TRANSFORMING AUSTRALIAN CITIES

FOR A MORE FINANCIALLY VIABLE AND SUSTAINABLE FUTURE

Transportation and urban design

July 2009

city of Melbourne

Victoria The Place To Be

TRANSFORMING AUSTRALIAN CITIES FOR A MORE FINANCIALLY VIABLE AND SUSTAINABLE FUTURE

Table of contents

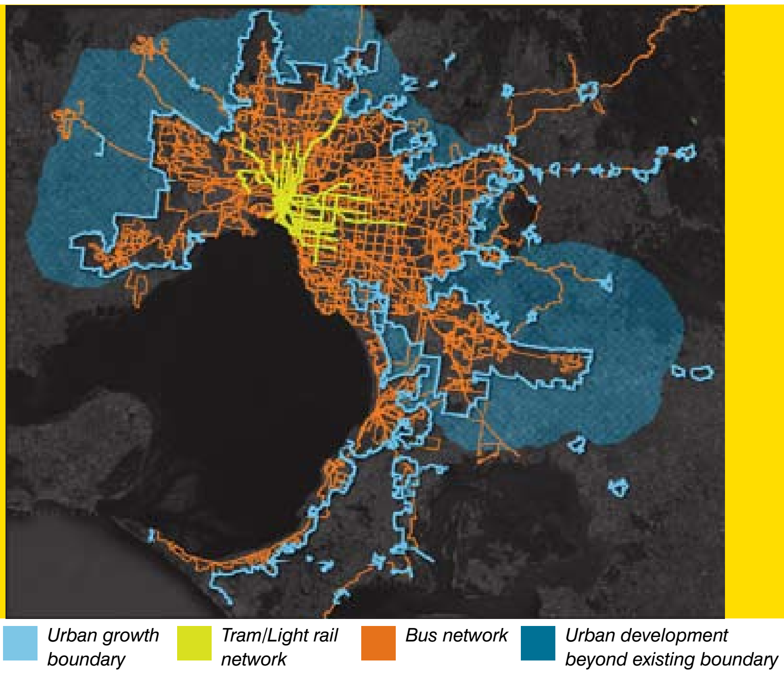
Introduction

This study was jointly commissioned by the Victorian Department of Transport and the City of Melbourne to establish the potential to transform metropolitan Melbourne to meet the projected population of 5 million by 2029. The study specifically does not deal with rail based public transport and Activity Centres as these have been the subject of extensive investigation over the last ten years.

The Victorian Government's Melbourne 2030 Strategy and more recently Melbourne @ 5 Million are both based on the Activity Centre or Transport Orientated Design principles and are widely regarded as both important and necessary strategies to meet the future needs of metropolitan Melbourne. This study concentrates on the 'missing links' in the above strategies, namely the potential of the tram and bus corridors to not only accommodate a significant proportion of Melbourne's future growth, but to do so in a way that will help to meet the aspirations and needs of the greater population while enhancing the performance of the existing infrastructure of the City, particularly the existing public transport infrastructure.

For the Strategy offered by this study to be successful it needs to be not only pragmatic in its implementation but politically 'palatable'.

Melbourne at 5 million if status quo development patterns prevail



‘...it is important to realise that in 2029 over 90% of the infrastructure of Australian cities would have been built prior to 2010’

Context

More than 80% of Australians and over half of the world’s population now live in cities — cities that are responsible, directly or indirectly, for nearly 75% of the world’s greenhouse gases. The design and operation of our cities is therefore a critical challenge facing humanity in the 21st century. Our successes or failures to transform cities over the next 20 years will be a key legacy to future generations.

In meeting this challenge, it is important to realise that in 2029 over 90% of the infrastructure of Australian cities would have been built prior to 2010. Transformation by this definition cannot simply be read as rebuilding infrastructure but rather will need to, in the main, involve the rationalisation and better utilization of our existing infrastructure.

Buildings, roads, railways, parks, waterways, energy, communications and fluid distribution systems will all need to be looked at in a new and open minded way. Only one thing is certain: if we continue to understand, develop and utilise our infrastructure in the traditional ways of the 20th century we are doomed to perpetuate our current problems.

On a daily basis we are witnessing the failure and short comings of these traditional systems.
It is no longer simply an argument about economy of production but increasingly an argument about capacity — the capacity of our cities to withstand the pressures of the future, notably population expansion, climate change and outdated modes of operation.

As recently as January 2009 (just prior to Victoria's horrific February bushfires), Melbourne experienced some of these limitations. As temperatures rose, and then settled in the 40s the city experienced a number of failures:

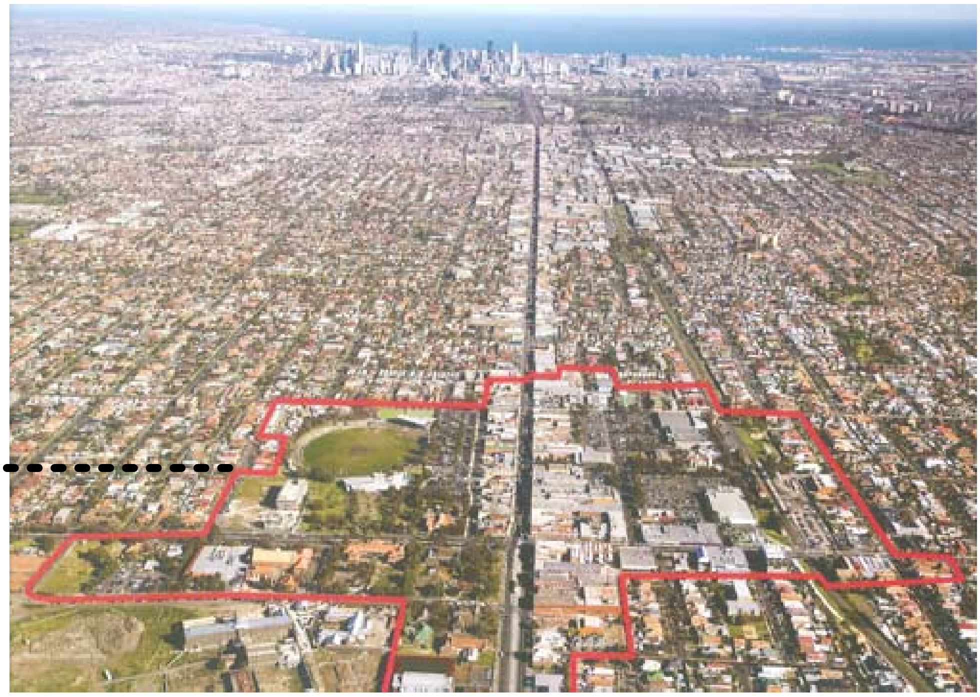
> Pressures on the electrical generation and distribution network saw blackouts and failures affect large areas of the city.

> Rail systems designed for cooler conditions overheated and failed, with up to half of the scheduled trips being cancelled.

> Fires threatened not only lives and property but also narrowly missed bringing down the main power distribution network from the Latrobe Valley – an occurrence that would have closed down the whole city.

> Water consumption trebled at a time when the water storage levels sat at a perilous 33%.

> The soil moisture levels in all the major parks and gardens fell to below 40%, the trigger point to significant stress for the municipality's 60,000 trees (including over 15,000 hundred year old tree stock).



Aerial view of Melbourne showing a major activity centre (Coburg)

‘Power generation at its peak could have been better secured and off set by distributed solar power generation fed into the grid from the suburban roofs’

These were some of the most significant recorded impacts on the city and surrounds, leading to loss of life and potentially 100s of millions of dollars of lost income, productivity and property damage. The biggest regret should be the realisation that much of this was avoidable. For example, power generation at its peak could have been better secured and offset by distributed solar power generation fed into the grid from the suburban roofs. The collection and filtration of stormwater and greywater closer to source could also have provided the necessary backup during peak demands, while protecting the capacity of our long term storage and river flows.

Why then, are these alternatives not being developed and implemented? Why do we continue to focus excessively on the short term, refusing to factor in all the adverse long term economic, social and environmental impacts of traditional technologies, transport, city form and energy distribution systems which are becoming more apparent on a daily basis? Clearly in this study it is not possible to deal with all of these issues. Instead, it seeks to identify the potential for the economic, social and environmental transformation of our existing cities, in the main built after the industrial revolution and in the model of the garden city movement and modernism.

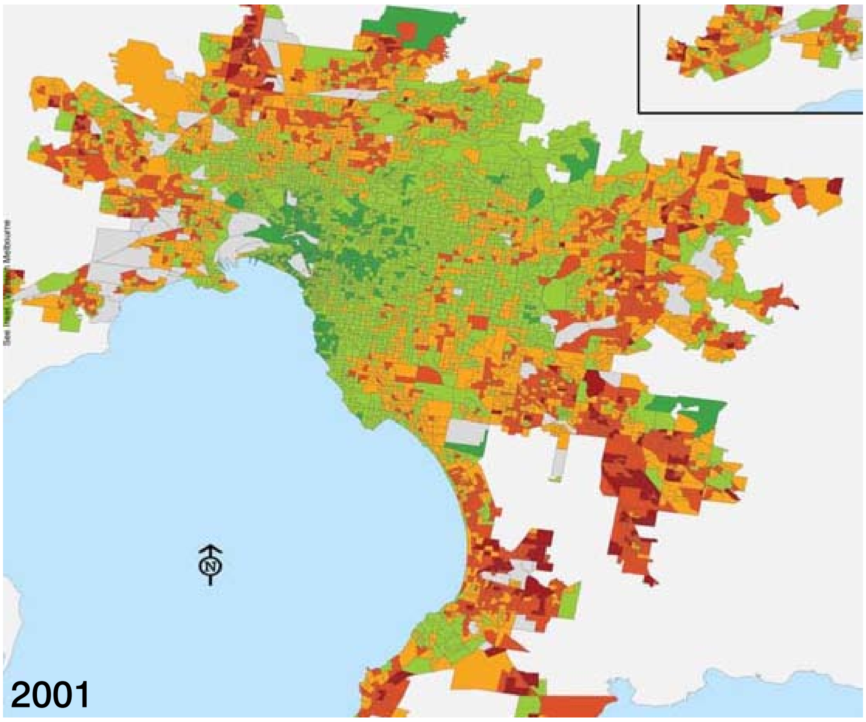
The garden city movement promised us the dream that we could live in the countryside and work in the city, while modernism turned us away from pragmatic locally based solutions and towards the international solutions supported by technologies (such as air conditioning) that no longer made appropriate, 'place influenced design' a necessity. Overlay this mindset with an over-reaction to the ills of the industrial city and the emergence of the motor car and you have the root causes of the current form of our cities – namely low density, widely spread, activity zoned cities where the motor car dominates our public realm and public transport has been largely marginalised.

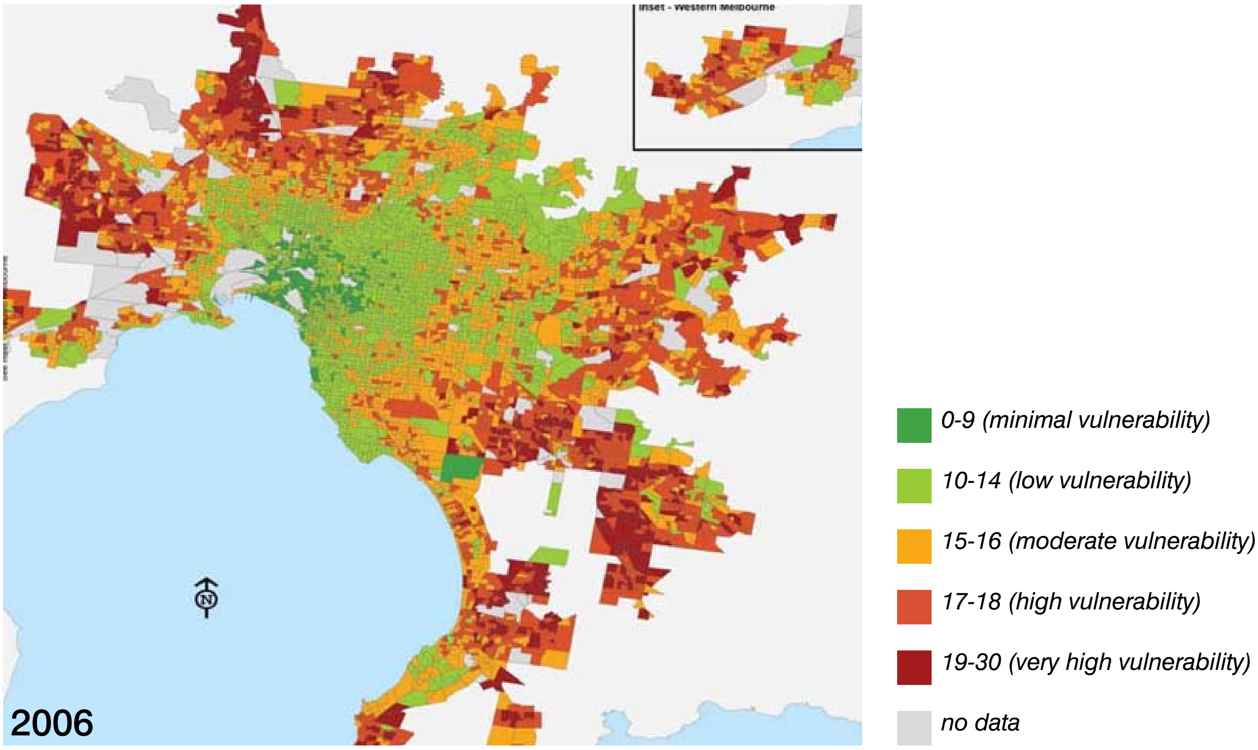
This is not to deny the obvious qualities of the Australian dream of living in a detached house in the well-treed suburbs. Dreams are important but ultimately need to be supportable if they are not to lead to economic, social and environmental disaster.

So how do we sustain the Australian dream and make it an exemplar to all other post industrial cities worldwide? Is it possible?

The Garden City movement promised we could live in the countryside and work in the city. Sustaining this dream today increasingly relies on efficient public transport.

Oil and mortgage vulnerability comparison –
by building on the fringe we are building in future poverty





Griffith University Urban Research Program VAMPIRE index,
Dr Jago Dodson and Dr Neil Sipe 2008,
Unsettling Suburbia: The New Landscape of Oil and Mortgage Vulnerability in Australian Cities

Saving the Australian dream

To save the Australian dream we first need to genuinely understand the current costs and vulnerabilities of our existing cities and then develop transformational strategies that will retain the quality of lifestyle we desire while producing cities that are liveable, economically viable, socially inclusive and ecologically sustainable.

So what are some of the short and long term costs of our urban developments when viewed through the new realities of climate change and diminishing fossil fuels?

Climate change will undoubtedly impact on infrastructure and urban development in the near future. Some of the main issues that will need to be considered when developing any future proofing strategy are:

> Climate change is already delivering more extreme weather events, such as flooding, storm surges, reduced rainfall in certain areas, increased wildfires and extreme temperature variations.

> Existing urban settlements and infrastructure are increasingly vulnerable and will need to be protected against these events (e.g. buckling rail lines and exposed overhead wires).

> Sea levels are likely to rise 1-2 meters in the next 100 years.

Recent research undertaken by Curtin University that found that for every 1000 dwellings, the costs for infill and fringe developments are $309 million and $653 million respectively (Trubka et. al. 2008). Additional fringe development costs incurred include hard infrastructure such as power and water, increased transport and health costs, and greenhouse gas emissions.

Therefore by encouraging infill development, the economic savings to society would equate to over $300 million per 1000 housing units, or in Melbourne's case $110,000,000,000 over the next 50 years. This figure does not take account of the indirect benefits to society of factors such as increased social capital and economic productivity as a result of better health and closer knit communities. This research adds considerably to concerns about the unending sprawl of our cities and strengthens the case for more compact settlement patterns.

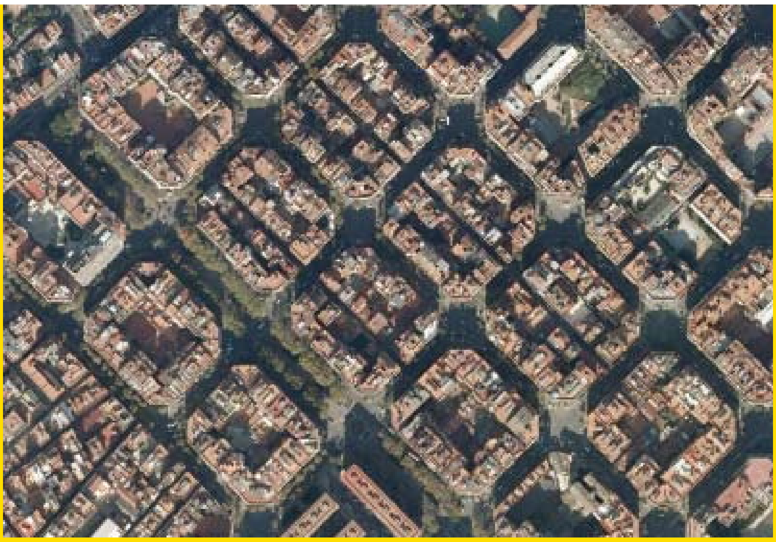
This built form and transport mode are no longer sustainable

If Australia's major cities are to meet future demands for population growth without simply repeating past practices of taking over farmland on the urban fringe, a new paradigm needs to be found. This needs to involve containing future development and infrastructure within the current city boundaries to the greatest extent possible, while achieving greater efficiencies and affordability. This is the aspiration of most cities but achievement typically falls short.

Strategies to achieve liveability and sustainability within the confines of existing city boundaries need to comprise the six key ingredients of existing successful cities, namely:

> Mixed use
> Density
> Connectivity
> High quality public realm
> Local character
> Adaptability

'We have reached an interesting time when the drivers of sustainable cities are the same as the drivers of liveable cities, namely, mixed use, connectivity, high quality public realm, local character and adaptability. When these characteristics come together as they do in Barcelona, they provide an alchemy of sustainability, social benefit and economic vitality. These cities reduce their need for car travel, reduce energy consumption and emissions, use local materials, support local businesses and create identifiable communities.'
– Rob Adams, *The Age*, 2009



Of the elements listed above, the question of city density is arguably the most important. Compact cities with high densities are emerging as the most robust in the challenges posed by climate change. They are capable of operating on lower consumption and often produce more equitable social characteristics and access to essential services.

Cities such as Barcelona with 200 persons per hectare, and more recently Malmo Bo01 in Sweden, are examples worth reflecting on. Built in 2001, Bo01 is an exemplar of a low carbon footprint. The development's density of 120 persons per hectare equates to about eight times the typical Australian urban density. Bo01 is comprised of highly sustainable buildings of 2-5 storeys in height. As with Barcelona, this low rise high density dispels the myth that high density requires high rise.

It is arguable that no new building needs to be higher than 8 storeys to achieve high density compact cities for the future. This built form is not only more sustainable but reduces the need for excessive embedded and operating energy; for example: windows can be operable and used for passive ventilation and cooling; stairs become alternatives to lifts for the lower floors; and the reduced height helps ameliorate excessive wind effects at ground level, which is characteristic of much taller buildings.

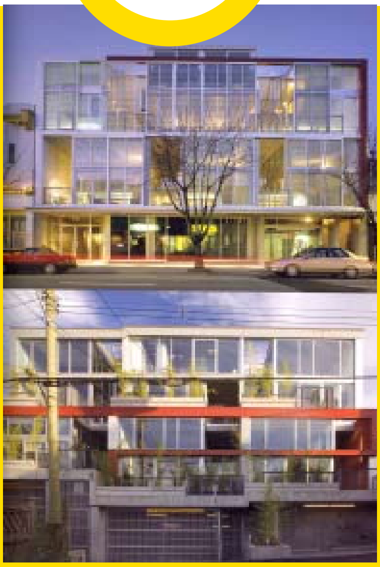
Malmo Bo01
Density = 120 persons per hectare

High density does not necessitate high rise. (NB: densities shown relate to specific buildings depicted)

449 people/ha

MEXICO CITY MEXICO

553 people/ha



VANCOUVER CANADA

903 people/ha

VIENNA AUSTRIA

A new paradigm for Australian Cities should recognise the need to not only direct future development to Activity Centres around rail infrastructure (which most are planning) but also to recognise the enormous development potential of the road based public transport corridors created by bus and tram movements. Curitiba in Brazil, for example, has pioneered development of the 'linear city', using a trunk Bus Rapid Transit network as the foundation for medium rise high density development, surrounded by low density development.

'In Australian cities, the aim should be to maximize development along new and future road based trunk public transport corridors'

In Australian cities, the aim should be to maximize development along new and future road based trunk public transport corridors. These, as with activity centres, would become 'key development areas', producing urban corridors that would utilise only up to 10% of the existing city area. This is not a new phenomenon but rather a recognizable trend that needs to be facilitated. In Melbourne, successful activity centres and transport corridors already exist as is apparent in Coburg and along Sydney Road, Brunswick. They are increasingly vibrant and sought after areas to live in with successful communities that support urban living for a wide cross section of nationalities and needs.

Importantly they exist in close proximity to suburban areas which make up the remaining 91% of the city which could be designated as 'areas of stability' protected from high density development and encouraged to become the 'green lungs' of the city through increased street tree plantings, water collection, passive solar energy generation and productive back yards.

Key Development areas of the city

Over the next decade, Urban Corridors along with Activity Centres, together which account for only 6% of the land area within the Urban Growth Boundaries, will need to become known as the most desirable locations for new urban development. This study did not look in depth at the capacity within Melbourne's Activity Centres. Research undertaken by Melbourne University (Kim Dovey et al) indicates that the current area available in the Activity Centres without any further extension of their boundaries is 6895ha. It is of interest to note that this area is similar to the land potentially available for development along the urban corridors and is equivalent to 3% of the available land within the Urban Growth Boundary. If this resulted in 60% take up for residential development this would equate to 4200ha which could reasonably accommodate 840,000 people at a density of 200 people per hectare.

The aim should be that, by 2029, the key linear transport corridors will have developed into medium rise high density corridors that connect all the activity centres, and provide easy access to high quality public transport from the adjacent 'productive suburbs'. Development of these corridors would take development pressure off the existing suburbs, which can then develop as the new 'green lungs' of our metropolitan areas.

The success of these high density corridors will rely on clear communications and a widely understood implementation strategy. The lessons from existing urban development strategies, like Melbourne 2030, are that unless the parameters of engagement are clearly understood by all the affected parties, the roll out will become bogged down and ineffectual. One of the issues is that the current planning process is not well equipped to handle rapid development approvals.

Aerial view of Melbourne showing urban corridor (tram)

Major activity centre

> ‘Development of these corridors would take development pressure off the existing suburbs’

Some of the requirements for this to work successfully are as follows:

> All the existing and future major trunk public transport corridors need to be clearly identified, so that there can be no confusion as to the extent of the key development areas.

> All heritage buildings and public open spaces along these routes need to be protected.

> The extent of the footprint for redevelopment needs to be easily measured.

> The appropriate level of development, 4 to 8 storeys, needs to be determined up front and be as of right.

> Clear principles around the transition and overlooking conditions in relation to the properties running along the back boundaries of the designated sites need to be established.

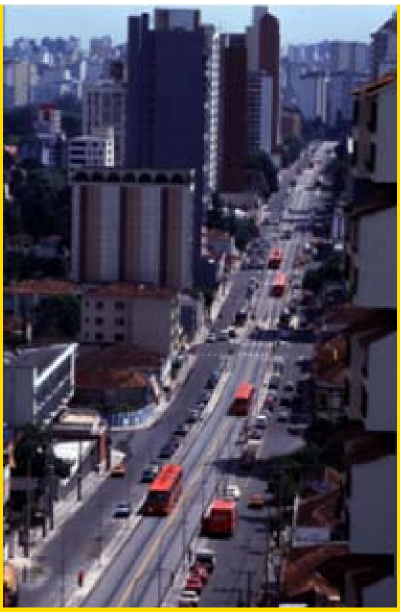
> All new development will be required to provide no less than 80% active frontages along all street frontages. Vehicle access to sites should preferably be from rear lanes or side streets.

> All developers will be required to provide a percentage of affordable housing in any residential redevelopment (ie. a form of value capture).

> All new development will be required to meet high environmental standards, including integrated energy/water/sewer systems.

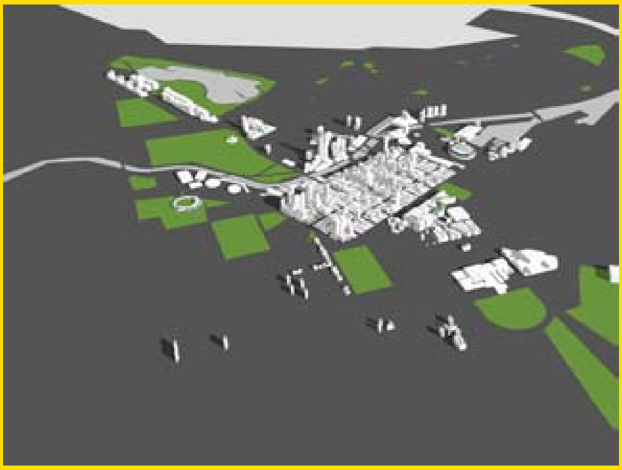
> Streets will be modified to favour rapid public transport, bicycles and pedestrians over motor vehicles

Combining dedicated tram corridors with extended dedicated bus corridors could achieve a rapid expansion of Melbourne’s public transport infrastructure. (Shown: Curitiba, Brazil)

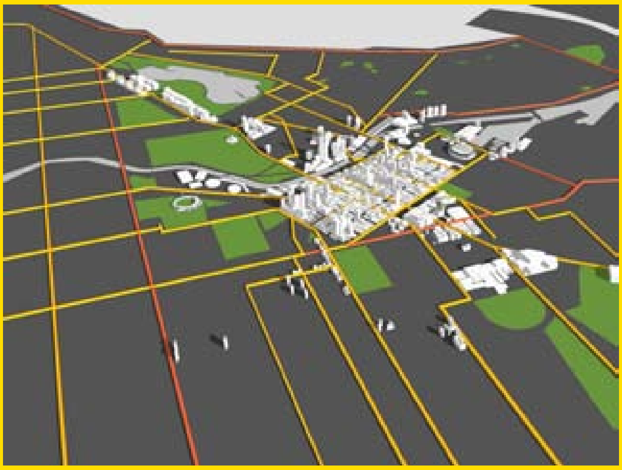


The advantage of these prescriptive controls over the current approach to planning is that it will be very easy for the land value to be determined. This will avoid developers 'over bidding' in the hope that additional development potential can be achieved through the planning process. This approach would also work in favour of small scale builders and developers, thus providing greater variety and a smaller scale that is all too often absent from new large scale developments.

3D model of the evolution of the new paradigm in inner Melbourne



1 *Central city built form with open spaces shown*



2 *Existing and proposed road based transport corridors*

3 *As of right development along corridors (early development)*

4 *Areas of stability between corridors*

Maribyrnong Road, Maribyrnong study area, currently

Possible future

Affordability could be further enhanced if small scale domestic builders could achieve special registration for developments up to 5-6 storeys. Current costing processes would indicate that this approach is only financially viable for 1-3 storey developments. New construction methods, such as factory fabrication of units, and/or the correct costing of all benefits so as to allow government involvement in site procurement or offsets, are some of the main challenges that should be addressed by economists.

Offsets need to be considered in the light of the over $300 million additional cost per 1000 houses if built on the fringe (Trubka et. al. 2008). A small proportion of this $300 million, if invested in the corridors, would both help ensure the viability of this approach and go some way to remedying market failures with current development patterns (e.g. external costs that are ignored), including infrastructure pricing (that does not reflect marginal social costs).

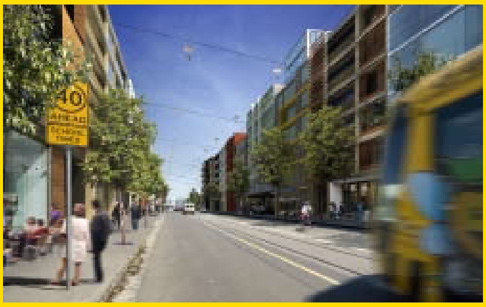
A key challenge for this approach is achieving public acceptance. The principles above will assist in this regard, since they are intended to help assure the wider community that these corridors are fixed and will not spill over into the suburban areas in between. There will also need to be good visualisation of the outcomes (such as below) so as to overcome a concern that high density inevitably equates to high rise.

'Selling' the idea should be helped by the reality that these development concepts are not new, as they are starting to take place in many locations around the country. The proposition in this study is that it is time to considerably speed up the process.

By encouraging infill development, the economic savings to society would equate to over $300 million per 1000 housing units or in Melbourne's case $110,000,000,000 over the next 50 years.

Nicholson Street, East Brunswick study area

Current



Possible future

Riversdale Road, Hawthorn study area

Current

Possible future

Johnston Street, Abbotsford study area

Current

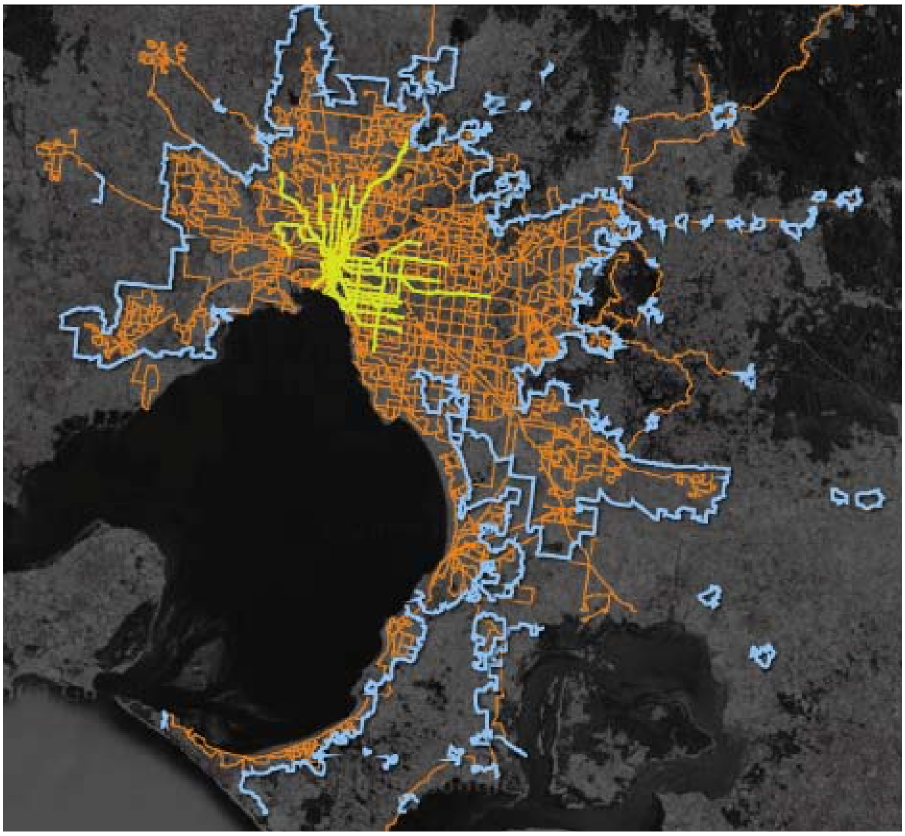
Possible future

Development capacity of Urban Corridors

This study looks at the potential yield that could accrue from this approach to intensification of the urban corridors. A number of assumptions, as illustrated below, were made in determining the potential for future development along these tram and bus corridors.

The results, as can be seen below, is that over 2 million people could be accommodated along these routes – providing affordable, well positioned accommodation without the need to subdivide any further land or extend the current growth boundaries. This could all take place using existing commercial delivery modes and saving up to $110,000,000,000 over 50 years.

The secret is to recognise the need to transform our existing infrastructure rather than building and expanding in the hope that increased size will improve our capacity.



Urban centre = 3,371,888 (2006)

Melbourne Statistical District = 3.9 million (2009)

Note: entire bus network is shown

Urban growth boundary

Tram/Light rail network

Bus network

Steps in calculating developable sites along Urban Corridors

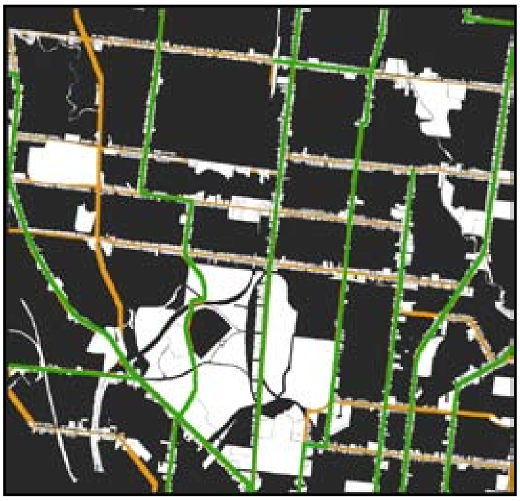
Refer to Appendix 1 for extended methodology

1 Identify cadastral parcels

Melbourne metropolitan cadastral parcels: 1,571,532

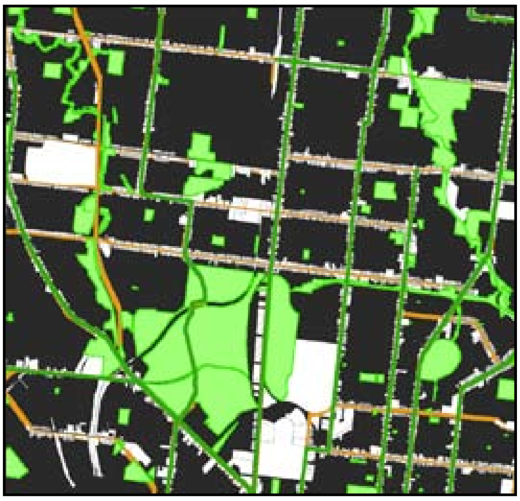
2 Remove special building zones (CBD, Southbank, Docklands, St Kilda Rd)

Total Melbourne metropolitan sites = 1,569,116



3 Then select parcels along tram and priority bus routes

Potential sites (tram routes) = 27,156
Potential sites (bus routes) = 98,132
Total = 125,288



4 Remove areas in parks

Potential sites (tram routes) = 23,505
Potential sites (bus routes) = 95,450
Total = 118,955

5 Remove public use and industrial zones

Potential sites (tram routes) = 23,202
Potential sites (bus routes) = 91,252
Total =114,454

6 Remove sites without rear laneway access

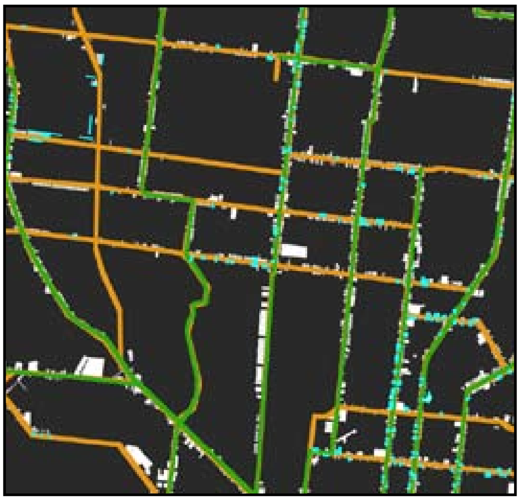
Potential sites (tram routes) = 18,188
Potential sites (bus routes) = 22,440
Total = 40,628

7 Remove recently developed sites and sites in planning (DPCD)

Potential sites (tram routes) = 18,118
Potential sites (bus routes) = 22,138
Total = 40,256

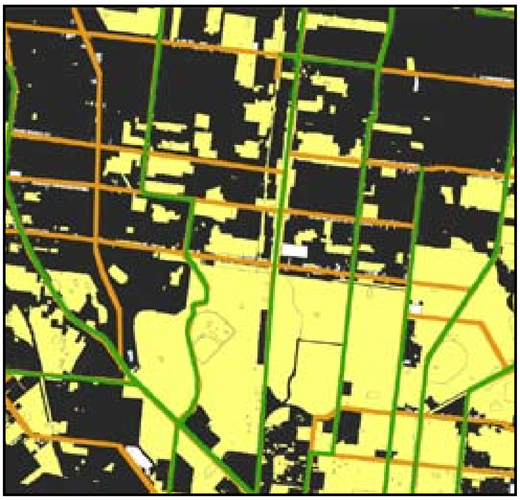
8 Remove heritage register buildings

Potential sites (tram routes) = 17,726
Potential sites (bus routes) = 22,038
Total = 39,764



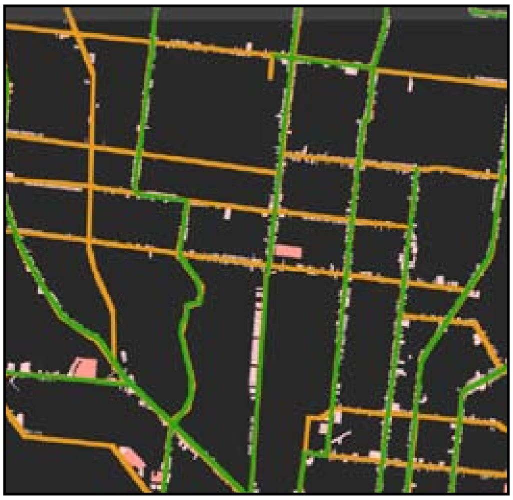
9 Remove sites with frontage <6m

Potential sites (tram routes) = 16,307
Potential sites (bus routes) = 21,973
Total available sites = 38,280



10 Remove 50% of sites within the heritage overlay

Potential sites (tram routes) = 13,439
Potential sites (bus routes) = 21,038
Total = 34,477



11 Available sites

Final total = 34,477

Developable sites along Urban Corridors – study results

As outlined here, urban design criteria were applied to identify the developable sites adjacent to Melbourne's transport infrastructure (tram line, priority bus line) with a view to calculating the potential developable sites along urban corridors.

	Adjacent to tram lines	Adjacent to Priority Bus Lines	Total
Developable sites – as per urban design criteria	13,439	21,038	34,477
Area of developable sites (ha)	1,418	5,275	6,693
Current population of developable sites	42,540	158,250	200,790

Development capacity of Urban Corridors

The number of developable sites was then used to calculate the development capacity of the urban corridors if two alternative density scenarios are applied.

	Net population increase
Low density (180 people per hectare)	1,003,950
High (400 people per hectare)	2,476,410

In summary this demonstrates that Melbourne's Urban Corridors could accommodate a potential population increase of up to 2,476,410 people.

Disclaimer

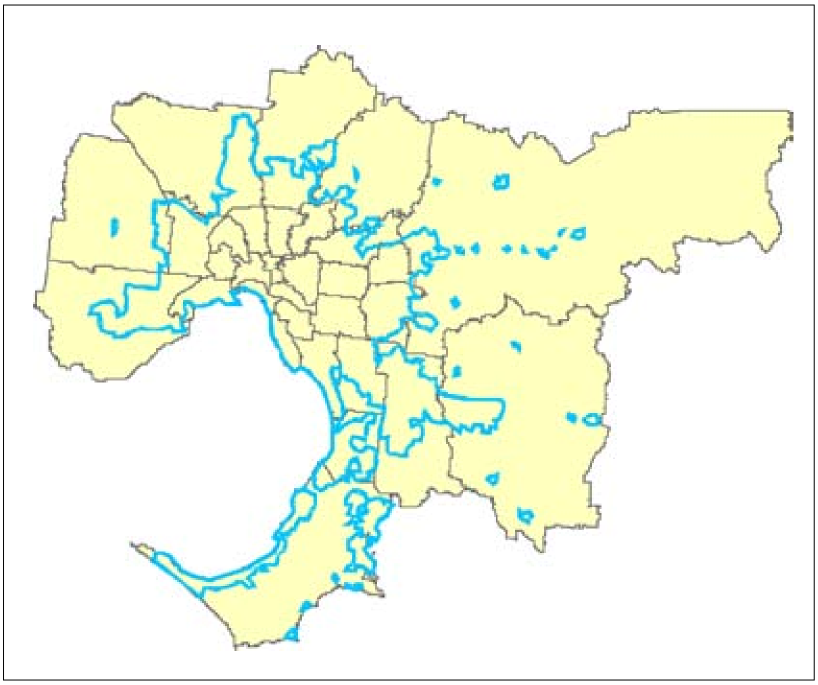
Data has been collected from a variety of sources including VicRoads, Department of Planning and Community Development (DPCD) and Department of Transport. Each dataset has been collected to various levels of accuracy, completeness and currency. Where data is not available it has been derived. For example rear laneways have been derived based on gaps between cadastral parcels.

Distribution of Urban Corridors in Melbourne Local Government Areas

Local Government Areas (LGAs) are responsible for assisting the State Government in planning for Melbourne's future growth. Using the LGA boundaries the potential distribution of urban corridors was determined in order to attribute potential development opportunities to each LGA within the Urban Growth Boundary.

Background

The area within the Urban Growth Boundary consists of approximately 224,895ha of land and contains 12 LGAs and intersects a further 19 LGAs.



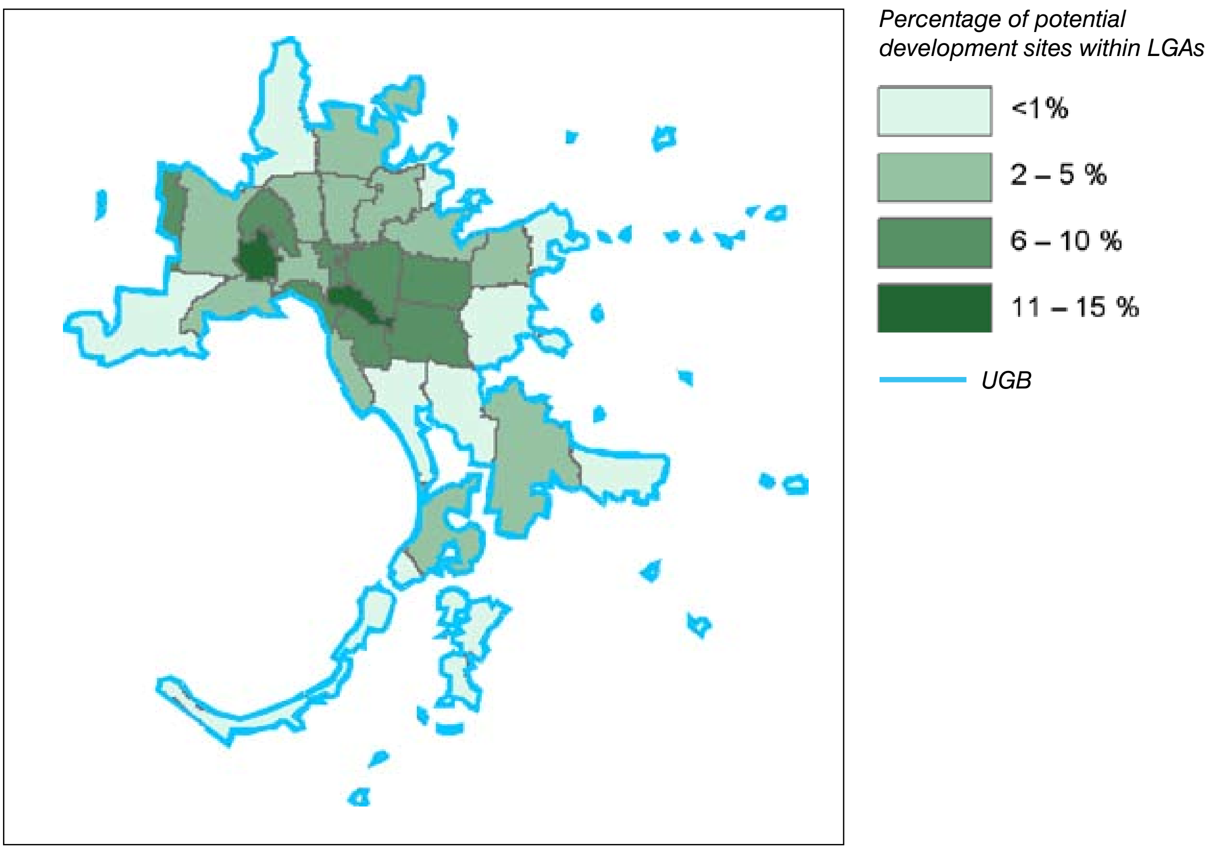
Intersection between LGAs and the Urban Growth Boundary across Metropolitan Melbourne

UGB

This table illustrates the proportion of each LGA that falls within the UGB as well as the area for potential development along the transport corridors.

LGA	LGA area (ha)	LGA area within UGB (ha)	% LGA within UGB	Area (ha) along urban corridors	% impact on LGA area within UGB
Banyule	6,253	6,253	100	205	3
Bayside	3,698	3,620	98	192	5
Boroondara	5,999	5,999	100	537	9
Brimbank	12,342	11,120	90	190	2
Cardinia	128,100	8,304	6	1	0
Casey	40,997	17,710	43	398	2
Darebin	5,345	5,345	100	288	5
Frankston	12,958	8,554	66	141	2
Glen Eira	3,869	3,869	100	312	8
Greater Dandenong	12,958	9,088	70	100	1
Hobsons Bay	6,425	5,683	88	112	2
Hume	50,392	12,434	25	185	1
Kingston	9,136	8,513	93	108	1
Knox	11,388	9,433	83	91	1
Manningham	11,351	7,143	63	226	3
Maribyrnong	3,123	3,123	100	432	14
Maroondah	6,139	5,933	97	94	2
Melbourne	3,623	3,604	99	128	4
Melton	52,771	3,606	7	202	6
Monash	8,148	8,148	100	480	6
Moonee Valley	4,427	4,427	100	244	6
Moreland	5,097	5,097	100	217	4
Mornington Peninsula	72,373	19,175	26	51	0
Nillumbik	43,303	3,416	8	35	1
Port Phillip	2,062	2,052	100	120	6
Stonnington	2,565	2,565	100	309	12
Whitehorse	6,428	6,428	100	613	10
Whittlesea	49,012	10,800	22	362	3
Wyndham	54,223	14,491	27	116	1
Yarra	1,954	1,954	100	194	10
Yarra Ranges	247,000	7,007	3	11	0

Total Area within UGB = 224,895ha
Total Area along urban corridors = 6693ha
Urban corridors represent 3% of land within UGB



Percentage potential urban development sites by LGA within the UGB

The above map illustrates the percentage of potential development sites by LGA within the UGB as a thematic map.

Based on the calculations the inner LGAs host a higher proportion of tram and bus lines and thus the opportunities for increased density is present on a greater number of small sites as reflected in the map. In contrast when urban corridor sites are located in the outer LGAs they tend to be very large and also provide significant opportunities.

The development potential of each LGA was then explored in terms of two density scenarios previously applied to the total available area.

The following assumptions were made:

1. High scenario 400 people per hectare
2. Low scenario 180 people per hectare
3. Each dwelling contains 2 people
4. Currently there are 30 people per hectare living along the transport corridors

	Net Population Increase		**Net Dwellings Increase**	
Local Government Area (LGA)	**Low (180 people/ha)**	**High (400 people/ha)**	**Low (90 dwellings/ha)**	**High (200 dwellings/ha)**
Banyule	30,783	75,932	15,392	37,966
Bayside	28,759	70,939	14,379	35,469
Boroondara	80,561	198,718	40,281	99,359
Brimbank	28,481	70,253	14,241	35,127
Cardinia	187	462	94	231
Casey	59,693	147,242	29,846	73,621
Darebin	43,131	106,391	21,566	53,195
Frankston	21,183	52,251	10,591	26,126
Glen Eira	46,781	115,392	23,390	57,696
Greater Dandenong	15,026	37,064	7,513	18,532
Hobsons Bay	16,796	41,431	8,398	20,715
Hume	27,773	68,508	13,887	34,254
Kingston	16,228	40,028	8,114	20,014
Knox	13,580	33,497	6,790	16,749
Manningham	33,895	83,608	16,948	41,804
Maribyrnong	64,866	160,003	32,433	80,002
Maroondah	14,056	34,671	7,028	17,335
Melbourne	19,164	47,272	9,582	23,636
Melton	30,240	74,592	15,120	37,296
Monash	72,005	177,614	36,003	88,807
Moonee Valley	36,623	90,336	18,311	45,168
Moreland	32,543	80,273	16,272	40,137
Mornington Peninsula	7,598	18,741	3,799	9,370
Nillumbik	5,288	13,044	2,644	6,522
Port Phillip	18,074	44,582	9,037	22,291
Stonnington	46,322	114,260	23,161	57,130
Whitehorse	91,942	226,791	45,971	113,395
Whittlesea	54,231	133,771	27,116	66,885
Wyndham	17,405	42,933	8,703	21,466
Yarra	29,118	71,824	14,559	35,912
Yarra Ranges	1,617	3,988	808	1,994

	Low	**High**
Total population increase (people)	**1,003,950**	**2,476,410**
Total dwelling increase (dwellings)	**501,975**	**1,238,205**

Benefits of Urban Corridors

The major benefit of this approach is that Australian cities could immediately start to move to improve their long term liveability, economic productivity and environmental sustainability, through the positive forces of the private market system, and achieve this by only changing about 3% of the existing footprint of the city. More specific benefits include the following:

- With increased densities resulting from medium rise development along corridors, substantial population growth can be accommodated in the existing urban area, easing pressures on fringe green space and agricultural land.
- These increased densities will support a wider array of services and experiences for residents and visitors.
- The economics of providing high quality public transport services along denser corridors would improve.
- High quality, calmed public transport streets with continuous active frontages would provide a safe and vibrant pedestrian environment.
- Environmental excellence in energy, water and waste management would minimise the need for upgrading existing or new infrastructure.
- Reduced car dependency would assist transport disadvantaged people.
- An increased pool of affordable housing would become available, provided through the market.
- The application of good urban design principles, such as high quality public realm, clear definition between public and private space, active street frontages, sun and weather protection would improve the quality of urban space.
- Production of mixed use development would result in greater accessibility to local work, services and recreation opportunities.
- New 'high streets' connecting activity centres provide an urban experience close to suburbia.

Productive suburbs: areas of stability

Australians have a love affair with the suburban block with its detached single dwelling and extensive greenery. This deep seated empathy is not going to change in the short term nor are these areas going to be rebuilt by 2029. Attempting to retro-fit significantly increased density development in areas not well serviced by public transport is unlikely to be a viable proposition. Instead we need to enhance the quality of these areas, while introducing greater sustainability.

These areas can become the new 'green wedges' of our future cities, working in conjunction with the urban corridors and activity centres, and providing alternative but complementary qualities of residential experience. These areas should become greener, capable of collecting and purifying storm water, generating renewable energy and with more productive back yards so as to reduce the overall ecological footprint of the city, making it more sustainable.

New 'green wedges'

‘This approach will see the majority of the city, namely the suburbs, remain largely in their current although improved form’

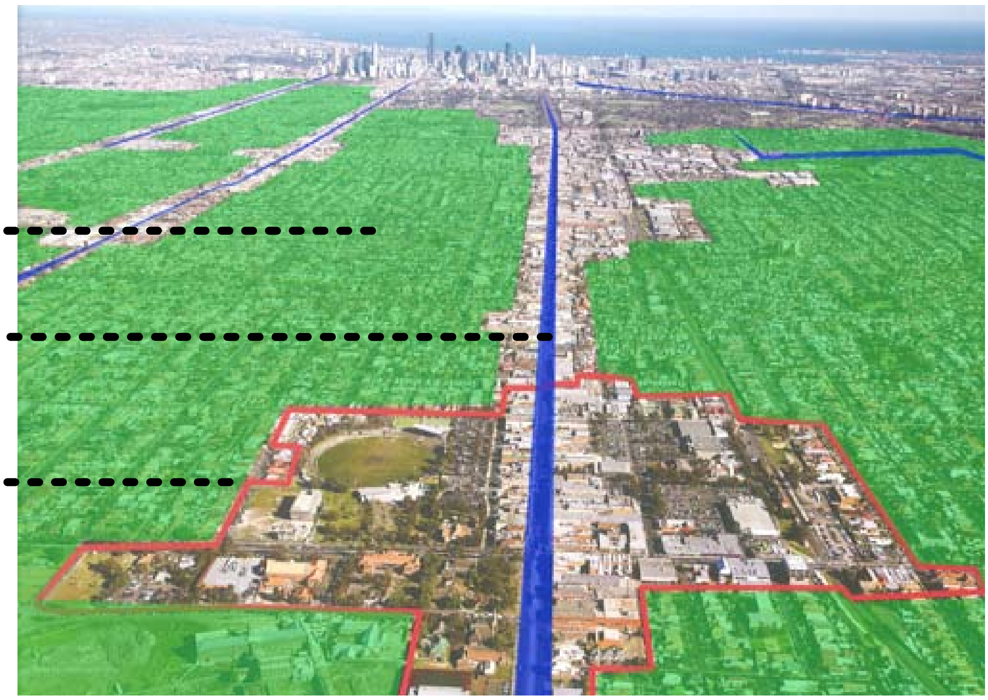
While corridor development is not a new idea, the idea of linking it to a consolidation of suburbia is.

If this part of the ‘new paradigm’ is to receive community acceptance, then it needs to be clearly understood that creating the suburbs as ‘areas of stability’ is fundamental to successful implementation. It is also important to reinforce the idea that this approach will see the majority of the city, namely the suburbs, remain largely in their current although improved form.

Aerial view of Melbourne showing productive suburbs

Urban corridor (tram)

Major activity centre



> ‘If a comprehensive approach to change becomes mandatory...the community will usually accept this change’

Some of the requirements for areas of stability to work successfully are as follows.

> The areas of stability need to be clearly designated.
> A maximum height limit, of say three storeys, needs to be placed over all these areas.
> Any new development within these areas needs to reinforce the character of these areas, namely as green suburbs.
> The streets within these areas need to become well-treed ‘bio links’ and slow speed, safe pedestrian environments. Water sensitive urban design treatments need to be installed to slow over ground water flows and allow time for stormwater to be cleansed and absorbed into the groundwater.
> All properties, old and new, should be required to collect their stormwater and greywater.
> Precinct-wide sewer mines should be introduced to water local parks and gardens.
> Wind and solar energy generation on all properties should be a requirement and be facilitated through standard nationwide feed in tariffs.
> Waste collection from properties should be minimised and infrequent so as to encourage recycling and reuse.
> Back yards should be encouraged to become water sensitive and productive.
> All new and old houses should be required to become energy and water efficient to the highest possible standards.

As has often been illustrated, if a comprehensive approach to change becomes mandatory, such as water rationing, the community will usually accept this change. This is where political leadership and courage are required.

Corner of Curtain and Station Streets, North Carlton, before

After (demonstrates the minimising of the impact of the corridor development on the streets behind)

Potential resources of productive suburbs

A study of inner, middle and outer suburban areas would indicate that they have the ability to not only be self-sufficient but capable of supporting the adjacent dense corridors. The following is a summary of the key findings:

> The gross energy demands in these areas by 2036 will increase by 14%, 50%, and 44% for inner, middle and outer case study areas respectively, assuming a 25% decrease in demand-side usage.

> The total roof space required to service existing and increased demand per dwelling is 16, 22 and 28 square meters for inner, middle and outer case study areas.

> With stringent demand-side management (eg. reduction by 45%), rainwater collection off 100% of residential roof space, supported by greywater collection and reuse, could meet 100% of our domestic requirements.

> 'This design approach plays to one of the strengths of all Australians, namely the do-it-yourself culture of our country'

Benefits of productive suburbs

If well-articulated, the major benefit of this approach will be community acceptance and buy-in. This is crucial as currently the conventional approaches to development and climate change are placing the responsibility for action beyond the reach and consciousness of the general public - it is seen as the government's problem not 'our' problem.

By crafting the solution back into the Australian dream – the suburban block – this design approach plays to one of the strengths of all Australians, namely the do-it-yourself culture of our country. Besides the community benefit described above, the following are some of the detailed benefits accruing from productive suburbs:

- The existing housing stock is valued and upgraded with a view to the future.
- Houses become less consuming of energy and water and each household becomes more self-sufficient. Australia becomes a country where every house generates much of its own energy, which it feeds into the grid at peak demand times and draws out of the grid at low demand times. The income from feed-in tariffs reduces the burdens of utilities on low income families.
- Greater tree planting reduces the heat island effect of our cities and increases carbon sequestration. It is estimated that $1 spent on tree planting yields $5.6 in benefit to a city. Also if street trees were to provide bio-links for fauna and flora we would assist in retaining our biodiversity.
- By harvesting stormwater and wastewater, less pressure is placed on our natural systems in terms of both demand and pollution.
- Precinct-based sewer mines provide water for parks and gardens but, more importantly, free up capacity in existing sewer systems for increased densities, avoiding the need for significant investment in new infrastructure. Also, the by-products of sewer mining are dealt with through existing treatment plants.
- The increase in productive back yards and a reduction in hard waste both have beneficial long term impacts on reduction of travel and landfill.
- Recent experience has shown that incentives applied to renewable energy installation and use dramatically reduce the costs of these products and help stimulate local industry and employment.

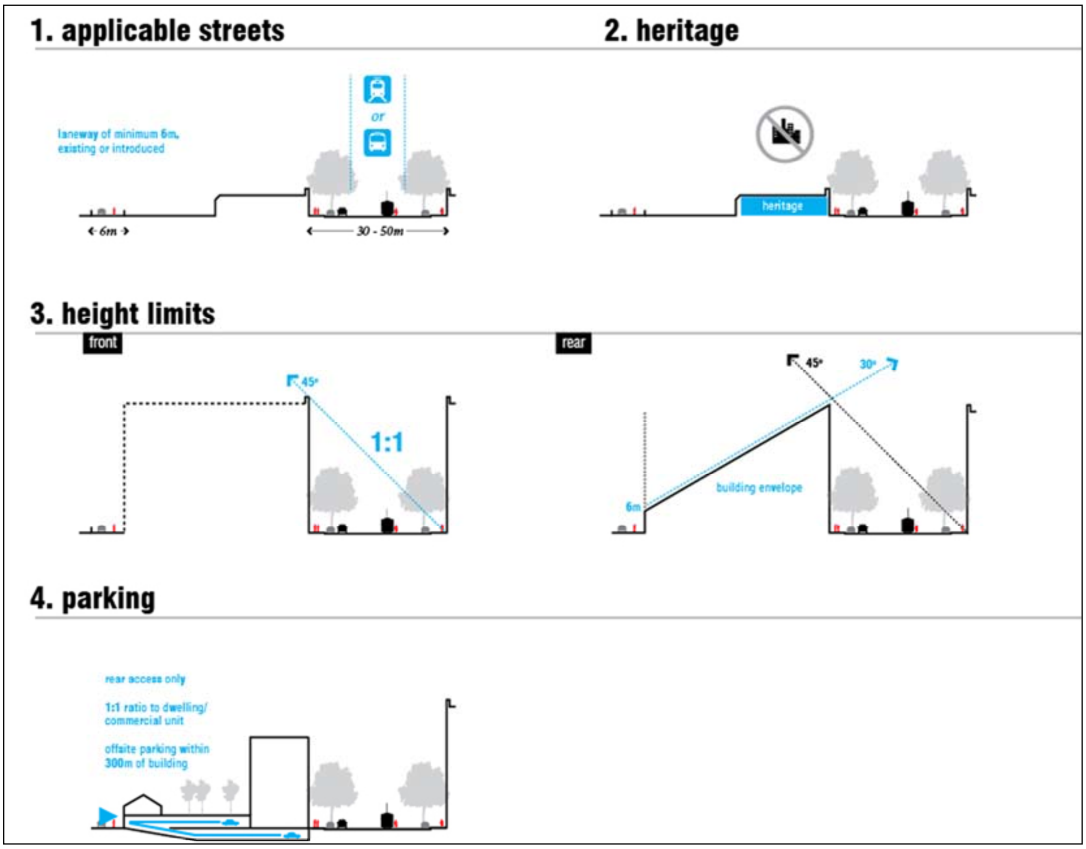
Implementation

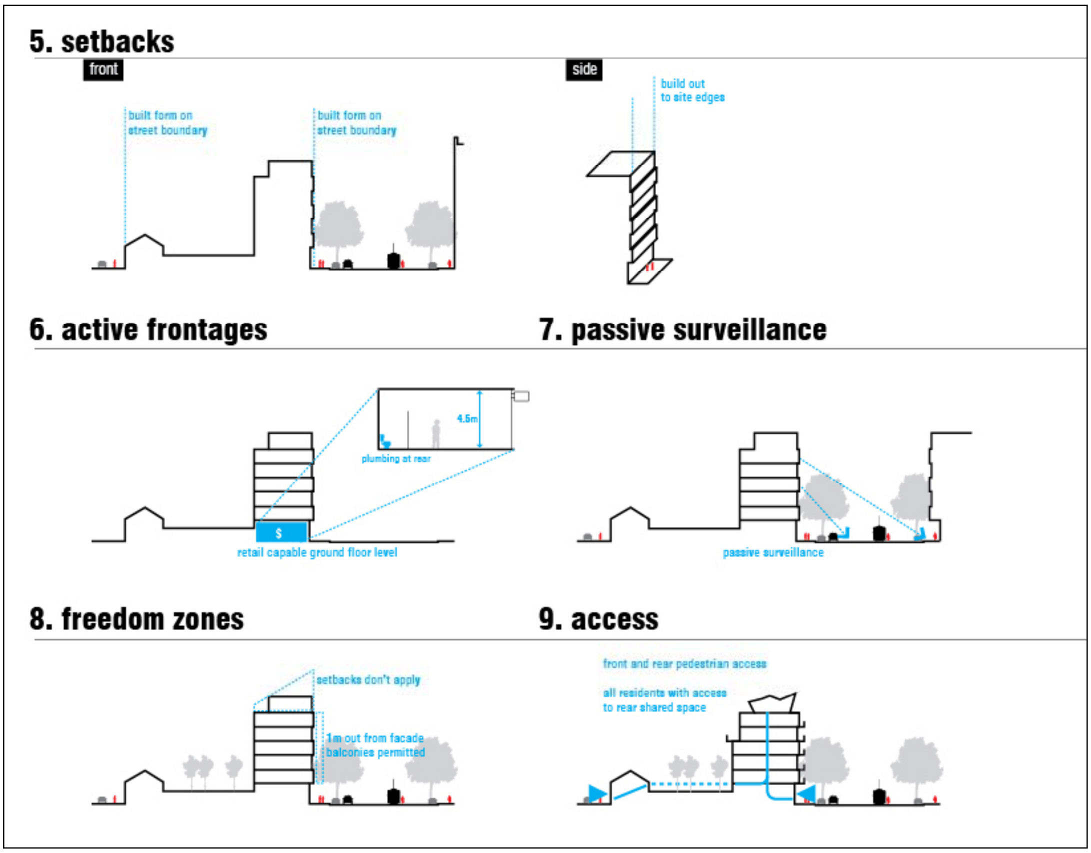
One of the key issues arising from Melbourne 2030 was the inability to implement the strategy rapidly enough to give confidence to the community and the development industry. The key to implementation is the ability to provide simple pragmatic guidelines and then use exemplar projects that can quickly and successfully produce results that demonstrate the efficacy of the new approach.

In a recent study produced for the Victorian Department of Planning and Community Development by SGS et al. a simple one page set of Urban Design Guidelines were developed that were capable of ensuring high quality urban design outcomes. If these guidelines were to be tested along a designated tram route such as Nicholson Street in North Fitzroy or Lygon Street in North Carlton, where there is sufficient road width to give dedicated road space to trams, it would be possible to illustrate the results within a few years.

A similar exercise was trialled in Swanston Street, Carlton during the late 90s where height limits were increased along the tram corridor. The result was a rapid increase in densities with little impact on the adjacent residential area. Another area currently under consideration is the Coburg Initiative which has the advantage of both a mature Activity Centre as well as a mature Urban Corridor. The only limitation would be the need to limit car access to Sydney Road during commuter times so as to give preferential treatment to public transport.

Design development overlay





Source: Department of Planning and Community Development

Concluding remarks

Australia requires a big shift in the way it visualises its cities and infrastructure. We need to break the myth that higher densities mean high rise development. More importantly, we need to quantify all the hidden costs (external costs and underpriced infrastructure) of continuing to build at low density on the periphery of our cities, and reinvest these hidden costs in making higher density Urban Corridors viable.

A related shift in thinking is to recognise that our cities are not necessarily best served by large scale infrastructure. Current thinking that power generation and water supply can only succeed through the provision of large centralised infrastructure limits our options and ability to not only climate proof our cities, but also defend them against the extreme weather events. Smaller distributed solutions are not only more efficient and economical in their requirement and use of distribution networks but are also, as a result of their distributed nature, less vulnerable to extreme circumstances.

$20 billion invested in conventional infrastructure, through the new Commonwealth Building Australia Fund, will give us conventional outcomes. $20 billion invested in 'new age' technologies could see us become a world leader. The proposal to transform our cities is one that relies on small investments at all levels of Local, State and Federal Government, with complementary private investment encouraged by government policy direction. It has the potential to deliver huge long term benefits in terms of more sustainable and resilient urban systems, agglomeration benefits in both production and consumption, and more engaged citizens. The end result will be a transformation of our cities, and nothing less will resolve the current problems confronting us.

At a time of global financial crisis, Australia, with its relatively strong economy, is uniquely positioned to catch up with its European counterparts by setting strategies for future infrastructure development that would not only strengthen and broaden our technological base but place us at the front of the field in future city making.

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TRANSFORMING AUSTRALIAN CITIES

FOR A MORE FINANCIALLY VIABLE AND SUSTAINABLE FUTURE

Transportation and urban design

APPENDIX 1
URBAN GROWTH CORRIDORS
METHOD AND RESULTS

URBAN GROWTH CORRIDORS
DRAFT METHOD AND RESULTS

Table of contents

This section of the report outlines the method used to identify the capacity of sites along the tram and bus network.

1. Aim

This study aims to estimate the potential population capacity, of sites located along the tram and bus network within metropolitan Melbourne, if residential intensification was to be encouraged according to best practice urban design principles.

2. This report

This report focuses on the rationale for undertaking the analysis, along with the method and results.

3. Study area

The study area is the bus and tram network across Metropolitan Melbourne (Figure 1).

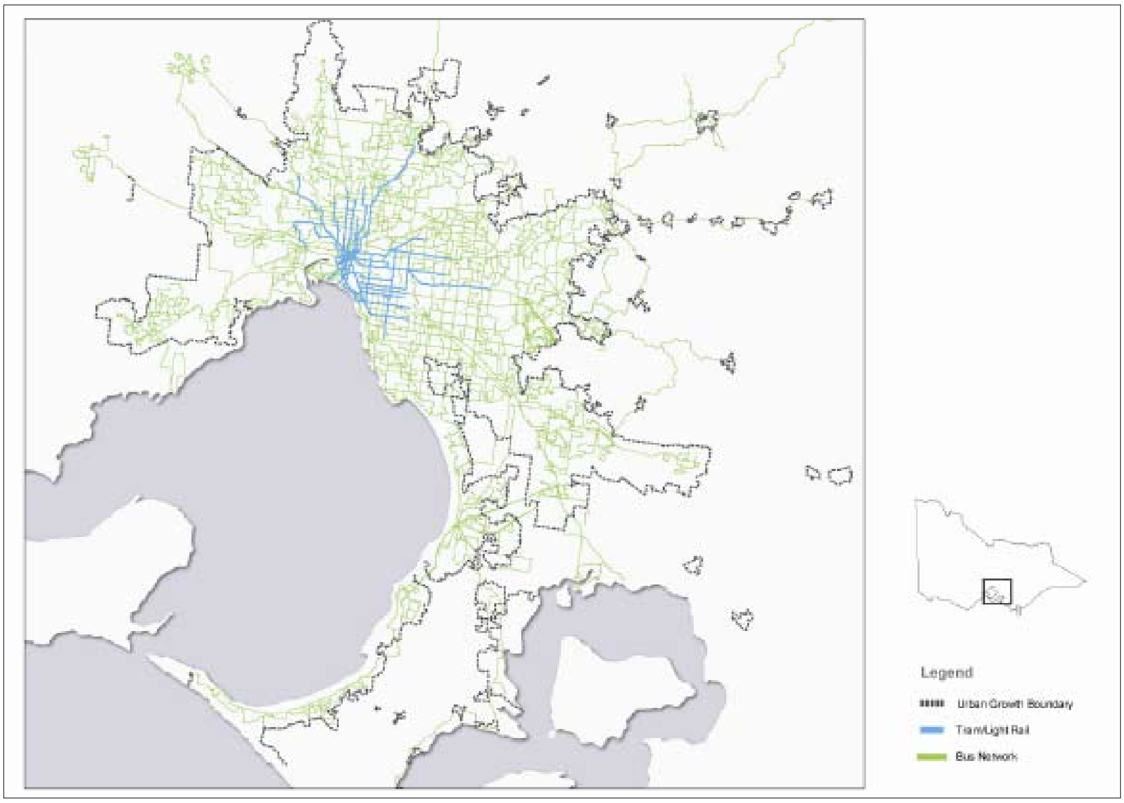


Figure 1: Tram and Bus Network across Metropolitan Melbourne.

4. Approach

To achieve the aim the work program was divided into the following three stages

1. Develop a model to assess if sites along the tram and target bus network are appropriate for redevelopment.

2. Calculate the current population density along tram and bus corridors

3. Develop density scenarios for the sites identified based on international city comparisons.

Stage 1: Model development - method

To begin, seven datasets were identified and sourced from the following organisations:

(1) Cadastral Parcels
(Source: DSE, Date: 2008)

(2) Tram and Bus Network
(Source: DoT, Date: 2007)

(3) Heritage Register
(Source: DPCD, Date: 2008)

(4) Heritage Overlay
(Source: DPCD, Date: 2008)

(5) Public Use, Mixed Use and Industrial Zones
(Source: DPCD: 2008)

(6) Recently Developed sites and sites Currently in the planning process
(Source: DPCD: Date 2007)

(7) Rear laneways
(Derived based on the Cadastre)

(8) Target Bus Routes*
(Source: Bus Association of Victoria 2008)

**Target Bus Routes are bus routes identified by Bus Association of Victoria as having priority for transport connections and opportunity for densification.*

These eight data sets formed layers which have been incorporated into a Geographical Information System (GIS) for visualisation, analysis and interrogation of the data. Figure 2 is a conceptual model of the integration of data within the GIS. Each of the eight steps and assumptions made throughout the model development are described below.

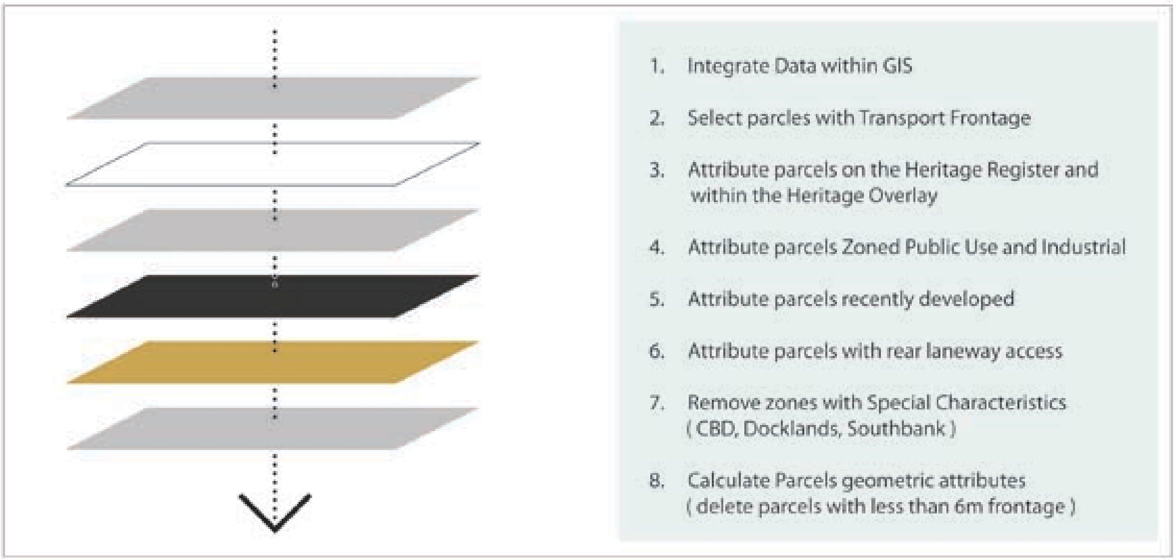


Figure 2 Method of data integration and capacity scenario development

Step 1 – Integrate data within GIS

To begin, the datasets were formatted into ESRI shape file format (.shp). It should be noted that although these are the latest available datasets they have been collected from a range of data sources and have been collected to various levels of currency, accuracy and completeness.

It is important to note that at this stage data processing has taken place to remove duplicate records. This process removes the potential problem of double counting.

Step 2 – Select parcels with transport frontage

Cadastral parcels with frontage to tram lines and target bus routes were selected and extracted. This process required buffering the tram lines and target bus routes and selecting parcels within the buffer, manual editing was then used to delete parcels which did not have a frontage to the tram network.

Step 3, 4 & 5 – Attribute parcels based on spatial location

From the potential parcels layer created in Step 2 spatial selection was used to identify parcels which have their centroid within parcels which are on the heritage register, Heritage Overlay, Planning Zones (Public Use and Industrial), Public Parks and Recreation Zones and/or recently developed sites. A field was added to the potential sites data layer to identify each of these parcel characteristics.

Step 6 – Attribute parcels with rear laneway access

Calculating the rear laneway access involved merging adjacent property parcels, the spaces between parcels were assumed to be road access. This dataset was then split at the vertices and lines with frontage to the tramways were deleted. The remaining lines were assumed to be laneway or rear access points. The potential sites were then selected based on an intersection with the laneway of rear access points. The selected sites were attributed as 1 for laneway access or 0 for no rear access.

Step 7 - Remove Zones with Special Characteristics

This step involved the deletion of sites within the CBD, Southbank and Docklands. These sites have very high density potential with defined high density height limits already in place.

Step 8 - Calculate parcels geometric attributes (Frontage, Depth and Area)

First the area was calculated using the standard function within ArcGIS. Second each parcel has been simplified and split into lines at the major vertices, lines with frontage to the road were selected using a buffer and their length calculated, these have been joined spatially to the land parcels and constitute the parcel frontage. Parcels with a frontage of less than six meters have been deleted; this is because of the assumed access restrictions to the sites and the limited redevelopment potential. Third, the depth for each parcel was calculated using the formula Depth = Area/Frontage. This assumes that each parcel is approximately rectangular.

Stage 2: Current population density

The current population density has been calculated based on the selecting Mesh Blocks along tram corridors (excluding “special zones” CBD, Southbank and Docklands). The density of these Mesh Blocks is then calculated.

Stage 3: Density scenario

Once the data has been prepared, scenarios can be applied to ascertain the potential capacity of identified sites. In this instance the density scenario chosen is in accordance with the following criteria:

1. No change to Public Use, Industrial or Public Park and Recreation Zones (PPRZ)

2. No residential development on land zoned for industrial use

3. No change to buildings listed on the heritage register

4. Only land parcels with rear or side road access have the potential for development

5. 50% of buildings in the Heritage Overlay have the potential to be developed

6. To avoid situations where sites are located on both tram and target bus routes, the tram routes have been given priority and these sites were removed from the bus routes.

7. A population density factor has been applied. This factor was ascertained by analysing developments along transport corridors from overseas (see figure 3) and ongoing research into developments currently under construction and recently completed within Melbourne.

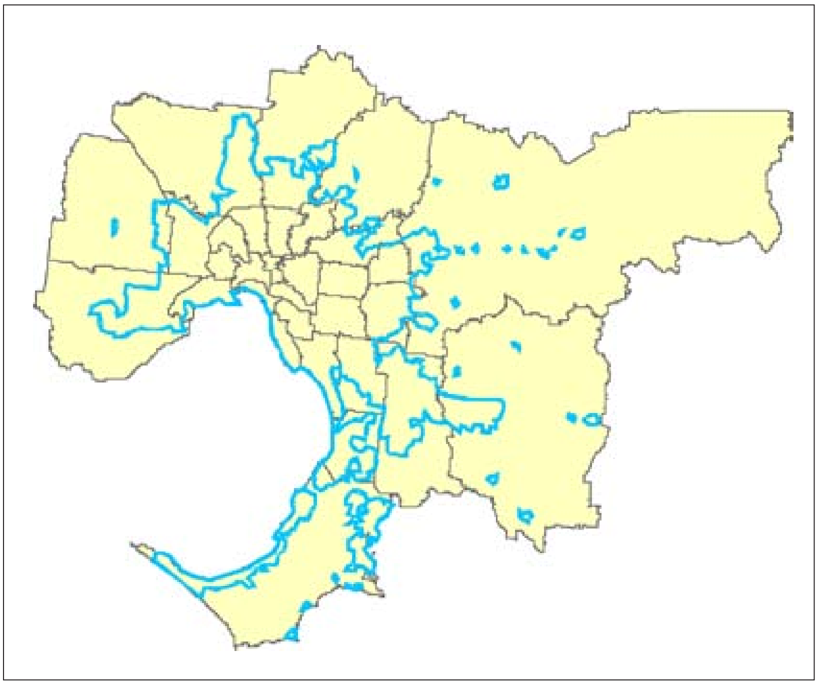
Once the model has been implemented potential sites remain and density ratios applied to ascertain the potential capacity of these sites. The results and assumptions are discussed further in section 5.

Stage 4: Application to local government areas

Method
To establish the area for each LGA within the UGB the following steps have been undertaken:

Step 1 Intersect the LGA boundaries with the UGB so that the areas of the LGAs are clipped by the UGB.

Step 2 Calculate the Area of the LGA and compare with the original LGA area to establish the proportion of the LGA which falls within the UGB.



Intersection between LGAs and the Urban Growth Boundary across Metropolitan Melbourne

UGB

Tallinn, Estonia

Population density per ha
237

Mexico City, Mexico

Population density per ha
449

Vancouver, Canada

Population density per ha
553

Vienna, Austria

Population density per ha
903

5. Results

The summary of results is outlined in Table 1 below. In calculating the results the following assumptions have been made.

> Household size = 2 persons (refer to Note 1 which outlines the household size by House Type for Metropolitan Melbourne).

> Current Density = 30 people per ha (This has been calculated based on the selection of Mesh Blocks along the tram and target bus routes).

> Future Population Density = between 180 and 400 people per hectare (This assumption is based on a selection of developments overseas, figure 3, and internal research into local examples of developments currently taking place).

Using the land area calculated based on the density scenario and subtracting the current population provides an estimate of the potential population along the tram and target bus routes.

	Tram	Priority Bus Lines
Sites available for densification	13,439	21,038
Total area	1,418	5,275
Current Density	30	30
Current Population	42,540	158,250

Proposed density range 180 – 400

	Low	High
Net Population Increase	1,003,950	2,476,410
Net Dwelling Increase	501,975	1,238,205

Table 1: Summary of results

Total net population increase

In total there were 34,477 sites identified adjacent to tram and target bus routes within the Melbourne Inner Growth Boundary which meet the criteria for development. The potential population capacity of these sites is between 1,003,950 (501,975 dwellings) and 2,476,410 (1,238,205 dwellings) (based on a density factor of 180 to 400 respectively).

6. Advantages of the model

It should be noted that the approach used in this study is flexible and additional data can be added and a range of scenarios tested. For example changes to the transport network, or changes to the development criteria can be added and the results retested.

7. Limitations

1. Site compactness

The assumption that sites are rectangular may not apply. One potential solution to this is to apply a compactness measure to test the degree of compactness. The compactness measure is based on a circularity ratio, which is compares the ratio of the area and perimeter to that of a circle having the same perimeter.

The formula for the ratio is M = 4π (area)/(perimeter)2

As M approaches 0, the shape approaches a long or irregular shape;

As M approaches 1, the shape approaches a compact shape, time permitting further investigation into the shape and density yields would be undertaken.

2. Subdivided blocks

In some situations small subdivisions have taken place and due to the structure of the land parcels the centre or side road area has also been selected for possible development. These cases were randomly assessed and because the area is relatively small (ie. Approximately 1/3 of the total site) we have opted to retain these parcels within the model.

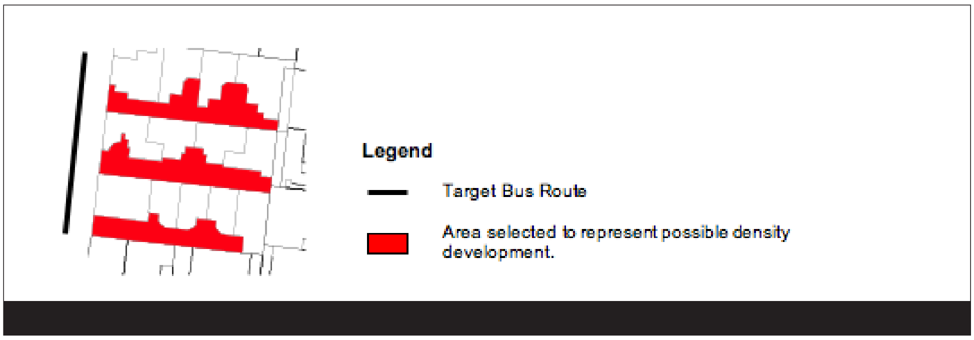


Figure 3: Example of subdivided parcels included in the analysis

3. Verges/Barriers

Some parcels are adjacent to the tram bus routes however they are separated by small slivers of land (See Figure 6) – in some cases these are road barriers and in other cases they are separating verges which could incorporate a substantial level of change. Further work would be required to analyse the impact of these verges/barriers on the results.

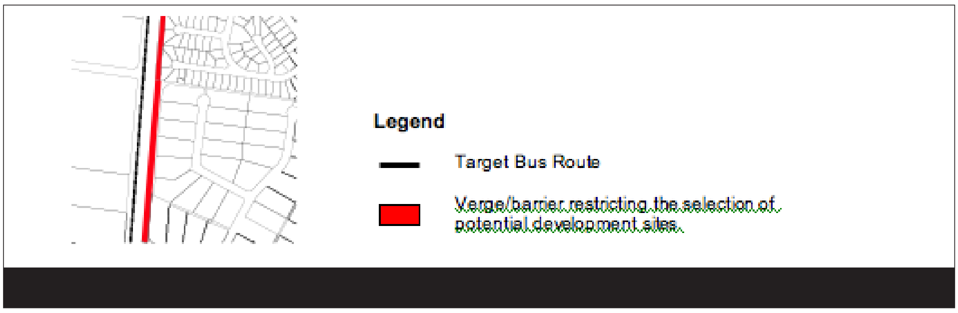


Figure 4: Example of verge or barriers which buffer the selection of potential sites

4. Data accuracy

Although the latest datasets have been obtained each data custodian has provided a disclaimer outlining that errors maybe present within the data.

8. Conclusion

This study uses spatial analysis to identify sites along tram and bus corridors across Metropolitan Melbourne. It has been conducted inline with the Metro 2030 vision in where sites for development are located within the Urban Growth Boundary whilst maximising access to transport.

In total the capacity of the sites identified through this study have the potential to yield a net population increase of between 1 million and 2.5 million depending on a high or low density ratio applied.

9. References

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Note 1 - Household size

	Average household size	Average household size
House Type	2001 (a)	2006 (b)
Separate house	2.89	2.87
Semi-detached, row/terrace, etc	2.03	2.13
Flat, unit or apartment	1.74	1.76
Other - Average household size	1.94	1.94
Total - Average household size	2.63	2.61

Source: (a) Department of Sustainability and Environment (2006)
(b) Data derived from ABS Census 2006

Disclaimer

To undertake this model and subsequent analysis data has been collected from a variety of sources including: VicRoads, Department of Planning and Community Development (DPCD) Department of Transport and Bus Victoria. Where data is not available it has been derived. For example rear laneways have been derived based on gaps between cadastral parcels. As a result each dataset has various levels of accuracy, completeness and currency. The accuracy of data collection/derivation will inevitably impact on the overall accuracy of the model.