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Travel characteristics and access to jobs by higher density residents in Sydney and Melbourne

ARC Project DP0773388 The Demand for Higher Density Housing in Sydney and Melbourne
Working Paper 4

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Introduction

The aim of the research project is to test the planning assumptions or perceived wisdom on which the case for a more compact city and higher densities of residential development rests. There is a growing body of work which has begun to modify or qualify the existing analysis that underlies the planning assumptions underpinning the promotion of higher density development in urban areas (Troy 1996; Searle 2004; Randolph 2006).

The analysis presented in this working paper concerns travel characteristics and transport utilisation within populations living in higher density housing in Sydney and Melbourne. At the centre of the analysis is an assessment of the role high density plays in the promotion of forms of public transport usage. The working paper attempts to align detailed survey analysis within a spatial framework.

Most of the analysis conducted on transport utilisation either comprises highly detailed sociological studies (see Ellaway et al. 2003) or consists of national or international comparative studies based on secondary data (for example Newman and Kenworthy (1989)). While sociological studies are successful at detailing behavioural patterns and influences on travel choice, these studies are seldom extrapolated to a scale which would be of use for planning purposes. On the other hand, generalised comparative studies do not recognise such influences on behaviour and cannot be scaled down and applied to residents of higher density dwellings.

The methods and sources of information used in this working paper attempt to structure a best practice, academically rigorous, applied survey approach in order to capture the extent to which these assumptions resonate with the experiences of residents in higher density developments in Sydney and Melbourne. Throughout the analysis the researchers are mindful of the complexity of social, demographic and spatial conditions attending the higher density residential population of metropolitan Sydney and Melbourne.

Working Paper 3 describes a methodology and the central importance of factor grouping as a method of identifying groups of higher-density residents. While these factor groupings are used in this Working Paper to describe the different perceptions and experiences of those living in higher-density dwellings, the data collected **cannot be used to quantifiably test, assess or provide concrete evidence to support or dismiss these assumptions.** Rather, the findings provide a qualitative discourse on the nature of the authenticity of planning assumptions.

This approach illuminates the extent to which these planning assumptions resonate with the experiences of apartment residents and how this varies in different locations between people with different socio-economic backgrounds, and between people who have had different experiences of apartment living.

Planning assumptions about travel & access to jobs

All current Australian metropolitan plans are predicated on the principle of a more compact city (Randolph 2004, 2006; Bunker and Searle 2009) where the emphasis is switched from expansion outwards at the urban fringe to renewal, redevelopment and infill in the existing urban area. To articulate and structure this intensification of current suburban densities, existing centres are expanded and act as a focus not only for commercial and community activity but for higher density dwellings. Further, these centres are connected with the central city and with one another by transport corridors. The intention is that such a planning strategy encourages travel by public transport and enables more people to live close to an array of jobs and services.

Although these kinds of proposals are a prominent feature of all current metropolitan strategies, they are most strongly adumbrated in Sydney and Melbourne, the subjects of this research project (Bunker and Searle, 2007). Melbourne has a long history of using centres as a means of structuring a more compact and higher density city. However it is in the Sydney metropolitan strategy *City of Cities* (Department of Planning, 2005) where these concepts are most developed. 'Centres and Corridors' is a central instrument in the planning of Sydney to 2031 and is interwoven with, and affects, other strategies concerned with economy and development; housing; transport; environment and resources; and implementation and governance. Centres and corridors contribute to all of the five aims espoused for the metropolitan strategy, but the two which are reviewed in this research project are those of:

- "fairness by planning for a spread of activities and services in the array of centres and corridors right across the metropolitan area providing more equitable access"; and

- "concentrating activities around public transport, thereby reducing car reliance and leading to less emissions and pollution" (Department of Planning NSW, 2005, p. 82).

The research questions

To connect planning assumptions with the evidence and data gathered together in this project, it is necessary to list the research questions, with some early comment on the findings:

1. Do people living in higher density housing use public transport more than those living in detached houses?

Comment: the answer to this appears to be yes

2. Does the use of public transport differ between the different types of people living in higher density housing?

Comment: the answer to this appears to be yes

3. Does the use of public transport differ between the different areas of the city in which people live in higher density housing?

Comment: the answer to this appears to be yes

4. Does access to jobs differ between the different types of people living in higher density housing?

Comment: the answer to this appears to be yes

5. Does access to jobs differ between the different areas of the city in which people live in higher density housing?

Comment: the answer to this appears to be yes

Axes of analysis: factor groupings

The 1,597 survey responses are grouped and classified in two ways. One is by the factor groupings described briefly in Working Paper 3, which group higher density residents into five main groupings with some overlaps and grey boundaries. They have been labelled ‘economically engaged’, ’battlers’, ‘achieving education’ ‘residentially retired’ and ‘apartment elite’. They are arranged in order of degree of definition of factor groupings (see Working Paper 3).

The Economically Engaged

This is the second largest of the factor groups making up about 23% of the total apartment population across the two cities (24% in Sydney and 22% in Melbourne). It is dominated by a population comprising young adults through to the younger middle aged. While many of these are single person households, there are also many couples, although the majority do not have children. They are employed in a range of higher-order occupations (ASOC categories 1-3) resulting in medium to high incomes with over $90,000 a year not being uncommon. Over two-thirds are renting their home, although a quarter are in the process of purchasing.

The survey respondents in this group were very mobile with 83% having moved within the five years prior to taking part in the survey, and 69% intending to move in the next two. Half had moved into their present apartment from another apartment, while a third (36%) had previously lived in a detached house.

The Battlers

This is the largest of the five factor groups across the two cities, although there are marked differences between their importance in them (38% in Sydney and 10% in Melbourne). This population is strongly characterised by families with children with 65% of households in this configuration and 21% of the population aged under 15. This group is predominantly engaged in lower-order occupations resulting in low household incomes (almost half of households with incomes below $800 a week compared to a national median of $1,207). Incidence of unemployment was also greatest in this group at 12%. This said, well over a third of this group either owned their home outright (14%) or were in the process of purchasing it (24%). Just over a third of this group was born in Australia, with Chinese, Indian and Vietnamese born people figuring highly.

The survey respondents falling into this group were relatively mobile, with 74% having moved at least once in the last five years prior to taking part in the survey and 56% intending to move within the next two years. About equal proportions of people had lived in a detached house (41%) or an apartment (43%) before moving into their present home.

Achieving education

This group also varies markedly in its relative importance, making up 6% of residents living at higher density in Sydney and 30% in Melbourne. It is almost entirely made up of young (under 25 years old) households living on their own (38%) or sharing as group households (23%). Less than a third of this group was born in Australia, with many being born in India, China and Korea. While almost 80% are renting, 10% own their apartment outright, perhaps bought by their parents. The survey respondents in this factor group were very mobile with 88% having moved in the five years prior to taking part in the survey and 73% intending to move in the next two.

Residentially retired

This group makes up about 25% of apartment residents in Melbourne and 10% in Sydney. Over a third of this population is aged over 65 and over half are lone person households. Although heavily correlated with low incomes and with over 40% not in the labour force, 37% own their apartment outright, by far the highest

of the five factor groups. This group also had the highest incidence of Australian or Anglo-centric (UK and New Zealand) country of birth.

The survey respondents in this factor groups were the most settled of the five factor groups. Although 39% had moved within the five years prior to taking part in the survey, 81% indicated they had no intention to move again. The majority (59%) had moved into their current apartment from a detached house, while 25% had moved from another apartment.

The apartment elite

This group makes up about 23% of apartment residents in Sydney and 13% in Melbourne. Predominantly they are couples over 50 without children living with them and are almost entirely employed in higher-order occupations with many households earning in excess of $130,000 a year. Over a half are renting and a quarter own their home outright.

The survey respondents in this factor group were less mobile than all the other groups with the exception of the residentially retired. However, almost half (49%) had moved in the five years prior to conducting the survey and a similar proportion (46%) intend to move at some stage.

Differences between the two cities

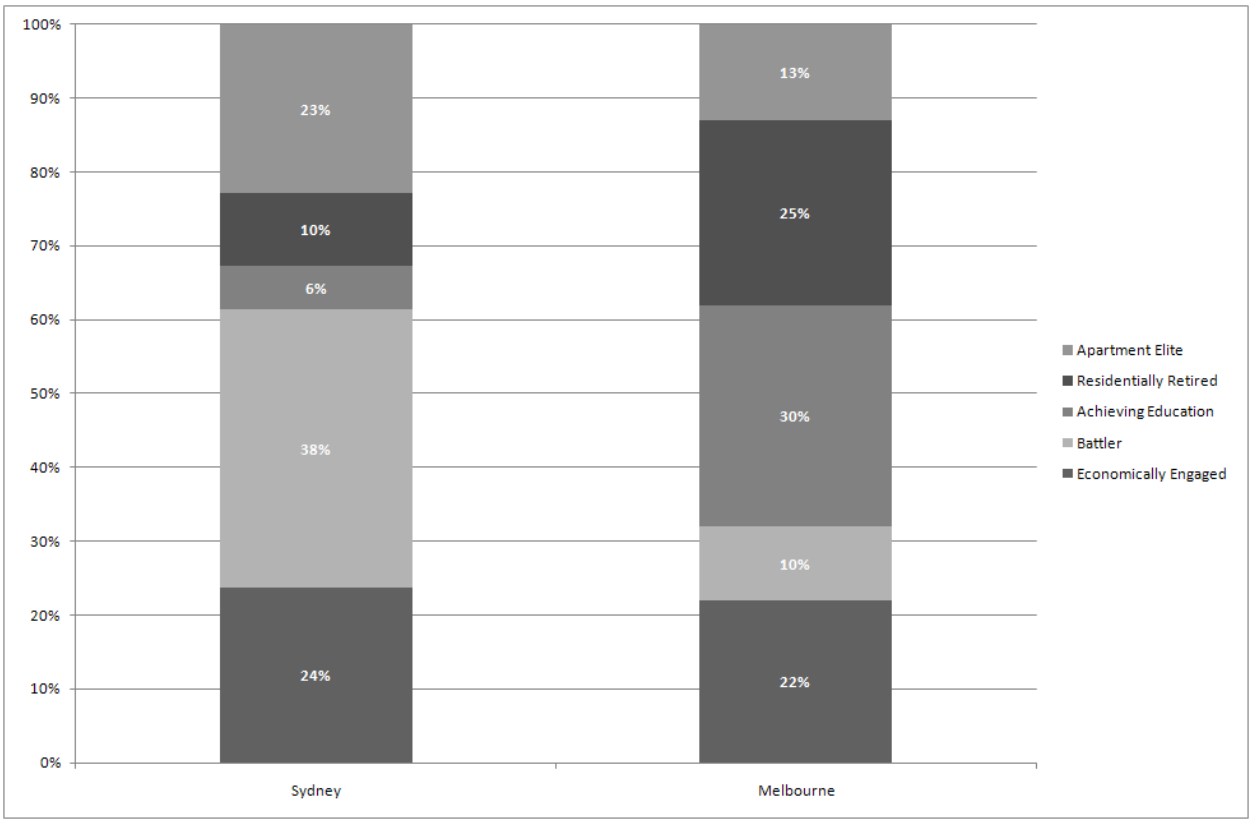
Whilst the factor analysis has been applied to data for both Melbourne and Sydney, it should be noted that the factor groups are not represented in the same way in the two cities and some significant differences exist between the two as shown in Figure 1.

Areas that can be determined as predominantly ‘economically engaged’ (SINKS / DINKS) in both cities contain around a quarter of the high density populations. This would suggest that the high density form in both cities provides similar amenity for these forms of households. One of the largest differences between the two cities is the relative absence of the ‘battler’ market in Melbourne, with only 10% of this city’s high density population living in locations that are dominated by this factor grouping. This, in itself, could be a legacy of the earlier flat block developments in Sydney's western suburbs from the 1960s, as similar suburban locations in Melbourne are still dominated by single houses.

Another key difference is the sheer scale of the student / young economically unengaged (or partly engaged) population in Melbourne. Well over a third of all of Melbourne’s high density locations can be *predominantly* categorised as populations ‘achieving education’ (compared to only 10% of Sydney’s). One potential reason for this is that a considerable number of newer higher density dwellings have been constructed for this market in locations immediately adjacent to the city's two largest universities. As noted earlier, a large component of this factor group is from overseas and it can be assumed that they would find such locations convenient if they had moved to Melbourne since these dwellings were built.

Finally, areas of highly economically engaged, affluent renters / purchasers (the ‘apartment elite’) are more prevalent in Sydney then in Melbourne. A possible explanation is that Sydney’s ‘premium’ apartment market is much more mature than in Melbourne.

Figure 1: Proportion of higher density population within predominant factor groupings in Sydney and Melbourne.



Axes of analysis: inner, middle and outer zones

The two cities were split into inner, middle and outer zones based on local government areas and these are shown in Figures 2 and 3. The survey respondents and interviewees were allocated to their appropriate zone.

Figure 2: Sydney Zones

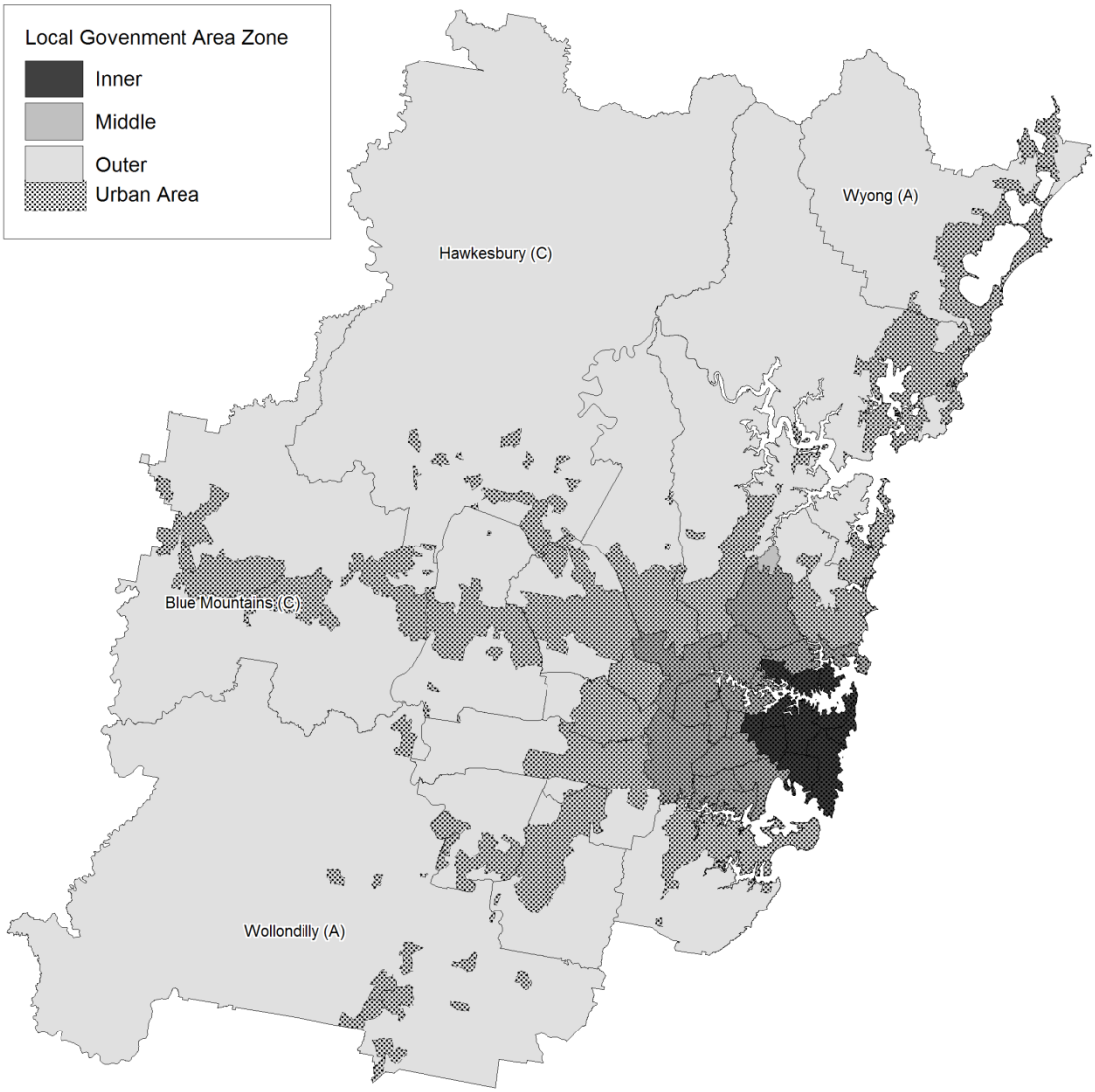
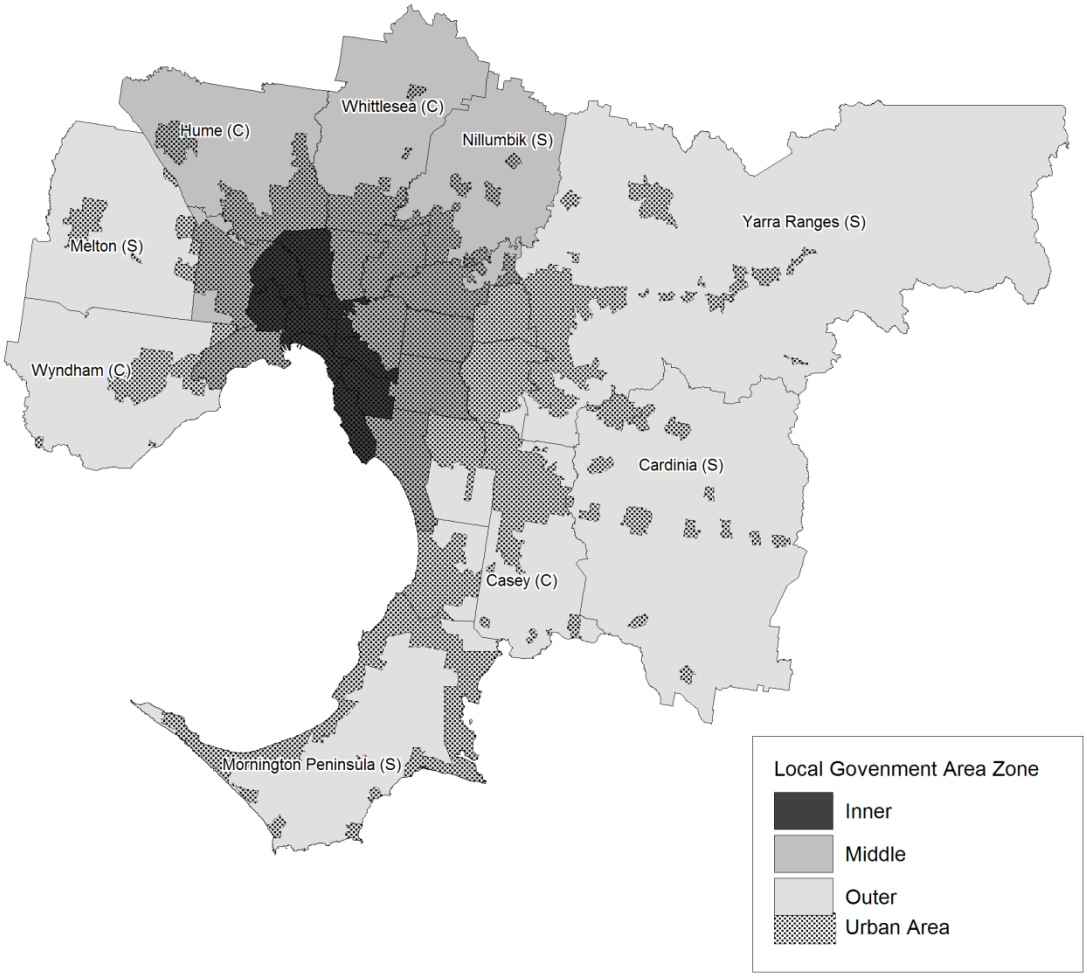


Figure 2: Melbourne Zones



While somewhat arbitrary, the zones do reflect in general terms the history of urban development, intensity of development activity and levels of density. This spatial differentiation is useful in trying to come to terms with the influence of **location** on the travel behaviour and access to services of those living in high density dwellings.

Do people living in higher density housing use public transport more than people in detached houses?

The first question addressed is whether people living in higher density housing use public transport extensively. Questions were asked as to the importance of the closeness of nine different groups of services and facilities in choosing the present dwelling. Significantly, closeness to public transport was regarded as the most important of these nine factors for survey respondents when choosing their current dwelling. Table 1 shows how respondents in Sydney and Melbourne replied to this question. Almost 80% of respondents in both cities regarded closeness to public transport as 'Very Important' or 'Important', but less than half of those in Sydney regarded it as 'Very Important' compared with 59% in Melbourne.

Table 1: Importance in choosing apartment – closeness to public transport

	Very Important	Important	Neutral	Not Very Important	Not at all important
Sydney	48.9%	28.2%	10.5%	6.9%	5.5%
Melbourne	59.2%	20.4%	10.2%	7.9%	5.4%

Given the importance attached to public transport what is the actual frequency of use? Table 2 shows this is less than might be expected. About a third of those interviewed in Sydney and Melbourne used public transport five or more times a week, and about another fifth one to four times a week. The responses are very similar in both cities with just over a quarter using public transport 'Very Rarely' or 'Never'.

Table 2: Frequency of use of public transport

	5 or more days a week	1 to 4 days a week	Occasionally	Very rarely	Never
Sydney	33.7%	19.6%	19.3%	18.0%	9.4%
Melbourne	31.7%	21.3%	20.9%	15.5%	10.6%

How does this use of public transport compare with the population at large? It is possible to answer this question only with regard to the journey to work, where survey responses can be compared with the same question asked in the 2006 Census.

Table 3 compares the primary mode used in the journey to work by survey respondents in Sydney and Melbourne with that of the total population for the two cities at the 2006 Census (train travel includes tram trips in Melbourne). This data indicates that those surveyed had on average around 23% less dependency on cars, an 8% increase in train patronage, a 3% increase in bus travel, and a 6% increase in walking to work than the general population.

Table 3: Mode used to travel to work (multi-mode trips excluded) in Sydney and Melbourne combined

	Car Only	Train Only	Bus Only	Walking Only	Bicycle Only
Survey	39%	18%	9%	11%	2%
Census	62%	10%	6%	5%	1%

Why is there increased use of public transport among those living in higher density housing?

Our findings indicate that people who live in higher density dwellings are more likely to use public transport than those who do not. However, we do not have any evidence to support the assumption that people who live in higher density dwellings use public transport *because* they live in higher density housing. It is also possible that people who live in higher density housing are more likely to use public transport because:

a. they are more likely to have certain characteristics which pre-dispose them to use public transport (e.g. age, occupation);

b. higher density dwellings are, on the whole, better serviced by public transport than other dwellings.

Unfortunately, we do not have the available data to test the extent to which people with different characteristics use public transport across the population, or to assess the extent to which proximity to public transport affects public transport patronage across the entire population. However, we are able to address these questions *within* our survey population (with results weighted to reflect the entire flat, unit and apartment populations in Sydney and Melbourne). These findings strongly support the position that people with different characteristics (such as age and employment type) will have different levels of patronage of public transport, and that people who live in areas that have different levels of access to public transport will have different levels of patronage of that public transport. For the remainder of this section, we will answer the following research questions:

1. Does the use of public transport differ between the different types of people living in higher density housing?

2. Does the use of public transport differ between the different areas of the city in which people live in higher density housing?

3. Does access to jobs differ between the different types of people living in higher density housing?

4. Does access to jobs differ between the different areas of the city in which people live in higher density housing?

Attitudes to, and use of, public transport by factor groupings

Tables 4 and 5 explore the **attitudes** to public transport use outlined by survey respondents compared with actual **behaviour** by the factor groupings. Table 4 shows the responses in the two cities to how important closeness to public transport was in choosing the apartment in which the respondent lived. In all but one of the factor groupings – the 'residentially retired'- closeness to public transport was regarded as 'Very Important', more so in Melbourne than in Sydney. In Sydney half of all respondents regarded closeness to public transport as 'Very Important' and the proportion was even higher in Melbourne (see Tables 4 and 5). Closeness to public transport was regarded as more important by those 'achieving education' and the 'residentially retired' in both cities. This, in part may be due to these groups having less financial capacity to run a car, or indeed health issues that make driving less feasible. This last factor group is elderly, and most respondents were not expecting to move again, so the availability of public transport is important as the willingness or capability to use a car declines.

Table 4: Importance when choosing apartment – closeness to public transport by factor group for Sydney

Sydney	Very Important	Important	Neutral	Not Very Important	Not at all important
Economically Engaged	47.1%	28.2%	11.8%	7.4%	5.6%
Battler	48.1%	31.8%	8.9%	5.0%	6.2%
Achieving Education	54.1%	26.7%	4.0%	10.2%	5.0%
Residentially Retired	61.6%	22.5%	7.6%	3.8%	4.5%
Apartment Elite	45.6%	30.5%	11.9%	6.3%	5.7%
Total	48.9%	28.2%	10.5%	6.9%	5.5%

Table 5: Importance when choosing apartment – closeness to public transport by factor group for Melbourne

Melbourne	Very Important	Important	Neutral	Not Very Important	Not at all important
Economically Engaged	55.2%	22.3%	10.3%	7.1%	5.1%
Battler	53.4%	19.2%	13.1%	4.5%	9.8%
Achieving Education	61.8%	17.3%	8.7%	7.2%	5.0%
Residentially Retired	59.6%	13.0%	8.6%	13.8%	5.0%
Apartment Elite	55.6%	26.4%	8.8%	9.2%	0.0%
Total	59.2%	20.4%	10.2%	7.9%	5.4%

Tables 6 and 7 show the **actual** frequency of use of public transport by respondents in Sydney and Melbourne respectively. These figures show much less regular use of public transport than might be expected from the results presented in Tables 4 and 5 and also from the very high percentages obtained in another question regarding the suitability of the apartment in terms of its access to public transport. Those in the 'achieving education' group used public transport most frequently, and again this was most prominent in Melbourne.

Table 6: Frequency of use of public transport by factor groups in Sydney

Sydney	5 or more days a week	1 to 4 days a week	Occasionally	Very rarely	Never
Economically Engaged	38.0%	18.3%	17.5%	17.7%	8.5%
Battler	30.4%	15.2%	21.4%	20.4%	12.6%
Achieving Education	31.1%	30.7%	17.7%	16.4%	4.0%
Residentially Retired	20.1%	28.4%	21.2%	18.5%	11.8%
Apartment Elite	26.6%	16.4%	26.6%	17.6%	12.8%
Total	33.7%	19.6%	19.3%	18.0%	9.4%

Table 7: Frequency of use of public transport by factor groups in Melbourne

Melbourne	5 or more days a week	1 to 4 days a week	Occasionally	Very rarely	Never
Economically Engaged	33.1%	20.6%	22.1%	15.2%	9.0%
Battler	29.7%	19.2%	18.4%	13.9%	18.8%
Achieving Education	43.8%	22.8%	18.8%	9.5%	5.0%
Residentially Retired	13.3%	31.3%	19.2%	19.0%	17.1%
Apartment Elite	45.6%	9.6%	21.5%	21.5%	1.9%
Total	31.7%	21.3%	20.9%	15.5%	10.6%

Attitudes to, and use of, public transport by location

The level of service provided by public transport varies significantly and this variation cannot be established from the surveys. As such, we have used the location of respondents in inner, middle or outer zones of the city as a surrogate.

Tables 8, 9, 10 and 11 also present responses to the question of how important access to public transport was when choosing an apartment and the actual use of public transport, but this time in terms of location in inner, middle or outer zones of the two cities. Tables 8 and 9 show that closeness to public transport is regarded more highly in Melbourne in inner and middle zones than in Sydney, but the more car-dependent outer suburbs of Melbourne are reflected in this analysis.

Table 8: Importance in choosing apartment – closeness to public transport by zone in Sydney

Sydney	Very Important	Important	Neutral	Not Very Important	Not at all important
Inner	46.0%	33.2%	10.4%	6.4%	4.1%
Middle	54.8%	23.2%	11.0%	6.6%	4.4%
Outer	47.9%	24.8%	9.3%	8.9%	9.1%
Total	49.5%	27.9%	10.4%	7.0%	5.3%

Table 9: Importance in choosing apartment – closeness to public transport by zone in Melbourne

Melbourne	Very Important	Important	Neutral	Not Very Important	Not at all important
Inner	57.6%	24.6%	8.5%	6.9%	2.4%
Middle	62.8%	13.7%	11.6%	6.1%	5.8%
Outer	38.1%	18.4%	15.0%	12.6%	15.9%
Total	56.5%	20.6%	10.3%	7.5%	5.2%

Tables 10 and 11 again show that the actual use of public transport is lower than might be expected from the perceived importance of access to public transport in choosing an apartment. Sydney respondents tended to use public transport more than Melbourne respondents, but there was more use for 1-4 days or occasionally in the middle suburbs of Melbourne than in Sydney.

Table 10: Frequency of use of public transport by zone in Sydney

Sydney	5 or more days a week	1 to 4 days a week	Occasionally	Very rarely	Never
Inner	35.2%	25.7%	18.7%	13.7%	6.7%
Middle	39.0%	16.3%	15.4%	20.3%	9.0%
Outer	28.4%	15.4%	21.4%	20.2%	14.6%
Total	35.0%	20.1%	18.2%	17.4%	9.3%

Table 11: Frequency of use of public transport by zone in Melbourne

Melbourne	5 or more days a week	1 to 4 days a week	Occasionally	Very rarely	Never
Inner	37.6%	21.3%	20.3%	12.6%	8.2%
Middle	27.7%	26.9%	19.0%	17.1%	9.3%
Outer	19.9%	9.1%	26.0%	25.8%	19.3%
Total	32.3%	21.3%	20.7%	15.7%	10.0%

Access to jobs by factor groups

Access to place of employment is an important area to consider as this journey is the one which most people make on a daily occurrence. Whilst other weekly journeys (such as those to facilitate shopping or social life) are important, the daily commute is one journey that tends to be structured and time critical. Reduction in commuting times is therefore one of the key metrics against which the successfulness of compact city approaches are assessed.

Tables 12 and 13 show the responses as to the suitability of the dwelling in terms of its access to workplaces by factor groupings. The 'achieving education' and 'residentially retired' factor groups have been excluded from this analysis. There were a higher proportion of people regarding access as 'ideal' or 'good' in Melbourne than in Sydney. In both cities the lowest score for 'ideal' is for the 'economically engaged' and the highest for the 'apartment elite'.

Table 12: Suitability of apartment in relation to workplaces by factor group in Sydney (employed groups only)

Sydney	Ideal	Good	Satisfactory	Not ideal	Entirely unsuitable
Economically Engaged	42.1%	35.8%	14.8%	5.4%	1.9%
Battler	47.2%	28.8%	15.4%	4.6%	4.2%
Apartment Elite	52.%	27.3%	14.0%	5.2%	1.1%
Total	44.1%	33.8%	14.8%	5.2%	2.1%

Table 13: Suitability of apartment in relation to workplaces by factor group in Melbourne (employed groups only)

Melbourne	Ideal	Good	Satisfactory	Not ideal	Entirely unsuitable
Economically Engaged	43.6%	36.7%	14.6%	4.0%	1.1%
Battler	56.0%	23.9%	16.0%	1.8%	2.3%
Apartment Elite	56.6%	27.7%	10.6%	3.5%	1.6%
Total	46.8%	33.7%	14.5%	3.6%	1.3%

Tables 14 and 15 show the actual time taken in commuting by the householder to work or place of study by factor groupings, excluding the 'residentially retired'. The results are similar in both cities for the 'economically engaged'. However amongst the 'battlers' only 64% of Sydney respondents had journeys of less than half an hour while the proportion in Melbourne was 92%, and there was a similar, if lesser discrepancy in the 'apartment elite' group.

Table 14: Time taken to travel to work by factor groups in Sydney (employed groups only)

Sydney	Economically Engaged	Battler	Apartment Elite	Total
< 5 Minutes	6.4%	1.6%	7.9%	6.1%
5-15 Minutes	27.3%	34.3%	25.5%	27.9%
15-30 Minutes	35.8%	27.8%	35.3%	34.8%
30-45 Minutes	16.3%	22.0%	22.4%	17.6%
45-60 Minutes	9.8%	12.6%	8.9%	10.0%
Over 1 hour	4.4%	1.8%	0.0%	3.6%

Table 15: Time taken to travel to work by factor groups in Melbourne (employed groups only)

Melbourne	Economically Engaged	Battler	Apartment Elite	Total
< 5 Minutes	6.1%	17.4%	6.3%	4.0%
5-15 Minutes	24.8%	25.5%	28.3%	13.2%
15-30 Minutes	39.9%	49.0%	43.9%	21.7%
30-45 Minutes	18.3%	0.0%	12.6%	8.0%
45-60 Minutes	8.2%	5.3%	8.9%	4.2%
Over 1 hour	2.7%	2.8%	0.0%	1.3%

Access to jobs by location

Tables 16 and 17 show that there is little difference between the two cities when the survey results regarding the suitability of the apartment in relation to workplace are classified by inner, middle and outer zones. The results show a high degree of satisfaction overall.

Table 16: Suitability of apartment in relation to workplaces by zone in Sydney (employed groups only)

Sydney	Ideal	Good	Satisfactory	Not ideal	Entirely unsuitable
Inner	54.0%	30.8%	10.3%	3.6%	1.4%
Middle	37.7%	37.5%	17.3%	5.6%	1.9%
Outer	38.2%	29.7%	19.0%	8.6%	4.5%
Total	44.9%	32.9%	14.6%	5.4%	2.2%

Table 17: Suitability of apartment in relation to workplaces by zone in Melbourne (employed groups only)

Melbourne	Ideal	Good	Satisfactory	Not ideal	Entirely unsuitable
Inner	53.4%	32.4%	10.5%	3.2%	0.7%
Middle	42.8%	30.2%	20.8%	5.3%	1.0%
Outer	42.0%	28.8%	17.2%	8.9%	3.1%
Total	48.9%	31.3%	14.2%	4.5%	1.1%

Tables 18 and 19 show the time taken by respondents to commute to their workplace or place of study by inner, middle and outer zones for each city. Journey times tend to be longer on average the further out of the city the survey respondents lived. While the profile of journey times is similar in both cities in the inner and outer zones, the time taken in the middle zone of Sydney is generally longer than in Melbourne.

Table 18: Time taken to travel to work by zone in Sydney (employed groups only)

Sydney	Inner	Middle	Outer	Total
< 5 Minutes	7.3%	4.2%	9.3%	6.6%
5-15 Minutes	31.8%	19.7%	27.4%	26.6%
15-30 Minutes	39.0%	41.2%	21.8%	36.2%
30-45 Minutes	14.7%	19.8%	17.7%	17.1%
45-60 Minutes	5.2%	10.0%	16.9%	9.4%
Over 1 hour	2.0%	5.2%	7.0%	4.2%

Table 19: Time taken to travel to work by zone in Melbourne (employed groups only)

Melbourne	Inner	Middle	Outer	Total
< 5 Minutes	8.4%	6.2%	8.5%	7.8%
5-15 Minutes	30.6%	19.0%	20.3%	26.5%
15-30 Minutes	37.5%	50.0%	32.9%	40.1%
30-45 Minutes	16.0%	11.4%	21.5%	15.5%
45-60 Minutes	5.0%	12.0%	13.4%	7.7%
Over 1 hour	2.6%	1.3%	3.4%	2.3%

Tables 20 and 21 show the primary mode used for travel to work for Sydney and Melbourne by residents living in the inner, middle and outer zones. The strength of Melbourne's tram network in the inner and middle zones is apparent. Sydney's more intensely developed inner areas may be reflected in the fact that over twice as many respondents (30%) walked to work compared with Melbourne. Melbourne's better cycling facilities are reflected in the data. However, the use of the car as the primary mode of journey to work is similar in both cities in their inner and middle zones. The dispersed outer suburban character of Melbourne is shown in the differences in the outer zone (52% for Sydney and 77% for Melbourne).

Table 20: Primary Mode of Journey to work by Zone for Sydney

Sydney	Walk	Bike	Car	Bus	Train
Inner	29.6%	1.8%	31.8%	24.0%	12.9%
Middle	6.5%	0.6%	55.9%	9.6%	27.3%
Outer	8.9%	3.0%	51.8%	7.7%	28.6%
Total	16.8%	1.6%	44.8%	15.2%	21.5%

Table 21: Primary Mode of Journey to work by Zone for Melbourne (Train includes Tram)

Melbourne	Walk	Bike	Car	Bus	Train
Inner	14.7%	6.7%	35.1%	4.2%	39.3%
Middle	10.4%	3.8%	50.2%	6.1%	29.5%
Outer	4.3%	0.0%	77.2%	6.9%	11.6%
Total	12.3%	5.1%	44.1%	5.1%	33.4%

Planning assumptions re-examined

Use of public transport

While the interviews have shown how various population groups living in high densities and in different locations use public transport, the data and information can be regarded as indicative only and suffers from a lack of comparison with the population at large. Where such comparisons can be made, there is some evidence to support the assumption that high-density living will lead to an increased patronage of public transport. Accordingly, for the journey to work all factor groupings recorded more use of public transport by higher density residents than by the population at large. Further, the proportions either walking to work or cycling were much higher, particularly in the inner zones of Sydney and Melbourne. This last point is of significance given that the greater concentration of jobs in the central and inner areas has been identified as a distinctively Australian characteristic compared with American cities (Mindali *et al* 2004).

The survey results and follow-up interviews also provide a number of significant findings. First, the surveys recorded a consistent gap between the high importance given to access to public transport by households in their choice of dwelling, and the actual level of public transport use reported. Public transport use was found to be higher amongst survey respondents who did not have the use of a car for one reason or another – usually because they do not own a car or do not drive.

> *"Question: is that a conscious decision that you've made, to live somewhere where you can use public transport to get to work?*
>
> *Yes, it's been really handy for me just going into the city on the bus. Another reason was I couldn't afford a car" (Economically engaged; Sydney middle).*

It is also used by those who find it convenient to use the radial lines of communication with the central city.

> *"Question: Does the train go where you need it? Is it a good route?*
>
> *Yeah, well where I think it should go anyway. The North Shore Line. Interesting actually, I've been thinking about it because I've just started a new job about two weeks ago which means I catch a train. Before I was actually driving to work each day.*
>
> *Question: So would it be fair to say that the routes go where you need them to and they go often enough for you?*
>
> *Oh yes, they're good thank you." (Residentially retired, Sydney inner)*

Second, where most households use public transport it is in conjunction with parallel use of a car. Public transport is used more for regular or routine journeys to destinations with high concentrations of activities and the car used to travel to more dispersed destinations and/or where the time of travel is more flexible.

> *"my ... strategy ... is to use public transport wherever possible where it is cheap and generally convenient. The use of the car comes when I've got to go to a place where the public transport isn't good or where there are time constraints. But in general I try to use public transport all the time. My partner does a bit but she can't do it for working so she uses her car a lot more" (Economically engaged; Melbourne middle).*

Third, there is some indication that workers in better paid and more skilled occupations use train, tram or bus to access workplaces, most of which are in central or inner areas. This is also the case with the 'achieving education' group who also often walk. Other working households, the 'economically engaged' and 'battlers'

have a higher use of cars. In some cases, this may be attributed to the fact that their work destinations are likely to be more dispersed, and can involve casual work in various locations.

> *"Question: You also said your access to workplaces was satisfactory. But you said that you work casually. Does that mean you work in different locations?*
>
> *Yes, I work in different locations because I have not ...stick to one working place. They call me to different places very often.*
>
> *Question: What about your wife. Does she work?*
>
> *Yes. She works in [an] operating theatre in ... [a] Medical Centre.*
>
> *Question: Is that quite close to you?*
>
> *No. It is not quite close to me. It is around 26 kilometres from here. So she takes the car and drives to [her] working place [sic]." (Economically engaged, Melbourne outer)*

Fourth, the ability to use both public transport and the car offers flexibility in the uncertainties of life:

> *"Actually the reason I chose Ryde (to live) is at the time I had a long term job and the offices were at Rosehill… and (then) they morphed the offices from Rosehill to Rhodes ...It (then) used to take me ten minutes to drive to work and I paid money to park there, we got a special deal so I had a parking space ...The bitter blow was that it was only last year that I was made redundant but the [unclear] changed shareholding … It used to take me ten minutes to drive to work …so losing that job which was May last year, it's been the last 12 months that I've been travelling into town (by bus) and I find it very, very traumatic … you've got Victoria Road and buses going up and down .. nobody told me how difficult it was to get on them" (Economically engaged; Sydney middle).*

Access to jobs

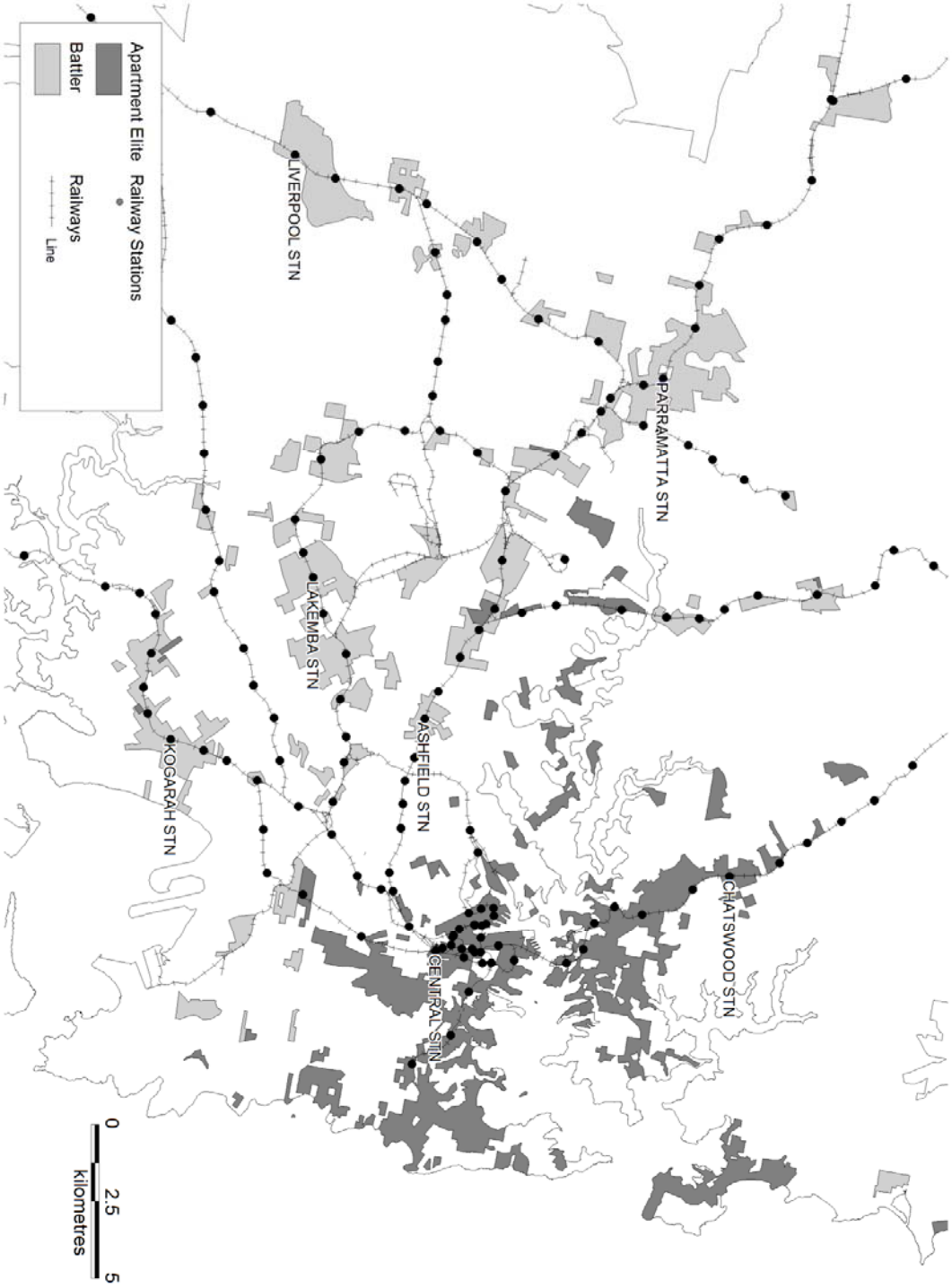
Some of the differences between Sydney and Melbourne are reflected in access to jobs and general services. The strength of Melbourne's public transport system in the inner and middle zones is apparent. Employment appears to be more centralised in Sydney and accessed by radial public transport systems. Both cities had substantial proportions of respondents walking to work when they lived in inner zones – 30% for Sydney and 15% for Melbourne. While the evidence presented by the surveys and interviews suggests that apartment dwellers have better access to outer suburban jobs in Melbourne than in Sydney, this is at the cost of long journeys predominantly by car (three-quarters of outer Melbourne respondents as opposed to half in Sydney).

There are also wider issues here regarding the distribution and concentration of activities – particularly jobs. Indeed there are many variables affecting the use of public transport and high density living is but one of them. Mindali et al (2004) conducted a sophisticated multivariate analysis of the same statistics used by Newman and Kenworthy (1989) to illustrate that the simple correlation of high urban densities with low energy consumption for travel was misleading and hid a number of complex relationships and influences, as Holloway (2008) has also pointed out more recently. There is therefore a need for public policy to move beyond an assumption that people living in higher density developments will necessarily use public transport as their predominant form of transport, and to recognise the need for more nuanced understandings of the factors influencing public transport use.

Choices and trade-offs

In order to explore some of the choices and trade-offs made in terms of location, dwelling type and travel, this section explores some of the decisions made about these by 'battlers' and the 'apartment elite' in Sydney. These factor groups are chosen because they demonstrate differences determined largely by income. Sydney was chosen for the analysis as these factor groups are larger in Sydney and the differences most clearly shown. Figure 4 shows the distribution of these two groups of high-density residents in Sydney.

Figure 4: Locational distribution of 'Battler' and 'Apartment Elite' Populations



The ‘battler’ household is well represented in Sydney making up 38% of the apartment population. To recap - the typical household has a high proportion of people born in China, India and Vietnam, has low household incomes with almost half with an income below $800 a week, has children and is employed in lower order jobs. Figure 4 shows that they tend to live in middle-western suburbs in the cheaper and older housing (typically three-storey flats) built along rail lines.

Despite this, their car ownership rates **per household** are higher than might be expected. They travel to work by car more than other factor groupings and this probably reflects the more widespread and less concentrated character of their workplaces, part-time working and unusual hours. Family needs make car travel for other trip purposes necessary too and a surprising number of households have more than one car.

> “*Question: Okay, it was obviously important to you to be near the train line?*
>
> *Yes, although ironically the place where we both work we actually drive to work now. Yeah, but yeah you never know, because you never know where you might end up working and I didn’t want to end up driving down to the city if I ended up taking a job down there. Yeah so whenever we have family or friends coming to live with us it would just have been easier for them to move around as well instead of depending on buses or our own transport” (Battler; Sydney middle)*

The ‘apartment elite’ is also strongly represented in Sydney making up 23% of the apartment population. Predominantly they are couples of late middle-age, without children, and almost entirely employed in higher-order well-paid occupations. Their purchasing power enables them to choose to live in locations of high amenity along the coast and waterways. However, these are often not well served by public transport, notably along the northern beaches. Other popular locations are in inner suburbs with expensive housing but admirable access to a range of urban services. Many work in the central and inner areas and either travel in by train, bus or car from more distant locations or walk from places close to the city. The North Shore line is a good example of expensive high density housing offering a pleasant environment with good local services and good train access for commuters to central areas. However high incomes also mean that these households can afford to own and use a car, and car ownership rates are high compared with other factor groups.

> *“In Chatswood there’s very good access to public transport ... the train station. I’m only three minutes away by foot. It’s 100 metres down the road. In fact on many weekends I don’t go near my car. It would be very easy to live here without one. There’s no link around Neutral Bay. You’re totally dependent on buses which don’t have the same level of convenience.*
>
> *Question: I was going to ask you about that, because you said you use public transport occasionally. Do you need to drive to work, or you choose to drive to work?*
>
> *I generally drive to work because I work long hours ... and then whilst I’m only three minutes from the station here I’m probably twelve minutes from the station at work. And then walking to the station at eight o’clock at night is something I don’t find all that appealing” (Apartment elite, Sydney inner).*

These examples demonstrate that living in close proximity to public transport does not necessarily equate to increased public transport use for some individuals and households. Indeed, there are a number of choices and constraints that must also be taken into account. Indeed, even when people live near main public transport routes, such as along the train lines, they may travel to work by car out of necessity (they work in a location not well serviced by public transport) or choice (they can afford the comfort and convenience of driving).

Conclusions

All the five research questions posed at the beginning of this paper can be answered in the affirmative from the information collected through the surveys and interviews. This shows that travel characteristics and access to jobs are affected not only by higher density living but also by the kind of household living in such accommodation, and their location in the city. Apart from encouraging higher density housing in more accessible locations, planning the compact city means also taking account of these social circumstances, and the location and kind of employment within reasonable access of such housing.

Travel and access to jobs are also influenced considerably by the level of service offered by public transport – proximity, routeing, frequency, comfort, security, reliability and cost. The improvement of public transport compared to travel by car would seem at least as important in developing the compact city as planning higher density housing.

This conclusion about the role of transportation is also reached in a recent analysis of detailed journey to work data in Sydney by Rickwood and Glazebrook (2009). Whilst their analysis follows a much more complex quantitative approach and tests the role of population density itself plays in promoting public transport patronage they conclude that "*access* provided by *local transit, on the other hand, is a much better predictor of transit use*" (p.14)

This is also an important point to return to the context of the planning assumptions underlying the utilisation of higher density development within Sydney and Melbourne. The developments themselves, if correctly orientated within a transport framework, can only be expected to provide *amenity of access* for those who wish to go to where the framework serves. Transport Orientated Design is therefore a successful planning device to serve a certain component of the high density population (the Economically Engaged and Apartment Elite in our research) who are *orientated* within transport framework's sphere of influence (CBD and major centre employers).

Where the assumption begins to falter is in the lack of consideration of the plethora of other household forms, with their own distinct transport orientations. In the case of Sydney, as has been demonstrated, the largest component of the high density population is comprised of "Battler" households who have considerably different relationship with transportation.

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