and Kenworthy, 1989), or on the ground after such development. If TOD implementation is going to be left to local councils to do by themselves, there will be much less achieved, as projects are generally watered down by local reactions.

### Housing affordability

One of the key benefits of TODs is that they enable affordable housing to be built as part of the project. Units can be built for under \$100,000, though often high density faces other problems such as extra red tape and extra construction costs due to union requirements. These issues are not fundamental to the nature of the development though and can be overcome, especially where good partnerships exist that are part of the governance structure. Dense TODs thus can enable housing affordability but generally this needs to be required as part of the development through a statutory mechanism. Affordable housing strategies are needed to make the most social benefit out of TODs, though this is not usually what local communities would prioritise. Every city has different needs for affordable housing and different potential policies that can work. Vancouver has required 15 per cent affordable housing and Boulder now requires 40 per cent in each new development. Gorowitz has summarised affordable housing techniques in TODs (Gorowitz, 2007).

Regional planning perspectives are necessary in the local political mix but they don't often get a hearing in local media and decision-making. Australian and American planning will continue to emasculate TODs by local politics if that is all that is considered. A governance structure seems necessary to facilitate such good things as affordable housing in TODs.

### 2.3.2 TODs Require Regional Planning Resources

Most TODs require land subdivisions to be repackaged, roads redesigned and reorientation towards the rail system. Proactive planning processes that create these land packages and do the detailed urban design are usually beyond local government resources. In the US this is often done by private developers and in Australia by government land development agencies. Both need local government involvement but the history of TOD development in Australia is such that without State Government intervention little happens. The best TODs in recent years came from the Federal Better Cities projects in the early 1990's such as Subiaco and East Perth in Perth, Pyrmont in Sydney and South Bank and Fortitude Valley in Brisbane. These were all linked to state development agencies.

The role of government in facilitating TODs such as those outlined above is not just in technical planning but also in public engagement and communication processes. Regional perspectives are needed to communicate why centres are required and how viable regional transit systems cannot happen without such centres. Development agencies for TOD can bring the creative human resources for charrette, visioning workshops, citizens' juries and so on, to enable these issues to be considered. Most redevelopments in Australian and American cities are required to have public engagement processes and an increasingly educated public is not satisfied with decisions made in a defensive top-down mode.

In order to assist TODs there needs to be zoning that enables the specific benefits of TODs to be built into the

planning system. A specific TOD zoning which enables these kinds of mixed use, dense centres with minimal parking and a proportion of affordable housing, can assist considerably in their delivery (Gorowitz, 2007).

Developers should be given special incentives if they build in a TOD perhaps using density bonuses or time benefits in the approval process in order to ensure the social benefits of having well located affordable housing, can be achieved. Communities need to see there are benefits in such a TOD zoning. Perhaps as with a Vancouver-like process where 5 per cent of the cost of a development in a TOD goes to social infrastructure such as community centres and public space landscaping, determined in partnership with the local community.

## 2.4 A Public-private Funding Mechanism that Enables the Transit to be Built or Refurbished Through a Linkage to the Centres it Will Service

Why do we need a financing mechanism for transit in developing TODs?

### 2.4.1 Urban Rail Development in Australian Cities has Floundered Since the 1960's While Road Development has Creatively Found Financing Mechanisms

Evidence for the above statement has been gathered by Laird et al (2002). Transport funding in many western democracies has had two radically different approaches in recent history:

- 1960s to 1990s: Centrist Road Planning.** Federal funds in the USA and Australia were the major input into transport from the 1960s but this was tightly controlled and channelled into roads. In Australia during the period 1974 to 2000 \$43 billion went to roads and \$1 billion to rail (Laird et al 2002). Rail managed to survive through the support of state governments but it was rarely expanded through any capital works. Only Perth did anything of significance in this period with new rail and this was because of an intensely political process (Newman, 2001). Brisbane's rail was electrified by a Federal grant from the Whitlam ALP Government and this was the only significant venture by Federal transport into rail. This era saw major roads built in all Australian cities feeding rapid urban sprawl and car dependence. The cost effectiveness of this was never challenged. Rail was never able to generate the political clout during this period to have tied funding like roads, where no market process was ever considered necessary. In the US a political lobby for alternative transport was successful in changing the system to enable road funds to become transport funds and the priorities for funding of each mode had to come from each local city, thus unlocking the many rail projects now happening across the country. No such mechanism exists in Australia.

- 2000's: Market Road Planning.** Tied road funding from the Federal Government to Australian cities stopped after the GST tax was considered sufficient for all state needs. Thus responsibility for transport in cities has been given solely to each state and territory, though Federally-funded regional roads still often come into cities. Federal transport funds for regions are still mainly for roads, but can include freight rail in the AusLink program. States/territories can fund roads or rail but the politics of funding transport when health, education and police are always higher on the agenda, means that road funding often goes elsewhere. A market process was thus discovered by the states using private capital and toll roads. After early models where government guarantees were needed, the system is now delivering major projects where the state government can not only get a road but a substantial cash grant from the private consortium just for the right to build it. Thus in Sydney over \$10 billion worth of toll roads has been built since the mid-1990s. Most other Australian cities are moving to tollways; with only Perth withstanding this move. Similar processes have happened in the US where increasingly road funding is through toll roads. The difference in the US is that Federal funds can be used to fund rail through partnership agreements between cities, states and their Federal Government.

When rail is built it tends to increase the value of land around it. Value capture techniques such as special rates can create the possibility of public-private partnerships around rail-based TODs. No market-based financing method has yet been developed for rail in Australia or the US apart from in the US:

- Portland's tram which was largely privately funded
- and in Australia:
- some additions to Melbourne's rail system where stations were built largely with private funds
  - the part private funding of Sydney's light rail.

Proposals for building fast rail systems using tollway financing have been suggested in Australia such as the Western Sydney Fast Rail, and proposals for building light rail using land development opportunities have also been considered in most Australian cities, though none have proceeded. Self-funding examples of both are found in other parts of the world, for example the whole Hong Kong rail system makes a profit through its land development functions. No such mechanism has yet been facilitated or approved by state governments in Australia or in the US (Hass Klau, 2004).

#### 2.4.2 Public-private Partnerships for Rail Projects Automatically Integrate Centres

A state government building a rail line entirely as a transport proposition can mean that it is optimised around rail operations without any consideration for the linking of centres or building of TODs. This has mostly been the history of rail development in Australia and the US in recent years. However if the private sector were to build rail in partnership with government with land development financing, rail would automatically be integrated with land use as a function of its funding. Privately funded rail, even if only in part, will give the advantage of attracting customers through adding dense, mixed use TODs around its stations. Thus public-private funding arrangements for rail are likely to be an inherently more effective way of creating TODs than state funding alone.

### 3.0 APPLYING THE FOUR PRINCIPLES TO AUSTRALIAN CITIES

These four strategic planning approaches have been evaluated and summarised in the Table below to see how they apply to Australian cities.

City	Strategic policy for centres	Strategic policy for rail transit	Statutory process to implement TOD	Public-private funding mechanism
<b>Sydney</b>	Yes, <i>City of Cities: Metropolitan Strategy</i> , 2005.	In past decade – weak. New rail project has huge potential.	Yes in new areas; centres are being given a major overhaul.	Potentially, but none as yet.
<b>Melbourne</b>	Yes, <i>Melbourne 2030</i> , 2001; but struggling.	Weak. At present mostly rail.	Yes but these are not strong in implementation.	No.
<b>Brisbane</b>	Yes, <i>SEQ 2030</i> , 2006; but not well defined with clear goals for each centre.	Yes. Present rail mainly but new rail lines and busways are being built.	Some, through concessions on density around stations.	No.
<b>Perth</b>	Yes, <i>Network City</i> , 2004; but not well defined.	Yes.	No.	No.
<b>Adelaide</b>	Yes, <i>Metropolitan Adelaide Plan</i> , 2006; but not well defined.	Weak on rail.	No.	No.
Others: • Canberra • Hobart • Newcastle	Yes, but not well defined.	No.	No.	No.

**Table 3. Application of four part TOD strategy to Australian cities**

### 3.1 Sydney

TODs can be found across Sydney, for example in Chatswood where the already very compact centre is having three large residential towers built over the new rail line from Epping. And also at Bondi Junction, Parramatta, and Edgecliff which have all been growing. Sydney has had a long history of locating major shopping centres around stations and hence has substantial TODs already. Recently the Kogarah Centre was built, which is quite possibly the best eco-TOD in the world, with its mixed-use centre built adjacent to the station and its low water and low /renewable energy design.



**Figure 5. Chatswood in Sydney is one of Australia's best TODs**

The redevelopment or consolidation of Sydney has been quite dramatic in the CBD, North Sydney and Parramatta. The new Metropolitan Strategy (NSW Government, 2005) is based on extending this centres-oriented development model to a range of further centres, from large centres like Liverpool and Penrith down to smaller ones with TODs around every station. It is partly designed to take the pressure off suburbs where redevelopment has been too rapid and partly to make centres more viable as places that can compete for new knowledge economy jobs and the provision of services. The Metropolitan Strategy also seeks to facilitate six **Transit Cities** that can be linked by rapid transit and provide the basis of a less car dependent city (see Newman and Kenworthy, 2005). Funding of strategic plans for each of these centres with clear goals for population and jobs in each has meant that Sydney's commitment to centres is very clear through a well articulated State Government vision developed in partnership with local governments (sometimes in regions).

The era of road tollways has been so dominant in Sydney over the past 15 years that it has made vision for future rail difficult. The politics of rail have not been helped by operational problems such as over-manning, and thus the priority in the past decade shifted to roads and busways. The \$10 billion of private funding for tollways in the past 10 years would not have been so easy had rail been more manageable. However the most recent proposal for the NW-SW 'Global Arc' rail is a fantastic opportunity for TOD, and will link the growth centres from the Rouse Hill and Leppington areas through a new under the harbour tunnel. It takes over from Perth's rail projects as being the most visionary rail proposal that has been put together in Australia in the past 50 years. It is now generating TODs at all stations along its length, though no mechanism of value capture is being used to help build the rail system. If such a mechanism could be developed it would enable the Metropolitan Strategy to have a market base for its plan, which is to bring most new people to Sydney into redeveloped urban centres which are attractive and far less car dependent.

A statutory process to guide TODs is in place for the new land release areas in New South Wales through a government Growth Centres Commission with all the required powers to ensure density and design are sufficient to create viable centres. Although nothing yet is in place to ensure they will be at the densities considered necessary as outlined above. A range of different state-based processes have been created for designated development areas such as TODs for the rest of the Sydney, including some that are under the direction of the NSW Government's development agency Landcom.

Sydney has no rail public-private financing system in place, but it has much potential:

- it has demonstrated one possible mechanism through the development levy on new blocks in the Southwest Land Release area;
- it has a proposal for a Western Fast Rail passenger system that is entirely privately funded based on the tollway model; and
- it has a light rail consortium prepared to look at ways of financing extensions to the small LRT system through a land development mechanism, though this is only possible in partnership with State and Local government.

The new NW-SW 'Global Arc' rail has the potential to provide the basis for this new funding mechanism, perhaps involving the Federal Government. It was suggested in the Federal Government's 'Sustainable Cities' report (House of Representatives, 2005) that rail funding in cities should be on the Federal agenda. Regions of local governments having a vision for how TODs could work around this new fast rail system are likely to be in a strong position to take advantage of funding as it shifts away from car dependence to such locations.

### 3.2 Melbourne

Melbourne has a strategic policy for centres based on its *Melbourne 2030 Strategy*. This requires 13 'transit cities' all on its extensive heavy rail network. Melbourne however has a much less TOD-oriented past than Sydney and many of its centres, especially large retail, are located off its rail network. Attempts to create more TODs in the past around its rail system have met with virulent opposition from some parts of the community (Birrell et al, 2005). Thus the success at implementing Melbourne 2030 so far has not been evident.

A rail vision for Melbourne is not yet clear despite several planning studies. Melbourne has an extensive rail network, especially its very large light rail (tram) system, and its heavy rail network which has recently been upgraded with fast trains to regional centres like Ballarat, Bendigo and Geelong. However new rail lines are painfully slow and difficult to create. The proposed spur to the new government agency suburban creation: Aurora, was to be the first new heavy rail extension but this has been postponed. The proposal for a Rowville extension (through Monash University) has not been successful, despite linking a series of major knowledge economy centres with huge TOD potential. Light rail extensions have been completed successfully on a few Melbourne tram lines.

The need for a statutory process that requires TODs to be developed is obvious in Melbourne where local opposition has been so devastating to their regional plans. The regional benefits are huge but the local opposition is well organised and dramatically political, mostly on NIMBY or 'not in my back yard' grounds (Newman, 2005). Creative public processes to resolve these tensions are necessary as well as the political nerve to implement them. This needs an institutional structure like a development corporation to assist local authorities.

There is no clear public-private financing mechanism for rail in Melbourne despite some small attempts with light rail to the Docklands and the city loop. Both of these projects demonstrated clear TOD benefits through dense developments that have been attractive for people to live and work in.

### 3.3 Brisbane

Brisbane has a new strategic centres policy in South-east Queensland's SEQ Regional Plan 2004. This plan sets aside 80 per cent of the SEQ area as a 'no go' zone for development in order to contain urban sprawl and instead concentrate development in a series of centres to support high frequency public transport. Higher density centres are not a feature of the SEQ region, apart from the Brisbane CBD and the Gold Coast; hence there is some cynicism about whether such a strategy is feasible (<http://www.cpd.s.qlg.gov.au>). However the infrastructure to enable rail-oriented development has now been assigned and thus new rail lines (complete with TODs) are being extended to the Sunshine Coast and Springfield, as well as an advanced light rail proposal for the Gold Coast. These projects

have demonstrated that state and local governments can develop innovative and visionary rail projects in Australia, though they are yet to be realised.

Rail patronage has continued to grow in the SEQ region despite the fact that most of the investment in recent years has been in expensive busways and most of the region's infrastructure plans are for road tunnels and freeways. The new rail-orientation promises to assist the development of TODs in South East Queensland.

No statutory planning mechanism for TOD currently exists in Brisbane. The one-off redevelopment project in Fortitude Valley has been the most impressive Australian example of a state-local partnership. This was the result of a strong government institutional framework that came out of the 1980s Federal Government Better Cities programme. Here large areas of redundant industrial and warehouse land were redeveloped with very clear benefits for the public and private sectors. A similar entity is required to make its TOD centres work.

No funding mechanism for rail involving public-private interests has happened though the opportunity existed in the failed Brisbane Light Rail project and in the proposed Gold Coast Light Rail.

### 3.4 Perth

Perth has a new strategic plan called Network City, which is designed to contain urban growth and focus it on centres and corridors. The plan is less specific about a growth boundary than the other strategies in Australia, although a recent planning court decision on Moore River has shown that urban sprawl will not be allowed as it is 'not sustainable'. The Plan is also less direct about how much of the future population or jobs should be focused in particular centres. However the plan is clear that urban growth should be transit-oriented, and a new TOD Strategy is being developed through a cross-agency TOD Committee.

Perth has the most ambitious urban rail vision of all Australian cities although it also had the least extensive urban rail system to build on. With the completion in 2007 of the 80 km rail to Mandurah (its \$1.5 billion cost having been already paid off due to the WA mining boom) the system will have around 180 km of fast electric rail line with 72 stations. This is a huge turnaround for a city that had no electric rail in 1990. Other potential lines and several light rail projects with links to new developments have been mooted, though none of these has yet been confirmed.

Private sector proposals for dense development in TODs, in partnership with local governments, are now appearing all along Perth's new rail system. There has been some statutory guidance on TOD for 15 years in Perth, but that has been of absolutely no consequence in the planning of most station areas during the period in which the State Government was making this substantial rail infrastructure investment. The only TODs to have been built have occurred at Subiaco and East Perth, due to State Government intervention with the Subiaco and East Perth Redevelopment Authorities

and Federal Government involvement through the Better Cities program. No mechanism requiring local authorities to provide TODs existed until a 2006 State Planning Policy Urban Growth and Development made a very clear requirement for TODs.



**Figure 6. Subiaco in Perth has rebuilt its centre around this new TOD.**

The model of development that occurred in Subiaco and East Perth is possible for all TODs. The mooted Development Authority (combining the Redevelopment Authorities and LandCorp) could have responsibility for all TODs with clear powers to assist in their design and development. This would appear to be necessary for widespread adoption of TODs though a few examples of planned TODs down the new southern line are being developed by local authorities. To assist their implementation a TOD Committee has been formed from across government agencies try to remedy some of the lack of co-ordination and focus on TODs in Perth. This will help, but unless there is a clear statutory requirement in the Metropolitan Regional Scheme, guided by a state development agency, it is unlikely to succeed where previous attempts based purely on advice have failed.

No financing mechanism joining public and private interests exists for rail TODs in Perth though proposals have occasionally appeared from the private sector.

### 3.5 Adelaide

Adelaide has the most recent strategic plan: *Planning Strategy for Metropolitan Adelaide* (April, 2005). It too tries to contain growth and to reduce car dependence through focussing on integrated land use around centres and public transport are clearly delineated.

Adelaide's public transport is ready for re-visioning. As its rail is slow and old no TODs are being attracted to it. The new light rail replacing the Glenelg tram and being extended to City Station could be the basis for a new rail vision. Electrification and a TOD vision in Adelaide should clearly be the next major urban development agenda for Adelaide.

Adelaide has no development control mechanism for TODs and little experience of Development Commissions in TODs is apparent, though some are now being proposed by their SA Land Corporation.

No public-private funding mechanism exists, though the extension of the light rail lends itself to such a model.

### 3.6 Other Cities

Other cities in Australia have sometimes produced strategic plans, e.g. Canberra, Newcastle and Hobart where centres are considered to be significant and public transport is focused. None are building rail. Amazingly, Newcastle was planned to lose their last 2 km of rail to the city centre, but saved it on the basis that TODs linked to the city could be a part of Newcastle's next major development phase. None of the smaller cities have TOD plans of consequence, though the Hunter and Illawarra regions which are satellite to Sydney are likely to focus their development along their existing rail connections to Sydney.

## 4.0 CONCLUSION

TODs have occurred occasionally in Australian urban development though they have not been strategically or statutorily planned, other than in Sydney. The property market is now exercising a bigger role in urban development and the financial benefits of TOD are coming to the fore with developers recognizing the obvious market for people living or working in TODs. This is parallel with a strategic planning focus derived from the many aspects of sustainability that is pushing Australian cities toward centres and public transport focused development. However the four part strategy which is necessary to guarantee the provision of TOD has not yet been put in place in any Australian city. Thus this paper would suggest that each Australian city reviews its planning and transport strategies, along with the Federal Government, to ensure each city has:

1. A strategic planning framework that asserts where centres need to occur, in what density and mix.
2. A strategic planning framework that links its centres with a rapid transit base, almost invariably with electric rail.
3. A statutory planning base that requires development to occur at the necessary density and design in each centre, preferably with state government intervention.
4. A public-private funding mechanism that enables the electric rail to be built or refurbished through a linkage to the centres it will service.

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