
Originally published in Built Environment, 36(1).

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Beyond Greenfields and Brownfields: The Challenge of Regenerating Australia’s Greyfield Suburbs

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A transition to more sustainable cities in Australia will require much greater focus on greyfield redevelopment than previously. With the multiple challenges facing city planning at the beginning of the 21st century – accommodating rapid population growth linked to immigration, attempting more intensive urban development, the need for climate change adaptation and mitigation strategies, and understanding what is required for cities to become more resilient in the face of local and global shocks to their economies and communities – a path of least resistance has seen most recent planning and urban development activity centre on greenfields and brownfields arenas.

This paper focuses on the prospects for more sustainable patterns of greyfield redevelopment in Australian cities, with particular reference to Melbourne. Both the Melbourne 2030 and the Melbourne @ 5 million strategies have failed to articulate processes capable of increasing the capacity of existing, ageing, occupied suburban areas – the greyfields – to accommodate projected growth. Greyfield redevelopment at precinct scale offers the potential for jointly transitioning urban housing, energy and water systems – and the residential communities they host – to a more sustainable future.

Introduction

A stage of urban development has been reached in Australia’s four largest capital cities (Sydney, Melbourne, Brisbane and Perth) that is now demanding more innovation and effort be given to identifying new models and processes for the regeneration of their greyfield suburbs. Greyfields is a term used here to describe the ageing, occupied residential tracts of suburbs that are physically, technologically and environmentally...
obsolescent and which represent economically outdated, failing or under-capitalized real estate assets. They typically reside in a 5 to 25 km radius of the centre of each capital city and are service, transport, amenity and employment rich in comparison to the outer and peri-urban suburbs. Regenerating, renewing, refurbishing, redeveloping, recycling, retrofitting greyfields – whatever the term used – is increasingly being advanced as one of the most significant sustainability challenges for cities in the 21st century (Siemens, 2008; Newton, 2008; Braganca and Mateus, 2008; Batty, 2007; Kadoriku and Gijutsu, 2007). Indeed, restoration of built assets has been advanced as one of the engines for a new 21st century economy (Cunningham, 2002, 2008).

Regeneration of greyfield precincts involves clusters of approximately 20 or more contiguous residential properties deemed to have high redevelopment potential. They provide an opportunity to break away from the unattractive and unsustainable pattern of piecemeal infill redevelopment characteristic of the past two decades in Australian cities which have failed to deliver new housing, environmental and lifestyle opportunities available in larger scale developments.

The twin pressures of population growth and a desire on the part of metropolitan planning agencies for intensification of urban development have revealed weaknesses in the strategies of these agencies in relation to the volume of redevelopment and production of net new dwellings required from the greyfield zone. The most recent statistics on the geographic distribution of an unprecedented surge in Melbourne’s growth (150,000 in the two year period 2007-08 – 60% due to immigration) are revealing (Colebatch, 2009): 19% has been absorbed within a 10 km radius of the CBD, 61% in the greenfield suburbs beyond 20 km, and only 20% in the ‘middle ring’ – the heart of the greyfields. Population forecasts for the 20 years to 2026 (ABS, 2008) envisage a continuation of high growth rates for the four big capital cities ranging from 30% and 40% respectively for Sydney and Melbourne to 50% for Brisbane and Perth.

Supply of housing has not kept pace with demand, with most recent data revealing a widening gap between underlying demand and completions of the order of 40,000 units annually (Burke and Hulse, 2009). Housing affordability has declined to historically low
levels, with Demographia (2009) rating Australia as having the least affordable housing of all English-speaking countries. By 2008 mortgage repayments on houses in Melbourne as a percentage of income had risen from 19% (1996) to 33% (2008); for inner Melbourne, the shift was from 31% to 68% (IMRHIA, 2009). Similar trends held for the other major capitals. The political heat was on government to respond.

All major Australian capital cities have recently developed metropolitan planning strategies designed to accommodate forecast growth within ‘urban boundaries’, contain city footprints and generate a majority of new housing via the redevelopment of existing residential areas at higher densities under compact city policies. The planned urban outcomes and dwelling targets for Sydney, Melbourne and Brisbane under their new millennium metropolitan development strategies are listed in Table 1.

<insert Table 1 here>

In each city, 50% or more of future dwelling targets was to be met from redevelopment in suburban greyfields. The failure to come close to meeting these targets from the outset identifies the real challenge associated with developing a workable model and set of processes for urban transformation of greyfield landscapes. This stands in marked contrast to the comparative success of brownfield and ‘smart growth’ greenfield developments. The following list of headlines and lead paragraphs from the Age chronicle the story for Melbourne 2030, which is now expected to reach its population target more than ten years ahead of schedule:

- 28 June 2007: *Bursting at the fringe not part of the plan*. Census revelations of a surging fringe population more reliant than ever on private cars has put the state government’s policies of containing urban sprawl and getting Victorians onto public transport under a cloud;
- 7 July 2007: *Housing for all while trying to curb dreaded sprawl*. Melbourne 2030 plans to manage growth to ensure that we protect what we most treasure (Op. Ed. by Planning Minister);
• 1 December 2008: *If there’s a change of plan, Melbourne needs to know.* A boundary that keeps moving is not really a boundary. That much can be said about Melbourne’s urban growth boundary – set in 2002 as part of the state government’s *Melbourne 2030* strategy;

• 3 December 2008: *Go-ahead for urban sprawl. Brumby expands Melbourne’s boundary as population explodes.* The Victorian government has all but given up on a long-standing pledge to contain urban sprawl, announcing another big expansion of the metropolitan boundary for new housing;

• 9 June 2009: *Brumby tackled on urban sprawl. Fury over planning policies.* Plans to contain Melbourne’s urban sprawl are ‘stone dead’ and the city’s cherished green wedge zones are in danger;

• 18 June 2009: *Urban expansion go-ahead.* Melbourne’s urban area will be allowed to grow another 41,000 hectares to accommodate an extra 415,000 people – more than the population of Canberra – under a twenty year growth and transport plan released by the Brumby government. New land zoned for development will include thousands of hectares previously protected as ‘green wedge’ zones.

Yet it was only in 2006 when conclusions– based on the established metropolitan plans in all major capitals – were being made that ‘from now on this form of higher density housing, principally delivered by urban renewal and infill development, is expected to be the main source of residential growth in major Australian cities’ (Randolph, 2006, p. 10).

With this as context, the paper proceeds to examine the following issues, using Melbourne as case study:

• What options currently exist for accommodating future population growth in the major capital cities? Recent trends in greenfield, brownfield and greyfield development are reviewed, together with issues of density of development.

• What pathways exist for greyfield residential redevelopment in Australian cities? Here we examine the principles of and prospects for infill development and housing
refurbishment, activity centres and transit-oriented development (TOD), urban corridor development and residential precinct redevelopment.

- What is the likely demand for higher density greyfield development in Australian cities? Could medium or high density living become part of the great Australian dream?

- What are the barriers that prevent greyfield (residential) redevelopment on a spatial and temporal scale that will minimize the frequency with which metropolitan plans need to be revised and boundaries need to be redrawn?

- Is it possible to engage a transitions arena of stakeholders (institutions and communities) to formulate a new model for greyfield precinct redevelopment that can be implemented in the most prospective neighbourhoods of our major cities? Key issues to examine would include understanding the life cycle of housing in different parts of a big city, identifying precincts (clusters of residential properties) with high redevelopment potential, and articulating a process for institutional and community engagement and decision making for precinct regeneration.

**Accommodating Urban Population Growth**

An update to *Melbourne 2030* was launched mid-2009 (*Melbourne @ 5 million*) as the state government’s response to population growth that would have seen the city reach its ‘planned’ 2030 population target more than ten years ahead of schedule. This revised plan indicates a need for an additional 600,000 dwellings, of which 53% are expected to be built in established areas as targeted redevelopment (the brownfields and greyfields) and 47% in the fringe growth areas (the greenfields) – three iconic and contrasting development arenas in Australia’s major cities.
Greenfields

The mid-20th century represented a period of transition in urban development in Australia, from an era of transit (tram, train, walk) oriented development to one of automobile-based, developer-led, low density suburbia (Newton and Bai, 2008). Despite the more recent injection of ‘smart growth principles’, low density greenfield development remains the dominant model for much 21st century city-building in Australia within both government (e.g. Victoria’s Growth Area Authority and VicUrban) and industry sectors (e.g. Delfin, Mirvac, Stockland, Lend Lease, Australand; see McGuirk and Dowling, 2007). Consumers are left to respond to what project home developers offer in their ubiquitous display villages.

In the absence of government regulations that would require higher levels of environmental performance (e.g. integrated urban water systems, Diaper et al., 2008; building energy performance that meets international best practice, Horne et al., 2005; distributed renewable energy generation, Jones, 2008; local waste utilization via eco-industrial clusters, Batten et al., 2008), opportunities are being lost in current greenfield developments to wind back the unsustainable ecological footprints of Australia’s cities (Melbourne’s footprint is 6.4 ha/person, approximately three times global average; see Turner and Foran, 2008).

In the eyes of politicians and the general population, liveability – where Australian cities rate highly on international comparisons (e.g. Economist Intelligence Unit surveys) – is often confused and erroneously interchanged with sustainability. The challenge is to deliver urban development that meshes sustainability with liveability (Newton, 2007).

The major issues that surround continued extensions to Melbourne’s low density suburbia are:

- relative lack of amenity and access to jobs and services, as reflected in house price gradients (Figure 1);
- car dependency (see Table 2);
• vulnerability to increased cost of petrol (Dodson and Sipe, 2008);
• loss of valuable agricultural industries in Melbourne’s mega-metropolitan region (Newton, 2006);
• loss of biodiversity from the green wedges and non-urban areas protected by growth boundaries (McDonnell and Holland, 2008);
• increasing social segregation according to measures of human capital (ABS Social Atlases: www.abs.gov.au);
• substantial cost savings associated with urban redevelopment compared to greenfield development – directly via infrastructure and transport, and indirectly via GHG emissions and health benefits (Trubka et al., 2008). Dowling and Lucas (2009) report that ‘for every 1000 new dwellings, the cost of infill development (in existing suburbs) is $309 million and the cost of fringe development is $653 million’, due to the difference imposed by new infrastructure.

<insert Figure 1 and Table 2 here>

**Brownfields**

Brownfield redevelopment has emerged as a process for re-imagining and transitioning those parts of our cities which have ‘outlived’ their original industrial-era functions. Principal among these are the abandoned or under-utilized docklands which now occupy prime waterfront sites in all coastal cities, as well as the thousands of ‘manufactured sites’ (Kirkwood, 2001) that are to be found in all large metropolitan areas: the factories, scrap yards, railroad corridors, vacant petrol stations which catalogue Australia’s industrial past. They can be distinguished from greyfield development sites in several key respects. They are typically:

• owned by a single party, usually government or industry;
• of a scale which is closer to that provided by greenfield sites for development;
• contaminated to some degree, depending upon the nature of prior use;
• unoccupied, obviating the need for community engagement at a level required of greyfields.
As such, brownfields have been attractive to the property development and finance industry who have been able to create a development model to undertake projects such as Docklands and Federation Square in Melbourne, Darling Harbour and Barangaroo in Sydney, Newport Quays in Port Adelaide and Southbank in Brisbane. They represent an important contribution to the revitalization of abandoned urban land and to the net additional housing stock in growing cities, but far from a level sufficient to meet aggregate metropolitan demand for new housing.

Brownfield developments, in particular the larger and higher profile (and more widely studied) waterfront developments, are not without their critics. Of particular concern has been:

- the governance on many of the projects has devolved to a development authority, by-passing local government and the normal public, political and community engagement processes associated with planning and urban design (Dovey and Sandercock, 2002; Oakley, 2007; Punter, 2005);
- whether many of the waterfront sites have been sanitized rather than revitalized (Searle and Byrne, 2002; Shaw, 2009; Szili and Rofe, 2007);
- the environmental sustainability of new waterfront precincts, given their preference for high rise apartments as the vehicle for delivering higher density development outcomes, which tend to have higher carbon footprints compared to medium density housing (Newton and Tucker, 2009) and their promotion as a destination for conspicuous consumption.

**Greyfields**

Greyfields is a term used here to describe occupied but economically and technologically obsolescent, failing and under-capitalized housing. Greyfields housing is also a poor performer environmentally (Newton and Tucker, 2009) and has become major location of social disadvantage (Randolph and Freestone, 2008).
Unlike brownfields, however, there is usually no need for site remediation. Furthermore, the dominant location of greyfields housing in between the more vibrant inner city housing market and the more recently developed greenfields suburbs provides greater access to employment, public transport and services than the latter zone, and explains why it has become a key target for more intensive redevelopment by the state government planning agencies in their future city strategies for Australia’s major capitals.

The potential for greyfields precinct redevelopment is significant, with regeneration possible in the following areas:

- **Housing**: delivers a mix of dwelling types, styles and costs, at higher densities, with some mixed use, while at the same time having the capacity to deliver a more aesthetically pleasing higher amenity redesigned neighbourhood than its predecessor;
- **Energy**: achieves carbon neutrality or zero carbon status with the introduction of distributed (renewable) energy and micro-generation technologies as new elements of ‘hybrid buildings’, capable of generating energy for precinct and national grid (Newton and Tucker, 2009);
- **Water**: integrated urban water systems involving water sensitive urban design are best implemented at precinct scale, enabling appropriate mix of technologies for local water capture, storage, treatment and end-use to be introduced in an eco-efficient manner, implementing ‘city as catchment’ (Kenway and Tjandraatmadja, 2009; Diaper et al., 2008);
- **Waste**: precinct scale redevelopment can optimize reuse of demolished stock and minimize the waste stream from new construction, as well as automate waste disposal and maximize recycling from occupied dwellings;
- **Street network**: opportunity to reduce land assigned to car transport and reconfigure to encourage active transport modes (walking, cycling).

This challenge is not unique to large Australian cities. In discussing the creative destruction of cities, Batty (2007) highlights the need for cities to develop the capacity to rebuild themselves *in situ*. Metropolitan metamorphosis is a related concept, emanating
from Japan (Kadoriku and Gijutsu, 2007), that suggests that ‘little progress has been made to break away from 20th century type architectural actions. In the 20th century such architectural actions represented activity to expand cities and make them more populous, but cities are now filled with building and a new construction vision, replacing that of the 20th century, is required.’

These aspects are discussed further in Birkeland (2008, p. 284), including a detailed catalogue of the reasons why suburban retrofitting is not occurring at the rate projected in the strategic plans for all three eastern seaboard capital cities. These include:

- Lack of exemplars to demonstrate eco-efficiency of urban retrofitting;
- Lack of government regulations and incentives to encourage shift away from business as usual; currently best practice is accepted by government as marginal improvement, not the Horizon 3 step changes necessary to avoid the multiple challenges facing cities in the 21st century (Newton, 2008);
- A fragmented and adversarial built environment industry that continues to focus almost exclusively on capital as opposed to life cycle costs, as well as slow response to innovation (Newton et al., 2009), linked to risk aversion and the purported lack of client demand, which cause builders and developers to stick to conventional practices;
- Infrastructure pricing and subsidies that favour non-renewable resources, and high levels of urban resource consumption (Newton, 2006) which encourage highly inefficient greenfield development and greyfields to continue to operate without significant renewal;
- The focus of building codes, assessment and rating tools on new construction over retrofitting;
- Strata title and its inhibiting effect on redevelopment of medium density housing blocks (Randolph, 2006);
- ‘Save our Suburbs’ and NIMBY movements that are responding to much inappropriately designed and piecemeal infill redevelopment which is often unsympathetic to both neighbours and neighbourhood character (Lewis, 1999; Birrell et al., 2005).
In response to a failure of Melbourne greyfield suburbs to yield sufficient net new housing in line with Melbourne 2030 forecasts, let alone intensified demand, the Minister for Planning released a discussion paper New Residential Zones for Victoria (February 2008) which will require each local government to undertake a housing capacity analysis in the context of three future residential zonings:

- **Substantial Change Zone**: the so-called ‘go-go’ areas, designed to promote a significant increase in new dwellings, greater housing diversity and new built form and character;
- **Incremental Change Zone**: the so-called ‘slow-go’ areas, designed to respect existing neighbourhood character while providing for an increase in housing diversity with a moderate increase in new dwellings;
- **Limited Change Zone**: the so-called ‘no-go’ areas where specific characteristics are recognized for protection, providing limited opportunity for increased housing.

**Identifying Greyfield Sites with High Redevelopment Potential**

Gillen (2007) reinforces the argument that there is an absence of understanding of what capacity exists for accommodating more housing in greyfield areas. This is due to an absence of analysis, a lack of understanding of housing life cycles across metropolitan regions, and the debate that continues to surround the issue of urban densification. However, even assuming a situation where land available is greater than land required for some period into the future, the difference between the amount available and the amount developed for housing is what Bramley (1993) has termed an implementation gap. In effect, it identifies the degree of mismatch between the strategies of the planners and the actions of land owners and underscores the difficulty that planning agencies have in estimating future housing stock yields.
Understanding the potential property redevelopment pipeline for different greyfield suburbs in Melbourne was an exploratory project undertaken for the Victorian state government planning agency (Newton et al., 2008) that is reported on here.

Efficiency and Intensity of Use

Capital is combined with land in the production of built space, and is reflected in the two measures of property value registered for each residential parcel in a municipality: land (or unimproved) value and capital improved value.

Typically, land is used more intensively the higher its price (Evans, 2004). Land-capital ratios are increased by:

- a relative scarcity of land. As revealed by Moran’s (2008) review of Australian capital city land and house prices between 1970 and 2007, the median cost of land overtook the median cost of constructing the dwelling in all capital cities over the past decade – and by a considerable margin. This represents an historic urban transition.

- reductions in the capital investment on dwelling maintenance and refurbishment over time that impact on the value and longevity of residential property via three routes:
  
  * Physical obsolescence: each building material has a service life, and at given intervals will need maintenance or replacement. Regular maintenance/replacement regimes of building elements can maintain the physical condition of the stock for several decades (Tucker et al., 1999), for example, provide data on the life expectancy of all building elements in a dwelling, and for life cycle assessment purposes assigns eighty years as a building’s life expectancy.
  
  * Technological obsolescence: over time, the development of new domestic products and appliances for entertainment, cooking, bathing and washing have dictated that certain spaces inside the dwelling need to be replaced in order that the full ‘enjoyment’ or benefit of these new products can be experienced.
Typically this involves extensions or alterations to bathrooms, kitchens and living/entertainment areas – an area of building activity that is now very significant.

*Social obsolescence:* is dictated when the location, style and age (not necessarily condition) of a building is deemed replaceable. Based on estimates by Evans (2004), residential building will need to reach twenty-five to thirty years of age prior to demolition if only to recoup the capital costs of their construction.

Land-capital ratios are decreased by intensified use of a property; e.g. by an increase in number of residential units on the site.

An index of property redevelopment potential (PRPI) was calculated for all individual residential properties within municipalities in Melbourne’s eastern corridor (Figure 2) that represented the ratio of the land value (numerator) to capital improved value (denominator). A PRPI approaching 1.0 indicates that the value of the property is represented almost entirely by the land component and as such is more prospective, from an economic perspective, for redevelopment compared to properties with PRPIs of 0.5 or less. This hypothesis was tested for one middle ring municipality (Maroondah) developed post-1945 that had 41,000 residential properties in 2000 and 45,000 properties in 2006. A set of statistical tests (Pearson correlation and linear regression) of the relationship between PRPI in 2000 and subsequent level of residential redevelopment 2000-06 (i.e. properties sold and redeveloped within the six year study period 2000-06) revealed a strong association (r = 0.76, p = 0.01). For Maroondah, redevelopment of the 190 residential properties that were sold and demolished in 2000 resulted in the construction of 688 new residential dwellings by 2006, a net addition to municipal stock of almost 500 dwellings and a residential redevelopment yield of 1: 3.5. Yields proved to be higher closer to the city centre, e.g. Stonnington’s yield was 1: 8, reflecting differences in land value ($230/m2 and $810/m2 respectively for Maroondah and Stonnington in 2006).
PRPIs calculated for all residential properties in the seven municipalities comprising Melbourne’s eastern corridor are depicted in Figures 3 to 8. Key points are:

- There are relatively few residential properties with high redevelopment potential in the City of Melbourne (primarily CBD and Docklands apartments), due to the high density capitalization of site land value;

- The inner municipalities of the City of Yarra and City of Stonnington (Figures 4 and 5) have begun the residential recycling process characteristic of the housing life cycle in mature housing markets (see Figure 10) where there is no vacant land remaining – nor has been for over twenty years. Here there is a significant proportion of stock which has already been redeveloped, and consequently has a PRPI with modal values around the range 0.1 – 0.5. The remaining stock has higher redevelopment potential indices in the range 0.7 – 1.0;

- The City of Boroondara (Figure 6) is yet to undergo significant residential redevelopment and is the quintessential NIMBY suburb: higher quality, well maintained family detached residences, with high socio-economic status occupants;

- The City of Maroondah (Figure 7) is representative of many of Melbourne’s suburbs developed after the Second World War. Now with few vacant lots remaining it depicts a profile where there is a quantity of stock that is rapidly maturing, with a significant number of entries in the range 0.7 – 1.0. The speed with which land values were accelerating relative to value of capital improvements is illustrated in the comparative analysis of Maroondah residential property in 2000 and 2006 (Figure 8 and compare to Figure 10);

- Further out towards the urban fringe, the City of Yarra Ranges depicts slightly newer stock again, with lower levels of redevelopment potential (Figure 9).

<insert Figures 3 to 10 here>
Issues of Density

Choice of ‘density multiplier’ to be applied to sites for residential redevelopment is a critical component in estimating the additional future dwellings capable of being generated from particular precincts, suburbs and municipalities. Density remains a contentious planning issue with urban populations in Australia (Bunker et al., 2005; Buxton and Tieman, 2005), and the latest target of fifteen dwellings per hectare for new greenfield development under *Melbourne @ 5 million* (Department of Planning and Community Development, 2009, p. 3) represents a perpetuation of conventional suburban development and highlights an inconsistency in densification policy between brownfields, greyfields and greenfields that will perpetuate urban sprawl (Buxton and Scheurer, 2007). There are alternative designs for achieving higher density developments that avoid high rise that deserve to be explored to a greater degree than at present (Buxton and Scheurer, 2007; Adams, 2009; Gillen, 2007). A new technology platform involving virtual building, automated eco-efficiency performance assessment and visualization awaits application to potential redevelopment precincts as a key element in driving the greyfields residential transition (Newton, 2009).

Pathways for Greyfields Residential Transition

Reference to five yearly (intercensal) additions to Melbourne’s housing stock (Figure 11) highlights the post-1990 re-urbanization of housing that occurred in the city’s inner core, driven initially by a significant conversion of low grade CBD high rise commercial property to residential (1991-96) triggered by the 1991 recession which resulted in high vacancy rates within the commercial property sector, followed by new residential high rise apartment construction in the CBD, Docklands and immediately adjacent precincts (1996 to present).

<insert Figure 11 here>
There is a comparatively smaller contribution that existing suburbs in a 5-15 km radius of the CBD have made to Melbourne’s housing stock over the past quarter century. The next ring (15-20 km) has also trended down as a source of additional housing over recent years. Combined, this 5-20 km ring constitutes the bulk of the city’s greyfield suburbs.

Extensions and alterations (of a scale that warrant a building permit) represent a major investment in property regeneration in greyfield suburbs 5-20 km from the city centre (Figure 12) and a key factor behind lower levels of additional housing yield from this zone. The Building Commission of Victoria data on extensions and alterations as a ratio to new dwelling completions for 2002-07 is 1 to 1.3; that is, for every extension or alteration project there were only 1.3 new dwellings constructed in Melbourne (see Figure 13). Extensions and alterations represent a drawdown on labour that would otherwise be employed on new construction, and is one contributor to the gap which has grown between demand and supply in the Melbourne housing market.

Clearly, there is a need for the introduction of major greyfield redevelopment initiatives that extend beyond the fragmented piecemeal process which has characterized the past twenty years, centred on individual residential properties (refurbished or redeveloped at low yield, most typically, 2:1 – 4:1). Here three major pathways can be identified:

- activity centres and transit-oriented development (TOD);
- urban transport corridors;
- residential precincts.

*Activity Centres and Transit-Oriented Development (TOD)*

Activity centres have been a focus for intensification of residential development in greyfields suburbs predating *Melbourne 2030*. They now constitute a renewed focus, coupled with transit-oriented development projects with activity centres at their core, not only for Melbourne (see Figure 14) but also for Brisbane, Sydney and Perth. The
The principles of TOD are well established: a stimulus for urban renewal and enhancement of centre image that clusters a greater mixture of land uses and housing – at higher densities – around high quality transport services configured as the heart of the enlarged community. They also benefit from having a number of development models that are effectively being applied to TOD projects: government-led (e.g. Gold Coast University hospital precinct), private-sector-led (e.g. Brisbane’s Albion Mill TOD precinct; see Dunn, 2009) and public-private partnerships (e.g. Green Square Town Centre in Sydney).

Their rate of progress has been much slower than anticipated, due to local reaction directed principally against the scale of high rise development proposed and change to neighbourhood character. In response, the state government is proposing the establishment of Development Assessment Councils (DACs) to control planning permit decisions in activity centres – decisions currently made by local councils. DACs are to comprise two local government and two state government representatives and a chairman. This proposal was blocked by the upper house (Lahey, 2009), but is scheduled to be returned to parliament. Governance of greyfield redevelopment remains a key hurdle to sustainable urban development in our cities.

Urban Transport Corridors

A recent proposal for urban redevelopment is one which focuses on a city’s linear transport corridors as an additional locus for medium rise high density development. Requiring approximately 9% of Melbourne’s existing urban area, the sites along major traffic corridors (estimated as 12,400 along tram lines and 22,000 along priority bus routes) could collectively accommodate about 500,000 new dwellings (Figure 15). The requirements for this to work are set out by Adams (2009) and include prescriptive controls over key aspects of corridor development, including up-front ‘as of right’ development to levels of between four and eight storeys. Key drivers, in addition to providing a pathway for delivering a significant volume of net new housing in greyfield
areas (as a result of enabling land value for redevelopment to be more easily determined),
include the removal of development pressure off the existing interstitial suburbs which
enables them to become the new ‘green lungs’ (enhanced water, energy, food production
etc.) of our cities, albeit at existing levels of low density.

As with all greyfield redevelopment initiatives, however, ‘A key challenge for this
approach is achieving public acceptance. The principles outlined 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
visualization of the outcomes [see Figure 16] so as to overcome a concern that high
density inevitably equates to high rise’ (Adams, 2009, p. 16).

Residential Precincts

The previous two approaches to urban greyfield redevelopment are both necessary but
not sufficient for a sustainability transition of our cities, as they consign the remaining
90% of greyfield residences to piecemeal infill redevelopment. This represents a sub-
optimal solution for regenerating housing, energy, water and waste systems and local
amenity via enhanced mixed use development and active transport (e.g. walking, cycling)
options, best done at a precinct level (McGee, 2008). The benefits to be gained are
considerable, and have been outlined earlier in respect of housing, energy, water, waste
and active local transport.

Precinct redevelopment can better respond to a set of sustainable urban development
performance targets that enable significant built environment advances for winding back
Australia’s current levels of unsustainable resource consumption, improving housing
affordability and enhancing the resilience of the suburbs in the face of climate change and
peak oil shocks. It will, however, require a new form of urban development model that is capable of navigating the challenges associated with assembling suitable (occupied) residential sites, interfacing with established utilities currently managing centralized networks in order to interface decentralized energy and water systems and challenging aspects of existing planning and building regulations.

The starting point is to identify the most prospective greyfields precincts where there is a clustering of residential properties (parcels) with high redevelopment potential (see previous section on PRPI). With property redevelopment, price and location are important, but contiguity of parcels can also exercise a significant influence over what can be designed and built.

If a developer wants to construct a complex of houses or medium to high rise buildings, then a larger than average site is required to facilitate this. In mature suburbs this will require the assembly of a site, adding contiguous sites to create a development precinct of a size necessary to deliver upon multiple objectives of redevelopment: economics, the character of development, neighbourhood amenity, environmental features etc. As noted by Evans (2004, p. 24): ‘if land can be acquired relatively easily the scale of development will tend to be bigger than if a large site can only be put together by patiently negotiating with numerous small land owners.’ It is generally agreed (Stuart Moseley, CEO of City of Adelaide, 2007 PIA Conference, Adelaide) that better designed redevelopments appear to be associated with a consolidated precinct, not fragmented sites.

The question is: can the PRPI provide a ‘helicopter view’ of potential redevelopment precincts, based on a geographic clustering of sites with relatively high PRPIs (e.g. > 0.8)? To address this issue, all properties in the municipality of Maroondah with a PRPI > 0.8 in 2006 were mapped. The results are presented in Figure 17. Neighbourhoods with high concentrations of contiguous properties with high land to capital ratios can then be further examined with a view to their constituting a redevelopment precinct, in the context of either a ‘go-go’ or ‘slow-go’ schema.
Where property is publicly owned, land can be more readily assembled and new benchmarks can be set in relation to greyfields precinct redevelopment, as illustrated by the K2 medium density public housing project of 96 units in Windsor (inner Melbourne) that successfully embodies several key ESD principles (DesignInc, 2009; see Figure 18).

The process of assembling a site for greyfield residential redevelopment in the private sector constitutes a more difficult challenge. Prime among the barriers are:

*Property owners* – property owners generally tend to view the value of their properties to be higher than current market prices, especially if the owner is also the occupier (Evans, 2004). If owners also become aware that property in their neighbourhood is being purchased with a view to some large precinct development, there is a tendency to hold out for a premium price. There are a range of developer actions (e.g. use of multiple agents to acquire sites so as to conceal the process of site consolidation) and government actions, e.g. compulsory acquisition, such as with the Eddington transport plan (*Age*, 25 April 2008), that can be undertaken to aid acquisition of contiguous properties. Reports on surveys of property owners in areas targeted for some kind of redevelopment would constitute important background information to inform the processes that would need to be established within a new model of urban precinct development in suburban greyfields.

*Preservation value* – sites identified for some form of protection from development; where the protection can be in relation to cultural or heritage value of the site or its biodiversity value.

There are also a number of factors which could be brought to bear as potential *inducements* for site consolidation, however. These include:
Public property – land owned by state or local government or utilities that is contiguous with private property could make a contribution if the project was deemed sufficiently strategic for the local area (refer again to Figure 17).

Government planning priorities – which would include the promotion of and provision of incentives for higher intensity development near designated activity centres, arterial roads, railway stations and shopping centres.

Suburb demographics – the ageing of Australia’s population. It is predicted that by 2036 a quarter of the population will be over 65 years of age (ABS, 2006, 2008). In Melbourne, there is a high concentration of this cohort in the middle ring greyfield suburbs, a significant proportion of whom would have aged in place (see Figure 19; and Figure 20 for the distribution of 65+ population in Maroondah). Currently, Australian households aged between 55 and 80 years exhibit significant levels of over-occupancy of housing (Table 3). There is clearly a major barrier to mobility at present for this age cohort, with relocation being ultimately forced on the ‘old old’. Recent research on Melbourne’s home owning empty nesters (Sweeney Research, 2006) identifies two segments that exhibit both similarities and differences in relation to future housing decisions: the stayers and the shifters. The stayers have not yet seen a real reason to move, are either attached to their home or location or both and, even if they wanted to move, many see that it is not financially viable. Many empty nesters will remain stayers until some life event triggers a change. For the shifters who are not forced to sell due to divorce or some financial setback, staying in the same area is also preferred, a sea or tree change is not on the list for many, and they are looking for the same style of housing with some downsizing. Both segments appear to favour housing solutions that do not require a shift too far removed from their current suburb. But what are the options on the supply side?

<insert Figures 19 and 20 here>

<insert Table 3 here>
Baby boomers are potentially poised to instigate one major final impact on Australia’s cities as they look for appropriate places and spaces to live in post-retirement. Places and spaces that are not well supplied and that will be sought are those as close as possible to the neighbourhoods with which they are currently familiar. With the Albion Mill TOD project, for example, Dunn (2009) reports that most of the units sold off the plan have been to households living within a 5 km radius. Such projects are not yet common, however. There is anecdotal evidence (Craig and Greenblat, 2008) that medium density development in established suburbs is ‘overpriced’, for example:

consider the hypothetical case of ‘Marge and Bill’, a Ringwood (City of Maroondah) couple who want to ‘downsize’ to a new apartment. Their 18-square home is valued at $387,000. For the same price they can buy an apartment only a third of the size.

‘There’s no trade-off to switch to high-density housing’, he says. ‘You have to pay so much for so little. You don’t get much more in terms of space in the city, but you do get much better access to amenities.’

This is where governments, developers and local communities need to be visionary in developing proposals whereby occupants of high redevelopment potential housing in greyfield suburbs can be induced to sell their properties into a consortium that will in turn provide them with some combination of cash and living space within the redeveloped precinct. A process that can create exciting, sustainable, regenerated precincts in our greyfield suburbs can become a magnet for baby boomers and others seeking a medium density mid-city location in the capital cities.

Conclusion: Towards a Solution for Greyfield Precinct Redevelopment

Greyfield precinct redevelopment constitutes one of the principal challenges for 21st century urban planning: a Horizon 3 challenge (Newton and Bai, 2007). In contrast to greenfields and brownfields, a new development model needs to be invented for precinct regeneration in order to release the value embodied in tracts of greyfield suburbs in Australian cities and to enable more sustainable urban development in the process. The key elements of this new model will involve:
• a new governance approach for precinct transition. The ‘transitions arena’ (Loorbach, 2007) has emerged as a new multi-actor governance instrument created to stimulate and coordinate innovation and action around ‘wicked’ public policy issues, in this case, the redevelopment of greyfield precincts. Transitions arena processes, as outlined by Kemp *et al.* (2007, p. 84), include ‘joint problem perception and structuring, complex systems analysis, vision development, agenda setting, policy instrument assessment and selection, experiments and monitoring through a process of social learning about radical innovation and new systems’. It engages a host of issues around public-community partnerships (Scheurer and Newman, 2009) as well as the more common PPPs, and raises prospects for entrepreneurial local government (TIF-type) initiatives. It also engages a range of stakeholder groups – non-profit, media, government, industry, politicians, community and academe – where there are multiple barriers, tensions and degrees of inertia. Given that much of the housing will be occupied, with varying levels of social-psychological attachment, new approaches to community engagement will be required within the context of a ‘transitions arena’;

• a project planning and design system capable of rapidly assembling virtual models for regenerated precincts, assessing their performance (via LEED for neighbourhood-type methods) in real time (Drogemuller *et al.*, 2009) and providing visualizations (Gul and Maher, 2009) as a basis for institutional and community engagement within the transitions arena process. Immersive design environments which enable prospective residents of a rejuvenated precinct to ‘experience’ the planned new living environment via a virtual ‘walk-through’ represents a more realistic basis for community engagement that has been available up to this time;

• a greyfield precinct redevelopment business model tailored for: a range of finance sources (non-profit, community-based etc.); risk assessments (reading where the market is likely to go over the life cycle of the project and identifying what part of the economic cycle the project will occupy); demand assessment (e.g. are the offerings attractive to empty nesters at both ends of the life cycle, as well as single person households?); site analysis, valuation and assessment; costs, revenues and
RoI analyses (e.g. on a $/year basis) including the challenges of assigning value to ‘green’ elements of the project;

- a new business enterprise for supplying housing to greyfield redevelopment precincts. Transformation is required here to overcome a market failure whereby new housing in Australia is delivered through two independent and conflicted residential development streams (Australand Holdings, 2008). One involves the domestic residential sector where houses, townhouses and flats of up to three storeys are built by self-employed subcontractors who traditionally build in greenfields. The other, the commercial residential sector, builds structures above three storeys with lifts and other services characteristic of those in high rise brownfield precincts. There are real cost differences between these two groups of housing suppliers which have been attributed to their use of two different sources of labour (unionized and non-unionized) and expected profit margins on projects;

The success of greyfield redevelopment could centre on creating a new class of business enterprise for delivering economically viable medium rise high density development (typically four to eight storeys), where the building shell is delivered via off-site manufactured commercial building technologies and materials and the fit-out is performed by housing subcontractors, i.e. developing a supply chain capable of creating medium density housing at price points that will trigger a purchase in greyfield redevelopment precincts.

A new wave of urban innovation is needed for a 21st century transition to sustainable metropolitan development.

Acknowledgements

The author wishes to thank Jeremy Reynolds, Michael Humphris and Slavo Salma for the contributions they made to the research consultancy upon which this paper draws. Also to the City of Maroondah for providing access to their database on property values.
References


Accepted for publication in BUILT ENVIRONMENT, volume 36, 2010


Moran, A. (2008) How land supply restraints have locked young people out of the housing market, and how Australia is starting to figure it out. *IPA Review*, May.


Table 1. Planned urban outcomes and dwelling targets for Sydney, Melbourne and Brisbane (South East Queensland) under metropolitan planning strategies.

<table>
<thead>
<tr>
<th>Preferred urban form</th>
<th>Sydney</th>
<th>Melbourne</th>
<th>Brisbane/South East Queensland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location of higher density outcomes</td>
<td>Regional Centres Major Centres plus town centres, urban villages and neighbourhood centres</td>
<td>Urban Activity Centres Transport oriented development</td>
<td>Activity Centres Strategic Development Sites</td>
</tr>
</tbody>
</table>

| Total dwellings targets | 640,000 by 2031 | 550,000 by 2026 | 620,000 by 2030 |
| Renewal/infill targets | 60-70% (445,000) | Increasing to 50% (244,000) | 67% (426,000) |

Table 2. Trips per day per person by area, Melbourne.

<table>
<thead>
<tr>
<th></th>
<th>Core</th>
<th>Inner</th>
<th>Middle</th>
<th>Outer/fringe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car</td>
<td>2.12</td>
<td>2.52</td>
<td>2.86</td>
<td>3.92</td>
</tr>
<tr>
<td>Transit</td>
<td>0.66</td>
<td>0.46</td>
<td>0.29</td>
<td>0.04</td>
</tr>
<tr>
<td>Walk/bike</td>
<td>2.62</td>
<td>1.61</td>
<td>1.08</td>
<td>0.81</td>
</tr>
</tbody>
</table>

Source: Trubka et al. (2008)
Table 3. Over-occupancy of housing in Australia, 2006: percentage of households with two or more bedrooms spare.

<table>
<thead>
<tr>
<th>Age Cohort</th>
<th>&lt;20</th>
<th>20-24</th>
<th>25-29</th>
<th>30-34</th>
<th>35-39</th>
<th>40-44</th>
<th>45-49</th>
<th>50-54</th>
<th>55-59</th>
<th>60-64</th>
<th>65-69</th>
<th>70-74</th>
<th>75-79</th>
<th>80+</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 or more bedrooms spare</td>
<td>3.8</td>
<td>24.1</td>
<td>34.2</td>
<td>31.4</td>
<td>27.3</td>
<td>29.3</td>
<td>33.9</td>
<td>46.5</td>
<td>59.7</td>
<td>61.2</td>
<td>64.4</td>
<td>64.6</td>
<td>64.4</td>
<td>45.7</td>
</tr>
</tbody>
</table>

Figure 1

Median House Price by Year

Source: Valuer General
Figure 3

Melbourne Residential Properties

Residential Properties in 2000
Residential Properties in 2006

0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 11000 12000 13000 14000 15000 16000 17000 18000

Properties

RDI

1.00 - 0.9 0.89 - 0.8 0.79 - 0.7 0.69 - 0.6 0.59 - 0.5 0.49 - 0.4 0.39 - 0.3 0.29 - 0.2 0.19 - 0.1 0.09 - 0.0

Accepted for publication in BUILT ENVIRONMENT, volume 36, 2010
Figure 5

Stonnington Residential Properties

<table>
<thead>
<tr>
<th>RDI</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00 - 0.9</td>
<td>200</td>
</tr>
<tr>
<td>0.89 - 0.8</td>
<td>300</td>
</tr>
<tr>
<td>0.79 - 0.7</td>
<td>400</td>
</tr>
<tr>
<td>0.69 - 0.6</td>
<td>500</td>
</tr>
<tr>
<td>0.59 - 0.5</td>
<td>600</td>
</tr>
<tr>
<td>0.49 - 0.4</td>
<td>700</td>
</tr>
<tr>
<td>0.39 - 0.3</td>
<td>800</td>
</tr>
<tr>
<td>0.29 - 0.2</td>
<td>900</td>
</tr>
<tr>
<td>0.19 - 0.1</td>
<td>1000</td>
</tr>
<tr>
<td>0.09 - 0.0</td>
<td>1100</td>
</tr>
</tbody>
</table>

Residential Properties in 2000
Residential Properties in 2006
Boroondara Residential Properties

Properties

RDI

1.00 - 0.9 0.89 - 0.8 0.79 - 0.7 0.69 - 0.6 0.59 - 0.5 0.49 - 0.4 0.39 - 0.3 0.29 - 0.2 0.19 - 0.1 0.09 - 0.0

Residential Properties in 2000
Residential Properties in 2006
Figure 7

Maroondah Residential Properties

- Residential Properties in 2000
- Residential Properties in 2006
Figure 8

Maroondah RDI 2000-2006 Comparison
Figure 9

Yarra Ranges Residential Properties

Properties

RDI

0.79 - 0.7
0.69 - 0.6
0.59 - 0.5
0.49 - 0.4
0.39 - 0.3
0.29 - 0.2
0.19 - 0.1
0.09 - 0.0

Residential Properties in 2000
Residential Properties in 2006

Accepted for publication in BUILT ENVIRONMENT, volume 36, 2010
Figure 10

**Inner Suburb**

**Profile for a mature, fully built suburb**

- Maturation of stock
- Older Stock
- Redevelopment of stock

**Middle Ring Suburb**

**Profile for a suburb developed post 1950**

- Gradual maturation of housing stock and rise of redevelopment potential index
- Current Profile of Stock
- Profile of stock during early development period

High Redevelopment Potential Low
Figure 12

Total Number of Permit Approvals - Extension/Alterations

Source: Building Commission
Figure 13

Total Value of Permit Approvals - New Buildings

Source: Building Commission
Figure 14
Figure 16

Maribyrnong Road, Maribyrnong study area, currently

Possible future
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18. K2 precinct redevelopment, Melbourne. (Source: David Wierzbowski, DesignInc, 2009)

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