Strategic land use capacity in in Melbourne

Abstract: Recent metropolitan planning in Melbourne estimates the demand for housing to 2051 at 1,570,000 new dwellings across three general spatial areas: inner, established and outer growth areas. The inner city will need 310,000, the established suburbs 650,000 and outer growth areas 610,000 new dwellings. However, the new metropolitan plan, *Plan Melbourne*, does not provide estimates of land supply or housing types in these areas. The Victorian State Government introduced new planning zones in 2014. The metropolitan plan does not consider how these zones potentially increase land supply spatially. This paper presents a comprehensive metropolitan-wide method and model for determining potential land supply in Melbourne. The model matches demand for new housing to land supply and emerging housing needs across the three general spatial areas. The paper proposes alternative models of development to the predominant high rise inner urban and low density outer urban models as a contribution to emerging metropolitan policy in Melbourne. It relates housing types to housing needs in all three general spatial areas by investigating trends in high rise, outer urban housing, and the need for increasing medium density housing in middle ring and other established suburbs. The paper provides detailed land supply estimates and locations for each area, calculating the impacts of the new residential zones and the potential for redevelopment of commercial and mixed use zones to contribute to future housing needs.

Introduction

The populations of the largest Australian cities, Sydney, Melbourne and Brisbane, are projected to double in size by 2050. Under current metropolitan strategies, between 60-70% of these increases will be located in established urban areas, raising previous urban consolidation achievements to a new level. The historic concentration of two thirds of the Australian population in five capital cities makes this task more difficult. These large increases raise the issue of land supply. Over the past two decades Australian governments have identified future demand for housing but most have tended to rely on the private sector to identify sources of supply to satisfy projected demand. In reducing regulatory provisions, most governments have intended that planning systems promote private sector selection of building sites, building types and densities instead of identifying sources of land and regulating dwelling type. This reliance on market decision making through neo-liberal policies is leading to a range of undesirable consequences for most Australian cities.

This paper presents a comprehensive metropolitan-wide method and model for determining potential land supply for housing in Melbourne in the three spatial areas identified in *Plan Melbourne*, the most recent metropolitan strategic plan: inner, established suburban and outer urban growth corridors. The model is used to estimate the impact on housing supply of the following policy options: a reduced emphasis on the current dominant inner city high-rise housing model on nominated large brownfield sites in favour of a traditional European urban form; development of other large sites; redevelopment within planning zones; the impact of excluding pre-1945 shopping strips with heritage value from development; and the potential for reducing outer urban growth. Developing and using a supply model in this way allows testing of different policy scenarios and can bring confidence to a more defined and interventionist role for governments in maintaining dwelling supply in Australian cities that delivers improved economic, social and environmental outcomes

Recent housing trends in Melbourne

Plan Melbourne proposes that an additional 1,570,000 new dwellings will need to be built in Melbourne by 2051, consisting of 310,000 for the central city and surrounds, 650,000 for established suburbs and 610,000, or 38%, in growth areas (DTPLI 2014). How this demand will be met, and the pressures that satisfying it will place on the amenity, functioning, productive capacity and social cohesion of the city are key issues confronting the city today.

Melbourne's metropolitan area has quadrupled in size over the last 40 years to cover almost 10,000 km^2 at one of the lowest densities in the world. In the decade to 2012, some 60% of the more than 600,000 new residents settled in the new outer urban growth corridors. However, in recent years Melbourne has seen significant intensification of development through medium and high-rise development. The municipality of Melbourne, covering the CBD and some adjoining areas, grew faster than any other Australian municipality in the year to June 2013 with a population increase of 11,029. The CBD population rose 22.7% to 29,000 while Docklands and Southbank each grew by 15%. New high-rise development is concentrated in the City of Melbourne, with almost $1.3 billion of annualised value of building approvals in the first half of 2013-14. Such investment is now spreading to the City of Yarra, an

inner urban municipality, where the value of annualised apartment approvals rose 255% to $491 million in the first half of 2013-14, up from $138 million the previous year. The value of apartment development in the middle ring suburbs of Toorak, South Yarra, Kooyong and Armadale has reached $500 million annually while the Cities of Port Phillip and Moonee Valley also attract significant investment (ABS, 2014; Millar et al., 2014). Ten years ago, no one predicted this trend. At the same time, medium density development continues in earnest in the middle and established outer suburbs. To summarise recent growth trends, in the period between 2003 and 2013 growth was greatest in the six growth area municipalities (Wyndham, Casey, Melton, Whittlesea, Hume and Cardinia) accounting for 362,719 or 49% of all new dwellings. The four inner municipalities (Melbourne, Port Phillip, Yarra and Stonnington) added an additional 94,455 dwellings or 13%, the 13 middle ring councils' dwelling stock increased by 179,090 or 24% of the total, and the eight established outer councils by 104,580 dwellings or 14% (DTPLI, 2014).

These trends imply a business-as-usual approach to the established suburbs, and a reduction in percentage terms of the proportion of growth on the fringe in favour of an increased proportion of supply in the central city and surrounds. Much of the central city target will be delivered in the CBD and by major Brownfield sites such as Fisherman's Bend, E-Gate and the Arden-Macaulay precinct. The figure for established suburb redevelopment, while significant, is distinguished by the general lack of detail in *Plan Melbourne* on how such supply could and should be achieved; or indeed whether increased supply in these regions might be achievable and more desirable than high-rise development and fringe expansion.

The main vehicle for delivering more development in the existing suburbs is the newly introduced reformed land-use zones (Buxton and Goodman, 2014). However, the Victorian government has provided no detail on the potential of zones to deliver dwellings through housing types and locations. Some commentators have expressed concern that the target of 650,000 new established area dwellings cannot be met because of regulatory restrictions imposed by new residential zones, leaving only the options of small inner urban high rise apartments or outer urban housing to meet demand. Supporters of urban intensification have criticised the high use of the most restrictive zone, the Neighbourhood Residential Zone (NRZ). This prevents the construction of medium-density housing by limiting development to one additional dwelling or the number listed in a schedule. The General Residential Zone (GRZ) allows medium-density development to occur, while the Residential Growth Zone (RGZ) allows medium-rise development. The Property Council (2013:1) commented that "the restrictive components of the new zoning arrangements will no doubt please local activists who would like to freeze dry Glen Eira, but they effectively torpedo numerous local revitalisation opportunities and lock out higher level investment". Kelly and Donegan (2013:20), similarly claimed that "if this pattern of councils locking down most of their neighbourhoods continues, nearly all new housing will be built in Melbourne's outer suburbs and on the urban fringe".

However, while a number of councils have applied the NRZ, the impact on potential supply is unclear. Potential for suburban redevelopment should be assessed against total land supply in all zones, not only the area affected by the Neighbourhood Residential zone. Considerable suburban areas are available for redevelopment: in commercial zones, small and larger infill sites, around activity and nominated redevelopment centres, along transport corridors and in other residential zones. The lack of analysis on the implications of the new zones highlights a failing of the process behind the production of *Plan Melbourne*. The Victorian State Government developed the new zones well in advance of the metropolitan strategy. The uses and developments the zones allow and prevent, not *Plan Melbourne*, in effect constitute much of the real strategy for Melbourne. Further, *Plan Melbourne* does not adequately match housing targets in nominated locations with potential supply, and as a result, its effectiveness in relating supply to projected demand cannot be assessed.

One predicted consequence of facilitating market decisions to build both large amounts of high rise apartments and detached outer urban housing is the failure to provide diverse dwelling options in established suburbs. Birrell et al. (2012) argue that neither high-rise nor fringe suburbs are likely to appeal as permanent housing to the 241,111 new households aged 25-34 which will form from 2011-21. To meet this emerging young demographic, proper planning must ensure an increased range of housing options in established suburbs.

Modelling alternative housing intensification

Past proposals have advocated alternative approaches to urban intensification implying a stronger role for government in identifying sources of land supply and associated design criteria. These studies

contribute to discussion on the potential location and nature of new housing supply. A public transport-focused approach targeted 3% of metropolitan land to house 1,003,950 people 6,693 hectares on along inner city tram and bus corridors at 180 people per hectare or 2,476,000 people at 400 persons per hectare. (Adams, 2010) Redeveloping transit corridors could stabilise Melbourne's suburbs, reduce development behind arterial roads, curtail further extension to the urban growth boundary and provide affordable housing.

Activity-centre modelling of *Melbourne 2030's* proposal for 255,000 new dwellings in activity centres over three decades doubled the 1990s' rate of infill. The model identified 6,300 hectares of developable land in activity centres, adjacent to tram, rail and bus routes with potential to accommodate 600,000 people at a density of 100-200 people per hectare. Land in activity centres comprised 57% of the total (Woodcock and Dovey 2009). Analysis of older middle-ring 'greyfields' identified large scale redevelopment in established areas to replace extensive tracts of existing low density detached housing – the "ageing, occupied residential tracts of suburbs which are physically, technologically and environmentally obsolescent" – with a denser urban form (Newton et.al, 2010: 81).

The model

We have built a comprehensive housing supply model for an entire metropolitan region. The model aims to estimate potential for increased housing supply across the city by identifying sites suitable for development under different policy settings; and applying appropriate yields to those sites under different built form guidelines/restrictions. We then calculate detailed estimates of dwelling supply potential. Our model is based on existing patterns of land use. Land ownership patterns have been shown to be highly persistent over time (Groenhart et al., 2013; Nygaard and Meen, 2013), with land fragmentation far more likely than land assembly (Eckhart 1985). Modelling of potential dwelling supply in existing areas of cities is served best by starting with the existing land-use patterns. While some land assembly may occur and thus enable greater yield, models based on assuming land assembly disregard evidence on the challenges of achieving such lot amalgamation.

With the foundation of a lot-level database of all lots in the metropolitan area, we then build in descriptors of those sites to inform potential for development. The database includes five key lot features for supply modelling: Lot Size; Zone; Region, Existing Dwelling Number and Heritage Value. Lot Size is recorded in square meters and provides the basis for potential dwelling yield calculations. The Zone provides the detail of the land-use policy provisions for the lot, and thus the nature of future permitted development. The Region provides information about the location of the lot within the metropolitan area which informs the intensity of appropriate development. Lots are coded as Expanded Central City, Inner, Established Middle, Established Outer or Growth Area (see Figure 1). The Existing Dwelling Number is an indicator of development potential for increased housing supply. Lots are coded as having no dwelling, one dwelling or more than one dwelling. Finally, the Heritage Value indicates lots with particular characteristics worth preserving.

Figure 1: Metropolitan regions
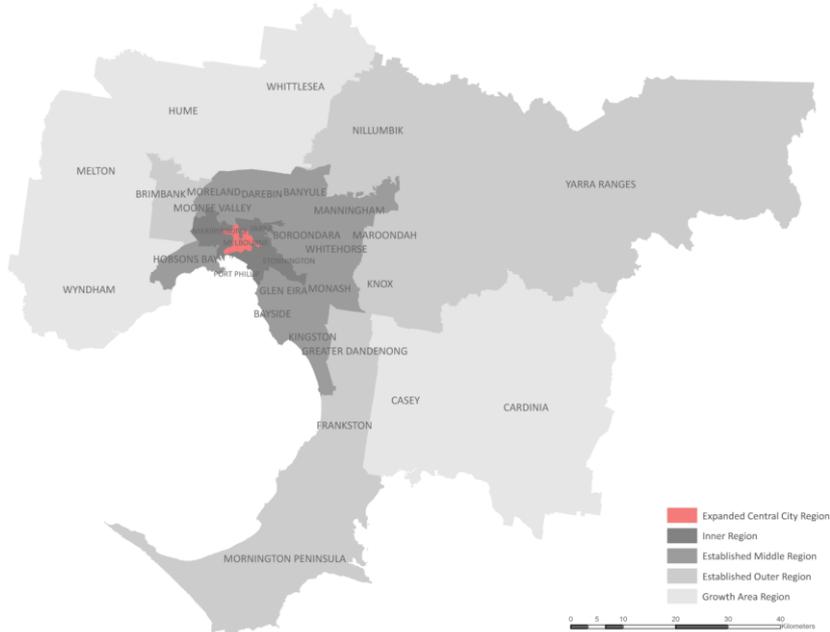
Housing supply potential in Melbourne - method

Our modelling of housing potential in Melbourne aims to identify potential land and dwelling supplies to 2051, when *Plan Melbourne* projects the metropolitan area will require an additional 1,570,000 homes. As a preliminary step we incorporate existing projected dwelling figures for specific parts of the metropolitan area. The City of Melbourne and Victorian state government departments have estimated dwelling supplies for lots in the *Plan Melbourne*-defined Expanded Central City which our model largely accepts (178,700). The model also incorporates the Metropolitan Planning Authority's (MPA) projections for new dwellings within Precinct Structure Plans (PSP) or other available growth area information (159,580). It also uses the *Urban Development Program's* 2013 dwelling estimate for infill redevelopment on large sites (30,470).

The next step is Lot Selection. Lots are filtered to exclude features of interest (such as Community spaces; Churches; Courts; Prisons; Education facilities; Hospitals; and Recreation reserves and facilities). The Zone characteristic is then used to identify lots suitable for intensified housing development. In the Victorian Planning Scheme the residential, commercial and urban growth zones. However, as we are modelling supply over 40 years, we include a number of zones which in the future councils may rezone to allow residential development: the Commercial 2 and Industrial zones. These additional zones have been restricted to lots in the Inner region within 400m of a designated activity centre (a strategic policy designation of areas suitable for intensified residential development) and to limited parts of the established suburbs. The Lot Size characteristic is used to exclude lots under 225sqm as generally inappropriate and impractical for redevelopment. The Existing Dwelling Number is a proxy for development potential: lots with more than one dwelling are excluded. The Heritage Value characteristic is used to remove additional sites. In this case study the heritage parameters are defined as lots under a Heritage Overly (planning scheme mechanism) and/or those lots with buildings developed prior to 1945 on tram corridors. This second constraint is an example of how the model can be adjusted to elevate particular policy objectives, here the preservation of heritage strip shopping centres. Table 1 presents the total number of lots in the dataset and those after the above exclusions. To demonstrate the impact of lot selection, figures 2 and 3 show the lots and zones for the City of Whitehorse before (figure 2) and after (figure 3) lot selection.

Table 1: Number of lots suitable for increased supply

Region	Total number of lots in HCA data set	Lots after Lot Selection and Heritage Value Characteristics
Inner	108,559	22,985
Established Middle	637,571	283,949
Established Outer	473,103	266,056
Growth areas	343,288	662

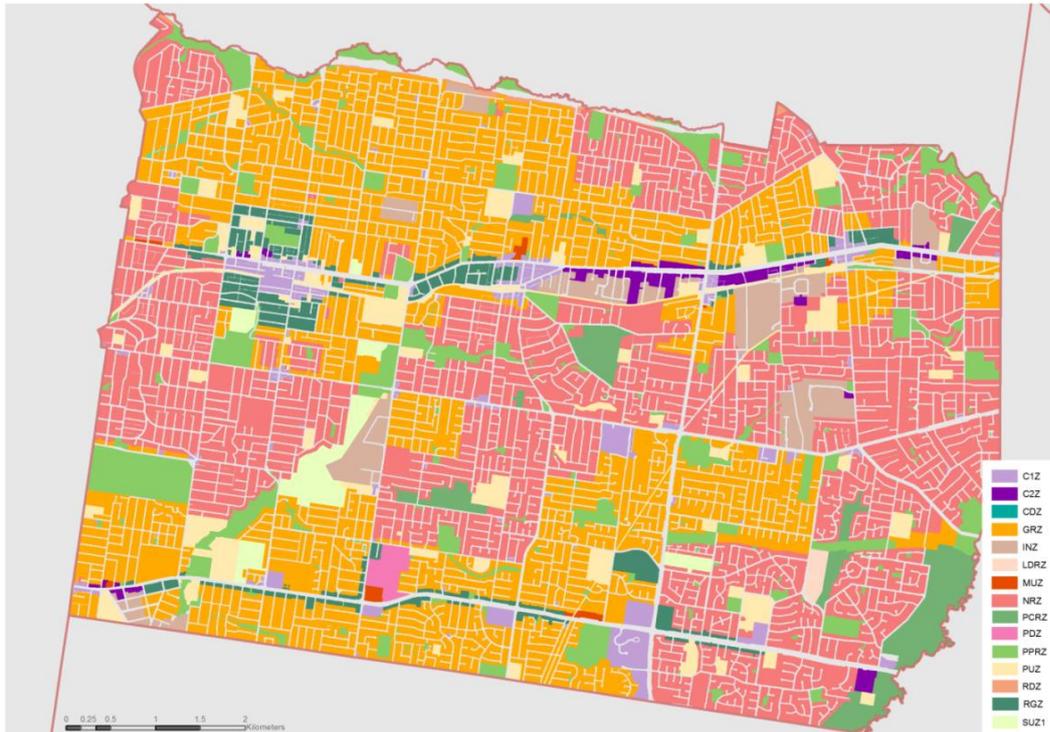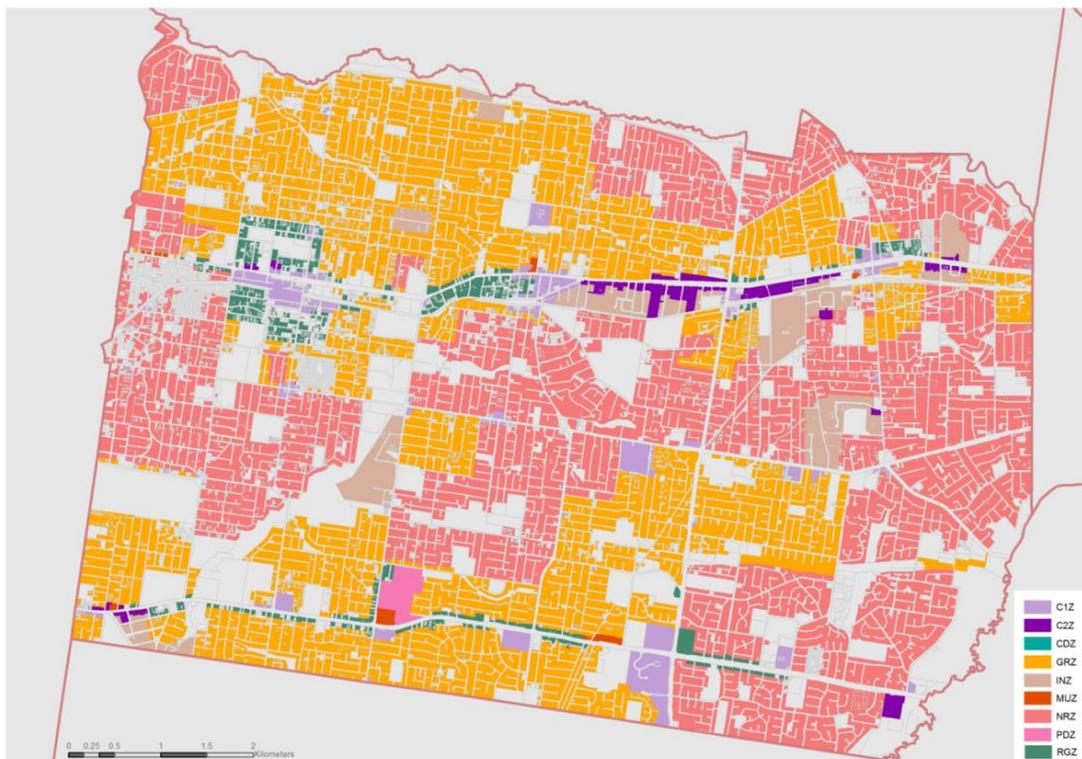**Figure 2: City of Whitehorse, all zones and all lots**

Figure 3: City of Whitehorse, lots without heritage overlays in zones appropriate for redevelopment

We start with the Victorian state government's *Housing Capacity Assessment* (2001-2012; HCA) data set which is based on Melbourne's cadastre. This data includes the five lot characteristics and Zone information is from December 2014. From this foundation we can then model different supply scenarios. We do this via three steps: Lot Selection; Lot-level Yield Potential; and take-up rate. The first step of Lot Selection restricts the overall lot database to those identified as suited to intensified development. The second step calculates the Yield potential for each remaining lot. Lot-level Yield Potential figures are based on detailed urban form, building design, dwelling size and dwelling mix models established via a combination of existing development examples, documented industry standards, and desired built form outcomes. The final step applies a take-up rate estimating the proportion of lots in a given category

(size, zone, location, development potential) which will be redeveloped in a specified time period. The specific values of the factors outlined in the case below are necessary to estimate potential yield, and are based on existing policy provisions and development characteristics, and particular policy objectives. However, these values can be changed in the model to reflect different assumptions or objectives. Setting the values allows the model to work as a tool for policy development.

The second step in modelling supply is determining lot-level yield potential. The yield rules aim to provide new supply appropriate to neighbourhood character. Table 2 presents the yield rules by lot size (up to 2,000sqm), zone and existing dwelling number for the Inner, Established Middle and Established Outer regions. Lots over 2,000sqm are treated differently due to their size, with a dwelling per hectare factor used based on regional location as follows: Inner, 120 dwellings per hectare; Middle, 70 dwellings per hectare; and Outer, 35 dwellings per hectare. All lots in Growth Areas used either existing documented yields from the MPA (via the PSP process) or a dwelling per hectare factor of 15 dwellings per hectare on vacant lots over 500sqm.

For the residential zones, we use the Victoria Planning Provisions (VPP) to broadly define lot yield rules and heights. For mixed use and commercial zones, the VPPs have fewer restrictions on built form. In these zones, we set height limits of six storeys, despite existing provisions' discretionary approach to the number of storeys. This deliberately reflects a European built form response. Yield rules also incorporate a Building Intensity Factor which considers site coverage (80% or 60% depending on zone) building setbacks and podiums, shared or private open space, and apartment size (an average of 80sqm).

Table 2 – Yield rules for sites <2,000sqm

	YIELD RULES	
	No dwelling	One existing dwelling
Neighbourhood Residential Zone (NRZ)		
NRZ 225-500sqm	1	0
NRZ 500-2,000	2	0
NRZ 750-2,000	n/a	1
General Residential Zone (GRZ)		
GRZ 225-450sqm	1	0
GRZ 450-675	2	1
GRZ 675-1,000	3	2
GRZ 1,000-2,000	8	8
Residential Growth Zone (RGZ)		
RGZ 225-500sqm	8	8
RGZ 500-1,000	18	18
RGZ 1,000-2,000	36	36
Mixed use and commercial zones		
ACZ, C1, MUZ 225-500sqm	11	11
ACZ, C1, MUZ 500-1,000	24	24
ACZ, C1, MUZ 1,000-2,000	48	48

The third step in modelling supply potential is assigning take-up rates to reflect the proportion of suitable sites that might be expected to be redeveloped by 2051 under supportive policy conditions. Through designating lots to Residential Growth, Comprehensive Development and Priority Development zones, councils have indicated their preference for short term redevelopment of these lots: our take-up rate for these lots is 100%. We similarly apply this take-up rate to commercial and mixed use lots without a dwelling, anticipating a combination of future residential and non-residential redevelopment. If Neighbourhood Residential, General Residential, commercial and mixed use zone lots are vacant, we expect 100% of those lots to be developed. Where large lots have one existing dwelling, we define this as underutilised in the Inner Region given their location and value: we apply a 100% take up rate to these lots. The Neighbourhood Residential Zone also overlaps extensively with Inner Region's heritage overlays and thus reduces the dwelling yield potential of that zone. However in the Established Middle and Outer regions, an existing dwelling is likely to act as a constraint on redevelopment: we apply a 50%

and 30% take-up rate respectively. For zones which prohibit residential uses, we anticipate the rezoning process will result in slower redevelopment with a residential component. We apply a 100% take up rate to C2Z and INZ lots in or within 400 metres of the Inner region's activity centres as these lots have clear locational advantages. In the Established Middle and Outer regions, developers are less likely to target these lots for redevelopment given their greater complexity: we apply a 30% take-up rate to lots in the Established Middle and 20% to those in the Established Outer region.

Housing supply potential in Melbourne - results

This model of Melbourne's metropolitan housing potential shows that projected future demand for dwellings can be met through a different approach to built form than inferred in *Plan Melbourne*. Three steps illustrate the process which could produce new dwellings appropriate to Melbourne's existing physical character and without putting additional demands on urban fringe land for new houses. The impact of these steps on potential dwelling yield are summarised in table 3.

After applying the Lot Selection characteristic filters (Zone, Lot Size, Existing Dwelling Number) to the Victorian state government's *Housing Capacity Assessment* data, the number of lots suited to calculating dwelling yields falls by more than a third from 1.56 million to 570,000. The total dwelling yield on these lots is 2.83 million, almost double the Victorian state government's dwelling demand projection of 1.57 million.

Table 3: Dwelling yields

Region	*Plan Melbourne*	Yield after Lot Selection	Yield with Heritage Value	Final scenario yield
Central City and Surrounds	310,000	410,988	314,388	279,829
Balance of Established Areas	650,000	2,114,482	1,938,906	933,697
Growth Areas	610,000	271,728	264,551	264,551
Urban Development Program	**-**	30,470	30,470	30,470
TOTALS	**1,570,000**	**2,827,668**	**2,548,315**	**1,508,547**

The Established Middle and Outer regions contribute over 70% of this potential dwelling supply, with the General Residential Zone in those areas providing the most opportunities for new homes particularly through dual and triple occupancy. Only ten per cent of additional dwellings are located in the Growth Areas, either within existing Precinct Structure Plan areas or at 15 dwellings per hectare on vacant lots over 500sqm.

Using the Heritage Value characteristic to remove lots with a Heritage Overlay or with buildings developed prior to 1945 along tram lines reduces the overall number of lots by about five per cent. Even though the Heritage Value characteristic's impact is greatest numerically in the Established Middle Region, its proportional effect is largest in the inner municipalities of Maribyrnong, Port Phillip, Stonnington and Yarra where their lot count falls by one third. This is consistent with the older age of the building stock in these areas; their proportional contribution to new dwellings on lots under 2,000sqm drops from four to two per cent.

This step reduces the total dwelling yield by around 280,000 to 2.55 million new homes, one million more than the Victorian state government projects will be needed by 2051. The overall impact of the Heritage Value Characteristic on possible future dwelling yields is relatively small: additional protection of Melbourne's pre-1950s architecture and built form will not remove large amounts of development potential. This approach notably protects 30% of lots under 2,000sqm in commercial and mixed use zones from demolition and redevelopment.

The final scenario takes the lots remaining after the Heritage Value characteristic is applied and introduces the take-up rates previously outlined, with calculated potential dwelling yields close to officially projected demand in *Plan Melbourne*. *Plan Melbourne* anticipates that the Balance of Established Suburbs will accommodate 41% of new homes by 2051: this scenario expects higher yields and a proportional contribution of 62% by that region. By contrast, this scenario models a reduced proportion of future housing supply in Growth Areas: *Plan Melbourne* defines their contribution as 39%, the model proposes 17%. The Central City and Surrounds remain at around 19%, little different to *Plan Melbourne's* 20%. This official proportion does not include the more extensive heritage protection incorporated in this scenario.

To explore the implication of our final scenario in more detail, table 4 breaks down the potential yield by region, zone and lot size. The Neighbourhood Residential Zone makes a small (6%) but important contribution to the scenario's potential dwelling yield. Almost half of new dwellings in this zone could be built on lots which currently do not have any dwellings. The model restricts dual occupancies in this zone in the Established Middle and Outer regions to 50% and 30% of lots, and remaining lots have a potential supply of 29,000 new dwellings. Only around 1,000 lots zoned NRZ are over 2,000sqm across the metropolitan area and these could potentially accommodate approximately 18,000 new homes.

In this scenario, the General Residential Zone has the largest prospective dwelling yield, and particularly on lots under 2,000sqm. Overall this zone contributes 31% of potential future metropolitan supply, even with the application of the 50% and 30% take up rates to the Established Middle and Outer regions' lots with one dwelling. Dual and triple occupancies in those regions provide the greatest possible gains on lots between 450 and 1,000sqm: the model shows that over two thirds of the 468,000 additional dwellings in the General Residential Zone could take this form of moderate density infill development.

Commercial, Mixed Use, Comprehensive and Priority Development-zoned lots could have almost 190,000 additional dwellings in buildings with a range of uses and a maximum height of six storeys. The Established Middle region has the greatest potential supply, and particularly on smaller lots which do not currently have any dwellings (note that the take up rate does not apply to these lots, only to those with an existing dwelling).

Table 4: Final scenario dwelling yield

	Inner Region	Middle Established Region	Outer Established Region	
Residential zones				
NRZ < 2,000sqm	865	26,836	14,372	
NRZ > 2,000sqm	607	19,434	21,125	
GRZ < 2,000sqm	20,111	182,135	161,879	
GRZ > 2,000sqm	9,097	38,863	55,835	
RGZ < 2,000sqm	6,344	76,000	98,868	
RGZ > 2,000sqm	847	3,865	1,266	
TZ > 2,000sqm	-	-	666	
Commercial and mixed use zones				
ACZ, C1, MUZ < 2,000sqm	31,591	77,959	32,365	
ACZ, C1, MUZ > 2,000sqm	14,158	15,916	4,618	
CDZ, PDZ >2,000sqm	2,749	4,322	4,594	
Non-residential zones				
C2 >2,000sqm	8,551	5,861	6,154	
INZ >2,000sqm	6,209	42,197	38,570	
Expanded Central City	178,700			
Subtotal	*279,829*	*493,385*	*440,312*	
Growth Areas				264,551
Urban Development Program				30,470

TOTAL   1,508,547

In all of the zones, larger lots have important potential for residential and non-residential redevelopment as illustrated in Figure 4. Under this scenario, they contribute around 22%, or 336,000 additional new dwellings across the metropolitan area. This figure includes the *Urban Development Program* estimates and conservative dwellings per hectare factors. Lots over 2,000sqm, and specific sites such as Maribyrnong Defence (3,000 dwellings) and the Alphington Paper Mill (600 dwellings on lots without Heritage Overlay), may be capable of producing greater potential dwelling yields than currently modelled in this scenario.

Figure 4: Dwelling yields by *Plan Melbourne* regions and lot size
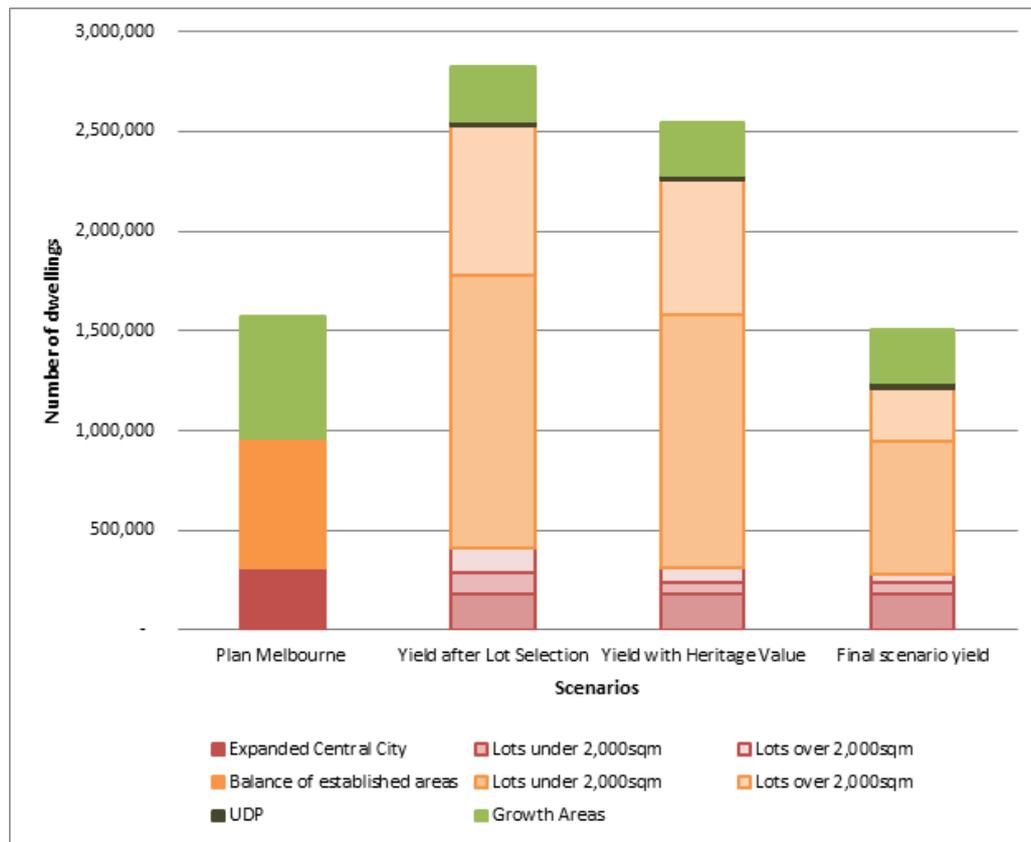
Discussion

Melbourne does not have a shortage of available land for redevelopment in its established areas. However, the assumptions governing the redevelopment of this land will determine the yield and the type of new housing.

Extensive redevelopment potential exists on land affected by all existing residential zones. Concerns that new residential zones will prevent or inhibit land available for redevelopment in the middle ring suburbs, or constrain the achievement of overall metropolitan housing targets are unfounded. Councils

in the inner and middle suburbs have widely applied the Neighbourhood Residential Zone (NRZ) but this zone allows dual occupancy housing and our model applies an expected take-up of one additional house on 50 and 30 per cent on existing lots over 750 square metres. The average percentage of residential land affected by the NRZ is about 33% leaving significant areas capable of more intensive development.

The majority of residential land in the established middle and outer suburbs is zoned General Residential Zone (GRZ). Housing in the GRZ need not be erased to meet housing targets; a gradual take-up 40% of lots to 2050 will contribute towards a balanced target. The challenge in the GRZ is to improve design and off-site impacts; this might involve measures such as better design standards or coordinated attempts to alter large-scale areas on the 'greyfields' model. The MUZ also allows significant development particularly in inner suburbs because of the lack of regulatory control. In addition, extensive redevelopment potential exists in non-residential zones, particularly the Commercial 1 (C1) and in conversions from industrial land.

Considerable land supplies exist as large sites ranging from substantial inner urban brownfield sites, nominated large redevelopment sites and lots above 2,000sqm in all zones.

The large potential supplies of land in middle ring and other established suburbs therefore can provide housing for the emerging demographic from these suburbs who are increasingly reluctant to purchase housing in high density inner areas or low density urban growth corridors.

In the C1 zone, protecting pre-1945 strip centre buildings leads to only a small reduction of overall metropolitan dwelling supply, while significant redevelopment opportunities remain on sites developed or redeveloped since 1945. Existing provisions of the heritage overlay and the lack of height controls in commercial zones are unable to prevent large scale demolition of traditional strip retail centres; yet amenity from heritage buildings has significant economic value particularly in attracting advanced business professions and knowledge workers.

Allowing the market to develop large inner urban brownfield sites without regulatory standards will leave a legacy of high rise poorly suited to the emerging needs of the city; the alternative is for the government to mandate a traditional European scale and building design types with high environmental performance. This will attract the newly forming households from the established suburbs and Melbourne will become a best practice international example of urban redevelopment

The proportion of outer urban growth corridor housing can be reduced and its density increased without unduly affecting metropolitan dwelling supply projections. The proportion has fallen from 48 per cent in 2008 to 28 per cent in 2013-14. Future policy could seek to further reduce this proportion as demonstrated by our model which reduces it to 18%.

Conclusion

This study contributes to an assessment of how available land supply in a major Australian city can be matched spatially with dwelling demand. It demonstrates how the proportion of outer urban growth can be reduced substantially, the potential for dense alternatives to high rise development in large brownfield sites to offer attractive housing opportunities to new households, and the extensive opportunities in established suburbs for the construction of a range of dwelling sizes and types. The study demonstrates how Melbourne can double its population while maintaining its stock of heritage buildings and high amenity.

Market-based development has a range of unpredicted and undesirable impacts on urban form, undersupply and overuse of infrastructure. It is producing poor quality high rise developments and insufficient affordable and diverse housing types close to employment and services. We have argued that an evidence-based approach to metropolitan-wide housing supply is needed. This requires a comprehensive and robust method for estimating the housing supply capacity of a city, and for modelling different policy scenarios and related market behaviour to estimate future supply. In turn, this implies a strong role for government in identifying land supply and defining redevelopment design and density rules.

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