

Transforming Australian Cities

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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 gas emissions. As a result, the design and operation of our cities is a critical challenge facing humanity in the 21st century. Our success or failure to transform our 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 2030 over 80% of the infrastructure in Australian cities will have been built prior to 2010. Transformation by this definition cannot simply be read as rebuilding infrastructure, but rather will need to involve the rationalisation and better utilisation of existing infrastructure. Buildings, roads, railways, parks, waterways, energy and fluid distribution systems will all need to be looked at in a new and open-minded way. Only one thing is certain, if Australians 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 the failures of these traditional systems are apparent. It is no longer simply an argument about the economy of production, but increasingly about the capacity of our cities to withstand the pressures of the future: population expansion, global warming and outdated modes of operation to name but a few.

As recently as summer 2009 (prior to Victoria's horrific February wildfires), Melbourne experienced some of these limitations. As temperatures rose to over 40°C, the city experienced a number of failures. While Melbourne's meltdown in January was a localised issue, the city's inability to cope with modern climate and demographic challenges resonates across the country. Adelaide in the same January period experienced similar infrastructure and service failures, while Sydney consistently battles transport issues, particularly in the CBD with narrow roads and limited public transport. Perth, as the country's fastest-growing city, is struggling to deliver reliable services to its booming population, and Brisbane seems unable to cope with extensive rainfall. For the purposes of this chapter, Melbourne serves as an example of an Australian city failing to cope with modern pressures.

Melbourne's Meltdown

Melbourne is Australia's second-most populous city, home to over 3.8 million (National Geographic, 2009) residents. Although globally speaking, a relatively young city, Greater Melbourne covers more landmass than the immense cities of Tokyo, Mexico City and Paris, covering over 8800 km². In January of this year, Melbourne experienced a once in a hundred year heatwave (Wilson, 2009), climaxing in three consecutive days of 43°C plus temperatures. By all accounts the city coped poorly in this climate. The very foundations of the city were put under extreme pressure, and in many instances, infrastructure and services broke down.

- Electrical generation and distribution failed, resulting in blackouts affecting large areas of the city. Despite advanced warning of the power required, over 100,000 residents lost power on January 27 (AAP, 2009).
- The rail network, designed for cooler conditions with timber sleepers and outdated airconditioning failed, with 1447 cancellations over a three-day period (Connex, 2009).
- 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 entire 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 central city's 60,000 hundred-year-old tree stock.

Despite its 2008 ranking as *The Economist's* second most liveable city in world, Melbourne proved most unliveable for the majority of January in 2009. The city's inability to cope with heat led not only to the tragic loss of life, but potentially hundreds of millions of dollars of lost income, productivity and property damage. Regrettably, much of this was avoidable. These issues each had viable solutions.

In Melbourne's case, power generation could have been better secured and offset by distributed solar-power generation fed into the grid from suburban roofs. Better maintenance and design of rail infrastructure would have avoided unnecessary breakdowns, and the collection and filtration of stormwater and sewage closer to the sources would have eased use of precious and ever-diminishing drinking-water stores.

Why then are these alternatives not being sought out and supported? 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? This chapter alone cannot deal with all of these issues. Instead, it seeks to identify the potential for the economic, social and environmental transformation of our existing colonial cities: cities in the main built after the Industrial Revolution and in the model of the garden-city movement and modernism.

The Garden City

The garden-city movement promised us the dream that we could live in the countryside and work in the city. Modernism turned us away from pragmatic locally based solutions and towards the international solutions supported by technologies, such as airconditioning, that no longer made appropriate 'place influenced design' a necessity. Overlay this mindset with an overreaction to the ills of the industrial city and the emergence of the motorcar and you have the root causes of the current form of Australian cities. Low-density, widely spread,

activity-zoned cities where the motorcar 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?

Saving the Australian Dream

To save the Australian Dream we first need to honestly 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 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 one to two metres in the next 100 years.

Overlay on this the 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). The research found that further 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. This figure does not take account of the indirect bene-

fits 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 to concerns about the unending sprawl of our cities and strengthens the case for more compact settlement patterns.

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 are likely to rotate around six key ingredients of existing successful cities, namely:

- mixed use;
- density;
- connectivity;
- high-quality public realm;
- local character; and
- adaptability.

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 with 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 Malmö Bo01 in Sweden, are examples worth reflecting on. Bo01, built in 2001, has a density of 120 persons per hectare, about eight times the typical Australian urban density, accommodated in highly sustainable buildings of two to five storeys. As with Barcelona, this low-rise high-density dispels the myth that high-density requires high-rise.

A new paradigm for Australian cities should recognise the need to not only direct future development to 'Activity Centres' around rail infrastructure, 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 maximise development along new and future road-based 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.

The remaining 90% of the city would 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 backyards.

Melbourne has the opportunity to serve as the model Australian city for the implementation of this new sustainable and climate conscious city design. Before focusing on future design programs, it's important to understand Melbourne's incredibly low population density of only 20 people per hectare in 2008 (Millar, 2008), and Melbourne's urban planning scheme, 'Melbourne 2030'. In short, Melbourne 2030 details areas for development, converting low-density to medium-density, and protects the city's boundaries and open spaces via the 'Green Wedges' and 'Urban Boundary' initiatives.

Although the major planning strategy of the Bracks Government, Melbourne 2030 has been widely criticised as being too vague and impractical in its implementation. Further problems include public discontent with proposed medium-density development in suburbs such as Camberwell and what appears to be a still-expanding urban fringe.

Urban Corridors: Key Development Areas – 10% of City

Over the next decade, Urban Corridors along with Activity Centres will need to be recognised as the most desirable locations for new urban development. The aim should be that by 2030, 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 expansion pressure off 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, such as Melbourne 2030, are that unless the parameters of engagement are clearly understood by all the affected parties, the rollout will become bogged down and ineffective. One lesson is that the current planning process is not well equipped to handle rapid development approvals. Some of the requirements for this to work successfully are:

- All the existing and future major 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 (four to eight storeys) needs to be determined up front and observed.
- Clear principles around the transition and conditions relating to properties running along the back boundaries of the designated sites needs 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 25% affordable housing in any residential redevelopment (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 cars.

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 overbidding 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 smallness of scale that is all too often absent from new large-scale developments.

Affordability could be further enhanced if small-scale domestic builders received special registration for developments up to five or six levels. Current costing would indicate that this approach is only financially viable for one to three 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 \$300 million plus additional cost per 1000 houses if built on the fringe (Trubka et al., 2008). A small proportion of this external cost, 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. ignored external costs), including infrastructure pricing (that does not reflect marginal social costs).

A key challenge for this approach, as noted briefly above, 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 so as to overcome a concern that high-density is equivalent to high rise. Selling the idea should be helped by the reality that this development concept is not a new idea. It is in fact starting to take place in many locations around the country. The proposal in this article is that it is time to considerably speed up the process.

Benefits

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 10% of the existing footprint of each city. More specific benefits include:

- 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.
- Public transport focused streets with continuous active frontages would provide a safe and vibrant pedestrian environment.
- Environmental excellence in energy, water and waste 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 as well as sun and weather protection would improve the quality of urban space.
- Production of mixed-use development would result in greater accessibility to work and services locally.
- 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 affection is not going to change in the short term, nor are these areas going to be rebuilt by 2030. 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, providing alternative, but complementary qualities of residential experience. These areas should become greener, capable of collecting and purifying stormwater, generating renewable energy and with more productive backyards so as to reduce the overall ecological footprint of each city, making them more sustainable.

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 90% of the city, namely the suburbs, remain largely in their current, although improved, form. Some of the requirements for this to work successfully are:

- The areas of stability need to be clearly designated.
- A maximum height limit, of say three stories, needs to be placed over all these areas.
- Any new development within these areas needs to reinforce the local character, 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 storm water to be cleansed and absorbed into the groundwater.
- All properties, old and new, should be required to collect their storm water and grey water.
- 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 standardised national system.
- Waste collection from properties should be minimized and infrequent, as to encourage recycling and reuse.
- Backyards 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 embrace this change. This is where political leadership and courage are required.

Benefits

If well articulated, the major benefit of this approach will be community acceptance and buy in. This is crucial as currently the conven-

tional 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, this design approach plays to one of the strengths of all Australians, namely the ‘do-it-yourself’ culture of our country. Besides the community benefits described above, the following are some of the detailed benefits resulting 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 household power generation reduces the burdens of utilities on low-income families.
- Greater tree planting reduces the heat-island effect of our cities and increases carbon sequestration. In addition, street trees provide bio-links for fauna and flora and assist in retaining biodiversity.
- By harvesting storm and waste water, less pressure is placed on our natural systems in terms of both demand and pollution.
- Precinct 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 backyards 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.

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.

Further, we must come 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 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.

Twenty billion dollars invested in conventional infrastructure, through the new Commonwealth Building Australia Fund, will give us conventional outcomes. Twenty billion dollars 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 regards to more sustainable and resilient urban systems, agglomeration benefits in both production and consumption and more engaged citizens. The end result will be transformation, and nothing less will resolve the current problems confronting our cities. The model of the evolution of Melbourne is a worked example of how a transformation and sustainable change can be made with minimal impact of residents' quality of life.

At a time of global financial crisis, Australia, with its relatively strong economy, is uniquely positioned to catch up with its European cousins 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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