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Population growth, jobs growth and commuting flows in Melbourne

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Population growth, jobs growth and commuting flows in Melbourne

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Foreword

This report identifies recent spatial changes in employment and the residential population within Melbourne, and investigates how commuting behaviour has responded to these changes. It also explores the extent to which the city's spatial development and commuting patterns have been reshaped in the direction envisaged by recent metropolitan plans.

The paper is part of a broader research project on population, employment and commuting change in Australia's largest capital cities, being undertaken by the Bureau's Cities Research team. The report was authored by Dr Karen Malam, Leanne Johnson and Dr Hema de Silva.

Gary Dolman
Head of Bureau
Bureau of Infrastructure, Transport and Regional Economics
October 2011

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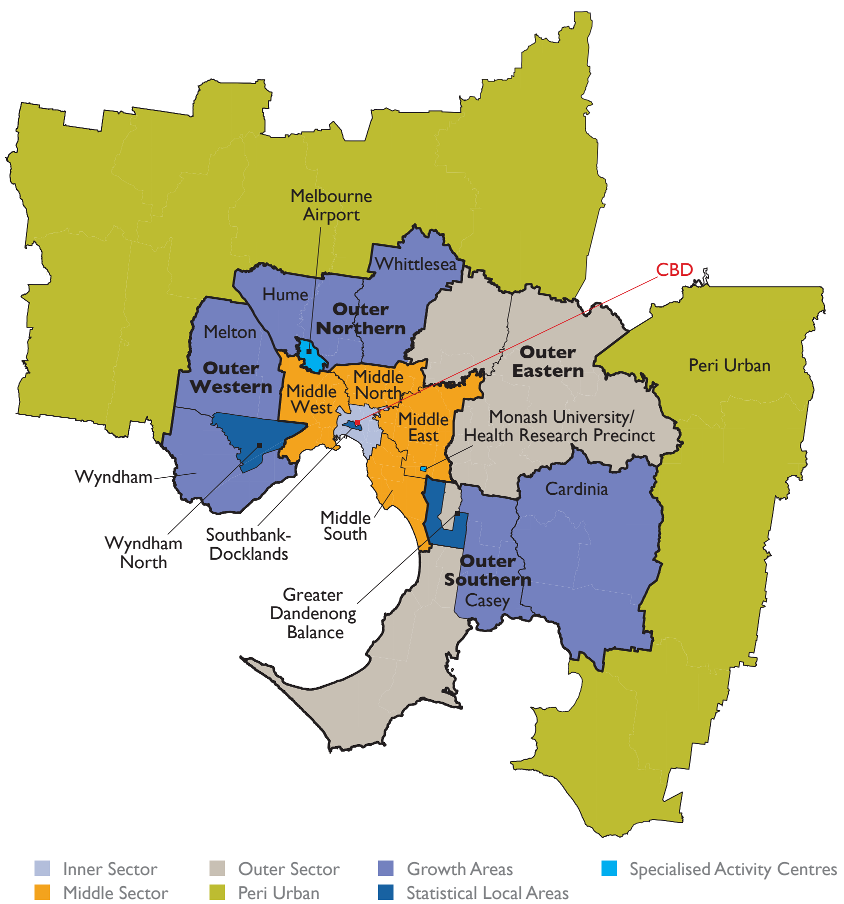
While BITRE is grateful for the assistance provided by these individuals and organisations, the views expressed in this report are those of BITRE and should not be attributed to any other individual or organisation.

At a glance

- This report is the second in a series of investigations into spatial changes in population, employment and commuting in our largest cities.
- Melbourne's working zone population increased by 630 000 persons between 2001 and 2010 to reach 4.2 million, at an annual growth rate of 1.8 per cent. Fifty eight per cent of the population increase was accommodated in the Outer sector, particularly in the Growth Area LGAs of Casey, Cardinia, Hume, Melton, Wyndham and Whittlesea (the following map presents sector and relevant LGA boundaries). Redevelopment of existing suburbs, including a shift to high density development in the inner city, also accommodated some of this population growth.
- Melbourne employment increased by 111 200 jobs from 2001 to 2006, of which 51 per cent was in the Outer sector. The major contributors to jobs growth were Southbank-Docklands (which added 10 500 jobs), Wyndham North (8100) and Greater Dandenong Balance (5500). Melbourne Airport and the Monash University/ Health Research Precinct also made important contributions to jobs growth. Melbourne maintained strong employment growth between 2006 and 2010, averaging 2.5 per cent per annum growth.
- The industry drivers of jobs growth varied across Melbourne. In the Inner sector, the main contributor was Government administration and defence, while it was Health and community services in the Middle, Outer and Peri Urban sectors.
- Melbourne is a car dependent city, with 77 per cent travelling to work by private vehicle in 2006. The commuter public transport mode share rose from 12.4 to 13.2 per cent between 2001 and 2006, with 78 per cent of the increase involving travel to a workplace in the Inner sector.
- Commutes in an inward direction (37 per cent) dominate those in an outward direction (9 per cent), while 24 per cent of all commutes occur within the home Statistical Local Area (SLA) and 22 per cent are to a different SLA in the home subsector. Commutes from one Outer subsector to another grew most rapidly between 2001 and 2006.
- From 2001 to 2006, commuting distances remained stable in Melbourne, but there was an increase in average commuting times, brought about by reduced speed.
- Gravity model regression analysis reveals that the spatial distribution of residents and jobs throughout the city explains 70–75 per cent of the current pattern of commuting flows between SLAs in Melbourne. The spatial growth in employed residents and jobs also played an important role in explaining over two-thirds of changes in commuting flows between 2001 and 2006.

- The Victorian Government projects that 66 per cent of Melbourne's population growth from 2007 to 2026 will be in the Outer sector, while 40 per cent of jobs growth to 2036 will be in the Outer sector. These spatial projections of population and jobs imply substantial increases in commuting flows within the Outer Southern, Outer Northern, Outer Western and Inner sectors to 2026 and rapid growth in commuting from the Outer West to the Middle West and Inner sectors.
- *Melbourne 2030* set the template for development of the metropolitan area from its release in 2002 through to early 2011, although the 2008 release of *Melbourne @ 5 million* introduced some policy changes. Some progress has been made against most of the relevant strategic plan goals since 2001. There was good progress in directing fringe development to the designated Growth Areas, shifting the focus of growth to the north and west, raising population density, providing more jobs outside Central Melbourne and increasing public transport's mode share. However, there was limited progress in concentrating residential and jobs growth in centres and commuting times have not been heading in the desired direction.

A map displaying Melbourne's sectors, subsectors and selected Local Government Areas and activity centres



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Executive Summary

This report is one case study in a broader research project which will identify recent spatial changes in employment and the residential population within Australia's largest capital cities and investigate how commuting behaviour has responded to these changes. A previous report has been completed for Perth (BITRE 2010).

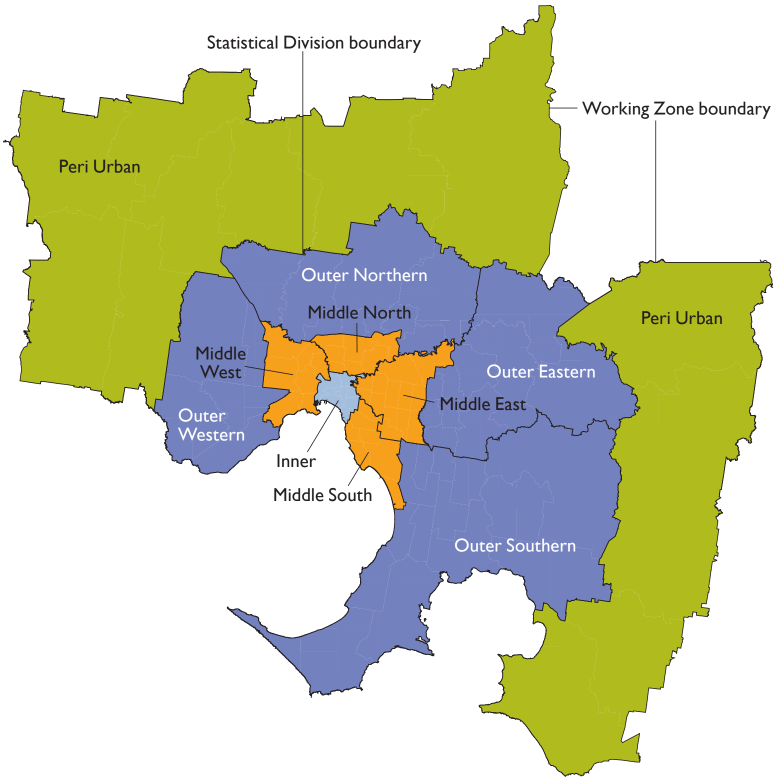
The primary aim of this study is to identify spatial changes in population, employment and commuting in Melbourne, with a view to providing a solid evidence base about the reality of the trends that have been shaping the city in recent years. A secondary aim is to investigate the extent to which there has been progress in reshaping the city's spatial development and commuting patterns in the direction envisaged by recent metropolitan plans. Understanding change in the spatial development of cities can assist in formulating urban policy and inform infrastructure investment decisions.

This analysis is based on BITRE's Melbourne working zone, which includes the Melbourne Statistical Division (SD), as well as a number of adjoining Peri Urban areas which have significant commuting connections with the city (e.g. Bacchus Marsh, Mitchell South). Some information is also presented for Victoria's main regional centres of Geelong, Ballarat, Bendigo and the Latrobe Valley, due to their linkages with the nearby capital. The map below shows the Melbourne working zone and the sectors and subsectors which are used throughout the report. The spatial analysis is presented at a range of different levels of disaggregation—including the Melbourne working zone as a whole, sectors, subsectors, Statistical Local Areas (SLAs), destination zones, suburbs, activity centres and census collection districts—to convey an understanding of both the overarching patterns and some of the finer detail.

The study focuses on the post-2001 period (particularly the 2001 to 2006 period for which detailed spatial data is available), but also incorporates information on longer-term trends to put current changes into their historical context. The key data sources are the ABS Census of Population and Housing for 2001 and 2006 and ABS Estimated Resident Population time-series data.[1]

1 The data presented in the Executive Summary were largely derived by BITRE through analysis of these two pr mary data sources and a range of secondary data sources (e.g. Victorian Government's VISTA survey, ABS-VicRoads distance dataset). Details of data sources are provided n the relevant chapters.

Map of Melbourne working zone, sectors and subsectors



Source: BITRE analysis

Residential patterns and trends

The population of the Melbourne SD grew from 501 580 in 1901 to 2.8 million in 1981, and by 2006 it had reached 3.7 million (ABS 2008a). The average annual rate of population growth was 1.2 per cent between 1981 and 1991 and 1.0 per cent between 1991 and 2001 (ABS 2008a), but has been higher than this in recent years (ABS 2011).

The Outer sector has grown rapidly since 1971, accounting for 78 per cent of the Melbourne SD's total population increase between 1981 and 2006 (DPCD 2008d). Melbourne's Inner and Middle sectors experienced population losses between 1981 and 1991, but since 1991 all three sectors have experienced positive growth, with the Inner sector growing more rapidly than the Outer sector since 1996 (ibid).

The Melbourne working zone added 628 000 residents from 2001 to 2010, to reach 4.2 million[2], which represents an average annual growth rate of 1.8 per cent (ABS 2011). The average annual growth increased from 1.5 per cent in the pre-2006 period to 2.2 per cent in the post-2006 period (ibid).

As of 2010, 46 per cent of the city's population lives in the Middle sector, 43 per cent in the Outer sector, 7 per cent in the Inner sector and 4 per cent in Peri Urban areas. Between 2001 and 2010, the annual population growth rate was greatest for the Inner sector (3.0 per cent), followed by the Outer sector (2.6 per cent), the Peri Urban sector (1.8 per cent) and the Middle sector (1.0 per cent). The Outer Western sector experienced very rapid population growth, averaging 7.3 per cent per annum. The average annual rate of population growth was highest in Wyndham South (25 per cent), Southbank-Docklands (17 per cent), Whittlesea North (15 per cent) and Melton East (15 per cent), reflecting a shift in the focus of growth to the north and west of the city.

Melbourne's increased population was accommodated largely through expanded residential development on the urban fringe but also through redevelopment of some existing suburbs, particularly in the Inner sector. Fifty eight per cent of the city's population growth between 2001 and 2010 occurred in the Outer sector, 26 per cent in the Middle sector, 12 per cent in the Inner sector and 4 per cent in Peri Urban areas. The Outer Southern sector contributed 23 per cent of growth, while the Outer Western sector contributed 20 per cent. At the SLA scale, Melton East added the most people (41 600), followed by Whittlesea North (33 800), Wyndham North (33 400), Casey–Cranbourne (32 600) and Casey–Berwick (32 200). There were also concentrations of population loss in some more established outer suburbs between 2001 and 2006 (e.g. St Albans, Frankston and Broadmeadows).

Melbourne's suburbs are distinctive for an 'emphasis on low density houses in garden settings' (Birrell, O'Connor, Rapson, and Healy 2005, p. 05–1). However, the population density of the Melbourne urban area increased from 1455 to 1566 persons per square kilometre between 2001 and 2006, with the largest increases occurring in the inner city suburbs of Melbourne, Southbank and Carlton. This reflects a shift towards higher density forms of housing.

2 The 2010 ABS ERP figures presented in this section remain prel m nary.

Employment and industry

Employment patterns and trends

Since 1961 there has been considerable dispersal of employment away from the inner city and towards the middle and outer suburbs. In 1961, 55 per cent of jobs were located in the Inner sector, but this fell to 28 per cent by 2001 (O'Connor 2006). The jobs share of the City of Melbourne Local Government Area (LGA) fell from 31 to 19 per cent between 1971 and 2001, while the Monash, Hume, Kingston and Dandenong LGAs emerged as significant employment hubs (DPCD 2008a).

Melbourne's employment is concentrated in the inner suburbs, while population is concentrated in the middle and outer suburbs. In 2006, the Inner sector accounted for just 8 per cent of the Melbourne working zone's population, but 28 per cent of employment. The Middle sector contained 47 per cent of population and 39 per cent of jobs, while the Outer sector had 42 per cent of population and 31 per cent of jobs.

The City of Melbourne, with 297 300 jobs in 2006, accounted for 19 per cent of Melbourne's jobs. Other major contributors to employment were Kingston North (61 300 jobs) and Port Phillip West (48 000 jobs). To Melbourne's west the recently developed SLAs of Melton East and Wyndham West are essentially dormitory suburbs, offering less than one job for every five employed residents.

The Outer sector accounted for 51 per cent of Melbourne's jobs growth between 2001 and 2006 and grew by 2.5 per cent per annum, which exceeded the Melbourne average of 1.5 per cent. Jobs growth was strongest in the Outer Western (6.6 per cent) and Outer Southern (2.8 per cent) sectors and slowest in the Middle North (0.4 per cent) and Middle South (0.5 per cent).

Melbourne's jobs growth was widely dispersed throughout the metropolitan area. The major contributors to jobs growth were Southbank-Docklands which added 10 500 jobs between 2001 and 2006, Wyndham North (+8100) and Greater Dandenong Balance (+5500)—the latter two results reflect very strong jobs growth in the West and South Industrial Nodes. Melbourne Airport and the Monash University/Health Research Precinct also made important contributions to jobs growth. The most rapid rates of jobs growth occurred in the Outer sector SLAs of Melton East, Wyndham South and Wyndham West. However, significant job losses did occur in Moreland–Coburg (–1600 jobs), Moreland–Brunswick (–1100 jobs) and Stonnington–Prahran (–1000 jobs).

Melbourne maintained strong employment growth between 2006 and 2010, averaging 2.5 per cent per annum growth (ABS 2010a). The City of Melbourne LGA grew particularly rapidly, adding more than 50 000 jobs between 2006 and 2008 (City of Melbourne 2009).

Industry patterns and trends

The principal trends impacting on Melbourne's industry structure in recent decades have been the decline of the manufacturing industry and the rise in consumer and business services. With decentralisation, jobs moved from the inner suburbs to larger sites in the outer suburbs, and all LGAs experienced growth in Property and business services employment between 1971 and 2001 (DPCD 2008a). While the inner city has maintained its dominance of new economy employment, the middle and outer suburbs have come to offer increasingly diverse job opportunities (O'Connor and Rapson 2003).

In 2006, the major employing industries in Melbourne were Retail trade (14.8 per cent of jobs), Manufacturing (14.0 per cent), Property and business services (12.9 per cent) and Health and community services (10.7 per cent). Property and business services was the major employer for the Inner sector, Retail trade was the major employer for the Middle and Peri Urban sectors, while in the Outer sector it was Manufacturing. Melbourne's SLAs each had their own distinctive mix of industries. Some were specialised in Manufacturing (e.g. Kingston North, Broadmeadows), and others in transport (e.g. Wyndham North, Craigieburn) or health (e.g. Yarra North, Heidelberg).

From 2001 to 2006, jobs growth was greatest for Health and community services (which added 29 400 jobs), Construction (23 200) and Government administration and defence (21 500). Manufacturing employment declined by 20 400 jobs within the Melbourne working zone.

The industry drivers of jobs growth varied across Melbourne. Government administration and defence was the largest contributor to jobs growth in the Inner sector, while Health and community services was the major contributor in the Middle, Outer and Peri Urban sectors. The Transport and storage industry also played an important role as the major contributor to jobs growth in the Middle West and Outer Northern subsectors. The strong jobs growth in Southbank-Docklands was primarily attributable to the Finance and insurance industry. Going against the city-wide trend, the substantial jobs growth in Wyndham North and Greater Dandenong Balance was primarily due to the Manufacturing industry.

Transport mode usage: patterns and trends

Melbourne is a car dependent city, with 77 per cent of employed residents travelling to work by private vehicle in 2006, while 13 per cent used public transport, 4 per cent walked and 1 per cent cycled. Residents of the Outer sector were most car dependent, with 85 per cent travelling by private vehicle. Access to Outer sector jobs was also very reliant on private vehicles (88 per cent).

Sixty five per cent of commuter public transport usage involved travel to a workplace in the City of Melbourne and 78 per cent involved travel to a workplace in the Inner sector. This reflects the city's radial rail and tram networks. Inner Melbourne had the highest proportion of employed residents travelling to work by public transport (26 per cent), bicycle (4 per cent) and by foot (16 per cent). Only 1 per cent of Peri Urban jobs and 3 per cent of Outer sector jobs were accessed by public transport.

Melbourne's public transport mode share declined from the late 1970s through to the mid 1990s, but since then public transport patronage has grown and the mode share has risen strongly from 2005 to 2009 (BITRE 2009c). Focusing on the journey to work, the public transport mode share rose from 12.4 to 13.2 per cent between 2001 and 2006, while the private vehicle mode share declined from 78.2 to 76.7 per cent. There was also a shift towards cycling and walking for the journey to work. The reduction in private vehicle mode share was most pronounced amongst Inner sector residents, with public transport use also declining, while the walking and cycling mode shares rose strongly. Middle sector residents switched away from private vehicles towards public transport and walking, but mode shares remained stable for Outer sector residents. On a place of work basis, the reduction in the private vehicle mode share was heavily concentrated in the Inner sector—from 2001 to 2006 there was an increase in the proportion of Outer and Peri Urban jobs that were accessed by private vehicle.

Commuting patterns and trends

Commuting flows

Melbourne attracts about 23 600 workers or 1.4 per cent of its 2006 workforce from regional Victoria, particularly from Geelong, Ballarat, Latrobe Valley and Bendigo. Just over 18 000 Melbourne residents commuted to work in a different working zone. From 2001 to 2006, long distance commuting patterns remained largely unchanged, but there was a greater increase in the number of Melbourne residents commuting to Geelong, than in commutes from Geelong to Melbourne.

Focusing on commutes *within* the Melbourne working zone, trips to work in an inward direction dominate those in an outward direction (37 and 9 per cent respectively), while 24 per cent of all commutes occur within the home SLA and a further 22 per cent of commutes are to a different SLA within the home subsector.

There were strong commuting flows from the Middle sector to the Inner sector, with between 28 and 33 per cent of employed residents of each Middle subsector commuting to a place of work in the Inner sector in 2006. Outer Western residents had a relatively high likelihood of commuting to a place of work in the Inner sector (22 per cent of residents) and the Middle West sector (24 per cent). The probability of commuting to the CBD exceeds 20 per cent for residents of nearby areas (e.g. Southbank-Docklands, Prahran), but is under 5 per cent for many urban fringe SLAs (e.g. Berwick, Melton Balance, Pakenham, Whittlesea North).

At the SLA scale, the ten most common commuter journeys in 2006 were all trips within the home SLA (e.g. 12 963 Kingston North residents travelled to a workplace in Kingston North). The most common inter-SLA flows were typically journeys to work in the CBD from nearby areas such as Melbourne Remainder, Yarra North and Prahran. Other substantial flows, with between 4000 and 5000 daily commuters each, were Craigieburn to Broadmeadows, Kingston South to Kingston North, and Frankston East to Frankston West.

The spatial structure of Melbourne's commuting flows remained relatively stable between 2001 and 2006. The relative importance of inward flows declined marginally, while outward flows and commutes to a different SLA within the home subsector experienced above-average growth, and commutes from one Outer subsector to another grew particularly rapidly. This reflects the longer term trend towards increased complexity of commuting flows.

Between 2001 and 2006, the self-containment rate increased for the Inner sector, but declined in the Middle North, Middle West and Peri Urban sectors. There were more than 21 200 additional commutes within the Outer South and more than 12 300 additional commutes within the Inner sector, while the Outer West sector provided just over 5 500 additional commuters to each of the Inner and Middle West sectors. The origin-destination pairs with the greatest increases were predominantly intra-SLA flows (e.g. flows within the Berwick or Wyndham North SLAs). Flows from Southbank-Docklands to the CBD and from Frankston East to Frankston West both grew by more than 1200 commuters.

Commuting distances and times

Average commuting distances are relatively low for Inner and Middle sector residents (7.5km and 12.5km respectively), and higher for Outer sector residents (19.1km), particularly those who live in the Outer West (22.8km). There is less variation in average commuting distance by place of work, but those with jobs in the Inner sector travel the longest average road distance to work (16.5km).

The average time taken to commute to work in the Melbourne SD was 36 minutes in 2006. Only a modest difference of 6 minutes exists between the average commuting times of Inner and Outer sector residents. However, those who work in the Inner sector have a much more time-consuming journey to work (48 minutes, on average) than those who work in the Middle (33 minutes) or Outer sectors (28 minutes).

Commuting distances have remained stable in Melbourne in recent years, with commuters travelling an average road distance of 14.7km in 2001 and 14.8km in 2006. However, there was an increase in average commuting times up to 2006, brought about by reduced speed. From 2007–08 to 2009–10, average commuting times remained unchanged at 36 minutes one way.

Some drivers of commuting flows

In addition to describing spatial patterns and trends in commuting, this project set out to explore how commuting behaviour has responded to recent spatial changes in population and employment. Regression analysis was used to investigate this issue. A simple gravity model of commuter flows explained 70 to 75 per cent of all variation in origin-destination flows in Melbourne.

The number of people commuting between an origin-destination pair tends to increase with the number of employed residents of the origin SLA and the number of jobs in the destination SLA. For example, rapid population growth in places such as Wyndham South, Southbank-Docklands, Melton East and Berwick has generated increased commuter flows within the home SLA and to a range of nearby areas.

The number of people commuting between an origin-destination pair tends to decline as the distance between the two SLAs widens. Distance is less of an impediment to travel for origin-destination pairs that have a direct rail connection. Similarly, distance is less of an impediment for pairs that can be travelled between without leaving Melbourne's freeway network, although a freeway connection has less influence than a rail connection. Distance was more of an impediment to travel in Melbourne than in Perth, reflecting the greater density and congestion of Melbourne.

The spatial concentration of industries also has implications for commuting, particularly where workers have specialised skills that tie them closely to specific industries. The greater the alignment between the skills available in the origin SLA and the skills demanded in the destination SLA, the greater the predicted commuting flows between those two places.

Growth in employed residents and jobs both played an important role in explaining *changes* in commuting flows in Melbourne between 2001 and 2006. These two factors alone explain more than two-thirds of the variation in commuting growth rates for origin-destination pairs with non-trivial commuter flows. Origin-destination pairs that had a high degree of skills mismatch tended to experience lower growth in commuting flows between 2001 and 2006. More distant origin-destination pairs also experienced lower growth in commuting, reflecting the impact of rising fuel prices.

The two very large scale road infrastructure projects that were completed just prior to 2001—the Western Ring Road (in 1999) and CityLink (in 2000)—improved the connectivity of Melbourne's road network and influenced spatial growth patterns (Allen Consulting Group 2003, Thakur 2009). However, regression analysis does not support the proposition that the smaller scale expansions of Melbourne's road and public transport networks between 2001 and 2006 have substantially altered spatial commuting flows.

Outlook

Official population projections point to Melbourne reaching a population of 5 million by 2025 (ABS 2008b). Melbourne is projected to increase its population by 1.2 per cent per year, on average, between 2006 and 2056—a much lower projected growth rate than Perth and Brisbane, but higher than that for Sydney and Adelaide (ibid).

The Victorian Government projects that 66 per cent of the Melbourne working zone's population growth from 2007 to 2026 will occur in the Outer sector, 19 per cent in the Middle sector, 10 per cent in the Inner sector and 6 per cent in Peri Urban areas (DPCD 2008b). The Outer sector is projected to add 831 000 new residents. The Whittlesea North SLA is projected to add about 109 000 new residents, while the Pakenham, Craigieburn, Cranbourne and Wyndham North SLAs are all projected to increase their population by between 80 000 and 85 000 people by 2026 (ibid). The Victorian Government has projected that 492 000 new dwellings will be required in the Melbourne SD between 2010 and 2024 to house this growing population (DPCD 2009g). Fifty eight per cent of these new dwellings will be in the Outer sector, largely in the six designated Growth Area LGAs (ibid).

The Melbourne SD is projected to gain 915 000 jobs between 2006 and 2036, reflecting average annual growth of 1.3 per cent (DT 2008a). The Property and business services and Retail trade industries are projected to experience the largest increases in employment, while Manufacturing is expected to decline (ibid). Forty per cent of jobs growth is expected to occur in the Outer sector, which is expected to grow substantially faster than the other sectors, although jobs growth in the Outer sector is not expected to keep pace with population growth, with average annual growth rates of 1.8 per cent and 2.2 per cent respectively through to 2026 (DT 2008a, DPCD 2008b). Employment in the Middle sector is expected to grow relatively slowly, averaging 1.0 per cent per annum from 2006 to 2036 (DT 2008a). The LGAs that are expected to grow most strongly are Melbourne (167 000 additional workers), Dandenong (62 500), Monash (52 500) and Wyndham (52 500) (ibid).

The Victorian Government's spatial projections of population and employment through to 2026 have implications for future spatial patterns of commuting within Melbourne, which in turn have ramifications for future congestion and infrastructure investment. If these projections are realised, the likely commuting implications are:

- General stability in the spatial structure of commuting (in terms of the mix of inward commutes, outward commutes, same SLA commutes etc)
- Commutes within the Outer Southern sector to contribute at least one-sixth of total commuting growth
- Commutes within the Inner, Outer Northern and Outer Western sectors to be key contributors to growth
- Rapid growth in commuting from the Outer Western sector to the Middle West and Inner Melbourne
- An increase in journeys to work involving a road distance of more than 30 kilometres and an increase in the average commuting distance.

Congestion costs in Melbourne have been projected to double between 2005 and 2020 (BITRE 2007), with growth in congestion delay costs during the morning peak expected to be most pronounced within 15km of the CBD, in the Casey and Greater Dandenong LGAs, and on freeways and highways (VCEC 2006). The *Victorian Transport Plan 2008* projects strong growth in public transport patronage through to 2036, with trains predicted to accommodate the majority of the increased demand (DT 2008b). However, future public transport patronage and mode share outcomes will depend on policy actions regarding urban form and infrastructure investment (DT 2009).

Strategic plans

There are a range of mechanisms through which governments attempt to directly influence the spatial allocation of population, jobs and commuting within our cities, including through the development of strategic metropolitan plans, provision of urban infrastructure, management of land release and zoning of land use. Other social, economic and environmental policy domains also play an important role in shaping our cities, even where that is not the primary aim.

The *Melbourne 2030* metropolitan strategy set the overall strategic direction for the growth and development of the metropolitan area from its release in 2002 through to early 2011, when the recently elected Liberal-National Coalition Government announced that a new outcomes-based metropolitan strategy was to be developed to replace it (DPCD 2011a). The principal goals of *Melbourne 2030* included achieving a more compact city by limiting urban sprawl and increasing density, concentrating residential and economic development in centres, reducing car dependence and increasing use of sustainable transport modes. Key mechanisms to achieve these goals include the Urban Growth Boundary, Growth Areas, the activity centre network and an upgraded public transport network. The 2008 release of *Melbourne @ 5 million* introduced some policy changes in response to greater than anticipated population growth. While the previously listed goals remained in place, several additional goals also achieved prominence, including provision of more jobs outside central Melbourne and reduced commuting times.

Melbourne has performed strongly in cross-city comparisons of planning systems, due to integrated plans, the review process and clear links to budgetary processes (KPMG 2010, Gleeson et al 2004). Nevertheless, reviews have highlighted a range of concerns about *Melbourne 2030*, including a need to clarify responsibilities between state and local government, unrealistic assumptions, a lack of implementation tools, little progress with implementation and limited integration with transport decision making. *Melbourne @ 5 million* and the *Victorian Transport Plan* contained significant new initiatives that addressed some of these concerns.

BITRE has analysed the extent to which progress has been achieved since 2001 against those metropolitan strategy goals that relate to the spatial distribution of population and employment or to commuting patterns—results are summarised in the table on the following page. Outcome measures on their own do *not* provide a reliable indication of how effectively government planning systems are working, due to the many other influences that can impact on outcomes (PC 2011), and so this report does not attempt to evaluate the performance of Melbourne's strategic planning system. Rather, the purpose of this analysis is to provide evidence about the actual 'on the ground' changes that have been occurring with respect to these strategic planning objectives, whether such movements are in the desired direction and progressing at the required pace of change. This evidence about the reality of the trends that have been shaping Melbourne's population, employment and commuting flows can then be used to inform future planning initiatives.

Observed change against urban planning goals for Melbourne since 2001

Objective	Time period to which evidence relates	Extent of progress	Comments
Spatial patterns of residential development			
Concentrating residential development in centres	Largely 2001 to 2006	Limited	There has been good progress in concentrating residential development within the CBD and other inner city centres, but limited progress in the suburban Central Activities Districts (CADs) and Principal Activity Centres (PACs) which housed just 4 per cent of 2001 to 2006 population growth. The CADs and PACs together housed 9.8 per cent of the city's population in 2001 and 9.9 per cent in 2006, indicating minimal change in the concentration of residential development in the most strategically important centres.
Increasing population density	2001 to 2010	Good	Melbourne remains a low density city, but has recently raised population densities, particularly through large-scale redevelopments in the City of Melbourne LGA which raised its density by 73 per cent from 2001 to 2010. There were more modest density gains in many suburbs, including a 100m^2 reduction in the average size of new lots in Growth Areas from 2000 to 2009. Reflecting this shift to higher density living, 75 per cent of Melbourne's 2001 dwelling stock was separate houses, but this fell to 73 per cent in 2006.
Restricting rural residential development	2001 to 2006	Good	While some new rural residential development occurred in the Melbourne working zone, it amounted to less than 1 per cent of Melbourne's increase in dwellings. Seventy per cent of Peri Urban population and dwellings growth was consolidated into existing urban settlements.
Shifting the focus of growth to the north and west	2001 to 2010	Good	There has been a significant shift in the focus of growth towards the north and west of Melbourne since 2001. The proportion of growth occurring in the north and west rose from 38 per cent between 1991 and 2001, to 41 per cent from 2001 to 2006 and 47 per cent from 2006 to 2010.
Directing fringe development to Growth Areas	2001 to 2010	Good	The estimated resident population of the six designated Growth Area LGAs rose by 297 000 from 2001 to 2010, while the population of other outer suburban municipalities rose by 72 000. Around 80 per cent of outer suburban population and dwellings growth was concentrated in the Growth Area LGAs.
Limiting urban sprawl	Largely 2001 to 2006	Limited*	The urban growth boundary was introduced to set clear limits on Melbourne's outward development, but has been expanded several times. *Melbourne 2030* aimed to reduce the greenfield share of new dwellings from 38 per cent to 31 per cent over the 2001 to 2030 period—but from 2001 to 2006 newly developing suburbs on the urban fringe contributed at least 38 per cent of dwellings growth and 51 per cent of population growth. Residential development has continued to move outwards, but has been largely directed to Growth Areas, and recent outcomes are in line with the revised *Melbourne @ 5 million* target that 53 per cent of new dwellings be in established areas.

continued

Observed change against urban planning goals for Melbourne since 2001 (continued)

Objective	Time period to which evidence relates	Extent of progress	Comments
Spatial patterns of jobs growth			
Concentrat ng jobs growth in centres	2001 to 2006	Isolated	The CADs, PACs and Specialised Activity Centres (SACs) had a lower comb ned rate of jobs growth than the rest of Me bourne (0.9 per cent compared to 1.3 per cent per annum). Jobs growth was not concentrated n these centres and the suburban CADs made a negative contr bution to jobs growth. Nevertheless, the Me bourne Airport and Monash University Health Research Prec nct SACs experienced rapid jobs growth.
Strengthen Central Me bourne's role as primary bus ness hub	2001 to 2008	Some	Central Melbourne added 25 000 jobs between 2001 and 2006 and while its employment share declined marg nally from 26.9 to 26.6 per cent, it remained by far the most important employment hub n the metropolitan area. Recent data shows a shift to more rapid jobs growth in the City of Me bourne between 2006 and 2008.
Provide more jobs outside Central Me bourne^	2001 to 2006	Good	From 2001 to 2006, 86 200 jobs were added outside of Central Melbourne. Jobs growth averaged 1.5 per cent per annum outside of Central Me bourne, compared to 1.2 per cent n Central Me bourne. This substantial ncrease in suburban jobs has been occurr ng n a range of dispersed locations, ncluding industrial areas.
Commuting-related objectives			
Increasing public transport's mode share	2001 to 2010	Good	The public transport share of motorised commuter trips rose from 14.1 per cent n 2001 to 15.1 per cent n 2006, due ma nly to greater use of public transport to access inner city jobs. Public transport's share of all motorised tr ps (commuter and non-commuter travel) has risen from 10.5 per cent n 2001 to 14.3 per cent n 2009, suggest ng significant progress has been made towards the target of 20 per cent by 2020. This recent surge in patronage can be attributed to ris ng petrol prices, strong CBD jobs growth and population increases, but has levelled off since December 2008.
Encourag ng cycling and walking	2001 to 2010	Some	Between 2001 and 2006, there was a shift towards cycl ng and walk ng for the journey to work, with cycl ng ncreasing its mode share from 0.9 to 1.2 per cent and wa k ng from 2.8 to 3.5 per cent. These sh fts were largely confined to the nner and middle suburbs—cycl ng and walking mode shares did not mprove n the Outer and Peri Urban sectors. Commuters' cycling and walking mode shares did not change sign ficantly from 2007–08 to 2009–10.
Reduc ng car dependence through development of activity centres	2001 to 2006	Some	The private vehicle mode share for commut ng trips n the Me bourne work ng zone fell by 1.5 percentage po nts from 2001 to 2006. Reduced car dependence amongst Melbourne CAD workers accounts for a large part of the observed decl ne. There was also a shift away from private vehicle usage by residents of most suburban CADs, but due to their small population base, these mode shifts did not contribute much to the Melbourne-wide results.

continued

Observed change against urban planning goals for Melbourne since 2001 (continued)

Objective	Time period to which evidence relates	Extent of progress	Comments
Ensur ng development is focused in access ble locations	2001 to 2006	Some	The residential and economic development in the City of Melbourne LGA is extremely well served by public transport. The residential development and jobs growth in Me bourne's outer suburbs is less well served, with about half of population and jobs n the selected areas be ng more than 500 metres away from a public transport stop with at least half hourly peak services. For new hous ng in the Growth Areas, the median distance to a tra n station has been gradually ris ng and reached 3.3km n 2007.
Reduc ng average commuting t mes and distances^	2001 to 2010	Negative	Average commut ng distances remained unchanged for the Melbourne SD between 2001 and 2006, but there was an increase n average commut ng times, brought about by reduced speed. From 2007–08 to 2009–10, average commuting times have rema ned unchanged at 36 minutes for a one-way commute. However, there was a shift towards longer distance commutes between 2006 and 2009.

Notes: * The change of target n 2008 makes assessment of progress problematic. The rat ng provided reflects BITRE's assessment of the extent to which practical l mits have been placed on Me bourne's outward development s nce 2001, based on the available evidence, rather than an assessment of progress towards the initial target or progress towards the revised target.

^ Change since 2001 has been assessed for these goals, even though the goal was only introduced with the release of *Melbourne @ 5 million* n 2008.

Source: BITRE analysis—details of assessment and sources provided n body of report.

The available evidence suggests that there has been some movement in the desired direction for most of these planning objectives since 2001. Good progress was achieved against several of these objectives, such as directing fringe development to the designated Growth Areas and shifting the focus of growth to the north and west of the city. More often, the evidence is mixed. For example, a pattern repeated across several objectives is one of substantial change in the City of Melbourne LGA since 2001, coupled with minimal change in the suburbs. There was limited progress with respect to concentrating residential and economic development within activity centres and the recent commuting time trend has not been heading in the desired direction. While some progress has been made against most of these planning goals, it has been incremental in nature as longstanding consumer preferences and the accumulated effects of decades of residential and industry development do not reverse in just five to ten years.

The recent spatial changes in population, jobs and commuting flows in Melbourne largely reflect market forces, demography and people's preferences as to where they live, work and do business. Government planning policies and infrastructure provision have also played a role, but have generally not been the dominant influence. For example, the increase in public transport usage results primarily from an environment conducive to growth in public transport patronage (e.g. rising petrol prices, immigration-led population growth), rather than from specific state government interventions. State and territory governments are of the view that management of greenfield development, accommodation of population growth and transition to higher densities are amongst the factors that are most able to be influenced by planning (PC 2011).

How does Melbourne compare?

This Melbourne study is part of a series of investigations of recent spatial changes in employment, residential and commuting patterns in Australia's largest capital cities. A final comparative report will provide an overview of the relevant statistics for each city, highlight commonalities and differences in the ways our cities are evolving over time and draw out the implications for urban development and infrastructure policy.

CHAPTER 1
Introduction

Key points

- This Melbourne study is part of a series of investigations into spatial changes in employment and residential patterns in Australia's largest capital cities, and how commuting behaviour has responded to these changes. A previous report has been completed for Perth.
- ABS *Census of Population and Housing* and *Estimated Resident Population* data are the two primary information sources used in the analysis, which is focused on the post-2001 period.
- The analysis is presented at a range of geographic scales, including the Melbourne Working Zone as a whole, the Statistical Division, sectors, subsectors, Statistical Local Areas, destination zones, suburbs, activity centres and Census Collection Districts.

Context

This document is part of a set of case studies by BITRE which aim to identify spatial change in employment and residential patterns in our largest capital cities and how commuting behaviour has responded to these changes. A secondary aim is to investigate the extent to which there has been progress in reshaping each city's spatial development and commuting patterns in the direction envisaged by recent metropolitan plans. A report has already been completed for Perth, with Sydney and Brisbane to follow.

These in-depth case studies will provide the basis for a final comparative report, which:

- provides an overview of relevant statistics across the cities
- pulls out some of the common themes which emerge from the individual city studies, as well as the differences
- highlights the implications of the analysis.

Understanding changes in the spatial patterns of major city land uses can assist in the development of urban, infrastructure and local government policy. The aim of this paper is to provide key stakeholders with an evidence base on the spatial nature of changes in population, jobs and commuting flows in Melbourne, including the changes that have been occurring with respect to the relevant strategic planning goals.

Information sources

The approach followed is based on the first investigation completed for Perth. This report uses the official population counts and detailed data from the Australian Bureau of Statistics (ABS) *Census of Population and Housing* to answer the following research question:

> What are the recent spatial changes in employment and residential patterns in the largest capital cities and how has commuting behaviour responded?

The period of interest for this study is the period from 2001 through to 2010. While information on post-2006 change has been incorporated wherever possible, in practice much of the analysis relates to the 2001 to 2006 period for which detailed spatial data is available from the ABS *Census of Population and Housing*. Information on longer term trends is also incorporated to put current changes into their historical context.

The datasets examined for this study are a combination of published and unpublished data:

- Estimated Resident Population (ERP) from ABS' *Regional Population Growth Australia* (Cat. 3218.0).
- Census data on employed residents and transport mode from ABS' *Basic Community Profile* (ABS Cat. 2069.0.30.001) and CDATA 2001.
- Customised unpublished census data from ABS on employment, industry, transport mode and commuting flows.
- ABS-VicRoads dataset on shortest road distance between each SLA pair for 1996, 2001 and 2006.
- Victorian Integrated Survey of Travel and Activity (VISTA) unpublished data on commuting times and distances for 2007 and 2009.

Many of the capital city Central Business District (CBD) councils and state governments have undertaken similar, and sometimes more in-depth, analysis of patterns of residential and jobs growth for their own city. For example the report by Sir Rod Eddington *Investing in Transport Report*; *Melbourne 2030 Audit*; *Melbourne Atlas; Transport Demand Information Atlas for Victoria*; and the City of Melbourne's *Census of Land Use and Employment (CLUE)*. BITRE's study will add value by bringing together the five cities on to a comparable basis and highlighting commonalities and differences in the ways the cities are evolving over time.

While the *Census of Population and Housing* and ERP data are the two main information sources, BITRE's study utilises a range of government and academic literature. Published material on past and projected population growth, jobs growth, commuting flows and transport usage is incorporated, where relevant.

An overview of the planning system and key strategic plans for Melbourne is provided in Chapter Two. BITRE's analysis includes reference to the goals of recent strategic plans and presents evidence about the actual 'on the ground' changes that have been occurring with respect to these strategic planning goals. The paper also makes reference to academic analyses of planning in Melbourne. Some academics are quite critical of metropolitan plans for ignoring the reality of economic forces and trends shaping our cities. This study will identify those economic trends and their spatial implications, which should be of benefit for future planning initiatives.

Geography

Several different geographic boundaries are relevant when considering planning issues for the city of Melbourne. Commonly the city boundary is based on the ABS Statistical Division (SD). In this report the city boundary had been extended to incorporate surrounding regions—the expanded area is referred to as the Melbourne working zone, and is based on BITRE's working zone classification (BITRE 2009a). These working zones are constructed through analysis of the commuting patterns revealed in the 2006 ABS *Census of Population and Housing*. There are approximately 400 working zones across the country which represents economic functional units. Melbourne's working zone expands the Melbourne SD by adding 12 contiguous Statistical Local Areas (SLAs). For example, the Bacchus Marsh SLA has approximately 85 per cent of its employed residents working within the SD of Melbourne. Hence, it has a strong connection to the growth of the city and forms part of the Melbourne working zone.

The analysis also expands the scope beyond the Melbourne working zone on limited occasions to reflect the interconnection of other working zones with Melbourne. This is reflected in Melbourne plans also, with *Direction 3* specifically addressing 'Networks with the regional cities' to 'build on improved links between regional Victoria and the economy and facilities of metropolitan Melbourne' (DI 2002a, p.35). The chosen working zones are:

- Geelong and surrounds
- Latrobe Valley
- Ballarat and surrounds
- Bendigo and surrounds[3].

Map 1.1 presents the key boundaries to define Melbourne, namely the Melbourne working zone and Statistical Division (SD).

This report will on occasion disaggregate Melbourne into further regions. A key unit of analysis is the sector level which is also illustrated in Map 1.1. This map separates Melbourne's working zone into four sectors which are Inner, Middle, Outer and Peri Urban. The Middle and Outer sectors have then been further disaggregated into four subsectors. Hence the structure is as follows:

- Inner
- Middle: consisting of the Middle North, Middle South, Middle East and Middle West subsectors
- Outer: consisting of the Outer Northern, Outer Southern, Outer Eastern and Outer Western subsectors
- Peri Urban.

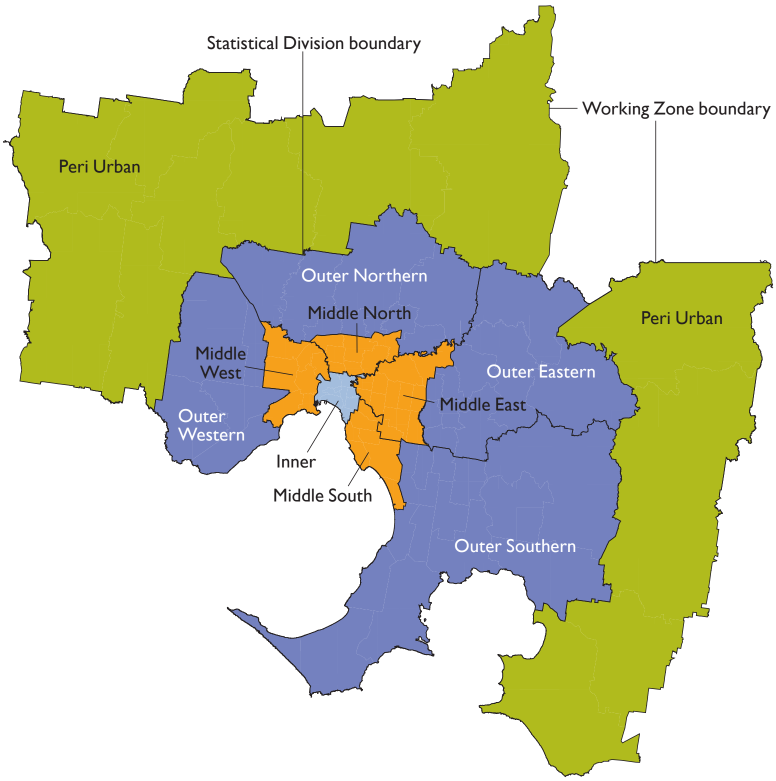
Together, the Inner, Middle and Outer sectors form the Melbourne SD. Adding the Peri Urban sector to the Melbourne SD gives the Melbourne working zone.

This classification provides a ring structure of the city, which has been utilised for the other BITRE studies such as Perth and Sydney. The sectors are based on the ABS' Statistical Subdivisions—details of the classification are presented in Appendix A. These boundaries are slightly different

3 These areas are also identified in the Melbourne 2030 plan. An analysis of the commuting flows illustrate the while other working zones have higher proportions of people commuting to Melbourne the absolute numbers are small. For example, the highest flow is from French island at 25 per cent but this represents 12 people.

to the structure presented in the *Melbourne 2030* plan. The plan separates Melbourne into five sectors (Inner, West, East, North and South) which is a more highly aggregated presentation than the geographical scale utilised by BITRE (sectors and their subsectors), but the BITRE subsectors can be aggregated to correspond to the Inner, West, North and South sectors used in *Melbourne 2030* and to approximate the East sector. A number of geographies have been used in the literature such as the Subregions used in the Victorian Department of Transport report titled *Melbourne Employment Projections* (DT 2008a).

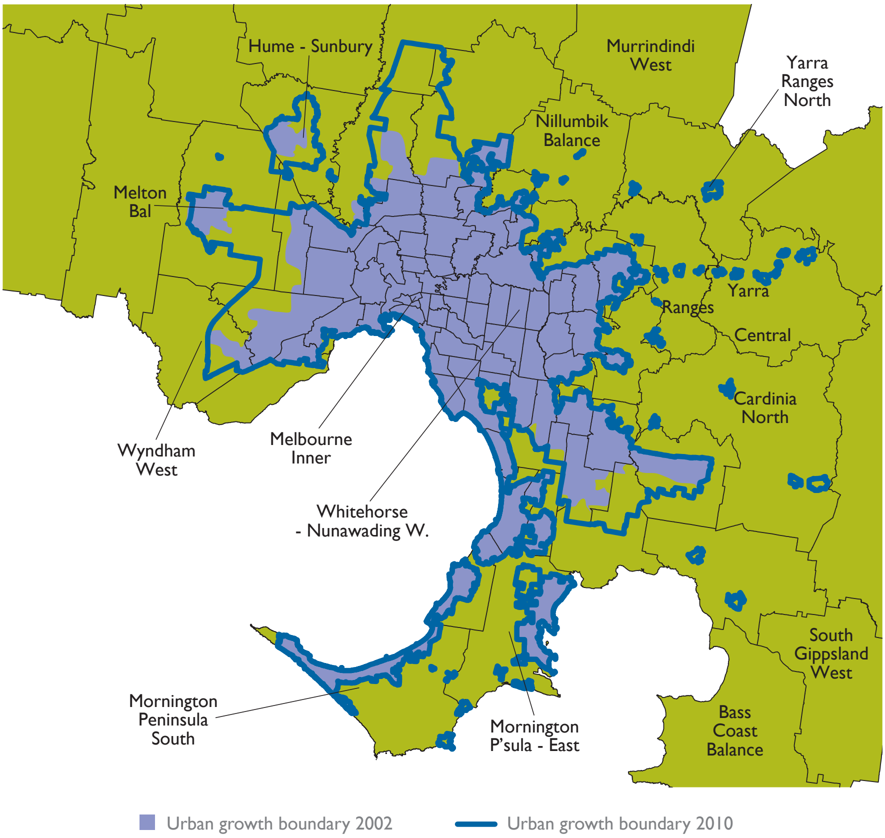
M1.1 Map of sectors for Melbourne's working zone, 2006



Source: BITRE analysis

Another important geography for Melbourne is the Urban Growth Boundary (UGB). The establishment of the UGB in 2002 was one of the key initiatives of *Melbourne 2030*. The purpose of the UGB is to set limits on the outward expansion of the city. The state government has revised the UGB on several occasions. Map 1.2 compares the initial interim UGB to the current UGB (as of July 2010). The main expansions have been to the west and north of Melbourne, around Werribee, Melton, Caroline Springs, Sunbury, Craigieburn, Donnybrook and Beveridge. As much of BITRE's analysis relates to the 2001 to 2006 period, the pre-2006 versions of the UGB are particularly relevant.

M1.2 Map of urban growth boundary for Melbourne, 2002 and 2010



Sources: BITRE analysis of DI(2002b) and DPCD 2010 Urban growth boundary

A lot of analysis for Melbourne is completed at the Local Government Area (LGA) level but for this paper most analysis will be at the smaller geographical scale of the Statistical Local Area (SLA). This is combined with, where data is available, analysis of suburbs, activity centres, Census Collection Districts (for population and transport) and destination zones (for employment).

The analysis presented in this paper is based on 2006 Australian Standard Geographical Classification (ASGC) boundaries, except where otherwise noted. There were some changes to ASGC boundaries between 2001 and 2006. To ensure a valid assessment of change can be made, 2001 and 2006 data has been brought on to a common set of boundaries using a concordance process. The most significant boundary changes in Melbourne during the period involved the creation of more disaggregated SLAs within the Whittlesea, Knox and Yarra Ranges LGAs. It should be recognised that the change data presented for these SLAs involves some estimation.

Structure of report

This paper begins with an overview of the urban planning system for Melbourne, followed by a spatial analysis of residential growth in Chapter 3 which includes investigations of population, density, urban expansion, households and employed residents. Chapter 4 focuses on the spatial dimensions of employment within Melbourne, while the location and growth of different industries is examined in Chapter 5. Spatial differences in car, public transport and other transport mode usage are then considered in Chapter 6. This is followed by an investigation of existing commuting flows and changes in these commuter flows. Chapter 8 considers the relationship of commuting flows to population and jobs growth. Chapter 9 examines the available spatial projections of population and jobs and explores their implications for future commuting patterns in Melbourne, while Chapter 10 discusses the study's main findings.

CHAPTER 2
Planning

Key points

- The *Planning and Environment Act 1987* (VIC) is the primary piece of legislation for planning in the state.
- The role of the Department of Planning and Community Development (DPCD) is to improve Melbourne's urban planning and development.
- Local government plays an important role in the implementation of the metropolitan strategy. This split in responsibilities created some tensions, and the State government has accepted that a stronger partnership with local government is required to implement the plan.
- Melbourne's has had numerous plans over time, which have contributed towards the current structure of the city. The focus of these plans has shifted, with recent plans emphasising the environment, liveability and functionality.
- The 2002 metropolitan strategy, *Melbourne 2030*, was the template for the growth and development of the metropolitan area for most of the period covered by this study. The *Melbourne 2030* goals of most relevance to this BITRE study are:
  - Achieving a more compact city by limiting sprawl and increasing density
  - Concentrating residential and economic development in centres
  - Reducing car dependence and increasing use of sustainable transport modes.
- Key initiatives to achieve these goals are the Urban Growth Boundary, Growth Areas, the activity centre network and an upgraded public transport network.
- With the 2008 release of *Melbourne @ 5 million* and the *Victorian Transport Plan*, several additional goals achieved prominence, including provision of more jobs outside central Melbourne, reducing commuting time, and using transport investment to reshape Melbourne. While *Melbourne 2030* continued to set the overall strategic direction, policy modifications were made to accommodate greater than anticipated population growth and feedback from the review process.
- In early 2011, the Baillieu Government announced that a new metropolitan strategy was to be developed to replace *Melbourne 2030*.
- Reviews have highlighted a range of concerns about *Melbourne 2030*, including unrealistic assumptions, a need to clarify responsibilities, a lack of implementation tools, little progress with on the ground implementation, and limited integration with transport decision-making. However, in cross-city comparisons, Melbourne performs strongly, due to its integrated plans, a strong review and audit process, and clear links to budgetary processes.

The planning system

The *Planning and Environment Act* 1987 (VIC) is the primary piece of planning legislation and sets out the purpose of Victoria's planning system. The specific purpose is stated as follows:

> 'The purpose of this Act is to establish a framework for planning the use, development and protection of land in Victoria in the present and long-term interests of all Victorians.'

The role of the Department of Planning and Community Development (DPCD) is to improve Melbourne's urban planning and development. Within the Department, the Planning and Local Government division 'manages the regulatory framework, providing advice on planning policy, urban design and strategic planning, providing information on land development and delivering planning and development projects. The *Melbourne 2030* Implementation Unit has been responsible for driving, coordinating and monitoring *Melbourne 2030* implementation' (DPCD 2009a). In fact, the creation of the Implementation Unit was part of the government's response to the 5 year audit of *Melbourne 2030* which highlighted a lack of clarity in terms of responsibility and recommended the creation of 'new governance arrangements with responsibility for implementing *Melbourne 2030*' (Moodie, Whitney, Wright, and McAfee, 2008, p.26).

The Department makes recommendations to the Minister for Planning and has some delegated decision making responsibility, on behalf of the Minister (DPCD 2011c). In certain circumstances, the Minister for Planning has the power to intervene on planning matters. This can include assumption of responsibility for planning applications being assessed by councils or the Victorian Civil and Administrative Tribunal (VCAT).

Local government makes most planning decisions, such as whether to grant a permit for a development and the conditions attached. Both state and local planning policies must be taken into account in making planning decisions (DPCD 2008e). All metropolitan councils have their own planning scheme, but there is a requirement 'to consider the need for consequential changes to their own planning schemes to give specific effect to *Melbourne 2030* within their local area' (DI 2002a, p.19). PC (2011 p. 76) notes that, compared to Western Australia and South Australia, in Victoria (and the remaining states) 'decision making is more focused at the local council level', with councils bearing responsibility for subdivision.

The split in planning responsibilities between the State government and local government has meant that 'tension has developed between the proponent of the policy, the State Government, and key players in implementation, namely local government' (Moodie et al 2008, p.21). The State government accepted that a stronger partnership with local government was required to implement the plan and in *Planning for all of Melbourne* the government stated that they would focus on 'developing a new planning partnership with clearer State/local government responsibilities' (State Government of Victoria 2008, p.ii). In a 2010 survey, 49 per cent of city councils agreed or strongly agreed with questions on positive engagement between local government and the Victorian state government—a mid-range result which compared to 42 per cent agreement in NSW and 61 per cent agreement in Queensland (PC 2011).

The Victorian planning system differs from other states in providing any objector with the right to lodge an appeal on a development assessment (PC 2011). As a result, Victoria has much higher rates of appeal and longer approval times (ibid).

The Planning Legislation Amendment Bill (No. 2) 2009 introduced Development Assessment Committees (DACs). DACs will work with local government to make planning decisions on 'matters of metropolitan significance' (DSE 2009, p.1), such as decisions relating to Principal Activity Centres.

A discussion of Melbourne's strategic plans follows, with a primary focus on the planning framework in operation over the 2001 to 2010 period.

Strategic plans

Melbourne has had a number of plans over time, which have contributed towards the current structure of the city. In the beginning of the 20th century Melbourne expanded but reforms to Melbourne's planning were 'piecemeal' (Freestone 2008). To combat this, the Metropolitan Town Planning Commission was established in 1922. The body introduced land-use zoning to avoid the misuse of land in the city and provide a comprehensive town plan.

The next wide-ranging plan for Melbourne was developed by the Melbourne and Metropolitan Board of Works (MMBW) in 1954. Its objective was to decentralise industrial employment, alleviate traffic congestion and focus major retail activities in designated centres on the public transport system (Freestone 2009, DI 2002a). However, the advent of the 'free-standing shopping mall was not anticipated and the extent of postwar population growth was seriously underestimated. It was underlain by traditional assumptions about the preference for low-density living and the availability of cheap energy' and strains on the city became evident (Freestone 2009).

New strategies to meet the changing demands on the city were identified in the 1971 report, *Planning Policies for the Melbourne Metropolitan Region*, from which the MMBW integrated two studies: *The Future Growth of Melbourne* and *Organisation for Strategic Planning*. The plan essentially covered linear transportation corridors, green wedges and limitations for outward growth of the city (Freestone 2009, DI 2002a).

As growth pressures subsided, this evolved into planning for sustainable cities with MMBW's release of the *Metropolitan Strategy* in 1980. This plan aimed to optimise use of the existing infrastructure and to further develop suburban activity centres (Freestone 2009). This was replaced by the 1987 strategy, *Shaping Melbourne's Future*, which reinforced the focus of the 1980 strategy.

Over time, the emphasis in planning moved towards the environment, liveability and functionality of a city and the release of the *Living Suburbs: a Policy for Metropolitan Melbourne into the 21st Century* in 1995 encompassed these aspects (Freestone 2008; DI 2002a). This plan also has a focus on economic restructuring and was a less spatially detailed plan than its predecessors (Freestone 2009).

A listing of some of the strategic plans for Melbourne is provided in Table 2.1.

T2.1 Some important planning milestones for the city of Melbourne, 1922 to 1999

1922	The establishment of the Metropolitan Town Planning Commission (MTPC)
1929	Plan of General Development – MTPC
1954	Melbourne Metropolitan Plann ng Schemes – MMBW
1967	The Future Growth of Melbourne – MMBW
1971	Plann ng Policies for the Melbourne Metropolitan Region – MMBW
1981	Metropolitan Strategy Implementation – MMBW
1984	Central Me bourne: Framework for the future, Land Use and Development Strategy – Department of Plann ng and Env ronment
1987	Shaping Melbourne's Future – Department of Plann ng and Environment
1992	'A Place to Live' Urban Development 1992–2031 – Department of Planning and Hous ng
1995	'Living Suburbs' A policy for metropolitan Me bourne into the 21st Century
1998	From doughnut city to cafe society – Department of Infrastructure
1999	'Implementation, Integration and Innovation' A better future for Victorians – Department for Planning and Local Government

Source: DI 2002a and Freestone 2009

Melbourne 2030—Planning for sustainable growth

The most recent metropolitan planning strategy for Melbourne, *Melbourne 2030*, was three years in the making and was released in 2002. It will be the main focus for this report, along with the subsequent reviews and alterations to the strategic plan. *Melbourne 2030* is a template for the growth and development of the metropolitan area. This high-level plan to manage future growth, land use and infrastructure investment across metropolitan Melbourne provides a context for other sector plans such as those for transport and housing (DI 2002a).

The document sets out to provide a strategic direction for Melbourne's future growth. Nine directions are identified:

- A more compact city
- Better management of metropolitan growth
- Networks with the regional cities
- A more prosperous city
- A great place to be
- A fairer city
- A greener city
- Better transport links
- Better planning decisions, careful management.

The present BITRE study focuses on the 2001 to 2010 period, and for most of this period *Melbourne 2030* was the operational strategic plan. The scope of *Melbourne 2030* extends well beyond the scope of this BITRE study, which is focused on changes in the spatial distribution of population, jobs and commuting flows. Table 2.2 identifies the detailed objectives from *Melbourne 2030* that relate to the spatial distribution of population, employment and commuting. This quite detailed list of objectives can essentially be summarised into the following overarching planning objectives for Melbourne:

- Achieving a more compact city by limiting urban sprawl and increasing population density
- Concentrating residential development and jobs growth in centres
- Reducing private motor vehicle trips and increasing use of sustainable transport modes by improving public transport services and concentrating development in accessible locations.

These planning objectives will be revisited in the chapters that follow, including analysis of the progress that has occurred against these objectives since 2001.

While *Melbourne 2030* continued to set the strategic direction for the city's development through to early 2011, some policy modifications were made in the intervening period to accommodate changes, such as greater than anticipated population growth. The five yearly audit of *Melbourne 2030* (Moodie et al 2008) and updated population projections (see *Victoria in Future 2008*) prompted the 2008 release of *Melbourne @ 5 million*, a planning update of *Melbourne 2030*. *Melbourne @ 5 million* considers the implications of the new growth projections for the future shape of Melbourne and contains a number of new initiatives:

- Six Central Activities Districts (CADs), with CBD-like functions
- Employment corridors
- A target for 53 per cent of new dwellings to be located in established areas, with 47 per cent located in Growth Areas
- Higher density greenfield development
- Investigation of changes to UGB and extensions to Growth Areas (largely in the north and west).

The principal objectives of *Melbourne 2030* have been embedded within planning schemes, such as the State Planning Policy Framework, to ensure they have some statutory weight (Goodman et al, 2010).

In comparison to *Melbourne 2030*, *Melbourne @ 5 million* has a much more pronounced focus on directing future residential growth to the city's north and west and directing future jobs growth to locations outside central Melbourne, particularly to employment corridors and CADs. It also aims to reduce commuting times and distances by locating jobs closer to home—an objective which was not previously articulated in *Melbourne 2030*.

Melbourne 2030 and *Melbourne @ 5 million* should be viewed together. Other relevant strategic plans that need to be considered in conjunction with *Melbourne 2030* are the *Victorian Transport Plan* (2008) and the *Victorian Integrated Housing Strategy* (2010).

T2.2 Summary of *Melbourne 2030* objectives of relevance to BITRE study

Theme/ Chapter	Detailed objectives
Population (Chapter 3)	Reduce the share of new dwell ngs n greenfield areas and dispersed locations (DI 2002a, p.30) L mit outward development through UGB (p.60) Fr nge development to be directed into well-defined Growth Areas, served by high capacity public transport (p.63) Concentrate new residential development at activity centres that are well served by the public transport system (p.57) Encourage higher density housing at activity centres and strategic redevelopment sites (p.57) Discourage new low density rural residential development (p.75) Sh ft the focus of growth from the south-east to the north and west of Me bourne (p.33)
Jobs and ndustry (Chapters 4 and 5)	Strengthen Central Melbourne's capital city functions and its role as the pr mary hub for the metropolitan area (p.80) Concentrate new economic development at activity centres and restrict out of centre development (p. 46, 55) Broaden the range of economic activity n centres that are currently dom nated by shopp ng (p.55) Protect the function of specialised activity centres and industrial areas (p.78, 83) Ma ntain an adequate supply of well-located land for industry (p.78) Make jobs more accessible, by ensur ng development is focused in areas with access to the public transport network (p. 152)
Commuter transport (Chapter 6)	Increase public transport's share of motorised trips to 20 per cent by 2020 (p.146) Encourage cycl ng and wa k ng (p.160) Upgrade and develop public transport services to better connect activity centres (p.146) Reduce the number of private motorised vehicle tr ps by concentrat ng tr p-generat ng activities n access ble locations (p.46)

Source: BITRE analysis of *Melbourne 2030* (DI 2002a).

Following the election of the new Victorian Government in December 2010, it was announced that a new outcomes-based metropolitan strategy was to be developed to replace *Melbourne 2030* (DPCD 2011a). Further information is provided in Box 2.1.

Box 2.1 The new Victorian Government

The Liberal-National Coalition Government, led by Premier Ted Baillieu, was elected in December 2010. In early 2011, it was announced that a new outcomes-based metropolitan strategy was to be developed to replace *Melbourne 2030* (DPCD 2011a), with an anticipated release in 2013 (Tomazin 2011). The development of the new plan will include an extensive consultation process (DPCD 2011a).

An early action of the new government was to reverse the previous government's VC71 planning scheme changes, which would have enabled high density developments along transport corridors (Guy 2010). Other planning initiatives include establishment of new Peri Urban and Housing Affordability units in DPCD and establishment of an Urban Renewal Authority (URA) (Guy 2011a,b). The URA will oversee major redevelopments, including a revamp of Richmond station, the "E-Gate" redevelopment of rail yards at North Melbourne and the proposed high-rise development at Fishermen's Bend (McMahon and Wright 2011).

On the transport front, there was an election commitment to establish a new and independent Public Transport Development Authority, which will plan, manage and co-ordinate public transport in Victoria (Baillieu 2010). The 'Transport Solutions Plan' is currently being developed with an aim to 'improve business competitiveness and assist the development of regional Victoria by identifying and prioritising actions to address rail, road and port logistical bottlenecks in the transport network'.[4] While the funding commitments outlined in the Victorian Transport Plan from 2008 are being re-evaluated (Lucas 2011) in the context of the strategy, the new government has decided to proceed with the Regional Rail Link project (Mulder 2011). Feasibility studies have also commenced into possible rail links to Rowville, Doncaster and Melbourne Airport (DPCD 2011b, DT 2011c,d).

Melbourne 2030 and *Melbourne @ 5 million* identify a number of specific initiatives (or mechanisms) for achieving their objectives. Amongst the most important of these mechanisms are the activity centre network, employment corridors, the Urban Growth Boundary (UGB), Growth Areas and an upgraded public transport network. Each of these is considered, in turn, through the remainder of this chapter.

4 Official e-mail communication with the Department of Transport, Victoria on 6 April 2011.

Activity centres

The vision of the *Melbourne 2030* plan is to have activity centres which are 'centres for business, shopping, working and leisure' (DI 2002a, p.46). The hierarchy of activity centres consists of:

- Central Activities Districts
- Principal Activity Centres
- Major Activity Centres
- Specialist Activity Centres
- Neighbourhood Activity Centres.

A number of key objectives were attached to the development of the activity centres. The key objectives relate to promoting economic development, broadening the mix of uses in the centre, reducing motorised vehicle trips and improving walking, cycling and public transport access (DI 2002a). According to *Melbourne 2030*, the Melbourne Central Activities District—which includes the CBD, Southbank and Docklands—will remain the preferred location for uses serving the State or nation. More generally, activity centres will be the preferred location for high density residential and mixed use developments.

The implementation of activity centres was through local government structure plans in partnership with the Department of Infrastructure. These structure plans for activity centres were to cover aspects such as setting the boundaries and assessing the role and function of the activity centre. The *Melbourne 2030* audit in 2007 stated that 'structure plans have been completed or are underway for 89 of Melbourne's 120 principal and major activity centres (74 per cent)' (DPCD 2007a, p.15). However, the audit highlighted concerns that there has been limited progress with respect to new development in activity centres.

The *Melbourne 2030* Audit expert group report recommended that the focus should be on a more limited number of activity centres. They highlighted 'not all activity centres are candidates for immediate development or redevelopment' (Moodie et al 2008, p.37). This was also highlighted by Birrell et al (2005, p. 02–1) which stated that 'there are too many centres and too few tools to ensure that the strategy is implemented'.

Hence, in the *Melbourne @ 5 million* report the focus was narrowed by creating six new Central Activities Districts (CAD), in order to develop Melbourne into a multi centre city. It is designed to be a movement away from a single dominant Central Business District (CBD). The six new CADs are Box Hill, Broadmeadows, Dandenong, Footscray, Frankston and Ringwood, along with the already existing Melbourne CAD. The new six CADs are a reclassification of the Principal Activity Centres (PAC) and 'will be the focus of a substantial proportion of future employment growth and public investment' (DPCD 2008c, p.11). These CADs are intended to have similar services and functions as the city CBD with major employment concentrations and well designed living and working areas (ibid).

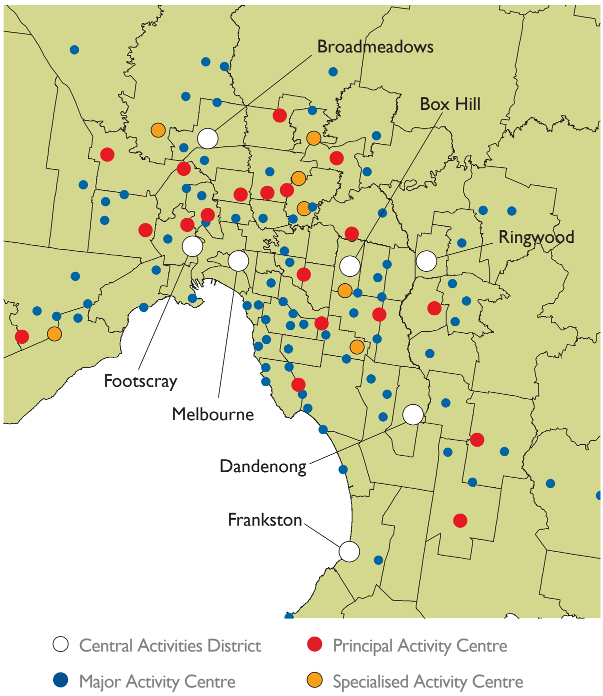
The six new CADs were previously part of the Transit Cities Program. The Transit Cities Program is a state government initiative to revitalise selected suburban and regional centres by implementing Transit Oriented Development (TOD).

> 'TOD seeks to maximise access to mass transit and non-motorised transportation with centrally located rail or bus stations surrounded by relatively high-density commercial and residential development' (Planning Institute of Australia (PIA) 2005, p.3).

Map 2.1 shows the locations of the CADs, PACs, Specialised Activity Centres and Major Activity Centres. With the catalogue of activity centres evolving over time, the list of activity centres utilised in this report are from the revised May 2009 listing.

In 2009, the state government introduced Activity Centre Zones (ACZ) and a simple development framework (DPCD 2009b). The ACZ provides the 'tool to guide and facilitate the use and development of land in activity centres' (DPCD 2009b, p1). Five 'market ready' activity centres were identified for these initiatives. The five PACs were Camberwell Junction, Coburg, Doncaster Hill, Central Geelong and Preston (High Street). An advisory committee was established to provide advice on the boundaries for the five 'market ready' activity centres and 'propose criteria and a methodology suitable to define the boundaries of the remaining activity centres' (DPCD 2009b, p.1).

M2.1 Activity centres and the public transport system in Melbourne



Note: The UGB has subsequently been revised.
Source: BITRE analysis of DPCD (2009e)

The previous lack of definition in the boundaries was highlighted by Birrell et al (2005, p. 02–5) who raised questions such as 'Where does a 'centre' end, and thus where do any special conditions on development cease to apply?'.

In September 2009 the government released a practice note explaining the purpose of the ACZ along with guidance on setting boundaries. Many local government councils had already completed their structure planning processes which included the setting of activity centre boundaries. 'However, different approaches have been taken to determine and set these activity centre boundaries' (DPCD 2009c). The introduction of the ACZ criteria would 'enable controls to be applied more consistently across a range of activity centres' (DPCD 2009c).

A key objective of ACZ is the development of mixed uses in the activity centres with DPCD stating that the criteria to set the boundaries should consider aspects such as:

- 'The location of existing commercial areas and land use.
- The location of existing government and institutional areas and land uses.
- Proximity to public transport, especially fixed rail (train or tram).
- Walkability – opportunities to provide for and improve walkability within 400 to 800 metres from the core of the centre (depending on topography and connectivity.
- Sufficient land to provide for the commercial (retailing, office, fringe retailing and support activities such as entertainment) activities needed over a 15 to 20 year time frame and then into the 30-year horizon' (DPCD 2009c, p.2 (sections of)).

Melbourne's activity centres are focused on shopping centres. An investigation by Yamashita, Fujii and Itoh (2006) has highlighted that PACs[5] in Melbourne can be classified into four types:

- Traditional centres on shopping streets in inner or middle suburbs.
- Stand-alone large suburban shopping centres.
- Town centres, in low density suburbs, formed around stations along with amenities such as City Halls.
- Recently built shopping centres near stations with other amenities positioned around them afterwards.

Yamashita et al (2006) have highlighted a number of 'attractive' points in the development of suburban centres in Melbourne, including their diversity of functions and the growth of many traditional centres. However, they also highlighted that activity centres in Melbourne face challenges:

- 'Some major shopping centres still have no transit access'
- 'Medium- or high-rise dwellings are also needed in order to form a compact town'
- 'Inadequate agglomeration of employment' (Yamashita et al 2006, p. 09–24).

In addition Birrell et al (2005) have underlined the mismatch between the existing employment distribution of the metropolitan area and the location of the activity centres along with the type of jobs offered. Mees (2003) has pointed out how the activity centre initiatives do not distinguish car-based centres from public transport accessible centres.

Further analysis of activity centres is incorporated throughout the paper, particularly in the population, employment and transport chapters. The focus will be on CADs, PACs and specialised activity centres. Table 2.3 presents a listing of those activity centres utilised in BITRE's analysis.

5 This study was completed when the CADs were still class fied as PACs.

T2.3 Activity centres and transit cities

Activity centre types	Location
Central Activities Districts	Melbourne
	Box Hill (Transit City)
	Broadmeadows (Transit City)
	Dandenong (Transit City)
	Footscray (Transit City)
	Frankston (Transit City)
	Ringwood (Transit City)
Princ pal Activity Centres	A rport West
	Camberwell Junction
	Chadstone
	Cheltenham, Southland
	Coburg
	Cranbourne
	Doncaster Hill
	Epping (Transit City)
	Glen Waverley
	Greensborough
	Mar byrnong, Highpoint
	Moonee Ponds
	Narre Warren, Founta n Gate
	Prahran/South Yarra
	Preston, High Street
	Preston, Northland
	Sunsh ne
	Sydenham (Transit City)
	Wantirna South, Knox Central
	Werr bee (Transit City)
Specialised Activity Centres	A fred Medical Research and Education Precinct, Prahran
	Aust n Biomedical Alliance Prec nct, Heide berg
	Deakin University, Burwood
	La Trobe Technology Park, Bundoora
	Melbourne Airport
	Monash University/ Health Research Prec nct, Clayton
	Parkville Medical and Bioscience Prec nct
	University Hill Technology Prec nct, Bundoora
	Victoria University, Footscray
	Werr bee Employment Prec nct

continued

T2.3 Activity centres and transit cities (continued)

Activity centre types	Location
Employment Corridors	Avalon A rport to Werr bee, Melton, Me bourne Airport and Donnybrook
	Cau field to Dandenong
	Monash University/Chadstone to Box Hill, Aust n hospital and Bell Street
	R ngwood to Box Hill and Hawthorn
	Melton to Sunsh ne and North Melbourne

Note: Some regional cities have previously been classified as Transit Cities.
Source: DPCD (2009e)

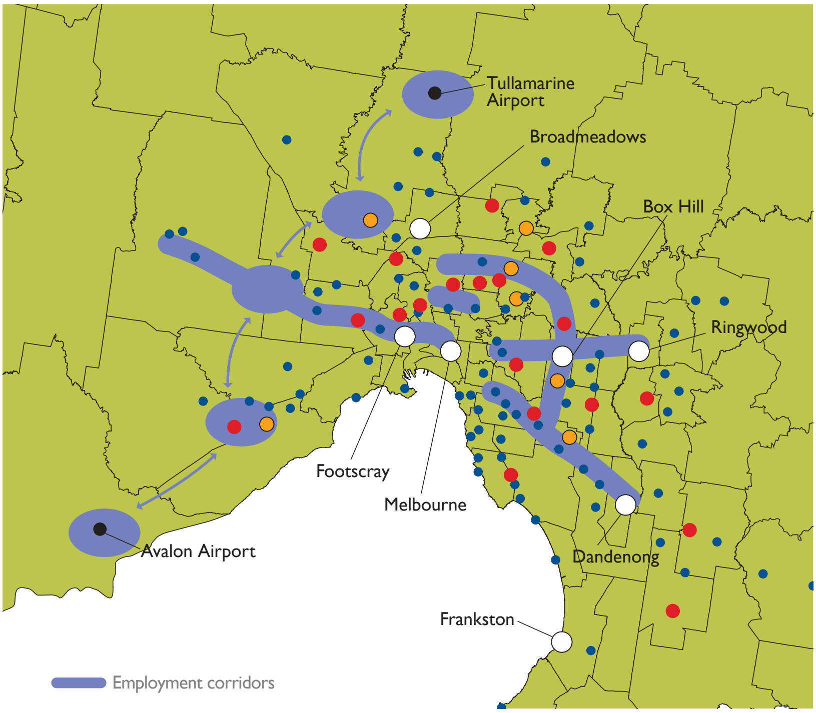
Corridors

Employment corridors are a new initiative of *Melbourne @ 5 million*, related to the development of the CADs. They are designed to 'link activity centres, universities, research and technology precincts, medical precincts, and areas with high employment' (DPCD 2008c, p.13) and 'to improve accessibility to jobs and services and reduce congestion on the transport network' (DPCD 2008c, p.6). Five employment corridors have been identified:

- Avalon Airport to Werribee, Melton, Melbourne Airport and Donnybrook (Hume-Mitchell)
- Caulfield to Dandenong
- Monash University/Chadstone to Box Hill, Austin Hospital and Bell Street
- Ringwood to Box Hill and Hawthorn
- Melton to Sunshine and North Melbourne.

Map 2.2 is a representation of the employment corridors across the city. Several of the employment corridors are located close to Growth Areas and they are intended to provide better access to employment, particularly in the west.

M2.2 Employment corridors in Melbourne



Note: The map displays the UGB passed in 2010.
Source: BITRE analysis of DPCD (2009f)

Urban Growth Boundary and Growth Areas

As part of *Melbourne 2030* direction 2, which is for the 'better management of metropolitan growth', two particular initiatives have been put into place, namely the Urban Growth Boundary (UGB) and the Growth Areas.

The Urban Growth Boundary (UGB) is an instrument to slow the growth of urban sprawl and to support the strategy of making Melbourne a more compact city. 'In the past, Melbourne has grown by extension of the suburban frontier, rather than by the intensification of housing within established urban areas' (Birrell et al 2005, p. 01–01). The strategy is to ensure that 'a reasonable amount of land has been set aside in metropolitan Melbourne to maintain a supply of affordable housing under a competitive market system' (DI 2002a, p. 62). Map 1.2 illustrates the UGB at its inception in 2002 and following the July 2010 expansion.

An issue that has been raised is its influence on housing prices through its restrictions on land (PC 2004, Birrell et al 2005). Birrell et al (2005, p. 03–8) cite the Centre for Population and

Urban Research published analysis that finds 'the establishment of the UGB had contributed to sharp price increases for broad hectare land within the UGB'. The UGB boundary has been extended on several occasions. A reason behind the most recent boundary extension was 'to provide for around 20 years of land supply to meet the new growth projections. This change is also important to maintain Melbourne's relative affordability' (DPCD 2008g).

Growth Areas have been identified in five locations around the city, namely Casey-Cardinia, Hume, Melton-Caroline Springs, Whittlesea and Wyndham. A more recent addition to the Growth Areas has been the inclusion of Mitchell LGA to the north of the city. This area was included because of the expansion to the UGB in 2010. Mitchell LGA divides into two SLAs—Mitchell North and Mitchell South (only Mitchell South is positioned within the Melbourne working zone). This report concentrates on the original listing of *Melbourne 2030* Growth Areas.

Directions for housing development in the Growth Areas included in the *Melbourne 2030* strategic plan were:

- Increasing the number of dwellings per hectare with a range of housing types
- Planning for provision of public transport and other forms of infrastructure with the release of land
- Having local employment opportunities.

Melbourne @ 5 million contains targets for the location of new housing, with 53 per cent of new dwellings to be located in established areas and 47 per cent in the designated Growth Areas.

The Growth Areas Authority (GAA) was established as an independent statutory body to facilitate the development of the Growth Areas and to oversee preparation of their precinct structure plans.

As part of the planning strategy the government had introduced the Growth Areas Infrastructure Contribution (GAIC) scheme which applies to areas of 'land brought into the UGB from 2005 and zoned for urban development' (GAA 2009a, p.1). The GAIC is 'charged on a per hectare basis and will be incurred on the first property transaction on either the sale or subdivision of the land' (DPCD 2008c, p.25). It is intended to ensure that landholders, 'who enjoy substantial windfall gains as a result of changes to the Urban Growth Boundary, also contribute fairly' to the costs of infrastructure provision in Growth Areas (ibid p 25).

Outside the UGB, 12 green wedges are to be protected from non-urban uses. These areas have environmental and recreational uses but also have 'assets such as airports, sewage plants, quarries and waste disposal sites – uses that support urban activity but which cannot be located among normal urban development' (DI 2002a, p.66).

Upgraded public transport network

Melbourne 2030's key transport-related initiatives include improving the speed and reliability of the existing public transport network, introducing new cross-town bus routes, giving greater priority to cycling and walking in urban planning, and integrating land use and transport policies around activity centres.

For the post-2001 period (the focus of the present study), there has been a series of strategic plans for transport, such as:

- *Linking Victoria (1999)* which outlined projects such as the redevelopment of the Southern Cross Station and Regional Fast Rail (DT 2009a)
- *Metropolitan Transport Plan (2004)* combined with *Melbourne 2030* outlined the strategic course for the city (SGV 2004)
- *Meeting our Transport Challenges* (MOTC) (2006) established a program to invest in Victoria's transport network (SGV 2006).

The most recent strategic plan is the *Victorian Transport Plan* (VTP) (2008) which replaces MOTC and incorporated the response to the report prepared by Sir Rod Eddington titled *Investing in Transport 2008*. The VTP outlines six priorities, of which the following four are most relevant to the current study:

- 'Using transport investment to change the shape of Victoria to make jobs and services more accessible'
- 'Creating a metro system by improving the capacity, frequency, reliability and safety of public transport
- Linking our communities by closing gaps, reducing congestion and improving safety on our roads
- Taking practical steps for a Sustainable Future' (DT 2008b, p.7 (sections of)).

The VTP aims to build on the framework set by *Melbourne 2030* and *Melbourne @ 5 million* by using 'major investment in transport to influence the decisions we make as individuals, business and government, about how and where we work, live and move around' (DT 2008b, p.14). Many of the new transport infrastructure projects outlined in the VTP are considered to be of sufficient magnitude to shape future city development. For example, it is argued that the Regional Rail Link and Melbourne Metro projects will 'unlock the potential of the north, west and south-west', while the North East Link will 'fundamentally alter the economic landscape in this part of Melbourne, just as the Western Ring Road did in the west' (DT 2008b, p.37). This reflects the transition to an infrastructure focus in Melbourne's planning over the 2002 to 2008 period, as highlighted by Dodson (2009).

The VTP emphasises an integrated approach to transport and urban development. This includes facilitating growth in CADs and along employment corridors, so that people live closer to jobs and spend less time travelling, as well as extending the reach of public transport into new growth areas.

A common goal of all the recent state government land use and transport strategic plans, as well as *Growing Victoria Together*[6], is to increase public transport's share of motorised trips within Melbourne to 20 per cent by 2020 (DI 2002a, DPC 2001). According to DI (2002a), the public transport share of motorised trips was 9 per cent at the time of release of *Melbourne 2030*.

Strategies put in place to help achieve this ambitious mode share target include expansions of public transport infrastructure, integrated transport and land use planning, and Travelsmart, which aims to reduce people's car dependency and encourage alternative travel options through travel planning (DT 2009b).

Reviews of recent plans

A key initiative of the *Melbourne 2030* report was the setting up of a formal process to review progress at least once every five years. The first review, conducted by the Audit Expert Group (AEG), was released in 2008. It identified strong community support for the fundamental principles of *Melbourne 2030*, but significant concerns about its implementation (Moodie et al 2008). While there was evidence that many of the *Melbourne 2030* initiatives had progressed, this progress related mainly to more planning and investigation, and had not generally translated into 'on the ground' implementation (ibid). Specifically, Moodie et al (2008, p.22) highlighted the following areas of under-performance:

- 'Insufficient progress, to date, in redirecting residential growth from the fringe to established areas of the metropolis
- The lack of significant residential or mixed-use development in and around principal and major activity centres
- Insufficient provision or commitment to crucial public transport investments, such as fixed rail to the Whittlesea growth area and expanding the capacity of the city rail loop.'

Moodie et al (2008) identified three fundamental recommendations:

- New governance arrangements need to be created to clarify responsibility and there needs to be high level commitment to implementation within the State government.
- Adequate resources must be allocated to implement *Melbourne 2030*.
- Strong partnerships need to be built with local government, local communities and developers.

There were also a range of more detailed recommendations, including focusing effort on a smaller number of key activity centres, progressively increasing densities in Growth Areas, maintaining the UGB without alteration for at least five years (unless compelling circumstances arise) and reducing congestion by increasing accessibility to jobs and services and investing in sustainable transport modes (Moodie et al 2008).

The state government formally responded to the AEG recommendations in *Planning for all of Melbourne* (SGV 2008), while *Melbourne @ 5 million* and the VTP both contained significant new initiatives that addressed some of the concerns raised by the AEG review.

6 *Growing Victoria Together* is a ten year vision that expresses the Victorian State Government's broad vision for the future and identifies the priorities the Government has set to build a better society (DPC 2001).

Melbourne 2030 'has fermented much public debate and some vocal opposition' (Moodie et al 2008, p.4). This is reflected in critiques from academics, local government, concerned residents and community organisations such as Save our Suburbs. Bunker (2009) points out that the main criticisms have related to whether its assumptions are realistic, whether it will achieve its objectives, and concerns about high density residential development.

One of the more comprehensive reviews was undertaken by Birrell et al (2005) who highlighted how the success of *Melbourne 2030* fundamentally depends on the feasibility of the activity centre proposal. Birrel et al (2005, p. 06-1) come to the conclusion that *Melbourne 2030*

> 'will not work as intended. Activity centres will not attract the desired numbers of residents because of lifestyle and cost issues. Business enterprises, too, are unlikely to concentrate in such centres because of the way the contemporary urban economy now functions and the limited tools which the planners possess to encourage such concentration'.

Other concerns that have been highlighted in reviews of *Melbourne 2030* include:

- The strategy preparation process was top-down (Dodson 2003). Feedback generated through the consultation process did not contribute to the substance of the strategy (Mees 2003).
- The plan will not prevent continued suburban sprawl, because the UGB is not a firm boundary (Birrel et al 2005). Major developments have also proceeded outside the UGB (Dowling 2009).
- 'Market forces rather than planning strategies appear to be dictating how Melbourne is growing' (Wood 2006, p.4). The city's actual growth pattern bears little relationship to what was envisaged by *Melbourne 2030* (Colebatch and Dobbin 2010).
- It appears to misunderstand the modern economy, with the planning rhetoric bearing little relationship to the actual priorities of employers and their employees (Birrel et al 2005, O'Connor and Rapson 2003).
- The plan 'seems ignorant of the expensive nature of urban development', such as the costs of redeveloping activity centres (O'Connor 2003, p.213).
- The plan aims to fundamentally reshape the distribution of housing and jobs and achieve a broad range of social, economic and environmental goals, but proposes doing so with a very limited set of instruments (O'Connor 2003). Millar (2007) points to a disconnect between the state government's strategies and the reality of planning, with councils not having the tools to implement these strategies. A specific example is the lack of substantive mechanisms to channel residential development into activity centres (Mees 2003, Buxton and Scheurer 2007).
- There is an over-reliance on land use considerations, and more attention should have been paid to creating major changes in urban infrastructure, particularly transport networks (Mees 2003, Dodson 2009).
- There has been a lack of progress on integration and upgrading of public transport services (Wood 2006).
- 'Transport decision-making was largely detached from the *Melbourne 2030* process' (Mees 2007, p. 1114), with a large program of freeway construction occurring, despite the stated goal of reducing car dependence. However, with the release of *Melbourne @ 5 million* and the VTP in 2008 the Victorian government has begun to more effectively link land use planning and transport infrastructure provision (Bunker 2009).

A number of strengths have also been highlighted in the literature, particularly in comparisons of Melbourne's strategic planning with other Australian cities. An assessment of the consistency of capital city strategic planning systems with the nine COAG national criteria was undertaken by KPMG (2010). Melbourne ranked highest of all the capital cities, because:

> 'it has the strongest representation of a capital strategic planning system supported by a metropolitan plan, a transport plan, land supply program and the recently released Integrated Housing Strategy. It has established a strong review and audit process conducted by independent experts that has triggered the development and implementation of Melbourne @ 5 million' (ibid, p.9).

KPMG (2010) also regarded the emphasis on the connections with regional centres as a strength of Melbourne's plans, but highlighted the need for more regular performance monitoring. Gleeson, Darbas and Lawson (2004) highlight the links to budgetary processes as being a comparative strength of *Melbourne 2030*.

> 'The influence of metropolitan strategies over infrastructure agencies is ensured in Melbourne by the establishment of a state budgetary mechanism that assesses alignment between infrastructure expenditure and metropolitan aims and objectives' (ibid, p.363).

PC (2011 p. 198) similarly identifies Victoria, along with Queensland and South Australia, as the best placed jurisdictions for infrastructure delivery due to 'detailed infrastructure plans with a level of committed funding from the state budget and a committed delivery timeframe' and 'scope to apply alternative planning processes to infrastructure projects'. Victoria also performs comparatively well with regard to openness, providing full access to strategic planning information, including submissions from community and business (PC 2011).

Summary

The metropolitan strategic plans provide important context for the Melbourne case study. *Melbourne 2030* and *Melbourne @ 5 million* have the following common goals that relate to the spatial distribution of population and employment, or to commuting:

- Limiting urban sprawl
- Higher density living
- Locating residential development in centres
- Concentrating economic development in centres
- Shifting the focus of growth to the north and west of the city
- Encouraging the use of public transport, cycling and walking
- Reducing car dependence
- Ensuring development is focused in areas that are well served by public transport.

With the 2008 release of *Melbourne @ 5 million* and the VTP, several additional goals achieved prominence:

- Providing more jobs outside central Melbourne
- Reducing average commuting times
- Using transport investment to reshape Melbourne and make jobs more accessible.

BITRE's spatial analysis of population growth, jobs growth and changes in commuting flows focuses on the post-2001 period, particularly 2001 to 2006. Where data permits, the study will analyse progress against these planning objectives since 2001. However, as *Melbourne 2030* was released in 2002, its extension *Melbourne @ 5 million* was only released in 2008, and not all of the objectives were in place over the entire post-2001 period, these comparisons are not intended to evaluate the success of any specific strategic plans. The primary purpose of BITRE's study is to provide evidence about the reality of the trends that have been shaping the city of Melbourne, which can then be used to inform future planning initiatives.

CHAPTER 3
Residential patterns and trends

Key points

- Almost half of the Melbourne working zone population lives in the Middle sector, 42 per cent in the Outer sector, 7 per cent in the Inner sector and 4 per cent in Peri Urban areas.
- Between 1981 and 2006, the Melbourne Statistical Division's population increased by nearly 937 000, with the majority of the growth occurring in the Outer sector.
- The long-term growth of Melbourne has been skewed towards the east and south sides of Port Philip Bay, extending to the Mornington Peninsula. Since 2001, there has been a shift in the focus of growth towards the north and west.
- From 2001 to 2006, the population of the Melbourne working zone grew by 283 000 to reach 3.9 million—an average annual growth rate of 1.5 per cent, which was slightly higher than the national figure of 1.3 per cent. The average annual growth rate increased to 2.2 per cent for the 2006 to 2010 period, representing 347 000 additional residents.
- Between 2001 and 2006 there was a decline in the proportion of Melbourne's population living 5 to 20 kilometres from the CBD. This reflects slow growth in the Middle sector (averaging 0.7 per cent per annum), compared to the Inner sector (3.3 per cent) and Outer sector (2.2 per cent). Sixty per cent of population growth was in the Outer sector, 21 per cent in the Middle sector and 15 per cent in the Inner sector.
- Between 2006 and 2010, the Outer sector (3.0 per cent) grew slightly more rapidly than the Inner sector (2.6 per cent). The Middle sector experienced an upturn in growth, accounting for 30 per cent of Melbourne's population increase, while 58 per cent was in the Outer sector.
- Over the entire 2001 to 2010 period, Melton East added the most population (41 600 persons), followed by Whittlesea–North (33 800), Wyndham North (33 400), Casey–Cranbourne (32 600) and Casey–Berwick (32 200). The highest average annual rate of population growth was in Wyndham South (25 per cent) and Southbank-Docklands (17 per cent). Areas of population loss were most evident in the established Outer suburbs (e.g. Broadmeadows).
- Melbourne is Australia's second most densely populated city. Its density increased from 1455 to 1566 persons per square kilometre between 2001 and 2006, with the largest increases occurring in the Inner sector (particularly in the suburbs of Melbourne, Southbank and Carlton). This reflects a shift towards higher density forms of housing.

- The metropolitan plans aim to concentrate new residential development at activity centres. Between 2001 and 2006, there has been good progress in concentrating population growth in the CBD, but limited progress in the remaining Central Activities Districts and Principal Activity Centres.
- Melbourne is continuing its outward sprawl, with newly developing suburbs on the urban fringe accounting for 51 per cent of population growth and 38 per cent of dwellings growth between 2001 and 2006. Urban expansion is largely being accommodated within the six designated Growth Area councils (i.e. Casey, Cardinia, Wyndham, Hume, Whittlesea, Melton).
- Employed people represented 53 per cent of Melbourne's population increase from 2001 to 2006.

Context

According to the vision of *Melbourne 2030*, over the next 30 years, Melbourne will grow by up to one million people and consolidate its reputation as one of the most liveable, attractive and prosperous areas in the world for residents, business and visitors (DI 2002a). *Melbourne 2030* has two key directions to achieve the vision for the city in regards to residential growth, these are:

- A more compact city
- Better management of metropolitan growth.

The urban strategy will involve locating 'a substantial proportion of new housing in or close to activity centres and other strategic redevelopment sites', setting an Urban Growth Boundary (UGB) around the city and concentrating 'urban expansion into growth areas that are served by high-capacity public transport' (DI 2002a, p.63).

Following the release of *Melbourne 2030*, a review of the Melbourne urban strategy showed that Melbourne was growing faster than anticipated which prompted the release of *Melbourne @ 5 million*. A number of initiatives were included such as expanding the UGB and the Growth Areas Infrastructure Contribution scheme.

The UBG, activity centres and Growth Areas will be investigated further in this chapter along with the trends in population growth and its spatial patterns across the city.

Population snapshot in 2006

Population location

The ABS' Estimated Resident Population (ERP) for Melbourne working zone was 3.9 million in 2006, up from 3.6 million in 2001. The working zone contains metropolitan Melbourne, with 31 Local Government Areas (LGAs), and expands out to Peri Urban areas which incorporate parts of another eight councils.

A summary of the total population of the Melbourne working zone is in Table 3.1. The working zone has been separated into sectors (i.e. the Inner, Middle, Outer and Peri Urban sectors). Most people live in the Middle and Outer sectors representing just under 90 per cent of the population. Within the Middle sector, the Middle East sector has the highest percentage at 15.3 per cent. The Outer Southern sector represents the highest proportion of people in the Outer areas with 17.3 per cent of the working zone population. In contrast Outer Western's proportion is only 5.1 per cent. The Peri Urban sector has the lowest proportion of people at 4.0 per cent followed by the Inner sector at 7.4 per cent.

Included in Table 3.1 are some of Melbourne's surrounding working zones such as the Geelong working zone. These are working zones in which more than 70 per cent of people work within the region. However, some of these regions have strong and growing connections with metropolitan Melbourne, and as such are important to understanding the changing nature of demographics. For example, between 2001 and 2006 the Geelong working zone has had an increasing commuting connection with Melbourne (see Chapter 6).

T3.1 Estimated resident population by subsector, Melbourne working zone, 2006

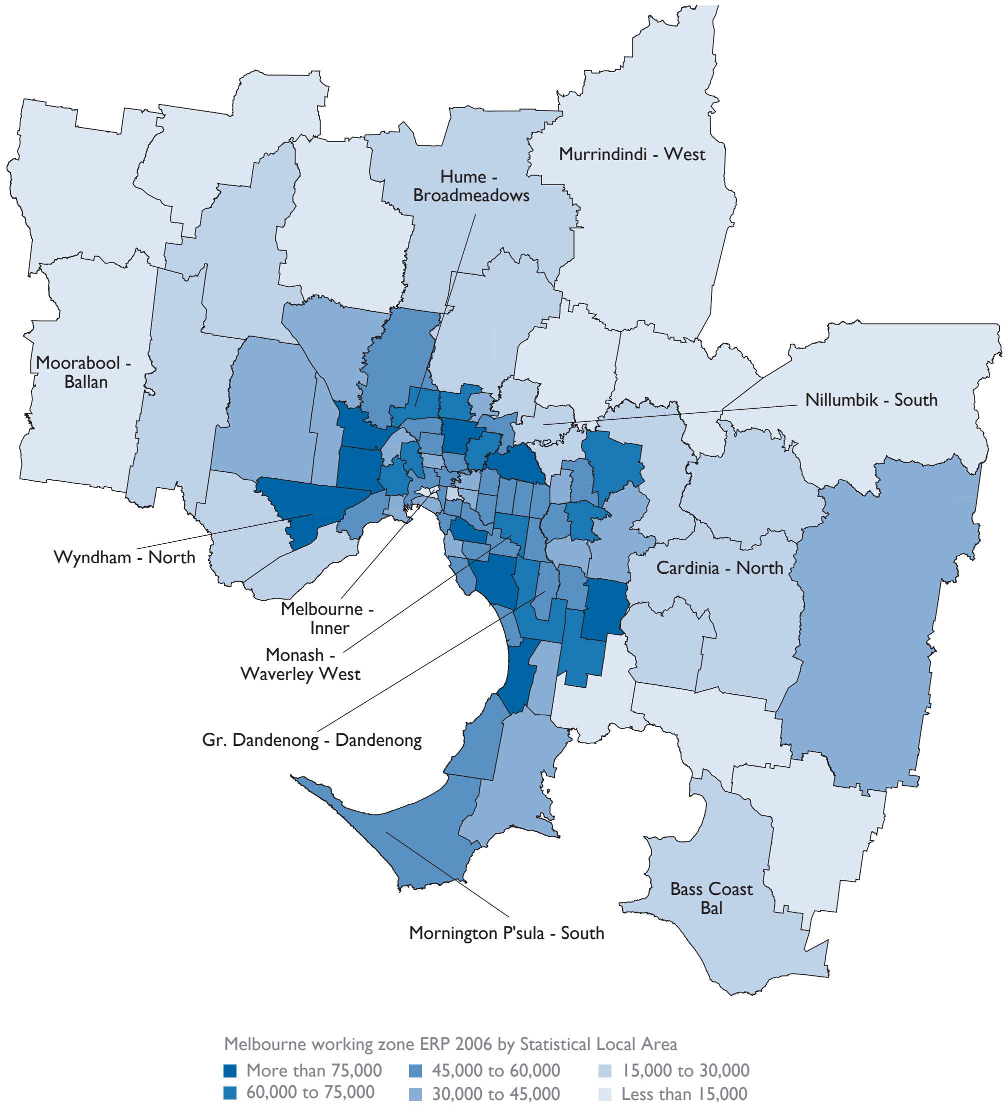
Sector	Estimated resident population 2006	Share of working zone population (per cent)
Inner	288 273	7.4
Middle	1 837 504	47.1
Middle North	395 113	10.1
Middle South	408 139	10.5
Middle East	595 543	15.3
Middle West	433 338	11.2
Outer	1 617 238	41.5
Outer Northern	346 286	8.9
Outer Southern	674 713	17.3
Outer Eastern	398 493	10.2
Outer Western	197 746	5.1
Peri Urban	157 024	4.0
Melbourne work ng zone	3 900 039	100.0
Geelong working zone	240 950	100.0
Ballarat working zone	113 292	100.0
Bendigo work ng zone	119 000	100.0
Latrobe Valley working zone	80 311	100.0

Note: Est mates are based on 2006 boundaries

Source: BITRE analysis of ABS Cat. 3218.0 Regional Population Growth

To illustrate spatially the distribution of people, Map 3.1 presents the number of people within each Statistical Local Area (SLA) in 2006, covering Melbourne's working zone. The three most populated SLAs are in the Middle sector, namely Manningham West, Kingston North and Keilor. The most populous SLA in 2006 was Manningham West with 99 412 residents, while Yarra Ranges Part B had just 620 residents. The average population size across the 91 SLAs in the Melbourne working zone was 42 858 and the median was 45 124. The Peri Urban areas typically had the lowest population levels such as Yarra Ranges Part B, Ballan and Hepburn East, but the second lowest population was in the Outer Sector SLA of Cardinia South. In the Inner sector, the most populated SLA was St Kilda and the least populated was Melbourne Inner.

M3.1 Distribution of population across SLAs, Melbourne working zone, 2006



Source: BITRE analysis of ABS Cat. 3218.0 Regional Population Growth

Other spatial units provide less variability in terms of population size—these include suburbs and census collection districts (CCDs).

The average Melbourne suburb (as defined by ABS in the 2006 ASGC) had a population of 7131 residents in 2006, with a median of 4795. Three suburbs had no residents (Tremont, Sherbrooke Balance and Truganina Balance). Other suburbs with low populations included Somerton with 4 people and Laverton North with 2. In contrast the most populous suburbs were:

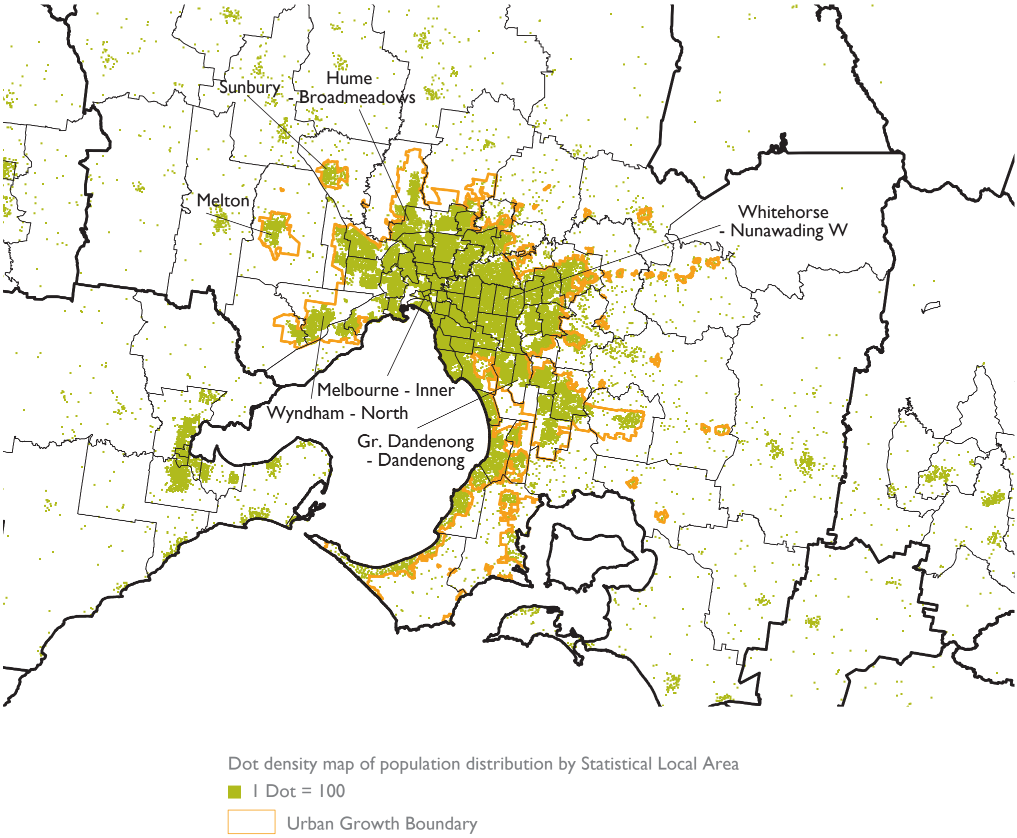
- Reservoir with 45 972 residents (SLA of Darebin–Preston)
- Glen Waverley with 38 217 residents (SLA of Monash–Waverley West)
- Hoppers Crossing with 38 112 residents (SLA of Wyndham–North).

The CCDs are the smallest units of geography, which range from a high of 1447 people to a low of no residents. The average is 572 residents, with a median of 568 people. These regions are used by the ABS for census collection.

Map 3.2 illustrates the population distribution for metropolitan Melbourne using CCDs for 2006. The population distribution is closely aligned with the state government's Urban Growth Boundary (UGB), which was previously discussed in Chapter 2. The settlement patterns are concentrated around inner Melbourne, and skewed towards the eastern and southern areas of the city. This is illustrated by the stretch of suburbs along the coast to the Mornington Peninsula and as far east as the Yarra Ranges. The satellite cities of Sunbury and Melton are clearly visible to the north-west and form part of the UGB, which is designed to concentrate urban development.

To limit the urban sprawl surrounding the UGB, green wedges have been created which are open landscapes to conserve rural and natural features. For example, areas on the northern, western and eastern boundaries of the City of Whittlesea are part of the green wedges distributed around the urban areas of metropolitan Melbourne.

M3.2 Dot density map of population distribution for Melbourne and surrounding regions, 2006



Note: This reflects the UGB as of 2005, rather than the 2010 expansion of the UGB.

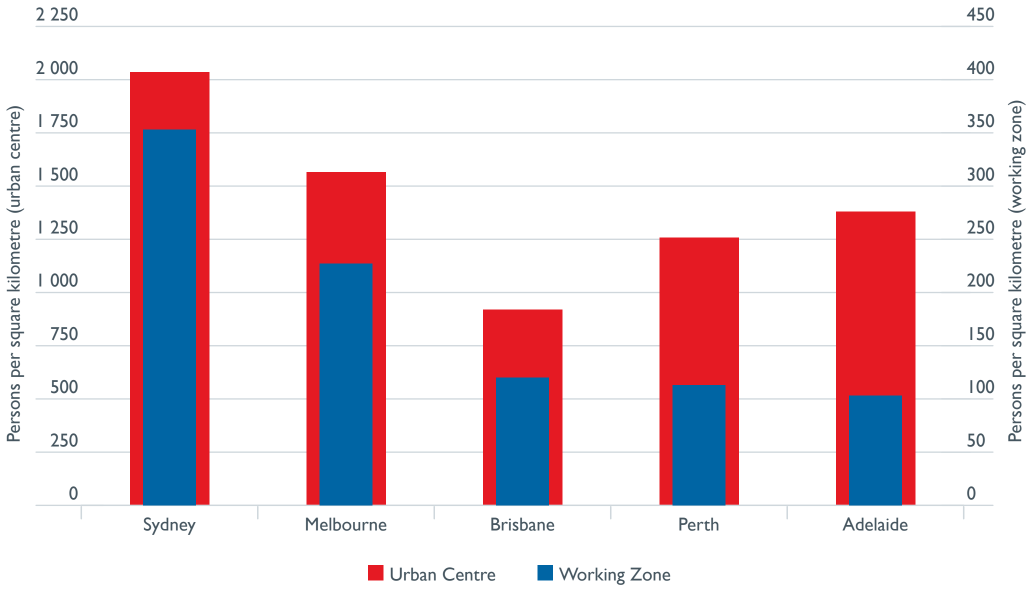
Source: BITRE analysis of ABS Census of Population and Housing 2006 usual residence data at CCD scale.

Population density

'Melbourne suburban dwelling style is distinctive for its emphasis on low density houses in garden settings which can often be traced back to the original plantings' (Birrell et al 2005, p. 05–1). Melbourne's population density has had an ongoing decline between the 1920s, when it housed 2700 persons per square kilometre, and 2001 (VCEC 2006). Nevertheless, Melbourne is the second most densely populated city in Australia. Figure 3.1 presents the population densities for Australia's state capitals along with their corresponding BITRE working zone for 2006. The Melbourne urban centre, as defined by the ABS, has a population density of 1566 persons per square kilometre, just below Sydney (2036).

The Melbourne working zone is far more sparsely settled. It includes areas of non-residential land, including industrial and rural land and nature reserves, which naturally have lower levels of population.

F3.1 Population density of Australia's largest cities, 2006



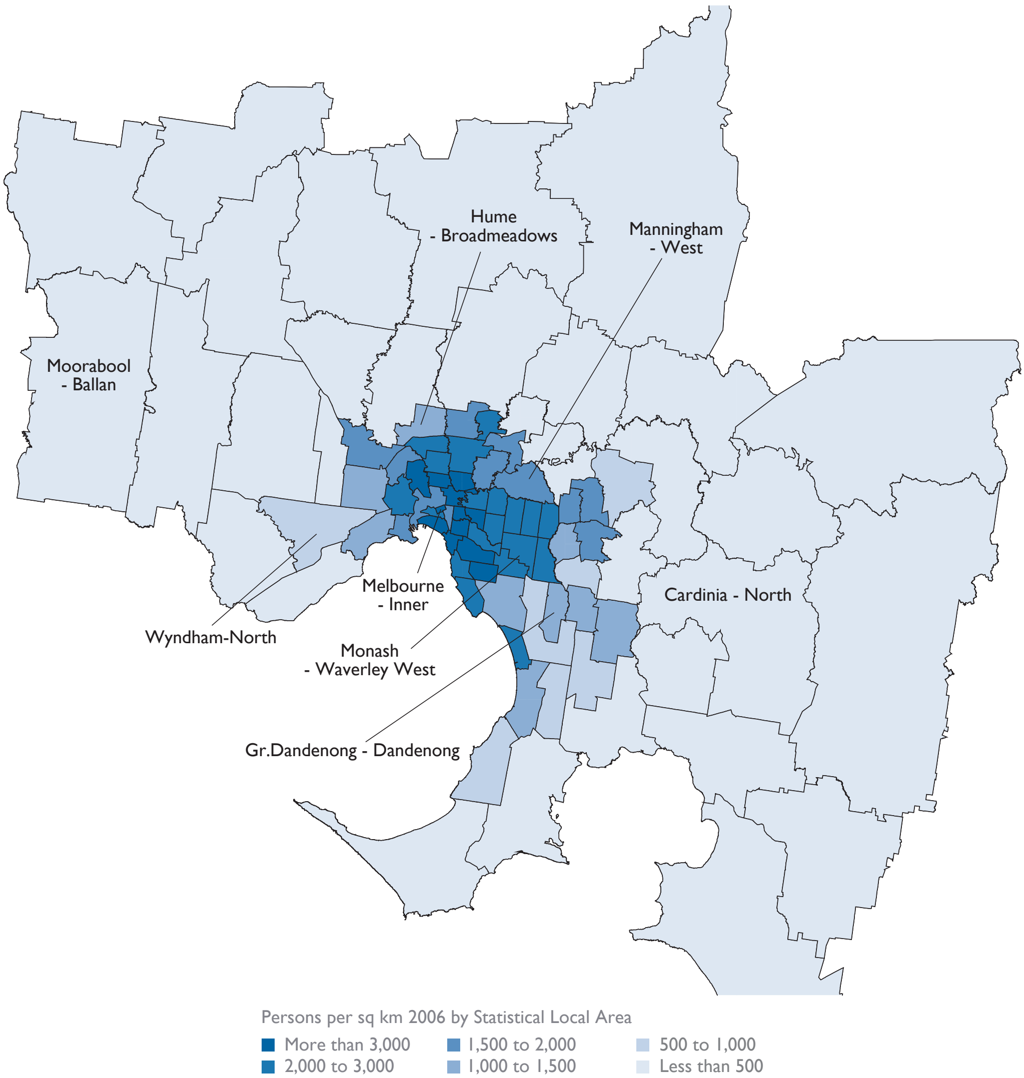
Source: BITRE analysis of ABS Cat. 3218.0 and Census of Population and Housing 2006.

A more compact city is a key direction of the *Melbourne 2030* plan. This is to be achieved through encouraging higher density development and the UGB limiting the expansion of the city. The main mechanism for increasing density is through the encouragement of higher density residential developments in activity centres because 'they are uniquely placed to provide for much of the anticipated growth' in households (DSE 2005b). Higher densities in greenfield sites are also being sought, with *Melbourne @ 5 million* introducing a target of 15 dwellings per hectare to make more efficient use of greenfield land (DPCD 2008c). Birrell et al (2005, p. 01–4) highlights how this movement towards consolidation is occurring at the same time as evidence highlights that 'Australian suburbanites quite like their surroundings' as they are.

The level of population density in an area is dependent on housing density, average household size and the amount of non-residential land in an area. The population densities for SLAs are presented in Map 3.3. As expected the centre of Melbourne and the areas surrounding the city centre have the highest densities, with the four most densely populated SLAs in the Inner sector. The highest is Melbourne–Inner at 6474 people per square kilometre, followed by St Kilda (6040), Prahran (5034) and Richmond (4210). The Outer sector's most densely populated area is Whittlesea South-East (2180) which is ranked 23rd in Melbourne. The Peri Urban sector dominates the low population densities with Yarra Ranges Part B having a density level of 1 person per square kilometre. Also, unlike Perth in which only six SLAs had more than 2000 people per square kilometre, Melbourne has over 30 per cent of SLAs in this category, but this is well below Sydney where 55 per cent of SLAs have more than 2000 people per square kilometre.

Some of Victoria's regional cities also have relatively high density levels. The Geelong West SLA has a density level of 2285 people per square kilometre. Only 21 SLAs in the Melbourne working zone have higher densities. However, the regional density levels drop off very quickly in comparison to Melbourne.

M3.3 Population density by SLA, Melbourne working zone, 2006



Source: BITRE analysis of ABS Cat. 3218.0 Regional Population Growth, 2007–08. Est mates of population density were derived by BITRE

Using census population estimates, rather than the official ERP data, provides a more disaggregated picture. Table 3.2 lists the ten suburbs with the highest population density within Melbourne in 2006. With the exception of Flemington, all these suburbs are classified to the Inner sector, and Flemington is also located relatively close to the CBD. The housing stock of these locations is dominated by unit style accommodation. The SLA most dominated by units is Southbank in which 99 per cent of dwellings are a unit style dwelling structure—this is a relatively new suburb in comparison to the others listed. The suburb in the listing with the highest number of separate houses is Windsor at 31 per cent of the dwelling stock. In the suburbs of Carlton and Fitzroy the housing stock has a high proportion of semidetached houses which is a characteristic of these suburbs.

T3.2 Suburbs with the highest population density, Melbourne working zone, 2006

Suburbs	Statistical Local Area	Sector	Persons per square kilometre 2006	Flat/unit or apartment as per cent of dwelling stock
Carlton	Me bourne–Remainder	Inner	6 886	76
Balaclava	Port Phil p–St Kilda	Inner	6 372	60
Fitzroy	Yarra–North	Inner	6 295	51
Flemington	Moonee Valley–Essendon	Middle	6 251	52
Windsor	Stonnington–Prahran and Port Phil p–St Kilda	Inner	6 089	50
St Kilda West	Port Phillip–St Kilda	Inner	5 800	73
Prahran	Stonnington–Prahran	Inner	5 605	51
Southbank	Me bourne–Southbank-Docklands	Inner	5 445	99
Elwood	Port Phil p–St Kilda	Inner	5 406	67
St Kilda	Port Phil p–St Kilda	Inner	5 338	76

Source: BITRE analysis of ABS Census of Population and Hous ng 2006 and ABS TableBuilder

Population density is a key determinant of the viability of public transport in a community. Newman and Kenworthy (1989, 2006) propose that the critical density threshold required for a viable public transport system is between 30 and 40 persons per hectare. This equates to a threshold of 3 000 to 4 000 persons per square kilometre. Table 3.2 shows that the population densities in all of the most densely settled suburbs exceed this threshold. For Melbourne 15 per cent of suburbs, housing 17 per cent of the working zone's population, have population densities over 3000 people per square kilometre, including the 10 suburbs listed in Table 3.2 as well as many others.

At the CCD scale, population densities range widely, from as high as 64 100 people per square kilometre to zero. Most of the high density locations are in the Inner sector of the city, with the top 10 CCDs averaging 47 430. The highest population densities correspond to areas with public housing towers and student housing complexes (DPCD 2008a).

Map 3.4 presents the population densities at the CCD level for 2006. The urban pattern of the city is clearly visible with satellite cities such as Melton and Sunbury appearing quite separate from the main urban areas. The UGB matches the contours of Melbourne's urban area. Key employment and recreational areas stand out for their lack of population, such as the Port

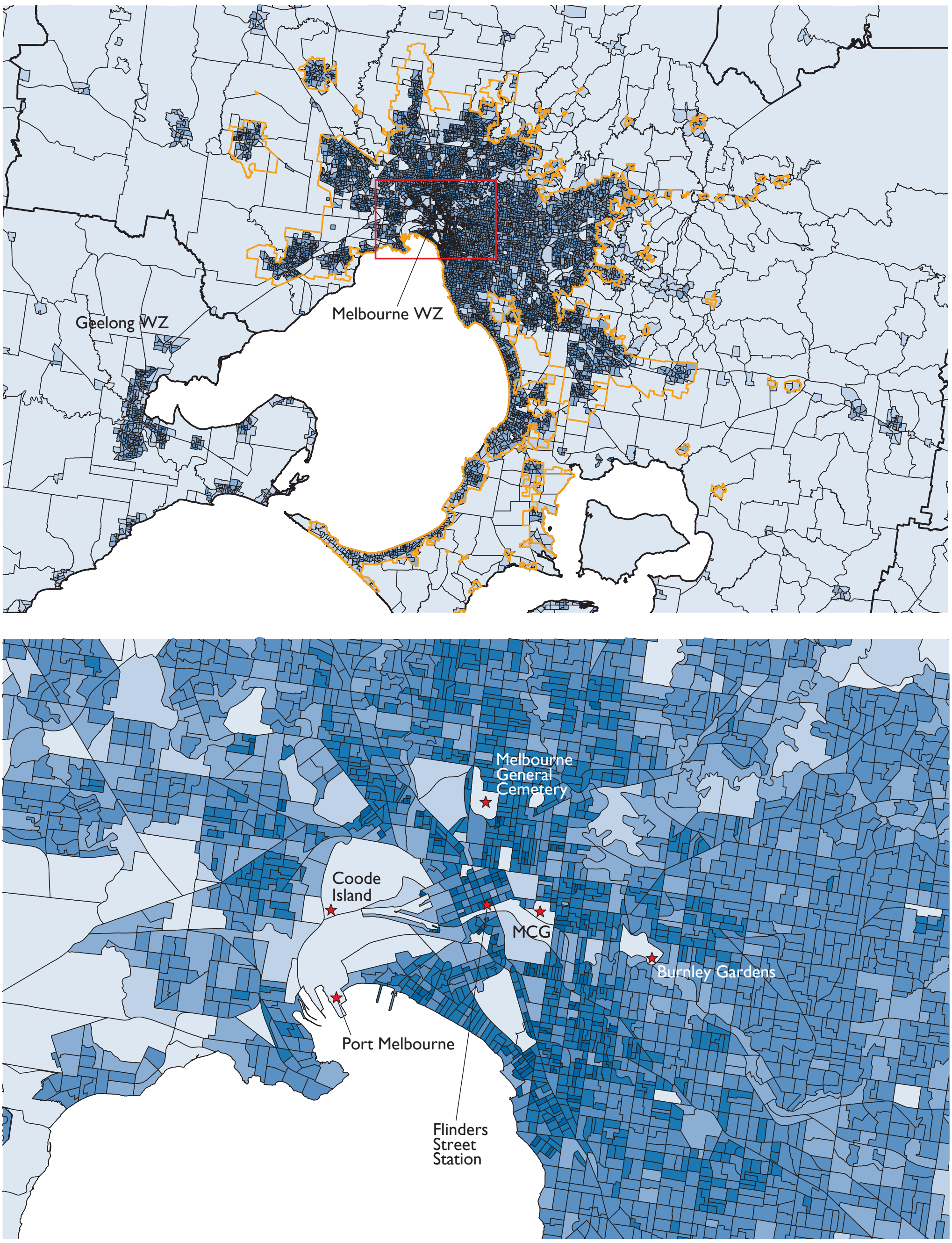
Melbourne precinct or Albert Park. Another feature is the identification of major highways such as the Princes or Monash Freeways.

The extensions of the UGB highlights both its weakness and its strength. It provides for the flexibility to manage population growth but if it is perceived to be easy to extend it will not serve its purpose of containing the urban sprawl.

Work completed by Chhetri, Chandra, and Corcoran (2008) investigated dwelling density and identified a number of spatial patterns, which are similar to the population densities revealed above. These observations included that:

1. Dwelling density varied substantially across the city with the Eastern parts of Melbourne having higher densities than the Western and Northern areas.
2. Dwelling density generally decreases further away from the CBD.
3. Transportation networks, particularly trains, are a strong influence on dwelling density.
4. Coastal areas, particularly along the Nepean highway, exhibit higher dwelling density patterns.

M3.4 Population density by CCD, Melbourne working zone, 2006



Population density (persons per square kilometre) by Collection District

- More than 8,000
- 4,000 to 8,000
- 2,000 to 4,000
- 500 to 2,000
- 100 to 500
- Less than 100
- Urban Growth Boundary

Note: This reflects the UGB as of 2005, rather than the 2010 expansion of the UGB.

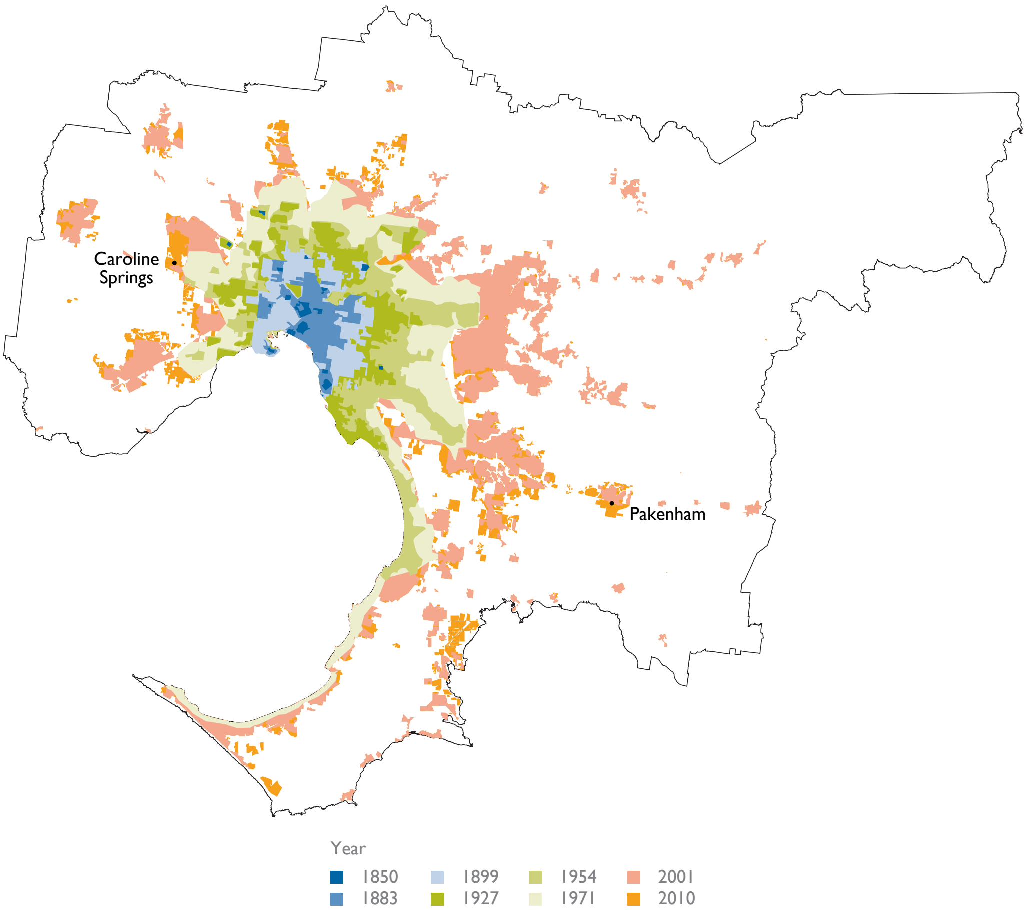
Source: BITRE analysis of ABS Census of Population and Hous ng 2006 usual residence data at CCD scale.

Residential growth

Historic population growth

The city of Melbourne has grown substantially over time from its founding in 1835. The famous grid pattern was laid out by Robert Hoddle in 1837 (City of Melbourne 2009). The city grew to be 501 580 people at Federation in 1901 and expanded to reach 3.5 million a century later. Map 3.5 presents the expansion of Melbourne's urban areas from 1850 to 2010. The growth of the city was skewed towards the east and south sides of Port Phillip Bay. The metropolitan areas have extended all the way down the Mornington Peninsula and as far west as Melton. This dominance of the eastern and south-eastern areas of the city is slowly changing with the growth of the western areas of the metropolitan area.

M3.5 Expansion of Melbourne's urban extent from 1850 to 2010



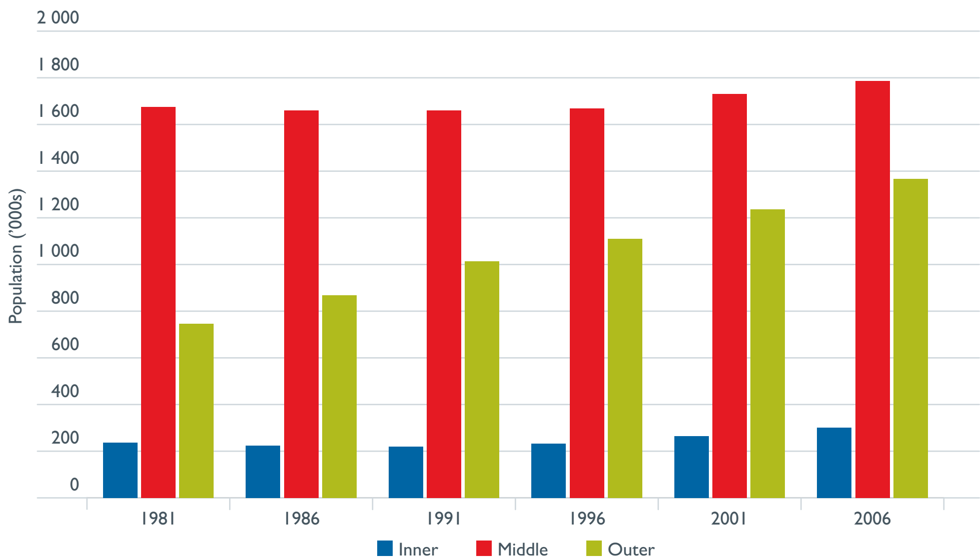
Source: DPCD 2010b, p.3

In 1901, Melbourne's population represented 41 per cent of the state's population (ABS 2008c). By 1981 the city grew to 2.8 million people with the share of the state's population expanding to over 70 per cent (ABS 2008c). The Melbourne SD's dominance of the state in terms of population has stabilised to some extent but it still represents 73 per cent of Victoria's population in 2006 (ABS 2009a).

The pattern of population growth for Melbourne's SD has fluctuated between 1981 and 2006, with an overall growth of 937 000 persons over the period. The largest increase occurred in 1986 with an increase of two per cent in the city's population for that year (ABS 2008c). From this high growth period, the city grew much slower with the lowest point occurring in 1993 and 1994 at both less than 0.5 per cent (ABS 2008c)—corresponding with the tail end of the deep recession that hit Melbourne particularly hard. After this period of slow growth, Melbourne has grown strongly, particularly from 1998, with every annual period having a growth rate above one per cent (ABS 2008c).

To provide a more disaggregated analysis of population change the DPCD has a population time series by suburbs, which can be used to illustrate sector changes. Figure 3.2 shows historical population growth by sector, from 1981 to 2006. As can be seen, the population of the Inner sector remained relatively steady from 1986 to 1996, but has seen growth from 1996 to 2006. The Middle sector, on the other hand, decreased slightly in the 1980's before slowly increasing from that point onwards and the Outer sector has seen consistently high growth. On average, the Outer sector grew by 2.7 per cent from 1981 to 1996 and then by 2.1 per cent from 1996 to 2006.

F3.2 Historical population by sector, Melbourne SD, 1981 to 2006



Source: BITRE analysis of DPCD (2008d) Suburbs n t me – Suburbs in Melbourne

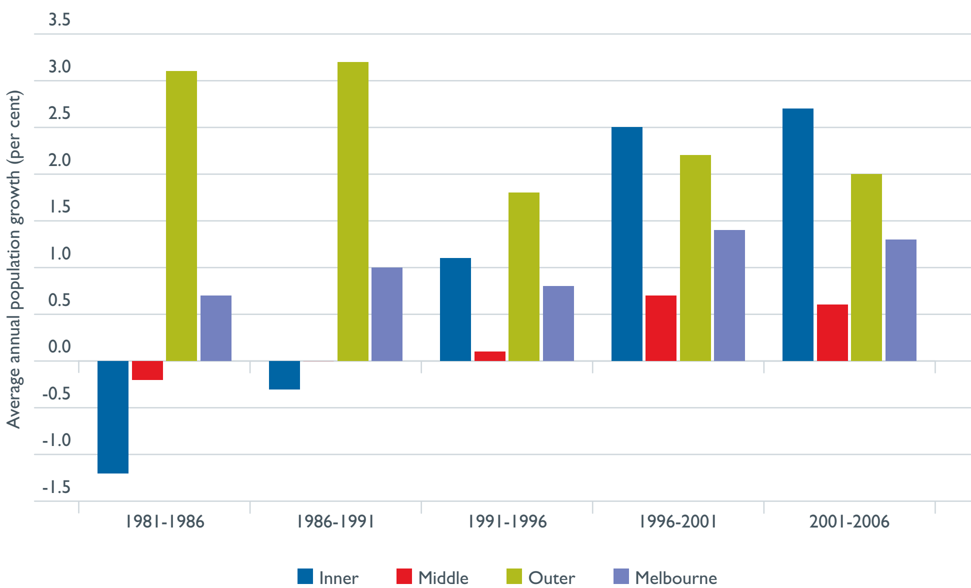
Figure 3.3 presents the average annual population growth for the sectors in five year intervals, from 1981 to 2006. In the earlier periods the striking feature is the growth of the Outer sector combined with negative growth for the Inner and Middle sectors. In contrast, from 1991 all three sectors experienced positive growth and from 1996 the Inner sector overtook the Outer sector to have higher average annual growth rates. This transition reflects the strong rate of population growth occurring in the Inner sector of the city even though the number of new residents was only a quarter of the number of new residents in the Outer sector. Newton et al (2001) note that the inner four kilometres recorded the most significant gains in density between 1986 and 1996.

The *Suburbs in Time* series for Melbourne (DPCD 2008c) enables estimation of how growth between 1981 and 2006 was distributed across the three sectors:

- Inner contributed 8 per cent of the growth
- Middle (14 per cent)
- Outer (78 per cent).

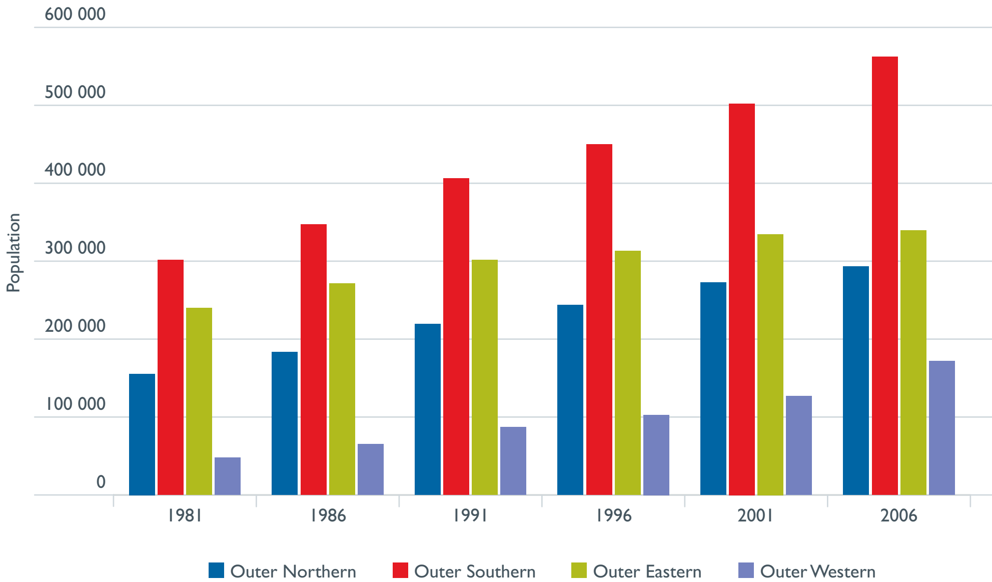
The continual growth in the Outer sector however has not been distributed evenly across the area as illustrated in Figure 3.4. The largest population increase occurred in the Outer Southern sector of Melbourne, but in terms of average annual growth the most rapid growth was in the Outer Western sector at 5 per cent per year on average from 1981 to 2006. The sector that has had the slowest increase in population is the Outer Eastern.

F3.3 Average annual population growth by sector, Melbourne SD, 1981 to 2006



Source: BITRE analysis of DPCD (2008d) Suburbs n t me – Suburbs n Me bourne

F3.4 Population in Outer subsectors, 1981 to 2006



Source: BITRE analysis of DPCD (2008d) Suburbs n t me – Suburbs in Melbourne

Changes from 2001 to 2006

Changes in estimated residential population

This section provides an in-depth analysis of population growth between 2001 and 2006. The Melbourne working zone's population grew by 283 000 persons or 7.8 per cent over this period. This represents an average annual increase of 1.5 per cent. In contrast, total ERP growth for Australia was 1.3 per cent per annum, while the ERP growth for Australia's most populous city, Sydney, was only 0.7 per cent.

Table 3.3 compares the percentage change in population between 2001 and 2006 in the Melbourne working zone and the four adjacent working zones. With 7.2 per cent growth, the Outer Western sector experienced the highest average annual population growth. Its contribution to the population increase was 20.4 per cent. The least average annual growth (0.3 per cent) was in the Latrobe Valley working zone. Of the four adjacent working zones, Geelong experienced a relatively similar population growth as Melbourne's working zone (1.3 per cent and 1.5 per cent respectively)—suggesting somewhat similar progression of growth determinants such as employment in both those working zones.

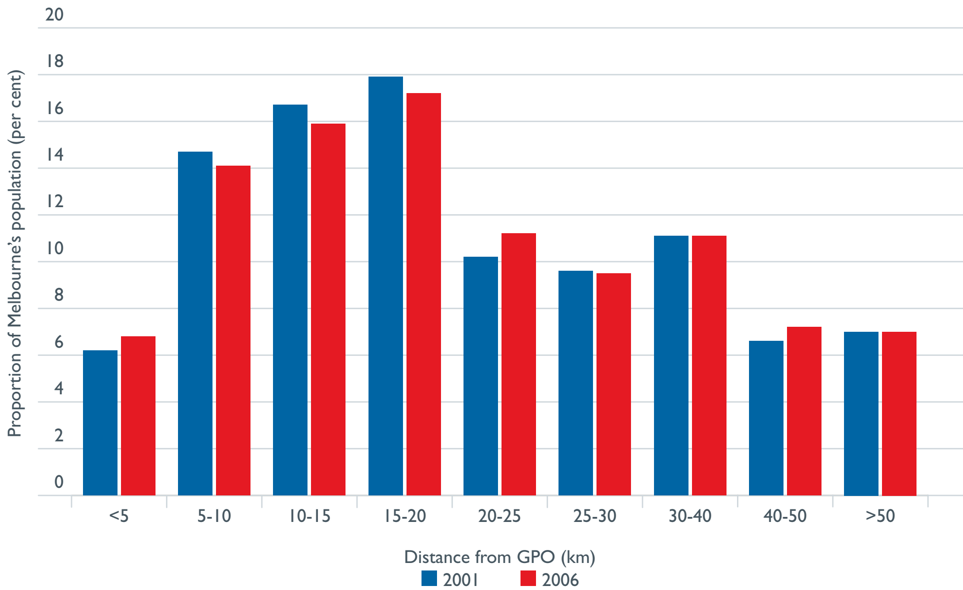
T3.3 Change in estimated resident population by subsector, Melbourne working zone, 2001 to 2006

Sector	2001	2006	Change	Proportion of Melbourne working zone increase (per cent)	Average annual growth (per cent)
Inner	245 274	288 273	42 999	15.2	3.3
Middle	1 778 292	1 837 504	59 212	20.9	0.7
Middle East	581 333	595 543	14 210	5.0	0.5
Middle North	382 932	395 113	12 181	4.3	0.6
Middle South	390 676	408 139	17 463	6.2	0.9
Middle West	423 351	438 709	15 358	5.4	0.7
Outer	1 448 059	1 617 238	169 179	59.8	2.2
Outer Eastern	389 683	398 493	8 810	3.1	0.4
Outer Northern	314 922	346 286	31 364	11.1	1.9
Outer Southern	603 483	674 713	71 230	25.2	2.3
Outer Western	139 971	197 746	57 775	20.4	7.2
Peri Urban	145 431	157 024	11 593	4.1	1.5
Me bourne work ng zone	3 617 056	3 900 039	282 983	100.0	1.5
Geelong work ng zone	226 380	240 950	14 570	na	1.3
Ballarat working zone	108 215	113 292	5 077	na	0.9
Bendigo work ng zone	112 637	119 000	6 363	na	1.1
Latrobe Valley work ng zone	79 006	80 311	1 305	na	0.3

Source: BITRE analysis of ABS Cat. 3218.0 Regional Population Growth (ABS 2009a)

Table 3.3 suggests that the contribution of the middle ring suburbs to Melbourne's population is declining. Figure 3.5 explores this issue further by examining the population living at various distances from the CBD, and how that has changed between 2001 and 2006. The proportion of Melbourne's population living between 5 and 20 kilometres from the CBD has declined from 49.4 per cent in 2001 to 47.3 per cent in 2006. There has been a notable increase in the proportion of Melbourne's population living 20 to 25 or 40 to 50 kilometres from the CBD. The proportion of the population living within 5 kilometres of the CBD also increased over the period.

F3.5 Proportion of Melbourne working zone population living at various distances from GPO, 2001 and 2006



Note: The General Post Office has been chosen as the central po nt of the CBD. To ensure comparability, place of enumeration counts (exclud ng overseas visitors) were used for 2001 and 2006. Calculation based on straight line distance from each CCD centroid to GPO.

Source: BITRE analysis of CCD data from ABS 2001 and 2006 Census of Population and Hous ng.

Table 3.4 shows the SLAs that have had the largest positive or a negative contribution to the total population change. The SLAs which grew the most were primarily in the Outer sector, such as Melton East and Wyndham North in the Outer Western Sector, Craigieburn in the Outer Northern sector, and Berwick and Cranbourne in the Outer Southern Sector. Some of the more densely populated SLAs in the Inner sector, such as Melbourne Remainder and Southbank-Docklands, also made an important contribution to Melbourne's growth.

The ten SLAs that showed a decline are spread across the city but no Inner sector location is present. The two SLAs with the highest population loss belonged to the Outer Northern sector, namely Broadmeadows and Whittlesea South-West. Both of these SLAs declined each year between 2001 and 2006.

T3.4 Change in population by SLA, Melbourne working zone, 2001 to 2006

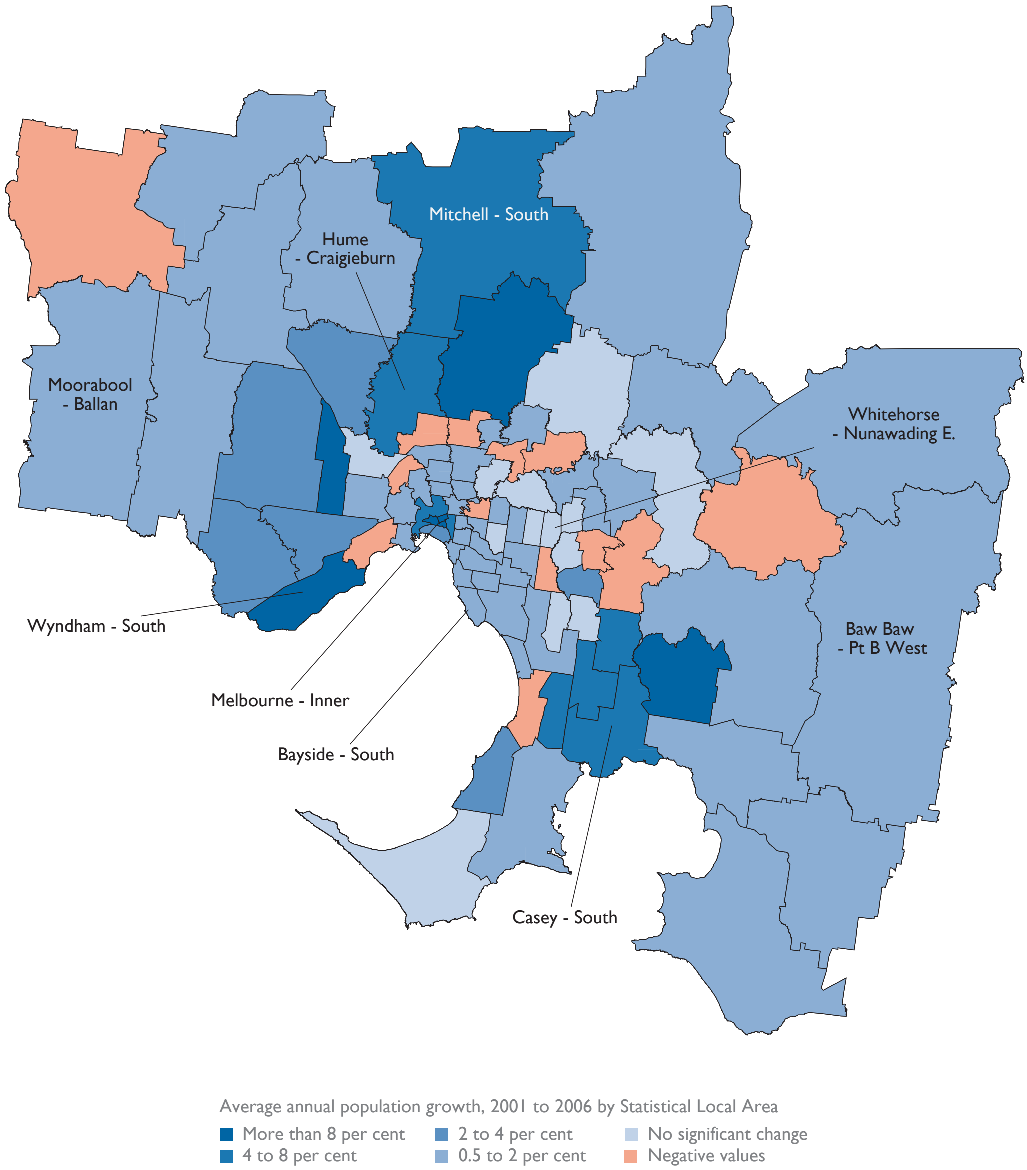
Greatest growth		Greatest decline	
SLA name	Resident Growth (Number)	SLA name	Resident Growth (Number)
Melton–East	24 685	Hume–Broadmeadows	–2 821
Casey–Berwick	22 901	Whittlesea–South-West	–1 918
Hume–Craigieburn	16 742	Monash–Waverley East	–830
Casey–Cranbourne	14 507	Frankston–West	–811
Wyndham–North	13 038	Moonee Valley–West	–745
Wyndham–South	12 667	Knox–North-East	–525
Whittlesea–North	11 098	Banyule–North	–519
Cardinia–Pakenham	10 467	Yarra Ranges–Dandenong	–419
Me bourne–Remainder	9 744	Nillumb k–South	–290
Me bourne–Southbank-Docklands	9 645	Boroondara–Kew	–246

Source: ABS Cat. 3218.0 Regional Population Growth, 2007–08 (ABS 2009a)

Table 3.4 displays population growth in terms of raw numbers. An alternative way to view population growth is to examine the growth as a percentage of the existing resident population, which can paint a slightly different picture.

To illustrate the spatial patterns in population growth across the working zone, Map 3.6 presents the average annual growth from 2001 to 2006. Strong growth is evident close to the city centre and in the outer western, northern and south-eastern areas of the metropolitan area. The new housing development in Craigieburn (in the north of the city) stands in direct contrast to the bordering SLA of Broadmeadows that has experienced the largest decline of the period. In fact, for the Melbourne working zone losses are occurring on the boundaries between the Middle and Outer sectors. Growth also occurred in outer parts of the Geelong working zone, but the surrounding areas of Ballarat in contrast have had declines.

M3.6 Average annual growth in population by SLA, Melbourne working zone, 2001 to 2006



Source: BITRE analysis of ABS Cat. 3218.0 Regional Population Growth 2007–08 (ABS 2009a)

Table 3.5 presents the SLAs with the most rapid growth and declines in population for the Melbourne working zone. The strongest growth SLA in absolute terms was Melton East but this SLA drops to third in relative terms. The strongest growth rate is in Wyndham South which is 8 percentage points higher than second place. A difference between Tables 3.4 and 3.5 is that Melbourne Inner replaces Wyndham North with a strong growth of 14 per cent per annum coming from a low base.

SLAs that had experienced declines in population all experienced less than a 1 per cent decline per annum and most had very small losses of about 0.2 per cent. The greatest population loss was again in the Outer Northern areas of Broadmeadows and Whittlesea South-West. Only one difference is evident between Table 3.4 and 3.5 with Yarra Ranges Central replacing Knox North-East.

T3.5 Growth rate of population by SLA, Melbourne working zone, 2001 to 2006

Fastest growth		Fastest declines	
SLA name	Average annual growth (per cent)	SLA name	Average annual growth (per cent)
Wyndham–South	33.9	Hume–Broadmeadows	–0.8
Me bourne–Southbank-Docklands	25.7	Whittlesea–South-West	–0.6
Melton–East	20.4	Moonee Valley–West	–0.4
Me bourne–Inner	13.9	Monash–Waverley East	–0.3
Whittlesea–North	13.1	Yarra Ranges–Dandenong	–0.3
Cardinia–Pakenham	9.6	Hepburn–East	–0.2
Hume–Craigieburn	7.3	Yarra Ranges–Central	–0.2
Casey–Berwick	6.0	Frankston–West	–0.2
Casey–Cranbourne	5.1	Nillumb k–South	–0.2
Me bourne–Remainder	4.5	Banyule–North	–0.2

Source: BITRE analysis of ABS Cat. 3218.0 Regional Population Growth, 2007–08 (ABS 2009a)

Taking a closer look at suburbs in Melbourne, Table 3.6 lists the suburbs which experienced the most rapid population growth and decline from 2001 to 2006[7]. Even though the first four positions are taken by suburbs in the Inner and Middle sectors, most of the suburbs listed are in the Outer sector. The most rapidly growing suburb was Waterways, positioned in the Middle sector to the South of the city. This is a new suburb that started from a low population base of 23 persons and increased population by 104 per cent per annum. Another strong growth area made recently available to residents is the Docklands suburb which features high rise apartments. In terms of absolute numbers, Point Cook has the greatest increase with over 12 000 people moving into the suburb—it is in the Outer Western sector and is a relatively new suburb. SLAs that feature strongly within Table 3.6 include Brimbank—Sunshine, Melton East and Wyndham North.

7 The analysis is based on ABS 2006 suburb boundaries. The classification of suburbs by the ABS has changed between 2001 and 2006. A number of new suburbs have been included n 2006, but this does not correspond to the creation of new locations for people to live. For example, while Melton and Sunbury are long established settlements near Me bourne, they were not classified as suburbs in 2001 but have been re-class fied as suburbs n 2006. The change measures involve considerable estimation for those suburbs which were not defined by ABS in 2001 and for those suburbs that have undergone a boundary change.

At the same time, some 21 per cent of Melbourne's suburbs experienced declines in population. Some of the largest relative drops were for Balnarring Beach and HMAS Cerberus, both being in the SLA of Mornington Peninsula East. Also, while not listed here, in absolute terms St Albans in Sunshine had the largest drop of over 1790 residents, which is in complete contrast to the strong growth in other suburbs in this SLA.

T3.6 Suburbs with rapid population change, Melbourne working zone, 2001 to 2006

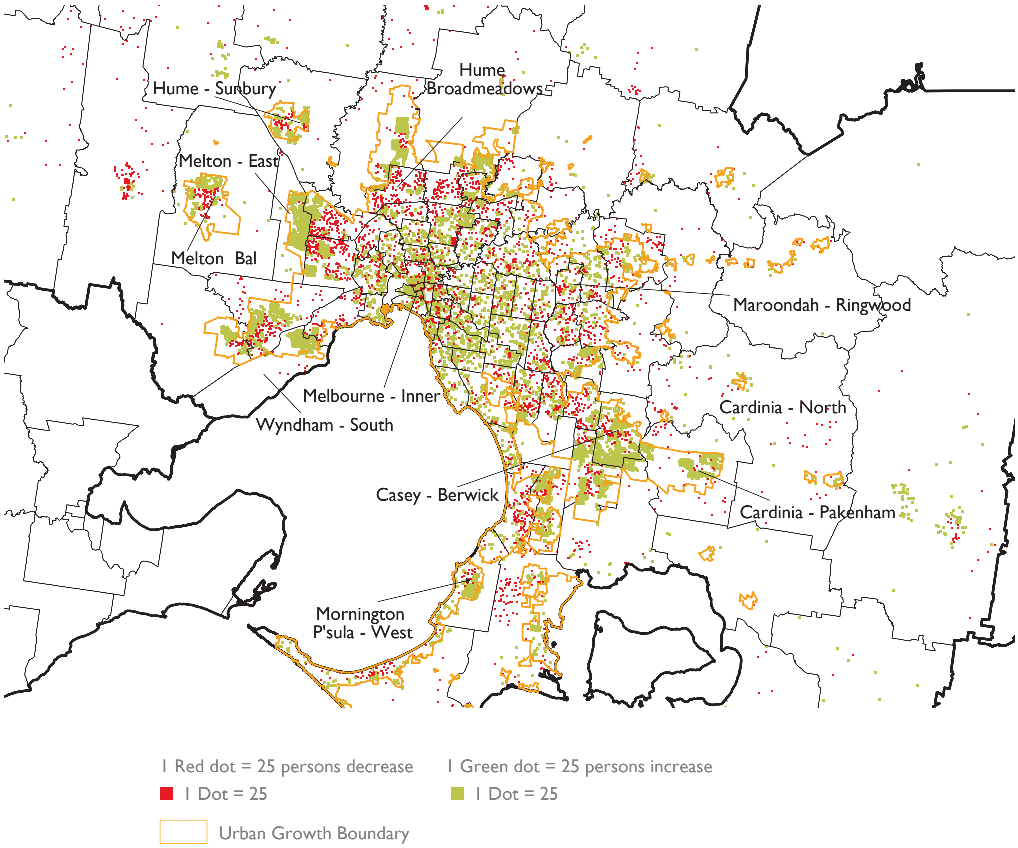
Suburb name	SLA name	Sector	2001 population	2006 population	Average annual growth (per cent)
Most rapidly growing suburbs					
Waterways	K ngston–North	Middle South	23	807	104
Docklands	Melbourne–Southbank-Docklands	Inner	157	3 940	91
Derr mut	Brimbank–Sunshine	Middle West	73	1 503	83
Ca rnlea	Brimbank–Sunshine	Middle West	358	6 072	76
Keysborough–Balance	Greater Dandenong Balance	Outer Southern	24	334	69
Taylors Hill	Melton–East	Outer Western	486	6 542	68
Lyndhurst	Casey–Cranbourne	Outer Southern	32	409	66
Caroline Spr ngs–Balance	Melton–East	Outer Western	39	471	65
Point Cook	Wyndham–South	Outer Western	1 942	14 164	49
Tarneit	Wyndham–North	Outer Western	1 078	6 669	44
Cranbourne East	Casey–Cranbourne	Outer Southern	730	3 599	38
Gowanbrae	Moreland–North	Middle North	396	1 892	37
Officer	Card nia–Pakenham	Outer Southern	328	1 416	34
Lyndhurst–Balance	Casey–Cranbourne	Outer Southern	27	112	33
Caroline Spr ngs	Melton–East	Outer Western	2 997	10 880	29
Lynbrook	Casey–Cranbourne	Outer Southern	1 345	4 487	27
Truganina	Wyndham–North	Outer Western	638	2 080	27
Pearcedale	Casey–South	Outer Southern	1 111	3 532	26
Doreen	Whittlesea–North	Outer Northern	1 165	3 454	24
Tarneit–Balance	Wyndham–North	Outer Western	68	197	24
South Morang	Whittlesea–North	Outer Northern	5 225	12 321	19
Burnside	Melton–East	Outer Western	2 509	5 794	18
Southbank	Melbourne – Southbank-Docklands	Inner	4 384	9 364	16
Skye	Frankston–East	Outer Southern	3 144	6 702	16
Heatherton	Kingston–North	Middle South	1 260	2 525	15
Rapidly declining suburbs					
Sherbrooke	Yarra Ranges–Dandenongs	Outer Eastern	230	198	–3
HMAS Cerberus	Morn ngton Pen nsula–East	Outer Southern	1 382	1 151	–4
Balnarring Beach	Morn ngton Pen nsula–East	Outer Southern	297	227	–5

Note: The change measures involve considerable estimation for those suburbs which were not defined by ABS n 2001 and for those suburbs that have undergone a boundary change.

Source: BITRE analysis of ABS 2001 and 2006 Census of Population and Hous ng data. Excludes suburbs with populations of less than 100 n 2006.

Map 3.7 uses the CCD data to show how population change was distributed throughout the Melbourne working zone. It shows that major clusters of population growth are clearly defined in the Outer areas of the city, just inside the UGB. However, these growth areas are often bordered by areas of significant population loss. For example, while the more established parts of Werribee are losing population, Werribee is surrounded by places that are experiencing strong population growth (e.g. Tarneit, Point Cook). Similar patterns are evident around Melton, Sunbury, Sunshine and Craigieburn. Map 3.7 also shows solid population growth in the inner suburbs, as well as in many (but certainly not all) middle suburbs.

M3.7 Dot density map of population change, Melbourne working zone, 2001 to 2006



Note: Due to boundary changes a number of CDs do not have data for 2001. However, 91 per cent of all CDs are covered. The map reflects the UGB as of 2005, rather than the 2010 expansion of the UGB.

Source: BITRE analysis of ABS 2001 and 2006 Census of Population and Housing data.

Sources of population growth

The ABS Estimated Resident Population of Victoria grew by 321 814 people from 2001 to 2006 (ABS 2009a). Melbourne's working zone accounts for 88 per cent of the state's overall increase. ABS (2009b) decomposes Victoria's population growth to the following three components:

- Natural increase – 45 per cent
- Net interstate migration – minus 2 per cent
- Net overseas migration – 45 per cent.[8]

Unfortunately, ABS does not publish an equivalent decomposition for Melbourne. However, given the extent to which Melbourne dominates Victoria population growth, the pattern is likely to be similar. The Melbourne working zone also has a net outflow of people to the remainder of Victoria, estimated at 4400 for the 2001 to 2006 period.

The sources of population growth will vary for different parts of Melbourne. For example, census data (derived from TableBuilder) reveals:

- The arrival of over 193 294 new migrants from overseas between 2001 and 2006 substantially increased Melbourne's working zone population (by about 5 per cent). The SLAs which were boosted by over 25 per cent from overseas migration were all in the Inner sector namely Melbourne Inner, Southbank-Docklands and Melbourne Remainder.
- Melton East, Berwick and Craigieburn have all experienced a substantial net inflow of residents from other parts of the Melbourne working zone between 2001 and 2006, each with over 7000 people entering the SLA. In relative terms (based on the SLA's 2001 population), Wyndham South has had the greatest net inflow to the SLA from the rest of the Melbourne working zone, followed by Melton East and Southbank-Docklands. Consistent with this, ABS (2009g) reports that the proportion of current residents who had moved house in the three years prior to October 2008 was highest for the Inner Melbourne (56 per cent) and Outer Western Melbourne (34 per cent) statistical regions.
- Three SLAs have residents aged between zero and four that represent over 10 per cent of total residents. These include Wyndham South, Melton East and Whittlesea North. This is in contrast to the six per cent figure for the whole Melbourne working zone. This suggests that natural increase is also an important source of population growth for a number of SLAs within the Melbourne working zone.

Changes in population densities

The Melbourne urban area's overall population density in 2006 was 1566 persons per square kilometre which increased by 111 from 2001. The inner and middle sectors of Melbourne increased their average population density by 230 persons per square kilometre (or 12 per cent) from 2001 to 2010, to reach a density of 2218 persons per square kilometre in 2010. The additional population was accommodated through expanded residential development on the urban fringe and redevelopment of existing areas, particularly in the Inner sector.

8 The components of population change do not sum to match the total population change due to ntercensal discrepancy (ABS 2009b).

There has been a movement towards high density forms of housing, with separate houses representing 75 per cent of the dwelling stock in 2001 declining to 73 per cent in 2006 according to Census data. A similar pattern was evident for Sydney, but in Perth the separate housing stock increased in importance. Of the 113 113 new dwellings in Melbourne between 2001 and 2006, 50 per cent were separate houses. The growth of separate houses was particularly pronounced in the Outer and Peri Urban sectors.

Population density increased from 2855 to 3356 persons per square kilometre in the Inner sector and from 1908 to 1972 for the Middle sector. The Outer sector and Peri Urban areas experienced positive population density growth but at a much more modest rate.

Table 3.7 lists the SLAs which experienced the greatest absolute increase in persons per square kilometre between 2001 and 2006. The SLAs that dominate the listing are from the Inner sector. The exceptions are Berwick in the Outer Southern sector and Melton East in the Outer Western sector. The two SLAs that have had substantial increases in population combined with increases in densities are Melbourne Inner and Southbank-Docklands. Several SLAs did however experience declines in their density level, and the largest drops were in Broadmeadows and Whittlesea South-West, reflecting declines in population.

T3.7 Greatest increases in population density by SLA, Melbourne working zone, 2001 to 2006

SLA Name	Persons per square kilometre 2001	Persons per square kilometre 2006	Increase in density
Me bourne–Inner	3 475	6 648	3 090
Me bourne: –Southbank-Docklands	960	3 012	2 043
Port Phillip–St Kilda	5 548	6 040	492
Port Phillip–West	2 701	3 182	481
Me bourne–Remainder	1 337	1 665	330
Stonnington–Prahran	4 743	5 066	321
Casey–Berwick	812	1 086	274
Melton–East	175	444	269
Yarra–Richmond	3 968	4 231	261
Yarra–North	3 345	3 569	224

Note: Est mates are slightly different from previous density estimates for SLA because they are derived from the area estimates presented n ABS Cat. 3218.0.

Source: BITRE analysis of ABS Cat. 3218.0 Regional Population Growth, 2007–08 (ABS 2009a)

There were just over 30 per cent of Melbourne suburbs which experienced declines in their population densities between 2001 and 2006. The top three suburbs with declines in densities are Kings Park, Princess Hill and Gladstone Park.

The top ten suburbs with the largest increases in their population densities are listed in Table 3.8. Again the Inner sector suburbs of Melbourne and Southbank are prominent with the highest increases in density. Carlton's strong increase in density led to it becoming Melbourne's most densely populated suburb. The Middle sector has had strong density growth in Cairnlea and Gowanbrae. The increase in Cairnlea is primarily due to it being a new estate, established in 1999, while Gowanbrae is another relatively new estate near the intersection of the Western Ring Road and Tullamarine Freeway. Similarly, for the Outer sector, the apparent density increases in the suburbs of Caroline Springs and Taylors Hill represent rapid population growth in new housing estates.

T3.8 Top ten suburbs which increased population density, by subsector, Melbourne working zone, 2001 to 2006

Sector	Suburb	Statistical Local Area	Persons per square kilometre 2001	Persons per square kilometre 2006	Change in density
Inner	Southbank	Melbourne–Southbank-Docklands	2549	5445	2896
	Melbourne	Melbourne–Inner	2817	4514	1697
	Carlton	Melbourne–Rema nder	5345	6886	1541
	Docklands	Melbourne–Southbank-Docklands	52	1312	1260
Middle	Cairnlea	Brimbank –Sunshine	84	1428	1344
	Gowanbrae	Moreland–North	312	1489	1177
Outer	Carol ne Spr ngs	Melton–East	624	2266	1642
	Taylors Hill	Melton–East	108	1451	1343
	Cranbourne West	Casey–Cranbourne	1425	2627	1202
	Roxburgh Park	Hume–Craigieburn	1657	2846	1189

Source: BITRE analysis of ABS 2001 and 2006 Census of Population and Hous ng data.

Households

The spatial patterns highlighted so far relate to population, but these patterns may be somewhat different for households. Similar to the other states, household sizes in Victoria have been decreasing since the mid 1990s and this has been combined with increases in the size of dwellings (ABS 2007).

This section presents a brief overview of spatial differences in average household size and the rate of growth of households, focusing on similarities and differences with the population results presented previously. This analysis has been included to provide some understanding of the connection between spatial change in population, households and demand for dwellings.

Table 3.9 summarises household growth and household size at the sectoral scale for the 2001 to 2006 period. For the Melbourne working zone as a whole, households grew at an average annual rate of 1.4 per cent, which is only 0.1 percentage points lower than the population rate. The lowest household growth rate occurred in the Middle East sector, with only a 0.3 per cent increase in households. In contrast, the Outer Western sector grew substantially at 7.3 per cent which is matched by its substantial increase in population.

T3.9 Household growth and household size by subsector, Melbourne working zone, 2001 to 2006

Sector	Average annual growth in households, 2001 to 2006 (per cent)	Average annual growth in estimated resident population, 2001 to 2006 (per cent)	Average household size 2001	Average household size 2006	Change in household size, 2001 to 2006
Inner	2.7	3.3	1.95	2.02	0.07
Middle	0.5	0.7	2.59	2.61	0.02
Middle North	0.5	0.6	2.50	2.51	0.01
Middle South	0.4	0.9	2.45	2.51	0.06
Middle East	0.3	0.5	2.66	2.68	0.03
Middle West	0.8	0.7	2.70	2.69	–0.01
Outer	2.3	2.2	2.87	2.86	–0.01
Outer Northern	2.3	1.9	3.18	3.12	–0.06
Outer Southern	2.1	2.2	2.74	2.76	0.02
Outer Eastern	0.6	0.4	2.80	2.78	–0.02
Outer Western	7.3	7.1	3.00	2.98	–0.02
Peri Urban	1.4	1.5	2.65	2.67	0.02
Me bourne work ng zone	1.4	1.5	2.64	2.65	0.02

Note: The est mated resident population data used for this calculation is based on only on residents of occupied private dwell ngs, to enable valid comparison with household data. Est mates may not sum due to round ng.

Source: BITRE analysis of ABS data on request.

The average household size in the Melbourne working zone did not change substantially between 2001 and 2006. In 2006, the average number of persons per household ranged from 2.02 for the Inner sector to 3.12 in the Outer Northern sector, reflecting differences in household and dwelling types. The average size of households between 2001 and 2006 also remained stable as reflected by the largest change occurring in the Inner sector at only a 0.07 percentage point increase.

At the SLA scale, as expected the increases are primarily in the Outer Western and Inner sectors of the city. Wyndham South in the Outer West had a substantial increase in the number of households with an average annual growth of 31 per cent. This was closely followed by the Southbank-Docklands SLA at 20 per cent. Other strong growth areas are Melton East, Whittlesea North and Melbourne Inner, which all had above 10 per cent average annual growth in households.

The spatial distribution of household growth is comparatively well aligned with the spatial distribution of population growth within the Melbourne working zone.

Employed residents

Up to this point the spatial analysis has been focused on residential population and how it has changed over recent years. The next chapter considers the spatial distribution of employment on a place of work basis. This current section connects the two by discussing the spatial distribution of employment on a place of residence basis.

The ratio of employed residents (from the census) to estimated resident population was 0.44 for the Melbourne working zone in 2006, and this has remained stable from 2001. All sectors, with the exception of the Inner sector, have a ratio of less than 0.5. Hence, strong growth in population within an area will not necessarily translate into strong growth in employed residents or commuters, particularly where the population growth is concentrated in the under 15 or over 65 age groups.

The number of employed residents of the Melbourne working zone increased from 1.60 to 1.75 million between 2001 and 2006, representing an increase of 150 500 employed residents. Table 3.10 summarises growth in the number of employed residents and the ratio of employed residents to ERP at the sectoral scale for Melbourne's working zone and selected surrounding working zones. A key point, that was also evident for Perth and Sydney, is that employed residents grew faster between 2001 and 2006 than population. This is particularly so for the surrounding regional working zones. An exception is the Inner sector which experienced strong population growth in comparison to employed residents. In fact it is the only sector that has experienced a negative change in the ratio between employed residents to ERP from 2001 to 2006.

Overall the sectors within the Melbourne working zone did not experience significant change in the ratio of employed residents to ERP, with the greatest change being only 0.03. However, differences across the sectors are evident with a high of 0.53 for the Inner sector and a low of 0.42 in the Middle West sector.

In terms of average annual growth in resident employment, the Outer sector had the highest growth at 2.6 per cent. In particular, the Outer Western sector had very strong growth at 7.5 per cent which was combined with high ERP growth. In contrast, the Middle sector has the lowest growth both in terms of employment and population.

T3.10 Change in employed residents by subsector, Melbourne working zone, 2001 to 2006

Sector	Average annual growth in employed residents, 2001 to 2006 (per cent)	Average annual growth in ERP, 2001 to 2006 (per cent)	Ratio of employed residents to ERP 2001	Ratio of employed residents to ERP 2006	Change in ratio, 2001 to 2006
Inner	2.0	3.4	0.57	0.53	–0.04
Middle	1.0	0.7	0.44	0.45	0.01
Middle North	1.3	0.6	0.43	0.44	0.01
Middle South	1.3	0.9	0.46	0.47	0.01
Middle East	0.6	0.5	0.46	0.47	0.01
Middle West	1.2	0.7	0.41	0.42	0.01
Outer	2.6	2.2	0.44	0.45	0.01
Outer Northern	2.1	1.9	0.43	0.43	0.00
Outer Southern	2.7	2.2	0.42	0.43	0.01
Outer Eastern	1.0	0.4	0.48	0.49	0.01
Outer Western	7.5	7.1	0.46	0.46	0.00
Peri Urban	2.8	1.5	0.41	0.44	0.03
Me bourne work ng zone	1.8	1.5	0.45	0.46	0.01

Note: The estimated resident population data used for this calculation is based only on residents of occupied private dwell ngs. Est mates may not sum due to rounding.

Source: BITRE analysis of ABS data on request and the 2006 Census of Population and Hous ng.

To illustrate the strong association between the growth of employed residents and the growth in population across Melbourne's working zone, Figure 3.6 presents the plots for SLAs. Panel (a) presents a comparison of the average annual growth rates for population and employed residents. A very strong correlation is evident at 0.92. The Outer sector has the strongest association with a correlation of 0.99. A weaker association is evident for Inner at 0.77, but this is still a high correlation. The three SLAs identified with both high growth in employed residents and population were Wyndham South (Outer), Southbank-Docklands (Inner) and Melton East (Outer).

The second panel (b) presents a comparison of the change in number of people that are employed and the number of residents. Clearly, the number of residents showed a greater change than the number of employed residents, but a strong correlation is again evident at 0.95. The Outer sector dominates the strong growth in both residents and employed residents with Melton East and Berwick showing strong growth in both.

The overall message from this analysis is that the spatial patterns of population growth and employed residents growth are closely related. Regions experiencing strong population growth are also experiencing strong growth in the number of employed residents. This connection has been clearly evident in the Outer and Peri Urban sectors of the Melbourne working zone. The exception was the Inner sector of Melbourne working zone in which population grew much faster than employed residents.

Another message that comes through is that employed residents showed a more rapid rate of growth than population from 2001 to 2006. Employed residents accounted for 53 per cent of Melbourne's population increase, which means that just under half of the increase is from those outside the labour force or unemployed.

F3.6 Growth in population and employed residents by SLA, Melbourne working zone, 2001 to 2006

a) Average annual rate of growth

b) Change in the number of persons

Note: The estimated resident population data used for this calculation is based on only on residents of occupied private dwell ngs.

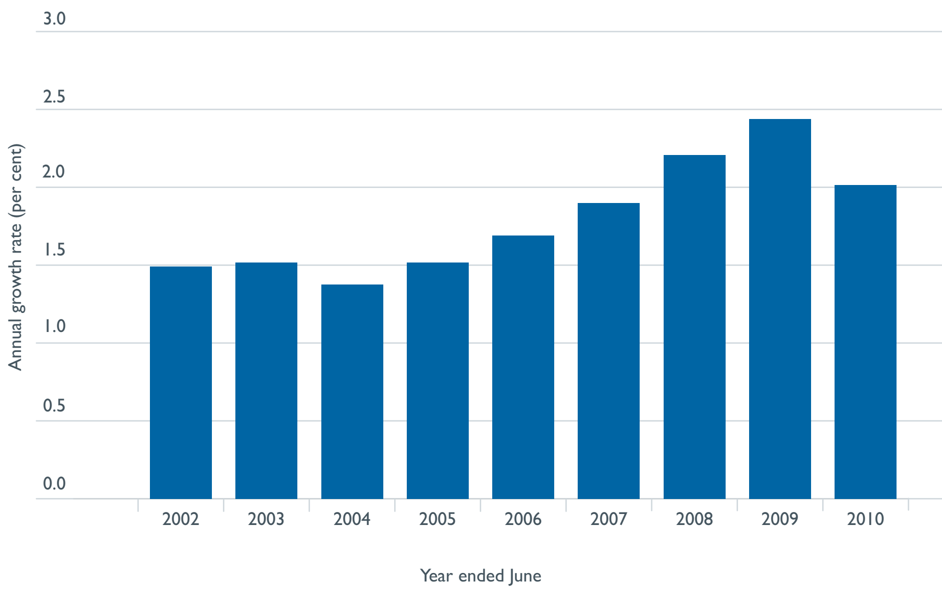
Source: BITRE analysis of ABS data on request and the 2006 Census of Population and Hous ng.

Recent population growth, 2006 to 2010

More recent ERP data to 2010 is also available for Melbourne, although the 2010 data remains preliminary (ABS 2011). Between 2001 and 2006, ERP grew at an average annual rate of 1.5 per cent (ABS 2011). However, Figure 3.7 shows that the rate of growth has been increasing from 2004 through to 2009. Two recent years had particularly high population growth rates, with population growing by 2.2 per cent for the year ended June 2008 and 2.4 per cent for the year ended June 2009. In 2010 Melbourne's population growth rate remained high at 2.0 per cent.

Melbourne's stronger than anticipated population growth and the impact on future population projections were important contributors to the release of the *Melbourne @ 5 million* update to *Melbourne 2030*. *Melbourne @ 5 million* estimated that the city's population was to reach 5 million before 2030.

F3.7 Annual rate of growth in Estimated Resident Population, Melbourne working zone, 2001 to 2010



Note: 2010 population estimates are prelim nary

Source: BITRE analysis of ABS Cat. 3218.0 Regional Population Growth (ABS 2011)

The average annual growth in the Melbourne working zone increased from 1.5 per cent in the pre-2006 period to 2.2 per cent in the post-2006 period ending June 2010, suggesting favourable growth conditions in the post-2006 years. The four adjacent regional working zones all experienced a higher growth rate in the post-2006 period than in the preceding five year period (see Table 3.11).

In terms of sectors, over the post-2006 period, the Outer sector had the strongest average annual growth of 3.0 per cent, with the Inner and Middle Sectors having 2.6 and 1.4 per cent population growth respectively. Growth in the Outer Western sector was extremely high, averaging 7.5 per cent per annum, which closely matching the 2001 to 2006 average annual growth rate. While there was an upturn in the population growth rate post-2006 in the Middle, Outer and Peri Urban sectors, growth moderated in the Inner sector.

Between 2006 and 2010, 57 per cent of population growth was in the Outer sector (largely in the Outer Southern and Outer Western subsectors) and 30 per cent was in the Middle sector. The Outer Southern sector continues to house a large proportion of Melbourne's population increase (21 per cent), even though its growth rate is much more modest than that of the Outer Western sector. Despite the Inner sector's high growth rate, only 9 per cent of Melbourne's population growth was accommodated within the Inner sector.

T3.11 Change in estimated resident population by subsector in the pre and post-2006 periods, Melbourne working zone

Sector	2006	2010	Change, 2006 to 2010	Proportion of Melbourne working zone increase (per cent)	Average annual growth, 2006 to 2010 (per cent)	Average annual growth, 2001 to 2006 (per cent)
Inner	288 273	319 273	31 000	8.9	2.6	3.3
Middle	1 837 504	1 941 009	103 505	29.8	1.4	0.7
Middle East	595 543	623 220	27 677	8.0	1.1	0.5
Middle North	395 113	416 226	21 113	6.1	1.3	0.6
Middle South	408 139	432 917	24 778	7.1	1.5	0.9
Middle West	438 709	468 646	29 937	8.6	1.7	0.7
Outer	1 617 238	1 816 754	199 516	57.4	3.0	2.2
Outer Eastern	398 493	413 503	15 010	4.3	0.9	0.4
Outer Northern	346 286	391 293	45 007	13	3.1	1.9
Outer Southern	674 713	748 235	73 522	21.2	2.6	2.3
Outer Western	197 746	263 723	65 977	19.1	7.5	7.2
Peri Urban	157 024	170 460	13 436	3.9	2.1	1.5
Melbourne working zone	3 900 039	4 247 496	347 457	100.0	2.2	1.5
Bendigo work ng zone	119 000	127 388	8 388	na	1.7	0.9
Ballarat working zone	113 292	121 882	8 590	na	1.8	1.1
Geelong working zone	240 950	260 042	19 092	na	1.9	1.3
Latrobe Valley working zone	80 311	85 427	5 116	na	1.6	0.3

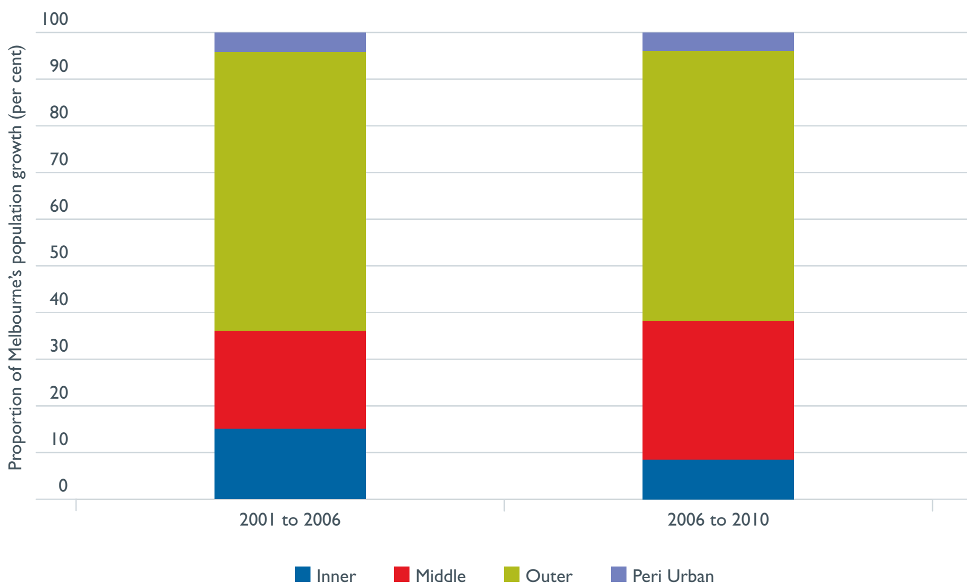
Source: BITRE analysis of ABS Cat. 3218.0 Regional Population Growth (ABS 2011)

Figure 3.8 shows how population growth was distributed across sectors for the 2001 to 2006 and 2006 to 2010 periods. Clearly the Middle sector was a more important contributor in the post-2006 period, while the Inner sector accounted for a considerably lower proportion of Melbourne's growth in the most recent period than in the 2001 to 2006 period. The Outer and Peri Urban sectors accounted for a slightly smaller proportion of growth in the post-2006 period.

Table 3.12 shows the SLAs with the ten highest average annual growth rates from 2006 to 2010 and compares their growth performance to the 2001 to 2006 period. Whittlesea North emerged as the most rapid population growth SLA between 2006 and 2010, up from fifth highest between 2001 and 2006. Wyndham South and West, Pakenham, Melton East and Southbank-Docklands continued to be amongst the most rapid growth SLAs. Wyndham West experienced a growth of 3.5 per cent per annum pre-2006, but emerged in the top ten in the post-2006 period with a growth of 7.3 per cent per annum. A similar pattern occurred for Casey South and Wyndham North. In contrast, the Craigieburn and Berwick SLAs both in the top ten for the 2001 to 2006 period experienced a slowdown in population growth in the post-2006 period.

Only one SLA recorded a population loss between 2006 and 2010—the Peri Urban SLA of Murrindindi West is estimated to have lost about 549 residents.

F3.8 Proportion of population growth by sector, Melbourne working zone, 2001 to 2006 and 2006 to 2010



Source: BITRE analysis of ABS Cat. 3218.0 Regional Population Growth (ABS 2011)

T3.12 Growth in the SLA population in the pre and post-2006 periods, Melbourne working zone

Melbourne WZ SLAs	2001 to 2006 period		2006 to 2010 period	
	Average annual growth (per cent)	Change as a proportion of the total change (per cent)	Average annual growth (per cent)	Change as a proportion of the total change (per cent)
Whittlesea–North	13.1	3.9	18.0	6.6
Wyndham–South	33.9	4.5	15.4	3.7
Card nia–Pakenham	9.6	3.7	9.8	3.7
Melton–East	20.4	8.7	9.1	4.9
Wyndham–West	3.5	1.2	7.3	2.1
Melbourne–Southbank-Docklands	25.7	3.4	7.1	1.3
Casey–Cranbourne	5.1	5.1	6.2	5.2
Casey–South	4.1	0.9	6.0	1.1
Wyndham–North	3.7	4.6	6.0	5.9
Melbourne–Inner	13.9	2.1	5.5	0.9

Source: BITRE analysis of ABS Cat. 3218.0 Regional Population Growth (ABS 2011)

Whittlesea North emerged as the single largest contributor to Melbourne's overall population increase during the 2006 to 2010 period, from its 7th highest position in the pre-2006 period. It added 22 700 residents, representing 6.6 per cent of Melbourne's growth. Other important contributors to Melbourne's population increase were Wyndham North (5.9 per cent of Melbourne's growth), Cranbourne (5 2 per cent) and Melton East (4.9 per cent). These four SLAs belong to the Whittlesea, Wyndham, Melton and Casey LGAs which are all Growth Area LGAs. Shin and Inbakaran (2010) analyse the results of a survey of home buyers in Oliver Hume estates in these four LGAs, finding that 48 per cent are upgrade buyers, rather than first home owners. They highlight how 'Melbourne's urban fringe is not merely a choice of last resort for those who are desperate to buy their first house in a city of declining housing affordability' (ibid, p.7).

Several SLAs made a notably smaller contribution to Melbourne's population increase in the post-2006 period (as compared to the 2001 to 2006 period). The Casey–Berwick SLA's share of Melbourne's growth dropped from 8.1 to 2.7 per cent, while Melton East's share dropped from 8.7 to 4.9 per cent. The Craigieburn and Southbank-Docklands SLAs also experienced a more modest rate of population growth in the post-2006 period.

To summarise the spatial patterns of population growth for the entire 2001 to 2010 period:

- The Melbourne working zone added 630 400 residents to reach 4 25 million population in 2010, representing an average annual growth rate of 1.8 per cent.
- Fifty eight per cent of this growth was in the Outer sector, 26 per cent in the Middle sector, 12 per cent in the Inner sector and 4 per cent in Peri Urban areas. The Inner sector experienced the highest average annual growth (3.0 per cent), followed by the Outer sector (2.6 per cent), the Peri Urban sector (1.8 per cent) and the Middle sector (1.0 per cent).

- The Outer Southern sector contributed 23 per cent of population growth and the Outer Western sector contributed 20 per cent. The most rapid growth occurred in the Outer Western sector, averaging 7.3 per cent per annum.
- At the SLA scale, Melton East added the most population (41 600 persons), followed by followed by Whittlesea North (33 800), Wyndham North (33 400), Casey–Cranbourne (32 600) and Casey–Berwick (32 200). Hume–Broadmeadows experienced the greatest population decline (–1300).
- The highest average annual rates of population growth were in Wyndham South (25 per cent), Southbank-Docklands (17 per cent), Whittlesea North (15 per cent) and Melton East (15 per cent).

Melbourne's strategic plan

This section takes a closer look at the strategies in place to manage population growth in the city. *Melbourne 2030* and its update *Melbourne @ 5 million* have a number of approaches to accommodate the growing and changing city.

The *Melbourne 2030* plan aims to manage population growth through directing residential development to activity centres, focusing fringe population growth into a small number of designated Growth Areas that are well served by public transport, and implementing the Urban Growth Boundary. A list of population-related objectives from *Melbourne 2030* was presented in Table 2.2.

Policy priorities have evolved over time, with the *Melbourne @ 5 million* report aiming to achieve higher residential densities in greenfield developments and proposing possible extensions to the Growth Areas and UGB (DPCD 2008c). The UGB was expanded in June 2010.

This section uses the available population data to assess the extent to which there has been progress since 2001 with:

- Concentrating residential development in centres
- Increasing population density
- Restricting rural residential development
- Shifting the focus of growth from the south-east to the north and west of Melbourne
- Directing fringe development to the defined Growth Areas
- Limiting outward development.

Note that the planning objectives are often framed in terms of the number of new dwellings. BITRE's analysis is focused on the population outcomes, rather than dwellings outcomes, reflecting the purpose of the study.

Concentrating residential development in centres

> 'Melbourne 2030 encourages concentration of new development at activity centres near current infrastructure, in areas best able to cope with that change while meeting the objective of sustainable development' (DI 2002a, p. 30).

Achieving a greater concentration of residential development in Melbourne's activity centres is fundamental to *Melbourne 2030*'s key direction of 'a more compact city'. If a high proportion of new residential development occurs in activity centres that will create a higher overall density in the established suburbs of Melbourne and alleviate pressure for continued urban sprawl, leading to a more compact city. For the 2001 to 2030 period, *Melbourne 2030* targets 41 per cent of new dwellings being located in strategic redevelopment sites (particularly Principal Activity Centres (PACs) and Major Activity Centres (MACs)) in established areas (DI 2002a, p. 30). This compares to the 24 per cent share achieved in the 1996 to 2001 period (ibid).

Melbourne @ 5 million introduced a change to the activity centre hierarchy, designating six new Central Activities Districts (CADs), but continued the focus on concentrating residential development in centres. CADs are at the top of Melbourne's activity centre hierarchy, followed by PACs. There are currently seven CADs, being Melbourne, Box Hill, Broadmeadows, Dandenong, Footscray, Frankston and Ringwood. There are twenty PACs in the Melbourne Statistical Division.[9]

Table 3.13 presents BITRE's estimates of the 2006 population of CADs and PACs. The activity centre boundaries were defined by BITRE, taking the DPCD's Destination Zone (DZ) based activity centre classification for 2006 as the starting point. This definition has been translated to the Census Collection Districts (CCD) geographic scale for the purpose of measuring population and retaining a consistent definition of activity centres throughout this report.[10] Priority was given to maintaining consistent activity centre boundaries between 2001 and 2006 given the focus is on assessing the *change* in population and employment over the period. The effect of this is that the activity centres are more encompassing than the original DPCD boundaries and incorporate a greater area than just the retail precinct. A discussion of the DPCD activity centre definitions is provided in Appendix D, along with the results of sensitivity analysis.

The CADs and PACs contain 353 000 persons in 2006, representing 10 per cent of Melbourne's population. The greatest share of population for CADs was in Melbourne with 29 000 people, followed closely by Broadmeadows at 27 000, and for PACs it was Sydenham and Prahran/ South Yarra both with over 24 000 people.

9 Table 4.8 lists all of the Pr nc pal Activity Centres n Melbourne.

10 Note that DPCD provided us with a DZ based activity centre classification for 2006 and a CCD based activity centre class fication for 2006. The geographic area covered by an activity centre often differed significantly between the two class fications.

T3.13 Population of Central Activities Districts and Principal Activity Centres, Melbourne SD, 2006

Centre type	Population (thousands)	Population share (per cent)
Me bourne CAD	29	0.8
Other CADs	74	2.1
All CADs	103	2.9
PACs	250	7.0
Comb ned total of CADs and PACs	353	9.8
Me bourne SD	3 593	100.0

Note: The numbers n this table are derived from the census and do not correspond to ERP data for 2006 presented in the remainder of this chapter.
DPCD provided BITRE with a 2006 DZ based definition for activity centres, which was then used as a starting po nt to define activity centre boundaries that enabled analysis of activity centres over time. Hence, priority was given to ensuring max mum consistency between the activity centre boundaries based on 2001 DZs and those based on 2006 DZs, and also with the boundaries based on CCDs. In practice this involved adopt ng relatively encompassing boundaries which often extended well beyond the retail prec nct.

Source: BITRE analysis of ABS 2006 Census of Population and Hous ng data at CCD scale.

In a study covering the 2001 to 2006 period, Chhetri et al (2008) found that density levels within 500 metres of activity centres were not statistically significantly higher than densities between 500 and 1000 metres from activity centres. The 27 CADs and PACs currently house a minor share of Melbourne's population and residential densities will need to increase markedly in these centres if the stated objectives are to be achieved. For example, *Victoria in Future* projects that metropolitan Melbourne will grow by 1.8 million people between 2006 and 2036. If the existing CADs and PACs are to house just one-fifth of this population increase, their population would need to double over the period.[11]

Table 3.14 summarises population growth estimates for CADs and PACs between 2001 and 2006. The CADs and PACs accounted for 10 per cent of Melbourne's population growth between 2001 and 2006, and grew at the same rate as Melbourne overall. However, closer inspection reveals that this result was dominated by the Melbourne CAD, which added around 14 000 residents and accounted for 6 per cent of Melbourne's population growth. If the Melbourne CAD is excluded, the PACs and CADs recorded a population gain of 8 000 persons and accounted for 4 per cent of the city's growth. The population growth rate in the PACs was only slightly lower than growth in the Melbourne SD as a whole, but the 'Other CADs' (i.e. excluding the Melbourne CAD) did not keep pace with growth in the Melbourne SD.

The top two levels of the activity centre hierarchy together housed around 9.8 per cent of the city's population in 2001 and 9.9 per cent in 2006, suggesting there has been only a very minor shift towards increasingly concentrating residential development in the most strategically important centres. While good progress has been made in concentrating residential growth within the CBD, progress has been limited within the remaining CADs and PACs.

11 Note that the 41 per cent target n Melbourne 2030 refers not just to CADs and PACs, but also to Major Activity Centres and potentially a range of other 'strategic redevelopment sites'. The document does not provide targets for d fferent types of activity centres.

Goodman et al (2010) analysed new housing construction in the vicinity of CADs, PACs and MACs. Between 1990 and 2007, the proportion of new dwellings constructed within 1 kilometre of any of the 115 CADs, PACs and MACs has fluctuated between 14 and 26 per cent. Goodman et al (2010) concluded that the amount of new housing constructed within 1 kilometre of these centres 'did not increase following the introduction of *Melbourne 2030* and in fact may have slightly declined' (ibid, p. 6). Moreover, the proportion of new dwelling construction within 2 kilometres of these activity centres has declined fairly steadily from its peak of 60 per cent in 1997 to reach a low of 49 per cent in 2007 (ibid).[12]

According to Kelly et al (2011, p.32), developers report that planning delays 'are a significant disincentive to embarking on medium density housing projects, particularly in established areas of Melbourne.' From 2002 to 2007, much of the new dwelling construction related to inner city centres, with South Melbourne, Melbourne, Port Melbourne and Carlton together accounting for 31 per cent of construction within 1 kilometre of centres. Activity centres in the Growth Areas also accounted for significant new housing construction, with South Morang, Casey Central, Caroline Springs and Manor Lakes each adding between 800 and 950 dwellings within 1 kilometre of the centre between 2002 and 2007 (ibid).

T3.14 Change in population of Central Activities Districts and Principal Activity Centres, Melbourne SD, 2001 to 2006

Centre type	Change in population (thousands)	Average annual growth rate (per cent)	Proportion of Melbourne SD's population growth (per cent)
Melbourne CAD	14	14.0	6.3
Other CADs	–1	–0.3	–0.5
All CADs	13	2.8	5.8
PACs	9	0.8	4.1
Total of CADs and PACs	22	1.3	9.9
Total PACs and CADs (excluding Melbourne CAD)	8	0.5	3.6
Melbourne SD*	225	1.3	100.0

Note: The numbers in this table are derived from the census and do not correspond to ERP data presented in the rema nder of this chapter.
DPCD provided BITRE with a 2006 DZ based definition for activity centres, which were then used as a start ng point to define activity centre boundaries that enabled comparable analysis of activity centres for 2001 and 2006. Hence, priority was given to ensuring maximum consistency between the activity centre boundaries based on 2001 DZs and those based on 2006 DZs, and also with the boundaries based on CCDs. In practice this nvolved adopt ng relatively encompass ng boundaries which often extended well beyond the retail prec nct and definitions provided by the DPCD.

Source: BITRE analysis of ABS 2006 Census of Population and Hous ng data at CCD scale.

Since 2006, there has been substantial new dwelling construction in several of the CADs and PACs, but little new construction in others. The 2009 *Urban Development Program Annual Report* (DPCD 2010c) identifies only a handful of the suburban CADs and PACs with more than 300 dwellings either recently constructed or under construction (in 2007–08 or 2008–09)—Prahran-South Yarra, Preston, Coburg, Box Hill and Footscray. The Dandenong, Frankston and Ringwood CADs each had less than 100 dwellings completed in 2007–08 and 2008–09 (DPCD 2010c).

12 These findings are subject to caveats regard ng possible undercounting of nfill development.

Moodie et al (2008) notes that activity 'centres are not yet attracting their intended share of household growth and the old patterns of urban development are continuing' (ibid, p.22). Goodman et al (2010 p. 74) conclude that 'planning policies which sought to increase the proportion of new housing built close to designated activity centres and public transport nodes, specifically train stations, appear to have had very little influence particularly on the urban fringe'. According to Birrell et al (2005), demographic trends mean there is likely to be limited market demand for high density dwellings in suburban activity centres. Without much stronger government intervention, recent trends suggest the suburban CADs and PACs will continue to play a relatively small role in accommodating Melbourne's future population growth.

A closer examination of the employment makeup of the activity centres is provided in the next chapter.

Increasing population density

According to *Melbourne @ 5 million*, higher population densities will be achieved through 'more intense housing development in and around activity centres, along tram routes and the orbital bus routes on the Principal Public Transport Network, in areas close to train stations and on large redevelopment sites' and through 'more efficient use of greenfield land with a target of 15 dwellings per hectare' (DPCD 2008c). Buxton and Tieman (2005, p.17) point out that 'for urban consolidation to have a major impact on population and dwelling density in Melbourne, consistent four- to six- storey development will be required on nominated development sites and in appropriate locations in activity centres'.

The available evidence suggests there was a clear increase in Melbourne's population density between 2001 and 2006. As noted previously:

- The urban area's overall population density increased from 1455 to 1566 persons per square kilometre.
- The inner and middle sectors of Melbourne increased their average population density by 230 persons per square kilometre (or 12 per cent) from 2001 to 2010, to reach a density of 2218 persons per square kilometre in 2010.
- There has been a shift towards high density forms of housing, with separate houses representing 75 per cent of the dwelling stock in 2001 declining to 73 per cent in 2006 according to Census data.
- More than two-thirds of suburbs recorded an increase in population density.

The increase in population density has been largely driven by higher densities in the inner city. Population density increased from 2855 to 3356 persons per square kilometre in the Inner sector and from 1908 to 1972 for the Middle sector, while increases were more modest in the Outer and Peri Urban sectors between 2001 and 2006. The inner city suburbs of Melbourne, Southbank and Carlton recorded the largest increases in population density between 2001 and 2006. Between 2001 and 2010, the City of Melbourne LGA recorded a much larger increase in population density than any other Inner or Middle sector LGA, increasing its density by 73 per cent (ABS 2011).

This is consistent with the state government's data on urban redevelopment, which shows that of the 31 269 new dwellings in metropolitan Melbourne's major redevelopment sites between 2005–06 and 2007–08, 55 per cent were in the inner region (as defined by Urban Development) (DPCD 2008h, p.30). Some of the redevelopments include Freshwater Place, the Commonwealth games village and the Eureka Tower (DPCD 2008h, p.30). Also 'the majority of redevelopment projects completed in metropolitan Melbourne from 2005–06 to 2007–08 were built at a medium to high density (attached one, two and three storeys and apartment blocks four storeys or higher)' (DPCD 2008h, p.31).

Chhetri et al (2008) conclude that densification is not restricted to the targeted areas (e.g. activity centres) and can be seen widely throughout Melbourne, specifically highlighting the densification of the outer suburbs located 20 to 30 kilometres from the CBD between 2001 and 2006. On the urban fringe, the average size of new lots in Growth Area municipalities has declined from around 660m^2 in 1990 to 620m^2 in 2000, and has continued to decline to 550m^2 in 2007 and 520m^2 in 2009 (DPCD 2008h, 2010c, Goodman et al 2010).

Melbourne is clearly a more densely populated city in 2010 than it was in 2001. The main contributor has been the large-scale development of high density housing within the City of Melbourne LGA (e.g. the suburbs of Melbourne, Southbank and Carlton), with more modest increases in density occurring in other Inner, Middle and Outer suburbs.

Restricting rural residential development

Low density rural residential development has previously comprised about 3 per cent of new housing in metropolitan Melbourne (DI 2002a). *Melbourne 2030* aims to 'reduce the proportion of new housing development provided in rural areas in order to encourage consolidation into existing settlements' (ibid p.75), aiming for just 1.5 per cent of household growth from 2001 to 2030 to be located in dispersed non-urban areas (ibid p.30). This objective relates both to metropolitan Melbourne and to that part of Victoria covered by the 'network cities' concept, but the latter is not considered here.

The 'rural balance' category from the ABS' Urban Centres and Localities classification captures settlements of less than 200 people, farms and lifestyle acreages. Analysis of 2001 and 2006 census data for this 'rural balance' category reveals that:

- In 2006, about 78 000 people and 26 000 dwellings were in the rural balance of the Melbourne SD, representing a 2 per cent share of the SD total.
- Between 2001 and 2006, the population and dwellings counts both declined by about 2 per cent for the rural balance of the Melbourne SD. Some previously rural areas were reclassified as urban, reflecting urban expansion.

- Just under a third of the Peri Urban sector's[13] population and dwellings are categorised to the rural balance. Between 2001 and 2006, the population and dwellings counts for the rural balance of Melbourne's Peri Urban sector both increased by more than 3 per cent, but this represented just 10 per cent of Peri Urban population and dwellings growth. The great majority of Peri Urban growth was in urban centres (70 per cent) or localities (20 per cent), not rural areas. In particular, Peri Urban growth was consolidated within existing towns of between 1000 and 5000 people.
- The net effect for the rural balance of Melbourne's working zone was virtually no change in population and dwellings between 2001 and 2006.

Thus, while new rural residential development did occur in Peri Urban areas between 2001 and 2006 (e.g. Mitchell South), it made a very minor contribution of less than one per cent to Melbourne's new housing development over the period. Rural residential development appears to have been limited, with growth consolidated into existing urban settlements within the Melbourne working zone.

Shifting the focus of growth to the north and west

Melbourne's development pattern is very biased towards the south and east (see Map 3.5). DPCD (2010b, p.3) points out that 'nearly three quarters of Melbourne's population lived east of a line running north south through the city' in 2006.

Tied in with *Melbourne 2030*'s establishment of a UGB and the designated Growth Areas is a recognition that 'eventually, the focus of growth will need to shift from the south-east to the north and west' (DI 2002a, p.33). *Melbourne @ 5 million* recognises this spatial redirection of growth as a long term objective, and proposes that potential extensions to Growth Areas will be investigated 'in the north and west, with a small proportion in the south east' (DPCD 2008c, p.3).

Table 3.15 shows that the proportion of Melbourne's population growth occurring in the north and west has been on the rise in recent years, while the proportion of growth occurring in the south-east has been declining. A similar pattern is evident if the analysis is extended to include Peri Urban areas of the Melbourne working zone. The population data provides evidence of a significant shift in the focus of growth towards the north and west of Melbourne since 2001. This shift is principally being driven by residential development in the Wyndham and Melton-Caroline Springs Growth Areas in Melbourne's outer western suburbs. The population share of the six western suburban LGAs has grown from 16.2 per cent in 2001 to 18.0 per cent in 2010, representing 28 per cent of the city's growth—the population share of these LGAs is projected to continue to rise, reaching 20 per cent by 2026 (DPCD 2010b).

The south-eastern corridor does continue to account for a substantial (if declining) proportion of Melbourne's growth. According to Birrell et al (2005, p. 03-7), it is likely that 'substantial additional amounts of land will have to be released in the south—predominantly in the Pakenham area and beyond—well before 2030'.

13 The Peri Urban sector is that part of the Melbourne working zone that lies outside the Melbourne SD.

T3.15 Proportion of population growth located to 'north and west' and south-east of Melbourne SD, 1991 to 2010

Period	Proportion of ERP growth in North and West (per cent)	Proportion of ERP growth in south-east (per cent)
1991 to 2001	38	35
2001 to 2006	41	31
2006 to 2010	47	28

Note: North and West were defined as the aggregation of the Middle North, Outer North, Middle West and Outer West sectors. South-east was defined as aggregation of the Middle South and Outer South sectors—the Middle East and Outer East sectors were not considered part of the south-east as they cover Me bourne's north-eastern suburbs and have consistently recorded below average growth.

Source: BITRE analysis of ABS Cat. 3218.0 Regional Population Growth (ABS 2011) and DPCD (2008d)

Directing fringe development to Growth Areas

Melbourne 2030 aims to 'concentrate urban expansion into growth areas that are served by high-capacity public transport'—this policy is expected to slow 'the number of areas that develop with scattered new housing and few services' (DI 2002a, p.63). The five broad areas identified as Growth Areas are Wyndham, Hume, Whittlesea, Casey-Cardinia and Melton-Caroline Springs[14]. The specific Growth Areas are displayed in Map 1.2 (a).

Melbourne 2030 proposed that 31 per cent of the additional households to be formed between 2001 and 2030 would be located in greenfield sites, but the greenfield development sites identified in *Melbourne 2030*[15] extend beyond the five identified Growth Areas.

The *Plan for Melbourne's Growth Areas* (State Government of Victoria, 2005) proposed the establishment of the Growth Areas Authority (GAA) to co-ordinate planning, infrastructure and service provision in partnership with the six councils which contain the designated Growth Areas (i.e. Wyndham, Melton, Hume, Whittlesea, Casey and Cardinia). These LGAs contain established residential areas as well as greenfield sites and the plan identifies specific areas within those LGAs that are expected to accommodate much of Melbourne's future growth.

Melbourne @ 5 million set a target that the Growth Areas will accommodate 47 per cent of new dwellings, with 53 per cent of new dwellings in established areas[16] (DPCD 2008c). It is implicit that greenfield sites outside the designated Growth Areas (e.g. in the Frankston, Knox or Mornington Peninsula LGAs) will make minimal contribution. *Melbourne @ 5 million* also aimed to increase densities in Growth Areas and proposed investigating expansions of these Growth Areas. Thus in 2010, the UGB was expanded which brought in the LGA of Mitchell to be a designated Growth Area.

The selected areas were targeted because they were the 'growth areas best served by the existing major rail lines' (DI 2002a, p.63). However, many of the designated Growth Areas in 2006 had less than 10 per cent of employed residents using public transport to get to work and high car dependence (e.g. Melton West, Tarneit, Craigieburn, South Morang, Cranbourne

14 In 2010, Mitchell LGA was ncluded as a designated Growth Area. However, this report will focus on the orig nal list ng of Growth Areas as defined by *Melbourne 2030*.
15 See Figure 17 of DI 2002a.
16 This target for urban consolidation n established areas is considerably lower than proposed by *Melbourne 2030*.

East). The State Government has taken some steps to rectify this through building the South Morang rail extension to better connect the Whittlesea Growth Area and the Regional Rail Link, which aims to improve rail capacity between the Wyndham Growth Area and the city.

Table 3.16 presents BITRE's estimates of population growth in the Growth Area municipalities and in the other Outer sector LGAs. The population of the Growth Area municipalities is estimated to have grown by about 140 000 persons between 2001 and 2006, representing 50 per cent of the Melbourne working zone's growth or 52 per cent of growth in the Melbourne SD.[17]

About 60 per cent of population growth in the Melbourne SD between 2001 and 2006 occurred in the Outer sector. This growth was largely in recently developed suburbs on the urban fringe, with many of the more established outer suburbs experiencing population losses (e.g. Broadmeadows, Frankston, Lalor).

Outer suburbs that do not belong to the six Growth Area councils made a relatively minor contribution to Melbourne's population growth (10 per cent). However, census data reveals that the suburbs of Rowville, Skye, Langwarrin, Mornington, Carrum Downs and Mount Martha each added between 2000 and 4000 people between 2001 and 2006. All of these (apart from Rowville) are located in the Outer Southern sector, with the Frankston and Mornington LGAs most prominent. Peri Urban locations contributed a further 4 per cent of the working zone's population growth between 2001 and 2006.

T3.16 Population growth in Growth Area LGAs and elsewhere in the Outer sector, Melbourne working zone, 2001 to 2006

Type of area	Population, 2001 (thousands)	Population, 2006 (thousands)	Change in population, 2001 to 2006 (thousands)	Average annual growth rate, 2001 to 2006 (per cent)	Proportion of Me bourne SD's growth (per cent)
LGAs contain ng Growth Areas*	623	763	140	4.2	49.6
Other Outer sector LGAs	825	854	29	0.7	10.1
Outer sector	1 448	1 617	169	2.2	59.8
Peri Urban sector	145	157	12	1.5	4.1
Me bourne work ng zone	3 617	3 900	283	1.5	100.0

Note: * Excludes the Mitchell Growth Area, introduced n 2010

Source: BITRE analysis of ABS Cat. 3218.0 Regional Population Growth

17 The targets are expressed n terms of the number of new dwell ngs or households and relate to the Me bourne SD. Population growth tends to outpace dwell ngs growth n newly developed suburbs, as young (and expanding) families make up a high proportion of residents. Based on census data (rather than the ERP data presented n Table 3.16), BITRE est mates that 47 per cent of the dwelling increase for the Me bourne SD was due to the six Growth Area councils and 59 per cent to the Outer sector.

Table 3.17 provides a more up-to-date picture of the extent to which population growth is occurring in the six Growth Area LGAs versus other Outer and Peri Urban SLAs using ERP data for 2006 to 2010 (ABS 2011). The Melbourne working zone's population grew by 347 000 persons between 2006 and 2010, with 57 per cent of this growth occurring in the Outer sector and a further 4 per cent in Peri Urban locations. About three-quarters of the Outer sector's population growth was in the six LGAs that contain Growth Areas. The Growth Area LGAs experienced average annual population growth of 4.8 per cent between 2006 and 2010, resulting in a population increase of 157 000 persons.

T3.17 Population growth in Growth Area LGAs and elsewhere in the Outer sector, Melbourne working zone, 2006 to 2010

Type of area	ERP 2006 (thousands)	ERP 2010 (thousands)	Change in population, 2006 to 2010 (thousands)	Average annual growth rate (per cent)	Proportion of Melbourne SD's growth
LGAs contain ng Growth Areas*	763	920	157	4.8	45.1
Other Outer sector LGAs	855	898	43	1.2	12.3
Outer sector	1 618	1 817	200	2.9	57.4
Peri Urban sector	156	170	13	2.1	3.9
Melbourne working zone	3 900	4 247	347	2.2	100.0

Note: * Excludes the Mitchell Growth Area, ntroduced in 2010

Source: BITRE analysis of ABS Cat. 3218.0 Regional Population Growth (ABS 2011)

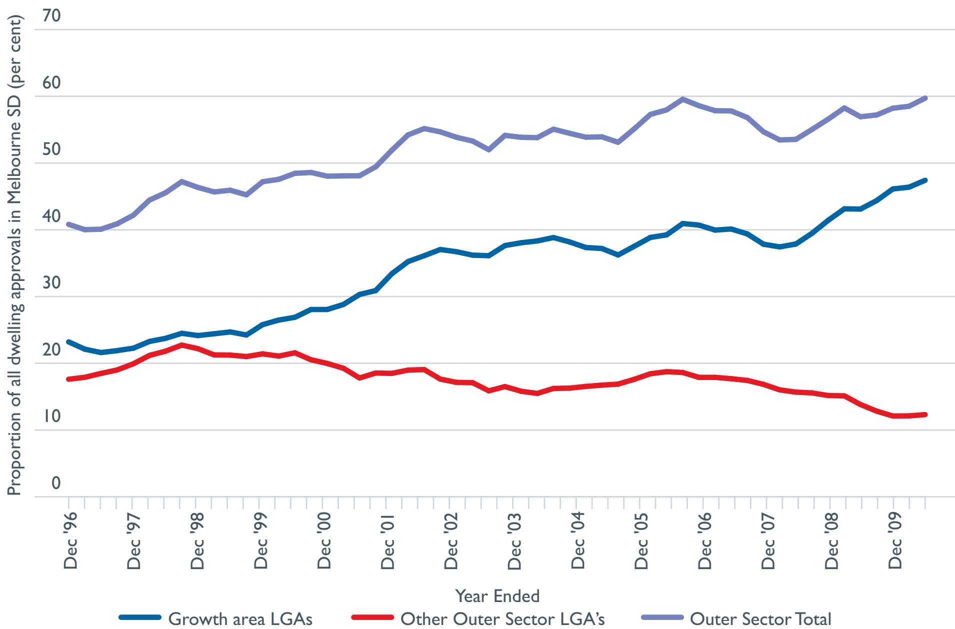
Table 3.17 also shows a significant post-2006 population increase in the Outer sector LGAs that do not contain the designated Growth Areas. Of the 43 000 increase since 2006, 60 per cent was in the Outer Southern sector, largely in the Mornington Peninsula (+9500 persons) and Frankston (+9000 persons) LGAs. This reflects continued strong population growth in some south-eastern urban fringe locations outside the designated Growth Areas. The strong growth of the Cardinia Growth Area in the Southern Sector may also be spilling over to adjacent Peri Urban locations, with Baw Baw Part B West experiencing the largest population growth of any Peri Urban SLA between 2006 and 2010 (+3300 persons).

The planning goal of directing fringe development to Growth Areas is about ensuring that, *to the extent that growth does occur on the urban fringe*, it is not widely scattered but instead is concentrated in the designated Growth Areas—for these Growth Areas, proper sequencing of development can ensure adequate services and infrastructure are available from early on. Taken together, Tables 3.16 and 3.17 show that the population growth that did occur in Melbourne's Outer Sector between 2001 and 2010 was indeed concentrated in the six Growth Area LGAs (81 per cent).

Figure 3.9 presents information on the proportion of Melbourne's dwelling approvals that occurred in the six Growth Area municipalities and in the remainder of the Outer sector. Around 90 per cent of new dwellings in the Growth Areas are detached housing (Goodman et al, 2010). The Outer sector's share of dwelling approvals has risen from about 40 per cent in 1996 to around 50 per cent by 2001 and is approaching 60 per cent in 2009. The dwelling approvals share in the six Growth Area municipalities has risen even more strongly, while the dwelling approvals share of the remaining Outer sector municipalities has declined from

20 per cent in 2000 to 12 per cent in 2009. This chart indicates that the dwellings growth that is occurring in Melbourne's outer suburbs has become increasingly concentrated within the designated Growth Area municipalities over the past decade.

F3.9 Proportion of dwelling approvals occurring in different parts of Melbourne SD, 1996 to 2010



Note: Data has been presented as an annual mov ng average to provide a clearer ndication of trends.

Source: BITRE analysis of ABS dwell ng approvals data, sourced from DPCD Residential Land Bulletin (19th March 2010 version)

While urban expansion was largely concentrated in Growth Areas, it was not entirely concentrated in those areas. A range of fringe suburbs in the Outer Southern sector's Frankston and Mornington Peninsula LGAs have recorded notable gains in population and dwellings. Excluding the six Growth Area LGAs, the ERP of the Outer and Peri Urban sectors increased by 97 000 persons between 2001 and 2010—this more scattered growth could potentially pose challenges for service and infrastructure provision.

Limiting urban sprawl

Melbourne 2030 established 'an Urban Growth Boundary to set clear limits to metropolitan Melbourne's outward development' (DI 2002a, p. 60). The UGB has been expanded on several occasions. The *Melbourne 2030* Audit recommended 'maintaining the UGB without alteration for at least the next five years, unless compelling circumstances arise' (Moodie et al 2008, p. 47).

The State government has a policy threshold of 15 years of land supply being available within the UGB (DPCD 2008h), so as to reduce property speculation and maintain housing affordability. In *Melbourne @ 5 million*, the state government argued that 'with rapid population growth, assessments show the available greenfield land supply is below the Government's policy threshold of supply and that a review of the Urban Growth Boundary is needed' (DPCD

2008c, p. 18). The review resulted in the latest UGB expansion in 2010. In practice, the state government has given a greater priority to maintaining the policy threshold of land supply than to maintaining a fixed UGB (Birrell et al 2005). PC (2011) concluded that UGBs have the potential to improve certainty with regard to land supply processes. Thus, the UGB may be contributing to better management of the city's expansion by channelling development into the designated Growth Areas. However, it is not likely to constrain metropolitan Melbourne's outward development (Buxton and Scheurer 2007).

The remainder of this section explores the extent to which population growth is being accommodated through urban expansion (i.e. greater urban sprawl), rather than within the existing urban area.

As Table 3.3 and Figure 3.8 showed, 60 per cent of Melbourne's population growth between 2001 and 2006 occurred in the Outer sector, followed by the Inner (21 per cent), Middle (15 per cent) and Peri Urban sectors (4 per cent). The population growth contribution of the Outer sector was somewhat lower for the 2006 to 2010 period at 58 per cent. Figure 3.9 showed that the Outer sector's share of all dwelling approvals in Melbourne SD has risen strongly from about 40 per cent in 1996 to around 50 per cent by 2001 and to almost 60 per cent in 2009.

While these sectoral trends suggest a large part of Melbourne's recent population growth has been accommodated through urban expansion (rather than urban consolidation), not all growth in the Outer and Peri Urban sectors involves an expansion of urban sprawl. The sectoral scale is highly aggregated and hides a distinction between established suburbs and newly developing suburbs. This distinction is not always straightforward, as there can be delays of many years between an initial land release and a suburb being fully populated, and significant new land releases can occur within established urban areas.

In order for BITRE to analyse these issues, it was necessary to develop some definitions. All ABS defined suburbs within the Statistical Division (SD) have been classified as either a 'newly developing suburb' or part of the 'existing urban area'. The classification of 'newly developing suburbs' is intended to capture urban fringe locations that are experiencing a very rapid increase in the number of dwellings, typically off a low base. Specifically a newly developing suburb needed to meet one of the following conditions:

- A suburb located in the Outer sector in which the number of occupied private dwellings increased by more than 50 per cent over the period *and* this involved an increase of at least 100 additional dwellings.
- A suburb located in the Outer sector in which the number of occupied private dwellings increased by between 30 and 50 per cent over the period *and* this involved at least 100 additional dwellings *and* at least one CD within the suburb more than doubled its number of dwellings *and* the growth that occurred was fringe development, not urban infill.

All growth that occurred in the Middle and Inner sectors is classified as growth in an existing urban area. Outer suburbs not classified as newly developing suburbs are also considered to be existing urban areas.

Criterion one captures newly developing suburbs which were experiencing very rapid growth off a low base. This criterion is quite restrictive, as only suburbs which have experienced very rapid dwellings growth qualify. Criterion two loosens this a little to ensure the definition is able to capture suburbs which contain some established residential areas, but in which substantial new land releases occurred during or just prior to the period of interest. Development of a suburb may occur over a ten to fifteen year period and our simple snapshot of the 2001 to 2006 period captures suburbs at a range of different stages of development.

In 2006, there were 502 suburbs designated by the ABS as being located in Melbourne's Statistical Division. Table 3.18 presents the 26 suburbs (5 per cent of suburbs) classified as newly developing suburbs for the 2001 to 2006 period. Only five of the 'newly developing suburbs' lie outside the six LGAs that contain Growth Areas (i.e. Skye, Portsea, Keysborough Balance, Plenty and Lysterfield). However, quite a few of the suburbs designated as Growth Areas by the state government do not meet the fairly strict criteria set above (e.g. Werribee, Melton, Cranbourne, Greenvale, Ravenhall, Hoppers Crossing).

T3.18 Suburbs classified as newly developing suburbs for the 2001 to 2006 period.

The following suburbs were classified by BITRE as newly developing suburbs
Beaconsfield, Berwick, Burnside, Caroline Spr ngs, Carol ne Spr ngs Balance, Craigieburn, Cranbourne East, Cranbourne West, Doreen, Hillside, Keysborough Balance, Lynbrook, Lysterfield, Narre Warren South, Officer, Pakenham, Plenty, Point Cook, Portsea, Roxburgh Park, Skye, South Morang, Tarneit, Taylors Hill, Trugan na and Wyndham Vale.

Note: Based on ABS suburb classification for Me bourne SD.

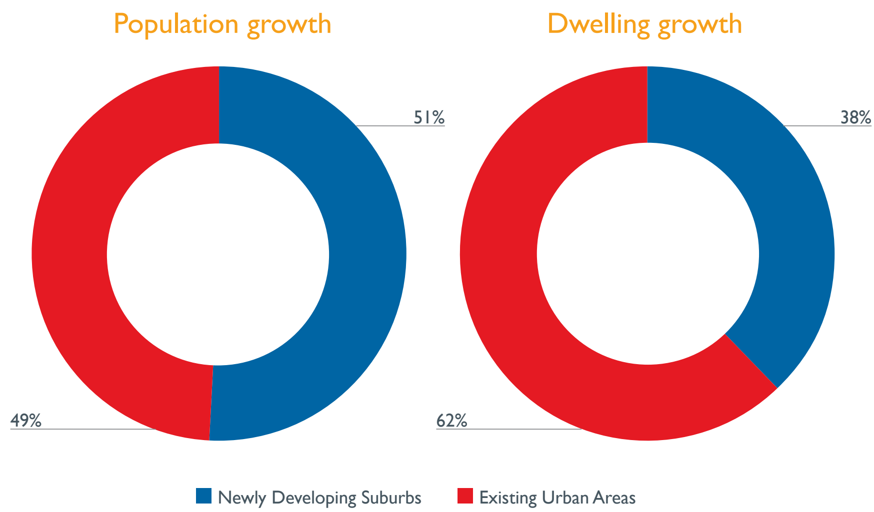
Source: BITRE analysis of ABS Census of Population and Housing suburb data for 2001 and 2006.

Some outer suburbs did experience rapid growth but did not meet the strict criteria. Examples include Lysterfield South, Diamond Creek, Bundoora, Mount Martha, Carrum Downs and Narre Warren North. These suburbs were excluded for several different reasons such as not making the 30 per cent cut-off; the number of dwellings increased by less than 100; or the dwellings growth was urban infill.

Between 2001 and 2006, the usual resident population of Melbourne's SD increased by about 225 400 people, according to census data. Private occupied dwellings increased by around 109 000 dwellings, which represents an 8 per cent increase. Figure 3.10 illustrates the distribution of population and dwellings growth. Much of the population and dwellings growth has occurred in the newly developing suburbs (51 and 38 per cent respectively).

The existing urban areas account for a greater proportion of dwellings growth than population growth. This pattern is likely to reflect a combination of factors, such as lower birth rates than the newly developing suburbs and smaller household sizes, with young families being less prominent in the existing urban areas compared to the newly developing suburbs.

F3.10 Proportion of population and dwelling growth attributable to newly developing suburbs and existing urban areas, Melbourne SD, 2001 to 2006



Note: The analysis relates to Melbourne's suburbs within the Statistical Division.
Source: BITRE analysis of ABS Census of Population and Housing suburbs for 2001 and 2006.

Existing urban areas in the Outer sector accounted for 16 per cent of population growth and 21 per cent of dwellings growth. The main contributors to this growth are Werribee (which added 2100 dwellings), Rowville (1600), Bundoora (1500), Mornington (1200), Langwarrin (1100) and Carrum Downs (1100). Each of these suburbs was already fairly well established in 2001 (containing more than 5000 dwellings). While these suburbs have not grown sufficiently rapidly to meet BITRE's definition of a 'newly developing suburb', much of the new development would be better described as greenfield development rather than urban infill.

DPCD (2010c, p.174) defines greenfield sites as 'undeveloped land identified for residential or industrial/commercial development, generally on the fringe of the metropolitan area'. Broadhectare land is defined as undeveloped land identified specifically for residential development and generally located on the urban fringe (ibid).[18] The 'newly developing suburbs' data can be viewed as providing a lower limit on the contribution of greenfield residential development to the city's growth between 2001 and 2006. The Outer sector data provides an upper limit. Thus, for the 2001 to 2006 period, greenfield development accounted for between 51 and 67 per cent of population growth and between 38 and 59 per cent of growth in dwellings.

18 DPCD (2010c) and its predecessors provide information by LGA on broadhectare lot construction and on dwelling completions in major redevelopment sites, which involve 10 or more dwellings and are located predominantly in existing urban areas. However, no information is provided on minor redevelopment sites which on average account for a larger number of new dwellings each year than the major redevelopment sites (11000 compared to 9000). The lack of information on minor redevelopment sites is a barrier to understanding the split of development between greenfield sites and established areas. This information gap will be rectified by the Victorian Government through the Housing Growth Requirements project which will provide 'detailed analysis of housing development data that covers existing housing, all recent residential developments and the supply of vacant lots in established areas' (ibid, p.21).

How do these figures compare to the state government's planning targets? As previously noted, *Melbourne 2030* proposes that 31 per cent of new dwellings between 2001 and 2030 will be greenfield development, down from the 38 per cent achieved between 1996–97 and 2000–01 (DI 2002a p.30). BITRE's analysis of census data for the 2001 to 2006 period finds that between 38 and 59 per cent of new dwellings were located in greenfield sites and DPCD (2007a) reports 48 per cent of household growth related to greenfield sites[19]—these results indicate there has been no reduction in the greenfield development share, and point to a likely shift in the opposite direction to that desired. Using property sales and valuations data from 1990 to 2007, Goodman et al (2010, p. 4) similarly concludes that the proportion of new housing built on vacant land in the Growth Areas 'has not declined since the introduction of *Melbourne 2030* in 2002'.

In 2008, *Melbourne @ 5 million* introduced a revised target that 53 per cent of new dwellings would be in established areas. This new target is more consistent with Melbourne's development outcomes between 2001 and 2006.

Table 3.19 presents the five newly developing suburbs and existing suburbs that added the most dwellings between 2001 and 2006. The suburb of Melbourne added the most dwellings, followed by the newly developing suburbs of Point Cook, Berwick and Narre Warren South, but the suburb of Melbourne experienced a much smaller increase in population than the three newly developing suburbs. Strong dwellings growth in existing urban areas is dominated by the Inner sector, with Melbourne, Southbank, Docklands and Carlton all featuring.

All of the top five newly developing suburbs are located in one of the Growth Area municipalities. Werribee in the Outer Western sector of the city has also been designated by the GAA for urban expansion—this long established outer suburb was classified as an existing urban area by BITRE as while it added a large number of dwellings, the rate of dwellings growth fell well below the 30 per cent threshold. Neighbouring suburbs such as Wyndham Vale did qualify as newly developing suburbs under the BITRE criterion.

T3.19 Suburbs adding most dwellings, Melbourne SD, 2001 to 2006

Newly Developing Suburbs				Existing Urban Areas			
	Suburb	Dwelling change	Population change		Suburb	Dwelling change	Population change
1	Po nt Cook	4 027	12 222	1	Melbourne	4 439	7 655
2	Berwick	3 838	10 129	2	Southbank	2 659	4 980
3	Narre Warren South	3 398	11 473	3	Docklands	2 115	3 783
4	Caroline Springs	2 626	7 883	4	Werr bee^	1 913	3 333
5	Pakenham	2 461*	6 559*	5	Carlton	1 676	2697

Note: * Pakenham was not class fied as a suburb n 2001, as such 2001 est mates are based on CD concordances from a customised ABS purchased dataset.
^ Werribee is part of Melbourne's Outer sector, but did not meet the criterion of a 'newly developing suburb'. It is a relatively established suburb that contained pockets of new development.

Source: BITRE analysis of ABS Census of Population and Housing suburbs for 2001 and 2006

19 The definition used extends beyond the designated Growth Areas, but it is not made clear how greenfield developments are dist nguished from exist ng urban areas with n the Outer sector.

The above results show the important role that urban fringe development has played in accommodating Melbourne's recent population and dwellings growth and reinforce the conclusions of the *Melbourne 2030* Audit:

> '*Melbourne 2030* seeks to redirect household growth from the urban fringe to the established urban areas. The material placed before us indicates that this is not yet happening at a rate that will deliver sustainable growth for the metropolitan area. There are still major pressures for outward movement of residential development' (Moodie et al 2008, p. 22).

Increases in assistance to first home buyers may have encouraged fringe growth in the early part of the decade (Davies 2010a). However, the data on population growth between 2006 and 2010 suggests that this outward movement of residential development is continuing (see Table 3.17). Birrell et al (2005, p. 06-3) predict that:

> 'given the likely outward dispersal of employment opportunities and the weakness of the measures incorporated in Melbourne 2030 to change this trend, it is likely that the suburban frontier will accommodate a higher proportion of Melbourne's housing growth than is contemplated in the plan. In short, Melbourne's suburban spread will continue under Melbourne 2030'.

Summary

This chapter has provided an in-depth snapshot of the population distribution within the Melbourne working zone in 2006 and has explored the changes that have occurred with regard to where people live between 2001 and 2010. The Melbourne working zone added 630 000 residents from 2001 to reach 4.25 million population in 2010, with 58 per cent of this growth occurring in the Outer sector, 26 per cent in the Middle sector, 12 per cent in the Inner sector and 4 per cent in Peri Urban areas. The principal residential growth location was Melton East, followed by Whittlesea–North, Wyndham North, Casey–Cranbourne and Casey–Berwick. The remaining key findings are summarised at the commencement of this chapter.

In addition, the chapter has considered the strategies in place for managing spatial aspects of population growth in Melbourne. The available population data was used to assess the changes that have occurred since 2001 with respect to key planning objectives such as increased population density, limiting urban sprawl, and concentrating residential development in activity centres and the designated Growth Areas.

CHAPTER 4

Employment location and trends

Key points

- In 2006, the Inner sector accounted for just 8 per cent of Melbourne's population, but 28 per cent of employment. The Middle sector accounted for 47 per cent of population and 39 per cent of employment, while the Outer sector contained 42 per cent of population and 31 per cent of employment.
- The City of Melbourne accounted for 19 per cent of Melbourne's employment in both 2001 and 2006, but added 20 000 jobs over the period. Southbank-Docklands experienced the greatest employment increase in Melbourne, adding 10 500 jobs. Outside the City of Melbourne, the major contributors to employment in 2006 were Kingston North (61 300 jobs) and Port Phillip West (48 000 jobs).
- Dormitory suburbs, offering few job opportunities for local residents, are clustered in the recently developed outer suburbs. To Melbourne's west, Melton East and Wyndham West offer less than one job for every five employed residents.
- From 1971 to 2001, there was strong jobs growth in the outer suburbs, coupled with a net job loss of more than 10 000 in each of the City of Melbourne and Maribyrnong LGAs, reflecting structural change and an outward shift of manufacturing and storage industries.
- The Outer sector accounted for 51 per cent of Melbourne's jobs growth between 2001 and 2006 and grew by 2.5 per cent per annum, which was higher than the Melbourne average of 1.5 per cent. Jobs growth was strongest in the Outer Western (6.6 per cent) and Outer Southern (2.8 per cent) sectors and slowest in the Middle North (0.4 per cent) and Middle South (0.5 per cent). The adjoining Geelong, Ballarat, Bendigo and Latrobe Valley working zones all recorded more rapid jobs growth than the Melbourne working zone.
- The Outer sector locations of Melton East, Wyndham South and Wyndham West increased employment by more than 50 per cent between 2001 and 2006.
- Melbourne's jobs growth was widely dispersed throughout the metropolitan area. Outside the City of Melbourne, the largest employment increases occurred for Wyndham North (+8100) and Greater Dandenong Balance (+5500), reflecting very strong jobs growth in the West and South Industrial Nodes. Melbourne Airport and the Monash University/Health Research Precinct in Clayton also made important contributions to jobs growth.
- Significant job losses occurred in Moreland–Coburg (–1600 jobs), Moreland–Brunswick (–1100 jobs) and Stonnington–Prahran (–1000 jobs).

- In 2006, 14 per cent of employment was in the Melbourne Central Activities District (CAD), 4 per cent in suburban CADs, 8 per cent in Principal Activity Centres and 5 per cent in Specialised Activity Centres. Between 2001 and 2006, these activity centres experienced a slightly lower rate of jobs growth than the rest of Melbourne. Specialised Activity Centres had above-average jobs growth, while the suburban CADs experienced a decline in employment.
- In 2006, 4.0 per cent of employed residents worked at home, down slightly from 4.1 per cent in 2001.
- Melbourne maintained strong jobs growth between 2006 and 2010, averaging 2.5 per cent per annum growth. The City of Melbourne LGA grew particularly rapidly, adding more than 50 000 jobs between 2006 and 2008.

Context

The location of jobs impacts on the functionality of a city. Originally, 'Melbourne was built around the ideal that residential areas should be separated from the work environment' (Birrell et al 2005, p.01–8). The current strategy is to have a 'refinement of the settlement pattern' (DPCD 2008c, p.8). The move is towards a multi-centre structure with a distribution of jobs and activity based on having a closer link between where people work and live.

Hence, 'the formulation of planning policy to sustainably manage urban development will need to pay as much attention to the distribution and density of jobs as it will the location and density of housing and residential population' (O'Connor and Healy 2004, p30).

Melbourne 2030's employment-related objectives revolved around concentrating new economic development at activity centres, making jobs more accessible, strengthening Central Melbourne's capital city functions and protecting the function of specialised activity centres and industrial areas (see Table 2.2). *Melbourne @ 5 million* introduced two new strategies for shaping the distribution of employment:

- 'The creation of a multi-centre city through six new Central Activities Districts in Box Hill, Broadmeadows, Dandenong, Footscray, Frankston and Ringwood. Moving from one centre (the Central Business District) to a number of centres will reduce congestion and enable people to spend less time commuting to and from work and more time with their family.
- Employment corridors that support the Central Activities Districts by linking activity centres, universities, research and technology precincts, medical precincts, and areas with high employment. Three employment corridors will be given priority attention by the government' (DCPD 2008c)

A part of the motivation is to have a more compact city and improve the ease of access to jobs and services to reduce congestion. Essentially the plan is to link transport, jobs and land use planning.

Place of work—2006 snapshot

There were 1 753 700 employed people living in the Melbourne working zone at the time of the 2006 census. Information on place of work was available for 95 per cent of employed residents. Most employed Melbourne working zone residents, who provided place of work information, worked at a location within the Melbourne working zone (1 561 000 persons). The total number of people that worked elsewhere in Victoria was 22 000 and interstate was 7700, with a further 73 000 people (representing 4 per cent of employed residents) having no fixed work address. This category includes many construction workers, drivers, tradespeople and labourers (VicRoads 2008), of whom most would probably be based in the Melbourne working zone.

The analysis in this section is based on the 1 591 000 people who reported a fixed place of work within the Melbourne working zone in 2006. From this group 98 per cent live and work within the Melbourne working zone with only 23 600 travelling from regional Victoria and 6100 commuting from interstate.

Sectoral overview

Table 4.1 presents the place of work data by sector for the Melbourne working zone along with the Geelong, Ballarat, Bendigo and Latrobe Valley working zones. About 28 per cent of employment is located in the Inner sector of Melbourne, although the Inner sector contains only 8 per cent of the city's population. This is clearly represented in the self-sufficiency ratio of over 3. The Middle sector accounts for 39 per cent of employment and 47 per cent of population. In this sector, the Middle North corridor has the lowest number of workers while the Middle East has more than double this amount with over 230 000 workers. As for the Outer sector, it contains around 31 per cent of Melbourne's employment and 42 per cent of its population, with the Outer South containing many of the sector's workers.

The Outer Western sector has the lowest self-sufficiency ratio in the Melbourne working zone. While there are more than 5000 jobs per square kilometre in the Melbourne Inner sector and just over 650 in the Middle sector, the Outer and Peri Urban sectors have less than 100 jobs per square kilometre. The Melbourne working zone has a greater overall employment density than the regional centres of Geelong, Bendigo, Ballarat and Latrobe Valley.

T4.1 Place of work data by subsector, Melbourne working zone, 2006

Sector	People who work in sector	Proportion of Me bourne WZ employment (per cent)	Proportion of the WZ ERP (per cent)	Employment density (jobs per square kilometre)	Self-sufficiency ratio
Inner	443 850	27.9	7.4	5 161.0	3.02
Middle	613 025	38.5	47.1	657.8	0.75
Middle North	105 494	6.6	10.1	631.7	0.61
Middle South	142 645	9.0	10.5	779.5	0.75
Middle East	230 054	14.5	15.3	721.2	0.84
Middle West	134 832	8.5	11.2	512.7	0.74
Outer	488 167	30.7	41.5	73.1	0.68
Outer Northern	108 333	6.8	8.9	76.0	0.73
Outer Southern	202 546	12.7	17.3	75.8	0.70
Outer Eastern	129 024	8.1	10.2	85.6	0.66
Outer Western	48 264	3.0	5.1	45.1	0.53
Peri Urban	41 437	2.6	4.0	3.9	0.61
Unknown address	4 693	0.3	na	na	na
Melbourne working zone	1 591 172	100.0	100.0	86.7	0.91
Geelong working zone	83 569	na	na	18.7	0.82
Ballarat working zone	42 393	na	na	6.5	0.89
Bendigo work ng zone	43 736	na	na	5.5	0.88
Latrobe Valley working zone	29 685	na	na	7.7	0.93

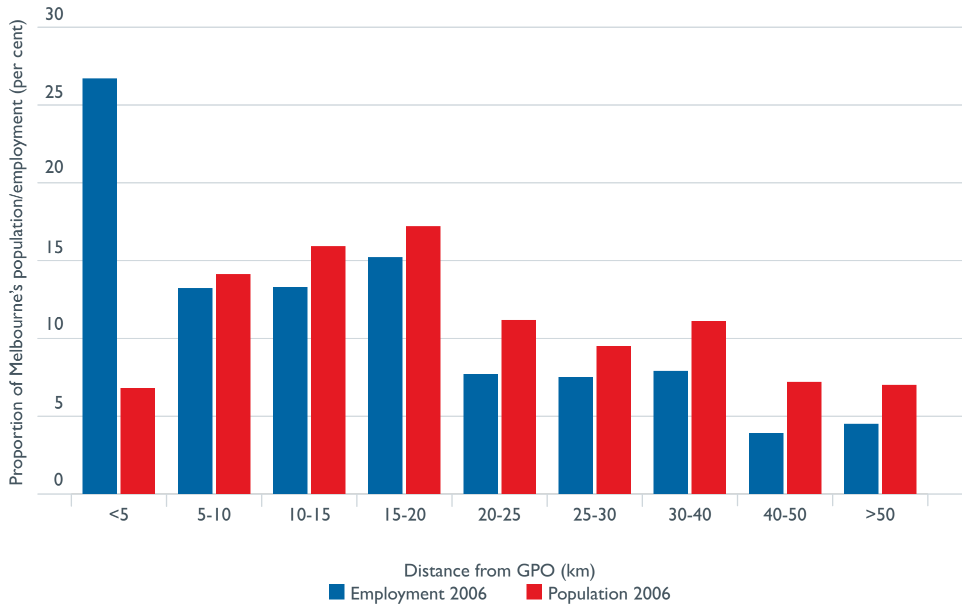
Note: The se f-sufficiency ratio is the ratio of people who work n the sector to the number of employed people who live n the sector. The ratio for the Me bourne work ng zone is less than one due to non-response, no fixed place of work and residents who work outside the Me bourne work ng zone.

Source: BITRE analysis of ABS Census of Population and Hous ng 2006

Figure 4.1 presents the distribution of jobs according to distance from the CBD, and compares it to the population distribution in 2006. About 27 per cent of Melbourne's jobs are located within 5 kilometres of the former General Post Office (GPO). A further 42 per cent of jobs are located between 5 and 20 kilometres of the GPO. There are some substantial employment concentrations located in the 15 to 20 kilometre ring, such as Melbourne Airport, Monash University and Laverton North.

Melbourne's jobs were much more centralised than its population in 2006. All of the suburban rings beyond the 5 kilometre mark contained a smaller proportion of jobs than of population. While 46 per cent of Melbourne's population lives over 20 kilometres from the CBD, only 32 per cent of jobs are located there. Similarly, while 25 per cent of the population lives over 30 kilometres from the CBD, only 16 per cent of the city's jobs are located in that area.

F4.1 Proportion of population and employment located at various distances from the GPO, Melbourne working zone, 2006



Note: The General Post Office has been chosen as the central po nt of the CBD. Calculation based on straight line distance from each CCD or DZ centroid to GPO.

Source: BITRE analysis of CCD and DZ data from ABS 2001 and 2006 Census of Population and Housing.

Statistical Local Areas

Table 4.2 lists the ten SLAs containing the largest number of jobs in 2006. The Inner Melbourne SLA is the place of work for more than 153 000 people, representing almost 10 per cent of Melbourne's employment. The Inner Melbourne SLA corresponds to the Melbourne CBD. The CBD extends from Latrobe Street in the North and towards the Yarra River in the South. It is also encompassed by Spencer Street in the west and Spring Street in the east. There are just over 30 times as many jobs as there are employed residents of this SLA, reflecting the CBD's very strong employment orientation. Employment density is extremely high at nearly 80 000 jobs per square kilometre.

The SLA with the second highest number of jobs is the Melbourne Remainder SLA (i.e. the Melbourne LGA minus the CBD and Southbank-Docklands). It includes Carlton, Kensington, West Melbourne, Parkville, East Melbourne and North Melbourne. It contains just over 106 000 jobs, representing 7 per cent of the city's employment.

The City of Melbourne LGA as a whole employed 297 300 people in 2006, representing 18.7 per cent of jobs in the Melbourne working zone. Sydney has a somewhat greater central agglomeration of jobs than Melbourne, with 357 800 jobs in the City of Sydney in 2006, representing 20.6 per cent of total employment in the Sydney working zone (BITRE forthcoming). In 2006, the City of Perth contained 109 700 jobs, representing 17.0 per cent of Perth working zone employment (BITRE 2010).

Two other inner SLAs also appear in the top ten namely, Southbank-Docklands and Port Phillip West. Kingston North, in the Middle South sector, is the third top employing SLA with over 61 000 jobs and 4 per cent of employment. The high number of jobs in this SLA is the result of a very strong manufacturing and retail sector, with Moorabbin Airport, pharmaceutical, logistics and food processing companies all making a contribution.

Of the six Central Activities Districts earmarked for development in *Melbourne @ 5 million*, Dandenong and Broadmeadows are already present in the top ten employing SLAs, whilst most of the rest are within the top twenty.

T4.2 Top employing SLAs, Melbourne working zone, 2006

SLA	Sector	People who work in SLA	Proportion of Me bourne WZ employment (per cent)	Proportion of Melbourne WZ ERP (per cent)	Employment density (jobs per square kilometre)	Self-sufficiency ratio
Me bourne Inner	Inner	153 394	9.7	0.3	79 893	30.20
Me bourne Rema nder	Inner	106 150	6.7	1.3	3 590	4.62
Kingston North	Middle South	61 302	3.9	2.4	894	1.43
Port Phillip West	Inner	47 987	3.0	1.0	4 050	2.49
Monash–Waverley West	Middle East	39 456	2.5	1.7	1 229	1.39
Greater Dandenong Balance	Outer Southern	37 758	2.4	1.9	416	1.37
Me bourne–Southbank-Docklands	Inner	37 719	2.4	0.4	7 991	4.90
Greater Dandenong–Dandenong	Outer Southern	36 455	2.3	1.5	938	1.78
Hume–Broadmeadows	Outer Northern	36 027	2.3	1.7	812	1.71
Monash South-West	Middle East	33 963	2.1	1.2	1 583	1.79

Note: The se f-sufficiency ratio is the ratio of people who work n the SLA to the number of employed people who live n the SLA.

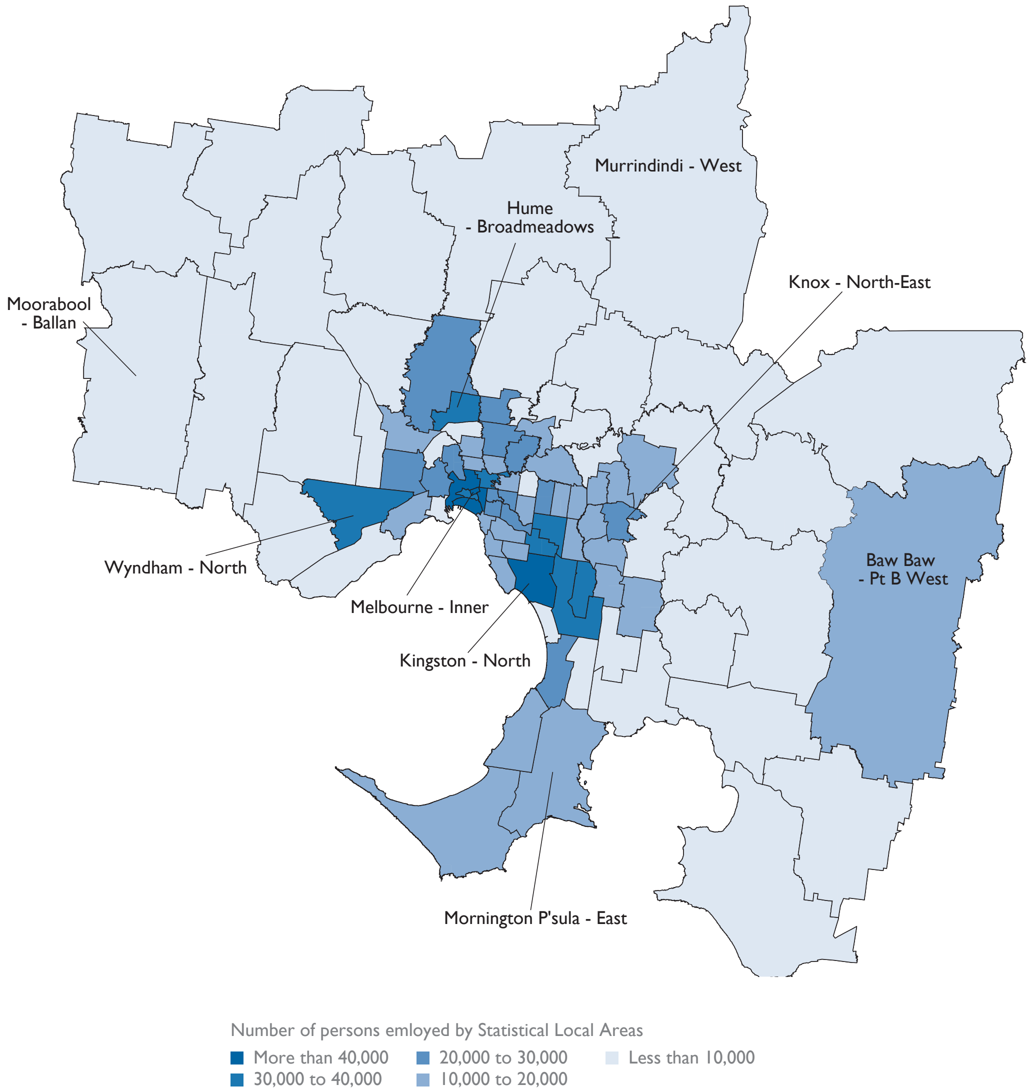
Source: BITRE analysis of ABS Census of Population and Housing 2006

Map 4.1 shows the number of people working in each SLA for 2006. It highlights the large number of jobs available in the City of Melbourne and several Middle sector SLAs. Within Melbourne, employment density is at its greatest in Melbourne Inner (80 734 jobs per square kilometre), Southbank-Docklands (8025) and Port Phillip West (4049). The number of jobs is more than double the number of employed residents in just 4 SLAs: Melbourne Inner, Southbank-Docklands, Melbourne Remainder and Port Phillip West. These are the same SLAs that had some of the highest employment densities and are important focal points for employment within Melbourne. Most of the SLAs with the lowest number of jobs are found in the Outer and Peri Urban sectors.

Map 4.2 presents the self-sufficiency ratio for each SLA for 2006. Three areas stand out as having high self-sufficiency, which are the inner city, Broadmeadows in the outer north, and the south-east (e.g. Monash South-West, Greater Dandenong). There are 16 SLAs which have more jobs than employed residents.

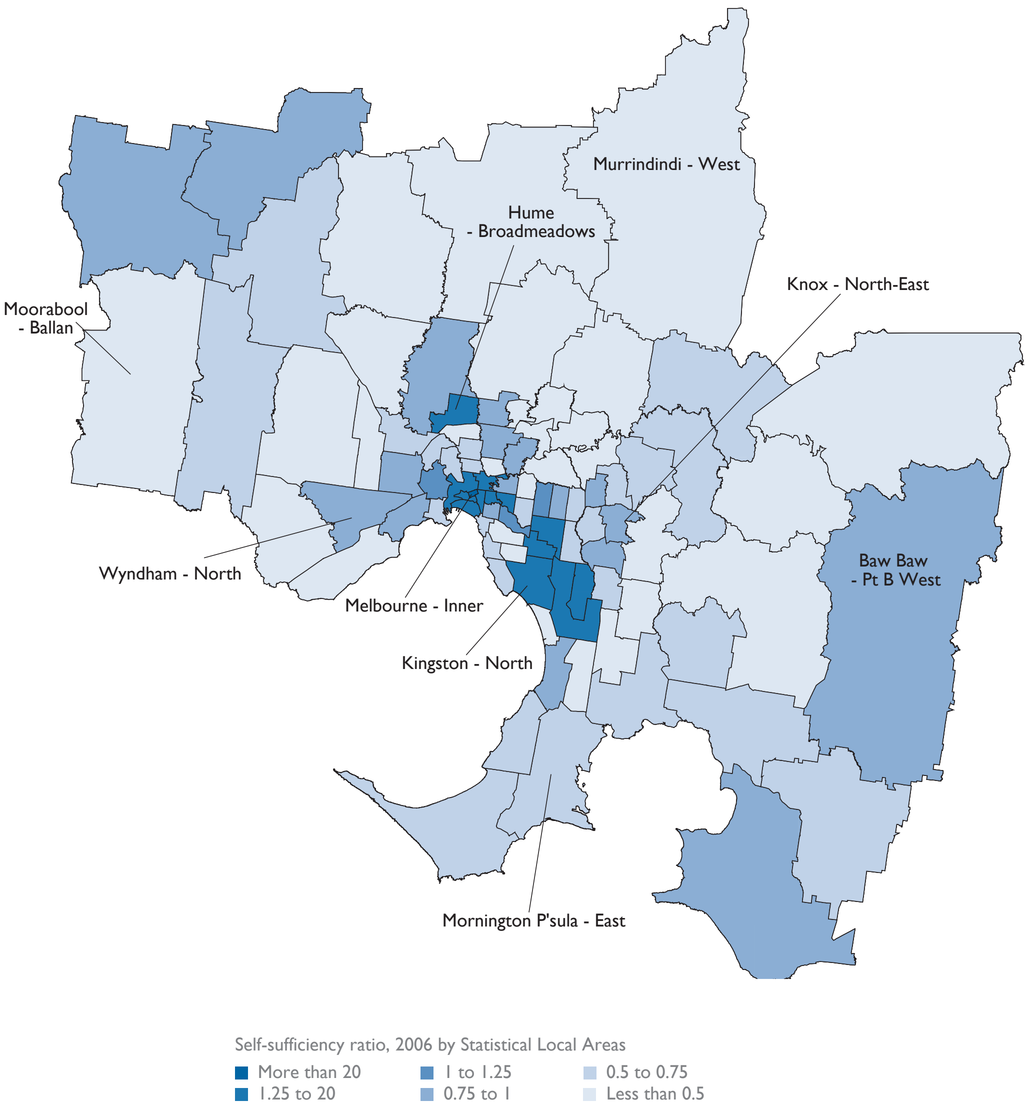
There are quite a few SLAs that have a self-sufficiency ratio below 0.5. They account for 33 per cent of the SLAs that make up Melbourne's working zone. The lowest two with ratios of less than 0.20 are Wyndham West and Melton East. In Chapter 3 these SLAs were highlighted as major locations of recent residential growth in Melbourne.

M4.1 People working in each SLA in Melbourne working zone, 2006



Source: BITRE analysis of ABS Census of Population and Hous ng 2006

M4.2 Self-sufficiency ratio in each SLA in Melbourne working zone, 2006



Note: The se f-sufficiency ratio is the ratio of people who work n the SLA to the number of employed people who live n the SLA.

Source: BITRE analysis of ABS Census of Population and Housing 2006

In 2006, 4.0 per cent of Melbourne working zone residents worked at home. The sectors represented highly were in the Peri Urban and Outer areas of the city. Two SLAs with just over 22 per cent of people working from home were the Outer Southern SLA of Cardinia North and the Peri Urban area of Murrindindi West. ABS (2009g) also reported a 4 per cent work from home share for Melbourne SD for 2008, with the Mornington Peninsula statistical region having a higher proportion of residents working from home (7 per cent) than other parts of Melbourne.

The proportion of people who worked from home in 2001 was 4.1 per cent of the total employees in the Melbourne working zone. The share dropped slightly to 4.0 per cent in 2006. A decline in the proportion of people working from home was also evident in both Perth and Sydney.

Destination zones

The place of work data can be disaggregated to a finer level—destination zones. Map 4.3 presents the distribution of jobs across Melbourne's working zone, based on destination zone data. As expected, the map follows the urban pattern of the city and its satellite cities. Job centres outside the Melbourne urban area are clearly visible such as Bacchus Marsh, Warragul, Melton, Sunbury and Kilsyth.

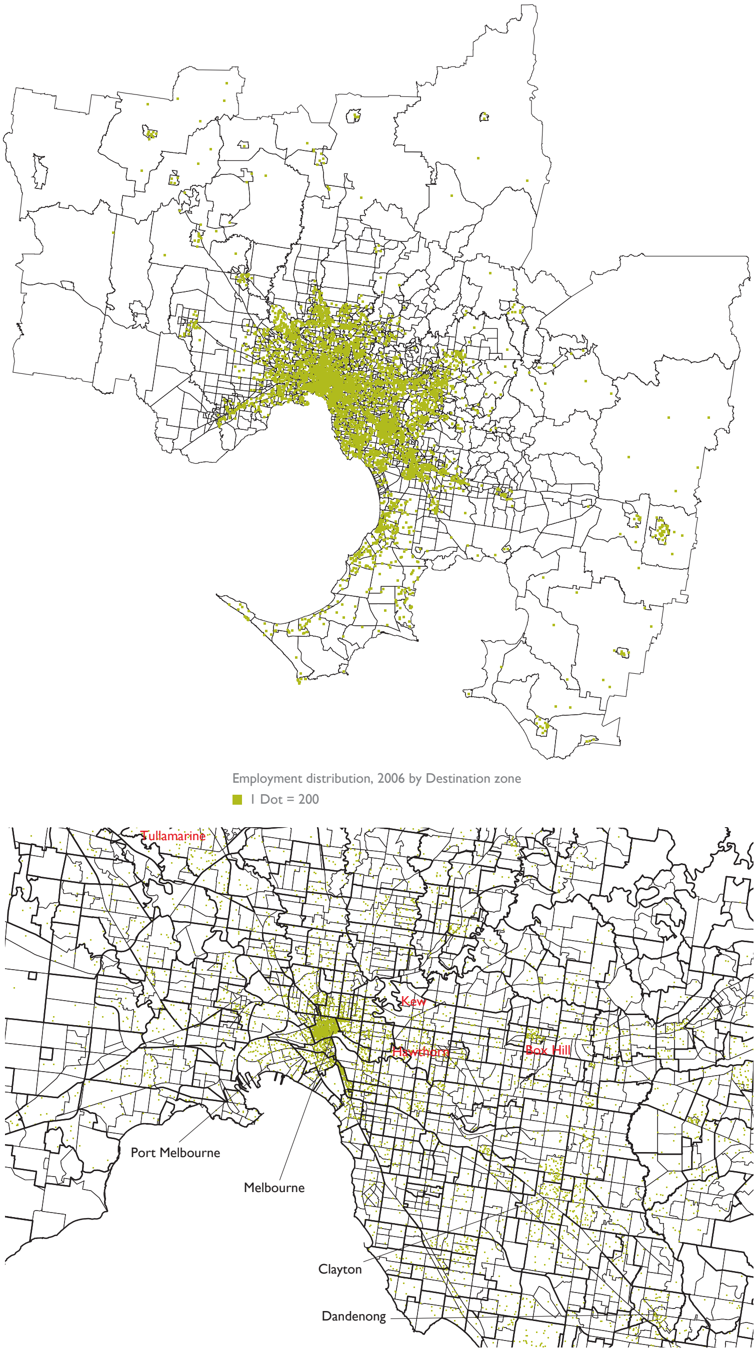
Taking a closer look at Melbourne, employment is clearly clustered in the Central Business District (CBD) and its immediate surrounds as well as Port Melbourne. Other employment clusters occur around Clayton, Dandenong, Melbourne Airport, Box Hill and Campbellfield. Using 2006 census data on job numbers and density, Davies (2010b) identified 31 suburban agglomerations of employment within Melbourne that together contain 20 per cent of employment. The largest suburban agglomerations can all be identified in Map 4.3, namely:

- Clayton
- Tullamarine
- Kew/Hawthorn
- Box Hill.

The top twenty employing destination zones are presented in Table 4.3 for 2006. The highest employing destination zone at over 13 500 jobs is the Melbourne Airport. However, the overriding majority of the listing is from the Inner sector, particularly from the Melbourne Inner SLA and the suburb of Southbank to its immediate south. Another strong employment hub is in the City of Monash LGA which has the Specialised Activity Centre Monash University/ Health Research Precinct in Clayton and significant commercial areas in the suburbs of Mount Waverley and Mulgrave. The eastern suburban industrial areas of Woodlands and Bayswater also feature in the top twenty.

The Peri Urban location listed in Table 4.3 corresponds to the city of Warragul to the east of Melbourne—it is clearly visible in Map 4.4, which shows the number of people who work in each of the 2006 destination zones in Melbourne and surrounding regions. Other regional centres such as Wonthaggi, Bacchus Marsh, Kyneton, Kilmore and Healesville are also visible. Melton and Sunbury do not stand out as much because these satellite cities have been separated into several destination zones.

M4.3 Dot density map of job distribution, Melbourne working zone, 2006



Note: About 1.3 per cent of Melbourne work ng zone employment in 2006 was allocated to an SLA but was not allocated to a destination zone by ABS and so is excluded from this map. A further 1.9 per cent of employment was only allocated to a suburb by ABS (not a DZ) and was concorded to DZ by BITRE based on the employment size of the DZs within the suburb.

Source: BITRE analysis of ABS Census of Population and Housing 2006 customised data request for DZs.

T4.3 Top twenty employing destination zones, Melbourne working zone, 2006

Destination zone code	Statistical Local Area	Sector	Description	People who work in zone
745	Hume–Craigieburn	Outer Northern	Melbourne Airport	13 564
35	Melbourne–Southbank-Docklands	Inner	Part of Southbank, bordered by Yarra River, Southbank Boulevard, West Gate Freeway, Whiteman Street and Clarendon Street	10 653
12	Melbourne–Inner	Inner	Part of CBD, bordered by Elizabeth Street, Collins Street, Queen Street and Bourke St	9 668
1117	Monash–Waverley West	Middle East	Part of Mount Waverley, including Axxess Corporate Park	9 433
1	Melbourne–Inner	Inner	Part of CBD, bordered by Spring Street, Flinders Street, Exhibition Street and Collins Street	9 252
38	Melbourne–Southbank-Docklands	Inner	Part of Southbank , bordered by St Kilda Road, Southbank Boulevard and Yarra River	9 160
1528	Kingston–North	Middle South	Braeside, including Woodlands Industrial Estate and the Waterways residential estate	9 098
10	Melbourne–Inner	Inner	Part of CBD, bordered by Williams Street, Collins Street, King Street and Bourke Street	8 933
32	Melbourne–Inner	Inner	Part of CBD, bordered by Spring Street, Lonsdale Street, Exhibition Street and La Trobe Street	8 755
7	Melbourne–Inner	Inner	Part of CBD, bordered by William Street, Flinders Street, King Street and Collins Street, and including the Rialto Towers	8 474
15	Melbourne–Inner	Inner	Part of CBD, bordered by Exhibition Street, Collins Street, Russell Street and Bourke Street	7 934
61	Melbourne–Remainder	Inner	Part of Port Melbourne , including Fishermans Bend	7 397
5	Melbourne–Inner	Inner	Part of CBD, bordered by Elizabeth Street, Flinders Street, Queen Street and Collins Street	7 191
117	Port Phillip–West	Inner	Part of suburb of Melbourne, bordered by St Kilda Road, Louise Street, Queens Road and Kings Way	7 004
1225	Knox–North-East	Outer Eastern	Part of Bayswater, including Bayswater Industrial Area	6 841
11	Melbourne–Inner	Inner	Part of CBD, bordered by Queen Street, Collins Street, William Street and Bourke St	6 761
1051	Monash–South-West	Middle East	Monash University and CSIRO campuses in Clayton	6 483
2509	Baw Baw–Part B West	Peri Urban	Warragul	6 292
1096	Monash–Waverley West	Middle East	Part of Mulgrave, a commercial area. Includes Australian headquarters of NEC and Daimler Chrysler	6 175
23	Melbourne–Inner	Inner	Part of CBD, bordered by William Street, Burke Street, King Street and Lonsdale Street	6 068

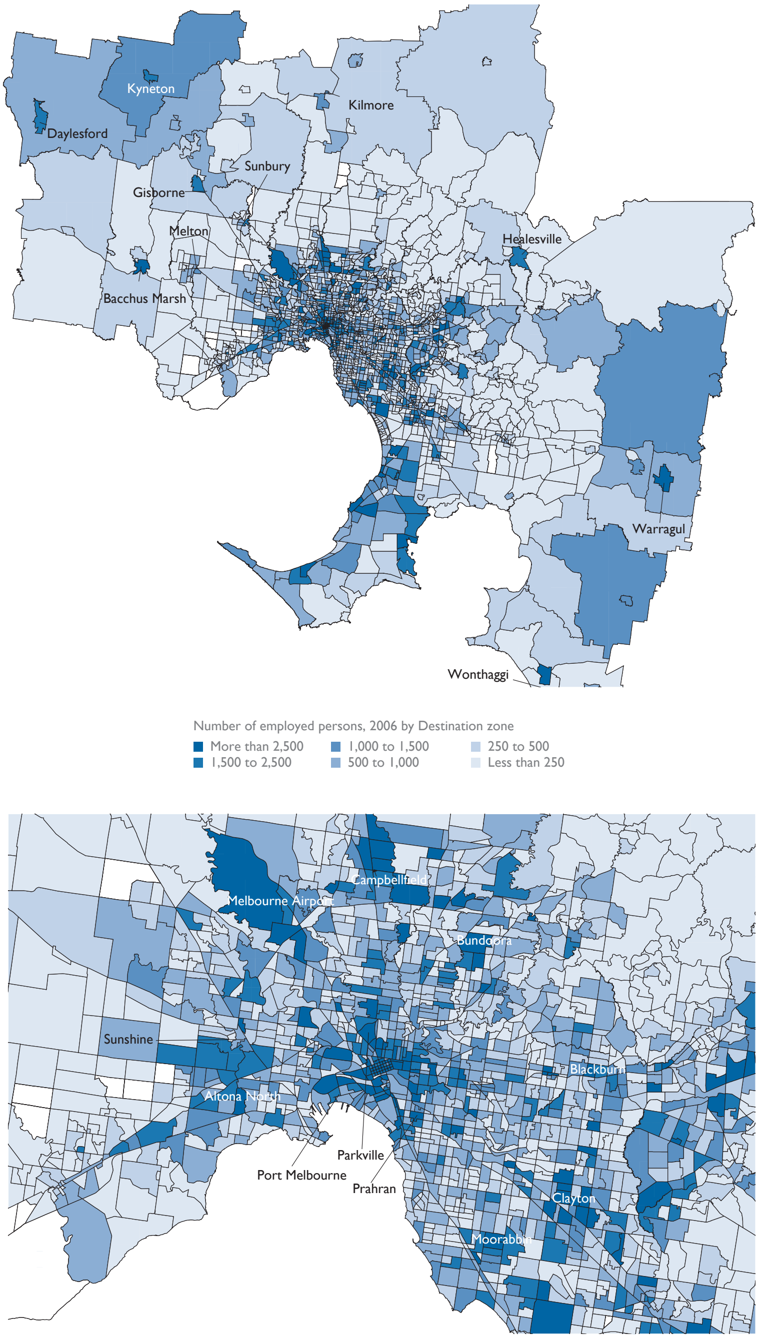
Note: About 1.3 per cent of Melbourne working zone employment in 2006 was allocated to an SLA but was not allocated to a destination zone by ABS and so is excluded from this table. A further 1.9 per cent of employment was only allocated to a suburb by ABS (not a DZ) and was concorded to DZ by BITRE based on the employment size of the DZs within the suburb.

Source: BITRE analysis of ABS Census of Population and Housing 2006 customised data request for DZs.

The destination zones in the centre of the city are very small geographically and may cover areas of only a single block. Beyond the city centre, several clusters of adjoining destination zones have substantial employment, focused around:

- Parkville and Port Melbourne in the Inner sector
- Clayton in the Middle East
- Moorabbin–Cheltenham and Braeside in the Middle South
- Melbourne Airport in the Outer North
- Dandenong South (this cluster is known as the South Industrial Node), Campbellfield (North Industrial Node) and Altona–Laverton (West Industrial Node).

M4.4 People working in each destination zone in Melbourne working zone, 2006



Note: About 1.3 per cent of Me bourne working zone employment n 2006 was allocated to an SLA but was not allocated to a destination zone by ABS and so is excluded from this map. A further 1.9 per cent of employment was only allocated to a suburb by ABS (not a DZ) and was concorded to DZ by BITRE based on the employment size of the DZs with n the suburb.

Source: BITRE analysis of ABS Census of Population and Hous ng 2006 customised data request for DZs.

Map 4.5 presents the employment densities of destination zones for Melbourne's working zone for 2006. The map is similar to the number of people working in the destination zones shown in Map 4.4. Destination zones close to the city centre are clearly areas with high levels of employment density. Another location with high levels of employment density is focused around the Clayton campus of Monash University.

A feature of the destination zones further away from the city centre is that they have generally lower densities, with pockets of high density especially along transport corridors. For example, Melbourne Airport has a substantial number of people working in the destination zone but the area is quite large, hence its density is low.

The self-sufficiency ratio for 2006 is presented in Map 4.6. The self-sufficiency ratio is the ratio of jobs to employed residents of the destination zone. Extremely strong employment oriented clusters include the CBD, Port Melbourne, Clayton, Dandenong, Campbellfield, Melbourne Airport, Laverton North and Altona.

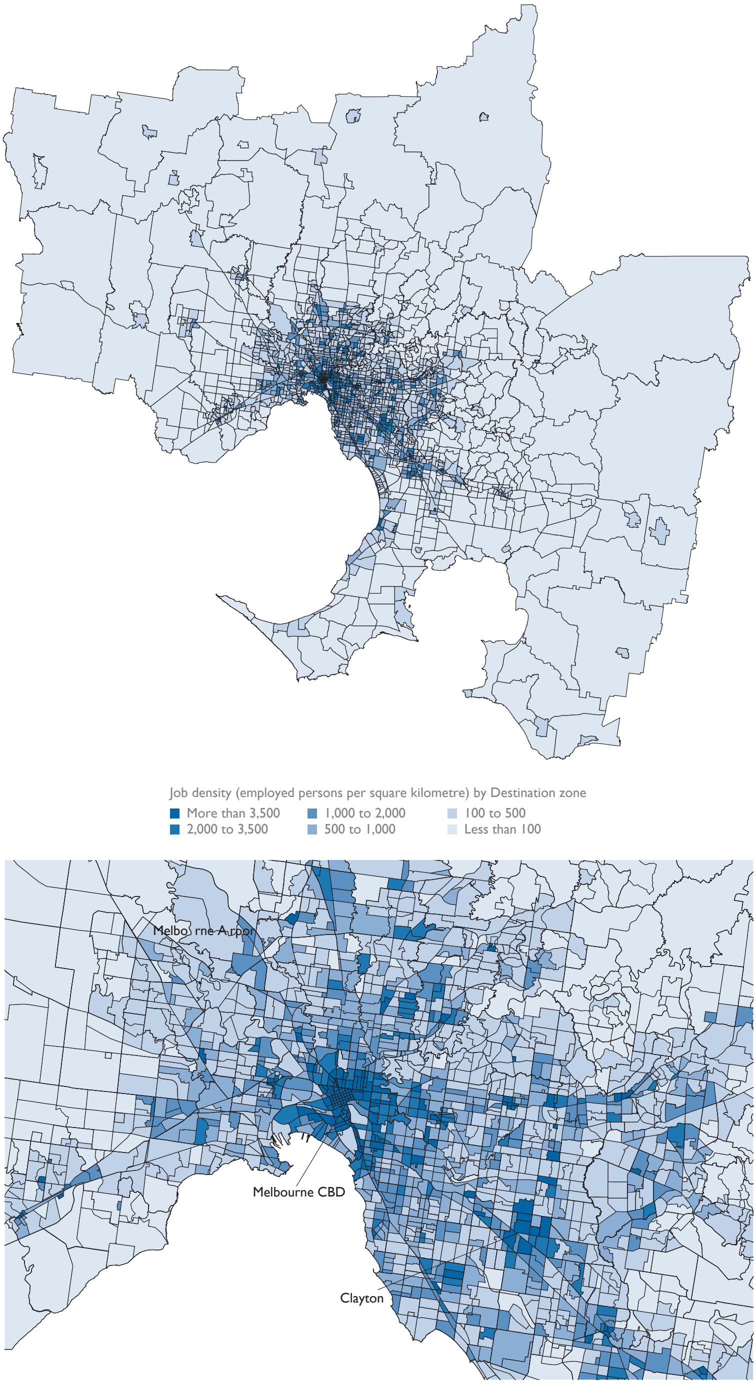
Most of Melbourne's destination zones have a residential focus in that there are considerably more employed residents than jobs. This is particularly so in the outer suburbs of the city, such as Wyndham Vale, Caroline Springs, Templestowe and Lysterfield.

The self-sufficiency ratios can be used to understand the extent to which Melbourne's working zone employment is heavily concentrated in employment focused areas or more dispersed throughout the suburbs. Features that exist include:

- 57 per cent of workers have a job in an employment focused destination zone, which either contains no employed residents or has least twice as many workers as employed residents (i.e. the self-sufficiency ratio exceeds two).
- 19 per cent of workers have a place of work in a residentially focused destination zone, which has at least twice as many employed residents as workers (i.e. the self-sufficiency ratio is less than 0.5).
- 25 per cent of employment is located in destination zones which are 'mixed use' containing more of a balance of residential areas and employing businesses.

Thus, most of Melbourne's employment (57 per cent) is located in employment focused destination zones. This is similar to the result for Sydney (58 per cent), but much higher than that for Perth (30 per cent), where the majority of employment was in mixed use zones.

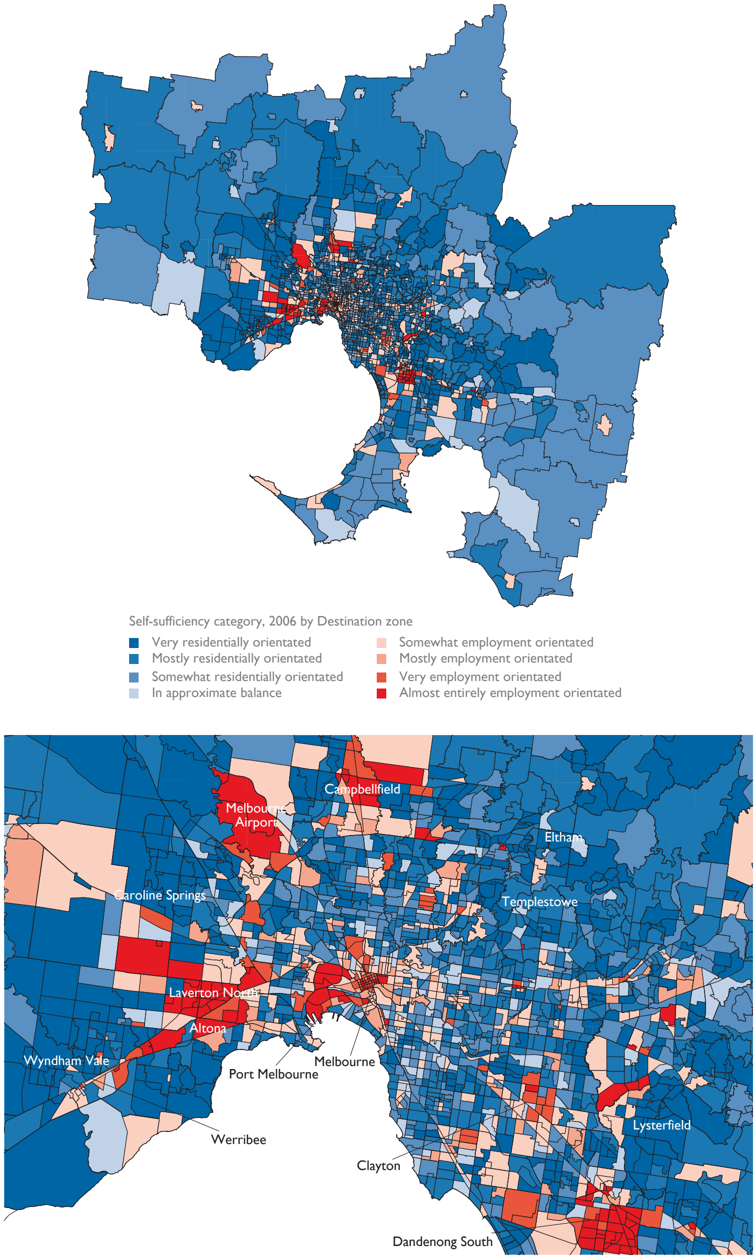
M4.5 Employment density of each destination zone in Melbourne working zone, 2006



Note: About 1.3 per cent of Me bourne working zone employment n 2006 was allocated to an SLA but was not allocated to a destination zone by ABS and so is excluded from this map. A further 1.9 per cent of employment was only allocated to a suburb by ABS (not a DZ) and was concorded to DZ by BITRE based on the employment size of the DZs with n the suburb.

Source: BITRE analysis of ABS Census of Population and Hous ng 2006 customised data request for DZs.

M4.6 Self-sufficiency ratio of each destination zone in Melbourne working zone, 2006

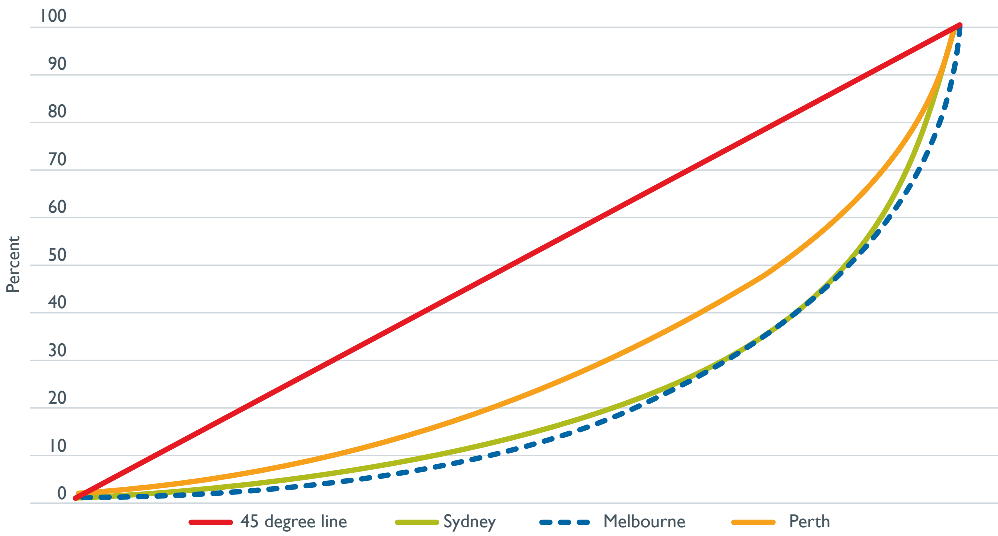


Note: About 1.3 per cent of Melbourne work ng zone employment in 2006 was allocated to an SLA but was not allocated to a destination zone by ABS and so is excluded from this map. A further 1.9 per cent of employment was only allocated to a suburb by ABS (not a DZ) and was concorded to DZ by BITRE based on the employment size of the DZs within the suburb

Source: BITRE analysis of ABS Census of Population and Housing 2006 customised data request for DZs.

The destination zone data also enable analysis of how concentrated or dispersed jobs are throughout the city. Figure 4.2 presents Lorenz curves that show the Sydney and Melbourne both have a similarly high spatial concentration of jobs, while in Perth jobs are more evenly distributed across the working zone.

F4.2 Lorenz curves for spatial distribution of jobs in Sydney GMA, Melbourne working zone and Perth working zone, 2006



Note: The smaller the area between the city's curve and the 45 degree l ne the more even is the distr bution of jobs across dest nation zones n that city.

Source: BITRE analysis of ABS Census of Population and Hous ng 2006 customised data request for DZs.

The spatial distribution of jobs can be summarised by calculating a Gini coefficient, which potentially ranges between zero and one, with a value of zero meaning that all destination zones have an equal number of jobs while a value of one means all jobs are located in a single destination zone. The Gini coefficients for the three cities are Melbourne (0.62), Sydney (0.60) and Perth (0.46). This indicates Perth's employment is less spatially concentrated than the two larger cities. One contributor to this result is the different size of the three city centres—the City of Perth LGA accounts for a smaller proportion of working zone employment than the City of Sydney or the City of Melbourne LGAs (BITRE 2010, BITRE forthcoming). While Sydney and Melbourne destination zones have roughly the same average employment (759 and 780 persons respectively), Perth destination zones are less disaggregated with an average employment of 1090 persons. This lack of strict comparability between destination zones for different cities may contribute to the result.

Thus, while Melbourne has a substantial agglomeration of jobs in the central city, this central agglomeration is slightly smaller than that of Sydney in both relative and absolute terms. Beyond the agglomeration of jobs in the inner city (which includes Port Phillip West and Prahran–South Yarra as well as the City of Melbourne), employment is widely dispersed throughout Melbourne's middle and outer suburbs, which account for 69 per cent of the city's jobs. Melbourne's suburban jobs tend to be clustered together in employment-oriented (rather than residentially-oriented or mixed use) zones. Some of the more substantial suburban employment clusters are specialised activity centres (e.g. Melbourne Airport, Monash University/Health Research Precinct), industrial areas (e.g. Moorabbin, West Industrial Node, South Industrial Node) or activity centres (e.g. Box Hill, Dandenong). While Melbourne's largest suburban industrial areas have greater scale (in terms of employment) than those of Sydney, Melbourne does not contain a suburban commercial centre of the same scale as Parramatta, and Melbourne's business parks also tend to be of smaller scale.

Long term trends in place of work

The *Melbourne Atlas 2006* highlights the movement of jobs from the inner and western regions of metropolitan Melbourne between 1971 and 2001 (DPCD 2008a). The atlas states that the job losses, which were concentrated in the cities of Melbourne and Maribyrnong, reflect 'structural change and some re-location of manufacturing industries' (ibid p4.9). The growth in jobs and home locations were primarily in the outer areas of the city. This illustrates the expansion of the city which has been combined with the 'outward shift of industries such as manufacturing and storage seeking larger sites' (DPCD 2008a, p4.9).

The *Melbourne Atlas* identifies the main 1971 employment locations as City of Melbourne (31 per cent of employment), Yarra (7 per cent), Port Phillip (5 per cent) and Kingston (5 per cent). By 2001, the City of Melbourne had reduced its employment share to 19 per cent, and the other major employment locations were Monash (6 per cent), Dandenong (5 per cent) and Kingston (5 per cent) (DPCD 2008a). The City of Melbourne, Yarra, Darebin, Maribyrnong and Moreland were the only LGAs to experience a decline in their employment share.

In 1971, the LGAs of Monash, Hume, Kingston and Dandenong were essentially dormitory suburbs, but the significant outward shift of jobs has meant that by 2001 these LGAs all had more jobs than employed residents (DPCD 2008a). Similarly, O'Connor and Healy (2004) found that, between 1966 and 1996, there was increasing alignment between the distribution of jobs and housing according to distance from the CBD, reflecting the trend towards suburbanisation of jobs.

To further illustrate the changes that have occurred, consider Table 4.4 which shows Inner Melbourne's share of Melbourne metropolitan jobs from 1961 to 2001. O'Connor (2006:4) states that 'although there is no doubt inner cities in most cities have become more prominent in terms of population and employment (and relative house prices) compared to their position over twenty or so years ago, it is important to recognise that these areas have not usually accounted for an increased share of all metropolitan jobs in the past to [sic] or three decades'. The 28 per cent result from the 2001 census is close to this studies Inner sector result for 2006, which was also a share of 28 per cent.

T4.4 Inner Melbourne's share of employment in the Melbourne metropolitan area, 1961 to 2001

Census Year	1961	1971	1976	1986	1991	1996	2001
Share	55	54	37	28	29	27	28

Note: Inner Melbourne has been 'defined as the City of Me bourne, Port Phillip, Yarra and the Prahran SLA of Stonnington, as a best correspondence to the area used for the 1961–1966 which included the original Collingwood, Fitzroy, Richmond, St Kilda, South Melbourne, Port Melbourne and Me bourne (O'Connor 2006, p.4)

Source: Replication of Table from O'Connor (2006, p.4)

O'Connor and Rapson (2003) completed a trend analysis of the location of Melbourne's employment from 1986 to 2001. They identify two trends:

- 'increasing concentration of a narrow range of economic activity in a small inner core of the metropolitan area' (O'Connor and Rapson 2003, p.42)
- 'increase in the diversity of jobs and housing in larger geographic areas in the suburbs' (O'Connor and Rapson 2003, p.42)

This has resulted in two zones. First, the CBD and its surrounding old industrial suburbs create the first zone. It is argued 'that the central region has maintained its dominance of new economy employment but has relinquished some of the retail, medical and other services it once provided to suburbanites' (O'Connor and Rapson 2003, p.51). Second, regions outside the central area are maturing beyond the initial economic activity through manufacturing and retail. They have become much 'more diverse in the range of employment opportunities they offer' (O'Connor and Rapson 2003, p.51). O'Connor and Rapson (2003) have highlighted that this urban employment development has implications for the *Melbourne 2030* plan. They state that 'it is very unlikely that the *Melbourne 2030* planning vision will achieve the kind of focus of job creation in particularly activity centres to which it aspires. These activity centres, for example, do not provide for industrial estates or for low rise warehouse, research and development, light manufacturing and diverse other services functions' (ibid, p.51).

Changes in place of work between 2001 and 2006

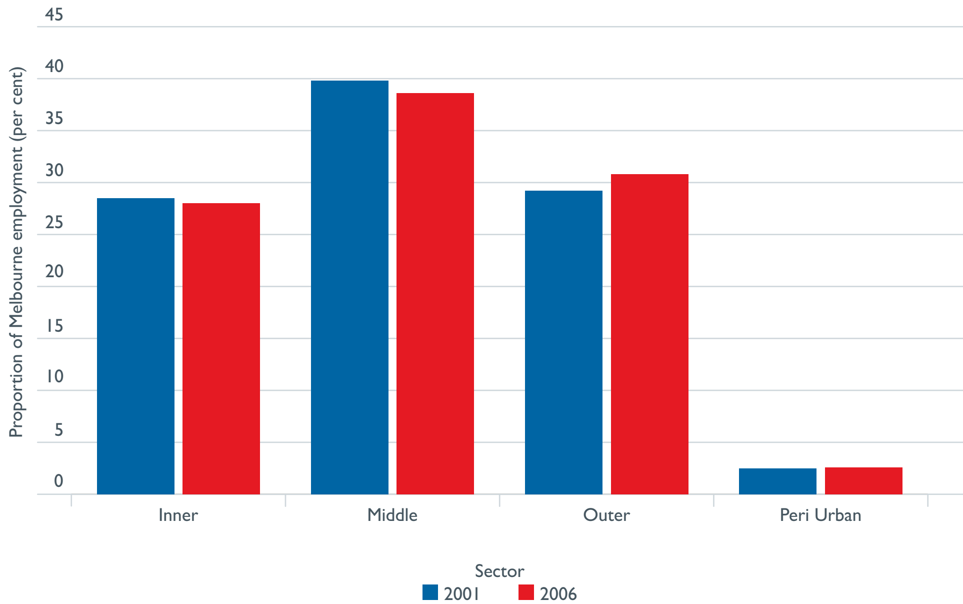
BITRE's analysis of change for employment is based on the Place of Work data from 2001 to 2006[20]. For 90 per cent of SLAs in Melbourne, boundaries remained essentially unchanged and the 2001 data can be directly compared to the 2006 data. Where boundary changes occurred between 2001 and 2006, and this involved a change of more than one per cent of either population or area, an alternative approach was adopted. The 2006 SLAs that were split have been aggregated back to their 2001 boundaries for comparison purposes. This was not possible for Whittlesea North and due to the slight boundary change the estimates of change for this SLA should be used with caution.

20 The place of work analysis is based only on persons who reported a fixed place of work within the Me bourne work ng zone, and therefore excludes those who reported no fixed work address or a place of work in 'Undefined Vic'. Due to issues of non-response, undercount and nadequately descr bed place of work, the actual number of people employed with n Melbourne's working zone is l kely to be considerably higher than the figure reported here.

Sectoral overview

Figure 4.3 summarises the sectoral distribution of employment in Melbourne from 2001 to 2006. The picture that emerges is one of stability with the largest change occurring in the Outer sector with an increase in its share by 1.5 percentage points. The Inner and Middle sectors both experienced declines in their share of employment, with falls of –0.5 and –1.1 percentage points respectively. The Middle sector remains the largest contributor at 39 per cent in 2006 with the Peri Urban sector representing only 2.6 per cent of employment.

F4.3 Contribution of sectors to total employment, Melbourne working zone, 2001 and 2006



Source: BITRE analysis of ABS 2001 and 2006 Census of Population and Housing data.

Table 4.5 presents changes in place of work by subsector between 2001 and 2006. Just under 111 200 additional employed people are now working in the Melbourne working zone. The strongest growth occurred in the Outer sector representing 51 per cent of total growth, and particularly in the Outer Southern subsector of the city which makes up almost half of this growth. The Middle and Inner sectors had similar shares of Melbourne's employment growth at 24 and 22 per cent respectively, but for the Middle sector the Middle East was the subsector that provided most of the employment growth. No sector had negative growth but the lowest growth was in the Middle North at 0.4 per cent per annum.

The surrounding working zones have all had higher average annual employment growth rates, from 2001 to 2006, than the Melbourne working zone at 1.5 per cent. The strongest growth was in Geelong's working zone at 2.3 per cent. This is comparable to the growth of the Outer sectors of Melbourne's working zone.

Population also appears to be connected with the increase in employment. The two sectors with the highest average annual growth in employment also have strong population growth rates. These are the Outer Western and Outer Northern sectors. The largest discrepancy between population growth and jobs growth was in the Inner sector, where population growth considerably outpaced jobs growth.

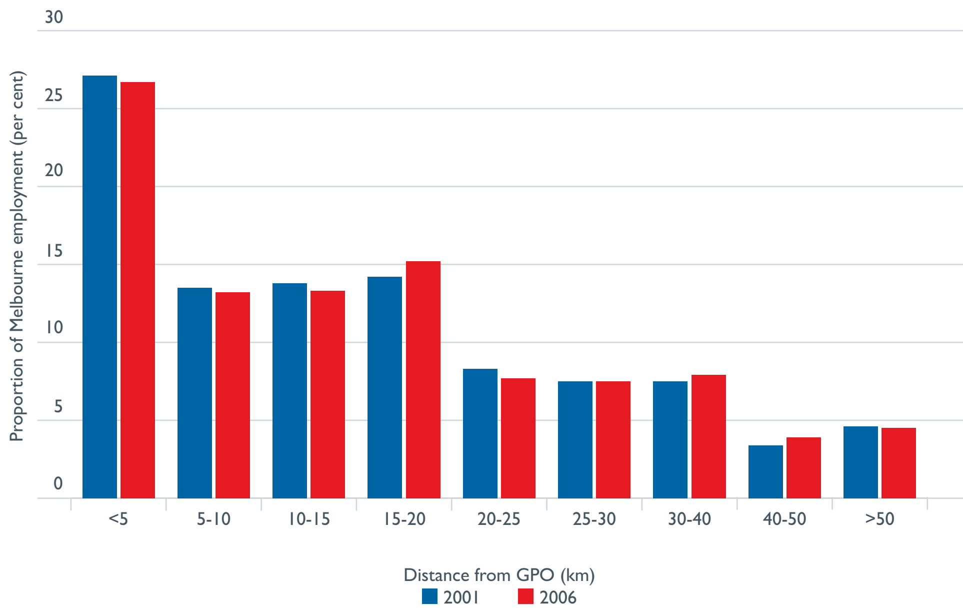
T4.5 Changes in place of work data by subsector, Melbourne working zone, 2001 to 2006

Sector	Change in employment	Average annual employment growth (per cent)	Sector's share of Melbourne employment growth (per cent)	Average annual population growth (per cent)
Inner	23 900	1.1	22	3.3
Middle	26 300	0.9	24	0.7
Middle North	2 200	0.4	2	0.6
Middle South	3 400	0.5	3	0.9
Middle East	12 100	1.1	11	0.5
Middle West	8 600	1.3	8	0.7
Outer	57 000	2.5	51	2.2
Outer Northern	10 300	2.0	9	1.9
Outer Southern	26 100	2.8	23	2.3
Outer Eastern	7 400	1.2	7	0.4
Outer Western	13 200	6.6	12	7.2
Peri Urban	4 000	2.0	4	1.5
Melbourne working zone	111 200	1.5	100	1.5
Geelong working zone	9 100	2.3	na	1.3
Ballarat working zone	4 400	2.2	na	0.9
Bendigo working zone	4 000	1.9	na	1.1
Latrobe Valley working zone	2 600	1.9	na	0.3

Source: BITRE analysis of ABS 2001 and 2006 Census of Population and Housing data and ABS Cat. 3218.0 Regional Population Growth, 2007–08

Figure 4.4 shows how the distribution of employment has changed according to distance from the CBD. The principal message is that the distribution of employment was very stable between 2001 and 2006. However, there are some apparent increases in the proportion of Melbourne's jobs located between 15 and 20 kilometres from the CBD (up from 14.2 to 15.2 per cent) and the proportion of jobs located more than 30 kilometres from the CBD (up from 15 5 to 16.3 per cent). Strong jobs growth at Melbourne Airport was an important driver of the former result, while the latter result is being partly driven by population-led jobs growth in service industries on the urban fringe. The proportion of jobs located within 15 kilometres of the CBD appears to have declined slightly, from 54.5 to 53.2 per cent. Strong outer suburban jobs growth in the 2001 to 2006 period appears to have resulted in a slightly more decentralised employment distribution within Melbourne.

F4.4 Change in the proportion of employment located at various distances from the GPO, Melbourne working zone, 2001 to 2006



Note: The General Post Office has been chosen as the central point of the CBD. Calculation based on straight l ne distance from each DZ centroid to GPO. The DZ classification was more disaggregated in 2006 than in 2001, which may nfluence the assessment of change.

Source: BITRE analysis of DZ data from ABS 2001 and 2006 Census of Population and Housing.

Statistical Local Areas

Employment became a little less spatially concentrated at the SLA scale between 2001 and 2006. The top five employing SLAs accounted for 27 per cent of employment in 2001, which dropped to 25 per cent in 2006 but the order did not change. The top employment SLA in 2006 was Melbourne Inner, followed by Melbourne Remainder, Kingston North, Port Phillip West and Knox North.

Melbourne's jobs growth was more dispersed than growth in the other cities. In Melbourne, the top contributor accounted for 9 per cent of jobs growth and the top five contributed 33 per cent. In Sydney, the top contributor was Sydney Inner with 12 per cent of jobs growth, while the top five SLAs contributed 62 per cent of the Sydney working zone's jobs growth. In Perth, 20 per cent of jobs growth was concentrated in the Perth Inner SLA, while the top five SLAs contributed 48 per cent of jobs growth.

The Gini coefficients (at both the SLA and DZ scales) declined for Melbourne between 2001 and 2006, indicating that jobs became more evenly distributed throughout the city. Specifically, the Gini coefficient calculated based on:

- 2001 SLA boundaries, fell from 0.525 in 2001 to 0.515 in 2006

- 2001 destination zone boundaries fell from 0.621 in 2001 to 0.604 in 2006.

The dispersed nature of Melbourne's recent jobs growth has created a less spatially concentrated employment distribution in 2006, compared to 2001.

Table 4.6 highlights the SLAs that experienced an increase in the place of work data involving more than 3000 employed persons or a decrease involving more than 1000 employed persons between 2001 and 2006. The highest contributor was Southbank-Docklands representing 9 per cent of the city's job growth with an absolute change of over 10 500 employed persons. In contrast, Melbourne Inner had strong growth in population but much slower growth in jobs.

The City of Melbourne LGA contributed 18 per cent of Melbourne working zone's jobs growth between 2001 and 2006. This is marginally higher than the equivalent figure of 16 per cent for the central LGA in both Sydney and Perth.

T4.6 Changes in place of work data by SLA, Melbourne working zone, 2001 to 2006

SLA	Sector	2001 People who work in SLA	Change in employment, 2001 to 2006	Average annual employment growth (per cent)	Share of employment growth in Melbourne (per cent)	Average annual population growth (per cent)
Largest increases						
Melbourne : Southbank-Docklands	Inner	27 200	+10 500	6.8	9	25.7
Wyndham–North	Outer Western	24 300	+8 100	5.9	7	3.7
Melbourne–Inner	Inner	146 100	+7 300	1.0	7	13.9
Greater Dandenong Balance	Outer Southern	32 200	+5 500	3.2	5	0.7
Casey–Berwick	Outer Southern	12 200	+5 000	7.1	4	6.0
Hume–Craigieburn	Outer Northern	17 900	+4 700	4.7	4	7.3
Monash–Waverley East	Middle East	11 100	+3 800	6.0	3	–0.3
Brimbank–Sunshine	Middle West	23 000	+3 700	3.0	3	1.4
Brimbank–Keilor	Middle West	15 400	+3 500	4.2	3	0.4
Frankston–West	Outer Southern	25 900	+3 300	2.4	3	–0.2
Largest declines						
Moreland–Coburg	Middle North	12 700	–1600	–2.6	–1	0.8
Moreland–Brunswick	Middle North	13 800	–1100	–1.6	–1	1.0
Stonn ngton–Prahran	Inner	23 100	–1000	–0.9	–1	1.3

Note: Based on 2001 SLA boundaries.

Source: BITRE analysis of ABS 2001 and 2006 Census of Population and Housing data and ABS Cat. 3218.0 Regional Population Growth, 2007–08 (ABS 2009a)

Other major contributors to Melbourne's jobs growth were the Outer sector SLAs of Wyndham North (+8100 jobs), Greater Dandenong Balance (+5500), Berwick (+5000) and Craigieburn (+4700). With the exception of Greater Dandenong Balance, these SLAs experienced above-average rates of population growth, and strong population growth is typically associated with strong jobs growth in industries that cater to local demand such as Retail trade, Education, Personal and other services and Construction. The industry drivers of jobs growth in these SLAs is explored in Chapter 5.

About 20 per cent of Melbourne's SLAs experienced an employment decline between 2001 and 2006. Job losses were greatest in the Coburg and Brunswick SLAs in the Middle North sector and in the Prahran SLA in the Inner sector. All three SLAs experienced an increase in population over the period.

Map 4.7 presents the changes in the place of work data between 2001 and 2006 for SLAs and compares it to the changes in the number of employed residents in each SLA over the same period. A clear difference is present, between employed residents and the number of workers within the SLAs, for the Peri Urban SLAs close to the edges of the working zone. These SLAs include Ballan, Yarra Ranges Part B and Hepburn East. Loss in workers is also evident in SLAs in the Middle North sector. This matches the long term trend with the movement of industry further out, particularly for the manufacturing and storage industries.

Strong growth in employment for both residents and workers is particularly evident in Southbank-Docklands, Wyndham North and Craigieburn. Locations with opposite outcomes of population declines with employment growth include Broadmeadows, Waverley East, Dandenong and Manningham West.

Map 4.8 takes a closer look at the average annual percentage change in workers and employed residents from 2001 to 2006. At the SLA scale the rate of employment growth was greatest for:

- Melton East (average annual growth of 26 per cent)
- Wyndham South (10 per cent)
- Wyndham West (9 per cent)
- Whittlesea North[21] (8 per cent)
- Moorabool–Bacchus Marsh (7 per cent)
- Casey–Berwick (7 per cent).

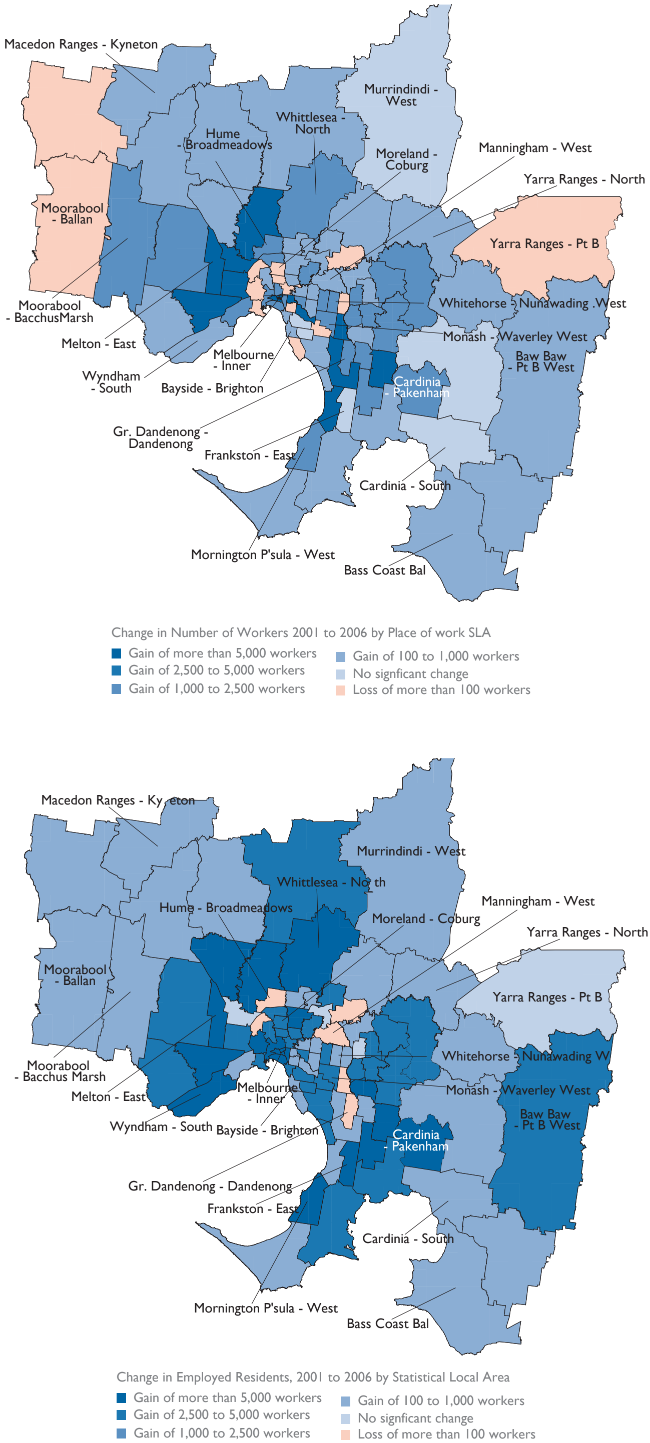
The highest rates of jobs growth are evident in the Outer Western and Northern locations of the city with pockets in the south and the city centre. The striking feature is the jobs growth in the western part of the working zone, which is characterised by lower but still strong growth in employed residents.

Just fewer than 20 per cent of SLAs had declines in employment, but most declined at less than 1 per cent per annum. Four SLAs experienced greater losses and these were:

- Yarra Ranges Part B (average annual growth rate of –17 per cent)
- Moorabool–Ballan (–10 per cent)
- Moreland–Coburg (–3 per cent)
- Moreland–Brunswick (–2 per cent).

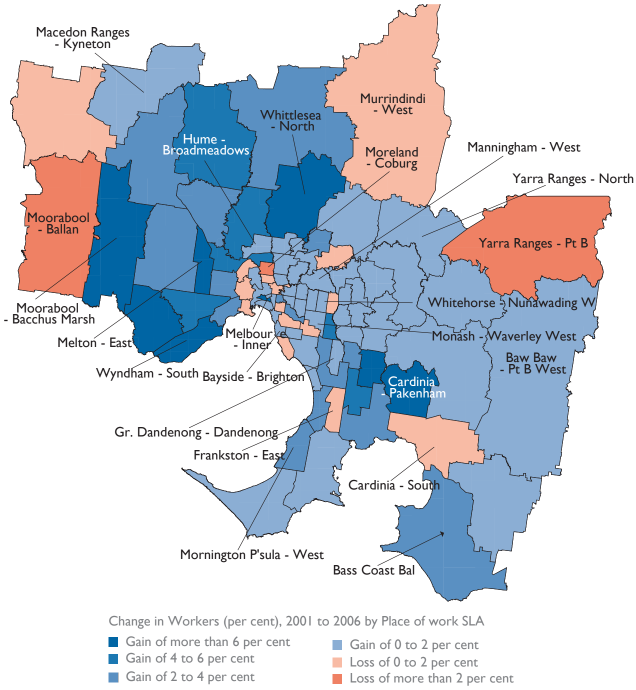
21 The Whittlesea North SLA experienced a boundary change between 2001 and 2006 and the employment change est mate should be treated with some caution.

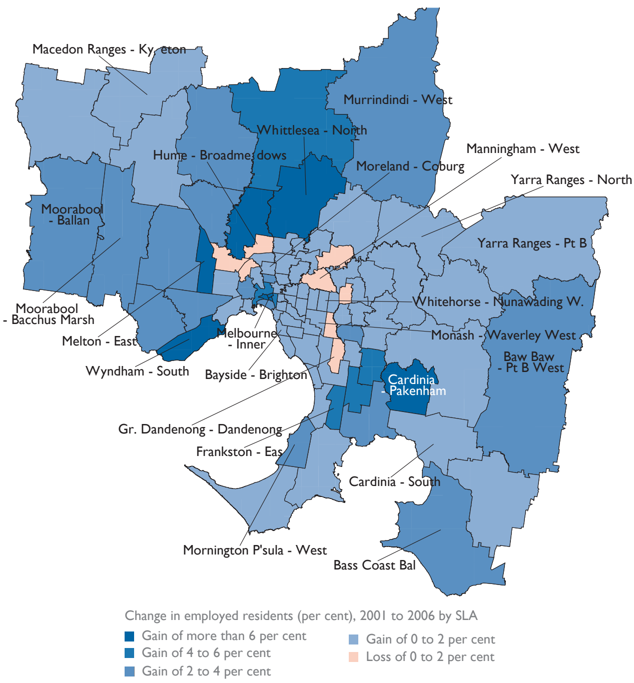
M4.7 Changes in the number of employed people working and living in SLAs, Melbourne working zone, 2001 to 2006



Source: BITRE analysis of ABS 2001 and 2006 Census of Population and Hous ng data.

M4.8 Average annual percentage changes in workers and employed residents by SLA, Melbourne working zone, 2001 to 2006





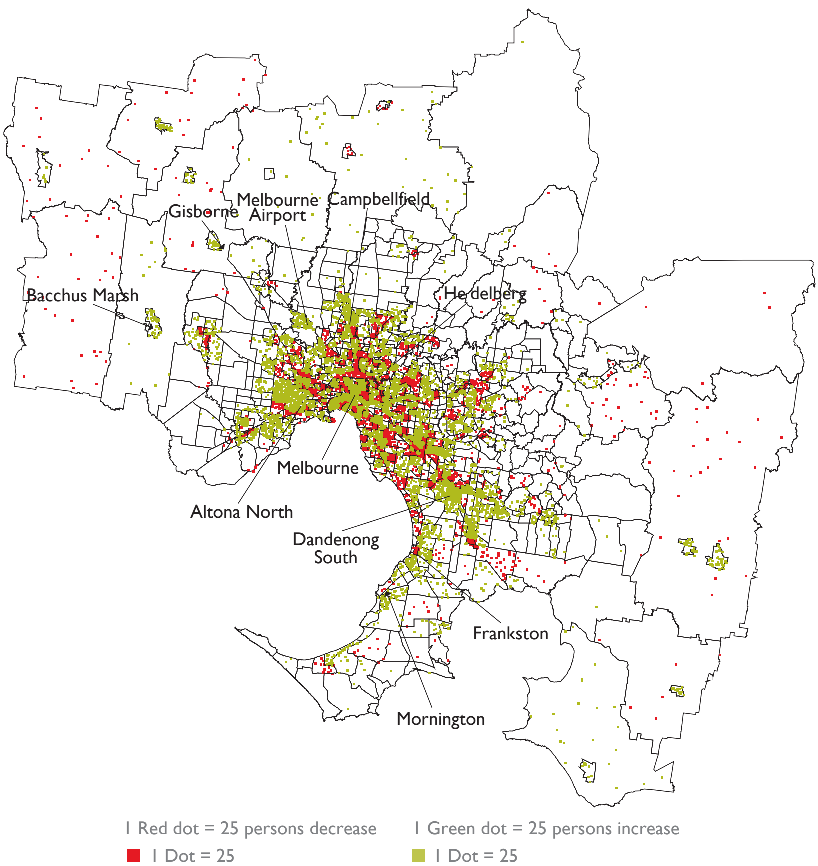
Source: BITRE analysis of ABS 2001 and 2006 Census of Population and Housing data.

Destination zones

Understanding can be gained from analysing the changes that have been occurring at the smaller geographical scale of destination zones. The ABS destination zones for 2001 and 2006 were placed on a common boundary by aggregating the 2006 destination zones to 2001 boundaries. Most 2006 boundaries are splits of the 2001 boundaries. At this detailed spatial scale, estimates of employment change are subject to numerous sources of error. Rather than relying on the measure of change for any single DZ, it is more useful to look for clusters of DZs experiencing a similar pattern of change.

Map 4.9 presents the DZ data on employment change for the Melbourne working zone from 2001 to 2006. The map shows intermixed jobs growth and declines but growth appears to be the stronger of the two. The city centre shows strong employment growth. A feature of the map is the jobs growth evident in the Peri Urban population centres such as Bacchus Marsh, Warragul, Gisborne and Kyneton.

M4.9 Dot density map of employment change, Melbourne working zone, 2001 to 2006

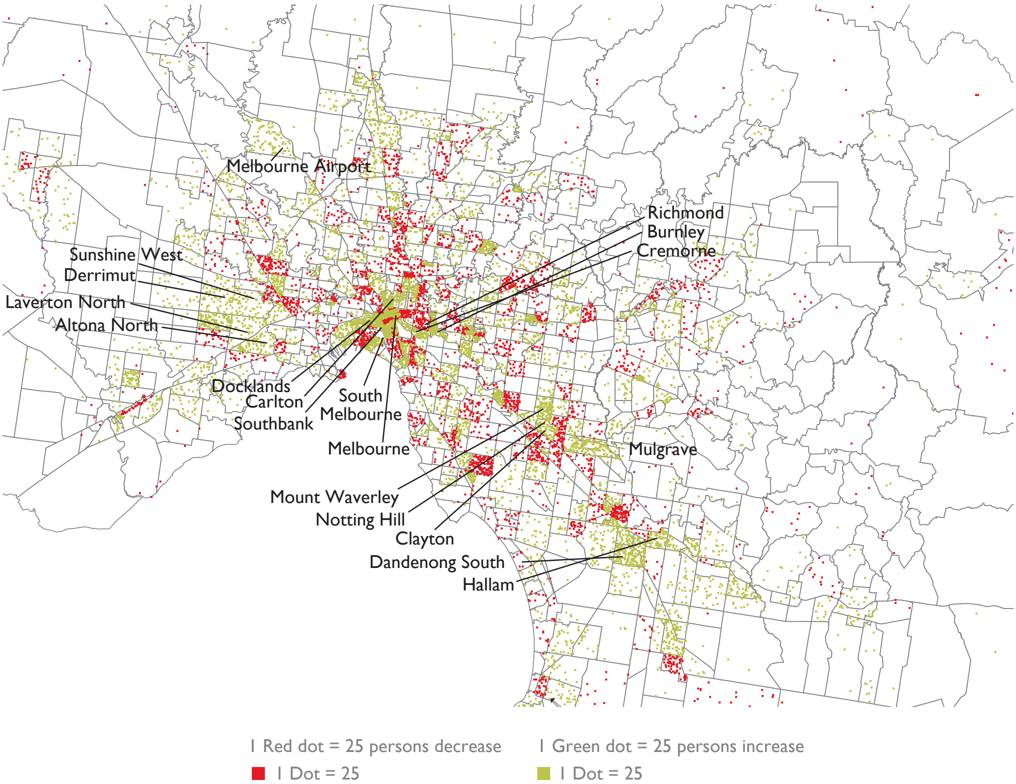


Note: About 1.3 per cent of Melbourne working zone employment in 2006 was allocated to an SLA but was not allocated to a destination zone by ABS and so is excluded from the change calculation. A further 1.9 per cent of employment was only allocated to a suburb by ABS (not a DZ) and was concorded to DZ by BITRE based on the employment size of the DZs within the suburb.

Source: BITRE analysis of ABS Census of Population and Housing 2001 and 2006 customised data request, based on 2001 destination zone boundaries.

Map 4.10 provides a more detailed picture of the changing patterns of employment by DZ for Melbourne, from 2001 to 2006. Strong employment growth is clearly evident in the city centre and the surrounding suburbs such as Southbank, Docklands, South Melbourne and Carlton. As previously noted, the City of Melbourne LGA contributed 18 per cent of the Melbourne working zone's jobs growth between 2001 and 2006.

M4.10 A close-up dot density map of employment change, Melbourne working zone, 2001 to 2006



Note: About 1.3 per cent of Melbourne work ng zone employment in 2006 was allocated to an SLA but was not allocated to a dest nation zone by ABS and so is excluded from the change calculation. A further 1.9 per cent of employment was only allocated to a suburb by ABS (not a DZ) and was concorded to DZ by BITRE based on the employment size of the DZs within the suburb.

Source: BITRE analysis of ABS Census of Population and Housing 2001 and 2006 customised data request, based on 2001 dest nation zone boundaries.

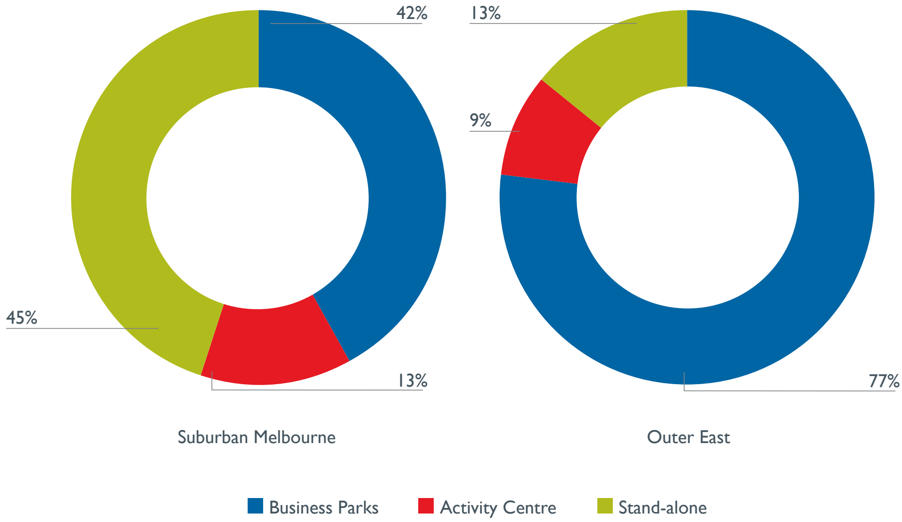
There are several other major clusters of jobs growth visible on the map:

- A cluster of destination zones incorporating the industrial areas of Derrimut, Sunshine West, Laverton North and Altona North in Melbourne's west together contributed about 8 per cent of Melbourne's jobs growth. This employment growth area incorporates the southern end of the Western Ring Road and extends west along the Princes Freeway. Strong jobs growth in the vicinity of the Western Ring Road was also a feature of the 1996 to 2001 period (O'Connor and Rapson 2003). This cluster has a strong manufacturing, logistics and warehousing focus and forms part of the West Industrial Node.
- A cluster of destination zones incorporating the industrial areas of Dandenong South and Hallam in Melbourne's south together contributed about 6 per cent of Melbourne's jobs growth. This employment growth area is located to the south-east of Dandenong town centre and immediately south of the Princes Highway. It contains a number of distribution centres, but also includes company headquarters and retailing. This cluster forms part of the South Industrial Node.
- A cluster of destination zones incorporating the Axxess Corporate Park, Monash Business Park, Monash University and CSIRO campuses in Melbourne's eastern suburbs of Mount Waverley, Notting Hill and Clayton, together contributed about 4 per cent of jobs growth.
- A cluster of destination zones based in the inner suburbs of Burnley, Cremorne and the southern part of Richmond also contributed about 4 per cent of Melbourne's jobs growth.
- A pair of destination zones in the eastern suburb of Mulgrave contributed 3 per cent of jobs growth. These destination zones include Enterprise Park Business Estate, a Woolworths office and the Waverley Park redevelopment.
- The destination zone based around Melbourne Airport added 2100 jobs.

Six industrial nodes have been identified across the metropolitan area which are estimated to have sufficient land stocks for approximately 25 years of demand (DPCD 2008h)—West Industrial Node, North Industrial Node, South Industrial Node, Melton Industrial Node, Pakenham Industrial Node and Airport Industrial Node. Of these, the West Industrial Node, the South Industrial Node and the Airport Industrial Node were amongst the major suburban clusters of jobs growth between 2001 and 2006.

Two industrial areas made the largest contribution to Melbourne's suburban jobs growth between 2001 and 2006, but several office parks also feature in the jobs growth clusters listed above. Data collated by Robert Papaleo of *Charter Keck Cramer* on office construction for suburban Melbourne from 2000 to 2005 and cited in O'Connor (2006) (see Figure 4.5) shows a heavy weighting towards business park development rather than activity centres. Concentrating on a group of eastern suburban councils (Monash, Whitehorse, Manningham, Knox, Maroondah), he finds 'since 2000, this form of development has accounted for three-quarters of total new supply in the Outer East' (ibid, p.11). This is similar to the Sydney findings by Parolin and Kamara (2003).

F4.5 Suburban Melbourne and Outer Eastern Region new office stock from 2000 to 2005



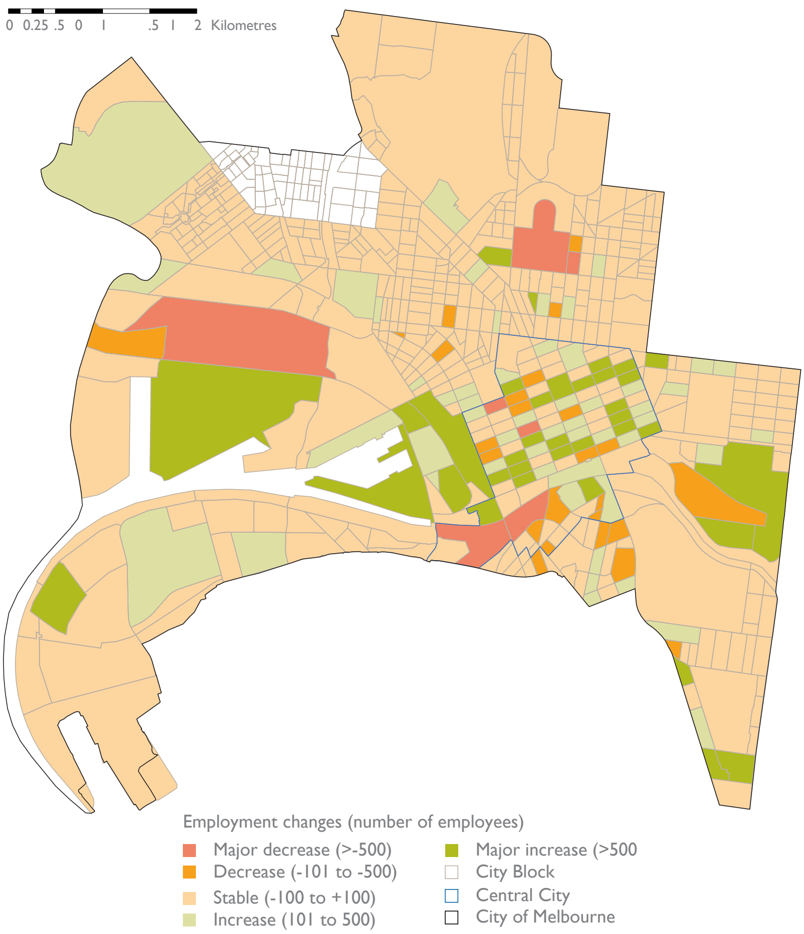
Note: Activity centres are the Principal Activity Centres as defined by Me bourne 2030.
Source: Replications of figures in O'Connor (2006, p.11)

While the central city has shown strong jobs growth overall, Map 4.10 reveals some pockets of job loss within the CBD and also in the surrounding areas (e.g. Albert Park, Port Melbourne, Flemington). Some of the other important clusters of job loss within Melbourne are:

- A set of destination zones along the eastern and southern borders of the Monash University/ Mount Waverley/Notting Hill growth cluster experienced substantial employment loss between 2001 and 2006.
- A cluster of destination zones in the inner suburbs of Abbottsford, East Melbourne and Richmond (northern part only) experienced significant job loss.
- A strip of destination zones broadly following Sydney Road through the suburbs of Brunswick and Coburg experienced notable job loss.

Map 4.11, which is based on the City of Melbourne's Census of Land Use and Employment (CLUE), provides a more detailed perspective on patterns of jobs growth and decline between 2002 and 2006. There appears to have been significant job losses on the southern side of Collins Street, between Spencer and Swanston Streets. The strong jobs growth in Docklands and Southbank is another prominent feature. CLUE data reveals that Docklands more than doubled its employment from 6 700 in 2002 to 13 900 in 2006, while Southbank grew from 31 900 to 38 000 jobs over the same period.

M4.11 Employment change in the City of Melbourne, 2002 to 2006



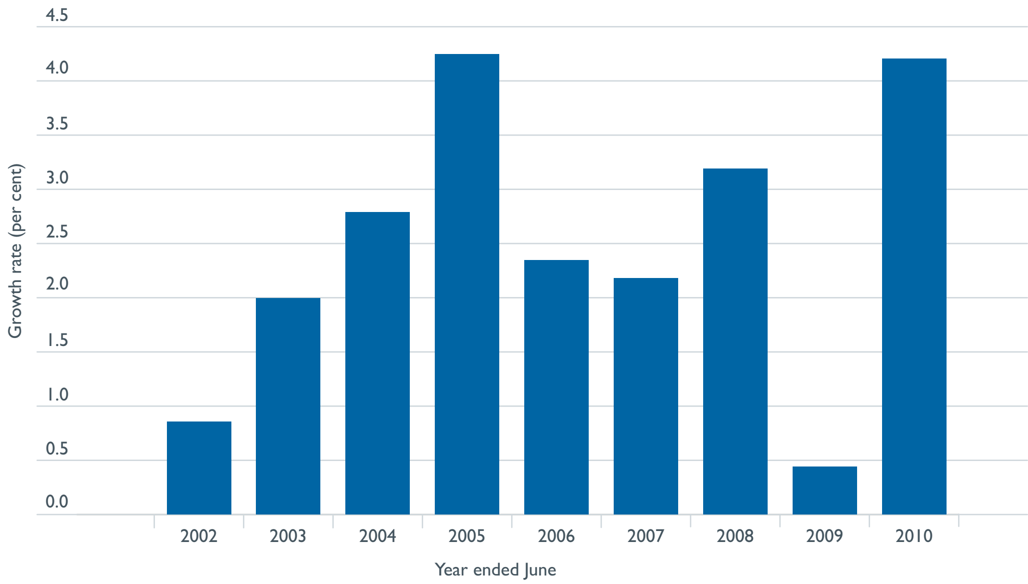
Source: City of Melbourne (based on CLUE data).

Recent changes in employment

The ABS *Labour Force Survey* provides the most up-to-date information on the number of employed residents in Melbourne's metropolitan area. It does not however provide information on the location of jobs. Figure 4.6 presents the growth rate for employed residents from 2001 to 2010. Over the entire period, employment grew by 24 per cent but this hides a lot of variation over this time. Employment growth has been positive throughout, with the strongest growth occurring in the years ending June 2005 and 2010 which both had a 4 per cent increase. The lowest growth was in 2009 at only 0.4 per cent. The dramatic drop in the growth rate in 2009 can be attributed to the global financial crisis.

Between June 2006 and 2010, Melbourne SD gained 197 000 employed residents. Melbourne's average annual employment growth rate between 2006 and 2010 has been very similar to the growth rate during the 2001 to 2006 period (2.5 per cent compared to 2.4 per cent).

F4.6 Growth in employed residents of Melbourne SD, 2001 to 2010



Note: Excludes the Peri Urban sector

Source: BITRE analysis of ABS Cat. 6291.0.55.001 (ABS 2009d)

The Census of Land Use and Employment (CLUE) provides information on employment and industry trends within the City of Melbourne. CLUE employment numbers for the City of Melbourne in 2006 were 22 per cent higher than figures from the ABS Census of Population and Housing. Part of this gap could be due to non-response to the relevant census questions and employees reporting no fixed place of work in the census, while the point in time nature of the census data may also contribute to the difference.

Between 2006 and 2008, the City of Melbourne added 50 400 new jobs, representing an increase of 7 per cent per year (City of Melbourne 2009). This is much more rapid jobs growth than the 3 per cent per annum growth experienced between 2002 and 2006. It is also more rapid jobs growth than experienced by the Melbourne SD between 2006 and 2008 (2.7 per cent), according to the ABS *Labour Force Survey*. These results suggest that, since 2006, the City of Melbourne has contributed a substantial part of Melbourne's jobs growth and increased its share of the city's total employment.

CLUE data reveals that about 25 800 jobs were added to the CBD between 2006 and 2008 and 6 900 to Docklands, while Southbank and Carlton both experienced a slight decline in employment. Unfortunately, similar information is not available on post-2006 employment trends for other parts of the Melbourne working zone. However, data on industrial land use from DPCD (2010c) may give some indication of spatial patterns of industry growth. It shows that since 2006 take up has been highest in the West Industrial Node (centred on the Wyndham

North SLA); with significant industrial land take up also apparent in the South Industrial Node (Greater Dandenong Balance SLA). Another relevant information source is the 2009 DEEWR *Surveys of Employers' Recruitment Experiences* (DEEWR 2009a, b, c) which point to a higher proportion of South Eastern Melbourne[22] employers planning to recruit over the coming 12 months (47 per cent), compared to North West Melbourne (39 per cent) and Moonee Valley (36 per cent) employers, and a higher proportion of South Eastern Melbourne employers planning to recruit to increase staff numbers (rather than due to turnover). However, by 2010, the recruitment outlook in North West Melbourne had improved markedly (DEEWR 2010b).

Industrial land sales data shows that the suburbs of Derrimut in the West Industrial Node and Campbellfield in the North Industrial Node were both featured repeatedly as one of the top three suburbs for industrial sales in the years from 2005–06 to 2009–10 (PC 2011). These were important jobs growth locations in the pre-2006 period, and appear to be continuing to play a key role in Melbourne's industrial activity.

Melbourne's strategic plan

This section takes a closer look at the strategies in place to manage employment growth in Melbourne. *Melbourne 2030*'s employment-related objectives relate largely to concentrating new economic development in centres, including achievement of growth across the network of activity centres and restriction of out of centre development. *Melbourne 2030* also aims to ensure economic development is focused in areas that are well served by the public transport system and to maintain an adequate supply of well located land for industry.

While *Melbourne @ 5 million* refined the activity centre hierarchy, the underlying policy objectives of concentrating economic development in centres and locating jobs growth in accessible areas remain in place.

However, the two state government planning documents have quite different objectives regarding the role of Central Melbourne. *Melbourne 2030* aims to strengthen Central Melbourne's capital city functions and its role as the primary hub for the metropolitan area (DI 2002a, p. 3). *Melbourne @ 5 million* shifted the focus to providing more jobs outside central Melbourne (DPCD 2008c, p. 7), particularly in employment corridors and the suburban Central Activities Districts (CADs).

This section uses the available place of work data[23] to assess the extent to which there has been change since 2001 with respect to:

- Concentrating jobs growth in centres
- Central Melbourne's contribution to jobs growth.

Because it requires analysis of recent jobs growth in the context of public transport networks, the issue of whether jobs growth has been focused in public transport accessible locations will be analysed in Chapter 6.

22 South East Me bourne includes the Cardinia, Casey, Frankston, Greater Dandenong and K ngston LGAs. North West Melbourne ncludes the Brimbank, Hobson's Bay, Melton, Wyndham, Hume, Maribyrnong and Whittlesea LGAs.

23 This study focuses on population, employment and commuting trends, rather than land use trends. Thus, the issue of trends in ndustrial land supply is not considered here.

Concentrating jobs growth in centres

A central part of the *Melbourne 2030* strategy is to encourage development in activity centres which are to become 'vibrant hubs where people shop, work, meet, relax and often live' (DPCD 2009e). Activity centres are also places for accessing 'public administration, education, health and emergency services' (DI 2002b, p. 46). Activity centres are intended to raise the level of concentration of various forms of activities across the city and 'will be the focus of major change in metropolitan Melbourne over the next 30 years' (DI 2002b p. 46).

Melbourne @ 5 million introduced a move towards a multicentre structure by creating six new Central Activities Districts (CADs). It is argued a multi-centre city 'will reduce congestion and enable people to spend less time commuting to and from work and more time with their family' (DPCD 2008c, p. 9). The future of CADs is envisaged as:

- 'Significant CBD-type jobs and commercial services;
- A strong and diverse retail sector;
- Specialised goods and services drawing on a large regional catchment;
- Significant opportunities for housing redevelopment in and around these centres;
- High levels of accessibility for walking, cycling, public transport or car by being located at a junction in the Principal Public Transport network; and
- Vibrant centres of community activity with a range of public facilities' (DPCD 2008c p.11).

There are seven CADs—Melbourne, Box Hill, Broadmeadows, Dandenong, Footscray, Frankston and Ringwood. The closest CAD to the CBD is Footscray and the furthest away is Frankston at just over 50 kilometres.

There are currently 20 Principal Activity Centres (PACs) that are regarded as 'large centres' with a 'mix of activities that are well serviced by public transport' (DPCD 2009e) and cater to a large catchment area of several suburbs. PACs have developed along two paths which are the town centres such as Sunshine, Moonee Ponds and Coburg, and the stand-alone centres developed around large shopping centres such as Chadstone, Highpoint and Southland.

Melbourne's strategic plan also identifies ten specialised activity centres. These are regarded as important economic localities, with strong employment links. A common speciality is biotechnology, typically around a university campus. A description of the specialised activity centres is provided in Table 4.7.

PC (2011) discusses how prescriptive planning regulations related to activity centres in Australian cities place restrictions on competition, with prescriptive zones and complex use conditions said to be 'particularly restrictive in Victoria, ACT and Western Australia' (p. 277). While the aim of such regulation may be to preserve the viability of existing activity centres, 'there is little to indicate that impacts on competition—or an analysis of the benefits of the desired outcome versus the costs of restricted competition—were considered in establishing planning regulations' (ibid, p.xxxiii). Consideration of the impacts on existing businesses and activity centre viability in the assessment of DAs or rezoning applications are singled out as measures which can 'unjustifiably restrict competition' (ibid, p. 351). However, survey data shows that Victoria had the second lowest proportion of city councils taking impacts on existing businesses or the viability of a nearby centre into account as a major consideration (ibid).

Of the six states, Victoria had the highest proportion of city councils (91 per cent) reporting that they enforced an activity centres approach (PC 2011). Further evidence of enforcement is provided by the fact that

> 'City councils in Victoria and Queensland rejected the most DAs on the basis that the proposal was inconsistent with specified activities to be located either *outside* or *within* the relevant activity centre' (PC 2011, p. 289).

T4.7 Specialised Activity Centres

Specialised Activity Centres	Description
Alfred medical research and education precinct, Prahran	This precinct 'integrates four nstitutions nto one complex at the A fred Hospital on Commercial Road, Prahran. The medical centres nclude: Baker Medical Research Institute, Macfarlane Burnet Centre for Medical Research, Monash Medical School Research Laboratories and the A fred L brary and Education Facilities' (DesignInc 2010)
Aust n Biomedical Alliance Precinct, Heidelberg	A relatively new biomedical precinct formed through the collaboration of several Research Institutes, Aust n Health and the University of Me bourne (Bus ness Victoria 2007)
Deak n University, Burwood	Melbourne campus which accommodates more then 13 000 undergraduate and postgraduate students. Areas of study nclude area such as arts, business, env ronment, health and community services, teach ng and creative arts (Deak n University 2010)
La Trobe Technology Park, Bundoora	'La Trobe's R&D Park is the largest wholly University owned and managed network of technology parks n Australia, focussed on nnovation, new product development and realisation, ndustry collaboration, and the commercialisation of ntellectual property.' (La Trobe ndp)
Melbourne A rport	Melbourne's nternational airport in the Outer Northern sector of the city.
Monash University/ Health Research Prec nct, Clayton	An area conta ning Monash University and The Monash Health Research Precinct is a partnersh p between Prince Henry's Institute, Southern Health, Monash University and the Monash Institute for Medical Research. (PHI 2009) The fund ng will support the development of translational facilities for eight research areas (cancer, cardiovascular and metabolic diseases, endocr nology and metabolism, inflammatory and nfectious disease, men's health, neuroscience and mental health, pediatrics and women's health), of which PHI is a partic pant in five of the themes.
Parkville Medical and Bioscience Prec nct	This research centre is the major precinct n Australia for medical and bioscient fic research, education, clinical practice, production of pharmaceuticals and biotechnology products (The University of Melbourne 2003).
University Hill Technology Precinct, Bundoora	University Hill is a mixed-use prec nct that will house 3000 residents and employ over 2000 people (DPCD 2010d)
Victoria University, Footscray	Primarily positioned n the western region of the city it is a multi-sector nstitution with a focus on research, teaching and tra ning.
Werribee Employment Precinct	A 925 hectare site of state government owned land which is 'home to a number of research and development organisations includ ng CSIRO Food and Nutritional Sciences, Victoria University, Melbourne University Veterinary Cl nic, the Dairy Innovation Centre and Agrifood Technology (Leadwest 2010).

Source: *Melbourne @ 5 million* (DPCD 2008c)

Employment in activity centres

Table 4.8 presents BITRE's estimates of employment in 2006 for activity centres covering the CADs, PACs and Specialised Activity Centres (SACs). Appendix D presents results of sensitivity analysis based on DPCD's DZ based definition of activity centres.

According to Table 4.8, the presented activity centres represent around 31 per cent of Melbourne's employment for 2006. The figure would of course rise if all activity centres were included. The strongest employing activity centre is the Melbourne CAD which includes around 216 300 jobs and represents 14 per cent of Melbourne employment. Overall, CADs represent 18 per cent of Melbourne employment, with Dandenong and Box Hill having strong employment precincts of about 14 600 and 13 600 jobs respectively. The Dandenong CAD in the south-east has a key target of creating 5 000 new jobs and improving leisure and recreation facilities in the area (DPCD 2010a).

Both Principal and Specialised Activity Centres represent a large proportion of Melbourne's employment, combining to represent 13 per cent of Melbourne's employment. Those with substantial employment include:

- Melbourne's international airport is an important employment hub with 16 400 jobs in the Specialised Activity Centre.
- The Specialised Activity Centre of Parkville Medical and Bioscience Precinct in Parkville (14 900 jobs).
- The PAC in Prahran/South Yarra which covers the Chapel Street shopping strip between the two suburbs (16 100 jobs).

T4.8 Employment in activity centres, 2006

Activity centres	Employed persons 2006	Proportion of employment (per cent)
Central Activities Districts	**279 200**	**17.8**
Me bourne	216 300	13.8
Box Hill (Transit City)	13 600	0.9
Broadmeadows (Transit City)	6 800	0.4
Dandenong (Transit City)	14 600	0.9
Footscray (Transit City)	6 800	0.4
Frankston (Transit City)	10 000	0.6
Ringwood (Transit City)	11 000	0.7
Principal Activity Centres	**127 800**	**8.2**
Airport West	4 800	0.3
Camberwell Junction	8 900	0.6
Chadstone	5 100	0.3
Cheltenham, Southland	4 700	0.3
Coburg	3 500	0.2
Cranbourne	5 000	0.3
Doncaster Hill	5 000	0.3

continued

T4.8 Employment in activity centres, 2006 (continued)

Activity centres	Employed persons 2006	Proportion of employment (per cent)
Principal Activity Centres (continued)		
Epping (Transit City)	6 000	0.4
Glen Waverley	5 900	0.4
Greensborough	4 500	0.3
Mar byrnong, Highpo nt	4 300	0.3
Moonee Ponds	6 500	0.4
Narre Warren, Founta n Gate	8 000	0.5
Prahran/South Yarra	16 100	1.0
Preston, High Street	7 000	0.4
Preston, Northland	7 800	0.5
Sunshine	7 500	0.5
Sydenham (Transit City)	3 900	0.2
Want rna South, Knox Central	10 400	0.7
Werribee (Transit City)	2 900	0.2
Specialised Activity Centres	**74 500**	**4.8**
Alfred Medical Research and Education Precinct, Prahran	10 400	0.7
Aust n Biomedical Alliance Precinct, Heide berg	6 900	0.4
Deak n University, Burwood	5 900	0.4
La Trobe Technology Park, Bundoora	3 800	0.2
Melbourne A rport	16 400	1.0
Monash University/ Health Research Precinct, Clayton	10 700	0.7
Parkville Medical and Bioscience Precinct	14 900	1.0
University Hill Technology Prec nct, Bundoora	1 900	0.1
Victoria University, Footscray	1 200	0.1
Werribee Employment Precinct	2 400	0.2
All presented activity centres	**481 400**	**30.8**
Melbourne SD	**1 565 100**	**100.0**

Note: About 1.3 per cent of Me bourne working zone employment n 2006 was allocated to an SLA but was not allocated to a destination zone by ABS and so is excluded from the calculation. A further 1.9 per cent of employment was only allocated to a suburb by ABS (not a DZ) and was concorded to DZ by BITRE based on the employment size of the DZs with n the suburb.
DPCD provided BITRE with a 2006 DZ based definition for activity centres, which was used as a start ng point to define activity centre boundaries that were comparable between 2001 and 2006. Hence, priority was given to ensuring max mum consistency between the activity centre boundaries based on 2001 DZs and those based on 2006 DZs, and also with the boundaries based on CCDs. In practice this involved adopt ng relatively encompassing boundaries which often extended well beyond the retail prec nct.

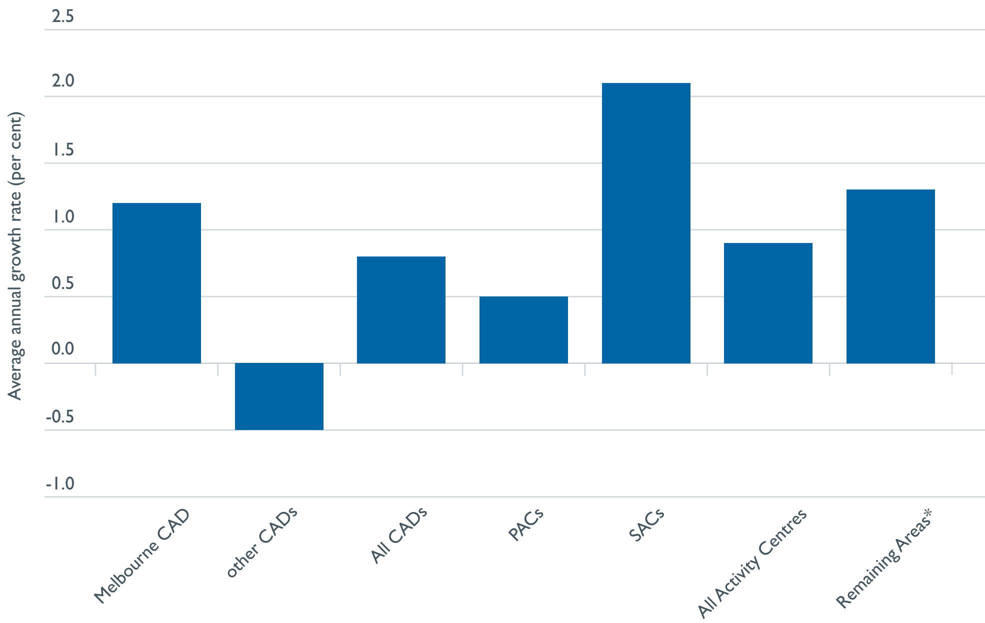
Source: BITRE analysis of 2006 ABS Census of Population and Housing customized data at DZ scale, DPCD (2009e) and activity centre structure plans.

Change between 2001 and 2006

Figure 4.7 summarises BITRE's estimates of the rate of employment growth in the different types of activity centres from 2001 to 2006. The standout performer was the Specialised Activity Centres, which experienced average annual jobs growth of 2.1 per cent per annum. Specialised Activity Centres also experienced the most rapid jobs growth of any centre type in both Perth (3.8 per cent growth per annum) and Sydney (2.1 per cent). The Specialised Activity Centres accounted for about 8 of Melbourne's jobs growth between 2001 and 2006, with the Monash University/Health Research Precinct in Clayton, Melbourne Airport and Parkville Medical and Bioscience Precinct making the largest individual contributions. The Werribee Employment Precinct and the two Bundoora based technology parks also grew rapidly, from a lower base.

The Melbourne CAD experienced average annual jobs growth of 1.2 per cent per annum. However, the remaining CADs (as a group) experienced a slight decline in employment between 2001 and 2006. Employment losses were greatest for Dandenong and Frankston, with Box Hill and Ringwood CADs experiencing jobs growth. That said, the overall CAD result is clearly dominated by the Melbourne CAD.

F4.7 Employment growth rates by activity centre type, Melbourne SD, 2001 to 2006



Note: About 1.3 per cent of Melbourne working zone employment in 2006 was allocated to an SLA but was not allocated to a destination zone by ABS and so is excluded from change calculations. A further 1.9 per cent of employment was only allocated to a suburb by ABS (not a DZ) and was concorded to DZ by BITRE based on the employment size of the DZs within the suburb.
DPCD provided BITRE with a 2006 DZ based definition for activity centres, which were then used as a starting point to define activity centre boundaries that enabled comparable analysis between 2001 and 2006. Hence, priority was given to ensuring maximum consistency between the activity centre boundaries based on 2001 DZs and those based on 2006 DZs, and also with the boundaries based on CCDs. In practice this involved adopting relatively encompassing boundaries which often extended well beyond the retail precinct.
*Remaining areas includes major centres and neighbourhood centres as well as industrial areas and dispersed locations.

Source: BITRE analysis of 2006 and 2001 ABS Census of Population and Housing customised data at destination zone scale, DPCD (2009e) and activity centre structure plans.

The PACs experienced moderate jobs growth, averaging 0.5 per cent per annum between 2001 and 2006. Some PACs experienced significant job losses (e.g. Doncaster Hill and Coburg), while newer centres in residential growth areas have added many jobs (e.g. Narrewarren-Fountain Gate, Sydenham). The more established Chadstone and Cheltenham-Southland PACs also experienced above-average rates of employment growth. BITRE's Sydney and Perth analysis indicates that the experience of the larger retail-based activity centres was similarly mixed in those cities, with some experiencing significant job decline (e.g. Penrith and Hurstville in Sydney, Morley and Cannington in Perth).

Overall, the selected activity centres experienced a lower rate of jobs growth than the remaining areas of Melbourne between 2001 and 2006. About one-quarter of Melbourne's jobs growth occurred in the higher-order activity centres (i.e. CADs, PACs and Specialised Activity Centres), and their employment share fell slightly from 31.1 per cent in 2001 to 30.8 per cent in 2006. Thus, jobs growth was not concentrated in these higher-order activity centres, and their relative contribution to Melbourne's employment declined slightly over the period. The overall picture hides considerable variation. Jobs growth was heavily concentrated in Melbourne's Specialised Activity Centres, to a much greater extent than would be expected based on their 2001 employment share. In contrast, the suburban CADs made a negative contribution to Melbourne's jobs growth between 2001 and 2006.

The suburban CADs were only elevated to CAD status in 2008 (they were previously PACs), so the observed employment decline between 2001 and 2006 says nothing about the effectiveness of CAD initiatives. However, the recent trend of below-average rates of jobs growth in many suburban CADs and PACs clearly poses a significant forward challenge to the Victorian state government.

The challenge faced in attempting to concentrate job growth in activity centres has been widely noted in the literature. Birrell et al (2005) argued that 'unless activity centre policy can induce some major shifts in the way that employment opportunities are currently located, the potential for their job growth seems slight' (ibid p. 02–13). Charter Keck Cramer (2006, p.2) report:

> 'that whilst *Melbourne 2030* aims to attract greater office development to activity centres, larger corporate users are avoiding them due to greater traffic congestion, higher parking costs and the typical prevalence of secondary grade buildings. More importantly, new commercial developments in activity centres are failing to materialise due to the higher acquisition costs of site consolidation and resultant higher required development rents to make them feasible'.

Birrell et al (2005 p02–1) points out that 'at a more fundamental level, the activity centre strategy does not come to grips with the economic realities of job location in contemporary Melbourne. This shows a strong trend towards dispersal rather than concentration. The aspiration to increase public transport usage through the centralisation of economic activities and housing in activity centres will be difficult to achieve'.

Central Melbourne's contribution to jobs growth

Melbourne 2030 defines Central Melbourne as consisting of three municipalities—Melbourne, Yarra and Port Phillip. It aims to 'strengthen Central Melbourne's capital city functions and its role as the primary business, retail, sport and entertainment hub for the metropolitan area' (DI 2002a p.3).

Table 4.9 summarises employment data for Central Melbourne as well as data for the City of Melbourne LGA. The City of Melbourne has experienced an employment increase of 20 100 persons between 2001 and 2006, while the remaining parts of Central Melbourne have added nearly 5 000 jobs. Central Melbourne has remained the principal employment hub within Melbourne, and was the single largest contributor to Melbourne's jobs growth between 2001 and 2006. However, Central Melbourne grew at a slightly slower rate than the rest of the city and its employment share declined marginally between 2001 and 2006. More recent CLUE data shows a shift to more rapid jobs growth in the City of Melbourne between 2006 and 2008 (see earlier section on 'Recent changes in employment').

T4.9 Employment in Central Melbourne, 2001 to 2006

	City of Melbourne LGA	Central Melbourne	Rest of Melbourne	Me bourne working zone
Employment 2001	277 200	396 900	1 078 400	1 475 300
Employment 2006	297 300	421 800	1 164 600	1 586 500
Change n employment, 2001 to 2006	20 100	25 000	86 200	111 200
Average annual growth rate (per cent)	1.4	1.2	1.5	1.5
Employment share 2001	18.8	26.9	73.1	100.0
Employment share 2006	18.7	26.6	73.4	100.0

Note: Central Me bourne is defined as the Melbourne, Yarra and Port Phill p LGAs. Rest of Melbourne is the Me bourne work ng zone less Central Me bourne.

Source: BITRE analysis of 2006 and 2001 ABS Census of Population and Housing data.

Melbourne @ 5 million shifted the focus to providing more jobs outside Central Melbourne (DPCD 2008c p.7), so as to address an imbalance between where people live and the location of jobs. This is essentially an employment decentralisation objective, defined by Burke et al (2010 p.3) as:

> 'a process by which city-regions increase the proportion of jobs that are located outside of their central business district (CBD) and its immediate frame. Employment decentralisation does not necessarily mean reducing the absolute number of jobs in the CBD, nor does it necessarily mean displacing the CBD as the primary focus of city-region activities'.

Between 2001 and 2006, the Melbourne working zone added 86 200 jobs that were located outside of Central Melbourne. A slightly higher share of Melbourne's jobs was located outside of Central Melbourne in 2006, compared to 2001. Thus, jobs are growing strongly both within and outside of Central Melbourne. Although Central Melbourne grew slightly more slowly than the rest of Melbourne between 2001 and 2006, it has retained its status as the city's primary employment hub and the primary location for jobs growth.

There has been substantial jobs growth outside of Central Melbourne, but much of this jobs growth is occurring outside of the higher-order suburban activity centres (i.e. CADs and PACs) and employment corridors, where the planners have been aiming to concentrate economic development. For example, the two principal jobs growth hubs in suburban Melbourne between 2001 and 2006 were the West Industrial Node and the South Industrial Node. These two jobs growth hubs are not activity centres and nor are they part of the employment corridors initiative of *Melbourne @ 5 million* (see Map 2.2) designed to link areas with high employment and improve accessibility to jobs.

Summary

This chapter concentrated on providing a detailed description of the spatial distribution of employment within the Melbourne working zone and showing how this distribution changed between 2001 and 2006. The chapter identified the principal locations of jobs growth in Melbourne as being the City of Melbourne LGA (particularly Southbank-Docklands and the CBD), the Wyndham North SLA (home of the West Industrial Node) and the Greater Dandenong Balance SLA (home to the South Industrial Node).

In addition, the chapter has considered the strategies in place for managing spatial aspects of employment growth in Melbourne, and with these planning objectives in mind, investigated the changes that have occurred since 2001 with regard to employment in activity centres and in central Melbourne. The key findings are summarised at the beginning of this chapter.

CHAPTER 5

Industry

Key points

- Melbourne's major employing industries in 2006 were *Retail trade* (14.8 per cent), *Manufacturing* (14.0 per cent), *Property and business services* (12.9 per cent) and *Health and community services* (10.7 per cent).
- *Property and business services* is the major employing industry for the Inner sector, Retail trade is the major employer for the Middle and Peri Urban sectors, while *Manufacturing* is the major employer in the Outer sector.
- Melbourne's Statistical Local Areas (SLAs) each have their own distinctive mix of industries. Some are specialised in *Manufacturing* (e.g. Kingston North, Greater Dandenong Balance, Broadmeadows), others in *Health and community services* (e.g. Melbourne Remainder, Yarra North, Heidelberg) or *Transport and storage* (e.g. Wyndham North, Craigieburn).
- The spatial concentration of industries has implications for commuting, particularly were workers have specialised skills that tie them closely to specific industries. *Finance and insurance* and *Communication* services are spatially concentrated industries, with more than half of jobs located in the Inner sector. Employment in *Retail trade*, *Construction, Education* and *Personal and other services* is well dispersed across SLAs.
- The principal trends impacting on Melbourne's industry structure over the last few decades have been the decline of *Manufacturing* and the rise in consumer and business services.
- From 2001 to 2006, jobs growth was greatest for *Health and community services* (which added 29 400 jobs), *Construction* (23 200) and *Government administration and defence* (21 500). *Manufacturing* employment within Melbourne declined by 20 400 jobs.
- *Government administration and defence* employment was the largest contributor to jobs growth in the Inner sector, while *Health and community services* was the major contributor in the Middle, Outer and Peri Urban sectors. The *Transport and storage* industry also played an important role as the major contributor to jobs growth in the Middle West and Outer Northern subsectors.
- The industry drivers of jobs growth varied across Melbourne. Southbank-Docklands added the most jobs between 2001 and 2006, due to the growth of the *Finance and insurance* industry. The strong jobs growth of Melbourne Inner reflected increasing *Government administration and defence* employment. Going against the city-wide trend, the jobs growth in Wyndham North and Greater Dandenong Balance was primarily due to the *Manufacturing* industry.

- The *Health and community services* industry was the largest source of jobs growth in one third of Melbourne's SLAs. It was particularly important in Melbourne Remainder (2700 jobs added) and Heidelberg (1750).
- Key post-2006 developments include the emergence of *Accommodation and food services* as a major contributor to jobs growth in Melbourne, and the continued increases in education, health and retail employment.

Context

This chapter investigates the spatial distribution of different industries within Melbourne's working zone and how that has changed between 2001 and 2006. The analysis is based on employment data for different industries from the *Census of Population and Housing*.

The location of different industries is not a primary focus of *Melbourne 2030* and *Melbourne @ 5 million*. There are, however, some *Melbourne 2030* objectives that do relate to industry, such as:

- protecting the specialised industry functions of the Specialised Activity Centres and industrial areas
- broadening the range of industries in centres that are currently dominated by the retail industry.

Unfortunately, the census data analysed in this chapter is not sufficiently fine-grained to assess the role of different industries within activity centres. Instead the analysis is undertaken at the sectoral and SLA scales—it provides information about industry specialisations and key drivers of jobs growth in these locations.

Employment by industry in 2006

This section considers the location of industries within the Melbourne working zone in 2006 using census data on employment by industry. The ANZSIC 1993 classification at the 1 digit level is analysed, which involves 17 different industries. The analysis is undertaken on a place of work basis, except where otherwise noted.

For the Melbourne working zone, the largest employing industries were *Retail trade* (14.8 per cent), *Manufacturing* (14.0 per cent), *Property and business services* (12.9 per cent) and *Health and community services* (10.7 per cent).

Table 5.1 presents the major employing industries for each sector, as well as each sector's main industry specialisation. A place can have a very high degree of specialisation without that industry being in the top three employers. For example, the *Wholesale trade* industry in the Middle sector accounts for 7.0 per cent of employment, but this is above the national average of 4.9 per cent. The top specialisation for each sector was identified using location quotients, which in the above example would equal 1.4 (i.e. 7.0 divided by 4.9).

Retail trade is the major employer for the Middle sector, particularly in the North, South and East, but it is also strongly represented in the Outer Western sector. In contrast, most Outer sectors are dominated by *Manufacturing*, where it represents just over 20 per cent of employment. The Inner sector's major employer is the *Property and business services* industry, while its top specialisation is *Finance and insurance*. This matches the result for Sydney, but in contrast, Perth's Inner sector specialises in *Mining*.

T5.1 Major employing industry and main specialisation by subsector, Melbourne working zone, 2006

Subsector of work	Major employing industry	Employment share (per cent)	Main specialisation	Employment share (per cent)
Inner	Property and bus ness services	23.2	Finance and insurance	12.6
Middle	Retail trade	17.5	Wholesale trade	7.0
Middle North	Retail trade	17.9	Health and community services	17.1
Middle South	Retail trade	18.9	Wholesale trade	7.6
Middle East	Retail trade	16.4	Wholesale trade	7.6
Middle West	Manufacturing	19.0	Transport and storage	8.0
Outer	Manufacturing	20.6	Manufactur ng	20.6
Outer Northern	Manufacturing	24.6	Transport and storage	12.1
Outer Southern	Manufacturing	19.2	Manufactur ng	19.2
Outer Eastern	Manufacturing	21.0	Manufacturing	21.0
Outer Western	Retail trade	17.7	Transport and storage	9.6
Peri Urban	Retail trade	17.2	Agricultural, forestry and fishing	9.9

Source: BITRE analysis of ABS Census of Population and Hous ng 2006

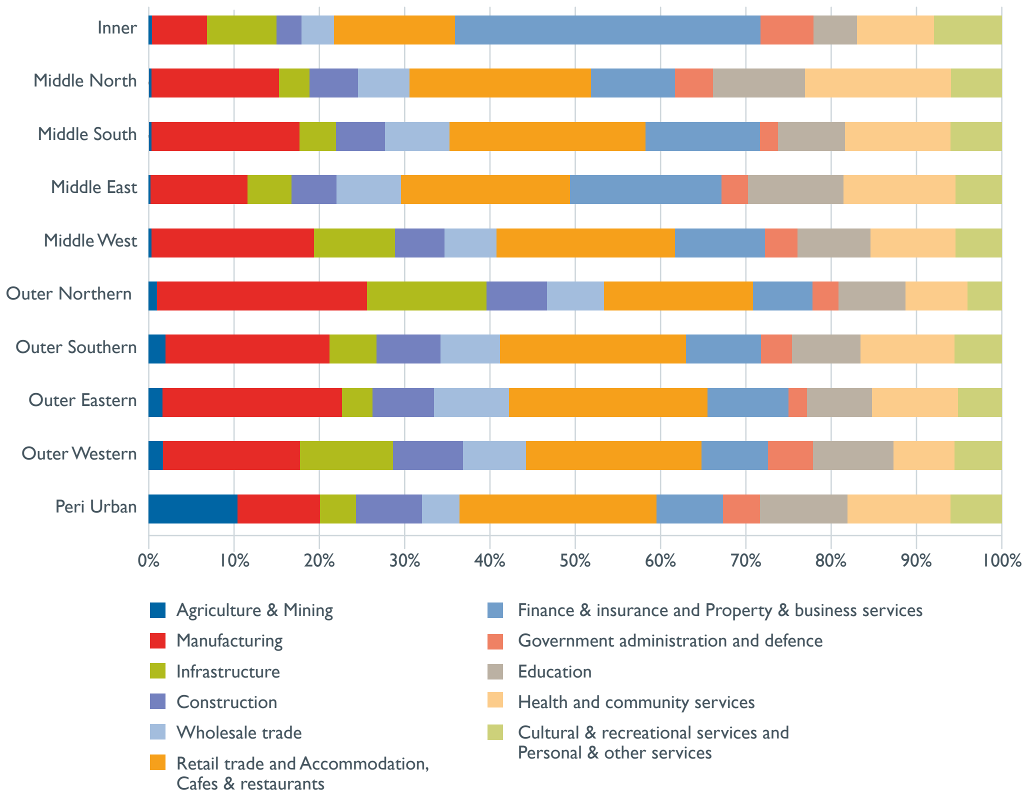
Figure 5.1 presents the industry mix by subsectors within Melbourne's working zone. The 17 industries have been condensed into 11 industries for presentation purposes. Key features of the chart are:

- *Agriculture and Mining* is a minor employer for all sectors except the Peri Urban sector where it is the third largest employer with 10 per cent of jobs.
- *Finance and insurance* and *Property and business services* is the largest employer for the Inner sector representing 36 per cent of the sector's employment. This is substantially higher than the second highest representation in the Middle East sector (18 per cent employment share).
- *Manufacturing* is strongly represented in the Outer sectors, with the highest proportion being in the Outer Northern sector at 25 per cent. The lowest representation is the Inner sector at only 6 per cent.
- A major employer for all sectors is the *Retail trade* and *Accommodation*, cafes and restaurants classification. In fact of the 10 sectors presented, employment in this industry has the highest share for 8 of them. It is highest in the Outer Eastern sector at 23 per cent.

- *Government administration and defence* is relatively strongly represented in the Inner sector.
- *Health and community services* is an important industry for employment in most sectors, particularly for the Middle sector in the North (17 per cent), East (13 per cent) and South (12 per cent).

Industries with strong levels of centralisation are *Finance and insurance services* (70 per cent in the Inner sector), *Communication services* (54 per cent) and *Property and business services* (50 per cent). In contrast, industries which are heavily concentrated in the Outer and Peri Urban sectors include *Agriculture, forestry and fishing* (88 per cent), *Construction* and *Manufacturing* (both with 46 per cent of the work force in the Outer and Peri Urban sectors).

F5.1 Employment by industry in each subsector of Melbourne's working zone, 2006



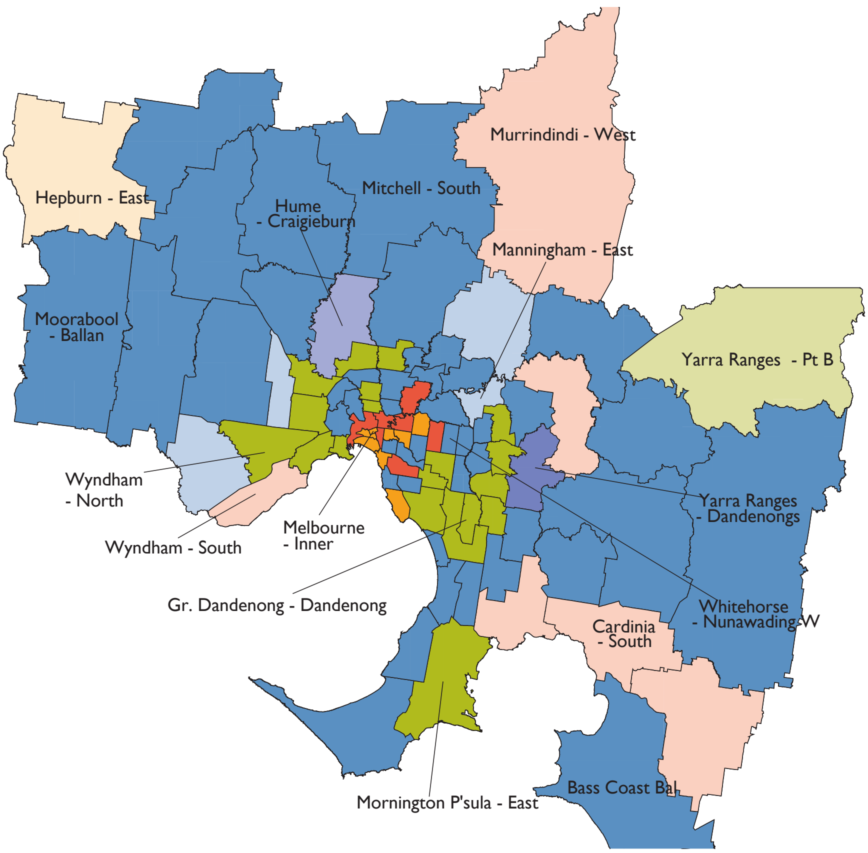
Note: Infrastructure ncludes Communication services, Transport and storage, and Electricity, gas and water supply.
Source: BITRE analysis of ABS Census of Population and Housing 2006

The results presented in Figure 5.1 are reflected in Map 5.1. Most SLAs highest industry employer is *Retail trade*, particularly for those SLAs in the Middle and Peri Urban sectors. *Manufacturing* is particularly strong in a ring of largely Outer sector SLAs such as Broadmeadows, Dandenong, Knox North-East and Wyndham North. *Property and business services* is strong in the Inner sector, particularly in the SLAs of Melbourne Inner, St Kilda and Port Phillip West. The *Health and community services* industry is the major source of employment in several Inner and Middle sector SLAs, such as Melbourne Remainder, Heidelberg and Box Hill, each of which contains one or more hospitals.

Construction is the major source of employment in several urban fringe SLAs, such as Wyndham West, Melton East and Nilumbuk Balance. *Agriculture, forestry and fishing* remains the largest employer in other urban fringe SLAs, such as Murrundindi West, Wyndham South and Yarra Ranges–Seville.

Yarra Ranges–Dandenongs is the only SLA where Education is the largest employing industry, Yarra Ranges Part B is the only SLA where *Government administration and defence* is the largest employer and the Peri Urban SLA of Hepburn East is the only place where *Accommodation, cafes and restaurants* is the dominant employer. The only SLA with the highest employment in *Transport and storage* is the SLA of Craigieburn. Most of this employment is related to road freight or the Melbourne Airport. This area is part of the Hume Growth Area classified by the state government and 'is renowned for its strategic positioning at the crossroads of the Hume Highway (incorporating a railway corridor), Calder Highway and Metropolitan Ring Road' (GAA 2009c).

M5.1 Largest employing industry in each SLA, Melbourne working zone, 2006



Largest employing industry, 2006 by Place of work SLA

- Agriculture, forestry and fishing
- Manufacturing
- Construction
- Retail Trade
- Accommodation, cafes and restaurants
- Transport and storage
- Property and business services
- Government administration and defence
- Education
- Health and community services

Source: BITRE analysis of ABS Census of Population and Hous ng 2006

Table 5.2 lists the top twenty employing SLAs along with the main employing industry and main specialisation industry. Looking at industry at a small geographical scale presents a more diverse set of industries.

T5.2 Main employing industries and specialisation by SLA of work, Melbourne working zone, 2006

Place of work SLA	People working in SLA	Main employing industry	Main industry's employment share (per cent)	Top specialisation
Me bourne–Inner	153 394	Property and business services	28.9	F nance and nsurance
Me bourne–Remainder	106 150	Health and community services	19.0	Health and community services
Kingston–North	61 302	Manufacturing	31.5	Manufactur ng
Port Phillip–West	47 985	Property and business services	30.4	Property and business services
Monash–Waverley West	39 454	Manufacturing	21.1	Wholesale trade
Greater Dandenong Balance	37 759	Manufacturing	35.4	Manufactur ng
Me bourne–Southbank-Docklands	37 718	Property and business services	23.7	Cultural and recreational services
Greater Dandenong–Dandenong	36 456	Manufacturing	30.4	Manufactur ng
Hume–Broadmeadows	36 028	Manufacturing	40.6	Manufactur ng
Monash–South-West	33 965	Manufacturing	21.9	Education
Yarra–North	32 732	Health and community services	21.6	Health and community services
Wyndham–North	32 388	Manufacturing	19.5	Transport and storage
Maribyrnong	29 246	Retail trade	21.5	Manufactur ng
Frankston–West	29 144	Retail trade	22.6	Health and community services
Dareb n–Preston	28 828	Retail trade	20.1	Education
Br mbank–Sunsh ne	26 643	Manufacturing	24.3	Manufactur ng
Whitehorse–Box Hill	26 330	Health and community services	20.0	Communication services
Yarra–Richmond	25 041	Property and business services	19.3	F nance and nsurance
Knox–North-East	24 334	Manufacturing	29.2	Manufactur ng
Banyule–Heide berg	24 324	Health and community services	34.7	Health and community services

Source: BITRE analysis of ABS Census of Population and Housing 2006

Over 153 000 people work in the Melbourne Inner SLA, where the single largest employing industry is *Property and business services*. Melbourne Remainder also has over 100 000 people employed in the SLA, with its main employing industry and top specialisation being the *Health and community services* industry. The Royal Melbourne Hospital, Royal Women's Hospital and Royal Children's Hospital are located in this SLA. Another Inner sector SLA, Southbank-Docklands has a major employer of *Property and business services*, but a specialisation in *Cultural and recreational services*, because it includes facilities such as the National Gallery of Victoria and the Crown Entertainment Complex. Similarly, the top specialisation of the Monash South West SLA is the *Education* industry, which reflects the presence of the Monash University Clayton campus.

The strongest representation for main employing industry is again in *Manufacturing* and *Retail trade*. However, while 6 of the 20 SLAs specialise in *Manufacturing*, *Retail trade* is not listed as a principal specialisation. *Health and community services* and *Property and business services* also have significant representation in Table 5.2.

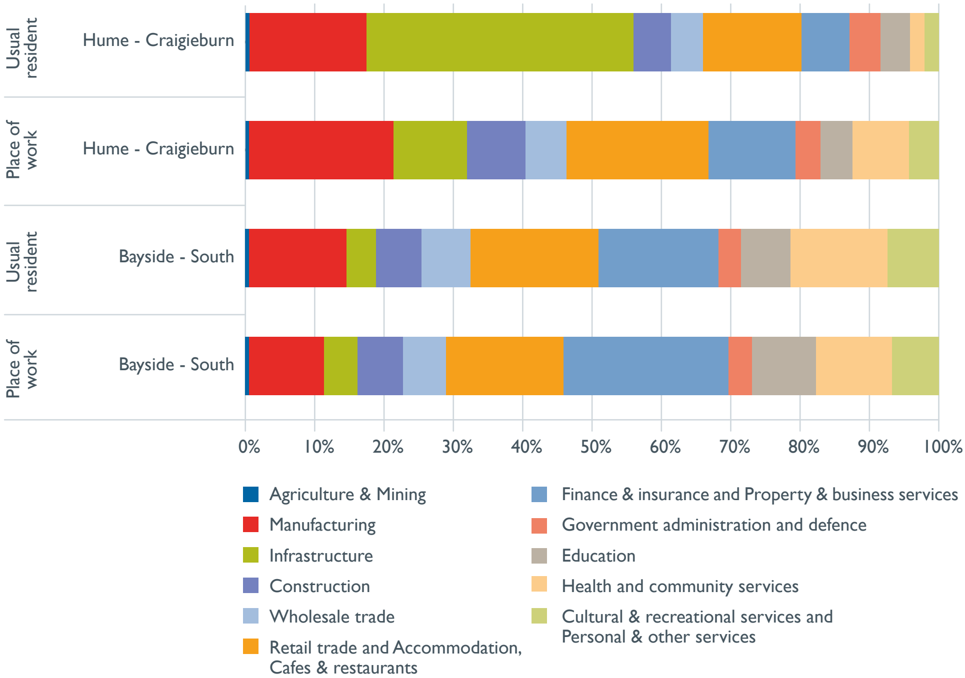
While a great deal of diversity is evident in Melbourne's industry structure, *Retail trade* is represented as one of the top three employing industries for 85 per cent of Melbourne SLAs. Some SLAs are extremely specialised in a single industry—for example, the Broadmeadows SLA has over 40 per cent working in the *Manufacturing* industry, Craigieburn has 36 per cent working in *Transport and storage*, Heidelberg has 35 per cent in the *Health and community services* industry and Greater Dandenong Balance has 35 per cent working in *Manufacturing*.

In some parts of Melbourne, there is a poor match between the jobs available and the industries in which local residents are employed. Figure 5.2 compares the employed resident industry mix and the place of work industry mix for selected SLAs. The Craigieburn SLA shows a strong mismatch with most people working in the SLA being employed in Infrastructure (39 per cent), while only 11 per cent of employed residents work in this industry. Other SLAs have good alignment between the industry mix of jobs available and the industries in which local residents are employed. For example, Bayside South in the Middle South sector has a high degree of industry alignment.

A good match between local employment opportunities and the skills of employed residents may boost self-containment. There is a statistically significant correlation of –0.35 between the industry mismatch index[24] and the self-containment rate of Melbourne's SLAs. A similar correlation result was obtained for Perth SLAs (BITRE 2010). This correlation means that the greater the degree of mismatch between the industry mix of jobs available in the SLA and the industries in which residents are employed, the higher the proportion of residents who tend to commute to a place of work outside the SLA. A high degree of industry mismatch can generate commuting, but the strength of the relationship should not be overstated, as some SLAs have very poor self-containment despite little industry mismatch (e.g. Coburg, Essendon). Even though the industry mix of jobs available in Bayside South seems to be a very close match to the industries in which its residents work, about half of employed residents of Bayside South still commute to a place of work outside the SLA, illustrating the complexity and interconnection of the metropolitan system.

24 The industry mismatch ndex was calculated us ng a variant of the Structural Change ndex, which compares the industry mix across the place of work and place of residence datasets, rather than across two separate po nts in time. See BITRE (2003) for more detail.

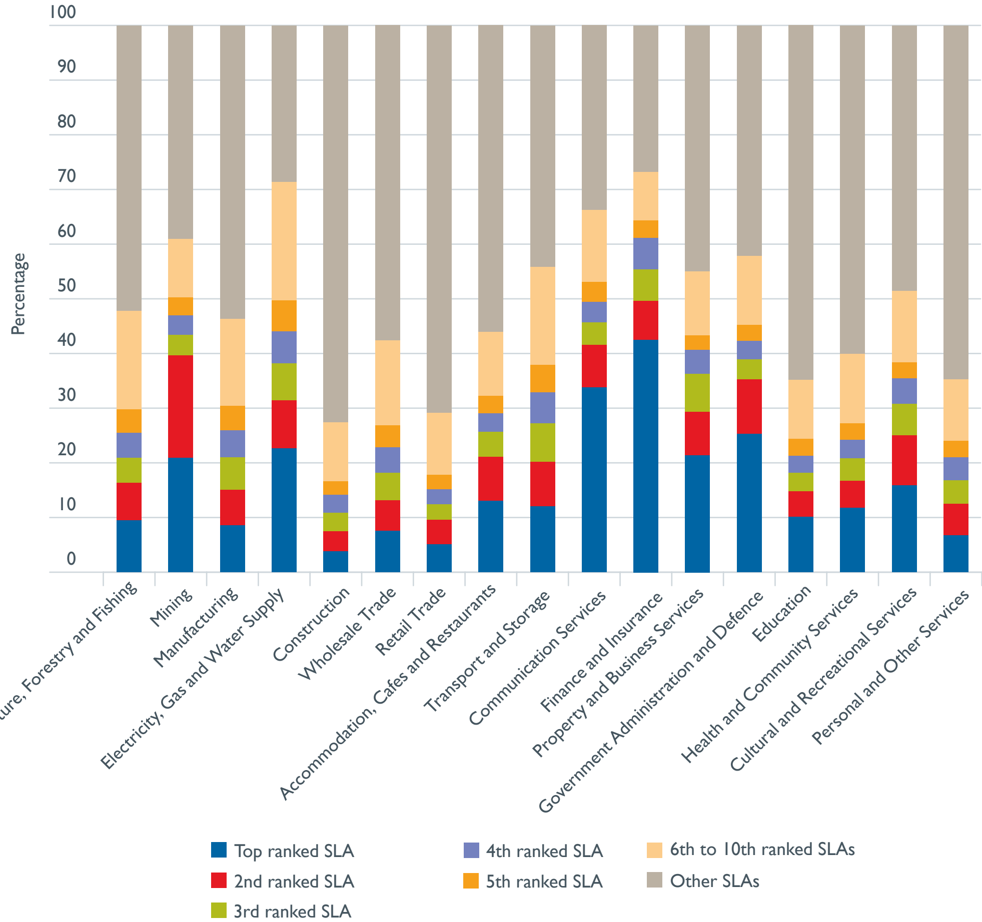
F5.2 Industry mismatch in Hume–Craigieburn and Bayside South, 2006



Note: Infrastructure ncludes Communication services, Transport and storage, and Electricity, gas and water supply.
Source: BITRE analysis of ABS Census of Population and Housing 2006

Various industries can have very different spatial structures by being either spatially dispersed or highly concentrated. Figure 5.3 presents the spatial concentration of each industry's employment for 2006. *Finance and insurance* is the most spatially concentrated industry, with the Melbourne Inner SLA containing 43 per cent of this industries employment. Another highly concentrated industry is *Communication services* with 34 per cent of jobs in the Melbourne Inner SLA. Industries with a more dispersed structure include *Retail trade*, *Construction*, *Education* and *Personal and other services*.

F5.3 Spatial concentration of each industry's employment within Melbourne's working zone, 2006



Source: BITRE analysis of ABS Census of Population and Hous ng 2006

The different spatial concentration of industries has repercussions for commuting, particularly for workers with specialised skills which closely tie them to specific industries. Employees of the *Finance and insurance* industry have a very high probability of commuting to the City of Melbourne for work (55 per cent). While 30 per cent of *Finance and insurance* employees live in the Outer sector, only 10 per cent of the industry's jobs are located in the Outer sector. In contrast, jobs for teachers and construction workers are widely distributed throughout Melbourne, so we would expect such workers to be more likely to have a place of work in close proximity to their place of residence.

Historic industry trends

The principal trends impacting on Melbourne's industry structure over the last few decades have been the decline of the *Manufacturing* industry and the rise in consumer and business services.

Manufacturing accounted for 33 per cent of Melbourne's jobs in 1971, which fell to 17 per cent by 2001, as 'decentralisation saw jobs move from traditional manufacturing areas of inner Melbourne to larger sites in outer areas with ready access to the road network' (DPCD 2008a, p. 4.24). *Manufacturing* jobs growth was concentrated in the outer LGAs of Hume, Greater Dandenong and Knox. The *Government administration*, Electricity and *Transport and storage* industries also experienced declines in their employment share between 1971 and 2001 (ibid).

The *Property and business services* industry increased its employment share from about 6 to 14 per cent between 1971 and 2001 (DPCD 2008a). All LGAs experienced growth in *Property and business service* jobs, with nearly a quarter of new jobs being in the City of Melbourne, while 10 per cent were located in the Port Phillip LGA (ibid).

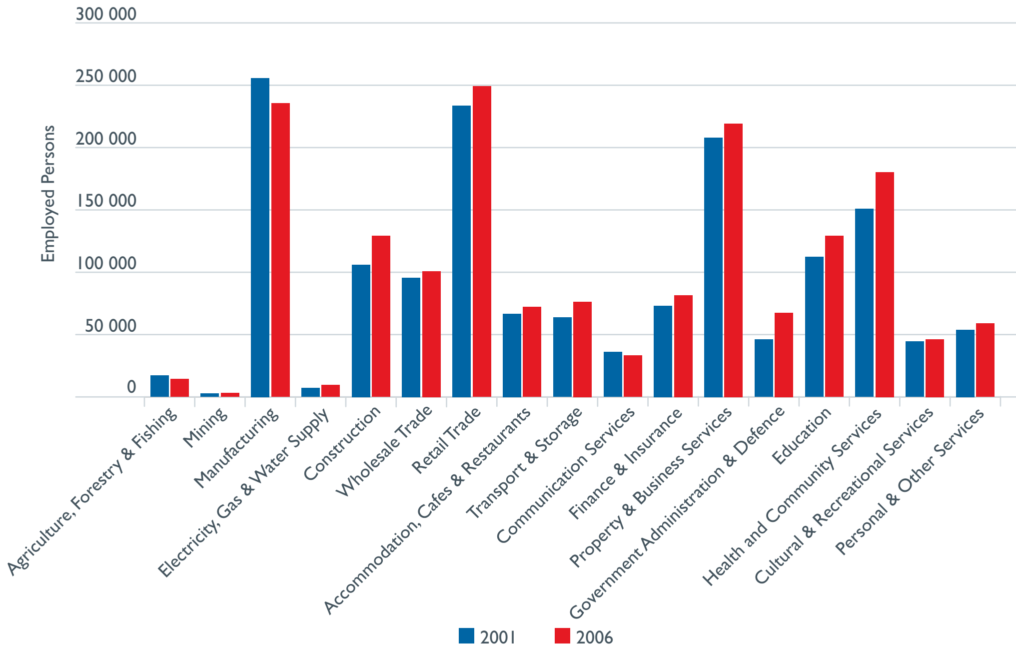
Other industries which significantly increased their employment share include *Health and community services*, *Education*, *Finance and insurance*, *Personal services*, *Culture and recreation* and *Accommodation, cafes and restaurants* (DPCD 2008a).

Industry changes, 2001 to 2006

Changes in industry composition are just as important as the spatial aspect. Figure 5.4 presents the number of people employed by industry in 2001 and 2006. Both *Retail trade* and *Manufacturing* are major employers for Melbourne working zone but with contrasting changes from 2001 and 2006. *Retail trade* grew between 2001 and 2006 with an increase of over 15 000 jobs. In contrast, *Manufacturing* declined by over 20 000 jobs, which is the largest absolute decline for any industry. The largest increase in the number of jobs was the nearly 30 000 jobs added in *Health and community services*, followed by *Construction* with over 23 000 jobs added.[25] Besides *Manufacturing*, only two other industries experienced declines, namely *Agriculture, forestry and fishing* (–2804) and *Communication services* (–2740).

25 While Construction emerges as the second largest source of jobs growth for Me bourne based on place of residence data for Me bourne working zone, in the place of work data the Construction ndustry is ranked 4th n terms of jobs added for Me bourne. This discrepancy reflects a high proportion of Construction industry workers hav ng no fixed place of work.

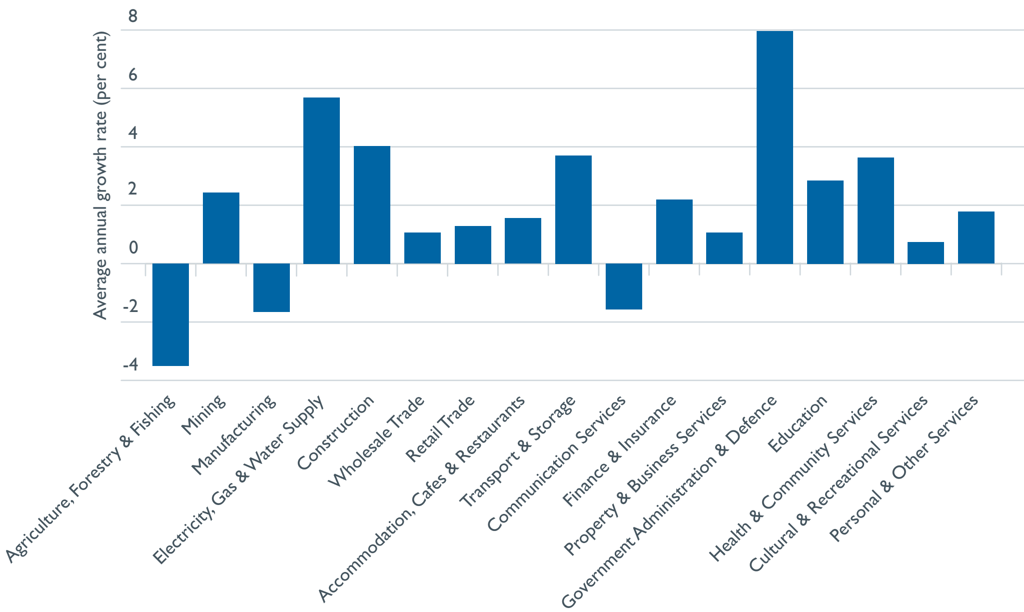
F5.4 Employment by industry for residents of Melbourne working zone, 2001 and 2006



Source: BITRE analysis of ABS Census of Population and Hous ng 2001 and 2006

Following on from observing absolute change, Figure 5.5 present the growth rates by industry from 2001 to 2006. The strongest growth has been in the *Government administration and defence* industry, which grew at an average annual growth rate of eight per cent, over two percentage points higher than the next highest rate of employment growth in *Electricity, gas and water supply*. In contrast, Perth and Sydney's most rapid growth industry was *Mining* (at 10 and 6 per cent respectively), while for Melbourne this industry grew by just over 2 per cent per annum. Industries that grew slowly in Melbourne included *Retail trade*, *Wholesale trade*, *Property and business services* and *Cultural and recreational services*.

F5.5 Employment average annual growth rates by industry, Melbourne working zone residents, 2001 to 2006



Source: BITRE analysis of ABS Census of Population and Housing 2001 and 2006

In Chapter 4, using place of work data, it was shown that the strongest jobs growth was in the Outer sector (representing 51 per cent of the total growth), with growth being particularly concentrated in the Outer Southern sector. Both the Inner and Middle sectors had similar shares of employment growth. Table 5.3 presents the industries that contributed to the employment growth for sectors on a place of work basis. For the Melbourne working zone the three dominant industries were *Health and community services*, *Government administration and defence* and *Education*. In fact, the *Health and community services* industry has been a substantial contributor to Melbourne employment growth in most sectors, with the Middle, Outer and Peri Urban sectors all having this industry as the largest contributor. Only the Outer Western sector does not have the *Health and community services* industry in the top three sources of jobs growth. The *Health and community services* industry was a similarly dominant driver of jobs growth in Sydney between 2001 and 2006.

A contrast is evident in the role of *Education* and *Construction*. In the Middle sector, *Education* is an important contributor to employment growth, particularly for the North and East subsectors. *Construction* is a major source of employment growth in the Outer sector. *Government administration and defence* has been an important driver of Melbourne's jobs growth in the Inner, Middle and Peri Urban sectors, but has been less influential in the Outer sector.

Table 5.3 also shows that *Manufacturing* experienced a greater employment decline than any other industry in the Inner, Middle (and all 4 subsectors), Outer Northern and Outer Eastern sectors. *Agriculture, forestry and fishing* showed the greatest employment decline in the Outer Western, Outer Southern and Peri Urban sectors of Melbourne.

T5.3 Main industry contributors to employment growth by subsector of work, Melbourne working zone, 2001 to 2006

SLA	Largest source of growth	2nd largest source of growth	3rd largest source of growth	Largest source of job decline
Inner	Government adm nistration and defence	Finance and nsurance	Health and community services	Manufactur ng
Middle	Health and community services	Education	Government adm nistration and defence	Manufactur ng
Middle North	Health and community services	Education	Government adm nistration and defence	Manufactur ng
Middle South	Health and community services	Retail trade	Education	Manufactur ng
Middle East	Health and community services	Education	Government adm nistration and defence	Manufactur ng
Middle West	Transport and storage	Property and business services	Health and community services	Manufactur ng
Outer	Health and community services	Construction	Retail trade	Agriculture, forestry and fish ng
Outer Northern	Transport and storage	Construction	Health and community services	Manufactur ng
Outer Southern	Health and community services	Construction	Retail trade	Agriculture, forestry and fish ng
Outer Eastern	Health and community services	Construction	Retail trade	Manufactur ng
Outer Western	Manufactur ng	Retail trade	Transport and storage	Agriculture, forestry and fish ng
Peri Urban	Health and community services	Government administration and defence	Retail trade	Agriculture, forestry and fish ng
Melbourne working zone	Health and community services	Government administration and defence	Education	Manufactur ng

Source: BITRE analysis of ABS Census of Population and Hous ng 2001 and 2006 with adjusted boundaries.

To the north and west of the city, the *Transport and storage* industry was an important contributor to jobs growth. This growth is linked to growth of warehousing, as shown in Table 5.4. Both the West and North regions have had strong growth in warehousing. In contrast, the South region has had strong growth in factory approvals. VCEC (2006) notes that logistics businesses in Melbourne have made location decisions to reduce congestion costs, but this is less of an option for distributors.

T5.4 Value and volume of industry building approvals, 2007

Region	Warehouse approvals ($m)	Warehouse approvals (No.)	Factory approvals ($m)	Factory approvals (No.)
West	278.3	202	62.1	48
North	216.5	169	57.7	80
South	133.7	121	128.0	171
East	85.1	74	16.3	26
Inner	52.8	45	1.8	7
Me bourne	764.4	611	265.9	332

Source: (DPCD 2008h, p135).

In Table 4.6 in the previous chapter, SLAs which had employment increases greater than 3000 were identified. Table 5.5 highlights the three industries that contributed to this employment growth. Taking a smaller scale focus reveals much more variation in the industries that have contributed to their region's jobs growth. The greatest increase in employment was in Southbank-Docklands in the Inner sector, where 70 per cent of employment growth was in the industries of *Finance and insurance* and *Property and business services*.

A number of Outer sector SLAs have *Transport and storage* as a strong contributor to jobs growth. Rasmussen (2010) describes how the rise of transport and distribution nodes in Melbourne's north and west reflects 'the substitution of locally based manufacturing by globally produced imported products which form part of a global supply chain supported by knowledge intensive logistics services'. This industry has been a particularly strong driver of jobs growth in Craigieburn, representing 70 per cent of the jobs growth. Going against the trend of a decrease in *Manufacturing* are the Outer sector SLAs of Wyndham North and Greater Dandenong Balance. The Wyndham North SLA includes the West Industrial Node and the Greater Dandenong Balance SLA includes the South Industrial Node—Chapter 4 identified these two industrial nodes as the major jobs growth locations in suburban Melbourne (see maps 4.7 and 4.8). Both SLAs experienced a big increase in *Manufacturing* employment, but also had widespread employment growth across the other industries.

In the Outer sector SLAs of Casey–Berwick and Frankston West, the principal drivers of jobs growth are service industries that cater primarily to the local population, such as *Retail trade*, *Health and community services*, *Education* and *Personal and other services*.

T5.5 Main industry contributors to employment growth for SLAs that added more than 3000 jobs, Melbourne working zone, 2001 to 2006

SLA	Largest source of growth	2nd largest source of growth	3rd largest source of growth
Melbourne–Southbank-Docklands	F nance and Insurance	Property and bus ness services	Cultural and recreational services
Wyndham–North	Manufacturing	Retail trade	Transport and storage
Melbourne–Inner	Government administration and defence	Property and bus ness services	Transport and storage
Greater Dandenong Balance	Manufacturing	Wholesale trade	Transport and storage
Casey–Berwick	Retail trade	Health and community services	Education
Hume–Craigieburn	Transport and storage	Wholesale trade	Government adm nistration and defence
Monash–Waverley East	Retail trade	Wholesale trade	Health and community services
Brimbank–Sunshine	Transport and storage	Wholesale Trade	Health and community services
Brimbank–Keilor	Retail trade	Transport and storage	Construction
Frankston West	Health and community services	Retail trade	Personal and other services

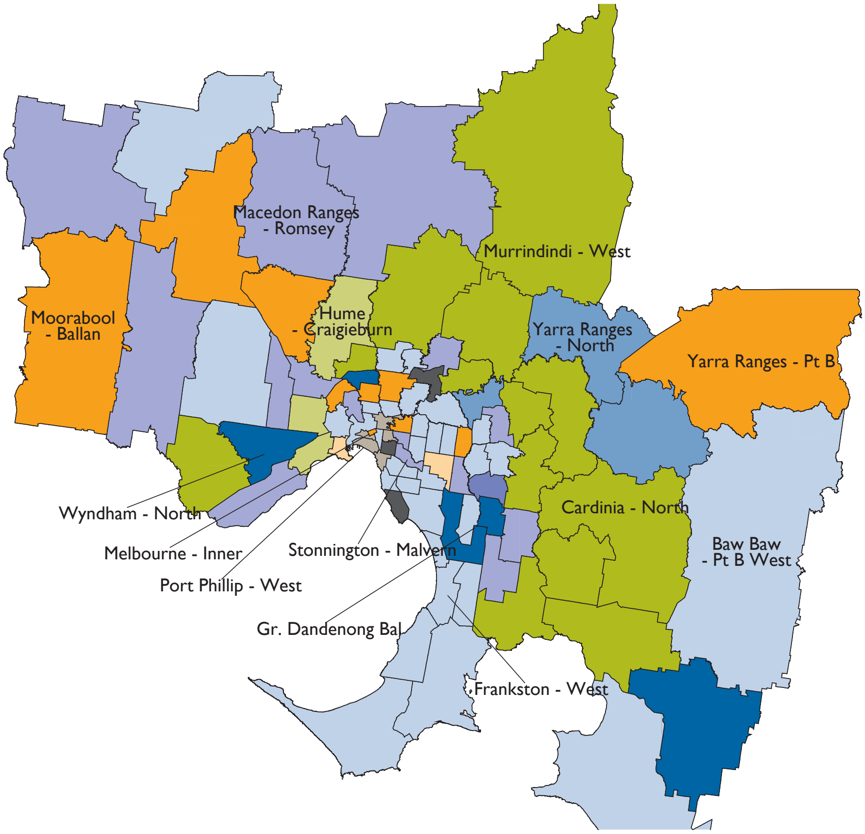
Source: BITRE analysis of ABS Census of Population and Hous ng 2001 and 2006 with adjusted boundaries.

There were three SLAs that experienced an employment decline of 1000 or more persons between 2001 and 2006—Brunswick, Coburg and Prahran. In all three SLAs, *Manufacturing* was responsible for the majority of the decline in employment.

Map 5.2 captures the spatial distribution of the different industries that have contributed to the employment growth of SLAs within the Melbourne working zone. Spatial patterns are evident with the *Finance and insurance* industry being the main source of growth for the Inner sector. *Construction* has been an important source of employment growth in the Outer sector, especially along the eastern side of the city from north to south.

Health and community services is represented in most sectors with 34 per cent of SLAs having this industry as the main source of growth. In contrast, Knox South is the only SLA for which the main contributor is *Wholesale Trade*.

M5.2 Main industry contributor to employment growth by SLA, Melbourne working zone, 2001 to 2006



Main contributor to employment growth, 2001 to 2006 by Place of Work SLA

- Health and community services
- Education
- Government administration and defence
- Property and business services
- Finance and insurance
- Transport and storage
- Accommodation, cafes and restaurants
- Retail trade
- Wholesale trade
- Construction
- Manufacturing

Source: BITRE analysis of ABS Census of Population and Housing 2001 and 2006 with adjusted boundaries.

Jobs growth within the Melbourne working zone is coming from a diverse set of industries. The following analysis will concentrate on the more important of these industries in terms of employment change between 2001 and 2006. To set the scene, Table 5.6 presents the SLA in which the largest increase in employment has occurred for a particular industry. This does not mean that the SLA's greatest increase has occurred in this industry.

A feature evident is that the Inner sector has been the major location of employment growth for a number of industries. Inner SLAs such as Melbourne Inner, Melbourne Remainder, Southbank-Docklands, Richmond and Port Phillip West are all represented. The largest increase in employment for an industry in a single SLA was over 6000 jobs for the *Government administration and defence* industry in Melbourne Inner.

Manufacturing employment growth was strong in the Outer sector SLA of Wyndham North, and was also the main contributor to employment growth for this SLA. For Greater Dandenong Balance, the main contributor to employment growth was *Manufacturing*, but this SLA was the main jobs growth location for the industry of *Wholesale Trade*.

Construction was a strong contributor for a number of SLAs but the greatest increase for this industry was in Waverley West at around 1000 jobs, which represented 78 per cent of the overall employment increase in this SLA.

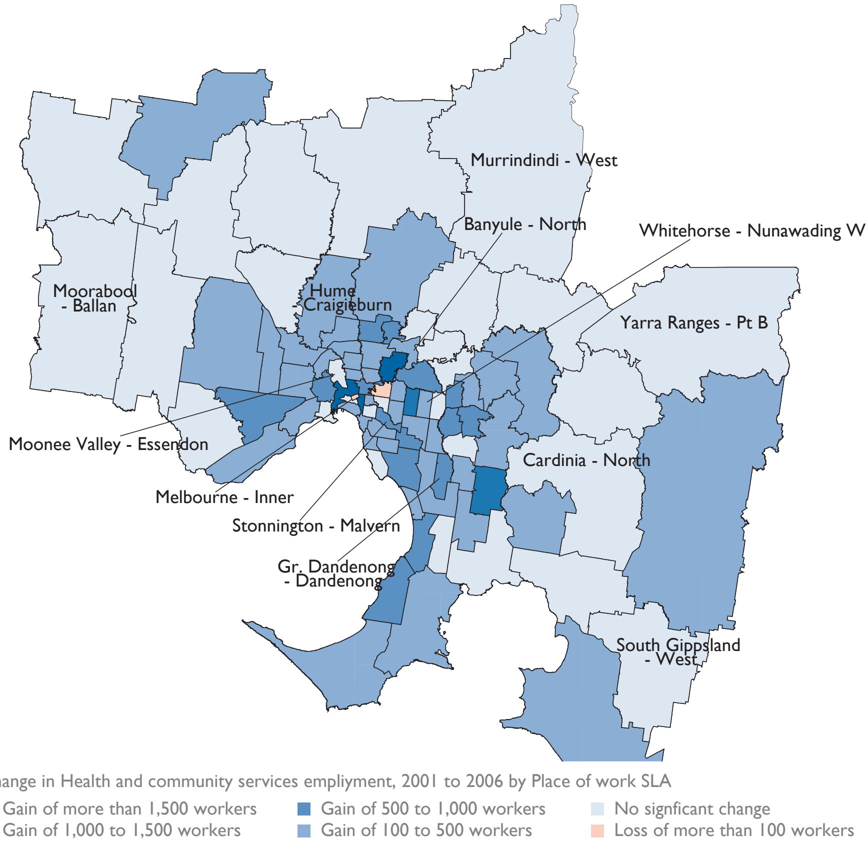
T5.6 SLAs which had largest increase in employed persons for each industry, Melbourne working zone, 2001 to 2006

Industry	SLA which had largest jobs growth for industry
Agriculture, Forestry and Fish ng	*
Min ng	Melbourne : Southbank-Docklands
Manufacturing	Wyndham North
Electricity, Gas and Water Supply	Port Phill p West
Construction	Monash–Waverley West
Wholesale Trade	Greater Dandenong Balance
Retail Trade	Monash–Waverley East
Accommodation, Cafes and Restaurants	Melbourne Remainder
Transport and Storage	Hume–Craigieburn
Communication Services	Yarra–Richmond
F nance and Insurance	Melbourne : Southbank-Docklands
Property and Business Services	Melbourne : Southbank-Docklands
Government Adm nistration and Defence	Melbourne Inner
Education	Melbourne Remainder
Health and Community Services	Melbourne Remainder
Cultural and Recreational Services	Melbourne : Southbank-Docklands
Personal and Other Services	Frankston West

Note: * No SLA had jobs growth of more than 100 persons for this industry.
Source: BITRE analysis of ABS Census of Population and Hous ng 2001 and 2006 with adjusted boundaries.

The largest source of employment growth for Melbourne's working zone was in the industry of *Health and community services*. Map 5.3 presents the spatial distribution of the change in the number of persons employed from 2001 to 2006. Strong growth is evident in the Inner sector, particularly in Melbourne Remainder with an increase of over 2600 jobs. This raised its employment share from 17 to 19 per cent. The second largest increase is for the Middle sector SLA of Heidelberg at just over 1750 jobs. The Heidelberg SLA includes the Austin Hospital, while the Royal Melbourne Hospital is one of several located in the Melbourne Remainder SLA. Only two SLAs experienced a decline in jobs in this industry between 2001 and 2006—Melbourne Inner and Boroondara–Kew.

M5.3 Change in the number of employed persons in Health and community services, Melbourne working zone, 2001 to 2006

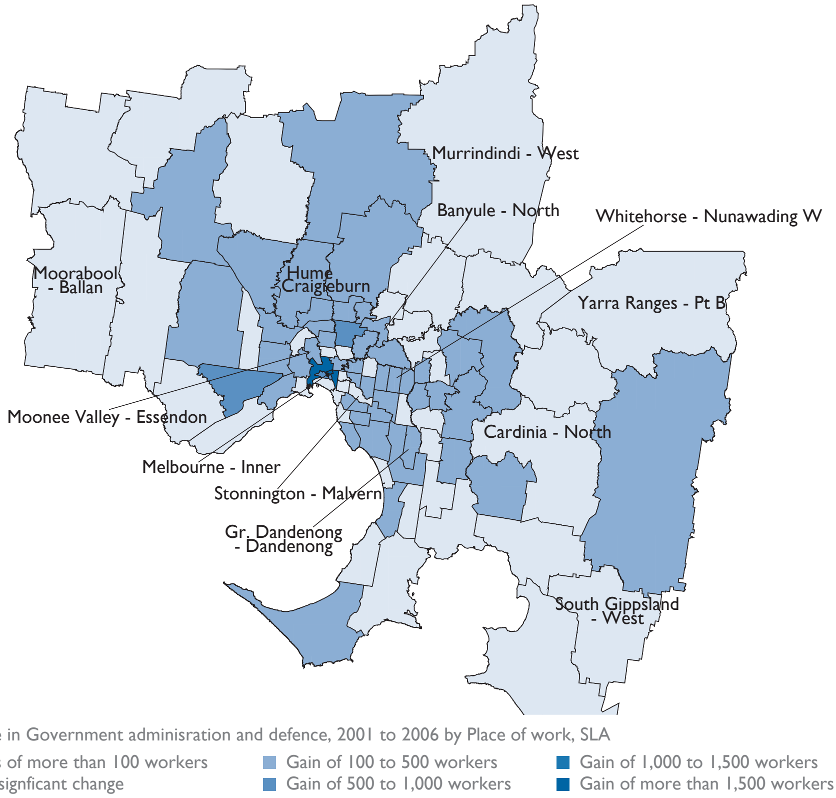


Source: BITRE analysis of ABS Census of Population and Housing 2001 and 2006 with adjusted boundaries.

The second largest source for employment increases, according to the place of work data, was the *Government administration and defence* industry. This industry also recorded the most rapid rate of jobs growth between 2001 and 2006. Map 5.4 presents the change in the number of employed persons for this industry from 2001 to 2006. The strongest growth has been in the SLAs of Melbourne Inner and Melbourne Remainder. Most other SLAs have had no significant change or gains of between 100 and 500 persons, with only 5 SLAs gaining more than 500 employed persons.

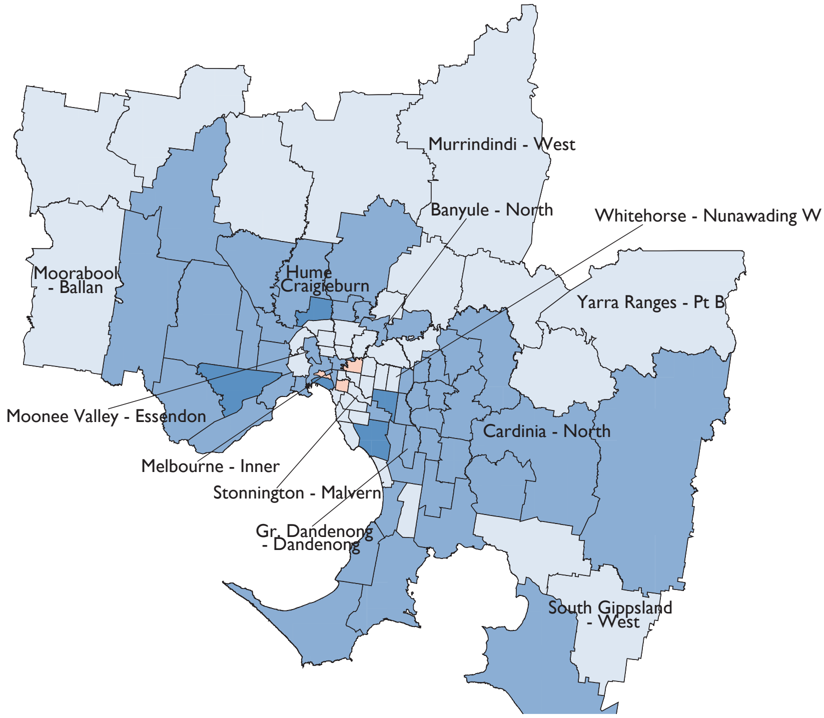
The *Construction* industry was also an important source of jobs growth for Melbourne residents between 2001 and 2006, although a significant proportion of workers in this industry did not nominate a fixed place of work. Map 5.5 illustrates how the growth in Construction jobs was spread widely throughout Melbourne's outer suburbs.

M5.4 Change in the number of employed persons in Government administration and defence, Melbourne working zone, 2001 to 2006



Source: BITRE analysis of ABS Census of Population and Hous ng 2001 and 2006 with adjusted boundaries.

M5.5 Change in the number of employed persons in Construction, Melbourne working zone, 2001 to 2006



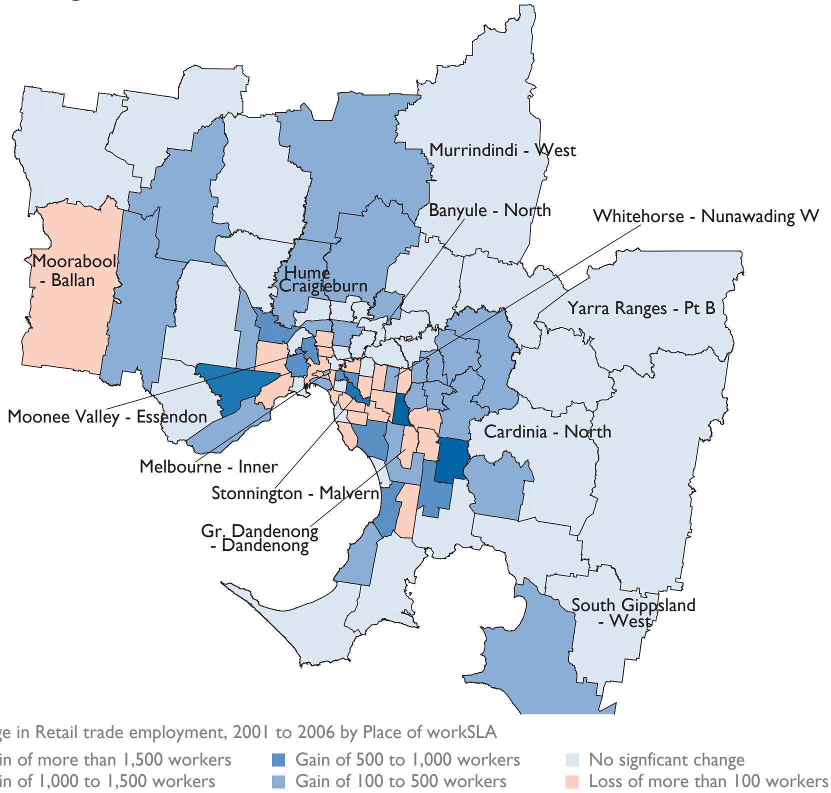
Change in Construction employment, 2001 to 2006 by Place of workSLA

- Gain of more than 1,500 workers
- Gain of 1,000 to 1,500 workers
- Gain of 500 to 1,000 workers
- Gain of 100 to 500 workers
- No signficant change
- Loss of more than 100 workers

Source: BITRE analysis of ABS Census of Population and Housing 2001 and 2006 with adjusted boundaries.

The *Retail trade* industry was the single largest industry in Melbourne in terms of jobs, although its growth rate was relatively modest between 2001 and 2006. Map 5.6 shows that the *Retail trade* industry had very mixed performance across Melbourne, with many SLAs recording a loss of jobs while many other (and sometimes immediately neighbouring) SLAs recorded substantial jobs growth. *Retail trade* has become more decentralised, with substantial jobs concentrations now found in the Monash and Casey LGAs and strong increases in jobs recorded in the Melton and Wyndham LGAs since 1996 (Lagura et al 2011).

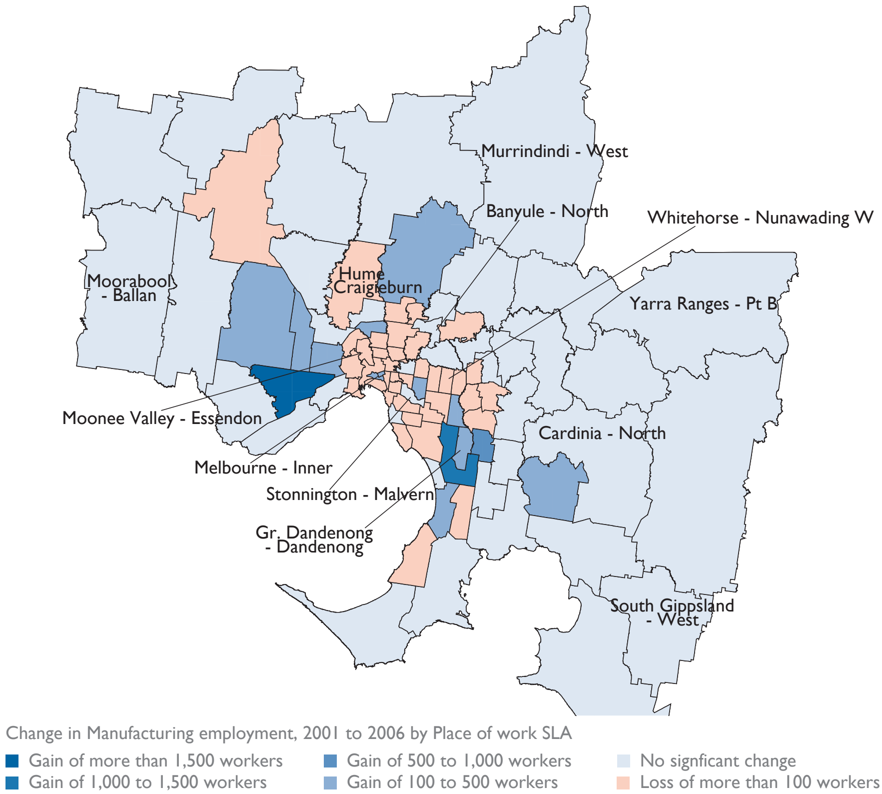
M5.6 Change in the number of employed persons in Retail trade, Melbourne working zone, 2001 to 2006



Source: BITRE analysis of ABS Census of Population and Hous ng 2001 and 2006 with adjusted boundaries.

The final industry to be examined in greater detail is *Manufacturing*, which has had a decline in employment in most SLAs. The long standing decline of the *Manufacturing* industry was discussed earlier in the chapter. Map 5.7 presents the change in the number of employed people in *Manufacturing*, from 2001 to 2006. A feature is the high proportion of SLAs (41 per cent) that have had declines of greater than 100 persons. The largest declines were in the Middle sector SLAs of Maribyrnong and Kingston North with job losses of over 2500 persons. Only two SLAs had an increase of over 1000 people—the Outer sector SLAs of Wyndham North and Great Dandenong Balance.

M5.7 Change in the number of employed people in Manufacturing, Melbourne working zone, 2001 to 2006



Source: BITRE analysis of ABS Census of Population and Housing 2001 and 2006 with adjusted boundaries.

Recent industry changes

The ABS' *Labour Force Survey* offers some insight into the industry drivers of employment change in Melbourne Statistical Division since the 2006 census. The industries listed have reported notable change in the number of employed residents between the August quarter of 2006 and the August quarter of 2010 (ABS 2010a)[26]:

- *Education and training* (+38 000)
- *Accommodation and food services* (+33 000)
- *Retail trade* (+31 000)
- *Health care and social assistance* (+29 000)
- *Professional, scientific and technical services* (+23 000)
- *Manufacturing* (–9 000).

The loss of jobs in *Manufacturing* is a long standing trend (see Maps 4.3 and 5.6). Strong employment growth has continued from the 2006 census in the industries of *Education and training and Health care and social assistance*, while the strong growth in the *Accommodation and food services* industry is a more recent development.

CLUE data provides some information on recent industry trends for the City of Melbourne. Between 2006 and 2008, the City of Melbourne experienced very rapid jobs growth, with the largest industry contributors being[27]:

- *Business services* (+10 700)
- *Accommodation and food services* (+5 700)
- *Information, media and telecommunications* (+5 600)
- *Public administration and safety* (+5 100).

The CLUE Business services industry corresponds to the ABS *Professional, scientific and technical services* industry, suggesting a substantial proportion of growth in this industry has occurred in the City of Melbourne. The *Education and training* industry added about 3000 jobs in the City of Melbourne, suggesting that Melbourne's strong recent jobs growth in this industry is occurring largely in suburban areas. Recent jobs growth in *Retail trade* similarly seems to have occurred largely in suburban Melbourne, rather than the City of Melbourne, where only 1300 jobs were added between 2006 and 2008. While *Information, media and telecommunications* has been an important source of recent jobs growth in the City of Melbourne, the Melbourne SD added only 4000 jobs in this industry between 2006 and 2010.

A clear message emerging from both datasets is that the *Accommodation and food services* industry has been an important driver of recent jobs growth. In the City of Melbourne, it is the food and beverage services component that is driving jobs growth.

26 Industry class fications are based on the 2006 ANZSIC.
27 Sourced from CLUE Free Reports on Employment for the Ent re City of Me bourne, accessed from: <www.melbourne.vic.gov.au/AboutMelbourne/Statistics/CLUE/Pages/freereports.aspx>

Another recent source of employment information is the *DEEWR Survey of Employers' Recruitment Experiences*. The February 2010 survey for North Western Melbourne[28] found that businesses in the Transport, Postal and Warehousing and Construction industries were most likely to report an increase in staffing levels in the preceding three months, with the Transport, Postal and Warehousing industry also having the highest recruitment expectations over the next 12 months, driven largely by a need to increase staff numbers (DEEWR 2010b). The May 2010 survey for South-Eastern Melbourne[29] found that recruitment expectations were particularly high for the local Construction industry (DEEWR 2010a). However, the April 2009 survey of employers in the Moonee Valley LGA found that expected increases in staff levels over the next 12 months were highest for the Health care and social assistance industry, and lowest for the Construction and Accommodation and food services industries (DEEWR 2009c). Thus, the industries driving jobs growth appear to vary across different parts of Melbourne.

Summary

This chapter has helped place the employment information presented in Chapter 4 in context, by examining how the industry mix of employment varies throughout the Melbourne working zone and by identifying the principal industry drivers of recent jobs growth and decline in different parts of Melbourne. While *Health and community services* was the major contributor to jobs growth in the Middle, Outer and Peri Urban sectors between 2001 and 2006, *Government administration and defence* employment was the largest contributor in the Inner sector. The *Transport and storage* industry also played an important role as the major contributor to jobs growth in the Middle West and Outer Northern subsectors.

28 Defined as the Brimbank, Hobson's Bay, Hume, Mar byrnong, Melton, Whittlesea and Wyndham LGAs.
29 Defined as the Card nia, Casey, Frankston, Greater Dandenong and K ngston LGAs.

CHAPTER 6
Transport mode

Key points

- *Melbourne 2030*'s transport-related objectives revolve around increasing use of public transport, encouraging cycling and walking, reducing car dependence and focusing development in areas that are well served by the public transport system.
- Melbourne is a car dependent city, with 77 per cent travelling to work by private vehicle, while 13 per cent used public transport, 4 per cent walked and 1 per cent cycled. Residents of the Outer sector were the most car dependent, with 85 per cent travelling by private vehicle. Access to Outer sector jobs was also extremely reliant on private vehicles (88 per cent).
- Inner Melbourne had the highest proportion of employed residents travelling to work by public transport (26 per cent), bicycle (4 per cent) and by foot (16 per cent). Public transport usage was least prevalent amongst Peri Urban residents.
- Inner Melbourne also had the highest proportion of jobs accessed by public transport (38 per cent) and bicycle (3 per cent), but jobs in Peri Urban areas were more likely to be accessed on foot (6 per cent). Only 1 per cent of Peri Urban jobs and 3 per cent of Outer sector jobs were accessed by public transport.
- Commuter public transport use is dominated by rail (71 per cent) and by Inner sector workers (78 per cent), particularly City of Melbourne workers (65 per cent).
- Between 2001 and 2006, Melbourne's private vehicle mode share declined from 78.2 to 76.7 per cent, while the public transport mode share rose from 12.4 to 13.2 per cent. There was a clear shift towards cycling and walking for the journey to work, but only in the Inner and Middle sectors.
- The reduction in the private vehicle mode share was most pronounced amongst Inner sector residents, with public transport use also declining, while the walking and cycling mode shares rose strongly. Middle sector residents switched away from private vehicles towards public transport and walking. Mode shares remained quite stable in the Outer sector.
- On a place of work basis, the reduction in the private vehicle mode share was heavily concentrated in the Inner sector. The private vehicle mode share rose for jobs in Melbourne's Outer and Peri Urban sectors. Inner sector jobs experienced a strong boost in public transport, cycling and walking mode shares between 2001 and 2006, while Middle sector jobs had modest increases.

- Lower car usage by City of Melbourne workers played a major role in reducing Melbourne's car dependence, but the suburban Central Activities Districts (CADs) made little contribution to the Melbourne-wide reduction due to their small residential and jobs base.
- Since 2001, significant progress has been made towards the Victorian government's public transport mode share target of 20 per cent by 2020, due to a surge in public transport patronage between 2004–05 and December 2008. Key drivers include increased petrol prices, population growth, CBD jobs growth and attitudinal change.
- Mode shares remained quite stable between 2001 and 2006 in Melbourne's residential growth SLAs and in the outer suburban jobs growth SLAs.
- Most new residential development is occurring in areas that are not well served by high-capacity public transport, and this pattern is gradually becoming more pronounced. In the outer suburbs (SLAs) that experienced the greatest residential (jobs) growth between 2001 and 2006, 52 per cent of population (jobs) was within 500 metres of a public transport stop with at least half hourly services.

Context

This chapter considers the usage of different transport modes for commuting purposes within Melbourne, concentrating on the journey to work information available from the ABS *Census of Population and Housing*. The chapter begins with some contextual information, before analysing transport mode usage and trends by place of residence, and then by place of work. The chapter also includes an analysis of progress against transport-related urban planning objectives.

Strategic plans

Melbourne 2030's transport-related objectives revolve around:

- Encouraging a shift away from private vehicles towards more sustainable modes (i.e. cycling, walking and public transport)
- Upgrading public transport services in the middle and outer suburbs, with a focus on better connecting activity centres
- Ensuring development is focused in areas that are well served by the public transport system.

Melbourne @ 5 million and the *Victorian Transport Plan* (VTP) are closely linked strategies released in 2008. These strategies emphasise an integrated approach to transport and urban development, including facilitating growth in Central Activities Districts (CADs) and extending the reach of public transport into new growth areas. As pointed out by Dodson (2009), these plans reflect a transition to an infrastructure focus in Melbourne's planning between 2002 and 2008. The VTP aims to use major transport infrastructure investment to shape the city's future spatial development (DT 2008b).

The impacts of past transport investment decisions have had profound and long lasting impacts on the city's structure. For example, the predominance of the car was strongly assisted by the construction of Melbourne's road network from the 1969 Melbourne Transportation Plan—a plan that has been described by historian Graeme Davison as 'the most expansive and expensive freeway experiment in Australian history' (Millar 2005).

Melbourne 2030 aims to 'promote transit-oriented development. The *Transit Cities Program*, which designs and develops urban precincts around key transport nodes to improve the interaction between land use and transport, will support *Melbourne 2030* by more efficient use of urban infrastructure' (DSE 2005a). The introduction of additional CADs in 2008 builds on the *Transit Cities Program*. Among other objectives, CADs aim to considerably reduce use of private vehicles. Accordingly, the State Government of Victoria has set a mode share target that: 20 per cent of motorised trips in Melbourne will be made by public transport by 2020 (DPC 2001).

More recently with the election of the Liberal-National Coalition Government in December 2010, the state government is developing a Transport Solutions Plan 'to improve business competitiveness and assist the development of regional Victoria by identifying and prioritising actions to address rail, road and port logistical bottlenecks in the transport network. Projects proposed as part of the Victorian Transport Plan are being reviewed by the Victorian Government in the context of these strategies' (DT 2011b).

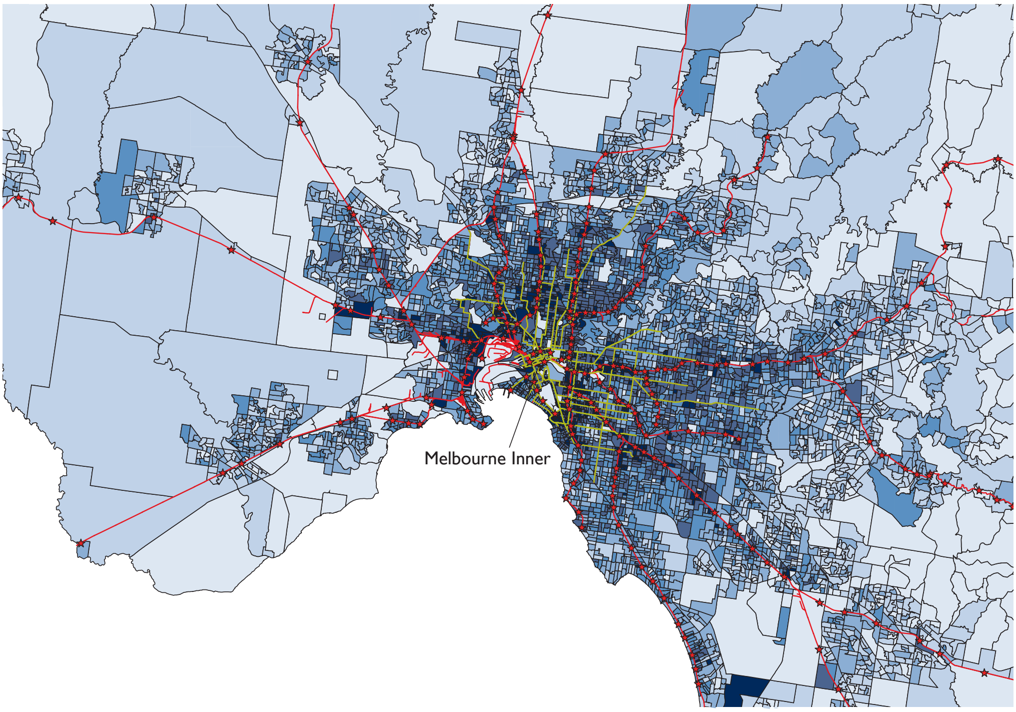
Key features

Key features relating to the usage of transport modes in Melbourne include:

- *Public transport network*: Melbourne has a Metro Train network of 372 kilometres, a Metro Tram network of 245 kilometres and a Metro Bus network of 4100 kilometres (DI 2006). The train network carried 146 million passengers in 2004–05 and the tram and bus networks carried 145 million and 90 million passengers respectively (ibid). The majority of Melbourne's rail network was already in place by the 1950s (DPCD 2008a). DI (2006 p.17) claims that 'more than 90 per cent of households in Melbourne are now within 400m of a public transport service'. The Government's ongoing program of investment in local buses (see DI 2006) aims to sustain this access level as the city grows by improving hours of operation and frequency of services, and by targeting services where they are most needed.

  Map 6.1 shows Melbourne's existing passenger rail network, which radiates from the city, and how it supports high levels of commuter use of trains—the most widely used mode of public transport in Melbourne. Commuter use of public transport is relatively high in the census collection districts (CCDs) that are adjacent to urban rail lines. Mees and Dodson (2011) highlight limited integration between the different modes in Melbourne's network, with only 10 per cent of rail passengers using feeder buses or trams.

M6.1 Percentage of employed persons commuting by public transport by CCD of residence, Melbourne and surrounds, 2006



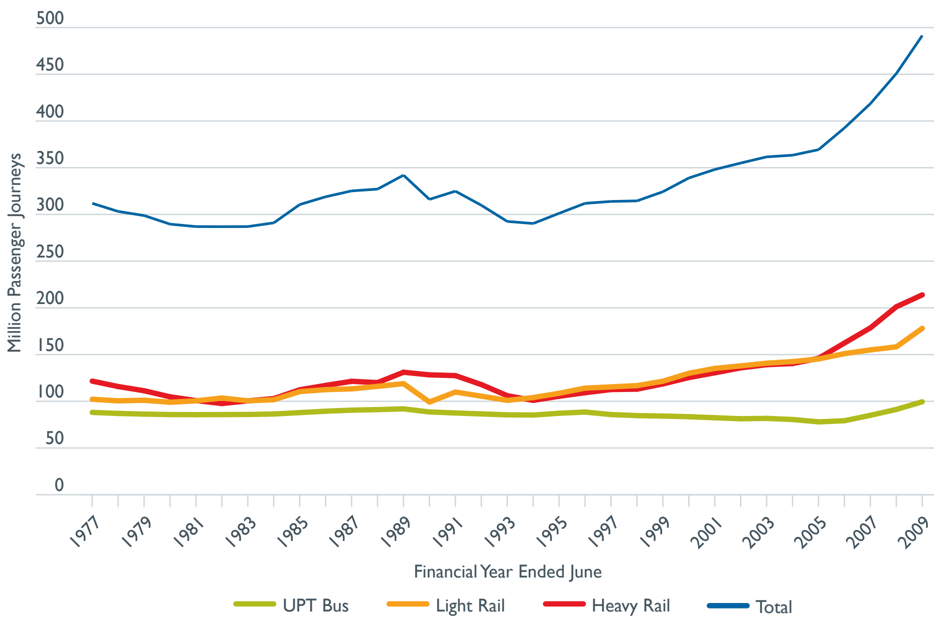
Source: BITRE analysis of ABS 2006 Census DataPacks: basic community profile release, Cat. 2069.0.30.001 (ABS 2008a) and rail and tram network data from the Department of Transport, Victoria

- *Journey to work mode shares*: BITRE analysis of ABS 2006 Census data shows that the mode share of public transport for commuter travel in Melbourne working zone was 13.2 per cent in 2006 (see Table 6.2). An average of 83 per cent of employed residents in Melbourne's outer suburbs travelled to work by car on census day—either as a sole driver or accompanied by passengers—due to:
  - the limited or non-existent '*cross-town*' connectivity of Greater Melbourne's established train network
  - limited car parking at outer suburban train stations, thus not supporting a '*park and ride mentality*'
  - a higher than average concentration of residents listing '*technicians and trades*' as their occupation and thus generally relying on driving to their workplaces with tools, plant and equipment aboard, rather than using public transport (Parliament of Victoria, 2008).

- *Trends in usage by mode:* Mode share changes in Melbourne have followed similar trends as in other major Australian cities, where the share of journey to work trips made by public transport, walking and cycling has fallen dramatically since its peak in the mid-1940s (Moriarty and Mees 2005). As residential areas expanded out beyond the extent of Melbourne's rail network, there was a substantial and ongoing shift away from public transport towards private vehicle use (DPCD 2008a). Although some modest increase in the public transport mode share was observed in the 1996 to 2006 period, it still remained around 12 per cent in 2006 (Mees, Sorupia and Stone, 2007). This is far below the corresponding figure for Sydney where it was 21 per cent in that year (ibid).

  Figure 6.1 shows trends in rail and bus passenger journeys for Melbourne in the 32 year period ending in 2009 (across all trip types, not just work trips). Following a trough in the mid 1980s, journeys by public modes of transport have increased. The increase has been driven by heavy rail, which has grown from 113 to 214 million passenger journeys (and from 1.9 to 3.5 billion passenger kilometres) between 1998 and 2009, representing growth of 6 per cent per annum. There has been a corresponding decline in the mode share of motor vehicles (expressed on a passenger kilometre basis) from 92 per cent in 1998 to 90 per cent in 2008 (BITRE 2009c).

F6.1 Public transport historical trends, Melbourne, 1977 to 2009



Note: Light rail includes tram.

Source: Unpublished update of BITRE 2009c.

- *Very high ownership of passenger vehicles*: A report by the Commissioner for Environmental Sustainability (CES) noted that 'compared to other state capitals, Melbourne and Perth have the highest levels of passenger vehicle ownership per household, with 35 per cent of Melbourne households owning two cars' (CES 2006 p.2). Currie and Senbergs (2007) found that 20 831 (23 per cent of) outer Melbourne households with income below $500 per week were running two or more cars, and these households had little or no walking access to local activities and limited public transport.
- *Spatial distribution of employment*: DPCD (2008c p.5) notes that 'recent transport modelling, combined with the population and household projections, demonstrate that Melbourne's transport performance is greatly affected by journey to work patterns'. DPCD (2008c) also notes how journey to work patterns are driven by the distribution of jobs relative to where people live. Job densities and employment self-sufficiency ratios are much lower in Melbourne's Outer sector than its Inner sector (see Chapter Four), and this is a factor contributing to the relatively long distance commutes by car made by many outer suburban residents. Using 2001 census data, Moriarty and Mees (2006) showed a strong correlation (R-squared=0.85) between travel using non-car modes and the percentage of local residents working in the Central Business District of Melbourne.
- *Freeway and tollway construction*: Melbourne University's Australasian Centre for the Governance and Management of Urban Transport (GAMUT) reports: 'More cars are driven to work each day in Melbourne than in Sydney, despite Sydney's much bigger workforce. The share of workers who drive is now higher in Melbourne than in Sydney, Brisbane, Hobart and even Canberra. This appears to be a result of Melbourne having constructed more urban freeways and tollways over the last 30 years than any other capital' (as cited in Parliament of Victoria, 2008). Examples of major road infrastructure projects in recent years include the Western Ring Road (completed in 1999), City Link (2000), Geelong Road upgrade (2002), the Hallam bypass (2003), the Craigieburn bypass (2005), the Calder-Tullamarine interchange project (2007), Pakenham bypass (2007), EastLink (2008), Calder Freeway upgrade (2009) and the Deer Park bypass (2009). Major ongoing projects include the Ring Road upgrade (commenced in 2008), Monash-City Link-West Gate upgrade (commenced in 2007) and Peninsula Link (commenced in 2010).
- *Rail infrastructure investments*: The main extensions to Melbourne's urban passenger rail network between 2001 and 2008 were the extension of the St Albans line to Sydenham in 2002 and the extension of the Broadmeadows line to Craigieburn in 2007. The Regional Fast Rail project, completed in 2006, aimed to improve rail services to regional cities and Peri Urban locations within the Melbourne working zone (e.g. Bacchus Marsh, Sunbury, Warrugul). Since 2008, the State government has committed to substantial future upgrades to Melbourne's passenger rail network. Key projects include the Regional Rail Link from West Werribee to Deer Park, the South Morang rail extension project and the Sunbury electrification.
- *Expanded bus services*: Since the 2006 *Meeting Our Transport Challenges* plan, the state government has been progressively rolling out new SmartBus services, which provide cross-town connections and run more frequently and for longer hours than other bus services. This has been complemented by extended weekend and evening services on existing bus routes and introduction of bus services to new suburbs (DT 2008d).

Place of residence snapshot for 2006

This section discusses modes of transport used by employed people journeying to work, based on their usual place of residence, in 2006. All data provided here has been drawn from the 2006 *Census of Population and Housing*. The section first outlines transport usage for the Melbourne working zone as a whole. It then outlines spatial patterns of transport use across planning sectors, Statistical Local Areas (SLAs), and finally, at the Census Collection District (CCD) level and associated suburban scales.

It is important to note that many commuters used more than one mode of transport to get to work. In order to assign each person's census response to one key mode of transport for analysis, a category hierarchy as shown below has been applied to the Census data used in this report. This hierarchy has been based on the *Transfigures* report published by the Ministry of Transport, New South Wales in 2008:

Highest

- Train
- Bus
- Ferry
- Tram/Light rail
- Taxi
- Vehicle driver
- Vehicle passenger
- Truck
- Motorbike
- Bicycle
- Other mode (not specified)
- Walk only.

Lowest

The hierarchy was created in such a way so that it 'gives priority to public transport over other modes' (ibid, p.14). This means that, for example, if a person used the train, a car and the bus to get to work, their journey to work was classified as a 'train' journey, because train is highest in the hierarchy. Similarly, if a person used the bus and a bicycle, their journey was classed as a 'bus' journey.

Melbourne working zone

In 2006, residents of the Melbourne working zone depended largely on private vehicles—particularly cars—to commute to work. Table 6.1 shows that 76.7 per cent of Melbourne working zone residents used private vehicles such as cars, trucks or motorbikes to travel to work—car users alone amounted to 75.1 per cent. Only 13.2 per cent of the resident working population commuted to work using public transport modes like bus, train, taxi, tram/light rail or ferry. Relatively few employed people walked (3.5 per cent) or cycled (1.2 per cent) to work. Just over 4 per cent stated that they worked from home, and hence did not commute at all.

T6.1 Journey to work by employed residents by mode of transport, Melbourne working zone, 2006

Transport mode	Employed usual residents (per cent)	Employed usual residents (number)
Car	75.1	1 152 845
Private vehicle (excludes cars)	1.6	24 330
Public transport	13.2	202 695
Bicycle	1.2	19 104
Walked only	3.5	53 218
Other	1.1	16 847
Worked from home	4.3	66 548
Total go ng to work	100.0	1 535 587
Mode unstated		33 282
Did not go to work		184 919
Total		1 753 788

Notes: The modal shares have been est mated by excluding (a) those who did not state the mode of travel and (b) those who did not work.

Source: BITRE analysis of ABS 2006 Census DataPacks: Basic community profile release 2, Cat. 2069.0.30.001 (ABS 2008a)

Table 6.2 shows that the most commonly used mode of public transport in Melbourne was the train, with 9.4 per cent of residents travelling to work this way.

T6.2 Journey to work by employed residents by mode of public transport, Melbourne working zone, 2006

Transport mode	Employed usual residents (per cent)
Tra n	9.4
Tram	2.2
Bus	1.4
Other (includes ferry and taxi)	0.3
Total	13.2

Note: Est mates out of total employed usual residents. This total excludes those not go ng to work or those not stating the mode of travel.

Source: BITRE analysis of ABS 2006 Census DataPacks: Basic community profile release 2 (Cat. 2069.0.30.001)

Sectors

This section discusses various modes of transport used by employed persons, by sector of residence in 2006.

Table 6.3 shows modal share as a percentage of all commuter travel in each sector. The Outer sector and the regional centre working zones (particularly the Latrobe Valley) had the highest car dependency. The Outer Western sector was the most heavily car dependent sector of the Melbourne Working Zone, with 83.9 per cent of employed residents either driving a car to work or travelling in a car to work as a passenger. With the exception of the Inner sector, a high dependence on cars as the mode of travel to work was observed in all remaining sectors. Comparing different cities in the past three decades, Mees, Sorupia and Stone (2007 p.14) note that 'Melbourne stands out as the worst performer, with the largest increase in car driving, and the largest declines in car-pooling'. This, they attribute to:

- Growth in more lane-kilometres of urban freeway and tollway than any other Australian city
- Failure to construct significant extensions to its suburban heavy rail system over this period
- Remarkably poor public transport management that has worked against coordinated operations of the different modes — that had been further exacerbated by the privatisation of trains and trams in 1999 (ibid).

Compared to other sectors, the share of public transport as a mode of travel to work was relatively high in the Inner sector (26.0 per cent). The percentages of working population that cycled and walked to work in the Inner sector were relatively high at 4.4 and 15.8 per cent respectively. The Middle North sector also had relatively high bicycle usage.

Each of the Middle sectors had a public transport mode share in the 15 to 20 per cent range, and so exceeded the Melbourne working zone average. In contrast, the public transport mode share was consistently between 6 and 10 per cent in the Outer subsectors and was below 5 per cent for the Peri Urban sector and the regional working zones.

Table 6.4 provides a breakdown of public transport mode shares in 2006 for each planning sector. The use of train as a mode of travel to work was highest in the Middle sector, particularly the Middle South. Train usage was lowest in the Outer Southern and Peri Urban sectors. Tram usage was highest for residents of the Inner sector, where it had higher commuter usage than trains, and was also significant in the Middle North.

As shown in Table 6.4, less than 3 per cent of employed residents of each sector used a bus to get to work, with a mode share of just 1.4 per cent across the Melbourne working zone. Bus usage was consistently well below train usage in all sectors. The bus mode share was highest for the Middle East sector of Melbourne at 2.7 per cent. Progressive implementation of the strategies in the *2008–09 State Budget of Victoria* is intended to make buses a more competitive public transport mode. These strategies include providing more funds to (a) include buses in the 'traffic priority' program with the intent to improve travel times, reliability and safety along the busiest parts of Melbourne's tram and road network and (b) improve tram and bus infrastructure (Department of Treasury and Finance, 2009).

T6.3 Employed residents by mode of transport and subsector, Melbourne working zone, 2006

Sector/subsector	Car	Private vehicle excluding car	Public transport	Bicycle	Walked	Other mode	Worked from home
	Mode share (per cent)						
Inner	46.2	0.9	26.0	4.4	15.8	1.7	5.0
Middle	72.6	1.3	16.6	1.5	2.7	1.1	4.3
Middle East	73.1	1.1	15.7	1.0	2.8	1.1	5.2
Middle North	68.6	1.6	19.3	3.0	3.0	1.3	3.3
Middle South	72.6	1.1	16.1	1.3	2.8	1.0	5.2
Middle West	75.8	1.4	15.7	1.2	2.2	0.9	2.8
Outer	83.4	2.0	7.6	0.4	1.8	1.0	3.9
Outer Eastern	82.3	2.0	7.9	0.5	1.9	0.9	4.6
Outer Northern	83.7	1.9	8.5	0.3	1.4	1.0	3.1
Outer Southern	83.7	2.1	6.4	0.4	2.0	1.0	4.3
Outer Western	83.9	1.8	9.2	0.3	1.2	0.9	2.6
Peri Urban	79.9	2.2	4.0	0.4	4.0	1.2	8.4
Me bourne work ng zone	75.1	1.6	13.2	1.2	3.5	1.1	4.3
Geelong work ng zone	83.4	1.6	4.3	1.1	3.8	1.0	4.8
Ballarat work ng zone	83.9	1.8	2.2	1.2	4.3	1.1	5.6
Bendigo work ng zone	82.6	1.8	1.8	1.4	5.1	1.2	6.3
Latrobe Valley work ng zone	87.0	1.8	1.4	0.7	3.6	0.9	4.5

Source: BITRE analysis of ABS 2006 Census DataPacks: basic community profile release 2, Cat. 2069.0.30.001 (ABS 2008a)

T6.4 Employed residents by mode of public transport and subsector, Melbourne working zone, 2006

Sector	Train	Bus	Tram	Other (including ferry, taxi)	Total
	Mode share (per cent)				
Inner	10.4	1.5	13.5	0.6	26.0
Middle	12.3	1.8	2.1	0.3	16.6
Middle East	11.1	2.7	1.7	0.2	15.7
Middle North	12.3	1.7	5.0	0.4	19.3
Middle South	13.9	1.0	1.0	0.3	16.1
Middle West	12.6	1.6	1.2	0.3	15.7
Outer	6.4	0.9	0.1	0.2	7.6
Outer Eastern	6.7	1.0	0.0	0.1	7.9
Outer Northern	7.2	0.9	0.2	0.2	8.5
Outer Southern	5.2	1.0	0.0	0.2	6.4
Outer Western	8.4	0.6	0.0	0.2	9.2
Peri Urban	3.4	0.4	0.0	0.1	4.0
Me bourne Working Zone	9.4	1.4	2.2	0.3	13.2

Source: BITRE analysis of ABS 2006 Census DataPacks: basic community profile release 2, Cat. 2069.0.30.001 (ABS 2008a)

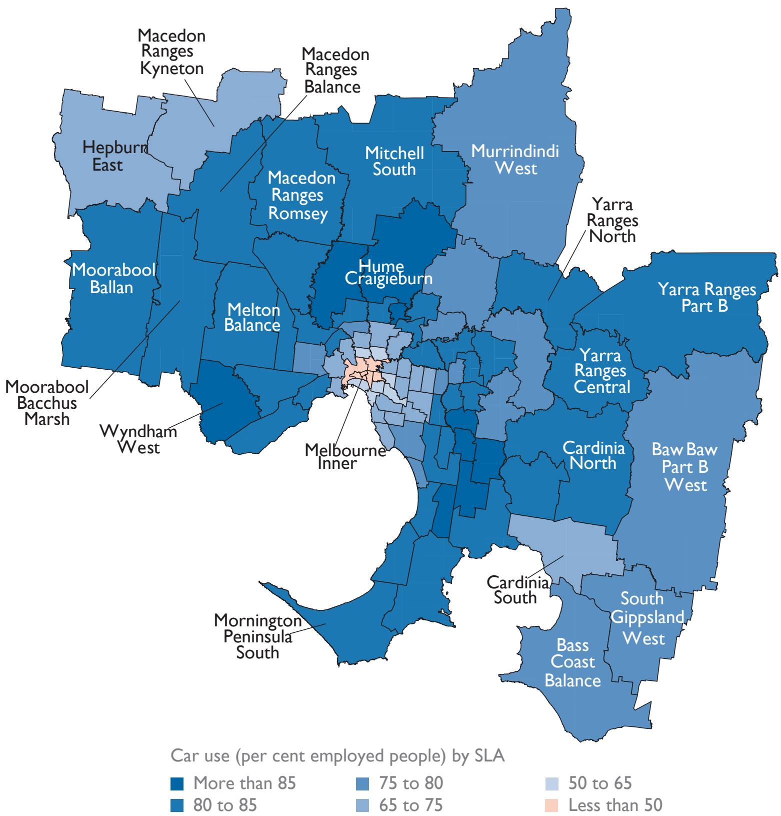
Commuter use of public transport in Melbourne is dominated by rail, which accounts for 71 per cent of trips. Rail accounts for only 40 per cent of commuter public transport trips by Inner sector residents, but the share rises to 74 per cent for the Middle sector and 85 per cent for the Outer sector, peaking at 91 per cent in the Outer Western sector.

Statistical Local Areas

This section discusses modes of transport used by employed persons, by SLA of residence, in 2006.

Map 6.2 shows that at the SLA level, car use was highest amongst residents in the Outer sector, where it was consistently above 70 per cent for all SLAs. The car mode share was highest for Frankston East (87 per cent), Knox South (87 per cent) and Craigieburn (86 per cent). The Keilor SLA in the Middle West sector had a higher car mode share than other Middle sector SLAs at 84 per cent. The car mode share was lowest in Melbourne Inner, where just 16 per cent of employed residents used a car to get to work, and in Southbank-Docklands and Melbourne Remainder (both 37 per cent).

M6.2 Percentage of employed persons commuting by car by SLA of residence, Melbourne working zone, 2006

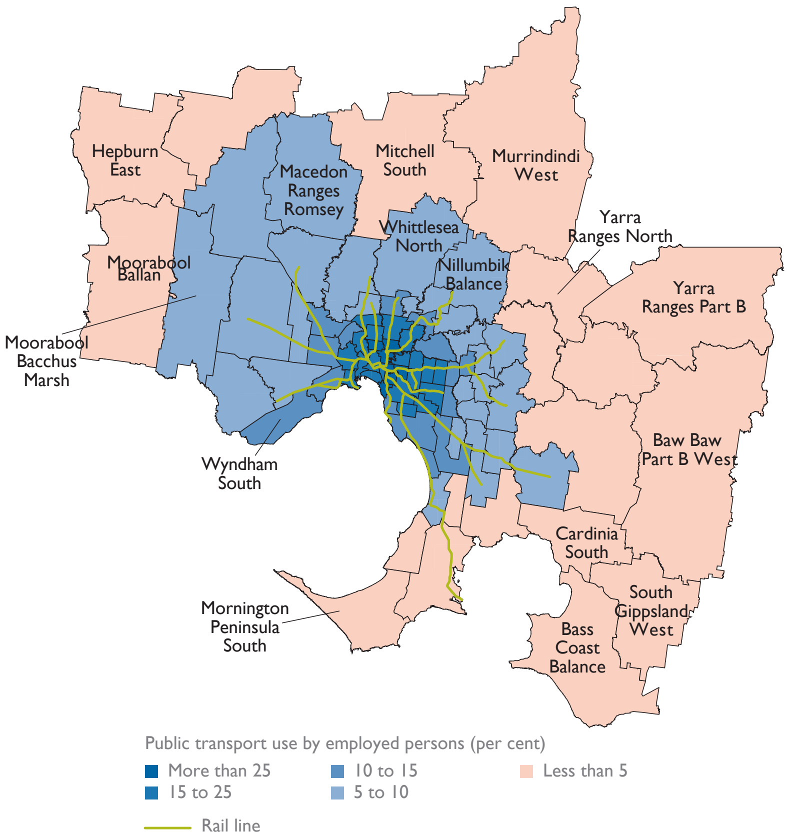


Source: BITRE analysis of ABS 2006 Census DataPacks: Basic community profile release 2, Cat. 2069.0.30.001 (ABS 2008a)

Map 6.3 shows that in 2006, public transport use levels were highest amongst residents of a group of SLAs located less than 10 kilometres from the CBD. The Middle North sector SLA of Brunswick had the highest public transport mode share (30 per cent), followed by the Inner sector SLAs of St Kilda (29 per cent), Richmond (28 per cent) and Prahran (28 per cent). Public transport usage was a little lower in the City of Melbourne, where the three component SLAs had mode shares of between 21 to 26 per cent, as many residents chose to walk to work. Even though public transport usage was at its highest in the Inner sector, nearly half of all employed people living in the Inner sector still travelled to work by car.

Public transport usage also tends to be higher along the main urban rail corridors. The Ringwood SLA has the highest public transport mode share in the Outer sector at 13 per cent, with 92 per cent of residents using trains. Manningham East had a lower public transport mode share than other Middle sector SLAs at 6 per cent—reflecting the lack of a railway line in this SLA. The use of public transport was relatively low in outlying areas away from regular urban passenger train services. SLAs with less than 3 per cent of employed residents using public transport to get to work include Cardinia South, Mornington Peninsula South and Murrindindi West. These patterns are depicted in greater detail in the section on transport use at the CCD and suburb level to follow.

M6.3 Percentage of employed persons commuting by public transport, by SLA of residence, Melbourne working zone, 2006



Source: BITRE analysis of ABS 2006 Census DataPacks: Basic community profile release 2, Cat. 2069.0.30.001 (ABS 2008a)

With regard to the specific public transport modes:

- The train mode share was highest in the Hawthorn (19 per cent), Caulfield (19 per cent) and Prahran SLAs (18 per cent). Of the 91 SLAs in the Melbourne working zone, 65 had a train mode share of more than 5 per cent.
- Tram usage was highest in Brunswick (19 per cent) and Port Phillip West (18 per cent), but only 14 SLAs had usage of over 5 per cent.
- Bus usage was most significant in Manningham West (7 per cent), Kew (4 per cent) and Maribyrnong (4 per cent). The bus mode share was below 2 per cent in 81 of the 91 SLAs.

About 4 per cent of Melbourne working zone employed residents journeyed to work on foot, using no other transport mode. The walking mode share was extremely high for those who live in Melbourne Inner (51 per cent), Southbank-Docklands (34 per cent), Melbourne Remainder (26 per cent) and other Inner sector SLAs. The walking mode share was at its lowest and below 1 per cent in Craigieburn, Melton East and Wyndham West. These three SLAs contain some of Melbourne's designated Growth Areas and many new housing estates, with the latter two SLAs also having relatively few jobs.

The cycling mode share is particularly high in the Yarra North (9 per cent), Brunswick (8 per cent) and Northcote (6 per cent) SLAs, which are clustered together to the north of the city centre. However, the cycling mode share lies below 1 per cent for about 70 per cent of Melbourne's SLAs.

Census collection districts and suburbs

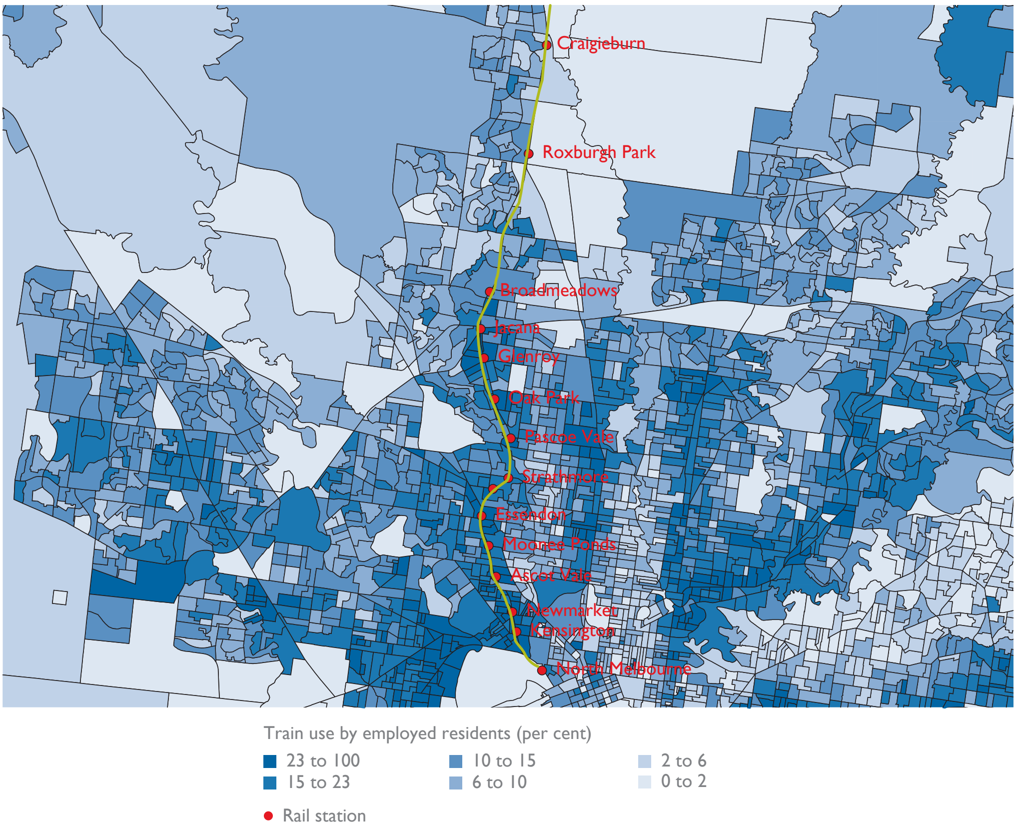
This section discusses modes of transport used by employed persons, by CCD and suburb of residence, in 2006. With the exception of the inner suburbs, car was the dominant transport mode used by commuters travelling to work in all sectors across the Melbourne working zone. This is also reflected at the CCD and suburban level. Regression analysis undertaken by Paez and Currie (2010) at the CCD scale identified three variables that explained most of the spatial variation in car use for commuting trips in Melbourne—public transport supply, distance from the CBD and residential density.

Train usage is the dominant mode of public transport in Melbourne, accounting for 9.4 per cent of all commuting trips. The train mode share was particularly high for the following suburbs:

- Glen Huntley (30 per cent), a Middle South suburb, on the Frankston line
- Ripponlea (30 per cent) and Balaclava (26 per cent), which are neighbouring Inner suburbs on the Sandringham line
- Burnley (29 per cent) and the neighbouring inner suburb of Cremorne (25 per cent), which are served by several rail lines
- Seddon (26 per cent) and Footscray (25 per cent) in the Middle West sector, which are served by several rail lines
- Kensington (26 per cent) on the Craigieburn line.

Out of the 17 Melbourne railways radiating from the CBD/City Loop of Melbourne, the Craigieburn and Frankston rail lines shown in Maps 6.4 and 6.5 reveal a similar pattern. The use of train as a mode of travel to work appears to be highest amongst the residents of CCDs that are located along the railway line. This was particularly true in the immediate vicinity of a railway station. Map 6.4, for example, shows that those CCDs adjacent to railway stations had the highest levels of train use along the Craigieburn railway line in the Outer Northern sector. The clustering effect is less pronounced for railway stations on the Frankston line.

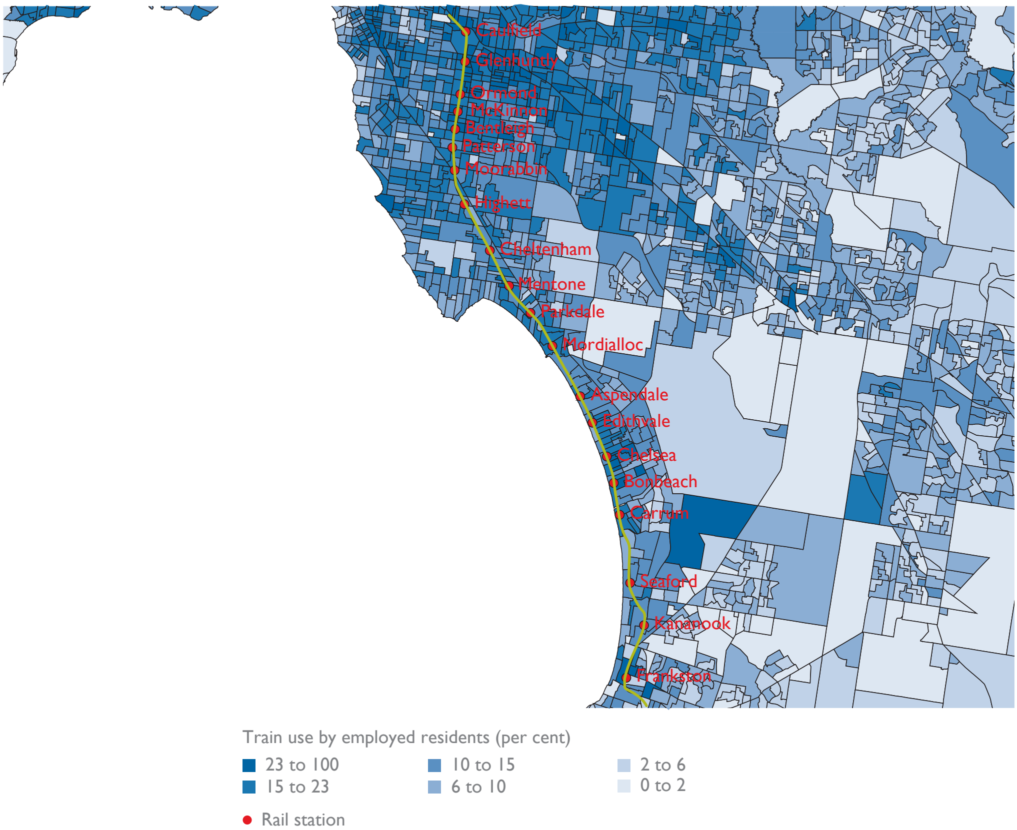
M6.4 Percentage of employed people using the train on the Craigieburn Line by CCD of residence, 2006



Note: Rail lines other than the Craigieburn line are not displayed on this map.

Source: BITRE analysis of ABS 2006 Census basic community profile release 2, Cat. 2069.0.30.001 (ABS 2008a)

M6.5 Percentage of employed people using the train on the Frankston Line by CCD of residence, 2006



Note: Rail lines other than the Frankston l ne are not displayed on this map.

Source: BITRE analysis of ABS 2006 Census basic community profile release 2, Cat. 2069.0.30.001 (ABS 2008a)

Table 6.5 identifies the suburbs in the Melbourne working zone with the highest bus use. They all belong to the Middle sector, and are concentrated in three principal clusters:

- The neighbouring suburbs of Doncaster, Doncaster East, Templestowe Lower and Bulleen in the Manningham West SLA (which does not contain any rail stations)
- The neighbouring suburbs of Heidelberg West and Bellfield
- The neighbouring western suburbs of Footscray, West Footscray and Braybrook in the Maribyrnong SLA.

Interestingly, the western suburb of Footscray is amongst the top ten suburbs in terms of both train and bus usage.

T6.5 Highest bus mode share by suburb, Melbourne working zone, 2006

Suburb	Sector	Bus use share (percentage out of total users)
Doncaster	Middle East	9.0
Heide berg West	Middle North	8.8
Templestowe Lower	Middle East	8.1
Doncaster East	Middle East	7.8
Bulleen	Middle East	7.7
Kew East	Middle East	7.5
Braybrook	Middle West	7.5
West Footscray	Middle West	7.4
Bellfield	Middle North	6.6
Footscray	Middle West	5.9

Note: Excludes suburbs with less than 100 residents.

Source: BITRE analysis of ABS 2006 Census DataPacks: basic community profile release 2 (Cat. 2069.0.30.001) suburb data.

The bus mode share is consistently low in the Inner, Outer and Peri Urban sectors. There are a few suburbs that stand out as having higher bus usage than their peers, such as the Outer Southern suburbs of Dandenong, Frankston North and Doveton and the Inner suburbs of Collingwood and Port Melbourne—all have a bus mode share of between 3.0 and 4.0 per cent. Notwithstanding the lower population densities and car being a viable alternative, some practitioners attribute the observed low bus usage in the outer suburbs to the lack of integrated circumferential bus routes in those areas (Moriarty and Mees, 2007).

Tram usage is more prominent than train or bus usage for many Inner and Middle sector suburbs of Melbourne. Tram usage is highest for residents of Brunswick East (26 per cent), with the mode share also exceeding 20 per cent for St Kilda, St Kilda West, Travancore, Fitzroy North, Carlton North and South Melbourne. For most Outer and Peri Urban suburbs of Melbourne the tram mode share is less than 1 per cent.

Journey to work by walking and cycling in Melbourne has declined since the early 1950s (Moriarty and Mees, 2007). In 2006, the percentage of persons walking to work was about 3.5 per cent, and this was considerably boosted by 15.8 per cent of persons walking to work in the Inner sector of Melbourne. In the Inner sector, the percentage of persons who walked to work was particularly high in the suburbs of Melbourne, Southbank, Carlton, West Melbourne and East Melbourne. In the Middle sector, Clayton stood out as having a higher than average proportion of people walking to work (10 per cent), as did Yallambie (9 per cent), which contains the Simpson Army Barracks, and Box Hill (8 per cent). Apart from some locations on the Mornington Peninsula (e.g. HMAS Cerberus, Sorrento), there were few suburbs in the Outer sector with a high walking mode share. However, walking to work was quite common in Peri Urban locations such as Wonthaggi (11 per cent) and Daylesford (10 per cent). Almost all of the Peri Urban regions surrounding Perth also showed high numbers of people walking to work (BITRE 2010).

Changes from 2001 to 2006

This section discusses changes in the modes of transport used by employed people who travelled to work between 2001 and 2006. Importantly, this section is not based on people's *usual place of residence* in August 2006, but upon the place *where they were staying on census night* (place of enumeration). Such an analysis was possible because BITRE was able to gain ready access to reliable, comparable, disaggregated transport mode data for the years 2001 and 2006 by place of enumeration. ABS 2006 Census data shows that across a range of geographical classifications within Melbourne, the figures for transport mode share were relatively similar between the place of usual residence and the place of enumeration census counts. This suggests that the place of enumeration data is useful in the analysis that follows.

Melbourne working zone and city sectors

Table 6.6 summarises changes in the usage of different transport modes for the journey to work in the Melbourne working zone. The changes of largest magnitude were the increase of 78 519 car trips and 24 406 train trips between 2001 and 2006. Growth in car trips accounted for 60.0 per cent of the overall change in the journey to work between 2001 and 2006, while train usage contributed 18.7 per cent and walking contributed 10.8 per cent. However, it was bicycle and walking trips that experienced the most rapid rate of growth over the period, at 8.0 and 6.3 per cent per annum respectively. Train travel and other forms of public transport trips also experienced above-average rates of growth. Private vehicle trips grew by 1.4 per cent per annum, which was below the 1.8 per cent increase in total journeys to work, implying a reduction in the mode share of private vehicles between 2001 and 2006.

T6.6 Change in transport mode usage for employed people enumerated in Melbourne working zone, 2001 to 2006

Mode	2001	2006	Change	Contribution to increase in journeys to work between 2001 and 2006 (per cent)	Average annual growth (per cent)
Train	120 153	144 559	24 406	18.7	3.8
Tram	30 477	33 452	2 975	2.3	1.9
Bus	19 854	21 012	1 158	0.9	1.1
Public transport total	174 576	203 259	28 683	21.9	3.1
Car	1 071 885	1 150 404	78 519	60.0	1.4
Private vehicle total	1 096 012	1 174 654	78 642	60.1	1.4
Bicycle	13 013	19 092	6 079	4.6	8.0
Other modes	13 397	16 184	2 787	2.1	3.9
Wa ked only	39 510	53 652	14 142	10.8	6.3
Worked at home	65 899	66 365	466	0.4	0.1
Total going to work	1 402 407	1 533 206	130 799	100.0	1.8
Did not go to work	164 452	177 784	13 332		1.6
Mode unstated	36 359	33 161	–3 198		–1.8
Total	1 603 218	1 744 151	140 933		1.7

Note: 2006 data d ffers from that n Table 6.1 which was on a place of usual residence basis. This table is on a place of enumeration basis.

Source: BITRE derived data from ABS 2006 Census DataPacks: place of enumeration profile release 2 (Cat. 2069.0.30.004); ABS CData 2001.

Table 6.7 looks at the change in mode share for the Melbourne working zone and each of its sectors. For the Melbourne working zone as a whole, there was a 1 5 percentage point reduction in the private motor vehicle mode share from 78.2 per cent in 2001 to 76.7 per cent in 2006. At the same time, the public transport mode share increased by 0.8 percentage points from 12.4 to 13.2 per cent, which reflected an increase in the train mode share of 0.9 percentage points. Increased train usage accounted for 85 per cent of the rise in public transport usage, and was particularly common amongst Middle sector residents who accounted for 59 per cent of the increase in train usage. The other notable mode share change was the increase in the walking mode share by 0.7 percentage points from 2.8 to 3.5 per cent of trips.

The reduction in the mode share of private vehicles was most pronounced in the Inner sector, but was also significant in the Middle sector. The Outer sector experienced little change in the private vehicle mode share, while the mode share rose in the Peri Urban sector.

The mode shares of private vehicles and public transport both declined in the Inner sector, but the proportion of journey to work trips undertaken solely by foot increased from 11.7 to 16.5 per cent and cycling trips increased from 3.2 to 4.2 per cent. There was a clear shift towards these two active transport modes by Inner sector residents in their journey to work. The census data also reveals declines in the mode share of trams and buses (but not trains) for Inner sector residents between 2001 and 2006.

The reduction in the private vehicle mode share in the Middle subsectors was accompanied by an increase in the mode share of public transport, and particularly of trains. The Outer subsectors experienced minimal changes in their mode shares between 2001 and 2006, with the exception of the Outer Western subsector which experienced a 1.1 percentage point increase in the train mode share from 7.3 to 8.4 per cent. The extension of the St Albans line to Sydenham in 2002 is a likely contributing factor. The increase in the private vehicle mode share in the Peri Urban sector reflects the continuing process of urbanisation and integration with Melbourne—there was an equivalent reduction in the proportion of residents working from home (e.g. on farms) as residents increasingly commuted to a workplace elsewhere in Melbourne.

T6.7 Change in transport mode share amongst employed people enumerated in the Melbourne working zone, by sector, 2001 to 2006

Sector	Train	Public transport total	Car	Private vehicle total	Bicycle	Other mode	Walked	Worked at home
	percentage point change in mode share							
Inner	0.4	–1.0	–5.1	–4.9	1.0	0.5	4.7	–0.3
Middle	1.5	1.6	–2.3	–2.5	0.5	0.1	0.4	–0.2
Middle East	1.4	1.7	–2.2	–2.3	0.3	0.1	0.4	–0.3
Middle North	1.5	1.6	–3.3	–3.4	1.1	0.3	0.4	–0.1
Middle South	1.2	1.1	–1.6	–1.8	0.3	0.1	0.5	–0.1
Middle West	2.0	2.0	–2.2	–2.4	0.4	0.1	0.3	–0.3
Outer	0.5	0.4	0.2	0.1	0.0	0.0	0.0	–0.5
Outer Eastern	0.3	0.3	0.2	0.0	0.1	–0.1	0.2	–0.4
Outer Northern	0.4	0.3	0.2	0.0	0.0	0.1	0.1	–0.5
Outer Southern	0.4	0.3	0.3	0.2	0.0	–0.1	0.0	–0.4
Outer Western	1.1	1.2	–0.1	–0.4	0.0	0.0	–0.4	–0.4
Peri Urban area	0.2	0.1	1.8	1.5	0.0	–0.1	0.0	–1.5
Melbourne Work ng Zone	0.9	0.8	–1.4	–1.5	0.3	0.1	0.7	–0.4

Source: BITRE derived data from ABS 2006 Census DataPacks: place of enumeration profile release 2 (Cat. 2069.0.30.004); ABS CData 2001.

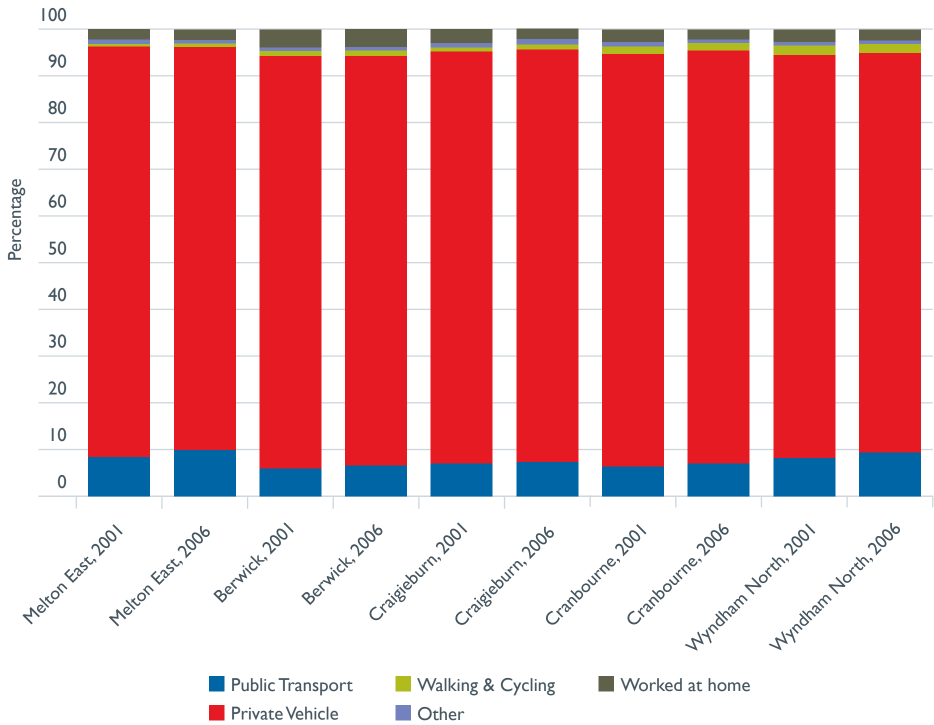
The Melbourne working zone's increase in the mode share of walking and cycling was largely due to the increases experienced in the Inner sector, although the Middle sector also made a positive contribution. In particularly, the Middle North sector recorded a 1.1 percentage point increase in cycling to work. The percentage of employed persons working from home declined in all sectors during the period from 2001 to 2006.

Statistical Local Areas

This section explores changes in commuter use of different transport modes at a more disaggregated scale—Statistical Local Areas (SLAs) of residence.

Chapter 3 detailed Melbourne's population growth between 2001 and 2006, highlighting the SLAs which added the most population (see Table 3.4). Figure 6 2 shows how mode shares have changed in the five SLAs that added the most new residents between 2001 and 2006. Generally, mode shares have remained quite stable as the population of these SLAs have expanded. The Melton East SLA more than doubled its population and the number of employed residents between 2001 and 2006—it experienced a 1.5 percentage point rise in the mode share of public transport while the private vehicle mode share declined by 1.5 percentage points. The other growth SLAs also experienced an increase in the mode share of public transport of between 0.3 and 1 2 percentage points. The private vehicle mode share declined in Berwick, Melton East and Wyndham North, but rose in Craigieburn and was unchanged in Cranbourne. The proportion of residents who worked from home declined notably in several of the growth SLAs, but the walking and cycling mode share remained stable.

F6.2 Transport mode shares by place of enumeration for selected residential growth SLAs, 2001 and 2006

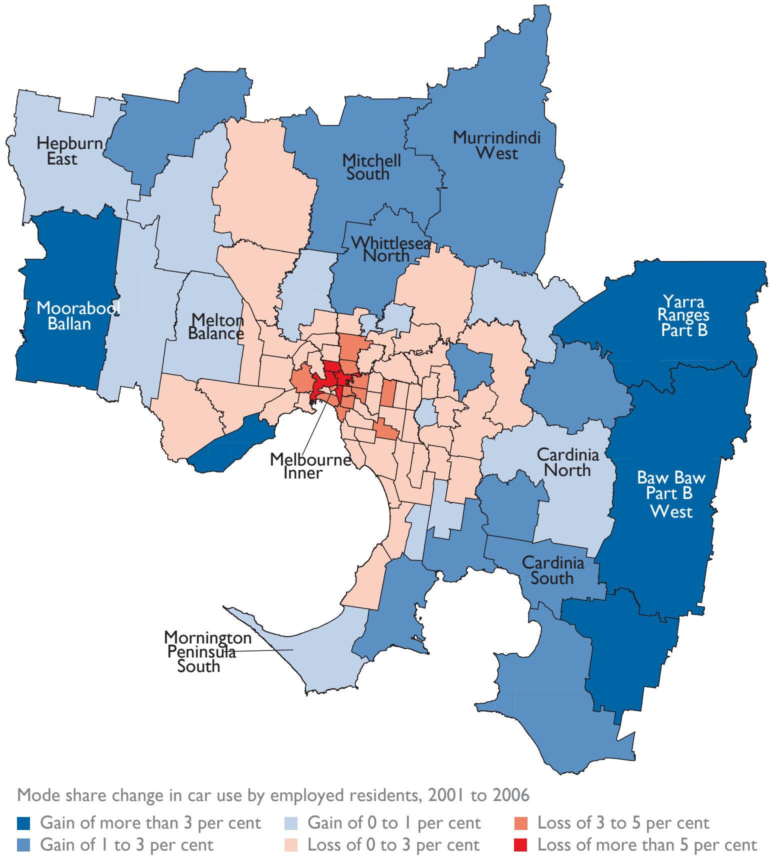


Source: BITRE derived data from ABS 2006 Census DataPacks: place of enumeration profile release 2 (Cat. 2069.0.30.004); ABS CData 2001.

Map 6.6 shows the percentage point change in the car mode share amongst employed persons in Melbourne working zone during the period between 2001 and 2006. Car increased its modal share most amongst residents of many Outer and Peri Urban SLAs. This was particularly evident in the SLAs of Wyndham South and South Gippsland West, which both experienced significant reductions in the proportion of residents walking to work or working from home.

It is also evident from Map 6.6 that decreases in the car mode share dominate throughout the urbanised part of Melbourne working zone, and the modal share has decreased most in SLAs within about 10 kilometres of the CBD. The largest decrease occurred for the Brunswick SLA in the Middle North sector where the car mode share fell from 56.9 to 50.5 per cent between 2001 and 2006. In Brunswick, cycling experienced the greatest mode share increase from 5.1 to 8.3 per cent, while the public transport and walking mode shares also rose. Other SLAs with a large decline in the car mode share included Yarra North and Melbourne Remainder in the Inner sector, Northcote in the Middle North and Maribyrnong in the Middle West sector. In Yarra North and Melbourne Remainder, walking recorded a substantial increase in mode share, while for Northcote it was cycling and for Maribyrnong it was public transport.

M6.6 Percentage point change in car mode share amongst employed people enumerated in the Melbourne working zone, by SLA, 2001 to 2006

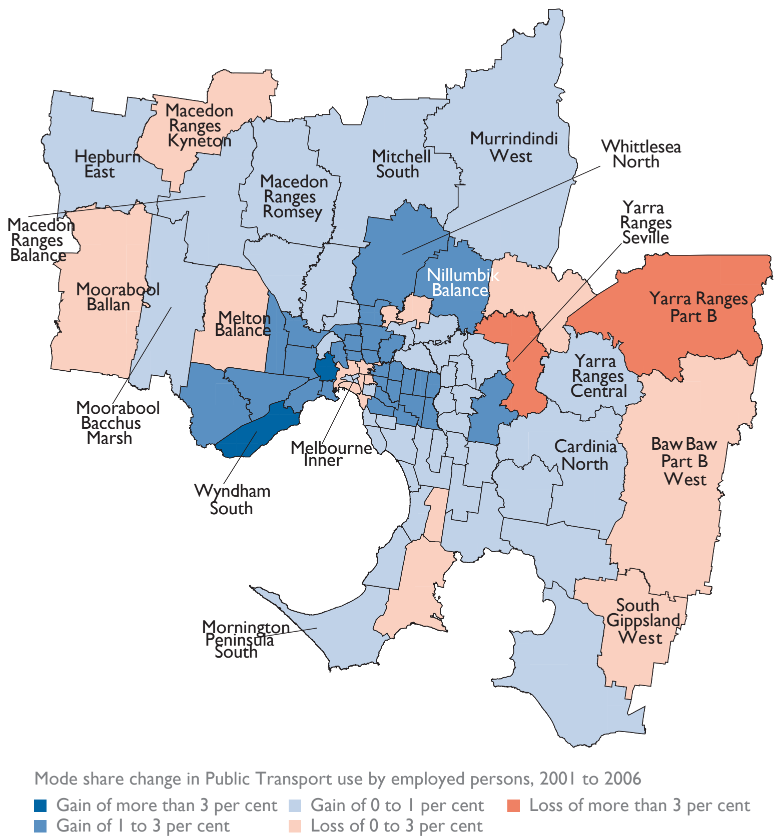


Source: BITRE derived data from ABS 2006 Census DataPacks: place of enumeration profile release 2 (Cat. 2069.0.30.004); ABS CData 2001.

Map 6.7 shows both positive and negative changes in the share of public transport in commuter travel between 2001 and 2006. Data underlying the spatial analysis shows that the use of public transport in work trips has had a 0.8 percentage point increase. This, in terms of absolute numbers was an increase of 28 683 people. The increases in public transport mode share were significant in a large number of SLAs in the Middle and Outer sectors. Particularly noteworthy were the increases in the Maribyrnong and Wyndham South SLAs. Maribyrnong experienced a shift away from cars towards public transport usage, while Wyndham South roughly quadrupled its population and in the process boosted both its car and public transport mode share, at the expense of walking to work and working from home. Increases were also substantial in the Middle East SLAs of Monash South West and Box Hill. The extension of the Mont Albert tramline to Box Hill in 2003 may have contributed to the Box Hill result, although increasing rail usage was the dominant factor.

The extension of the St Albans line to Keilor Plains and Sydenham in 2002 appears to be reflected in the rising public transport mode share for the Keilor SLA (from 8.7 to 10.3 per cent). It may also be reflected in the neighbouring Melton East SLA, which contains no rail stations, but where the number of residents using the train to get to work increased from 534 in 2001 to 1490 in 2006, representing a mode share increase from 7.5 to 8.9 per cent.

M6.7 Percentage point change in public transport mode share amongst employed people enumerated in the Melbourne working zone, by SLA, 2001 to 2006



Source: BITRE derived data from ABS 2006 Census DataPacks: place of enumeration profile release 2 (Cat. 2069.0.30.004); ABS CData 2001.

Declines in the public transport mode share were most prevalent on the urban fringe (e.g. in parts of the Yarra Ranges LGA) and in Melbourne's Inner sector (e.g. Yarra North, Melbourne Remainder). The Inner sector SLAs with a decline in the public transport mode share typically experienced a decline in the car mode share, while walking increased strongly.

Place of work snapshot for 2006

This section discusses modes of transport used by employed people journeying to work, based on their place of work (regardless of whether they lived in the Melbourne working zone) in 2006. All data provided here has been drawn from the 2006 *Census of Population and Housing*.

Spatially, this section first considers mode usage for the Melbourne working zone as a whole. Second, it considers transport use across sectors. Third, it considers transport use at the Journey to Work Statistical Local Area (JWSLA) level.[30]

Melbourne working zone

Table 6.8 shows the mode of transport used by employed persons working within the Melbourne working zone in 2006. The transport mode shares shown in this table and the mode share for employed persons who usually live in the Melbourne working zone (shown in Table 6.1) are very similar. People who worked in the Melbourne working zone were largely dependent upon car in their journey to work.

T6.8 Mode of transport used by employed people to travel to a place of work in the Melbourne working zone, 2006

Transport mode	Employed persons working within the Melbourne working zone (per cent)	Employed persons working within the Melbourne working zone (number)
Car	74.6	1 043 411
Private vehicle (excludes cars)	1.3	18 066
Public transport	13.7	191 682
Bicycle	1.3	18 173
Walk only	3.6	49 945
Other	1.0	14 048
Worked from home	4.6	64 194
Total	100.0	1 399 519

Source: BITRE analysis of ABS 2006 Census DataPacks: work ng population profile release 2 (Cat. 2069.0.30.006)

Table 6.9 shows that in the Melbourne working zone, the commuter demand for trains is more than four times that for buses or trams. The use of different modes is similar to that revealed on a place of residence basis in Table 6.2, although those who work in Melbourne are slightly more likely to travel to work by train (9.8 per cent) than employed usual residents of Melbourne (9.4 per cent). This gap reflects the train commutes made by residents of the adjoining regional working zones (e.g. Geelong, Ballarat).

30 BITRE does not hold statistics on journey-to-work transport modes at the CCD or Destination Zone level, where these statistics are based on place of work (as opposed to place of residence).

T6.9 Mode of public transport used by employed people to travel to a place of work in the Melbourne working zone, 2006

Transport mode	Employed persons (per cent)	Employed persons (number)	Proportion of public transport users (per cent)
Tra n	9.8	137 749	71.9
Tram	2.3	31 542	16.5
Bus	1.4	19 251	10.0
Taxi	0.2	2 957	1.5
Other (includes ferry)	0.0	183	0.1
Public transport total	13.7	191 682	100.0

Source: BITRE analysis of ABS 2006 Census DataPacks: work ng population profile release 2 (Cat. 2069.0.30.006)

Sector

This section discusses modes of transport used by employed persons, by place of work sector in 2006. Table 6.10 shows that car dependence was highest amongst people working in the Outer Western and Outer Northern sectors. Car dependence was lowest amongst people working in the Inner sector and the Peri Urban sector. In 2006, public transport use was highest in the Inner sector—as a result of good public transport access to Inner city workplaces, 37.5 per cent of the people who worked in the Inner sector used public transport as the dominant mode of travelling to work. Public transport use ranged between 4 and 7 per cent for the Middle sectors and between 2 and 3 per cent for the Outer sectors, while only 1 per cent of jobs in Peri Urban areas were accessed by public transport. Although 69 per cent of Melbourne's jobs are located in either the Middle or Outer sector, only 4 per cent of those jobs are accessed using public transport.

Due to the short work trips, walking and cycling were also favoured modes of transport amongst the people working in the Inner sector. Walking to work was also a relatively common way of accessing jobs in the Peri Urban sector of Melbourne.

T6.10 Mode of transport used by employed people to travel to a subsector of work, Melbourne working zone, 2006

Subsector of work	Car	Private vehicle (excludes cars)	Public transport	Bicycle	Walked only	Other mode	Worked from home
	Mode share (per cent)						
Inner	49.9	1.0	37.5	2.7	5.5	1.4	2.1
Middle	83.0	1.2	5.8	1.0	3.0	0.8	5.3
Middle East	82.4	1.0	6.2	0.8	2.9	0.9	5.8
Middle North	82.1	1.3	5.9	1.4	3.7	0.8	4.9
Middle South	81.6	1.1	6.0	1.0	3.2	0.8	6.3
Middle West	86.1	1.4	4.9	0.9	2.5	0.8	3.5
Outer	86.7	1.7	2.6	0.5	2.3	0.9	5.4
Outer Eastern	85.3	1.6	2.9	0.6	2.4	0.8	6.4
Outer Northern	88.8	1.7	2.6	0.4	1.7	0.8	4.0
Outer Southern	86.1	1.7	2.6	0.5	2.5	0.9	5.7
Outer Western	87.9	1.8	2.3	0.6	2.0	0.9	4.4
Peri Urban	76.5	2.0	1.0	0.5	5.9	1.2	12.9
Melbourne Work ng Zone	74.6	1.3	13.7	1.3	3.6	1.0	4.6

Source: BITRE analysis of ABS 2006 Census DataPacks: Working population profile release 2 (Cat. 2069.0.30.006)

As shown in Table 6.11, nearly 78 per cent of all Melbourne working zone employees who used public transport worked in the Inner sector (148 871 people from a total of 191 682). Just under two thirds of public transport users were commuting to a job located within the City of Melbourne LGA. These results highlight how commuter use of the public transport network in Melbourne is dominated by those travelling to a workplace located in the CBD or its immediate surrounds. Related data shows that of the 124 800 people who commuted by public transport to a workplace in the City of Melbourne, the great majority commuted by train (77 per cent), but tram was also significant (18 per cent).

Although 39 per cent of Melbourne's employment is in the Middle sector, Middle sector workplaces accounted for only 16 per cent of public transport users, with the Middle East sector having the largest volume of public transport use. The usage of public transport to access workplaces in the Outer sectors was only 6 per cent of the total, compared to the Outer sector's employment share of 31 per cent.

A host of reasons are cited for the significant use of public transport by employees in the Inner sector. Apart from the greater network densities, the large concentration of employees and very high employment opportunities, Currie (2004) asserts that higher spending on public transport in the Inner sectors than in the Outer sectors could also be a causal factor for the wide gap in public transport use between the Inner and Outer sectors.

Table 6.11 also shows that out of the three widely used public transport modes, tram use was much more concentrated amongst the people who worked in the Inner ring. About 90 per cent of tram commuters journeyed daily to workplaces in the Inner sector. Train use showed a similar concentration—where over 81 per cent of train users worked in the Inner ring of Melbourne working zone. However, only 36 per cent of bus usage is to a workplace in the Inner sector, while 39 per cent was to a Middle sector workplace and 23 per cent to an Outer sector workplace. The Middle East and Outer Southern sectors feature prominently as a place of work for bus commuters.

T6.11 Proportion of all employed public transport, rail, tram and bus users by subsector of work, Melbourne, 2006

	Proportion of all users of that mode within Melbourne working zone (per cent)			
Subsector of work	Employed public transport users	Employed train users	Employed tram users	Employed bus users
Inner	77.7	81.4	90.0	36.8
City of Melbourne LGA	65.1	69.9	69.8	29.2
Rest of Inner sector (Port Phillip; Stonnington; and Yarra)	12.6	11.5	20.2	7.6
Middle	16.3	14.3	9.6	38.9
Middle East	6.5	5.7	4.2	15.2
Middle North	2.8	2.0	2.3	8.9
Middle South	3.9	3.8	1.7	7.6
Middle West	3.0	2.7	1.4	7.2
Outer	5.9	4.2	0.3	23.4
Outer Eastern	1.7	1.3	0.1	6.7
Outer Northern	1.3	0.9	0.2	4.8
Outer Southern	2.4	1.7	0.1	10.1
Outer Western	0.5	0.4	0.0	1.8
Peri Urban	0.2	0.1	0.0	0.8
Me bourne Working Zone	100.0	100.0	100.0	100.0

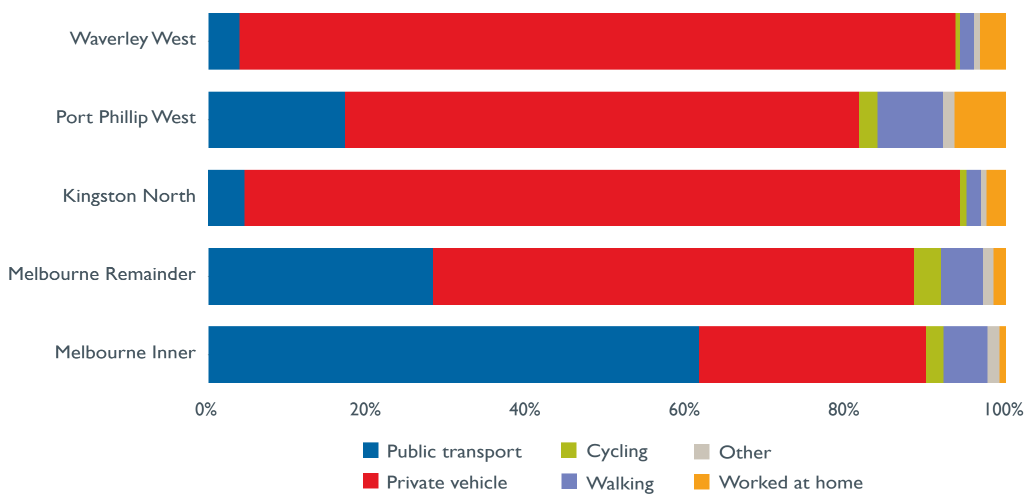
Source: BITRE analysis of ABS 2006 Census DataPacks: Work ng Population Profile release 2, (Cat. 2069.0.30.006)

This differs from the results on a place of residence basis, in which public transport use was not dominated to the same extent by Inner sector residents, who accounted for just 17 per cent of public transport use. Instead the demand was much more widely scattered, with 58 per cent being due to Middle sector residents and 24 per cent to Outer sector residents. This would suggest that a large proportion of the public transport users were Middle and Outer sector residents travelling to a workplace in the City of Melbourne. The most prominent origin-destination flows for public transport users are considered in Chapter 7.

Journey to work statistical local area

This section provides a spatial analysis of the modes of transport used by employed persons in 2006 by SLA of work. Figure 6.3 summarises the distribution of commuting trips by mode for the five main employment SLAs in Melbourne. The Melbourne Inner, Melbourne Remainder and Port Phillip West SLAs all have public transport, cycling and walking mode shares that are well above the city-wide average and relatively low reliance on private vehicles. For example, 62 per cent of CBD workers travelled to work by public transport, while 8 per cent walked or cycled. By contrast, in the main Middle sector employment locations of Kingston North and Waverley West, roughly 4 per cent of the workforce commute to work using public transport and 90 per cent commute to work by car.

F6.3 Transport mode shares by place of work for SLAs with greatest employment, 2006

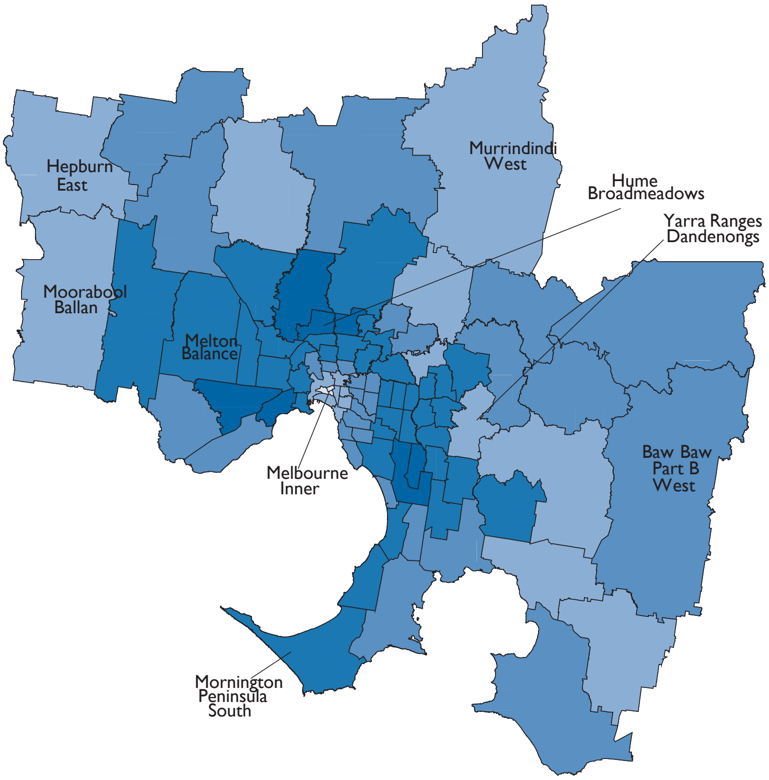


Source: BITRE analysis of ABS 2006 Census DataPacks: Working Population Profile release 2, (Cat. 2069.0.30.006)

As shown in Map 6.8, levels of car use were highest amongst people working in the Outer sector SLAs of Broadmeadows, Dandenong, Greater Dandenong Balance, Craigieburn, Whittlesea South West and Wyndham North, which all had a car mode share of over 90 per cent. The Altona SLA in the Middle West sector also had car usage of over 90 per cent.

The mode share of cars was lowest for those who worked in Melbourne Inner (28 per cent), Southbank-Docklands (49 per cent) and Melbourne Remainder (59 per cent). In total, 42 per cent of workers in the City of Melbourne LGA travelled by car (110 400 persons). The remaining Inner sector SLAs also had car mode shares below the Melbourne-wide average of 74.6 per cent. Within the Melbourne SD, levels of car usage tended to increase with distance from the CBD, but the Peri Urban SLAs generally had lower car usage than the Outer SLAs.

M6.8 Percentage of employed persons commuting by car, by SLA of work, Melbourne working zone, 2006

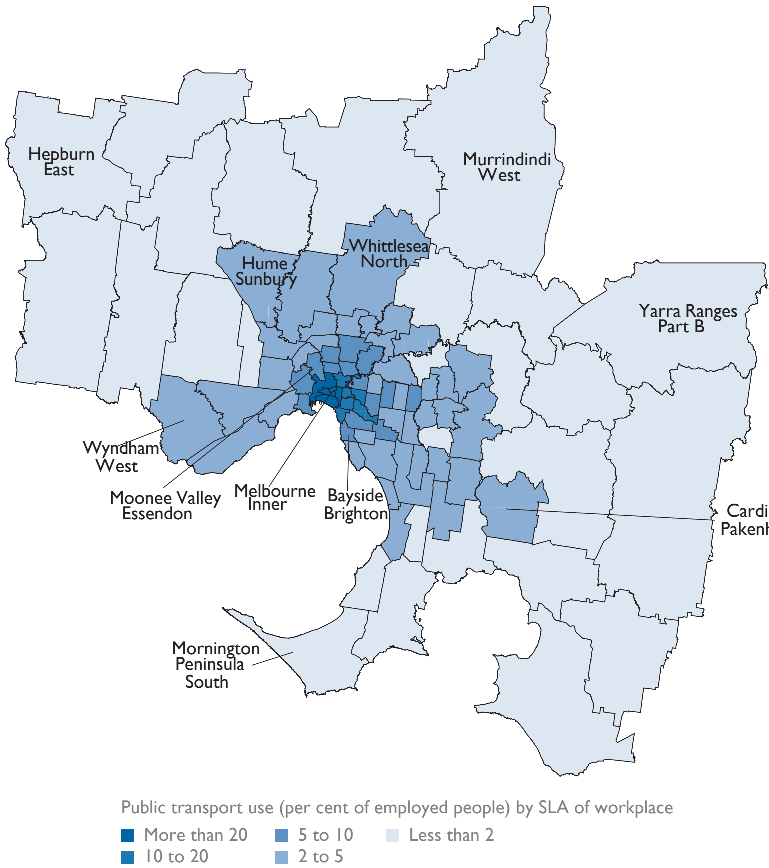


Source: BITRE analysis of ABS 2006 Census DataPacks: Work ng population profile release 2 (Cat. 2069.0.30.006)

Map 6.9 provides details on the distribution of public transport commuters by place of work. It shows that commuters using public transport to get to work tend to have workplaces that cluster around the CBD. Almost all of the SLAs where public transport mode share was highest were located in the Inner sector of Melbourne. These SLAs were also located in close proximity to urban rail, tram and other public transport routes.

The public transport mode share was 62 per cent for Melbourne Inner, 39 per cent for Southbank-Docklands, 28 per cent for Melbourne Remainder and 47 per cent for the City of Melbourne LGA as a whole. In the Middle sector, the public transport mode share was highest for those with a place of work in Hawthorn (12 per cent) or Malvern (10 per cent). No Outer or Peri Urban SLAs of work had a public transport mode share of more than 5 per cent. This reinforces how public transport is overwhelmingly used to access jobs in or near the CBD, with only a very small fraction of middle and outer suburban jobs being accessed by public transport.

M6.9 Percentage of employed persons commuting by public transport, by SLA of work, Melbourne working zone, 2006



Source: BITRE analysis of ABS 2006 Census DataPacks: work ng population profile release 2 (Cat. 2069.0.30.006) and data from the Department of Transport, Victoria.

Changes in place of work from 2001 to 2006

The previous section examined the mode of travel by place of work in 2006 and the ensuing modal shares. The aim of this section is to examine how the employees' chosen mode of travel changed in the five years since 2001. This section first provides a general discussion at the sector level, followed by a discussion at a much smaller area level (SLA). Analysis at the CCD level has not been carried out as comparable data for 2001 was not available.

Many factors may have influenced employees' choice of mode—for example:

- changing costs of different modes (e.g. petrol prices, parking fees)
- changing preferences for different modes
- shifts in the availability of employment in the vicinity of public transport hubs, such as the CBD
- changes in public transport network and service levels
- changes in the job mix.

Melbourne working zone and city sectors

Table 6.12 compares the change in modal share for work trips between 2001 and 2006 using the census data for the working population. For the Melbourne working zone, all modes recorded an increase in the number of persons using them to commute to work, with cars recording the largest increase of 57 098 persons and public transport recording an increase of 25 165 persons. However, the car mode share fell from 76.2 to 74.6 per cent between 2001 and 2006, while the public transport and walking mode shares rose by 0.8 and 0.7 percentage points respectively.

T6.12 Change in mode of transport used by employed people to travel to a place of work in the Melbourne working zone, 2001 to 2006

Mode	2001 mode share (per cent)	2006 mode share (per cent)	Change in mode share (percentage points)	Change, 2001 to 2006 (persons)
Car	76.2	74.6	–1.6	57 098
Private vehicle (excludes cars)	1.4	1.3	–0.1	515
Public transport	12.9	13.7	0.8	25 165
Bicycle	1.0	1.3	0.3	5 869
Walked only	2.9	3.6	0.7	12 760
Other mode	0.9	1.0	0.1	2 687
Worked from home	4.9	4.6	–0.3	544
Total	100.0	100.0	0.0	104 638

Note: Differs from change reported n Table 4.3 due to exclusion of those who did not go to work or did not state mode of transport.

Source: BITRE analysis of ABS 2006 Census DataPacks: Work ng population profile release 2 (Cat. 2069.0.30.006) and ABS 2001 Census data requested from the ABS

According to the Census data for these two years, the primary mode of travel for employed persons in all sectors of the Melbourne working zone was the car. Although the modal share of car for those travelling to work dropped by 1.6 percentage points between 2001 and 2006, Table 6.13 shows that this was mostly due to the drop in car usage share in the Inner and the Middle East, North and South sectors. Car use rose amongst those who worked in the Outer and Peri Urban sectors. The decline in car usage was associated with increases in public transport use, cycling and walking in the Inner sector and Middle sectors. While there was a 2.5 percentage point increase in public transport use in the Inner sector from 35.0 to 37.5 per cent, and the proportion using public transport to access Middle sector workplaces also rose, there was little change in the (very low) proportion using public transport to access workplaces in the Outer and Peri Urban sectors.

Although the Inner sector accounts for 28 per cent of Melbourne's jobs, 78 per cent of the increase in public transport usage was to access Inner sector jobs, along with 75 per cent of the increase in cycling and 69 per cent of the increase in walking. The shift to sustainable transport modes is dominated by those who work in Melbourne's Inner sector. While there is some evidence this mode shift is also impacting on travel to work in the Middle sector, the outer suburbs experienced little change in usage of these transport modes between 2001 and 2006.

The exception was the Outer Western sector—the most rapidly growing sector in terms of jobs—which experienced a shift towards car usage of 1.5 percentage points, due to a smaller proportion of jobs being accessed by walking or by working from home. This result reflects the fact that Manufacturing was the main driver of jobs growth in the Outer Western sector (see Chapter 5), and the West Industrial Node served as one of the principal hubs of jobs growth in the Melbourne working zone between 2001 and 2006 (see Chapter 4), with jobs in industrial areas typically being accessed by car.

T6.13 Change in mode of transport used by employed people to travel to a subsector of work in the Melbourne working zone, 2001 to 2006

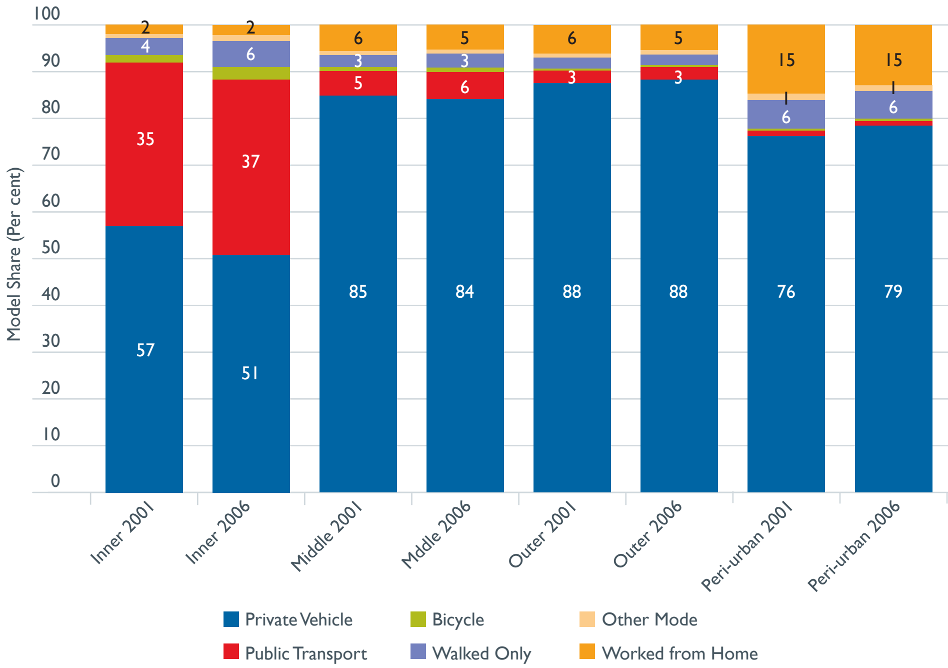
Subsector of work	Car	Private vehicle (excludes cars)	Public transport	Bicycle	Walked only	Other mode	Worked from home
	(Percentage point change in mode share)						
Inner	–6.2	0.1	2.5	1.0	2.0	0.5	0.1
Middle	–0.7	–0.1	0.6	0.2	0.4	0.0	–0.3
Middle East	–0.8	–0.1	0.8	0.2	0.4	0.0	–0.5
Middle North	–1.1	–0.1	0.4	0.4	0.5	0.0	0.1
Middle South	–1.0	–0.2	0.5	0.1	0.6	0.0	–0.1
Middle West	–0.1	0.0	0.3	0.1	0.3	–0.1	–0.5
Outer	1.0	–0.2	0.0	0.0	0.0	–0.1	–0.7
Outer Eastern	0.7	–0.2	0.1	0.1	0.2	–0.1	–0.8
Outer Northern	0.7	–0.1	–0.1	0.0	0.0	0.1	–0.6
Outer Southern	1.1	–0.2	0.0	0.0	–0.1	–0.1	–0.6
Outer Western	1.5	–0.3	0.1	0.0	–0.5	–0.1	–0.6
Peri Urban	2.7	–0.5	–0.2	0.0	–0.1	–0.2	–1.8
Melbourne WZ	–1.6	–0.1	0.8	0.3	0.7	0.1	–0.3

Source: BITRE analysis of ABS 2006 Census DataPacks: Working population profile release 2 (Cat. 2069.0.30.006) and ABS 2001 Census data requested from the ABS

Census data also reveals that the increase in public transport usage between 2001 and 2006 was dominated by rail, with 87 per cent of the additional public transport trips in the Melbourne working zone due to rail and 88 per cent of the additional public transport trips to an Inner sector workplace involving rail. Of the 25 200 additional public transport commuting journeys in Melbourne between 2001 and 2006, 69 per cent were commutes by rail to a place of work in the Inner sector.

Figure 6.4 shows the relative sizes of the modal shares applicable to employees at the place of work between 2001 and 2006. Private vehicle usage in the Inner sector has dropped from 57 per cent to 51 per cent. It was also notable that out of all sectors in the Melbourne working zone, the percentage of persons working from home was considerably higher in the Peri Urban sector. In 2006 it amounted to about 13 per cent—a drop of 1.8 percentage points from the corresponding figure for 2001. Figure 6.2 also shows how the walking mode share was highest in the Inner and Peri Urban sectors, but while the proportion that walked to work increased in the Inner sector, it remained stable at 6 per cent in the Peri Urban sector.

F6.4 Change in modal share by sector, Melbourne working zone, 2001 and 2006



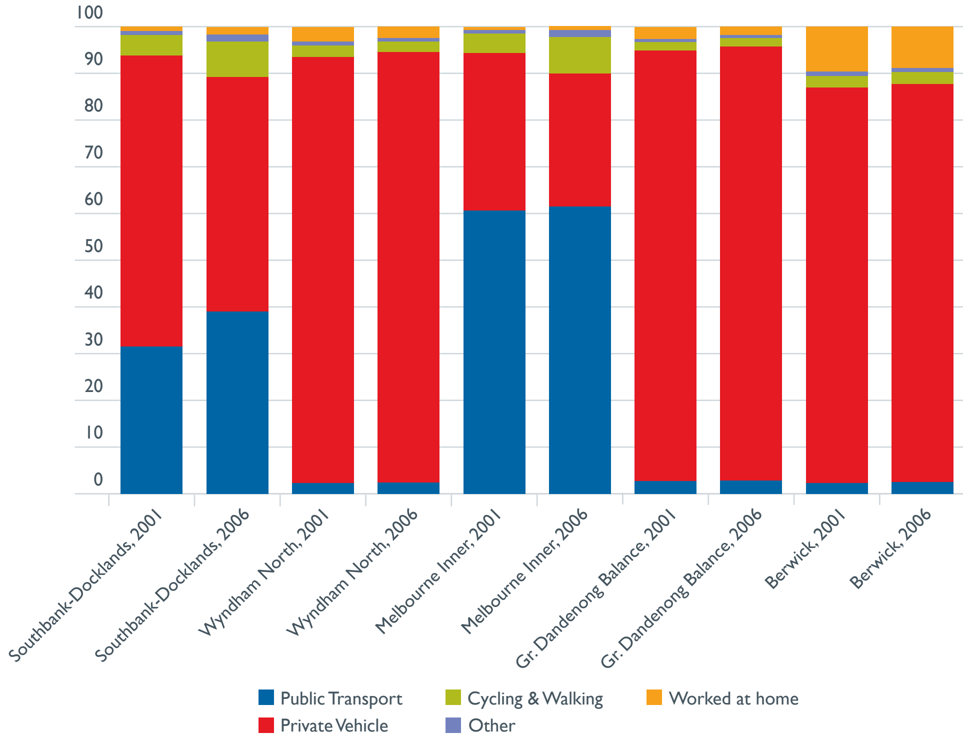
Source: BITRE analysis of ABS 2006 Census DataPacks: Work ng population profile release 2 (Cat. 2069.0.30.006) and ABS 2001 Census data requested from the ABS

Statistical Local Areas

Turning attention to the more disaggregated SLA scale, it is of interest whether the transport mode shares remained stable or fundamentally changed in the SLAs that added the most jobs between 2001 and 2006. Chapter 4 detailed Melbourne's employment growth, highlighting the SLAs which added the most jobs (see Table 4.6). Figure 6.5 shows how mode shares have changed in the five SLAs that added the most new jobs between 2001 and 2006.

The mode share split differs markedly between the City of Melbourne SLAs and the suburban jobs growth SLAs, particularly regarding public transport usage. Southbank-Docklands and Melbourne Inner both experienced a marked shift in mode shares in association with their strong jobs growth between 2001 and 2006. This shift strongly favoured public transport, walking and cycling, with a much smaller proportion of workers travelling to their jobs by car in 2006 than in 2001. In the three suburban jobs growth SLAs, mode shares remained quite stable over the period. For example, employment in Wyndham North increased by about one third between 2001 and 2006, with the public transport mode share remaining unchanged at 2.4 per cent while the private vehicle mode share rose by 1.1 percentage points. All three suburban jobs growth SLAs experienced an increase in the proportion of local workers who accessed their jobs by car and a decline in the proportion of the local workforce who worked from home.

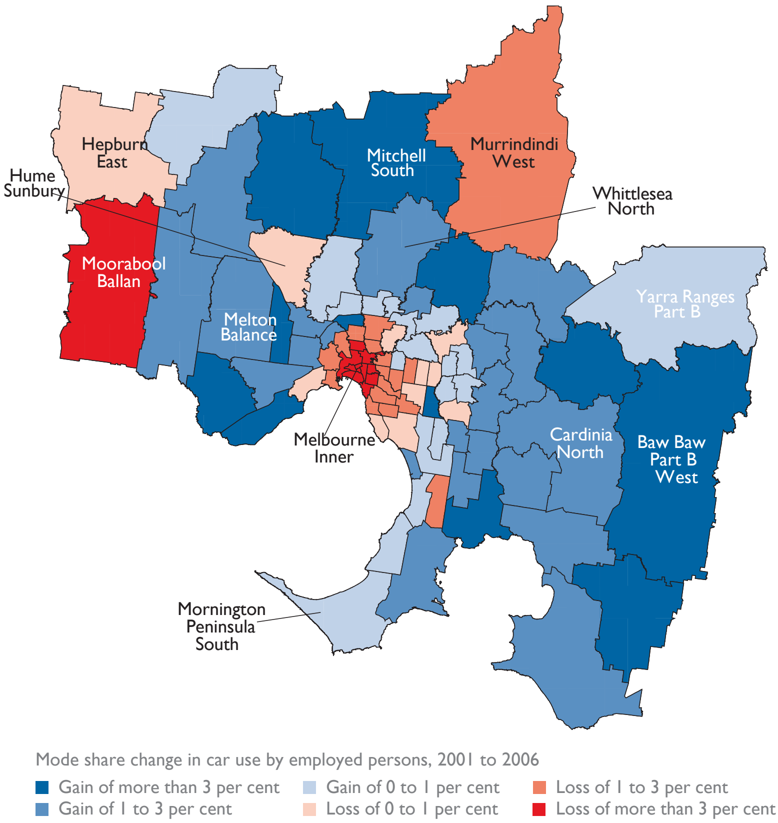
F6.5 Transport mode shares by place of work for selected jobs growth SLAs, 2001 and 2006



Source: BITRE analysis of ABS 2006 Census DataPacks: work ng population profile release 2 (Cat. 2069.0.30.006) and ABS 2001 Census data requested from the ABS

The change in car use in different SLAs of work between the two reference years of 2001 and 2006 is shown in Map 6.10. The proportion of workers using a car to travel to work dropped substantially in all Inner SLAs. Some Middle sector SLAs such as Brunswick, Coburg, Hawthorn, Glen Eira South and Box Hill also recorded significant declines in car travel to jobs. However, a larger number of SLAs recorded an increase in car usage. The largest gains in car usage were in Peri Urban and Outer SLAs such as South Gippsland West, Baw Baw Part B West, Wyndham West, Casey South and Melton East. The Middle sector SLA of Waverley East also recorded a large increase in car usage from 79 per cent in 2001 to 84 per cent in 2006 during a period in which it added 3 800 jobs.

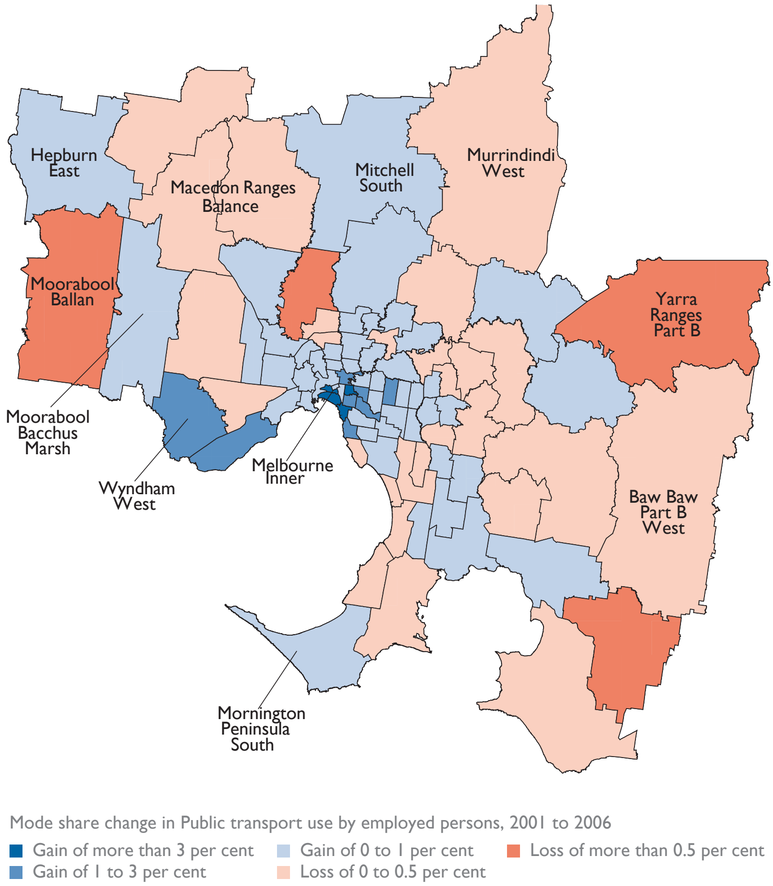
M6.10 Percentage point change in car mode share amongst people who travel to work in the Melbourne working zone, by SLA, 2001 to 2006



Source: BITRE analysis of ABS 2006 Census DataPacks: working population profile release 2 (Cat. 2069.0.30.006) and ABS 2001 Census data requested from the ABS

As previously noted, the number of public transport commuter trips in Melbourne rose strongly between 2001 and 2006—59 per cent of this increase was attributable to people travelling by public transport to work in the City of Melbourne LGA. Map 6.11 shows that the use of public transport in travel to work has generally increased in the Inner sector of the Melbourne Working Zone and in many of the Middle sector SLAs that are well served by frequent and highly accessible train, tram and bus networks. The largest increases in public transport mode share occurred for the place of work SLAs of Southbank-Docklands, Port Phillip West, Richmond and St Kilda. The Outer SLA of Wyndham West also substantially boosted its public transport mode share from 1 to 3 per cent, but as the car mode share also rose, this reflected a significant decline in the proportion of the local workforce working from home. Some declines in the public transport mode share were evident in Outer and Peri Urban SLAs such as Craigieburn, Ballan and Mornington Peninsula East.

M6.11 Percentage point change in public transport mode share amongst people who travel to work in the Melbourne working zone, by SLA, 2001 to 2006

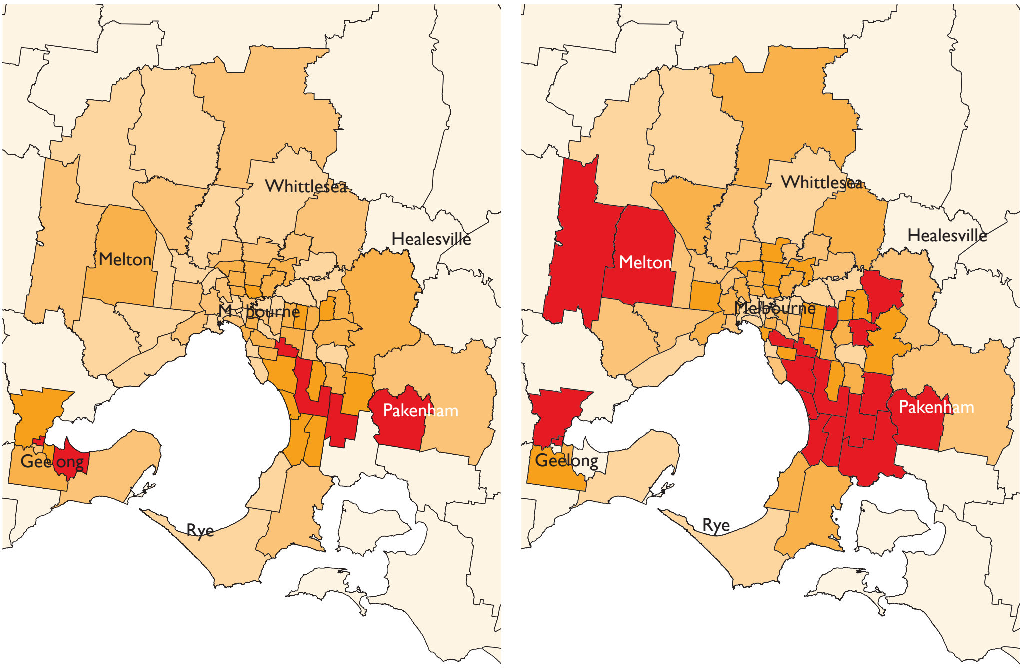


Source: BITRE analysis of ABS 2006 Census DataPacks: work ng population profile release 2 (Cat. 2069.0.30.006) and ABS 2001 Census data requested from the ABS

Map 6.12 presents a different perspective, highlighting the proportion of commuters travelling to the CBD who access the CBD by public transport, rather than another transport mode. It shows that when people commute to the CBD from the outer south-east of Melbourne they are particularly likely to use public transport. Between 2001 and 2006, there was significant growth in the proportion who used public transport to commute to the CBD from their residences in the south-eastern and north-eastern suburbs of Melbourne or from the Melton Balance and Bacchus Marsh SLAs to the west.

M6.12 Proportion of commuters travelling to the CBD who commuted by public transport, by SLA of residence, Melbourne and Geelong, 2001 and 2006

a) 2001 b) 2006



Public Transport Use (%)

- N/A less than 100 travellers
- 10.0 to 58.3
- 58.3 to 64.4
- 64.4 to 68.7
- 68.7 to 72.5
- 72.5 to 80.61

Note: The CBD has been defined as the Melbourne Inner SLA

Source: VicRoads analysis of ABS 2001 and 2006 Census journey to work data (unpublished).

Transport in the strategic plan

Introduction

This section takes a closer look at the strategies in place to manage commuter transport in Melbourne. As outlined in Chapter 2, the key *Melbourne 2030* objectives of relevance to commuter use of different transport modes are:

- Increase public transport's share of motorised trips to 20 per cent by 2020
- Encourage cycling and walking
- Reduce car dependence by concentrating trip-generating activities in accessible locations
- Ensure residential development and jobs growth are focused in locations that are well served by public transport
- Upgrade public transport services to better connect activity centres.

Melbourne @ 5 million and the VTP retained similar goals to *Melbourne 2030*, but the 2008 VTP in addition proposed using transport investment to fundamentally reshape Melbourne and make jobs more accessible.

This section uses the available data on mode usage to investigate the changes that have been occurring since 2001 in relation to the first four of the listed objectives. No attempt is made to assess whether progress has been made in upgrading public transport services, as that issue lies outside the scope of the present study. No attempt is made to assess progress in 'using transport investment to reshape Melbourne' because the recent introduction of this goal and the lead times involved in major infrastructure investment would make such an assessment premature.

Increasing public transport's mode share

A common goal of all the recent state government land use and transport strategic plans, as well as *Growing Victoria Together*, is to increase public transport's share of motorised trips within Melbourne to 20 per cent by 2020 (DI 2002a, DPC 2001), compared to the quoted share of 9 per cent at the time the target was set. Strategies put in place to help achieve this ambitious mode share target include expansions of public transport infrastructure, integrated transport and land use planning, and Travelsmart, which aims to reduce people's car dependency and encourage alternative travel options through travel planning (DT 2009b).

Table 6.14 summarises data from a range of sources which shed light on progress towards this target since 2001. While the ABS *Census of Population and Housing* focuses on commuter travel, the state government's public transport target is broader, encompassing all purposes of travel. Similarly, BITRE's urban passenger transport dataset is not directly comparable to the state government's target, as although it covers all trip purposes, it calculates mode share on a passenger kilometres basis, rather than a trips basis. Nevertheless the different data sources present a very consistent picture of solid growth in both public transport patronage and the public transport mode share since 2001.

The BITRE and Victorian Department of Transport data both indicate that the pace of growth was more rapid between 2006 and 2009, than it was between 2001 and 2006. For example, the BITRE passenger journeys data presented in Table 6.14 implies an average annual growth rate of 2 per cent between 2001 and 2006 compared to 8 per cent between 2006 and 2009.

The Victorian Department of Transport (2009c, 2010a) pinpoints the growth period as commencing in 2004–05 and lasting until December 2008, followed by a period of restricted growth in public transport patronage. This is broadly consistent with the VISTA surveys undertaken in 2007–08 and 2009–10 which suggest that there was no statistically significant change in commuter's public transport patronage or mode shares over this period. However, more recently, total patronage increased by 4 per cent in the twelve months ending March 2011.[31]

In 2009–10, train was the principal public transport mode in Melbourne, contributing 44 per cent of public transport boardings, compared to 35 per cent for tram and 20 per cent for bus (DT 2010a). During the 2004–05 to 2008–09 period, metropolitan train patronage increased by 48 per cent and tram patronage by 23 per cent (ibid). While all three modes experienced patronage growth, the increase in train usage was the primary contributor to the

31 Department of Transport official patronage series, March 2011 results

increase in public transport usage, with heavy rail accounting for 80 per cent of Melbourne's increase in public transport passenger kilometres between 2004–05 and 2008–09 (BITRE 2011a). The increase in train patronage over this period was associated with a marked reduction in customer satisfaction with metropolitan trains (DT 2010b).

T6.14 Changes in public transport usage and mode share since 2001 for Melbourne SD

	2001	2006	2009
ABS Census of Population and Housing (commuting trips)			
Number us ng public transport to travel to work	172 677	201 040	na
Public transport mode share for commut ng purposes (per cent)	12.8	13.6	na
Public transport share of motorised trips for commuting purposes (per cent)	14.1	15.1	na
BITRE Urban Passenger Transport (all trips)			
Urban public transport task in billions of passenger kilometers	3.7	4.4	5.6
Urban public transport task in millions of passenger journeys	348.1	392.6	491.5
Public transport share of total motorised urban transport task, measured in billions of passenger kilometers (per cent)	8.1	8.8	11.2
Victorian Department of Transport household travel surveys (all trips)			
Public transport trips as a proportion of trips taken by motorised means (per cent)*	10.5	11.3	14.3

Notes: Census data relates to August of the relevant year. Rema ning data relates to the financial year ending June of the relevant year.

* 2001 est mate from Victorian Activity and Travel Survey (VATS), rema ning data are Victorian government estimates based on the 2007–08 VISTA survey, historic VATS data, public transport patronage data and VicRoads traffic data. The 2007–08 VISTA figure was 13 per cent.

Sources: ABS Census of Population and Housing 2001 and 2006 place of enumeration data; BITRE 2011a and unpublished update of BITRE 2009c; Department of Premier and Cab net 2010.

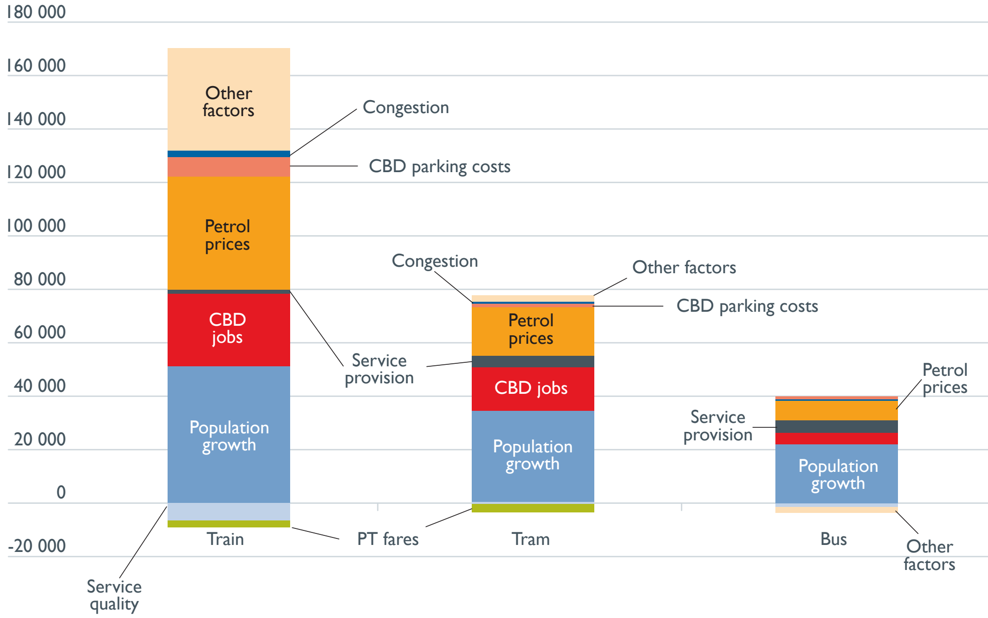
The census-based analysis of change in commuter use of transport between 2001 and 2006, presented earlier in this chapter, revealed that:

- 78 per cent of the increase in public transport usage was to access Inner sector jobs, and 57 per cent was to access a workplace in the City of Melbourne LGA.
- Middle sector residents accounted for 58 per cent of the increase in public transport usage, compared to 27 per cent for Outer sector residents and 14 per cent for Inner sector residents. The rate of growth in public transport usage was highest for Outer sector residents and lowest for Inner residents.
- Increased train usage accounted for 85 per cent of the rise in public transport usage.

The Victorian Department of Transport has investigated the factors contributing to the increase in public transport patronage between 2002 and 2007. Three principal drivers were identified—population growth, CBD jobs growth and the increase in petrol prices (Gaymer 2010). Changes in public transport service levels, CBD parking costs and congestion made a modest contribution (ibid). Figure 6.6 illustrates the results of this exercise for the three principal public transport modes.

At the time of writing, petrol prices remain below their mid-2008 peak, but the other two principal drivers of patronage growth remain relevant. Between 2007 and 2010, Melbourne's population grew more rapidly than between 2002 and 2007 (see Figure 3.7) and the most recent employment data points to large increases in CBD jobs (City of Melbourne 2009). Despite the strong recent performance of these two drivers, the growth rate of public transport patronage growth has been slower since December 2008 (DT 2010a, 2011a). Lagura et al (2011) points out that average weekday public transport patronage has been growing less rapidly in Inner Melbourne (defined by Metlink zone 1) than in Outer Melbourne (defined by Metlink zone 2) between 2005–06 and 2008–09.

F6.6 Factors affecting public transport patronage growth in Melbourne, 2002 to 2007



Source: Gaymer (2010) p4

The Victorian Department of Transport research largely accords with forthcoming BITRE research on trends in urban public passenger transport, which points to the role of "budget squeeze" pressures (i.e. petrol prices, interest rates) in contributing to the rapid increase in Melbourne's public transport mode share up until 2009 (BITRE 2011c).

Other evidence suggests the Congestion Levy in the central city area, higher parking costs and reduced public transport fares may have encouraged some car users to switch to public transport (DTF 2010). A further potential contributor to growth in public transport patronage is the extremely strong growth that has occurred in international student numbers in Victoria, from 46 401 at the end of June 2004 to 117 711 at the end of June 2009 (DIAC 2010). International students are heavy users of public transport (DT 2010c). Only long term students get reflected in the official population counts.

Recent market research undertaken by the Department of Transport has 'suggested the role of attitudinal change—particularly attitudes on the environment and health & fitness—may have been significant' additional drivers of patronage growth (Gaymer 2010, p.1).

In summary, the surge in public transport patronage between 2004–05 and December 2008 has resulted in significant progress being made since 2001 towards Melbourne's 20 per cent public transport mode share target. The recent surge in public transport patronage has largely been a consequence of an environment conducive to growth in public transport patronage (i.e. rising petrol prices, strong CBD jobs growth and strong population growth), rather than being driven by infrastructure investment or specific transport and land use policies. According to Gaymer (2010 p.15), 'the "next surge" will occur if and only if there are significant service quality improvements on the public transport network'.

Encouraging cycling and walking

> 'Melbourne 2030 encourages a change in travel behaviour to more sustainable options, such as public transport, walking and cycling. In particular, it promotes non-motorised travel for short trips, and public transport for longer trips.' (DI 2002a p.160)

Initiatives to achieve this behavioural shift include walking and bicycle action plans, development of the Principal Bicycle Network, the Travelsmart program and review of car parking policies.

Table 6.15 summarises the changes that have occurred in travel to work by bicycle or foot between 2001 and 2006. Use of these two active transport modes for the journey to work has grown strongly, rising from 52 523 persons in 2001 to 72 744 in 2006. Both walking and cycling grew rapidly, with cycling growing somewhat more rapidly than walking, but from a lower base. Walking and cycling increased their joint share of the journey to work task from 3.7 per cent in 2001 to 4.7 per cent in 2006. According to Légaré (2008), the growth in cycling and walking between 2001 and 2006 considerably outpaced growth in the previous five year period.

Between 2001 and 2006 there has been a clear shift towards cycling and walking for the journey to work:

- The growth in walking was primarily due to residents of the Inner sector (63 per cent) and to those who worked in the Inner sector (69 per cent).[32] The shift towards walking is being driven by an increase in short distance walking trips in the Inner sector, particularly within the City of Melbourne. This reflects the strong recent jobs growth, coupled with a rapid increase in residential densities in the City of Melbourne (see Chapters 3 and 4).
- The growth in cycling was primarily due to those who worked in the Inner sector (75 per cent), but was quite evenly split across residents of the Inner sector (33 per cent) and the Middle North sector (31 per cent). The shift towards cycling is being driven by increased use of cycling to travel from inner and middle suburban residences to a place of work in the inner city. Pucher et al (2010) identify favourable topography, climate, CBD access, cycling promotion and integrated cycling infrastructure as factors contributing to the very rapid growth of cycling in Melbourne (compared to Sydney). There were significant expansions to the Inner and Middle North cycle path networks between 2000 and 2008 (ibid, Figure 8).

32 Presumably, most of the growth was due to those who both lived and worked n the Inner sector, but BITRE was not able to access the disaggregated 2001 census data requ red to assess this.

- Gaymer (2010) points to attitudinal change around environmental awareness and health and fitness as having contributed to the shift towards sustainable transport options in Melbourne.

T6.15 Change in cycling and walking for journey to work, Melbourne working zone, 2001 to 2006

	Bicycle	Walked only	Cycled or walked
Number of persons, 2001	13 013	39 510	52 523
Number of persons, 2006	19 092	53 652	72 744
Change in number of persons, 2001 to 2006	6 079	14 142	20 221
Average annual growth, 2001 to 2006	8.0	6.3	6.7
Mode share, 2001	0.9	2.8	3.7
Mode share, 2006	1.2	3.5	4.7
Change in mode share, 2001 to 2006	0.3	0.7	1.0

Note: 2006 data d ffers from that n Table 6.1 which was on a place of usual residence basis. This table is on a place of enumeration basis to ensure comparability of data over t me.

Source: BITRE derived data from ABS 2006 Census DataPacks: place of enumeration profile release 2 (Cat. 2069.0.30.004); ABS CData 2001.

While there has been a marked behavioural shift towards cycling and walking for commuting purposes, it is not broadly based. Close to half of the Melbourne working zone's population lives in the Outer and Peri Urban sectors, but:

- the cycling and walking mode shares both remained unchanged in the Outer sector between 2001 and 2006
- the walking mode share declined marginally in the Peri Urban sector from 4.0 per cent in 2001 to 3.9 per cent in 2006[33], while the cycling mode share remained unchanged.

There is mixed evidence as to whether this shift towards cycling and walking has persisted beyond 2006. VicRoads (2010) indicates that the number of cyclists on the Melbourne cycle path network in the morning peak period has continued to grow strongly between 2006 and 2009. City of Melbourne research shows that between 2006 and 2009 bicycles accounted for an increasing proportion of private vehicles travelling into the central city in the morning peak (DTF 2010). The Victorian Government's VISTA surveys point to modest increases in the number of persons cycling and walking to work in Melbourne, and the related mode shares, from 2007–08 to 2009–10, but the observed changes are well within the surveys' margins of error. ABS (2009f) suggests the Victorian mode shares of cycling and walking fell between 2006 and 2009, returning to 2003 levels, but again the change lies within the statistical margin of error.

33 This is the second highest wa k ng mode share, after the Inner sector.

Reducing car dependence through development of activity centres

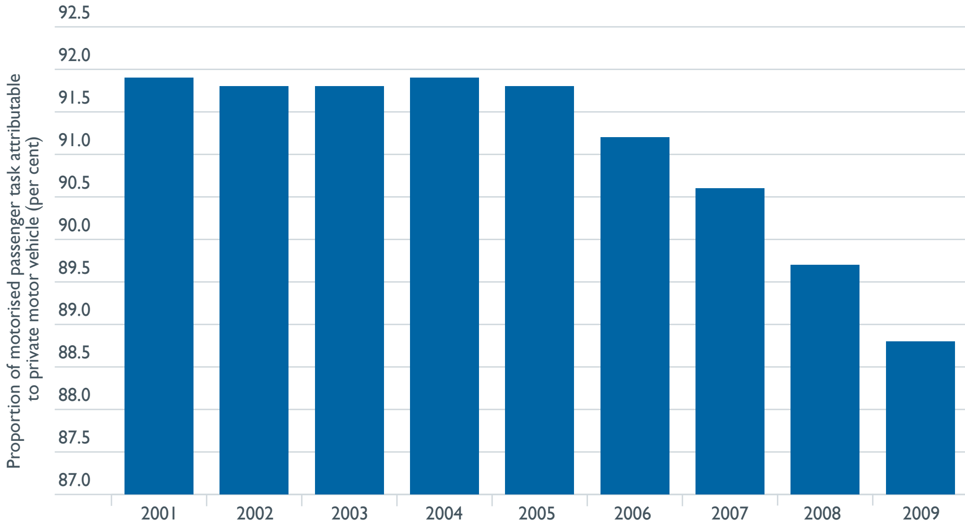
Melbourne 2030 aims to reduce the number of private motorised vehicle trips by concentrating trip-generating activities in locations that are accessible via public transport (DI 2002a p46).

Has car dependency been reduced?

Table 6.7 showed that there was a reduction in the car dependence of commuting trips in Melbourne between 2001 and 2006, which was associated with a rise in public transport, cycling and walking mode shares. While the private vehicle mode share declined by 1 5 percentage points for commuting trips, there was still an increase in the number of commuting journeys undertaken by private vehicle.

When all trip types are considered, there has similarly been a decrease in car dependency in Melbourne since 2001, with the decrease concentrated between 2005 and 2009 (see Figure 6.7). Between 2001 and 2009, the total private motor vehicle task increased in Melbourne (from 42 to 44 billion passenger kilometres), but on a per capita basis it declined from 12 100 to 11 100 passenger kilometres per person (BITRE 2011a). Thus, while there has been a reduction in the private vehicle mode share in Melbourne since 2001, the aggregate private motor vehicle task is continuing to grow. Victorian Government research identified petrol prices as the principal reason for reduced vehicle usage (Gaymer 2010). Other reasons that were frequently stated include 'health and fitness' and 'environmental concerns' (ibid). DTF (2010) identifies the congestion levy and the consequently higher parking costs as having discouraged commuters from travelling to the central city by car, citing the findings of a City of Melbourne City Users Survey from 2006 that 4 per cent of travellers who switched from cars to non-car transport did so directly due to the levy and a further 29 per cent did so due to parking costs.

F6.7 Proportion of motorised passenger task attributable to private motor vehicles, Melbourne, 2001 to 2009



Source: BITRE 2011a (update of BITRE 2009c).

Have CADs contributed to reduced car dependency?

Government policy is to concentrate trip generating activities (such as residential and economic development and service provision) within activity centres, but particularly in Central Activities Districts (CADs) (DI 2002a, DPCD 2008c). *Melbourne @ 5 million* notes that the CADs are located at a junction of the Principal Public Transport Network, providing high levels of accessibility (DPCD 2008c). As Table 2.3 showed, all of the CADs were part of the Transit Cities program, which served as the initial demonstration program for transit oriented development in Melbourne.

If CADs were an important contributor to the observed reduced car dependency of commuting trips in Melbourne, the mode shift away from cars (towards public transport, walking and cycling) would be expected to be more pronounced for those who live or work near a CAD, than for those who live or work elsewhere in Melbourne. In this section we analyse shifts in mode share for the seven CADs between 2001 and 2006, based on ABS *Census of Population and Housing* data, to identify whether the CADs made an important contribution to the Melbourne-wide reduction in the private vehicle mode share over this period.

Before investigating the CADs, the following points based on the spatial analysis presented in this and earlier chapters are relevant:

- For employed residents of the Melbourne working zone, the private vehicle commuting mode share declined by 1 5 percentage points between 2001 and 2006 (see Table 6.7), with 1.1 percentage points of this decline attributable to Middle sector residents and the remaining 0.4 percentage points to Inner sector residents.
- For those with a place of work in the Melbourne working zone, the private vehicle commuting mode share declined by 1.7 percentage points (Table 6.12), with those with a place of work in the Inner sector accounting for essentially the entire 1.7 percentage points of this decline.
- Of the seven CADs, only the Melbourne CAD is located within the Inner sector, while Box Hill and Footscray are the only CADs in the Middle sector. The other four CADs are in the Outer sector, which made a negligible contribution to Melbourne's reduction in car dependency between 2001 and 2006.
- While the Melbourne CAD experienced rapid jobs and population growth between 2001 and 2006, the remaining CADs account for a small share of Melbourne's population and jobs and (in aggregate) experienced a net job loss and only a small net increase in population (see Figure 4.7 and Table 3.14).

Thus, Melbourne's reduction in car dependency is highly concentrated amongst the subset of commuting journeys for which there is a viable alternative to vehicle travel, namely journeys from middle suburban residences to workplaces in the Inner sector (for which public transport is often a viable alternative) and journeys within the Inner sector (for which public transport, cycling and walking can be viable alternatives).

Table 6.16 presents information on the change in the private vehicle mode share that occurred amongst employed residents of CADs between 2001 and 2006. The decline in the private vehicle mode share was more pronounced in CADs (particularly in the Footscray and Frankston CADs) than in other parts of Melbourne. Of the CADs, Dandenong and Broadmeadows increased their private vehicle mode share. The shift away from private vehicle usage amongst CAD residents was associated with an increased mode share for cycling and walking (particularly in the Melbourne and Frankston CADs) and a shift towards public transport (particularly in Footscray CAD). Despite the reduction in the private vehicle mode share of CAD residents, the absolute number of CAD residents using a private vehicle to get to work did increase somewhat between 2001 and 2006.

Table 3.13 and 3.14 previously showed that the CADs account for just 2.9 per cent of the Melbourne working zone population and 5.8 per cent of population growth between 2001 and 2006, with most of the contribution due to the Melbourne CAD rather than the suburban CADs. While the private vehicle mode share of CAD residents has declined, the small number of CAD residents means that this has made a relatively minor contribution to the overall reduction in Melbourne's private vehicle mode share. Even if the private vehicle mode share of CAD residents had declined to zero (rather than 56 per cent) in 2006, the contribution to the Melbourne working zone's overall private vehicle mode share would have been a decline of only one percentage point.

T6.16 Private vehicle mode share in the Central Activities Districts by place of residence, 2001 and 2006

Central Activities District	Private vehicle mode share by place of enumeration, 2001	Private vehicle mode share by place of enumeration, 2006	Change in private vehicle mode share, 2001 to 2006	Number of employed residents travelling to work by private vehicle, 2006
Melbourne CAD	32	30	–2	5 519
Box Hill CAD	66	63	–3	2 204
Broadmeadows CAD	85	86	1	5 781
Dandenong CAD	78	79	1	3 271
Footscray CAD	56	48	–7	855
Frankston CAD	79	74	–5	1 969
R ngwood CAD	81	79	–2	4 338
All CADs	65	56	–9	23 937
Outside of CADs	78	77	–1	1 150 717
Melbourne working zone	78	77	–2	1 174 654

Note: DPCD provided BITRE with a 2006 DZ based definition for activity centres, which were then used as a starting point to define activity centre boundaries that enabled comparable analysis of activity centres between 2001 and 2006. Hence, priority was given to ensur ng maximum consistency between the activity centre boundaries based on 2001 DZs and those based on 2006 DZs, and also with the boundaries based on CCDs. In practice this involved adopt ng relatively encompass ng boundaries which often extended well beyond the retail precinct.

Source: BITRE derived data from ABS 2001 and 2006 Census DataPacks: place of enumeration profile release 2 (Cat. 2069.0.30.004).

The CADs play a more important role as a place of work, with the Melbourne CAD accounting for nearly 14 per cent of jobs in Melbourne, and the suburban CADs for a further 4 per cent. Comparable mode share data was not available at the DZ scale for 2001 and 2006 (and hence not at the CAD scale). A potentially useful substitute is information on the change in private vehicle mode share in the place of work SLAs/LGAs that encompass each of the CADs, as summarised in Table 6.17. The City of Melbourne LGA, which encompasses the Melbourne CAD, experienced a significant 6 percentage point decline in the private vehicle mode share between 2001 and 2006. The Middle sector SLAs that contain the Box Hill and Footscray CADs also experienced declines in the private vehicle mode share, but the remaining place of work SLAs in Table 6.17 did not share in this decline. Overall the proportion of jobs in CAD-related SLAs that were accessed by private vehicle declined from 64 to 60 per cent between 2001 and 2006, due largely to the influence of the City of Melbourne SLAs.

Due to the substantial proportion of Melbourne's jobs that are located in the City of Melbourne, the decline in the private vehicle mode share amongst people who work in this LGA made a substantial contribution to the overall decline in the Melbourne working zone's private vehicle mode share. If the private vehicle mode share for the City of Melbourne had remained stable at 48 per cent between 2001 and 2006 (rather than declining), the private vehicle mode share for Melbourne working zone would have been 1.1 percentage points higher than was actually realised in 2006. Given the Melbourne CAD accounts for around three-quarters of jobs in the City of Melbourne LGA, it is reasonable to assume that most of this impact was due to the Melbourne CAD, rather than the peripheral parts of the City of Melbourne LGA. The declining private vehicle mode share in the Box Hill and Maribyrnong SLAs made a very minor contribution to the overall results for the Melbourne working zone.

T6.17 Private vehicle mode share for selected places of work, 2001 and 2006

SLA/LGA that contains a Central Activities District	Private vehicle mode share by place of work, 2001	Private vehicle mode share by place of work, 2006	Change in private vehicle mode share, 2001 to 2006
City of Melbourne LGA	48	42	–6
Whitehorse–Box Hill SLA	85	83	–2
Maribyrnong SLA	87	85	–2
Hume–Broadmeadows SLA	93	94	1
Maroondah–R ngwood SLA	87	88	0
Frankston West SLA	88	89	1
Greater Dandenong–Dandenong SLA	93	93	0
All SLAs that contain CADs	64	60	–4
Rema ning SLAs	83	83	–1
Me bourne work ng zone	78	76	–2

Note: The Me bourne CAD accounted for about 73 per cent of jobs in the City of Me bourne LGA in 2006. For the rema ning CADs, the proportion of SLA jobs accounted for by the CAD ranges from 15 per cent for Mar byrnong to 59 per cent for R ngwood.

Source: BITRE analysis of 2001 and 2006 ABS Census of Population and Housing place of work data.

In summary, these results indicate that the Melbourne CAD has played an important role in Melbourne's reduced car dependency—people are increasingly accessing their jobs in the Melbourne CAD by means other than a private vehicle (i.e. public transport, cycling or walking) and due to the large and growing number of jobs in the Melbourne CAD (see Figure 4.7), this shift accounts for a large part of the observed decline in the private vehicle mode share of the Melbourne working zone.

The analysis shows that there has also been a substantial shift away from private vehicle usage by residents of many of the suburban CADs. However, due to their small population and employment base, mode shifts in the suburban CADs do not appear to be contributing much to the Melbourne-wide results. The CADs represent only a subset of activity centres and this section has not attempted to investigate the role that other types of activity centres have played in explaining Melbourne's recent reduction in the private vehicle mode share. However, Birrell et al (2005, p. 02–17) have argued that 'activity centre policy by itself will have very limited impact on car use'.

Ensuring development is focused in accessible locations

Melbourne 2030 aims to concentrate new residential development into designated Growth Areas and activity centres that are well served by the public transport system, and to make jobs more accessible by ensuring economic development is focused in areas which have good public transport access. The commitment to Growth Areas being served by high capacity public transport was reaffirmed in *Melbourne @ 5 million*.

To place the analysis that follows in context, DPCD (2007a) report that 90 per cent of the population within Melbourne's UGB live within 400 metres of a tram or bus stop or 800 metres of a rail station[34]. Currie (2010) presents an overview of access to public transport in Melbourne in 2006 which highlights the following issues:

- 2.5 per cent of Melbourne residents have zero supply of public transport while 23.6 per cent have a very low supply and a further 25.7 per cent have a low supply
- Outer Melbourne averages 156 services per week per stop, compared to 630 for Inner Melbourne and 313 for Middle Melbourne
- In Outer Melbourne, on average 66 per cent of the area of each CCD was within 400 metres of a bus or tram stop or 800 metres of a train station, compared to 91 per cent for Middle Melbourne and 98 per cent for Inner Melbourne.

Exploring this planning objective involves bringing together information on residential and jobs growth outcomes with information on coverage and frequency of the public transport network. Unlike Currie (2010), BITRE has not attempted to assess this issue in a comprehensive (city-wide) manner—the approach taken here is to concentrate on a small number of places that were the focal points for population growth and jobs growth in Melbourne between 2001 and 2006 and to investigate whether commuters in those areas are well served by the public transport system.

BITRE obtained rail and tram service frequency data for the morning peak period (7am to 9am) from the Victorian Department of Transport that related to 2006. Vline train services are not included in the dataset. Reliable data on bus services and their frequency could not be obtained for 2006. BITRE has extended the analysis to cover all serviced bus stops in or near the selected areas, using publicly available timetable information for the relevant bus routes (current as of October 2010). The analysis is based on the assumption that the 2010 bus service frequencies are a useful approximation to the 2006 bus service frequencies.

The assessment of public transport access is based on stops with a service frequency of 8 or more services in the morning peak period, which on a bidirectional bus, tram or train route corresponds to a service in each direction roughly every 30 minutes during the morning peak.[35] This is a much less stringent criterion than the five departures per hour (i.e. every 12 minutes) that is said to lead to 'forget the timetable' (Mulley 2009).

34 VCEC (2006) provides further detail, stat ng that 84 per cent of people live within 400m of a bus route, 15 per cent with n 400m of a tram route and 23 per cent with n 800m of a tra n station. Neither source specifies the frequency of the service to which residents have access.

35 For example, accord ng to the Victorian Department of Transport dataset, there were 12 departures from the Berwick railway station in the morn ng peak period n 2006, seven heading in the direction of the city and five towards Pakenham. With 12 departures, Berwick station exceeds the frequency criteria of 8 departures underpinning this analysis.

The co-ordinates of each bus, rail or tram stop that met this frequency criterion were used to construct the 500 metre and 1 kilometre buffers, and these buffers were then used to estimate the proportion of the population with access to a public transport stop that met this frequency criterion based on CCD population or DZ employment data from the 2006 ABS *Census of Population and Housing*. This involves making the assumption that population is distributed within each CCD (jobs are distributed within each DZ) in accordance with area. Given the assumptions within the methodology, the access estimates should only be considered indicative. The analysis is undertaken based on ABS ASGC 2006 boundaries of the five selected suburbs and the five selected place of work SLAs.

Residential growth

Census data reveals that between 2001 and 2006 the following Melbourne suburbs experienced the largest increase in residential population:

- Point Cook (12 222 persons)
- Narre Warren South (11 473 persons)
- Berwick (10 129 persons)
- Caroline Springs (7 883 persons)
- Melbourne (7 655 persons).

Together these five suburbs accounted for 22 per cent of Melbourne's population increase between 2001 and 2006. The first four suburbs are urban fringe developments located in one of the Growth Area LGAs, while the strong population growth in the suburb of Melbourne reflects urban consolidation in the Melbourne CAD.

Table 6.18 summarises BITRE's estimates of the proportion of residents in each of these growth suburbs which lived within a given distance of a public transport stop with 8 or more departures during the morning peak period. Unsurprisingly, the suburb of Melbourne, which represents the hub of the city's public transport network, had 100 per cent access. The results for Berwick, Narre Warren South and Caroline Springs are broadly similar to one another, with 51–65 per cent living within 500 metres of a public transport stop that meets the frequency criteria and 79–90 per cent living within 1000 metres.

T6.18 Public transport access in the morning peak period for residential growth suburbs of Melbourne

Growth suburb	Proportion of suburb employed residents who live within:		Proportion of employed residents commuting to work by public transport, 2006 (per cent)
	500m of public transport stop meeting minimum frequency criteria (per cent)	1000m of public transport stop meeting minimum frequency criteria (per cent)	
Point Cook	10	46	11
Narre Warren South	65	90	7
Berwick	51	79	7
Caroline Spr ngs	54	87	10
Melbourne	100	100	27

Note: The selected growth suburbs are the five ABS suburbs that experienced the most substantial population increase between 2001 and 2006. Public transport stops that had fewer than 8 departures during the morn ng peak period are excluded from the analysis. For bidirectional routes this corresponds to a departure n each d rection once every 30 minutes. The public transport access nformation is intended to represent access levels n 2006, but as bus nformation was not available for 2006, 2010 bus information has been used as a proxy.

Source: BITRE analysis of ABS census data on CD population for 2006, Victorian Department of Transport stops data for 2006, supplemented with Metlink onl ne bus t metables as of October 2010.

Point Cook stands out as having much more limited public transport access than the other residential growth suburbs. Like Caroline Springs, it is a recently developed suburb (both suburbs had populations of less than 3000 in 2001). There are no rail or tram stops within the ABS suburb of Point Cook[36], although the rail stations of Aircraft, Laverton and Hoppers Crossing are all within a few kilometres. In 2010, Point Cook was served by two bus routes (413 and 416), with both routes having three services in each direction during the morning peak. Thus, only the stops served by both routes met the frequency criteria of 8 departures during the morning peak. Consequently, just 10 per cent of the population of Point Cook is estimated to live within 500 metres of a public transport stop meeting the frequency threshold. Interestingly, despite the limited public transport access, public transport usage is not particularly low in Point Cook, with closer inspection revealing that public transport use is dominated by train usage.

With respect to the planning objective of concentrating residential development in areas that are well served by the public transport system:

- the residential development that is occurring in the Melbourne Central Activities District is extremely well served by public transport
- the residential development that is occurring in Melbourne's urban fringe growth areas is not particularly well served by public transport—fifty two per cent of the population of the four selected fringe growth suburbs live more than 500 metres from a public transport stop with at least 8 departures during the morning peak period, while 23 per cent lived more than 1000 metres away.

36 This is also the case for Carol ne Springs and Narre Warren South, although Narre Warren station is a short distance from the latter.

Note that the focus for the designated Growth Areas is that they are 'served by high-capacity public transport' (DI 2002a, p.63). For new housing in the designated Growth Areas, the median distance to a train station has been gradually rising and reached 3.29 kilometres in 2007 (Goodman et al 2010). The proportion of all of Melbourne's newly constructed dwellings that are within 3 kilometres of a train station has been declining gradually from 1996 to 2007, and reached a low of 56 per cent in 2007. Only 21 per cent of dwellings constructed in 2007 were within 1 kilometre of a train station (ibid). This data indicates that the majority of new residential development in Melbourne is occurring in areas that are not very well served by high-capacity public transport, and this pattern is gradually becoming more pronounced.

Even in the three growth suburbs that do not contain a rail station (i.e. Point Cook, Narre Warren South and Caroline Springs), census data reveals that commuter use of public transport is dominated by rail, rather than bus, indicating that residents are prepared to travel several kilometers from home in order to access high capacity public transport. This is consistent with Shin and Inbakaran (2010) who investigated transport usage for residents of new housing estates on Melbourne's urban fringe, finding that amongst those who used public transport, 42 per cent used a car as well, suggesting greater effort to reach public transport than employed residents of Melbourne more generally (where only 14 per cent used a car and public transport).

Jobs growth

Table 4.6 previously identified the SLAs that experienced the largest increase in jobs between 2001 and 2006 as Southbank-Docklands (10 500), Wyndham North (8 100), Melbourne Inner (7 300), Greater Dandenong Balance (5 500) and Casey–Berwick (+5 000). Together these SLAs accounted for 33 per cent of Melbourne's employment increase between 2001 and 2006. Jobs growth in Wyndham North and Greater Dandenong Balance is being driven by the West and South Industrial Nodes, respectively. Jobs growth in Berwick is in service industries catering to the rapidly growing local population, while Melbourne Inner and Southbank-Dockland's jobs growth is led by the *Property and business services*, Finance and Government administration industries (see Table 5.5).

Table 6.19 summarises BITRE's estimates of the proportion of jobs in each of these growth SLAs which were located within a given distance of a public transport stop with 8 or more arrivals during the morning peak period. There is a clear split between the 100 per cent of jobs with public transport access in the two central SLAs (Melbourne Inner and Southbank-Docklands) compared to the lower proportions in the outer suburban jobs growth SLAs. Berwick, which is a more residentially oriented SLA, has better public transport access to jobs than the employment-oriented SLAs of Wyndham North and Greater Dandenong Balance. Public transport was only very rarely used to commute to a place of work in the Wyndham North, Greater Dandenong Balance and Berwick SLAs.

With respect to the planning objective of concentrating jobs growth and economic development in areas that are well served by the public transport system, the analysis indicates that:

- substantial jobs growth is occurring in the Melbourne CAD (i.e. the Melbourne Inner and Southbank-Docklands SLAs), which is extremely well served by public transport
- substantial jobs growth is occurring in outer suburban industrial areas and residential growth areas which are less well served by public transport—fifty two per cent of the jobs in the three selected outer SLAs are more than 500 metres from a public transport stop with at least 8 arrivals during the morning peak period, while 22 per cent of jobs are more than 1000 metres away.

T6.19 Public transport access in the morning peak period for jobs growth SLAs in Melbourne

Growth SLA	Proportion of SLA workers whose job is within:		Proportion of workers commuting to workplace in this SLA by public transport, 2006 (per cent)
	500m of public transport stop meeting minimum frequency criteria (per cent)	1000m of public transport stop meeting minimum frequency criteria (per cent)	
Southbank-Docklands	100	100	39
Wyndham North	41	68	2
Melbourne Inner	100	100	62
Greater Dandenong Balance	44	81	3
Casey–Berwick	69	90	3

Note: The selected growth SLAs are the five SLAs that experienced the most substantial employment increase between 2001 and 2006 (see Table 4.6). Public transport stops that had fewer than 8 arrivals during the morn ng peak period are excluded from the analysis. For bid rectional routes this corresponds to an arrival in each d rection once every 30 m nutes. The public transport access information is intended to represent access levels n 2006, but as bus information was not available for 2006, 2010 bus information has been used as a proxy. There was a review of bus services that led to an upgrade of bus services in Wyndham North in 2010, so the Wyndham North estimates are likely to overstate 2006 access levels.

Source: BITRE analysis of ABS census data on CD population for 2006, Victorian Department of Transport stops data for 2006, supplemented with Metlink onl ne bus t metables as of October 2010.

Summary

This chapter has summarised spatial variation in the use of different transport modes and recent shifts in transport mode shares within Melbourne. This contextual information adds value to the population and employment information presented in Chapters 3 and 4, by helping to draw out the links between the spatial distribution of population and jobs and usage of different transport modes in Melbourne. The chapter has also explored progress against several transport-related urban planning objectives in Melbourne. The key findings are listed at the beginning of this chapter.

CHAPTER 7
Commuting flows

Key points

- In 2006, about 98 per cent of workers lived and worked within the Melbourne working zone, with about 1.4 per cent or 23 600 workers commuting from regional Victoria, particularly from Geelong, Ballarat, Latrobe Valley and Bendigo. Just over 18 000 Melbourne residents commuted to a place of work in another working zone.
- In 2006, 1.59 million workers commuted to a known place of work within the Melbourne working zone. Of these 764 800 worked in their local planning subsector denoting a *self-containment rate* of 44 per cent. Self-containment is highest for the Inner sector (68 per cent) and lowest for the Middle North (29 per cent) and Outer West (30 per cent) subsectors. Between 2001 and 2006, self-containment improved in the Inner sector, while declining in the Middle West and Middle North.
- Between 2001 and 2006, there were over 21 200 additional commutes within the Outer South and over 12 300 additional commutes within the Inner sector. The Outer Western sector provided more than 5500 additional commuters to each of the Inner and Middle West sectors.
- The Inner sector draws 77 per cent of its workers from beyond its boundaries, compared to 51 per cent for the Middle sector, 32 per cent for the Outer sector and just 20 per cent for the Peri Urban sector.
- The probability of commuting to the CBD exceeds 20 per cent for residents of nearby areas (e.g. Southbank-Docklands, Prahran), but is under 5 per cent for many of the more distant SLAs (e.g. Knox South, Berwick, Melton Balance).
- The origin-destination pairs with the greatest commuting flows were typically either intra-SLA flows (e.g. flows within Kingston North or Frankston West) or flows to the CBD. Similarly, the pairs with the greatest increase from 2001 to 2006 were predominantly intra-SLA flows (e.g. flows within the Berwick or Craigieburn SLAs), but flows from Southbank-Docklands to the CBD and from Frankston East to Frankston West both grew by more than 1200 commuters.
- Trips to work in an inward direction dominate those in an outward direction (37 and 9 per cent respectively), while 24 per cent of all commutes occur within the home SLA. Between 2001 and 2006, the relative importance of inward flows declined slightly, while outward flows and commutes to a different SLA within the home subsector experienced above-average growth, and commutes from one Outer subsector to another grew particularly rapidly. This reflects an increase in the complexity of commuting flows.

- Average commuting distances are low for Inner and Middle sector residents (7.5km and 12.5km respectively), and higher for Outer sector residents (19.0km), particularly those who live in the Outer West (22.8km). There is less variation on a place of work basis, although those with jobs in the Inner sector travel a longer average road distance to work (16.5km) than do Middle North workers (11.9km).
- The average time taken to commute to work in the Melbourne SD was 36 minutes in 2006. Only a modest difference of 6 minutes exists between the Inner and Outer sector's average commuting times.
- Average commuting distances remained essentially unchanged for the Melbourne SD at 14.7km in 2001 and 14.8km in 2006. Average commuting times increased from 2001 to 2006, but remained unchanged between 2007–08 and 2009–10.

Introduction

The aims of this chapter are to identify the main *commuting flows* (i.e. the number of people who travel from a particular place of residence to a particular place of work) for Melbourne in 2006, spatial differences in average commuting distances and times, and the main commuting changes that occurred between 2001 and 2006. Accordingly, the chapter brings together the analysis of population and employed residents in Chapter 3 with the analysis of employment location of Chapter 4.

The primary sources of data and information for the study of commuting flows in this chapter are the journey to work matrices that are constructed based on 2001 and 2006 ABS censuses. The analysis is undertaken at the sectoral and statistical local area (SLA) scales, not at the more disaggregated destination zone scale. The journey to work matrices that underly this chapter compare a commuter's place of usual residence to their place of work.

The next section of the chapter provides a snapshot of six key dimensions that describe Melbourne's commuting flows as at 2006. The dimensions are: long distance commutes; subsectoral commuting in the Melbourne working zone; commuting flows between different SLAs in the working zone; commuting distances; commuting times; and commuting costs. The remainder of the chapter examines the changes in commuting flows between 2001 and 2006 against each of these dimensions.

2006 snapshot

Long distance commutes

In 2006, Melbourne had a workforce of 1.59 million people who reported a fixed place of work within the working zone. While about 98 per cent of them lived and worked within the Melbourne working zone, about 1.4 per cent or 23 600 people commuted from regional Victoria to a workplace in the Melbourne working zone. Those who commuted from interstate locations to the working zone amounted to 6100 or a mere 0.4 per cent of the total workforce (Chapter 4). Table 7.1 ranks, in descending order of commuter numbers, the main regions of residence of these long distance commuters.

Out of the working zones listed in Table 7.1, daily commuting to Melbourne was most common for those in the working zones of Geelong, Ballarat, Latrobe Valley and Bendigo. As these major regional centres are located close to metropolitan Melbourne, promoting economic growth in them, as envisaged in the *Melbourne 2030* strategy, would help ease the need for long distance commuting.

The other intrastate locations from which frequent commuting to Melbourne occurs are Mitchell North, Phillip Island and South Gippsland Central. These are also located within a radius of 150 kilometres from the CBD. Those commuting to work from the interstate working zones of Sydney, Adelaide, Brisbane and Perth are most probably undertaking less frequent commutes, such as at weekly intervals. Note that a person who is living and working in Melbourne at the time of the census, but has a usual residence in Sydney where they live more than six months of the year, will show up as commuting from Sydney to Melbourne in Table 7.1.

Table 7.1 also summarises the tendency for employed persons to commute to a workplace outside the working zone where they live. Among the factors that govern a person's propensity to commute long distances are availability of suitable employment for multiple workers in the family in and around where they live, highly paid city positions, frequency of public transport, freeway connections, housing affordability in close proximity to workplace, access to schools and social amenities. This table shows that as high as 23 per cent of employed persons in Bass Coast–Phillip Island commuted to a place of work in Melbourne. Other regions showing high propensities include Geelong, Mitchell North and South Gippsland Central, all of which adjoin the Melbourne working zone.

T7.1 Main regions of residence for people employed at a fixed work address in Melbourne working zone, 2006

Working zone of residents	Number of working zone residents employed in Melbourne working zone	Percentage employed at fixed work address in Melbourne working zone	Percentage of employed residents of origin working zone
Melbourne & surrounds	1 557 222	98.16	93.6
Geelong & surrounds	11 128	0.70	11.4
Ballarat & surrounds	2 329	0.15	5.1
Latrobe Valley	1 880	0.12	6.1
Bendigo & surrounds	1 847	0.12	3.9
Sydney & surrounds	1 762	0.11	0.1
Mitchell North	745	0.05	17.0
Brisbane & surrounds	723	0.05	0.1
Bass Coast–Phill p Island	681	0.04	22.9
South Gippsland Central	663	0.04	12.3
Adelaide & surrounds	599	0.04	0.1
Perth & surrounds	486	0.03	0.1

Note: The place of work total is substantially less than the number of employed residents, due to non-response and no fixed work address.

Source: BITRE analysis of ABS Census of Population and Hous ng 2006 unpublished data.

Residents of Geelong who commuted to the Melbourne working zone were most likely to work in Melbourne Inner, Melbourne Remainder and Wyndham North. Commuting to the CBD is facilitated by relatively frequent train connections, while Wyndham North (which includes the West Industrial Node) is an employment hub easily accessible from Geelong. Similarly Ballarat and Bendigo residents tend to commute to either the CBD or a part of Melbourne working zone in close proximity to Ballarat or Bendigo (e.g. Hepburn East, Kyneton). A majority of those who commuted from Latrobe Valley, Mitchell North, Phillip Island and South Gippsland Central commuted a relatively short distance to a directly adjoining part of the Melbourne working zone.

The ten main non-Melbourne places of work for employed residents of the Melbourne working zone are listed in Table 7.2. In total 18 224 Melbourne residents commuted to a place of work in another working zone. However, the number of out-commuters was outweighed by those commuting in. In addition to daily commuters and those who commute to a non-Melbourne place of work on a less frequent basis (e.g. weekly or around shifts), the data in Table 7.2 may capture usual residents of Melbourne who are living and working in another part of Australia for some of the year.

T7.2 Main non-Melbourne places of work for employed residents of Melbourne working zone, 2006

Working zone	Number of Melbourne residents employed in the Working Zone
Geelong & surrounds	3 325
Sydney & surrounds	2 188
Latrobe Valley	1 726
Ballarat & surrounds	1 341
South Gippsland Central	981
Bendigo & surrounds	852
Brisbane & surrounds	729
Mitchell North	698
Canberra & surrounds	444
Perth & surrounds	410
Adelaide & surrounds	394

Source: BITRE analysis of ABS Census of Population and Housing 2006 (unpublished data).

All of the listed intrastate destinations in regional Victoria are within a daily commuting distance of about 150 km from Melbourne. In particular Geelong was an important destination for commuters from the Melbourne working zone. There were five interstate locations to which commuters travelled from Melbourne in significant numbers. The highest percentage of interstate travel was to Sydney and surrounds, a result which accords with ABS (2010) which reports that NSW was the most common interstate destination for workers from Victoria, attracting 13 297 employed persons or 0.61 per cent of total employed persons in Victoria in 2006. The interstate commuters worked as professionals, managers, technicians and trade workers in manufacturing, retail trade and public administration and safety (ABS 2010).

Commuting to Geelong was most common amongst employed residents of the neighbouring Wyndham LGA. A similar pattern of commuting from nearby areas was observed for Ballarat and Latrobe Valley. Commuters to Sydney had a range of origins—particularly from Port Phillip, Melbourne and Stonnington LGAs.

Sub-sectoral overview

The focus of this section is to provide an analysis of commuting flows that occurred *within* the Melbourne working zone in 2006.

In 2006 there were 1 586 453 jobs with a known place of work in the Melbourne working zone. There were 1 753 765 employed residents, of whom 764 782 worked in their local planning subsector denoting a *self-containment rate* of 44 per cent (i.e. 764 782/1 753 765). The proportion of jobs that involved commuting to a different subsector in 2006 was 52 per cent (i.e. {1 586 479 – 764 782}/1 586 453). The Inner subsector had 343 359 (i.e. 443 850 less 147 053) more jobs than employed residents[37], resulting in 77 per cent of its workforce commuting to the Inner sector from other subsectors. This inflow was considerably above the average for the working zone of 52 per cent.

Table 7.3 summarises each subsector's degree of employment self-containment and the extent to which employees commute to work from outside each subsector. As shown there, the degree of self-containment and the extent to which employees commute to work in different subsectors vary significantly across the working zone— but it is evident that 44 per cent of the workforce lives and works locally. The self-containment rates of most subsectors were lower than the average for the working zone. All the subsectors in the Middle sector, as well as the Outer Northern and Outer Western subsectors had self-containment rates much below 44 per cent. The table shows that the self-containment rate is low in the Middle sector, particularly in the Middle North subsector. A similar result is evident for the Outer West subsector. The Inner sector, Outer Southern subsector and the Peri Urban area showed self-containment rates considerably above the Melbourne working zone average of 44 per cent. The high self-containment within the Inner sector is linked to its high ratio of jobs to residents (Table 4.1 shows the high employment self-sufficiency rate for the Inner sector), with the Inner sector also attracting a high proportion of workers from locations outside its boundaries. With a distinctive focus on manufacturing and technology, the Outer Southern subsector (e.g. LGA of Greater Dandenong) had an above average self-containment rate—but the number of workers that commuted from places outside the sub-sectoral boundary was relatively low. A similar pattern of self-contained employment and lack of inward commuting characterised the Outer Eastern subsector and the Peri Urban area. The lower self-containment in the Outer Western subsector reflects scarcity of jobs relative to residents in this subsector (see Table 4.1), but also its greater proximity than other outer suburban areas to the CBD.

37 It had a self-sufficiency ratio of 3.02. Self-sufficiency ratios for other sectors and subsectors are n Table 4.1.

T7.3 Self-containment and proportion who commute from outside by subsector, Melbourne working zone, 2006

Planning subsector	Workers	Employed residents	Work in home sector	Self-containment rate (per cent)	Proportion who commute from outside sector (per cent)
Inner	443 850	147 053	100 491	68	77
Middle	613 025	817 085	298 973	37	51
Middle East	230 054	273 009	107 575	39	53
Middle North	105 494	171 777	50 030	29	53
Middle South	142 645	189 114	72 586	38	49
Middle West	134 832	183 185	68 782	38	49
Outer	488 167	721 820	332 084	46	32
Outer Eastern	129 024	194 359	92 265	47	28
Outer Northern	108 333	149 038	55 890	38	48
Outer Southern	202 546	287 804	156 907	55	23
Outer Western	48 264	90 619	27 022	30	44
Peri Urban	41 437	67 807	33 234	49	20
Me bourne Working Zone	1 586 479	1 753 765	764 782	44	52

Note: The place of work total is substantially less than the number of employed residents, due to non-response and no fixed work address.

Source: BITRE analysis of ABS Census of Population and Housing 2006 unpublished data.

Table 7.4 summarises commuting flows across subsectors for 2006. It shows that the main source of workers in a subsector is those residing within that subsector (i.e. all diagonally highlighted numbers are higher than the other numbers in the same column). Excluding commuter flows within a single subsector, the commuter flows which exceeded 20 000 persons all involved a place of work in the Inner or Middle sectors. Details of these flows are as follows:

- to the Inner sector from all of the Middle subsectors and all the Outer subsectors—except the Outer Western subsector.
- to the Middle East subsector from the Middle South, Outer Eastern and Outer Southern subsectors.
- to the Middle North, Middle South and Middle West sectors from the Outer Northern, Outer Southern and Outer Western subsectors respectively.

T7.4 Commuting flows between subsectors of the Melbourne working zone, 2006

Subsector of residence	Subsector of work										Melbourne Working Zone
	Inner	Middle East	Middle North	Middle South	Middle West	Outer Eastern	Outer Northern	Outer Southern	Outer Western	Peri Urban	
Inner	100 491	10 902	4 380	7 804	4 899	1 448	2 309	2 141	899	157	135 430
Middle East	75 527	107 575	9 899	18 171	4 468	15 779	4 423	11 264	851	207	248 164
Middle North	56 564	11 956	50 030	2 309	10 299	1 717	18 238	1 022	1 242	261	153 638
Middle South	55 284	20 766	1 703	72 586	2 910	2 622	1 172	13 570	683	97	171 393
Middle West	53 842	4 795	7 693	2 239	68 782	632	12 013	996	9 886	392	161 270
Outer Eastern	20 905	35 098	2 595	6 411	1 387	92 265	1 617	11 351	328	216	172 173
Outer Northern	25 041	7 303	23 545	1 159	12 046	1 537	55 890	780	1 989	959	130 249
Outer Southern	21 170	26 638	972	29 520	1 771	11 024	849	156 907	505	1 038	250 394
Outer Western	19 569	1 783	1 972	878	21 553	314	4 605	423	27 022	740	78 859
Peri Urban	5 119	951	1 662	404	3 625	662	5 654	2 288	2 053	33 234	55 652
Melbourne Work ng Zone	433 512	227 767	104 451	141 481	131 740	128 000	106 770	200 742	45 458	37 301	1 557 222

Note: The total is less than the workers total in Table 7.3, due to the exclusion of those who live outside the Me bourne working zone but work n it.

Source: BITRE analysis of ABS Census of Population and Hous ng 2006 unpublished data.

An alternative way of expressing the commuting flows across sectors and subsectors is by considering the probability[38] that an employed resident of one sector will commute to a workplace in another sector (see Table 7.5). In 2006, the highest probabilities of commuting to a workplace in a subsector outside the subsector of residence ranged up to 33 per cent. Most of the high probabilities relate to residents commuting to the Inner sector from their residences in the Middle East, Middle North, Middle South, Middle West and Outer Western subsectors. Middle West was the only other subsector with a high probability of attracting commuters from another subsector. The probability of commuting to that subsector from the Outer Western subsector was 24 per cent.

38 For example, the probability of commut ng from the Middle East subsector to the Inner sector can be est mated by divid ng 75 527 in Table 7.4 by 273 009 n Table 7.3. In the discussion, this probability is expressed as a percentage.

T7.5 Probability of employed residents commuting to each subsector of work, Melbourne working zone, 2006

Subsector of residence	Subsector of work											
	Inner	Middle East	Middle North	Middle South	Middle West	Outer Eastern	Outer Northern	Outer Southern	Outer Western	Peri Urban	Place of work unknown*	Total
Inner	68	7	3	5	3	1	2	1	1	0	8	100
Middle East	28	39	4	7	2	6	2	4	0	0	9	100
Middle North	33	7	29	1	6	1	11	1	1	0	11	100
Middle South	29	11	1	38	2	1	1	7	0	0	9	100
Middle West	29	3	4	1	38	0	7	1	5	0	12	100
Outer Eastern	11	18	1	3	1	47	1	6	0	0	11	100
Outer Northern	17	5	16	1	8	1	38	1	1	1	13	100
Outer Southern	7	9	0	10	1	4	0	55	0	0	13	100
Outer Western	22	2	2	1	24	0	5	0	30	1	13	100
Peri Urban	8	1	2	1	5	1	8	3	3	49	18	100

Note: * This total ncludes persons who did not respond, have an undefined place of work or no fixed work address.
Source: BITRE analysis of ABS Census of Population and Housing 2006 unpublished data.

The following commuting flows came within the probability range of 10 to 20 per cent:

- From Outer Eastern and Outer Northern subsectors to the Inner sector
- From Middle South and Outer Eastern to Middle East subsector
- From Outer Southern to Middle South subsector
- From Outer Northern to Middle North subsector, and
- From Middle North to Outer Northern subsector.

This latter flow from the Middle North to the Outer North is the only commuting flow operating in an outward direction that has a probability exceeding 10 per cent.

Table 7.6 shows the three top SLAs of work for residents living in each of the subsectors. The analysis shows that in instances where subsector of residence was Inner, Outer Eastern, Outer Northern or Outer Southern, all three main SLAs of work were located in their respective home subsectors. However for residents of the Middle East, Middle North, Middle South and Middle West subsectors, only one or two SLAs of work were found in the home subsector, with commuting to the CBD common in all four subsectors.

T7.6 Main places of work for residents of each subsector, Melbourne working zone, 2006

Subsector of residence	Main SLA of work	2nd main SLA of work	3rd main SLA of work
Inner	Melbourne–Inner	Melbourne–Remainder	Port Phillip–West
Middle East	Melbourne–Inner	Melbourne–Remainder	Monash–Waverley West
Middle North	Melbourne–Inner	Melbourne–Remainder	Darebin–Preston
Middle South	Kingston–North	Melbourne–Inner	Glen Eira–Caulfield
Middle West	Melbourne–Inner	Melbourne–Remainder	Maribyrnong
Outer Eastern	Knox–North-East	Yarra Ranges–Lilydale	Maroondah–Croydon
Outer Northern	Hume–Broadmeadows	Whittlesea–South-West	Hume–Craigieburn
Outer Southern	Frankston–West	Greater Dandenong–Dandenong	Greater Dandenong Balance
Outer Western	Wyndham–North	Melbourne–Remainder	Melbourne–Inner
Peri Urban	Baw Baw–Part B West	Bass Coast Balance	Macedon Ranges Balance

Source: BITRE analysis of ABS Census of Population and Housing 2006 unpublished data.

Table 7.7 shows the public transport mode share for commuting within a subsector as well as commuting between subsectors. Largely due to such factors as greater public transport availability, better accessibility (see Chapter 6) and cost effectiveness of commuting, residents in the Inner sector showed a greater tendency to use public transport when commuting to work than those in any other sector. As shown in the table, on average 24 per cent of all Inner residents used some form of public transport to commute to their workplace. Residents of all four Middle subsectors also exceeded the working zone average of 12 per cent, but above average public transport mode shares occurred primarily for commutes from these Middle subsectors to Inner workplaces. The use of public transport was least pronounced for places of work in the Outer sector and in the Peri Urban area, where it was 2 per cent or less.

The proportion of residents from various sectors that commuted to the Inner sector by public transport averaged around 34 per cent and ranged between a low of 28 per cent for those commuting from the Outer Western subsector to a high of 41 per cent for those commuting from the Outer Southern subsector. The high use of public transport by Outer Southern residents commuting to work in the CBD was previously evident in Map 6.12.

Commuting by public transport within a subsector of the working zone was most pronounced in the Inner sector. With respect to between sector commutes, origin-destination pairs with an above average mode share were Middle West to Middle East, Middle West to Middle South, Middle North to Middle South and the various pairs that involved the Inner sector as either an origin or destination. This latter result can be attributed to the radial nature of public transport networks which facilitates travel to the CBD[39].

39 As implied by Mees (1995), radial commutes are trips made towards the CBD, even if not the whole way.

T7.7 Public transport mode share by subsector of residence and subsector of work, Melbourne working zone, 2006

Subsector of residence	Sector or subsector of work										
	Inner	Middle East	Middle North	Middle South	Middle West	Outer Eastern	Outer Northern	Outer Southern	Outer Western	Peri Urban	Total
Inner	28	15	15	14	12	8	8	9	4	nr	24
Middle East	37	5	3	6	7	3	2	3	5	nr	14
Middle North	39	7	6	14	6	3	4	5	2	nr	18
Middle South	36	6	10	4	9	3	6	3	4	nr	15
Middle West	34	13	6	14	4	3	2	5	3	4	15
Outer Eastern	39	4	2	3	5	2	2	1	3	nr	7
Outer Northern	32	2	3	3	3	1	2	2	1	0	8
Outer Southern	41	4	7	4	6	2	1	2	1	1	6
Outer Western	28	8	4	5	2	4	1	2	2	1	9
Peri Urban	31	3	2	6	2	2	1	2	0	1	4
Total	34	5	5	5	4	2	2	2	2	1	12

Note: nr refers to not reliable, due to the small number of Census respondents in this category.

Source: BITRE analysis of ABS Census of Population and Housing 2006 data, extracted from TableBuilder

Table 7.8 shows commuting flows associated with other environmentally sustainable travel modes—namely walking and cycling. On average, 4 per cent of commuters either walked or cycled to work.

Jobs in the Inner sector and the Peri Urban area recorded the highest mode share for walking and cycling for the working zone in 2006 (7 per cent). Much of this higher mode share arose due to walking and cycling within the respective areas of residence. The walking and cycling mode share was typically highest for commutes within the home subsector, particularly within the Inner (24 per cent), Middle North (8 per cent) and Peri Urban sectors (7 per cent). Commutes between the Inner and Middle North in both directions also have an above average mode share (6 per cent in each direction).

T7.8 Mode share of walking and cycling by subsector of residence and subsector of work, Melbourne working zone, 2006

Subsector of residence	Subsector of work										
	Inner	Middle East	Middle North	Middle South	Middle West	Outer Eastern	Outer Northern	Outer Southern	Outer Western	Peri Urban	Total
Inner	24	3	6	5	4	1	1	1	1	nr	19
Middle East	2	5	1	1	1	1	0	0	0	nr	3
Middle North	6	1	8	1	2	0	1	1	0	nr	5
Middle South	2	2	1	6	1	0	0	1	1	nr	4
Middle West	2	1	1	0	5	1	1	0	1	1	3
Outer Eastern	1	1	0	0	0	4	1	0	1	nr	2
Outer Northern	1	1	0	1	0	0	3	1	0	1	2
Outer Southern	1	0	1	0	0	0	0	3	1	1	2
Outer Western	0	1	0	0	0	0	0	1	4	0	1
Peri Urban	1	1	0	1	0	1	0	0	0	7	4
Total	7	3	4	4	3	3	2	3	2	7	4

Note: nr refers to not reliable, due to the small number of Census respondents in this category.

Source: BITRE analysis of ABS Census of Population and Hous ng 2006 data, extracted from TableBuilder

Commuting flows between SLAs

This section analyses commuting flows between SLAs in the Melbourne working zone in 2006.

Summary of different types of flows

In 2006, 1 557 222 commuting flows occurred solely within the Melbourne working zone from a known place of residence to a known place of work. Table 7.9 summarises these flows by category as:

- *inward* flows;
- *outward* flows; and
- *residual* flows.

The flows between SLAs have been identified as occurring either within a 'ring' or across rings (whether in an inward or outward direction). The City of Melbourne LGA is the central point of reference for the direction of flow. As defined in Chapter 1, the geographic entities referred to as rings are the same as the 'sectors'—except that the Inner sector has been modified by splitting it into:

(a) City of Melbourne LGA consisting of the innermost SLAs of Melbourne Inner, Southbank-Docklands and Melbourne Remainder;

(b) an Inner ring formed of the rest of the Inner sector, namely the SLAs of Port Phillip–St Kilda, Port Phillip West, Stonnington–Prahran, Yarra–North and Yarra–Richmond.

In Table 7.9, commuting flows that converged towards the City of Melbourne LGA from any of the four rings external to this LGA have been categorised as occurring in an *inward* direction. All commuting flows that diverged away from the City of Melbourne LGA to any of the four rings external to this LGA have been categorised as operating in an *outward* direction. Commuting flows that take place within the bounds of one of the rings—irrespective of whether the direction is oriented towards the inner periphery or the outer periphery of the ring or oriented in a circumferential direction within the ring are treated as *residual flows* (e.g. from Greater Dandenong Balance to Greater Dandenong-Dandenong).

Table 7.9 shows that a majority (54 per cent) of the commuting flows belong to the residual category. Of these, 367 478 commutes or 24 per cent of all commutes in the working zone occurred within home SLAs. The next most important type of flow was the 343 976 commutes or 22 per cent of all commutes that occurred from one SLA to a different SLA in the home subsector (e.g. Frankston East to Frankston West). Together these two categories of relatively short distance commutes account for close to half of all commutes within Melbourne and are analysed in more detail in the following section (e.g. Table 7.12).

In Table 7.9, a total of 37 per cent of commuting flows have been identified as occurring in an inward direction. Of particular importance were the inward flows to a place of work in the City of Melbourne LGA (18 per cent), on which further information is presented in Table 7.11. Inward flows to a place of work in the rest of the Inner sector represented a 7 per cent share. This is a small share relative to the total share of all commutes heading to the City of Melbourne LGA. Also of significance were the total inward flows to a place of work in the Middle sector from Outer and/or Peri Urban sectors (12 per cent), such as:

- Greater Dandenong Balance to Kingston North (3 820 persons)
- Frankston West to Kingston North (2 990)
- Wyndham North to Hobsons Bay-Altona (2 523), and
- Whittlesea South-West to Darebin–Preston (2 165).

T7.9 Summary of commuting flows occurring in Melbourne working zone by direction of flow, 2006

Commuting direction	Number	Per cent
Total for nward direction	572 195	36.7
To a place of work in City of Melbourne LGA	277 256	17.8
To a place of work in rest of the Inner sector from Middle, Outer or Peri Urban sectors	103 009	6.6
To a place of work in Middle sector from Outer or Peri Urban sectors	181 273	11.6
To a place of work in Outer sector from Peri Urban sector	10 657	0.7
Total for outward direction	141 043	9.1
From City of Melbourne to a place of work elsewhere	13 333	0.9
From rest of the Inner sector to a place of work n Middle, Outer or Peri Urban sectors	27 690	1.8
From Middle to a place of work in the Outer or Peri Urban sectors	97 067	6.2
From Outer to a place of work n the Peri Urban sector	2 953	0.2
Total for *residual* flows	843 984	54.2
To a place of work with n the home SLA	367 478	23.6
To a place of work in a d fferent SLA n the subsector of residence	343 976	22.1
To a place of work in a d fferent subsector with n the Middle sector	97 208	6.2
To a place of work in a d fferent subsector with n the Outer sector	35 322	2.3
Total for all directions	1 557 222	100.0

Notes: Commuting flows that operate across rings are classified as either inward or outward. Commuting flows that occurred with n a r ng are classified as residual flows.

Flows to Me bourne Inner from Melbourne Remainder or Southbank-Docklands have been classified as inward flows to a place of work in the City of Melbourne LGA. Flows n the reverse direction have been classified as outward flows.

Source: BITRE analysis of ABS Census of Population and Hous ng 2006 unpublished data.

Only 9 per cent of commuting flows within the Melbourne working zone were classified as occurring in an outward direction. Of these, the most important sub-category was outward flows by residents of the Middle sector to either the Outer or the Peri Urban sector (6 per cent). Some of the most important examples are:

- Hobsons Bay-Altona to Wyndham North (2 253 persons)
- Moreland North to Hume-Broadmeadows (1 830)
- Brimbank-Keilor to Hume-Broadmeadows (1 745)
- Kingston North to Greater Dandenong Balance (1 726), and
- Darebin–Preston to Whittlesea South-West (1 556).

Table 7.10 summarises how usage of different transport modes to commute to work is distributed across the different types of commuting presented in Table 7.9 (collapsed into six broad categories). With regard to public transport, the table shows that inward commutes dominate public transport use, accounting for 76 per cent of all commuter use of public transport, and are also prominent for cycling (48 per cent share) and private vehicle commutes (33 per cent share). However, commutes within the home SLA account for the majority (63 per cent) of walking commutes.

Another way of analysing this data is by considering the mode shares that correspond to each type of commute. The private vehicle mode share is consistently above 50 per cent for each of the different commuting categories, but is highest for commutes from one Outer subsector to another (88 per cent) and for commutes to a different SLA in the home subsector (84 per cent). These forms of commuting tend to be highly car dependent. The public transport mode share is much greater for inward commutes than for the other categories of commuting, while the cycling mode share is also at its highest for inward commutes. Walking is most prevalent for commutes within the home SLA, for which it has a mode share of 8 per cent.

T7.10 Commuter use of different transport modes by direction of flow, Melbourne working zone, 2006

Type of commuter flow	As a percentage of all public transport commutes	As a percentage of all walking commutes	As a percentage of all cycling commutes	As a percentage of all private vehicle commutes
Inward to a different subsector or City of Melbourne	76	20	48	33
Outward to a different subsector	5	5	7	11
Same SLA	6	63	23	19
D fferent SLA, same subsector (excludes commutes from rest of the Inner sector to City of Melbourne)	9	11	18	27
From one Middle subsector to another	3	1	4	7
From one Outer subsector to another	0	0	0	3
All commuter tr ps	100	100	100	100

Source: BITRE analysis of ABS Census of Population and Housing 2006 unpublished data, extracted from TableBuilder.

Flows within and between SLAs

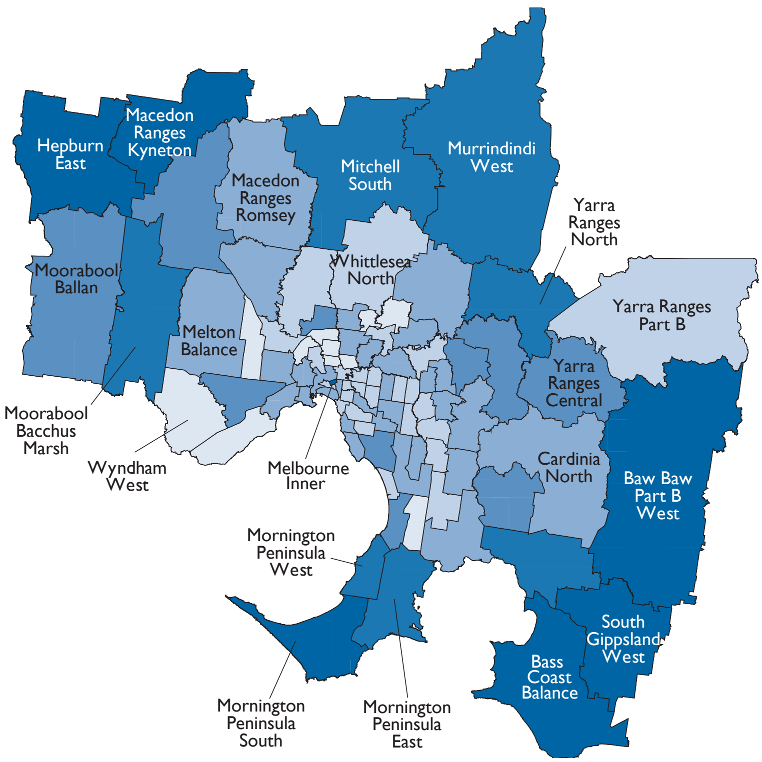
One of the most important types of commuting flows in Melbourne is commuting within the home SLA, which represents 23.6 per cent of all commuting trips. This figure is referred to as the SLA-based self-containment rate. Map 7.1 provides a spatial analysis of the self-containment rate at the SLA scale.

The self-containment rate is less than the working zone average of 23.6 per cent in over 60 per cent of the SLAs in the working zone (55 out of 91). In the Peri Urban SLAs of Hepburn East, Baw Baw Part B West and Bass Coast Balance, the self-containment rate was high at over three times the average rate for the working zone. These SLAs are distant from Melbourne's main employment hubs and have local employment opportunities—especially in the retail trade, agricultural and construction industries. On the other hand, the Outer sector SLAs of Melton East and Wyndham West recorded self-containment rates of less than 10 per cent in 2006—the lowest for the working zone. These SLAs attracted about 61 per cent of their workers from outside the respective SLAs and had about one job for every 5 employed residents. This observation implies that these SLAs currently offer limited employment opportunities and the jobs that are available are not well matched to the type of employment sought by the local population. As these SLAs are located in the urban fringe growth areas, where much of the population and housing growth is occurring—a further implication stemming from these lower self-containment rates is that any preference for choosing a home located very close to suitable jobs has been overridden by other factors such as housing affordability, housing preferences and proximity to family, friends and schools.

The proportion of employed residents who work in their home SLA of Melbourne Inner was about 50 per cent, despite its very high ratio of jobs to residents (i.e. a high self-sufficiency rate). Thus, even in locations with a large number and variety of jobs, many residents choose to work further afield. In '*Charting Transport*' Loader (2010) suggested that easy access and mobility to an employment centre is a further reason for commuting outside the SLA for employment. Accordingly, there is no single dominant factor that explains commuting flows in or out of an SLA.

In terms of the number of commuters involved, flows within the home SLAs were particularly large for the SLAs of Kingston North, Wyndham North and Frankston West in the Middle South, Outer Western and Outer Southern subsectors respectively. These SLAs have a substantial residential population and a large jobs base.

M7.1 Self-containment rates in each SLA, Melbourne working zone, 2006



Employment self containment rate, 2006 by Statistical Local Area

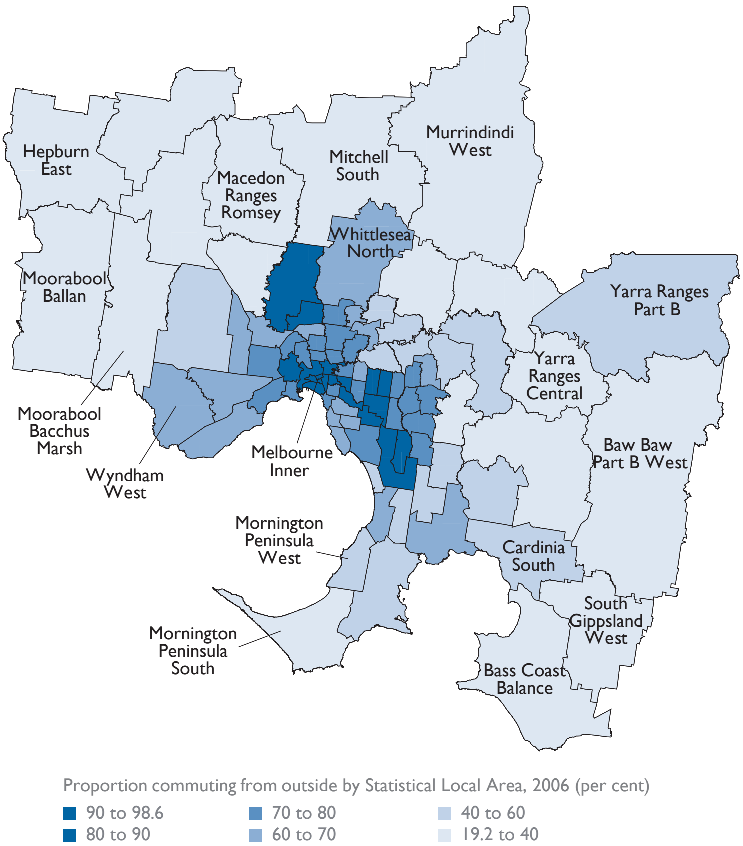
- More than 50%
- 40 to 50%
- 30 to 40%
- 20 to 30%
- 15 to 20%
- Less than 15%

Source: BITRE analysis of ABS Census of Population and Hous ng 2006 unpublished data.

Map 7 2 shows the number of workers commuting from outside an SLA as a percentage of its total workers. Across the Melbourne working zone, the SLA average was 77 per cent of local jobs being filled by residents of other SLAs.

As indicated by the darker shading of the map, the SLA of Melbourne Inner attracted over 98 per cent of its total workers from other SLAs—the highest of any SLA in the working zone. This reflects the fact that Melbourne Inner has 30 jobs for every employed resident (Table 4.2), the industry, occupational and wage mix of those jobs and the accessibility of the SLA. Other SLAs in the Inner sector that attracted 90 per cent or more of workers from beyond their boundaries were Southbank-Docklands, Melbourne Remainder, Port Phillip West and Yarra–Richmond. A number of job hubs in the Outer and Middle sectors also attracted a large proportion of workers from other SLAs. SLAs such as Monash South-West, Monash—Waverley West and Whitehorse—Box Hill in the Middle East subsector attracted 81 to 90 per cent of their workers from other SLAs. For instance the Middle East SLA of Monash South-West, with 34 000 jobs and specialisation in Education (due to Monash University), has an inward flow of commuters from the SLA of Greater Dandenong Balance and the LGAs of Casey, Knox and Frankston. It also created significant outward flows from the SLA of Port Phillip–St Kilda in the Inner sector.

M7.2 Proportion of workers who commute from outside the SLA of work, Melbourne working zone, 2006



Source: BITRE analysis of ABS Census of Population and Housing 2006 unpublished data.

Map 7.2 shows that Peri Urban areas generally have relatively low capacity to attract workers from further afield, as do some SLAs on the city's outer western and southern fringes. Along with the SLAs within about 10 kilometres of the CBD, there is a cluster of SLAs in the south eastern suburbs which have a higher ability to attract workers from further afield. Several SLAs with a specialisation in manufacturing and/or transport-logistics have a high proportion of workers commuting from outside the SLA, such as Greater Dandenong Balance, Craigieburn and Broadmeadows.

Table 7.11 lists the major commuting flows within Melbourne. The single largest commuting flow of 12 963 employed residents occurred within the SLA of Kingston North. All the top 10 flows were commutes within the home SLA.

The second part of the table lists the top ten major commuting flows which involved an SLA of work different to the SLA of residence. Seven out of the ten inter-SLA flows listed in the second part of Table 7.11 took place within the same sector or subsector (shaded in orange). Seven commuting flows related to a place of work in the CBD. Of all these commuting flows, the single largest inter-SLA flow was 5 534 residents and it took place between the SLAs of Melbourne Remainder and Melbourne Inner.

T7.11 Major commuting flows between SLAs, Melbourne working zone, 2006

SLA of residence	Subsector of residence	SLA of work	Subsector of work	Number of people
Top commuting flows				
Kingston–North	Middle South	K ngston–North	Middle South	12 963
Wyndham–North	Outer Western	Wyndham–North	Outer Western	10 962
Frankston–West	Outer Southern	Frankston–West	Outer Southern	10 654
Yarra Ranges–Lilydale	Outer Eastern	Yarra Ranges–Lilydale	Outer Eastern	9 352
Manningham–West	Middle East	Manningham–West	Middle East	8 989
Casey–Berwick	Outer Southern	Casey–Berwick	Outer Southern	8 646
Mornington Peninsula–West	Outer Southern	Morn ngton Pen nsula–West	Outer Southern	8 617
Baw Baw–Part B West	Peri Urban	Baw Baw–Part B West	Peri Urban	8 613
Mornington Peninsula–South	Outer Southern	Morn ngton Pen nsula–South	Outer Southern	8 552
Knox–North-East	Outer Eastern	Knox–North-East	Outer Eastern	7 061
Top commuting flows between different SLAs, 2006				
Me bourne–Remainder	Inner	Me bourne–Inner	Inner	5 534
Yarra–North	Inner	Me bourne–Inner	Inner	5 025
Stonnington–Prahran	Inner	Me bourne–Inner	Inner	5 016
Port Phillip–St Kilda	Inner	Me bourne–Inner	Inner	4 942
Glen E ra–Caulfield	Middle South	Me bourne–Inner	Inner	4 705
Moonee Valley–Essendon	Middle West	Me bourne–Inner	Inner	4 652
Hume–Craigieburn	Outer Northern	Hume–Broadmeadows	Outer Northern	4 594
Kingston–South	Middle South	K ngston–North	Middle South	4 457
Frankston–East	Outer Southern	Frankston–West	Outer Southern	4 302
Manningham–West	Middle East	Me bourne–Inner	Inner	4 235

Note: The shaded cells represent commutes to a d fferent SLA within the home subsector.

Source: BITRE analysis of ABS Census of Population and Housing 2006 unpublished data.

Table 7.12 lists all SLA pairs which have a commuting flow involving more than 3 000 employed persons, excluding flows within the home SLA. The SLAs attracting commuting flows of this magnitude cover six of the Melbourne working zone's 10 main employment hubs (see Table 4.2)—namely Melbourne Inner, Melbourne Remainder, Kingston North, Greater Dandenong–Dandenong, Greater Dandenong–Balance and Broadmeadows. The remaining four employment hubs not captured in Table 7.12 drew small numbers of workers from a diverse range of SLAs.

Table 7.12 also shows that Melbourne CBD (i.e. the SLA of Melbourne Inner) attracted more than 3 000 workers from each of 16 different SLAs. These residential SLAs cover places in the Inner and Middle sectors—particularly the Middle North subsector. The other SLAs that attracted substantial flows of workers from three or more SLAs were Melbourne

Remainder, Kingston North and Greater Dandenong–Dandenong. It is noteworthy that large commuter numbers (3 000 or more) heading towards the CBD from a single SLA have mostly originated from a northerly, easterly or a southerly direction. The other job hubs such as Hume-Broadmeadows, Brimbank–Sunshine and Kingston North primarily attracted workers from neighbouring locations.

T7.12 Commuting flows between different SLAs involving more than 3 000 workers, Melbourne working zone, 2006

Sector	Employment hub	SLAs from which it attracts more than 3 000 workers
Inner	Me bourne–Inner	Stonn ngton–Malvern, Glen E ra–Caulfield, Mann ngham–West, Boroondara–Hawthorn, Boroondara–Camberwell South, Dareb n–Preston, Darebin–Northcote, Banyule–Heide berg, Moreland–Brunswick, Moonee Valley–Essendon, Maribyrnong, Yarra–North, Stonnington–Prahran, Port Phillip–West, Port Phill p–St Kilda, Me bourne–Remainder
Inner	Me bourne–Remainder	Moreland–Brunswick, Moonee Valley–Essendon, Maribyrnong, Yarra–North
Middle West	Brimbank–Sunsh ne	Br mbank–Keilor
Outer Northern	Hume–Broadmeadows	Hume–Craigieburn
Middle East	Monash–Waverley West	Monash–Waverley East
Outer Eastern	Maroondah–Croydon	Yarra Ranges–Lilydale
Middle South	Kingston–North	Greater Dandenong Balance, K ngston–South, Bayside–South
Outer Southern	Greater Dandenong–Dandenong	Casey–Hallam, Casey–Cranbourne, Casey–Berwick
Outer Southern	Greater Dandenong Balance	Casey–Cranbourne, Casey–Berwick
Outer Southern	Frankston–West	Mornington Peninsula–West, Frankston–East

Note: Excludes commutes with n the SLA of residence.

Source: BITRE analysis of ABS Census of Population and Hous ng 2006 unpublished data.

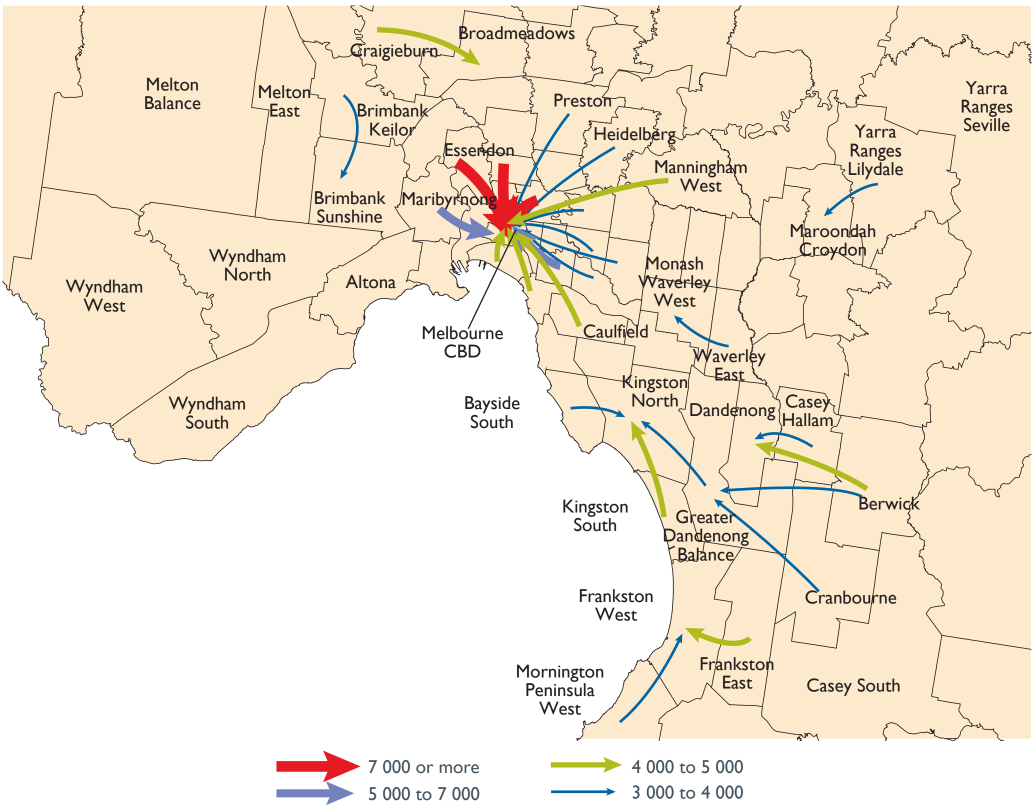
Map 7.3 visually depicts the analytical results summarised in tables 7.11 and 7.12. It shows all inter-SLA commuting flows involving more than 3 000 people and for clarity of presentation the three SLAs in the City of Melbourne have been aggregated to a single entity. The map does not show any commutes that occurred within an SLA. The direction of arrows in Map 7.3 is indicative of the direction of the commuter flow and in 2006 they were mostly in an inward direction[40].

As shown in Map 7.3, the commuting flows into the City of Melbourne LGA were the most dominant of all commuting flows. It had commutes of over 3 000 persons from 15 SLAs. Of these, the SLAs of Yarra–North, Moonee Valley–Essendon and Moreland–Brunswick were most dominant. There were commutes of 7 000 or more persons from these SLAs. Commutes of 5 000 to 7 000 occurred from the SLAs of Maribyrnong and Stonnington–Prahran. The CBD and its immediate surrounds also received commutes of 4 000 to 5 000 from the SLAs of Port Phillip–St Kilda, Port Phillip West, Manningham West and Glen Eira–Caulfield.

40 Note that some of the flows which may be clearly either inward or outward in Map 7.3 were classified n Table 7.9 as residual flows as they were ent rely with n one of the five rings (e.g. Casey-Berwick to Greater Dandenong-Dandenong).

Of the non CBD job hubs, Kingston North received between 3 000 and 5 000 commuters from three of its neighbouring SLAs. The other notable job hubs that received 3 000 to 5 000 commutes from more than one SLA were Frankston West, Greater Dandenong Balance and Greater Dandenong—Dandenong. Kingston North and these three job hubs are ranked amongst the 'top employing SLAs' of the Melbourne working zone (see Table 4.2). In Kingston North, Greater Dandenong Balance and Greater Dandenong—Dandenong, manufacturing was the dominant industry providing employment to over 30 per cent of workers. In Frankston West, retail trade provided employment to about 23 per cent of its workers (see Table 5.2). A feature of Map 7.3 is that the non-CBD job hubs are concentrated in the south-east of the metropolitan area.

M7.3 Inter-SLA commuting flows involving 3 000 or more persons, Melbourne working zone, 2006

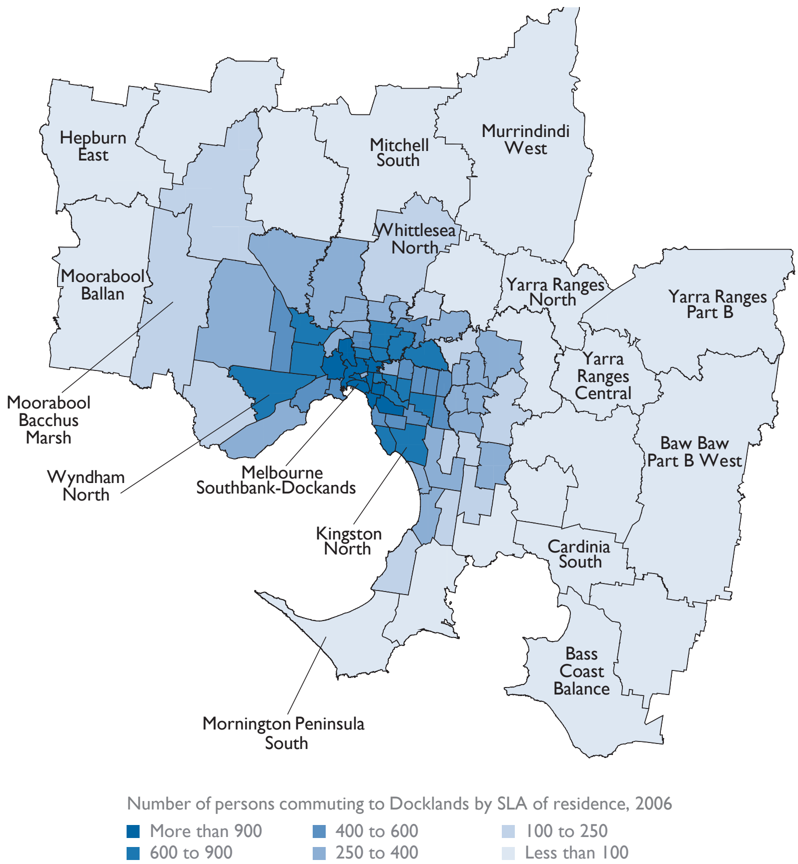


Note: For clarity of presentation the three SLAs in the City of Melbourne have been aggregated to a single entity. Excludes commutes within the SLA of residence.

Source: BITRE analysis of ABS Census of Population and Housing 2006 unpublished data.

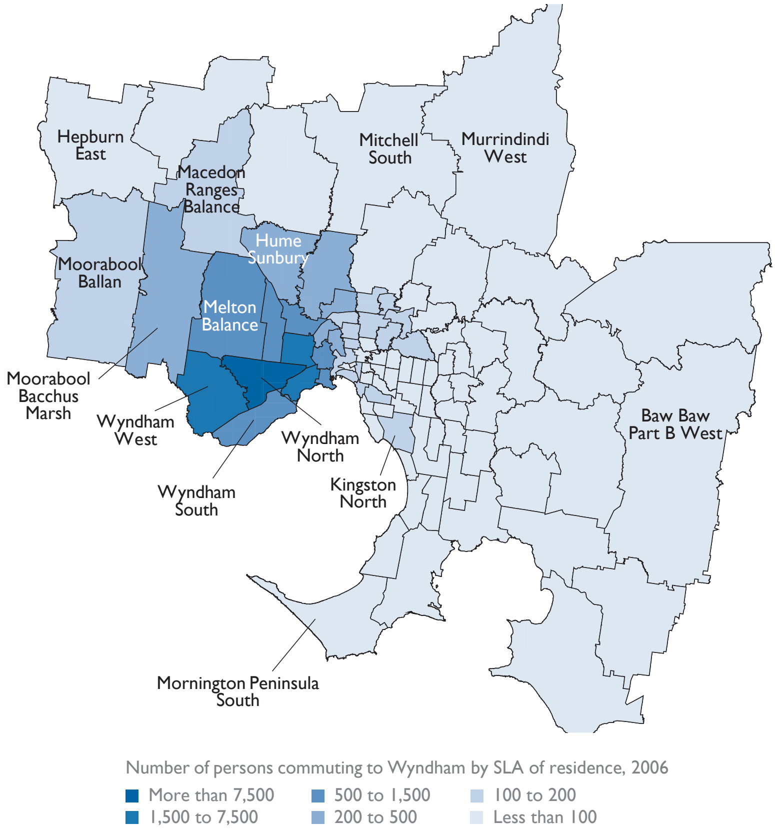
Maps 7.4 and 7.5 show two selected employment hubs in the Melbourne working zone and the SLAs from which they draw their workers. In 2006, the SLA of Southbank-Docklands (see Map 7.4) had 37 719 workers. Several SLAs in each of the Inner, Middle West and Middle South sectors provided more than 900 workers to Southbank-Docklands, and although a large number of the Inner and Middle sector SLAs provided more than 600 workers, SLAs located more than 25km from Southbank-Docklands typically provided relatively few workers. The SLAs that provided workers to the employment hub of Wyndham North were concentrated to the city's west and north (see Map 7 5), with Wyndham North and the immediately adjacent SLAs of Wyndham West, Altona and Sunshine being the most prominent sources of workers.

M7.4 Origin of commuting flows to the Southbank-Docklands SLA in 2006



Source: BITRE analysis of ABS Census of Population and Hous ng 2006 unpublished data.

M7.5 Origin of commuting flows to the Wyndham North SLA in 2006



Source: BITRE analysis of ABS Census of Population and Housing 2006 unpublished data.

The remainder of this section examines the likelihood or the probability of a commuter from one SLA travelling to another SLA. These probabilities, as noted in preceding discussions in this report, are measured simply by taking the number commuting to a given destination as a proportion of employed residents. The highest probabilities for commutes to the CBD and for commutes to a place of work outside the CBD are listed in Table 7.13.

Table 7.13 shows that the probability of commuting to the CBD is relatively high for many SLAs. The highest probability occurred for residents of Southbank-Docklands commuting to the CBD (28.5 per cent). The highest probability for a resident to commute to a place of work outside the CBD was 28 per cent and occurred in two instances:

- between the adjacent SLAs of Yarra Ranges Part B and Yarra Ranges Central; and
- from the SLA of Wyndham West in the Outer Western sector to the neighbouring job hub of Wyndham North.

T7.13 Highest probabilities of commuting between SLAs, Melbourne working zone, 2006

SLA of residence	Selected SLA of work	Total employed residents	Total commuting to selected SLA	Probability of working in this SLA (per cent)
Top ten probabilities of commuting to work in CBD				
Melbourne–Southbank-Docklands	Melbourne Inner	7 704	2 198	28.5
Melbourne–Rema nder	Melbourne Inner	23 001	5 534	24.1
Port Phill p–West	Melbourne Inner	19 253	4 204	21.8
Yarra–North	Melbourne Inner	24 530	5 025	20.5
Stonnington–Prahran	Melbourne Inner	25 021	5 016	20.0
Yarra–Richmond	Melbourne Inner	13 910	2 758	19.8
Boroondara–Hawthorn	Melbourne Inner	18 406	3 212	17.5
Moreland–Brunswick	Melbourne Inner	21 745	3 772	17.3
Port Phill p–St Kilda	Melbourne Inner	28 554	4 942	17.3
Stonnington–Malvern	Melbourne Inner	22 113	3 411	15.4
Top ten probabilities of commuting to work outside the CBD				
Yarra Ranges–Part B	Yarra Ranges–Central	213	60	28.2
Wyndham–West	Wyndham–North	10 363	2 915	28.1
Kingston–South	Kingston–North	22 005	4 457	20.3
Frankston–East	Frankston–West	21 422	4 302	20.1
Hume–Craigieburn	Hume–Broadmeadows	24 344	4 594	18.9
Moreland–Brunswick	Melbourne–Rema nder	21 745	3 625	16.7
Yarra–North	Melbourne–Rema nder	24 530	3 783	15.4
Bayside–South	Kingston–North	24 930	3 636	14.6
Greater Dandenong Balance	Kingston–North	27 496	3 820	13.9
Mornington Pen nsula–West	Frankston–West	23 891	3 317	13.9

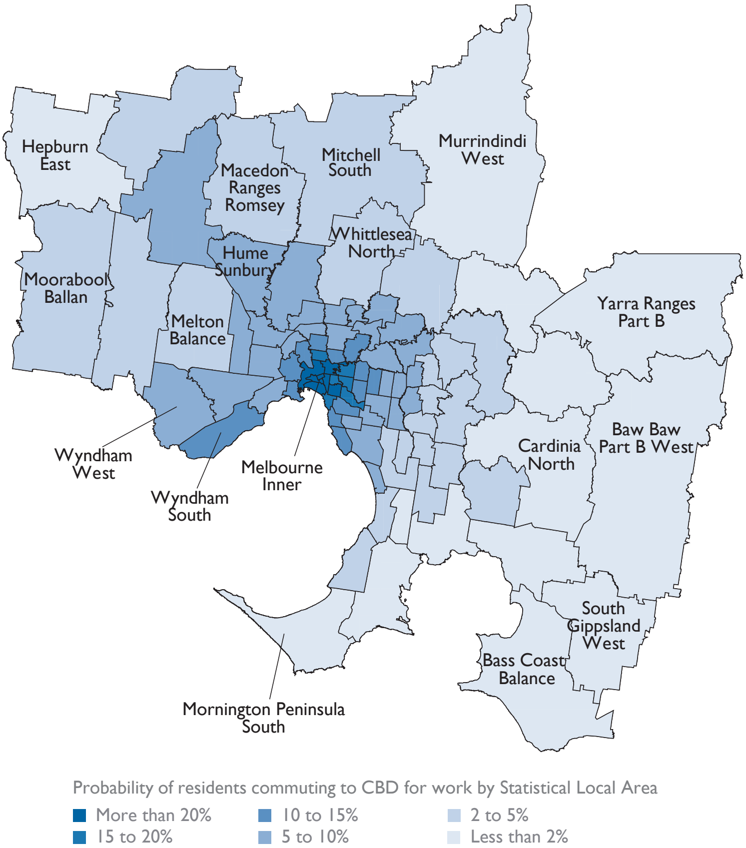
Note: Excludes commutes with n the SLA of residence.

Source: BITRE analysis of ABS Census of Population and Hous ng 2006 unpublished data.

Seven of the ten SLAs of residence which have the highest probability of commuting to a CBD workplace are located in the Inner sector—two of these within about a kilometre of the CBD. The three exceptions are the following SLAs that are well served by tram and rail networks: Moreland–Brunswick in the Middle North subsector; Boroondara–Hawthorn in the Middle East subsector; and Stonnington–Malvern in the Middle South subsector. The relevant probabilities for these top ten residence SLAs ranged from 15.4 per cent to 28 5 per cent.

Map 7.6 shows the probability of commuting to the major employment hub of Melbourne CBD for residents of each SLA. The pattern of variation from the highest to lowest resembled a set of concentric rings around the CBD. That is, virtually all Peri Urban SLAs showed very low probabilities of commuting to the CBD (less than 5 per cent), as did many SLAs in the Outer sector—whereas SLAs close to the CBD showed probabilities over 20 per cent. The probability of commuting to a place of work in the CBD was very high for residents of the SLAs adjacent to it—particularly the Inner sector SLAs of Melbourne Inner, Southbank-Docklands and Melbourne Remainder.

M7.6 Probabilities of residents of each SLA commuting to the Melbourne CBD, Melbourne working zone, 2006



Note In this map, CBD has been defined as Melbourne Inner SLA.

Source: BITRE analysis of ABS Census of Population and Housing 2006 unpublished data.

Returning to the lower half of Table 7.13, the highest probabilities of commuting to a non-CBD SLA typically occurred for neighbouring SLAs. Most of these pairs involved commutes from a relatively residentially orientated SLA to a more employment orientated location—that is to a location where there were more jobs relative to the population. For example the SLA of Kingston North had 3.9 per cent of jobs in the working zone whilst its population was only 2.4 per cent of the working zone (see Table 4 2). The resulting self-sufficiency ratio of 1.43 far exceeded the self-sufficiency ratio of the neighbouring SLA of Kingston South—which was under 0 5—and generated a significant flow of workers from Kingston South to Kingston North. This same reasoning underlies commutes to Wyndham North from Wyndham West and between most other pairs.

Commuting distance, time and cost

The commuting distance, time and cost are highly interrelated factors of significance to city planners and policy makers. Commuting per se is largely governed by these three factors—hence this section aims to discuss these as much as is relevant to the chapters that follow.

The principle estimates of commuting distance presented in this section were based on an ABS-VicRoads dataset. ABS Victoria compiled this data set using shortest road distances calculated by VicRoads and *Census of Population and Housing* data. The discussion of commuting time is largely based on the Victorian integrated Survey of Travel and Activity (VISTA). Commuting costs have been discussed with reference to cost information published by various researchers and practitioners.

Commuting distances

Background

This section aims to present a spatial analysis of the variation in average distances travelled to work within the Melbourne Statistical Division (SD). The analysis is confined to Melbourne residents who work within the Melbourne SD—thus excluding any commutes between the SD and the rest of Victoria as well as interstate commuting.

The ABS-VicRoads distance dataset contains estimates of distance between each SLA in the Melbourne SD. The estimates are based on shortest road distance from centroid of CCD of enumeration to centroid of destination zone, weighted according to Census counts of car driver commuters, and aggregated to the SLA level. The distance data is available for 1996, 2001 and 2006.

For some of the less travelled origin-destination pairs the ABS-VicRoads dataset provides no estimate of distance. BITRE has imputed the road distance for these pairs based on the straight line distance, and by applying the overall relationship that existed between the straight line and road distance estimates, i.e. for 2006:

Imputed Road distance = 1.13 + 1.23 * Straight line distance (R-squared = 0.989).

To construct estimates of average commuting distance (and distributional information), BITRE has used the shortest road distance between any two SLAs to proxy for the shortest rail distance, cycling distance, walking distance etc. More specifically, in order to derive measures of average commuting distance that apply across the entire population of commuters, it has been assumed that the ABS-VicRoads estimate of the road distance between each origin-destination pair for car driver commuters is representative of the distance travelled between that origin-destination pair by all commuters. Those who report working from home have been assigned a commuting distance of zero.

The ABS-VicRoads distance dataset is based on the shortest road distance and so does not capture the effect of detours made on the journey to work (e.g. school, shops). According to ABS-VicRoads data, commutes to work involved a mean distance of 14.9 kilometres in 2006, when distance was measured based on the shortest available route. According to VISTA-07 data, about 18 per cent of the work trips in 2007–08 involved intermediate stops, and for these indirect trips between home and work the average distance travelled was 51 per cent higher than on direct trips between home and work.

It is important to note that the road distance estimates presented in this chapter are not directly comparable to the straight line distance estimates presented in the Perth report (BITRE 2010). Some basic tables of the comparable straight line distance estimates for Melbourne are presented in Appendix B.

A specific limitation of the ABS-VicRoads dataset is that it is restricted to the Melbourne SD, and so excludes Peri Urban SLAs (e.g. Bacchus Marsh, Mitchell South, South Gippsland West). BITRE analysis of straight line distance estimates found that residents of the Peri Urban sector had a higher average commuting distance than residents of any other Melbourne sector, while those who worked in the Peri Urban sector had the shortest commuting distance of all sectors. Some further details for Peri Urban SLAs are included in Appendix B.

Despite its limitations, BITRE has chosen to base the spatial analysis of distance on the ABS-VicRoads dataset because:

- It enables comparison of change between 2001 and 2006;
- It supports spatially disaggregated analysis (particularly at the SLA scale); and
- It provides a useful guide to spatial differences in the distance actually travelled by commuters in Melbourne.

Distribution of commuting distance

ABS (2006b) presents information on the frequency distribution of the distance travelled to the usual place of work or study in the Melbourne SD for 2006, based on data collected through a supplement to the Monthly Population Survey. The responses show that:

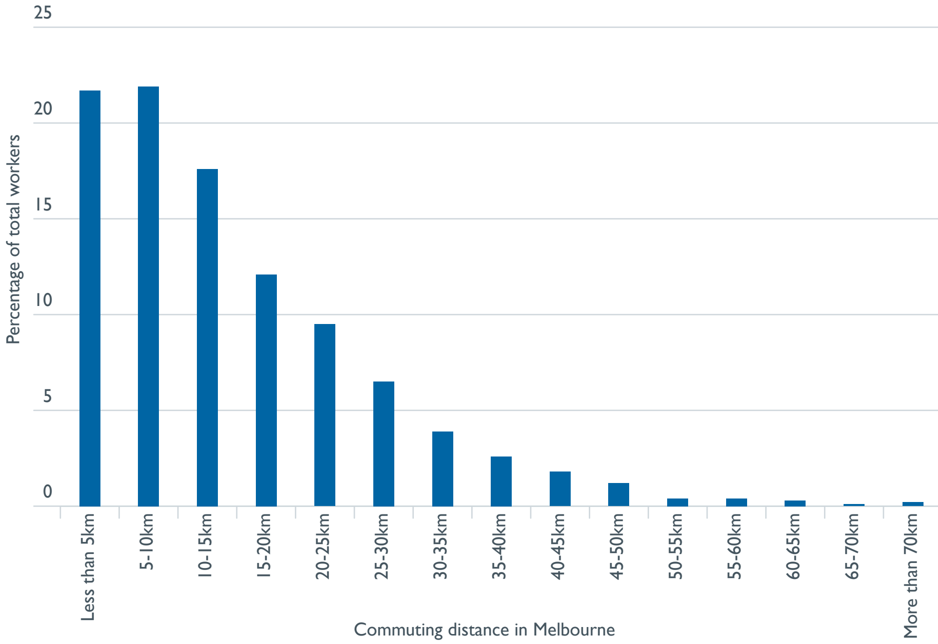
- 21 per cent travelled less than 5 kilometres (including 6 per cent who worked or studied at home)
- 21 per cent travelled between 5 and 10 kilometres
- 45 per cent travelled between 10 and 30 kilometres (of which 31 per cent travel between 10 and 20 kilometres)
- 13 per cent travelled more than 30 kilometres.

The ABS-VicRoads distance dataset is less well suited to examining distributional issues,[41] but nevertheless produces a very similar picture of the distribution of journey to work travel distances within the Melbourne SD in 2006 (see Figure 7.1). It shows that 22 per cent of workers travelled less than 5 kilometres to work (including those who worked at home), 22 per cent travelled 5 to 10 kilometres, 46 per cent travelled between 10 and 30 kilometres, and 11 per cent travelled more than 30 kilometres. A further source of information is VISTA-07, which indicates that 15 per cent of Melbourne SD residents who did not work from home travelled less than 5 km to work, 20 per cent between 5 and 10 km, 48 per cent between 10 and 30 km and 17 per cent more than 30km (DT 2009d). In comparison to ABS (2006b) and the ABS-VicRoads dataset, the VISTA-07 results attach greater prominence to trips of more than 30km.

41 The estimates underly ng Figure 7.1 are based on average distance between each SLA pa r. ABS-VicRoads data do not provide any information on the distribution of tr p lengths with n any given pa r of SLAs. For example the mean road distance for trips between Banyule–North and Banyule–North was 3 kilometres, but the distr bution of travel distances around that mean is not known. Therefore a drawback of the ABS-VicRoads data for analysis of the distr bution of trip length is potential under-estimation of the mportance of commutes nvolv ng very short or very long distances.

The distribution of commuting distances varies across sectors in the Melbourne SD (see Figure 7.2). For instance, 45 per cent of the workers in the Inner sector commute less than 5 kilometres to reach their place of work. Such high commuter numbers travelling such short distances were not seen in any other sector. Commuting distances of 30 or more kilometres were not generally favoured except in the Outer Western sector. In that sector, more than 30 per cent of workers travelled such long distances in getting to work. In the Inner sector and the Middle subsectors only about 2 to 6 per cent of residents travelled 30 plus kilometres to get to work.

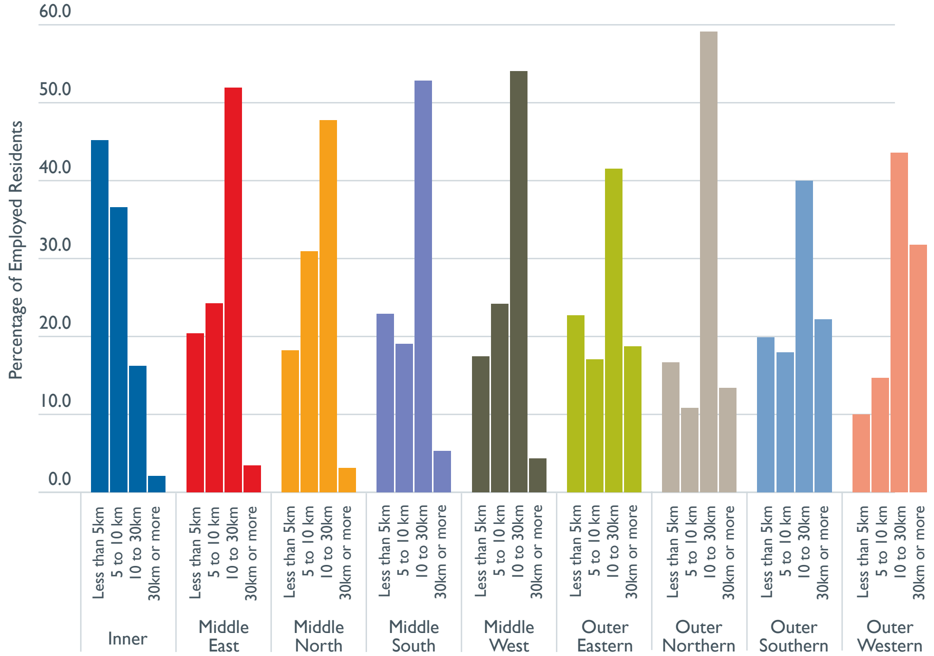
F7.1 Distribution of workers by journey to work travel distance, Melbourne SD, 2006



Note: These est mates are based on average distance between each SLA pair. No nformation was available on the distribution of trip lengths with n any given pa r of SLAs. For example the average road distance for tr ps between Banyule– North and Banyule—North was 3 kilometres, but the distr bution around that mean is not known.

Source: BITRE analysis of ABS-VicRoads road distance data for 2006.

F7.2 Distribution of commuting distances by subsector of residence, 2006



Note: Refer to note for Figure 7.1.
Source: BITRE analysis of ABS-VicRoads road distance data for 2006.

Average commuting distance

Table 7.14 shows the average commuting distance:

- *from* an origin sector to a workplace in *any destination sector* (column 2); and
- *to* a workplace in a destination sector from any origin sector (column 3).

On average, Melbourne SD residents travelled 14.8 km to work in 2006. As shown in the table, the average commuting distances *from an origin SLA* in the Inner and Middle sectors *to a workplace anywhere* within the Melbourne SD were relatively low (7.5 km and 12.5 km respectively) compared to the corresponding figures for the Outer sector or the corresponding figure for the SD as a whole. On the other hand, the average commuting distance to an Inner sector place of work (16.5 km) was higher than the corresponding average distances for the Middle and Outer sectors and the SD as a whole. The averages for the Middle and Outer sectors were 13.7 km and 14.6 km respectively.

Table 7.14 also shows the average distances commuted to get to a workplace in a particular subsector. Generally, the average distance estimates were reasonably similar for the subsectors within each sector. However, on a place of work basis, average commuting distances were somewhat shorter for people who worked in the Middle North subsector. The Middle West subsector had the highest average commuting distance in the Middle sector on both a place of work and place of residence basis. The Outer Western subsector had the highest average commuting distance in the Outer sector and for the SD (22.8 km). This subsector recorded the lowest self-sufficiency rate for the SD (see table 4.1) and amongst the lowest self-containment rates (see table 7.3), with 24 per cent of Outer Western employed residents commuting to the Middle West sector, 22 per cent to the Inner sector and 5 per cent to the Outer North.

T7.14 Average commuting distance for journey to work, by subsector, 2006

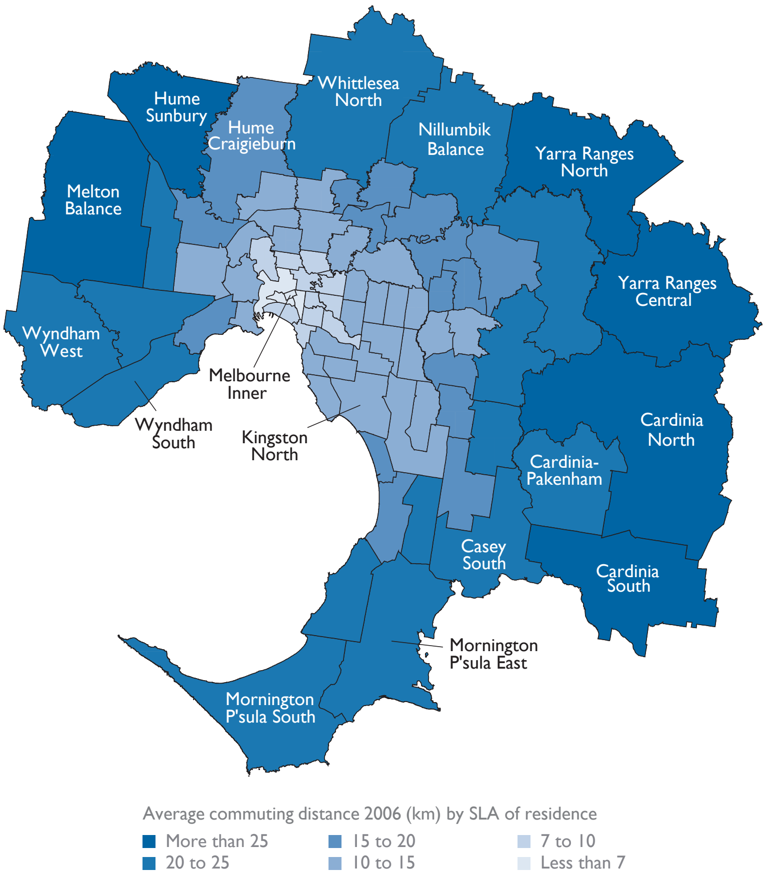
Sector	Average commuting distance for residents of sector (km)	Average commuting distance to a workplace in this sector (km)
Inner	7.5	16.5
Middle	12.5	13.7
Middle East	12.6	13.9
Middle North	11.7	11.9
Middle South	12.4	13.5
Middle West	13.4	15.1
Outer	19.0	14.6
Outer Eastern	17.1	13.0
Outer Northern	18.0	15.4
Outer Southern	19.7	15.1
Outer Western	22.8	15.1
Melbourne Statistical Division	14.8	14.8

Note: Based on 2006 ASGC boundaries.
Source: BITRE analysis of ABS-VicRoads road distance data for 2006.

Map 7.7 highlights spatial differences in the average road distance commuted to work, by SLA of residence. There is a clear pattern with the average commuting distance at its lowest in the central city and tending to rise as distance from the CBD increases. However, the pattern is not symmetric, with the 7 to 10 and 10 to 15 km bands extending further in a south-easterly direction, than in a westerly direction.

As shown in Map 7.7, residents in the SLAs of Melbourne Inner (CBD), Southbank-Docklands and Melbourne Remainder commuted average distances of less than 7 kilometres to get to a workplace. The SLAs that on average required commutes of 7 to 10 kilometres included Yarra North, Port Phillip West, Richmond, Prahran and St Kilda in the Inner sector and some SLAs in the Middle sector. The longest average distance (18 kilometres) commuted to work by residents in the Middle sector was in the SLA of Kingston South. Residents in the Outer Eastern SLA of Yarra Ranges—Central commuted the longest average distance of 30 kilometres to get to a place of work.

M7.7 Average commuting distance by SLA of residence, Melbourne working zone, 2006



Note: SLA boundaries as at 2006 ASGC.

Source: BITRE analysis of ABS-VicRoads road distance data for 2006.

Table 7.15 lists the five SLAs of residence with the highest and lowest average commuting distances. Most of the highest commuting distances relate to SLAs in the Outer sector. The shortest average commuting distances were confined to residents of the Melbourne LGA, who commuted 6.5km to work on average. In particular, Melbourne Inner (CBD) residents commuted an average distance of 4.3 km. The average commuting distance for the SD was 14.8 kilometres, while residents of the Yarra Ranges Central SLA commuted roughly twice that distance on average.

T7.15 Five longest and shortest average distances commuted to work by SLA of residence, 2006

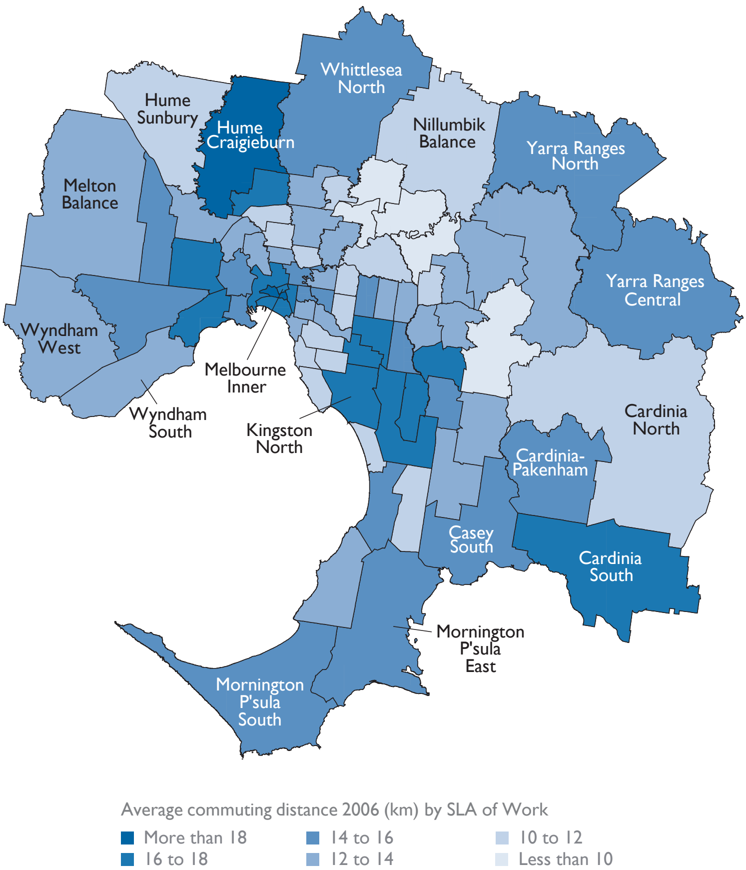
SLA of residence in Melbourne SD	Longest average commuted distance (km)	SLA of residence in Melbourne SD	Shortest average commuted distance (km)
Yarra Ranges–Central	29.1	Me bourne–Inner	4.3
Melton Balance	28.3	Me bourne–Southbank-Docklands	6.7
Card nia–North	27.6	Me bourne–Remainder	6.8
Hume–Sunbury	26.5	Port Phillip–West	7.4
Card nia South	26.1	Yarra–North	7.4

Source: BITRE analysis of ABS-VicRoads road distance data for 2006.

Map 7.8 depicts the average commuting distance for each SLA of work. Unlike in Map 7.7, this map does not show a clear pattern of concentric circles of varying commuting distances radiating out from a strategic point such as the CBD. Instead there are four clusters containing SLAs with higher average commuting distances than their surrounds, located in the Inner sector, the west, the outer north and the south-east.

Table 7.16 lists the SLAs of work with the highest and lowest average distances commuted to work. Most of the highest commuting distances relate to SLAs in the Outer sector, while the lowest commuting distances are a mix of Middle and Outer sector SLAs. The SLA of Hume–Craigieburn, which has a strong transport-logistics orientation, has the longest average commuting distance of 20.7 km. Altona and Greater Dandenong Balance are manufacturing-oriented SLAs to which workers travel a considerable distance, Cardinia South remains agriculturally-oriented, while Property and business services jobs dominate in the Southbank-Docklands SLA. The lowest average distance commuted to work was to the SLA of Manningham East (8 km). There was much less variation in average commuting distance with respect to place of work (range of 8 to 21 km), than was evident on a place of residence basis (range of 4 to 30 km).

M7.8 Average commuting distance by SLA of work, Melbourne working zone, 2006



Note: SLA boundaries as at 2006 ASGC.

Source: BITRE analysis of ABS-VicRoads road distance data for 2006.

T7.16 Five longest and shortest average distances commuted to work by SLA of work, 2006

SLA of work in Melbourne SD	Longest average commuted distance (km)	SLA of work in Me bourne SD	Shortest average commuted distance (km)
Hume–Craigieburn	20.7	Manningham–East	8.1
Me bourne–Southbank-Docklands	18.0	Nillumbik–South	8.9
Hobsons Bay–Altona	18.0	Banyule–North	9.0
Cardinia–South	17.7	Nillumbik–South-West	9.2
Greater Dandenong Balance	17.5	Yarra Ranges–Dandenongs	9.5

Source: BITRE analysis of ABS-VicRoads road distance data for 2006.

Commuting time

Commuting time is defined as the time taken for door-to-door travel and usually includes waiting time and in-vehicle time. The aim of this section is to discuss travel time involved in commuting to work in the Melbourne SD with some emphasis on its spatial variability.

Analysis of information presented in Ironmonger (2006) indicates that in 2006, the average travel time in the Melbourne SD for a work-related trip was 30 minutes. This figure closely corresponds to the VISTA-07 *median* travel time figure of 30 minutes[42] although the VISTA-07 average travel time for commuter trips (one-way) was considerably higher at 36 minutes (see Table 7.17). The average travel distance and travel time information for journey to work trips from VISTA imply an average commuter speed of 31 kilometres per hour for a door to door trip within the Melbourne SD. A community survey undertaken by the Productivity Commission in 2011 similarly reports a median peak hour travel time for Melbourne of 30 minutes (excluding in-between destinations such as daycare, school, shopping or gym), with respondents reporting that 10 minutes could be saved if the journey was not undertaken at peak hour (PC 2011).

VISTA-07 data made available to BITRE by the Victorian Department of Transport shows that in 2007–08, on average, 40 per cent of employed residents in the Melbourne SD commuted to work in under 30 minutes, while a further 21 per cent took 30 to 39 minutes (and most of those provided a response of exactly 30 minutes). However, a significant minority of employed residents had very long commutes, with 17 per cent reporting a journey to work taking one hour or longer.

Table 7.17 shows that Outer sector residents spent the longest average travel time in commuting to work. They spent 38 minutes per trip, compared to 36 minutes by Middle sector residents and 32 minutes by Inner sector residents. Residents of the Outer West had the longest average commute at 42 minutes. The spatial differences in average commuting time are relatively modest on a place of residence basis, with all sectoral estimates lying between 32 and 42 minutes. While Inner sector residents travel much shorter distances to work than Outer sector residents (7.6km vs 19.1km), Outer sector residents have only a 6 minute longer commute than Inner sector residents, on average. This is because residents of the Inner sector have a much lower implied average commuting speed (17 kilometres per hour) than residents of Outer Melbourne (38 kilometres per hour), presumably reflecting the more widespread use of comparatively slow modes such as walking and cycling, as well as the impact of inner city congestion.

42 From VISTA-07 onl ne source at: <www5.transport.vic.gov.au/vista/#view=summaryWorkView>

T7.17 Average commuting time and speed by subsector of residence and subsector of work, 2007–08

Sector	Average commuting time from place of residence in this sector (minutes)	Average commuting time to a place of work in this sector (minutes)	Average commuting speed from place of residence in this sector (kilometres per hour)	Average commuting speed to place of work in this sector (kilometres per hour)
Inner	32	48	17	24
Middle	36	33	26	32
Middle West	36	31	28	36
Middle North	36	30	24	30
Middle East	36	34	26	31
Middle South	37	33	27	31
Outer	38	28	38	39
Outer West	42	31	42	38
Outer North	38	29	35	37
Outer East	37	27	34	34
Outer Southern	37	28	41	42
Melbourne Statistical Division	36	36	31	31

Note: May 2007 to mid-June 2008 survey data expanded to 2006 Census of Population and Hous ng figures (Australian Bureau of Statistics).

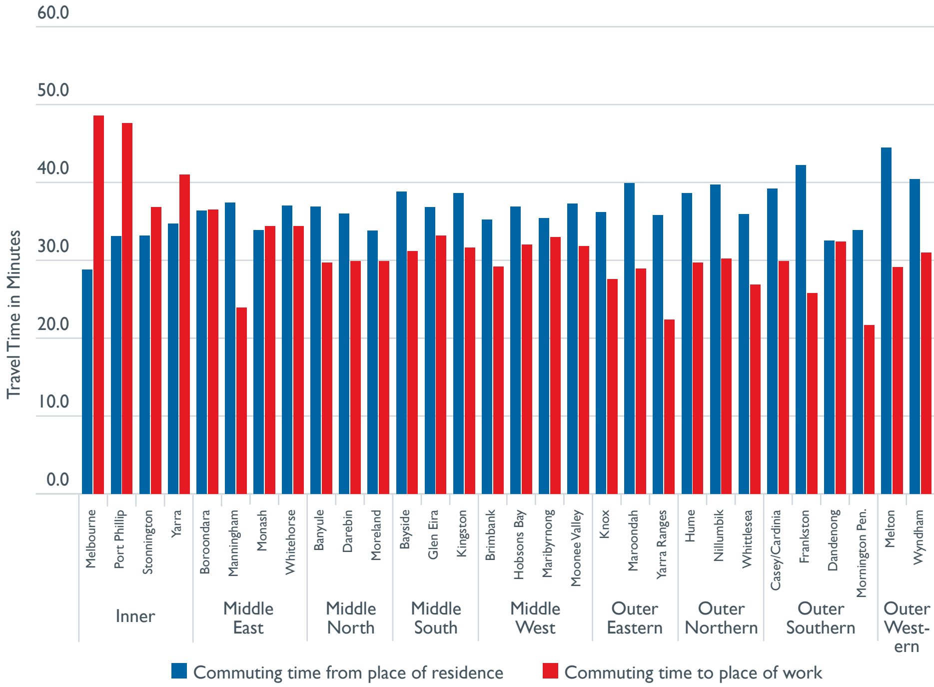
The speeds of commuting reported here should be treated cautiously. The distances used are factored straight line distances and are not the actual travel distances. The travel t mes are se f reported by survey respondents and are normally rounded to 5, 10 and 15 m nute ntervals.

Source: Based on unpublished VISTA-07 data from the Department of Transport, Victoria.

As shown in Table 7.17, Inner sector workers had an average commuting time of 48 minutes, compared to 33 minutes for Middle sector workers and 28 minutes for Outer sector workers. Workers in the Outer East sector had the shortest average commute of 27 minutes. The higher travel times in the Inner sector reflect the longer average commuting distance travelled to jobs in the Inner sector (see Table 7.14) as well as the use of slower modes of transport and the intensity of traffic congestion in the Inner sector. This is reflected in the estimates of average commuting speed, which averages 24 kilometres per hour for journeys to a place of work in the Inner sector compared to 39 kilometres per hour for journeys to a place of work in the Outer sector.

Figure 7.3 presents the average journey to work travel time by LGA based on VISTA-07. The average commuting time estimates are heavily clustered at 25, 30 and 35 minutes, reflecting the clustering of the survey responses of individuals at 5 minute intervals. On a place of residence basis, only City of Melbourne residents have an average commuting time of less than 30 minutes, but employed residents of the Melton, Wyndham and Frankston LGAs each have average commuting times of over 40 minutes. There is greater variation on a place of work basis. Average trip durations are less than 25 minutes for commuters who work in the Manningham, Yarra Ranges and Mornington Peninsula LGAs, while the average duration of a commute to work in the City of Melbourne or Port Phillip LGAs exceeds 45 minutes one-way.

F7.3 Average commuting time from LGA of residence and average commuting time to LGA of work, Melbourne SD, 2007–08

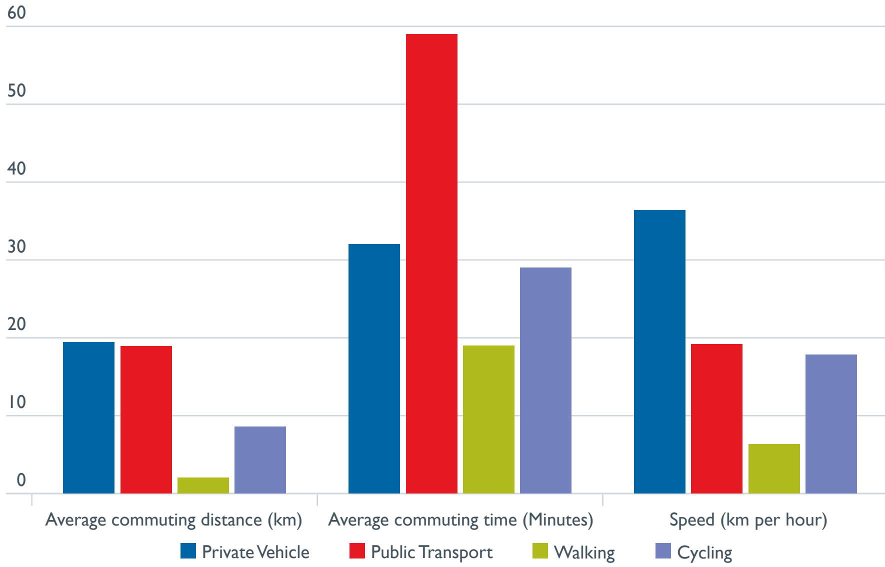


Source: BITRE analysis of VISTA-07 data from DoT 2010.

An alternative source of information is a survey undertaken by the Productivity Commission in 2011, but the estimates of median travel time have only a moderate correlation with the VISTA-07 data. PC (2011) reports that median commuting time is at its lowest for residents of Maroondah (20 minutes), Yarra (23 minutes) and the Mornington Peninsula (23 minutes) and highest for residents of Cardinia (45 minutes) and Wyndham (42 minutes). Those who commute from Wyndham and Whittlesea report that they would save 20 minutes if the journey was not conducted at peak hour, indicating that congestion impacts are particularly pronounced for residents of these LGAs.

The average distance commuted by residents, the average commuting time and the average speed of commuting by mode are given in Figure 7.4. It shows that those who commuted by public transport spent on average 59 minutes per trip in 2006. Owing to the relatively higher speed of commuting by car—compared to that by public transport—those who used private vehicles travelled virtually the same distance as the public transport commuter (i.e. 19 kilometres) in about 32 minutes. Average walking speeds were of course much lower than for the other modes of commuting, while average cycling speeds were only slightly lower than the average speed of public transport commutes.

F7.4 Mean commuting distances, times and speeds by mode, Melbourne SD, 2007–08



Note: The estimated speeds are based on average commut ng distances and times by mode.
Source: BITRE analysis of VISTA-07 data from DoT 2010.

Commuting cost

The commuting costs estimated and discussed in this section are based on the concept of the generalised cost of commuting. The generalised costs in this context refer to a combination of financial costs and time costs from an individual's or a household's perspective. For private motor vehicle, the generalised cost of commuting (henceforth referred to as 'commuting cost') consists of a combination of: (a) travel time costs for commutes undertaken via the quickest route; and (b) the financial costs or the direct money costs such as costs of vehicle ownership, parking and running costs. The commuting cost of using public transport on the other hand comprises: (a) travel time—including time spent in accessing transport stops, waiting to board a public transport vehicle, in-vehicle time and where applicable, transfer time; and (b) the direct money costs such as fares. Irrespective of the travel mode, a more comprehensive estimate of commuting costs to the user should ideally include time and financial costs as well as various indirect costs to the user such as human costs arising from crashes, pollution, noise and aesthetic degradation etc (see VCEC 2006 and Litman 2010).

The aim of this section is to focus mainly on the commuting cost to the individual user or a household. Nevertheless, owing to its importance, this section also briefly notes commuting costs incurred by society as it relates to Melbourne. Congestion imposes large commuting costs to the society. These arise when the free flow of road traffic is impeded. VCEC (2006) notes that congestion could also arise due to reduced comfort and amenity of public transport commuters —especially when the number of persons riding on a tram, a train or a bus exceeds its design capacity. The Department of Infrastructure (DI) Victoria has identified a number of traffic congestion hotspots in Melbourne for 2004 (see Map 9.3), where the traffic volumes exceeded the expected holding capacities. BITRE has previously estimated that congestion costs in Melbourne would double from $3.0 billion in 2005 to $6.5 billion in 2020 (BITRE 2007).

The estimates in Table 7.18 of the total weekly cost per household of commuting by car are based on published empirical findings—mostly those that are specific to Melbourne. The cost estimates relate to the average cost for a working couple household with two children aged under 18, should they choose to commute to work solely by car, which can be compared to the average cost should they choose to commute to work solely by public transport from Table 7.19. The cost estimates are averages across those households who commute to work using the relevant mode—they are not averages across all in-scope households, as presented in Inbakaran and Shin (2010). The data, information and various assumptions underlying the costs in Table 7.18 are summarised below.

- The ***travel time cost*** or the value of travel time refers to the cost of time spent on commuting, including waiting as well as actual travel. It includes costs to consumers of personal (unpaid) time spent on travel, and costs to businesses of paid employee time spent in travel (Litman 2010). Empirical literature shows that travel time cost is one of the largest components of commuting costs, and savings in commuter time are often claimed to be the greatest benefit of transport projects such as roadway and public transit improvements (see for example Litman 2010). The inclusion of travel time costs in the estimation of commuter costs enables a better comparison between the costs of using various transport modes as well as a better understanding of how commuter decisions on modal choice are made (Scheurer et al 2005, Kenworthy and Laube 1999). In this section, the travel time costs have been estimated by taking the average commuting times per week for the Inner, Middle and Outer sectors and converting those to weekly costs by taking the average per capita weekly wage ($804.60[43]) for a 7 hour 30 minute working day. Average commuting times for private vehicle and public transport commutes were sourced from unpublished VISTA-07 data[44] and are presented in Table 7.18.
- The ***money costs*** of commuting encompass both fixed costs and variable costs for car commuters and variable costs to public transport commuters.
    - *Fixed costs:* The annualised cost of car ownership and other associated costs (e.g. depreciation on purchase value of the car, interest foregone, insurance charges, cost of registration and the driving licence fees) are generally termed fixed costs. Once committed, these do not vary per trip, per unit of distance or whether the car is used each day of the week or not. Several factors determine the fixed costs and are largely determined by whether the car is a new car or a used car (i.e. a 'second-hand' car), the make and its engine capacity. Inbakaran and Shin (2010) provided estimates for both new and used cars. Their analysis assumed *Toyota Camry* as a common, medium-sized standard car. Only a proportion of total fixed costs were allocated to commuting, based on the proportion of usage attributable to work travel. Depending on the car ownership rates, the fixed costs for new and second-hand cars varied across the three sectors in the Melbourne SD.

43 Source: ABS 2010b.
44 Unpublished VISTA 07 data made available to BITRE in February 2011 by the Victorian Department of Transport.

- *Variable costs:* As assumed by Inbakaran and Shin (2010), the commuting cost estimates in this section assumed that public transport fares are the only variable money cost involved in commuting by public transport (i.e. by tram, train or bus). On the other hand, commuting by car involves several variable costs. These mainly include car running costs such the cost of fuel, tyres, servicing, repairs and parking. Except for the 'time costs' or the opportunity cost of time spent in commuting to work from home sector to an outside sector, and the parking and fuel costs, the other costs are virtually the same across all sectors in the Melbourne SD. The cost of commuting is sector-specific and is driven by time costs, fuel costs and parking costs. Except for time costs and parking costs, this section uses the variable costs estimated by Inbakaran and Shin (2010). They estimated the average variable cost per employed resident in each of the sectors—irrespective of whether they commuted to work by car or public transport. Their variable costs were converted by BITRE to cost per public transport commuter and per car commuter.

  The parking costs provided by Hopkins (2010) for the Melbourne CBD—validated using parking cost figures in Booz Allen Hamilton (2006) have been assumed as representative of the parking costs of people who work in the Inner sector. The parking costs for other sectors have been estimated using parking fees published by various city councils in the working zone. The fees for the Middle and Outer sectors were obtained from weekly community publications of various cities (e.g. Whitehorse Leader, Mordialloc-Chelsea Leader). The parking fees per hour were converted to a cost per week by assuming that a commuter would park a car for an average period of 8 hours per day for 5 days. Information from chapter 7 on the number of persons commuting by car to a place of work in the home sector and to other sectors was used to estimate cost of parking per household. In 2006, 16 per cent of car commuter residents in the Inner sector commuted to a workplace in the Inner sector and paid $55.00 per week to park the car. Similarly, 60 per cent and 24 per cent of the Inner sector residents who commuted to work by car travelled to workplaces in the Middle and Outer sectors and paid $10.00 and $7.50 per week respectively to park the car. This commuting pattern results in an average parking cost for Inner sector residents who commute to work by car of $17.00 per week per household (assuming parking costs are incurred for only one car per household). Applying a similar estimation approach to car commuters from the Middle and Outer sectors resulted in weekly average parking costs of $11.00 and $9.00 respectively.

T7.18 Total weekly cost per household of commuting by car, by sector, Melbourne SD, 2006 dollars

Cost type	Inner sector	Middle sector	Outer sector
Fixed cost per household			
New standard car	$130	$172	$220
Used standard car	$101	$134	$176
Variable cost per week per household			
New or used car	$46	$44	$73
Total fixed and variable costs per week per household			
New standard car	$176	$216	$293
Used standard car	$147	$178	$248
Other costs per week per household			
Parking cost	$17	$11	$9
Commut ng time for a return tr p based on quickest route (minutes)	406	446	561
T me cost (average weekly wage of $804.62, 450 minutes of work per day)	$145	$160	$201
Total of all commuting costs per week per household			
New standard car	$338	$387	$502
Used standard car	$309	$349	$458

Note: VISTA-07 data obtained by BITRE from the Department of Transport gives average commuting time disaggregated by mode and sector. This data was used for est mating the commuting time by private vehicle by sector.

Fixed and variable costs per household are n Inbakaran and Sh n (2010). Parking cost has been est mated by mult ply ng the parking cost paid by a person per week in each sector by the number of employees commut ng to work by car per household n that sector. Similarly, the t me spent by a household n commuting to work from a place of residence to a place of work and back has been est mated by multiply ng the t me spent by a person n each sector to commute to work by the number of employees commut ng to work per household in that sector (based on Figure 3 of Inbakaran and Sh n 2010).

Sources: BITRE estimates based on Inbakaran and Sh n (2010), Hopk ns (2010) and ABS (2010b)

Table 7.19 provides an estimate of the total weekly cost of commuting to work in the Melbourne SD by public transport. The variable cost of commuting to work by public transport consists of two components: cost per trip chain (i.e. home to work and back) and the time cost. The costs per day by sector shown in the table are from Inbakaran and Shin (2010). Time cost or the opportunity cost of travel was estimated based on unpublished VISTA-07 data from the Victorian Department of Transport. As outlined previously, travel cost or the opportunity cost of commuting by public transport was estimated assuming an average weekly wage of $804.60.

T7.19 Total weekly cost per household of commuting by public transport, by sector, Melbourne SD, 2006 dollars

Cost type	Inner sector	Middle sector	Outer sector
Cost per day for public transport fares across all commuter households	$9.43	$7.08	$3.09
Cost per week for public transport fares across public transport us ng households	$36.27	$42.65	$40.66
Cumulative weekly travel t me (minutes)	588	806	1326
Time cost (average weekly wage of $804.60; 450 m nutes of work per day)	$210	$288	$474
Total cost of commut ng by public transport per week per public transport using household	$247	$331	$515

Note: VISTA-07 data obtained by BITRE from the Department of Transport gives (a) average commuting t me disaggregated by mode and sector. This data was used for estimat ng the commuting time by public transport by sector.

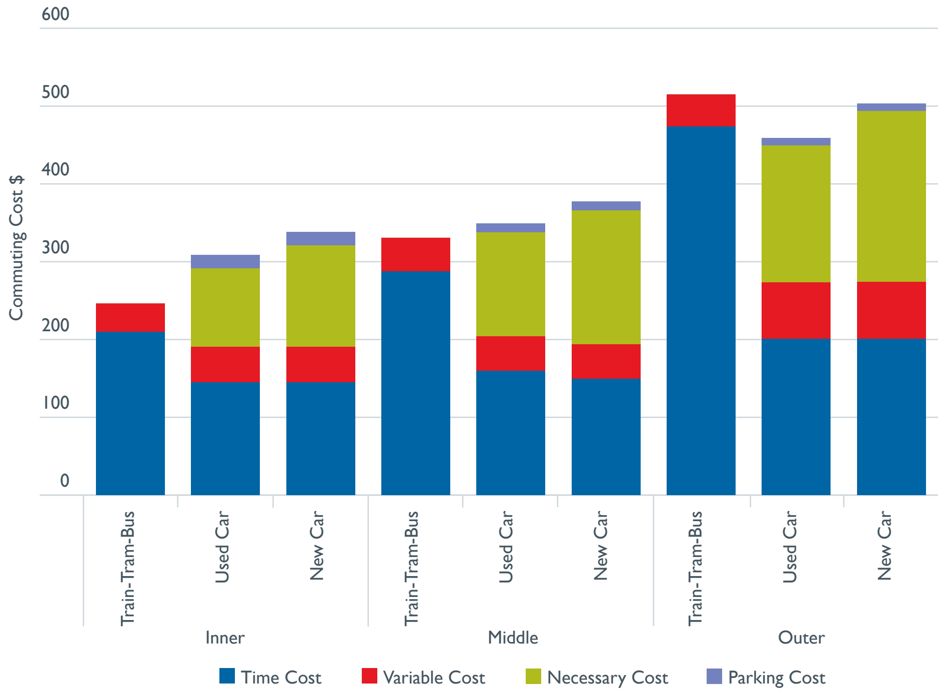
The time spent by a household n commuting to work from a place of residence to a place of work and back has been estimated by mult plying the t me spent by a person in each sector to commute to work by the number of employees commuting to work per household in that sector (from Figure 3 of Inbakaran and Sh n 2010).

Sources: BITRE est mates based on Inbakaran and Sh n (2010) and VISTA-07.

This commuting cost analysis for the Melbourne SD shows that opportunity cost or the time spent in commuting dominated the cost of commuting by public transport in 2006 (see Figure 7.5). The travel time cost for the Outer sector public transport users was over 92 per cent of the total cost. For the Inner and the Middle sectors it was 85 and 87 per cent respectively. For the Outer sector, the opportunity cost of travel by public transport was more than double the opportunity cost of travel by car. If time costs are excluded from commuting costs, the public transport fares would be about 20 per cent the cost of using a car to commute to work.

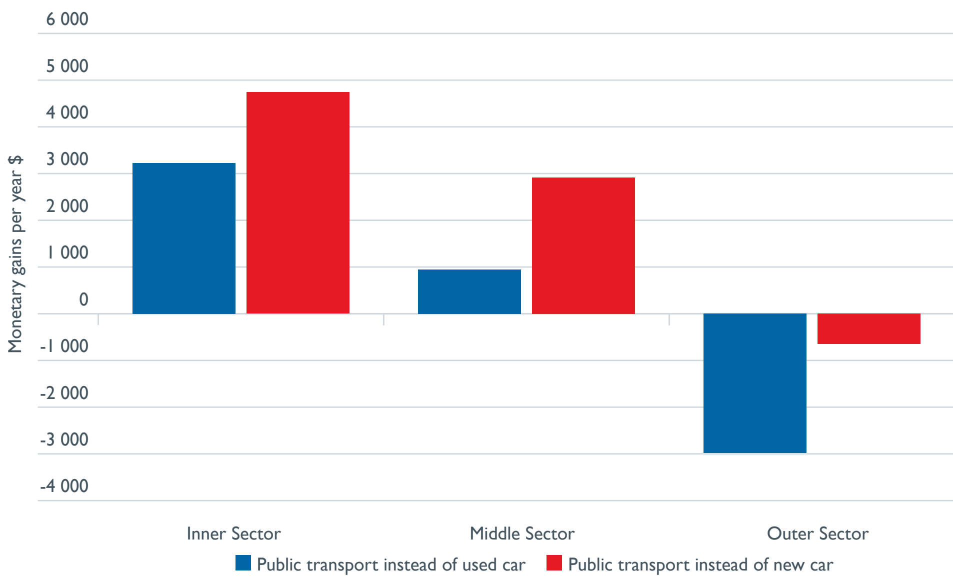
Figure 7.6 shows that except in the Outer sector, there are economic benefits to be made by using public transport instead of a new car or a used car to commute to work. As noted by Litman (2010), the above analysis strongly suggests that the gap in commuting costs between public transport use and car use would significantly narrow if the travel time cost—the largest component of the commuting cost formulation (Litman 2010)—is minimised or ignored. The Victorian Competition and Efficiency Commission (2006:p47) noted that the 'demand for public transport is more responsive to changes in travel time than to changes in fares which is not surprising given that travel time costs are usually the largest component of user costs'. This has implications for *Melbourne 2030* strategy which strives to boost public transport usage to 20 per cent of all motorised travel by 2020.

F7.5 Comparison of various components of commuting costs, by mode and by sector, 2006



Sources: BITRE analysis mainly based on Inbakaran and Shin (2010) and VISTA-07.

F7.6 Comparison of annual monetary gains to public transport users by sector, 2006



Sources: BITRE analysis mainly based on Inbakaran and Shin (2010) and VISTA-07.

Historic change

Commuting patterns have changed over time. To illustrate, in 1951, 31.0 per cent of those that travelled to work in Melbourne lived in the Inner Melbourne SSD, but this dropped dramatically over time to be only 8.6 per cent in 2001 (Moriarty and Mees 2006, p.8). That said, employment in Melbourne is suburbanised with both the Middle and Outer sectors' employment shares being larger than the Inner sector (see table 4.1), which is also a consistent finding from research completed on the 1991 Census (Gipps et al., 1997). Hence, commuting patterns are increasingly dispersed as 'just over half of all workers, lived in one suburban LGA and worked in another, and therefore had to undertake a cross-suburban journey to work each day' (Forster 2006, p.174).

Analysis by AHURI (2002, p.4) on journey to work census data (1986 to 1996) has also revealed that jobs in the middle suburbs are 'shaping residential development in more distant locations. Workers from outer suburbs are likely to have jobs in middle suburban areas; the image of outer suburban workers commuting daily to the Inner Core is not necessarily accurate'. Basically, some mid-suburban regions are functioning as workplaces for their surrounding regions (Healy and O'Connor 2001).

Moreover, the AHURI (2002) study points out the disconnection between the South/Eastern regions of the city and the North/Western regions. This may reflect that by end of the 1970s, freeways on the outskirts of the centre were built but a freeway that connected the network and bypassed the CBD was still to be completed (Muhammad and Low 2006, p.5). This link was completed in 2000 with the construction of City Link.

Yet, as highlighted earlier in Table 7.9 over half of commuting flows occur either within the home SLA or within the same sector. This is a similar commuting pattern from two decades earlier with most people living and working in the same region or travelling to an adjacent region (AHURI 2002).

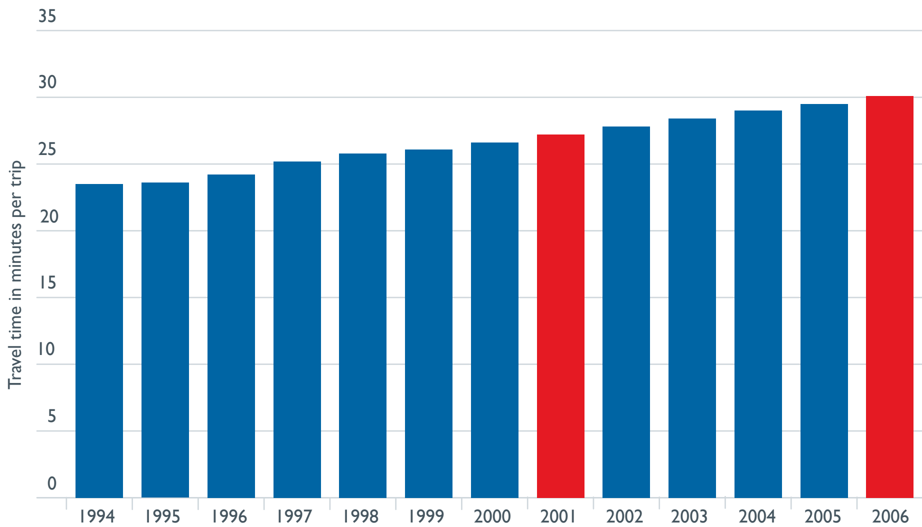
Further analysis by Healy and O'Connor (2001) on intra-regional commuting flows found that this form of commuting was amongst the largest flows that occurred in Melbourne. They note that 'Melbourne's development incorporates suburban areas that are relatively self contained and are significant economic units' (Healy and O'Connor 2001, p.15). For example, self-containment of the core region increased from 43.7 per cent in 1986 to 45.4 per cent in 1996 and the authors go on to suggest that the region is becoming more inward looking. This has continued to be the case. Whilst the Inner sector in this report is slightly smaller than the core region in the Healy and O'Connor (2002) report, the self-containment rate for the Inner sector has risen by 2 percentage points from 2001 to be 68 per cent in 2006 (see Table 7.22).

Another feature that is illustrated by the Healy and O'Connor analysis of self-containment is that the middle regions around the city have some of the lowest self-containments rates, while the outer areas have high rates of self-containment. The analysis of Birrell et al (2005, p.02–16) of self-containment between 1996 and 2001 found that 'the greatest gains in local links (self-containment) are in the more distant outer suburbs', although the authors cautioned that the size of the outer municipalities exaggerates the effect.

Long distance commuters coming into Melbourne are also not a recent phenomenon. Adjacent areas have had strong connections with the metropolitan city, with just over 8800 commuters travelling from Geelong to a place of work in Melbourne in 1996, and a further 7000 commuting from the Macedon Ranges (DSE 2005c). This strong link with regional cities is expected to increase further over time with the *Melbourne 2030* plan adopting the concept of networked cities that build on the links between regional areas and metropolitan Melbourne.

Changes in travel times have also occurred over time. Figure 7.7 shows the average travel time per work related trip in Melbourne for the period from 1994 to 2006. It shows that the commuting time has increased gradually in the 12 year period. This increase on average was roughly half a minute each year. Although the number of vehicles on the road—both passenger and freight—have increased, this gradual increase in commuting times is suggestive of important structural changes in the city as well as changes in travel behaviour as a means of overcoming growing traffic congestion and travel delays.

F7.7 Annual change in time spent in work-related travel in Melbourne, 1994 to 2006



Source: BITRE analysis of published travel t me data for 1994 to 2006 from Ironmonger (2006).

Changes between 2001 and 2006

This section's main focus is on the changes that have occurred to commuting flows between 2001 and 2006. First an analysis of long distance commuters is presented, followed by an investigation into the changes occurring in commuter flows at the sectoral and SLA levels.

Changes in long distance commutes

The long distance commutes into and out of the Melbourne working zone have increased between 2001 and 2006. Tables 7.20 and 7.21 present both the inward and outward major commuting flows for the Melbourne working zone for 2001 and 2006. The overwhelming feature of the major commuting flows is the near identical listing in both tables, illustrating the strong connection Melbourne has with several working zones either based on proximity or economic links with other capital cities.

Another feature was the minimal change in the ordering between 2001 and 2006, reflecting a strong degree of stability in commuting flows. The strong and sustained connection between the inward and outwards flows can be illustrated by the Mitchell–North working zone, as a high proportion of the commuter flows are between two adjacent SLAs; Mitchell–South in the Melbourne working zone and the Mitchell–North working zone.

The largest absolute commuter flows, both into and out of Melbourne remains the Geelong working zone, with over 11 000 people commuting to Melbourne and a further 3325 workers moving in the opposite direction. In terms of change, the number of workers commuting towards Geelong has grown faster than workers commuting to Melbourne by around 560 workers. The growth in commuting in either direction is concentrated in the Melbourne–Inner, Wyndham and Hobson's Bay areas of Melbourne and Geelong (central), Corio, South Barwon and Greater Geelong Part C, which includes the Avalon airport which Jetstar commenced operating from in June 2004.

The largest increase in commuter flows towards Melbourne has occurred from Sydney with 452 extra residents of the Sydney working zone commuting to Melbourne. These commuter flows are dominated by the Inner sector in both periods. Yet, a lot of the increase in commuter flows for the listed working zones has been by Melbourne working zone residents commuting outward, particularly towards the Geelong, Sydney and Latrobe Valley working zones.

T7.20 Main regions of residence for people employed at a fixed work address in Melbourne working zone, 2001 and 2006

Working zone of residents	Number of working zone residents employed in Melbourne working zone 2001	Number of working zone residents employed in Melbourne working zone 2006	Change in number of commuters
Melbourne & surrounds	1 447 421	1 557 222	109 801
Geelong & surrounds	10 921	11 128	207
Ballarat & surrounds	2 363	2 329	–34
Latrobe Valley	1 647	1 880	233
Bendigo & surrounds	1 607	1 847	240
Sydney & surrounds	1 310	1 762	452
Mitchell–North	795	745	–50
Brisbane & surrounds	607	723	116
Bass Coast–Phill p Island	502	681	179
South Gippsland–Central	565	663	98
Adelaide & surrounds	464	599	135
Perth & surrounds	394	486	92

Note: The place of work total is substantially less than the number of employed residents, due to non-response and no fixed work address.

Source: BITRE analysis of ABS Census of Population and Hous ng 2006 and 2001 unpublished data.

T7.21 Main regions of residence for Melbourne residents employed at a fixed work address outside the Melbourne working zone, 2001 and 2006

Working zone of residents	Number of Me bourne working zone residents employed outside of working zone in 2001	Number of Melbourne working zone residents employed outside of working zone in 2006	Change in number of commuters
Melbourne & surrounds	1 447 421	1 557 222	109 801
Geelong & surrounds	2 560	3 325	765
Sydney & surrounds	1 718	2 188	470
Latrobe Valley	1 282	1 726	444
Ballarat & surrounds	1 283	1 341	58
South Gippsland–Central	902	981	79
Bendigo & surrounds	1 234	852	–382
Brisbane & surrounds	356	729	373
Mitchell–North	640	698	58
Canberra & surrounds	285	444	159
Perth & surrounds	218	410	192
Adelaide & surrounds	271	394	123

Note: The place of work total is substantially less than the number of employed residents, due to non-response and no fixed work address.

Source: BITRE analysis of ABS Census of Population and Hous ng 2006 and 2001 unpublished data.

Changes in commuting between and within subsectors

The focus of this section is to provide an analysis of the changing commuting flows that occurred *within* the Melbourne working zone between 2001 and 2006.

Table 7.22 summarises each subsector's degree of employment self-containment and the extent to which employees commute to work from outside each subsector for 2001 and 2006. Melbourne's self-containment has remained stable at 44 per cent but the degree of self-containment has changed at the subsector level. The largest increase in self-containment occurred in the Inner sector by 2 percentage points. Yet, only two other subsectors increased their degree of self-containment. Most subsectors either had a decrease in self-containment or remained stable between 2001 and 2006, with the largest declines occurring in the Peri Urban, Middle North and Middle West subsectors.

The overall proportion of workers commuting to their workplace from a different sector has also remained stable for the Melbourne working zone at 52 per cent, with again some variation occurring at the subsector level. The increase in the Inner sector's self-containment rate is also reflected by a fall in the proportion of people who commute from outside by 2 percentage points. It has, however, remained very high at 77 per cent. The Middle West subsector experienced the largest increase in the proportion of its workers commuting into the subsector from beyond its boundaries, but it still remains lower than the Middle sector's rate of 51 per cent in 2006. The proportion of Peri Urban workers that commute from the rest of Melbourne has remained low at 20 per cent, but more employed residents are working outside the sector.

T7.22 Self-containment and proportion who commute from outside by subsector, Melbourne working zone, 2001 and 2006

Planning subsector	Work in home sector 2001	Self-containment rate 2001 (per cent)	Proportion who commute from outside sector 2001 (per cent)	Work in home sector 2006	Self-containment rate 2006 (per cent)	Proportion who commute from outside sector 2006 (per cent)
Inner	87 852	66	79	100 491	68	77
Middle	292 078	38	50	298 973	37	51
Middle East	104 780	40	52	107 575	39	53
Middle North	49 051	31	53	50 030	29	53
Middle South	69 698	39	50	72 586	38	49
Middle West	68 549	40	46	68 782	38	49
Outer	292 657	46	32	332 084	46	32
Outer Eastern	87 674	47	28	92 265	47	28
Outer Northern	50 028	37	49	55 890	38	48
Outer Southern	135 647	54	23	156 907	55	23
Outer Western	19 308	31	45	27 022	30	44
Peri Urban	29 820	51	20	33 234	49	20
Me bourne Working Zone	702 407	44	52	764 782	44	52

Note: The place of work total is substantially less than the number of employed residents, due to non-response and no fixed work address.

Source: BITRE analysis of ABS Census of Population and Housing 2006 and 2001 unpublished data.

Substantial change has occurred in the number of people commuting within and between subsectors from 2001 to 2006 (Table 7.23). Most of the commuter increases are either from within the subsector (i.e. all diagonally highlighted numbers) or from an adjacent subsector. For example, the largest commuter increase was within the Outer Southern subsector at over 21 000 workers, which also had the largest absolute increase in the number of people working in the subsector at 26 021 workers. This is followed by the Inner sector with over 12 600 extra people who both lived and worked in the Inner sector, and an increase in the number of workers in the area by 23 481 between 2001 and 2006.

The table also highlights commuter flows that have increased by over 1000 workers across subsectors. The Inner and Middle East subsectors had substantial gains in workers from four other subsectors, particularly from the Outer Western subsector to the Inner sector and the Inner sector workers travelling to the Middle East. Other increases in cross subsector flows have occurred between the Middle West and Outer Western subsectors, with an increase of nearly 5 800 commuters from the Outer West to the Middle West, and an increase of about 2 700 commuters in the opposite direction.

Two subsectors have had large declines in commuter flow towards the Inner subsector, namely the Middle East and Outer Eastern subsectors highlighted in red. These were the two subsectors that experienced the most modest growth in employed residents between 2001 and 2006 (see Table 3.10). Although sectoral self-containment has not risen, both of these subsectors have had a substantial increase in the number of residents working within the home subsector and have also had a shift to working in the Outer Southern subsector.

T7.23 Change in subsectoral commuting flows in the Melbourne working zone, 2001 to 2006

Subsector of residence	Subsector of work										Melbourne Working Zone
	Inner	Middle East	Middle North	Middle South	Middle West	Outer Eastern	Outer Northern	Outer Southern	Outer Western	Peri Urban area	
Inner	12 639	1 736	514	907	546	238	180	481	236	11	17 488
Middle East	–1 650	2 795	–47	–222	8	922	57	833	186	2	2 884
Middle North	4 115	1 276	979	142	685	233	346	96	269	–15	8 126
Middle South	1 093	1 428	67	2 888	–73	27	81	1 405	131	–48	6 999
Middle West	1 778	528	–167	–101	233	3	663	151	2 672	–46	5 714
Outer Eastern	–1 369	858	57	–446	–84	4 591	218	1 116	97	–211	4 827
Outer Northern	177	736	339	16	1 550	70	5 862	130	793	236	9 909
Outer Southern	728	1 481	–14	–100	145	1 105	190	21 260	232	276	25 303
Outer Western	5 524	720	481	242	5 782	143	1 767	198	7 714	195	22 766
Peri Urban area	446	148	91	6	64	72	718	351	475	3 414	5 785
Melbourne Working Zone	23 481	11 706	2 300	3 332	8 856	7 404	10 082	26 021	12 805	3 814	109 801

Source: BITRE analysis of ABS Census of Population and Housing 2006 and 2001 unpublished data.

A different way to analyse the commuter change is to consider the changes in the probability of commuting between subsectors. Table 7.24 presents the 2001 to 2006 change in the probability of an employed resident of one subsector commuting to each of the other subsectors.[45] The diagonal elements in Table 7.24 reflect the change in the self-containment rate for the relevant subsector, as previously summarised in Table 7.22. The changes in probabilities range from a high of +2 per cent to a low of –2 per cent, illustrating the fairly stable commuting patterns of Melbourne's employed residents.

Employed residents of the Inner sector had a higher probability of working in the Inner sector in 2006 (compared to 2001), and a lower probability of having an unknown place of work. Employed residents of most of the other subsectors, and particularly the Outer North subsector, had a lower probability of commuting to an Inner sector workplace in 2006 than in 2001.

Another two subsectors with declines of 2 per cent were Middle West and Peri Urban, with residents of these subsectors experiencing a decline in their probability of commuting to a place of work in their home subsector.

45 For example, the probability of an employed resident of the Inner sector working within the Inner sector was 68 per cent for 2006 (see Table 7.5) and 66 per cent for 2001. To calculate the change in probability, simply subtract the 2001 estimate from the 2006 estimate (68 – 66 = 2).

T7.24 Change in probability of employed residents commuting to each subsector of work in the Melbourne working zone, 2001 to 2006

Subsector of residence	Subsector of work										Place of work unknown*	Melbourne Working Zone
	Inner	Middle East	Middle North	Middle South	Middle West	Outer Eastern	Outer Northern	Outer Southern	Outer Western	Peri Urban area		
Inner	2	1	0	0	0	0	0	0	0	0	–4	0
Middle East	–1	0	0	0	0	0	0	0	0	0	2	0
Middle North	0	0	–1	0	0	0	–1	0	0	0	1	0
Middle South	–1	0	0	–1	0	0	0	0	0	0	2	0
Middle West	–1	0	0	0	–2	0	0	0	1	0	2	0
Outer Eastern	–1	0	0	0	0	0	0	0	0	0	2	0
Outer Northern	–2	0	–1	0	0	0	0	0	0	0	2	0
Outer Southern	–1	–1	0	–1	0	0	0	1	0	0	2	0
Outer Western	–1	0	0	0	–1	0	1	0	–1	0	2	0
Peri Urban area	0	0	0	0	–1	0	0	0	0	–2	3	0

Note: * This total ncludes persons who did not respond, have an undefined place of work or no fixed address.

Source: BITRE analysis of ABS Census of Population and Hous ng 2006 and 2001 unpublished data.

Turning towards changes in the top working SLAs for residents living in each of the subsectors shows that very little change has occurred between 2001 and 2006 (see Table 7.6 for the 2006 results). Only four subsectors had changes in the top three working SLAs. These were:

- For Middle South residents, the 3rd and 4th most common SLAs of work swapped positions between 2001 and 2006, with Melbourne–Remainder moving down one spot and Glen Eira–Caulfield up one position.
- In the Outer Northern subsector, Hume–Craigieburn has gone from being the 6th most important place of work for Outer Northern residents in 2001 to the 3rd most important in 2006.
- Outer Southern residents are increasingly commuting to a place of work in the Greater Dandenong Balance SLA (within the Outer Southern subsector), which has improved by one position to third.
- Employed residents of the Outer Western subsector are increasingly commuting to a place of work in the CBD, with Melton Balance dropping out of the top 3 and replaced by the Melbourne–Inner SLA in 2006.

Changes in commuting between and within SLAs

This section analyses the changes in commuting flows between SLAs in the Melbourne working zone from 2001 to 2006.

Summary of different types of flows

Between 2001 and 2006, 109 801 extra commutes were made within the Melbourne working zone from a known place of residence to a known place of work. Table 7.25 summarises the proportion of commuter flows for 2001 and 2006 by category (i.e. inward, outward and residual flows) to consider where changes have occurred.

This table is constructed in exactly the same way as Table 7.9, with 2001 commuter flows now included. Hence, the flows between SLAs have been identified as occurring either within a 'ring' or across rings (whether in an inward or outward direction)[46].

The mix of commuting flows has changed to having a somewhat lower proportion commuting *inward* and a greater proportion of *outward* and *residual* commuting flows.

Inward commuter flows have declined slightly by 0.8 percentage points, with the largest relative decline in inward commuter flows to the rest of the Inner sector, while inward flows to the City of Melbourne also declined in importance. The only relative increase in *inward* commuter flows has occurred from the Peri Urban sector to the Outer sector, particularly from Mitchell South towards two SLAs positioned just south; Hume–Broadmeadows and Hume–Craigieburn.

Outward commuter flows have increased slightly from 8.7 per cent in 2001 to 9.1 per cent in 2006, mainly due to City of Melbourne LGA residents commuting outwards to other sectors. The largest change in flows at the SLA scale is from Southbank-Docklands towards Port Phillip–West, which are adjacent to each other.

Residual commuter flows increased between 2001 and 2006 by 0.4 percentage points. The *residual* commuter flows within the same SLA has remained unchanged but the number of commuters travelling to work in a different SLA located within the home subsector has risen by 0.4 percentage points. The largest change in commuter flows to a different SLA within the home subsector has occurred for:

- Frankston–East towards Frankston–West has risen by 1280 commuters
- Hume–Craigieburn towards Hume–Broadmeadows has risen by 1110 commuters
- Casey–Cranbourne and Casey–Berwick commuting towards Greater Dandenong Balance has risen by 1090 and 930 commuters respectively.

46 For greater nformation on the construction of the classification refer to discussion of Table 7.9.

The Middle and Outer sectors have had contrasting changes with respect to commuting flows to a different subsector within the home sector. In the Middle sector, such flows are declining, while the Outer sector is increasing the number of commuters who commute to a place of work in different Outer subsector. The relative decline for the Middle sector is particularly attributable to commuting declines for Malvern residents (Middle South) commuting towards Monash–South-West (Middle East) and Monash–Waverley East residents (Middle East) commuting towards Kingston–North (Middle South). The largest gains for the Outer sector were from residents of the Melton East SLA in the Outer Western sector commuting towards the Outer Northern subsector SLAs of Hume–Craigieburn and Hume–Broadmeadows at 480 and 370 extra commuters respectively.

T7.25 Summary of change in commuting flows occurring in Melbourne working zone by direction of flow, 2001 and 2006

Commuting d rection	**2001 per cent**	**2006 per cent**
Total for *inward* direction	37.5	36.7
To a place of work in City of Melbourne LGA	18.1	17.8
To a place of work in rest of the Inner sector from Middle, Outer or Peri Urban sectors	7.1	6.6
To a place of work in Middle sector from Outer or Peri Urban sectors	11.7	11.6
To a place of work in Outer sector from Peri Urban sector	0.6	0.7
Total for *outward* d rection	8.7	9.1
From City of Me bourne to a place of work elsewhere	0.6	0.9
From rest of the Inner sector to a place of work n Middle, Outer or Peri Urban sectors	1.8	1.8
From Middle to a place of work n the Outer or Peri Urban sectors	6.2	6.2
From Outer to a place of work n the Peri Urban sector	0.2	0.2
Total for *residual* flows	53.8	54.2
To a place of work with n the home SLA	24.2	24.2
To a place of work in a d fferent SLA n the subsector of residence	21.1	21.5
To a place of work in a d fferent subsector with n the Middle sector	6.5	6.2
To a place of work in a d fferent subsector with n the Outer sector	2.0	2.3
Total for all directions	100.0	100.0

Notes: Commuting flows that operate across rings are classified as either inward or outward. Commuting flows that occurred with n a r ng are classified as residual flows.

Flows to Me bourne Inner from Melbourne Remainder or Southbank-Docklands have been classified as inward flows to a place of work in the City of Melbourne LGA. Flows n the reverse direction have been classified as outward flows.

Source: BITRE analysis of ABS Census of Population and Hous ng 2001 and 2006 unpublished data.

The increase in the complexity of commuting flows is reflected in Figure 7.8, which presents the average annual growth rates of commuting flows by category between 2001 and 2006. The chart illustrates the changing nature of commuting flows from an *Inward* to an *Outward* direction, which is also reflected in the cities of Perth and Sydney. Commutes to a different SLA in the home subsector also had strong relative growth, but commutes from one Outer subsector to another recorded by far the most rapid growth, averaging 3.8 per cent per annum.

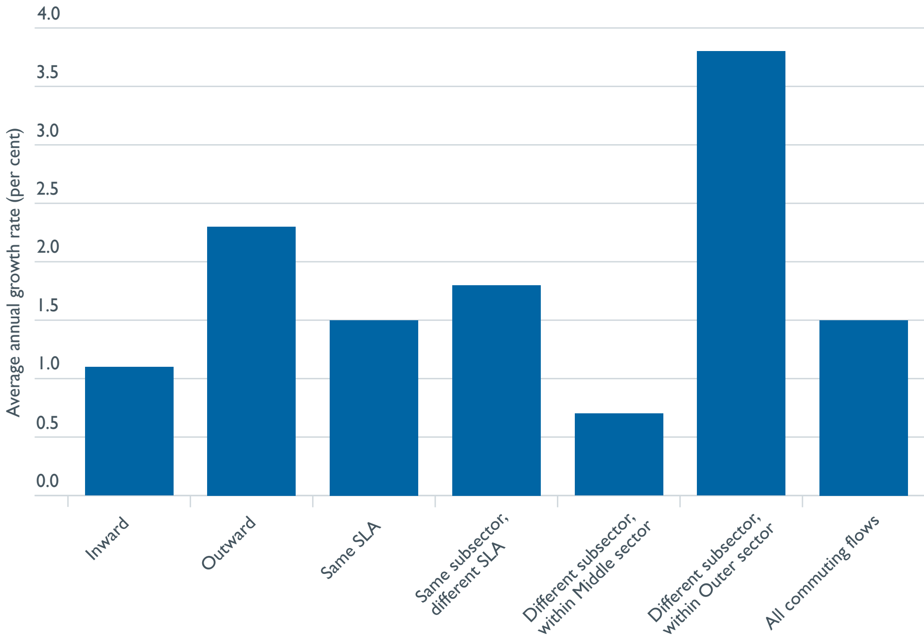
While the focus here is on change, the changes that have occurred between 2001 and 2006 are relatively subtle, and the three most important types of commuter flows continue to dominate—commutes within the home SLA (24 per cent), commutes to a different SLA in the home subsector (22 per cent) and inward commutes to the City of Melbourne LGA (18 per cent). While outward commuting flows are growing strongly, they make a much more modest contribution to total commuter flows (9 per cent).

In terms of the direction of commuting flows an important connection that was introduced to the city's freeway network was the construction of CityLink in 2000. Its construction provided the connection between the North-West and South-East sections of the city, while bypassing the CBD. To consider if the construction of CityLink has raised the level of commuting flows between the North-West and South-East sections—the relevant Middle and Outer sectors have been divided into two categories of North/West and South/East. These two categories show an increase in commutes across the city between 2001 and 2006:

- An increase of 4580 residents in the North/West are commuting to a place of work in the South/East Middle and Outer sectors.
- An increase of 1250 residents in the South/East are commuting to a place of work in the North/West Middle and Outer sectors.

However, these increases are largely explained through population growth rather than shifts in commuting patterns. For example, the probability of commuting from the South/East to the North/West declined slightly. There is no clear cut pattern of workers accessing a workplace based on the connection of the North-West and South-East sections of the city. Some of the largest increases in commuter flows have been towards the SLA of Banyule–Heidelberg (in the Middle North subsector) from Camberwell North or Box Hill (Middle East), and commuting towards Manningham–West (Middle East) from Banyule–North or Banyule–Heidelberg (Middle North). These examples illustrate commutes that occur on the north-eastern side of the city, which is outside the range of the CityLink freeway connection and highlights the increasing complexity and diversity of commuting flows in Melbourne.

F7.8 Growth in different types of commuting flows within the Melbourne working zone, 2001 to 2006



Source: BITRE analysis of ABS Census of Population and Hous ng 2001 and 2006 unpublished data.

Detailed analysis of SLA change

Table 7.26 presents the commuting flows which experienced the greatest change in the number of commuters between 2001 and 2006. Most of the large increases in commuting flows have occurred within the same SLA—i.e. same place of work and residence. SLAs experiencing rapid residential growth are very well represented in the table. For example, the single largest change in the number of commuters related to flows within the home SLA of Casey–Berwick, with an extra 2460 commuters. This large increase did not translate into a substantial change in its self-containment rate. The largest rise in self-containment occurred in the SLA of Melbourne Inner with a percentage point increase of 24 points to have a 44 per cent self-containment rate in 2006. Large increases in self-containment also occurred in the SLAs of Moorabool–Bacchus Marsh and Southbank-Docklands with a rise of 6 percentage points. The largest decline in self-containment occurred in Wyndham South with a fall of 11 percentage points. This fall has been driven by the large increase in the number of workers between 2001 and 2006 because while the self-containment rate fell, the number of commuters within this SLA increased by 470 workers.

In terms of average annual growth, a particularly rapid increase in commuting occurred between Southbank-Docklands and Melbourne Inner, with an increase of 1410 commuters at an average growth rate of 22.8 per cent per annum. This origin-destination pair is also ranked first in the greatest change in the number of people commuting between different SLAs.

A resident SLA that features strongly in the table is Melton–East, which has both high absolute and high average annual growth rates in commuter flows. This reflects the fact that the origin region is on the urban fringe and is experiencing rapid population growth.

That said, some commuting flows have declined between 2001 and 2006. The largest absolute decline occurred within the home SLA of Hume–Broadmeadows—it fell by 780 workers between 2001 and 2006

T7.26 Origin-destination pairs with greatest change in commuting flows, Melbourne working zone, 2001 to 2006

SLA of residence	SLA of work	Change in number of commuters	Average annual growth rate (per cent)
Greatest change			
Casey–Berwick	Casey–Berwick	2 460	6.9
Wyndham–North	Wyndham–North	2 360	5.0
Me bourne –Southbank-Docklands	Melbourne–Inner	1 410	22.8
Hume–Craigieburn	Hume–Craigieburn	1 350	8.6
Frankston–East	Frankston–West	1 280	7.3
Mornington Peninsula–West	Mornington Pen nsula–West	1 270	3.2
Hume–Craigieburn	Hume–Broadmeadows	1 110	5.7
Casey–Cranbourne	Greater Dandenong Balance	1 090	8.5
Me bourne–Inner	Melbourne–Inner	1 070	13.7
Me bourne–Remainder	Melbourne–Rema nder	1 060	4.4
Greatest change for commuting flows between different SLAs			
Me bourne –Southbank-Docklands	Melbourne–Inner	1 410	22.8
Frankston–East	Frankston–West	1 280	7.3
Hume–Craigieburn	Hume–Broadmeadows	1 110	5.7
Casey–Cranbourne	Greater Dandenong Balance	1 090	8.5
Melton–East	Brimbank–Sunshine	970	18.5
Casey–Berwick	Greater Dandenong Balance	930	7.2
Maribyrnong	Melbourne–Inner	930	5.9
Melton–East	Melbourne–Inner	840	17.8
Melton–East	Brimbank–Keilor	840	19.2
Wyndham–South	Melbourne–Inner	810	44.9

Note: Commut ng figures have been rounded to the nearest 10.

Source: BITRE analysis of ABS Census of Population and Housing 2001 and 2006 unpublished data.

Table 7.27 presents the largest increases in terms of the average annual growth rate of commuter flows from 2001 to 2006. A striking feature of the table is the dominance of Wyndham South residents (part of the Outer Western sector) increasing their commuting towards the Inner sector SLAs of Melbourne Inner, Southbank-Docklands, Melbourne Remainder and Port Phillip, and also towards Brimbank–Sunshine in the Middle West. In contrast, declines in the average annual rate of growth in commuter flows are more spatially dispersed around the city, although the declines all relate to the Outer or Peri Urban sectors. For example, the largest decline of 32.4 per cent per annum occurred in commuting between the Peri Urban areas of Moorabool–Bacchus Marsh and Moorabool–Ballan, positioned to the west of the city.

T7.27 Origin-destination pairs with greatest average annual percentage change in commuting flows, Melbourne working zone, 2001 to 2006

SLA of residence	SLA of work	Change in number of commuters	Average annual growth rate (per cent)
Greatest increase			
Wyndham–South	Melbourne–Inner	810	45
Wyndham–South	Melbourne–Southbank-Docklands	250	41
Wyndham–South	Melbourne–Rema nder	610	40
Wyndham–South	Port Phill p–West	290	35
Wyndham–South	Brimbank–Sunshine	240	35
Greatest decline			
Casey–Hallam	Frankston–East	– 30	–14
Yarra Ranges–North and Central	Murrind ndi–West	– 90	–21
Melton Balance	Moorabool–Ballan	– 50	–28
Yarra Ranges–North and Central	Yarra Ranges–Part B	– 90	–30
Moorabool–Bacchus Marsh	Moorabool–Ballan	– 390	–32

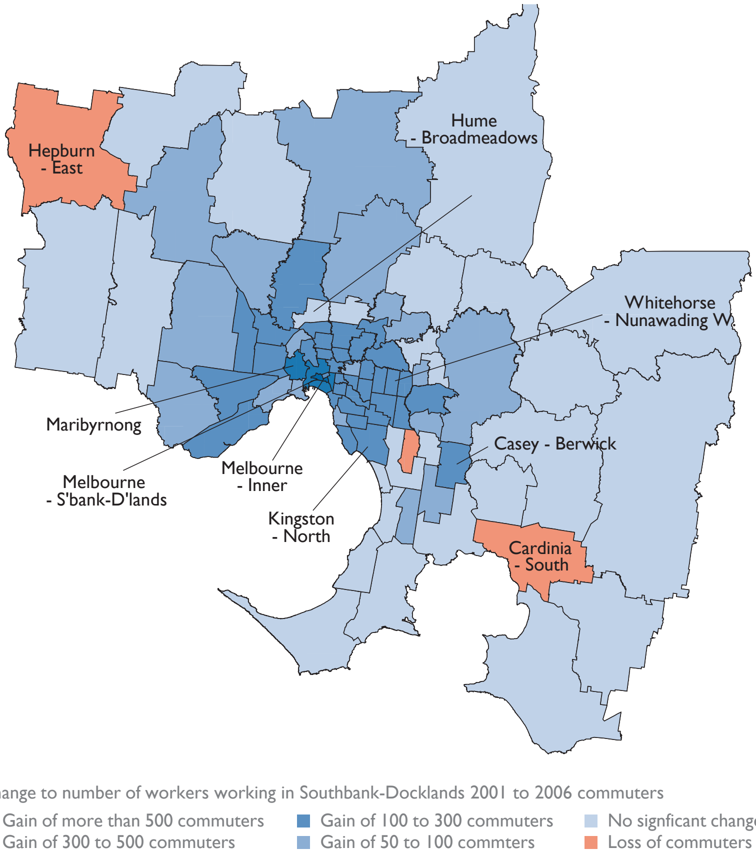
Note: Commuting figure have been rounded to the nearest 10. Table presents only SLA pairs with a m nimum of 50 commuters in 2001.

Source: BITRE analysis of ABS Census of Population and Hous ng 2001 and 2006 unpublished data.

The remainder of this section focuses on changes in commuting patterns for two SLAs that have featured strongly in the analysis of commuting change; these are Southbank-Docklands and Melton–East.

The largest overall increase in the number of commuters between 2001 and 2006 has been towards the Southbank-Docklands SLA, with over 10 000 extra workers. Map 7.9 presents the change (2001 to 2006) in the number of workers that are commuting towards Southbank-Docklands.

M7.9 Changes in commuting flows into Southbank-Docklands SLA between 2001 and 2006



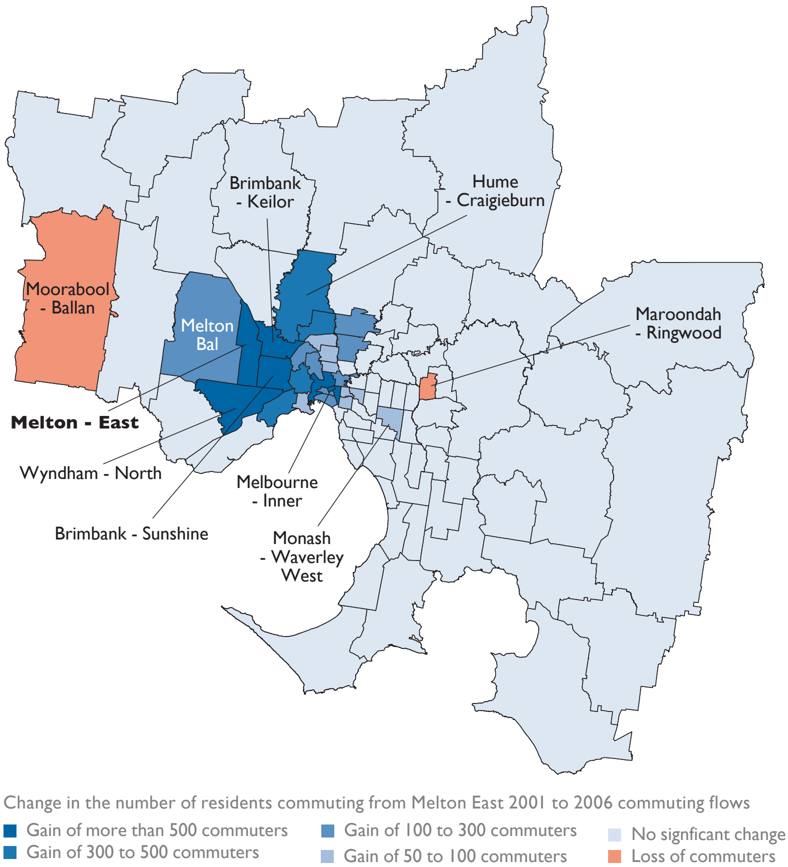
Source: BITRE analysis of ABS Census of Population and Housing 2001 and 2006 unpublished data.

The map illustrates that this Inner SLA is attracting increasing numbers of people from across the working zone, particularly from other Inner SLAs and several Middle sector SLAs. The largest increase has been within the home SLA with an extra 900 commuters, followed by Maribyrnong (390 workers), Melbourne–Remainder (370 workers) and Port Phillip–West (350 workers). Only three SLAs have had very small declines in commuters, with the largest being from Greater Dandenong–Dandenong at a loss of 20 workers.

Melton–East has had high population growth, which is reflected in an increase in the number of employed residents between 2001 and 2006. Map 7.10 presents the change in the number of residents commuting from Melton–East towards other SLAs in the Melbourne working zone, from 2001 to 2006. A feature of the changes in commuter flows is the western concentration of flows. The largest increase in commuters is within the home SLA with a rise of 1000 workers. The next three largest increases also feature amongst Melbourne's largest changes in commuter flows (see Table 7 26)—flows from Melton–East to Brimbank–Sunshine, Melbourne–Inner and Brimbank–Keilor. Only two SLAs declined, with the largest loss of only 6 workers for commuting to Moorabool–Ballan in the Peri Urban sector.

The connection between rapid population growth and commuting changes are explored further in the next chapter on the drivers of change.

M7.10 Changes in commuting flows out of Melton–East SLA between 2001 and 2006



Source: BITRE analysis of ABS Census of Population and Hous ng 2001 and 2006 unpublished data

Changes in the probabilities in commuting flows at the SLA scale suggest a greater degree of change at this more disaggregated geographical scale (see Table 7.28), as compared to the subsector probabilities presented earlier (see Table 7.24). Melbourne–Inner has had a substantial increase in the probability of employed resident's working within the home SLA, with an increase of 23.6 percentage points between 2001 and 2006. In fact, Melbourne–Inner is represented strongly in both categories of place of residence and place of work, reflecting the increase in the number of people living and/or working in the SLA over the period. SLAs within the Peri Urban sector are also represented in the top ten increases in probability, with Moorabool–Bacchus Marsh and Yarra Ranges–Part B raising their probabilities to commute either within the home SLA or to an adjacent SLA.

Large declines in probabilities are also evident for a number of origin-destination combinations. The top ten declines are dominated by commuting flows within SLAs as illustrated by the largest decline in Wyndham–South of 10.8 percentage points, with residents instead increasingly commuting to the CBD. Moreover, this part of the table is dominated by the Peri Urban and Outer sectors, with only Maribyrnong (Middle West) and Nunawading West (Middle East) from another sector.

T7.28 Origin-destination pairs with largest changes in commuting probabilities, Melbourne working zone, 2001 to 2006

SLA of residence	Selected SLA of work	Probability of working in this SLA in 2006 (per cent)	Probability of working in this SLA in 2001 (per cent)	Change in probability of working in this SLA (2001 to 2006)(per cent)
Top ten probability increase in commuting flows between SLAs				
Melbourne–Inner	Melbourne–Inner	44	21	24
Melbourne–Inner	Melbourne–Remainder	11	6	6
Moorabool–Bacchus Marsh	Moorabool–Bacchus Marsh	34	28	6
Melbourne–Southbank-Docklands	Melbourne–Southbank-Docklands	16	10	6
Melbourne–Inner	Melbourne–Southbank-Docklands	6	2	4
Wyndham–South	Melbourne–Inner	11	7	4
Melbourne–Southbank-Docklands	Melbourne–Inner	29	25	4
Yarra Ranges–Part B	Yarra Ranges–South-West	13	10	3
Yarra Ranges–Part B	Yarra Ranges–Part B	14	12	3
Melbourne–Inner	Port Phillip–West	4	2	3
Top ten probability declines in commuting flows between SLAs				
Wyndham–South	Wyndham–South	11	22	–11
Moorabool–Bacchus Marsh	Moorabool–Ballan	1	7	–6
Cardinia–Pakenham	Cardinia–Pakenham	28	33	–5
Cardinia–South	Cardinia–South	35	39	–4
Baw Baw–Part B West	Baw Baw–Part B West	66	69	–4
Whittlesea–North	Whittlesea–North	15	19	–3
Casey–South	Casey–South	20	23	–3
South Gippsland–West	Baw Baw–Part B West	3	6	–3
Maribyrnong	Maribyrnong	19	21	–3
Yarra Ranges–Part B	Whitehorse–Nunawading West	1	4	–2

Note: Excludes commutes within the SLA of residence.

Source: BITRE analysis of ABS Census of Population and Housing 2006 and 2001 unpublished data.

Changes in commuting distances

This section analyses and discusses changes in the spatial patterns of commuting distances in the five year period ending 2006. The ABS-VicRoads data used in the analysis does not contain comparable distance data for the Peri Urban area of the working zone. Therefore the Peri Urban area has been excluded from analysis in this section. Apart from this, the data has certain limitations arising from aggregation which were outlined in the earlier distance discussion relating to the 2006 data.

Estimates of commuting distance for 2001 and 2006 were derived by BITRE from the ABS-VicRoads dataset, using 2001 ABS ASGC boundaries. Average commuting distance for the Melbourne SD is estimated to have remained virtually stable at 14.7km in 2001 and 14.8 kilometres in 2006.[47]

Between 2001 and 2006, the proportion of commutes less than 15 kilometres declined slightly from 62.2 to 61.5 per cent, while there was an equivalent increase in the proportion of commutes between 15 and 30 kilometres from 26.9 to 27.7 per cent, and the proportion of commutes involving a distance of more than 30 kilometres remained unchanged. It is not clear whether this represents a real shift away from short distance commutes or is instead a consequence of differences in the underlying data for the two years, such as the greater spatial disaggregation of travel zones in 2006.

Table 7.29 summarises the change in average commuting distance travelled from each subsector of residence and to each subsector of work. Over the five year period reviewed, all of the observed changes were less than one kilometre. The largest changes were a decline in the average commuting distance travelled by Outer Western residents from 23.6 to 22.8 kilometres and an increase in the average commuting distance travelled by Outer Northern residents and by those who work in the Outer Northern subsector of 0.5 kilometres.

47 Note that the estimates of average road distance for 2006 d ffer marginally depend ng on which set of boundaries the estimate is based (i.e. 14.82 based on 2006 ASGC boundaries versus 14.79 kilometres based on the more aggregated 2001 ASGC boundaries).

T7.29 Change in the average journey-to-work travel distance by subsector of residence and subsector of work, 2001 to 2006

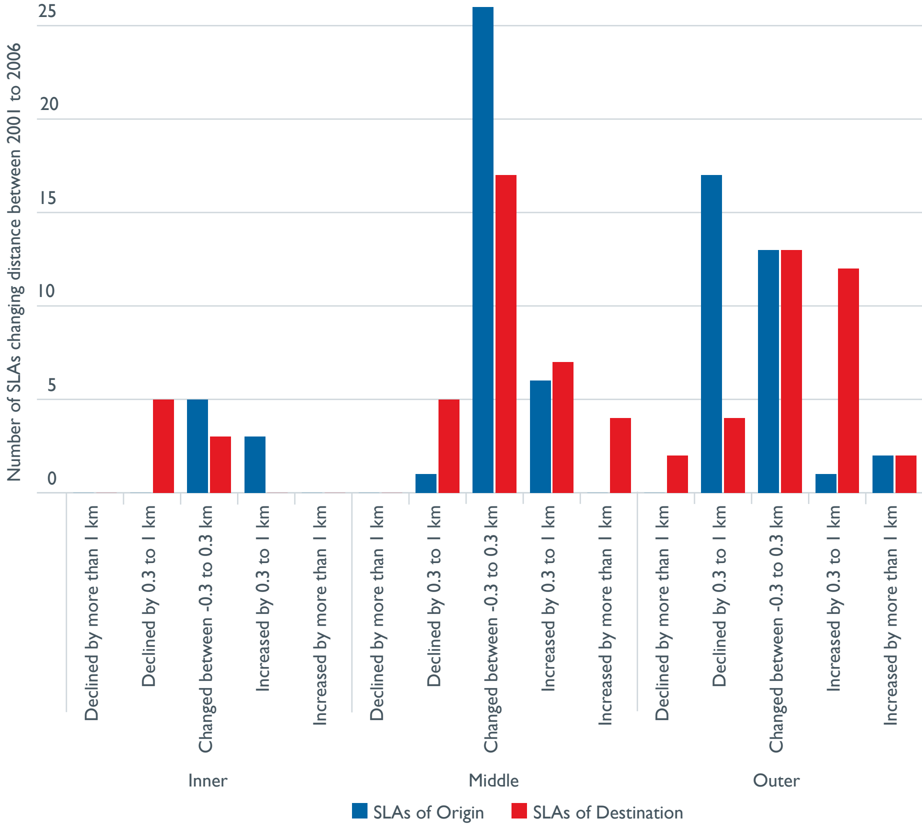
Sector	Average distance from subsector of residence (kilometres)			Average distance to subsector of work (kilometres)		
	2001	2006	Change	2001	2006	Change
Inner	7.5	7.5	0.1	16.8	16.5	–0.3
Middle	12.5	12.5	0.0	13.5	13.7	0.2
Middle East	12.7	12.6	0.0	13.6	13.9	0.4
Middle North	11.5	11.7	0.1	11.9	11.9	0.1
Middle South	12.3	12.4	0.1	13.7	13.5	–0.2
Middle West	13.4	13.4	–0.1	14.7	15.1	0.4
Outer	18.9	19.0	0.1	14.2	14.5	0.3
Outer Eastern	17.1	16.9	–0.2	12.4	12.7	0.3
Outer Northern	17.5	18.0	0.5	15.0	15.5	0.5
Outer Southern	19.9	19.7	–0.1	14.9	15.1	0.2
Outer Western	23.6	22.8	–0.8	14.8	15.1	0.3
Me bourne SD	14.7	14.8	0.1	14.7	14.8	0.1

Note: The 2006 data in this table differ slightly from the data used in Table 7.15 (particularly for the Outer Eastern sector). Table 7.15 was based on 2006 ASGC boundaries while data n this table is based on 2001 boundaries.

Source: BITRE est mates based on ABS-VicRoads data and ABS Census and Housing 2001 and 2006 unpublished data.

Figure 7.9 shows the number of SLAs in each sector that showed changes in commuting distance of different magnitudes. In this period, reductions or increases in an SLA's average commuting distance of more than one kilometre were very rare. None of the Inner sector SLAs experienced a change in average commuting distance of more than 1 kilometre between 2001 and 2006. No SLAs of residence recorded a decline in the average commuting distance of over 1 kilometre. However, residents of Pakenham increased their average commuting distance from 23 to 24 kilometres between 2001 and 2006 and the average commuting distance for Wyndham South rose from 20 to 22 kilometres. On a place of work basis, there were more SLAs experiencing a change of over 1 kilometre. The average distance travelled to a workplace in Moonee Valley West, Moreland North, Cardinia South, Waverley East and Sunshine increased by between 1 and 2 kilometres, while for Wyndham West workers the average commuting distance rose by 3 kilometres. Declines of more than 1 kilometre were recorded for workers in Wyndham South and Craigieburn.

F7.9 Number of SLAs showing changes in the commuted distance by sector, 2001 to 2006



Source: BITRE estimates based on ABS-VicRoads data and ABS Census and Housing 2001 and 2006 unpublished data.

Changes in commuting times and costs

Changes to commuting times and costs outlined here are based on data and information elicited from various published sources. The dearth of time-series information has prevented a comprehensive analysis of changes in the time and cost aspects of commuting in Melbourne.

BITRE analysis of data from Ironmonger (2006) suggests that the average commuting time in Melbourne has increased from 27.2 minutes for a one way trip in 2001 to about 30.1 minutes in 2006. This is an increase of about 3.0 minutes.

The *Household Income and Labour Dynamics in Australia* (HILDA) survey (2006) indicates that the average time spent travelling by full-time workers to and from work per week remained relatively stable for Melbourne, at 5.1 hours in 2002 and 5.2 hours in 2006 (Melbourne Institute 2009). This corresponds to an average rise of just 36 seconds in the duration of the average trip to or from work.

Thus, while both data sources point to an increase in average commuting times in Melbourne, Ironmonger (2006) points to a larger magnitude change than the Melbourne Institute (2009).

Table 7.30 shows that peak period traffic delays, measured in minutes per kilometre, were greater in 2006 than in 2001. Travel speeds were lower in both the morning and afternoon peak. While this data relates only to road travel, it is consistent with the upward movement in average commuting times discussed above.

It is most likely that the 2006 commuting costs estimated in a preceding section of this chapter reflect higher variable costs than in 2001—this is particularly likely for private vehicle commuting costs, due to the 55 per cent rise in automotive fuel prices between the September quarters of 2001 and 2006 (ABS 2009h). Lagura et al (2011) present evidence that weekly public transport fares did not increase as a proportion of income between 1996 and 2006 in Melbourne. Nevertheless, increases in commuting times, average wages and other variable and fixed costs are also likely to have increased the overall cost of commuting between 2001 and 2006.

T7.30 Key indicators of road travel performance in Melbourne, 2000–01 to 2008–09

Performance indicator	Measure-ment unit	2000–01	2001–02	2002–03	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09
Traffic delay: am peak	min/km	0.69	0.74	0.73	0.70	0.76	0.78	0.82	0.83	0.84
Traffic delay: pm peak	min/km	0.56	0.63	0.59	0.61	0.66	0.66	0.69	0.71	0.72
Variability of travel t me: am peak	per cent	19.6	24.0	21.2	20.8	25.3	19.9	18.9	20.4	19.7
Variability of travel t me: pm peak	per cent	18.4	19.1	17.3	18.8	17.7	18.6	17.6	18.4	18.1
Actual travel speed: am peak	km/hour	37.9	36.7	36.8	37.4	36.2	35.8	35.0	34.8	34.7
Actual travel speed: pm peak	km/hour	41.2	39.3	40.3	39.8	38.5	38.6	38.0	37.4	37.2

Source: AustRoads National Performance Indicators

Recent changes, 2006 to 2010

There is relatively little information available about how spatial commuting patterns in Melbourne have changed since 2006, and it is only once the 2011 census is released that a clear picture will emerge.

An important source of information on recent changes in commuting within Melbourne is the Victorian Government's VISTA survey, first undertaken between May 2007 and June 2008 (VISTA-07), and then repeated between July 2009 and July 2010 (VISTA-09). The average commuting time of Melbourne residents was stable at 36 minutes in both VISTA-07 and VISTA-09. A change in the way distance was calculated across the two surveys means it is not possible to identify changes in average commuting distance using VISTA. However, ABS collected information on the distance travelled to the usual place of work or study in both 2006 and 2009 (ABS 2006b, 2009f), which indicates that the proportion who travelled 30 kilometres or more increased from 13 per cent in 2006 to 17 per cent in 2009 for the Melbourne SD. As these surveys also revealed a slight decline in the relative importance of short distance commutes (of less than 5 kilometres), this is suggestive of an increase in average commuting distances in Melbourne since 2006.

Table 7.30 and the analysis undertaken by Loader (2010) provide insight into selected aspects of recent change, drawing heavily on the statistics published in the *Traffic Systems Performance Monitoring Bulletin* by VicRoads and AustRoads (2010).

Loader (2010) points out that road traffic volumes in Inner Melbourne have been trending downwards from 2004, and continued to decline between 2005–06 and 2008–09. This trend decline in inner city traffic volumes is associated with the rapid increase in public transport patronage in Melbourne over the same period (ibid).

The *AustRoads National Performance Indicators* (AustRoads 2010) show that the average travel speed on Melbourne's monitored road network has dropped from 35.8 km/hour in the morning peak in 2005–06 to 34.7 km/hour in 2008–09. In the evening peak it has dropped from 38.6 to 37.2 km/hour in 2008–09. This gradual slowing trend is also evident in other large cities (Loader 2010). The AustRoads congestion indicators have both risen by 0.06 minutes per kilometre for Melbourne between 2005–06 and 2008–09, pointing to continued growth in congestion costs. While traffic volumes on Outer Suburban freeways increased markedly following the opening of Eastlink in 2008, this had little discernible effect on the aggregate travel speed and traffic delay figures for Melbourne (VicRoads 2010b). There was no clear trend in the variability of peak period travel times in Melbourne since 2005–06.

Commuting in the strategic plan

Melbourne 2030 did not specifically articulate goals relating to commuting patterns, commuting time or the distance travelled to work. However, *Melbourne @ 5 million* noted that 'government planning and policy should seek to reduce these commuting times as much as possible' (DPCD 2008c, p.7). It proposes a polycentric urban structure and 'a better distribution of jobs and activity, so that Melburnians can work closer to where they live', arguing that this 'will reduce congestion and enable people to spend less time commuting to and from work and more time with their family' (ibid, p.9).

Thus *Melbourne @ 5 million* aims to reduce commuting times, move jobs closer to home, and (implicitly) reduce commuting distances. The evidence presented in this chapter points to the following changes having occurred in Melbourne since 2001:

- *Have commuting times declined?* Melbourne Institute (2009) and BITRE's analysis of Ironmonger (2006) both identify an increase in average commuting times between 2001/2002 and 2006. According to the VISTA survey, average commuting times remained unchanged between 2007–08 and 2009–10.
- *Have commuting distances declined?* Based on ABS-VicRoads data, BITRE estimates that the average road distance of commutes within the Melbourne SD remained essentially unchanged at 14.7 kilometres in 2001 and 14.8 kilometres in 2006. Average commuting distances remained relatively stable across all subsectors—the largest change was for Outer Western residents, where jobs were 0.8 kilometres closer to home in 2006, compared to 2001. The proportion of people who travelled over 30 kilometres to work or study increased from 13 per cent in 2006 to 17 per cent in 2009, while the proportion travelling less than 5 kilometres declined (ABS 2006b, 2009f), which suggests average commuting distances may have risen in Melbourne since 2006.
- *Are jobs becoming closer to home?* The distance analysis suggests that jobs in Melbourne were located a similar average distance from home in both 2001 and 2006. Table 7.22 suggests that self-containment has risen in the Inner sector, but declined in other parts of Melbourne. The overall self-containment rate for Melbourne remained unchanged from 2001 to 2006 (whether calculated at the SLA or subsectoral scale), supporting the distance-based conclusion of minimal change for Melbourne as a whole.

Overall, the evidence points to some increases in commuting times up until 2006, brought about by reduced speeds rather than greater commuting distances. Average commuting times have remained unchanged since 2006, although a growing minority of Melbourne residents are travelling long distances to work or study.

Summary

This chapter has provided a detailed picture of spatial commuting flows in Melbourne in 2006 and has explored how average commuting distances and times vary across different parts of the city. While the overall structure of commuting flows remained quite stable in Melbourne between 2001 and 2006, a number of changes were identified, such as the rapid growth in commuting flows from one Outer subsector to another and the rise in average commuting times.

CHAPTER 8
Some drivers of these changes

Key points

- Residents of areas experiencing rapid population growth predominantly find work within the home area or neighbouring areas.
- Areas experiencing rapid jobs growth largely draw their additional workers from amongst local residents. Areas in which jobs growth is being driven by the Retail or Construction industries tend to draw their additional workers from a relatively narrow range of locations.
- Spatial patterns of residential and jobs growth reflect the accumulated effect of thousands of decisions by individuals and families about where they wish to live and work. Roughly 20 per cent of decisions to move house or job location were specifically undertaken with the aim of improving access between home and work, with the majority moving for reasons unrelated to commuting. In turn, these decisions that people make about moving house and job location are subsequently reflected in changed commuting behaviour (e.g. distance travelled, mode usage).
- A simple gravity model of commuter flows can explain between 70 and 75 per cent of all variation in origin-destination flows in Melbourne.
- The amount of people commuting between an origin-destination pair tends to increase with the number of employed residents of the origin SLA and the number of jobs in the destination SLA, but declines as the road distance between the two SLAs widens. Distance is less of an impediment to travel for origin-destination pairs that have a direct rail connection. Similarly, distance is less of an impediment for pairs that can be travelled between without leaving Melbourne's freeway network, although a freeway connection has less influence than a rail connection.
- The greater the alignment between the skills available in the origin SLA and the skills demanded in the destination SLA, the greater the predicted commuting flows between those two locations.
- Road distance was a greater impediment to travel in 2006 than in 2001, reflecting the 55 per cent increase in automotive fuel prices over the period.
- Distance was more of an impediment to travel in Melbourne and Sydney than in Perth, reflecting the greater density and congestion of the two larger cities.
- Growth in employed residents and jobs played a very important role in explaining *changes* in commuting flows in Melbourne between 2001 and 2006. These factors alone explain more than two-thirds of the variation in commuting growth rates for origin-destination pairs with non-trivial commuter flows.

- More distant origin-destination pairs and origin-destination pairs that had a high degree of skills mismatch tended to experience lower *growth* in commuting flows between 2001 and 2006.
- There is evidence the two very large scale road infrastructure projects that were completed just prior to 2001—the Western Ring Road and CityLink—significantly improved the connectivity of Melbourne's road network and influenced spatial growth patterns. However, regression analysis does not support the proposition that expansions of Melbourne's road and public transport networks between 2001 and 2006 have significantly altered spatial commuting patterns.

Context

This chapter explores how the recent changes in commuting behaviour relate to the observed spatial patterns of residential and jobs growth within Melbourne. The role of other potential drivers of commuting flows, such as distance, transport infrastructure and skills are also investigated. The chapter commences with a descriptive analysis of the relationships between changes in commuter flows and these potential drivers. In the second part of the chapter, gravity models are used to explain variation in origin-destination commuter flows within Melbourne, and the drivers of recent change in these commuter flows.

Residential and jobs growth

It is expected that the change in the number of people commuting between an origin location and a destination location will be related to the growth that is occurring in those two locations. At the origin location, growth in the number of employed residents is the primary variable of interest—it will be influenced by population growth, as well as changes in age structure, labour force participation and unemployment rates. At the destination location, growth in the number of available jobs is the relevant measure.

Within the Melbourne working zone, there were 8281 possible origin-destination combinations based on 2006 ASGC boundaries (i.e. 91 X 91, where 91 is the number of SLAs). However, some boundary changes occurred in Melbourne between 2001 and 2006. BITRE has constructed a dataset measuring the change in commuter flows that is based on 2001 ASGC SLA boundaries to ensure maximum comparability of the 2001 and 2006 data[48]. The dataset contains 7396 origin-destination pairs (86 X 86). Correlation analysis of this dataset shows that the change from 2001 to 2006 in the number of persons commuting between any two SLAs was:

- Significantly positively associated with the change in the number of employed residents in the origin SLA (correlation = 0.25)
- Significantly positively associated with the change in the number of jobs in the destination SLA (correlation = 0.24).

48 A single modification was made to the use of 2001 SLA boundaries to ensure comparability of 2001 and 2006 data—this nvolved aggregating the Yarra Ranges North and Yarra Central SLAs into a single spatial unit.

These correlations mean that strong growth in the origin and destination SLAs tends to translate into strong growth in commuting flows between the two locations. The correlations are of roughly equal magnitude and are not overly strong, suggesting other factors may also play an important role in driving growth in commuter flows.

This relationship is explored further below by investigating the changes in commuting behaviour that occurred in those SLAs that experienced the most substantial growth or decline in employed residents and jobs between 2001 and 2006.

Residential growth and decline

There were only two SLAs that experienced a substantial decline in employed residents between 2001 and 2006:

- Broadmeadows lost about 1800 employed residents between 2001 and 2006, and the main effect on commuting flows was that 800 fewer Broadmeadows residents commuted to a place of work within the Broadmeadows SLA.
- Waverley East lost about 1400 employed residents between 2001 and 2006, and the main effect on commuting flows was the 500 fewer Waverley East residents who commuted to a place of work in Waverley West.

Table 8.1 focuses on the SLAs that experienced the most rapid residential growth between 2001 and 2006. The table contains two Inner sector SLAs (Southbank-Docklands, Melbourne Inner) and a Peri Urban SLA (Mitchell South), but is dominated by outer suburban growth SLAs.

The rapid residential growth in Wyndham South, Southbank-Docklands and Melbourne Inner is primarily generating increased commuting flows to the CBD. The rapid residential growth in Melton East, Pakenham, Craigieburn, Berwick and Mitchell South is primarily generating increased commuting flows within the home SLA. For two of the rapid residential growth SLAs—Whittlesea North and Cranbourne—it is a directly adjoining SLA, rather than the home SLA or the CBD, which is receiving the largest increase in commuters.

The home SLA typically features as one of the top two destinations in Table 8.1, but Wyndham South is an exception, reflecting the limited jobs base and the residential orientation of this SLA. Instead, the additional residents of Wyndham South are increasingly commuting to the City of Melbourne LGA over 25 kilometres away and to the much closer Wyndham North SLA, home to the West Industrial Node.

The Melton East and Berwick SLAs experienced the largest increase in the number of employed residents between 2001 and 2006, and consequently provided more than 300 additional workers to numerous SLAs. Amongst Melton East residents, there was substantial growth in commuting flows within the home SLA and to the adjoining SLAs of Sunshine, Keilor and Wyndham North, as well as to more distant locations such as Melbourne Inner, Melbourne Remainder and Broadmeadows. Amongst Berwick residents, along with the substantial growth in commuting flows within the home SLA, there was substantial growth in commuting to the City of Greater Dandenong, which is about 15 kilometres away by road and does not immediately adjoin the Berwick SLA. Berwick residents increasingly commuted to the neighbouring SLAs of Hallam, Cranbourne and Pakenham, but also to locations such as Melbourne Inner, almost 50 kilometres away.

T8.1 Areas in which residents of rapid residential growth SLAs are increasingly finding work, Melbourne working zone, 2001 to 2006

SLAs with most rapid growth in employed residents	Average annual growth (per cent)	Change in number of employed residents	More than 300 additional residents commuted to a place of work in the following SLAs (in descending order of importance)
Wyndham South	33	6 400	Melbourne Inner, Wyndham North, Me bourne Remainder, Wyndham South, Altona, Maribyrnong
Southbank-Docklands	26	5 300	Melbourne Inner, Southbank-Docklands, Me bourne Remainder, Port Phill p West
Melton East	19	10 900	Melton East, Sunsh ne, Melbourne Inner, Keilor, Melbourne Rema nder, Wyndham North, Broadmeadows, Mar byrnong, Altona, Craigieburn
Me bourne Inner	16	2 600	Melbourne Inner
Whittlesea North*	13	5 200	Whittlesea South, Whittlesea North, Preston, Broadmeadows
Pakenham	10	5 100	Pakenham, Berwick, Greater Dandenong Balance
Craigieburn	6	6 500	Craigieburn, Broadmeadows, Whittlesea South
Berwick	6	10 700	Berwick, Greater Dandenong Balance, Dandenong, Hallam, Cranbourne, Pakenham, Me bourne Inner, Waverley East
Mitchell South	5	2 100	Mitchell South
Cranbourne	5	6 500	Greater Dandenong Balance, Cranbourne, Berwick, Dandenong, Frankston West, K ngston North

Note: * Results may be nfluenced by boundary change between 2001 and 2006.

Source: BITRE analysis of ABS 2001 and 2006 Census of Population and Housing commut ng flows matrix.

Typically, the residents of areas experiencing rapid residential growth are finding work within the home SLA or neighbouring SLAs. It is less common for SLAs experiencing rapid residential growth to form an important source of additional workers for more distant SLAs. However, there were three residential growth SLAs which were an important source of workers for more distant SLAs:

- Berwick provided more than 300 additional workers to Melbourne Inner and Waverley East between 2001 and 2006
- Melton East and Wyndham South both provided more than 300 additional workers to Melbourne Inner and to Melbourne Remainder.

Some of the major outer suburban employment hubs—such as Greater Dandenong Balance, Dandenong, Broadmeadows and Wyndham North—received more than 300 additional commuters from several nearby residential growth SLA.

From the results in Table 8.1, it is not clear if residents of growth areas had to increasingly look further afield to find work. Of the areas experiencing strong residential growth listed in Table 8.1, only Wyndham South experienced a large change in the average road distance travelled to work, increasing from 19.8 to 22.1 kilometres from 2001 to 2006, because residents of this growth SLA were increasingly looking further afield (and particularly to the City of Melbourne) to find work. The average commuting distance also increased for Southbank-Docklands (rising from 6.0 to 6.6 kilometres) and for Pakenham (from 22.7 to 23.8 kilometres), but decreased by between 0 5 and 0.7km for Cranbourne, Wyndham West and Wyndham North. Other SLAs in Table 8.1 experienced a change of less than 0.5 kilometres in average commuting distance between 2001 and 2006.

Thus, the increased commuting flows generated by residential growth areas tend to be concentrated within the home SLA and its immediate neighbours. There was no systematic tendency for average commuting distances to either rise or fall in growth areas between 2001 and 2006.

Jobs growth and decline

Table 8.2 shifts the focus to the places which experienced the most rapid jobs growth between 2001 and 2006. It identifies the principal industry drivers of jobs growth in each SLA and the locations from which the strong jobs growth SLAs drew their additional workers from. Nine of the twelve rapid jobs growth SLAs belong to the Outer sector, 2 to the Middle sector and 1 to each of the Inner and Peri Urban sectors.

A notable difference between Tables 8.1 and 8.2 is that the rapid jobs growth SLAs listed in Table 8.2 typically draw more than 300 additional workers from just a few origin SLAs (and sometimes from just one SLA or none), whereas the rapid residential growth SLAs listed in Table 8.1 commonly supplied more than 300 additional workers to four or more place of work SLAs.

Table 8.2 shows that the rapid jobs growth SLAs principally drew their additional workers from within the SLA's own boundaries. In many cases the home SLA was the only SLA which increased commuter flows by more than 300 persons. This reflects the limited jobs base of SLAs such as Melton East, Wyndham South and Bacchus Marsh, as areas with a limited jobs base tend to have below-average capacity to attract workers from further afield.

For the jobs growth SLAs which drew 300 or more workers from multiple SLAs of origin, the additional SLAs of origin were typically direct neighbours. This is illustrated by the results for the three adjoining SLAs of Berwick, Pakenham and Cranbourne. The jobs growth SLAs of Southbank-Docklands and Wyndham North have comparatively large geographic catchments, but in both cases the SLAs of origin that recorded increased flows were tightly clustered around the jobs growth SLA.

Waverley East was a notable exception to this general pattern. It was the only jobs growth SLA for which additional workers were not primarily drawn from within the SLA's own boundaries. For Waverley East, there was a large increase in commuting from the residential growth SLA of Berwick, more than 20 kilometres away. The residential growth SLA of Berwick shows up repeatedly in Table 8.2 as supplying increased flows of workers to several jobs growth SLAs (including itself).

The jobs growth SLA of Craigieburn, which includes Melbourne Airport, is also of interest. Additional workers were primarily drawn from within the SLA's own boundaries, but also from the Whittlesea South and Melton East SLAs, which are not amongst the Craigieburn SLA's closest neighbours.

For most of the jobs growth SLAs in Table 8.2, the employment growth is being driven by the Retail or Construction industries. The jobs growth SLAs which have a different industry driving jobs growth (such as Manufacturing, Transport and storage, or Finance and insurance) are the SLAs that tend to be drawing workers from a wider range of locations.

T8.2 Areas which rapid jobs growth SLAs are drawing their additional workers from, Melbourne working zone, 2001 to 2006

SLA name	Average annual growth (per cent)	Change in number of jobs	Main industry contributor to jobs growth	Origin SLAs which increased commuting to this place of work SLA by more than 300 persons (in descending order)
Melton East	27	2 600	Retail trade	Melton East
Wyndham South	10	900	Retail trade	Wyndham South
Wyndham West	9	700	Construction	None
Whittlesea North*	8	1 900	Construction	Whittlesea North, Whittlesea South
Bacchus Marsh	7	1 100	Retail trade	Bacchus Marsh
Berwick	7	5 000	Retail trade	Berwick, Cranbourne, Pakenham
Pakenham	7	2 300	Construction	Pakenham, Berwick
Southbank-Docklands	7	10 500	Finance and insurance	Southbank-Docklands, Maribyrnong, Me bourne Remainder, Port Phillip West
Waverley East	6	3 760	Retail trade	Berwick
Wyndham North	6	8 100	Manufacturing	Wyndham North, Wyndham South, Wyndham West, Melton East, Sunshine, Keilor, Altona, Melton Balance
Moreland North	6	1 500	Manufacturing	None
Cranbourne	6	2 400	Retail trade	Cranbourne, Berwick
Craigieburn	5	4 700	Transport and storage	Craigieburn, Whittlesea South, Melton East

Note: * Results may be nfluenced by boundary change between 2001 and 2006.

Source: BITRE analysis of ABS 2001 and 2006 Census of Population and Housing commut ng flows matrix.

There were several Melbourne SLAs that experienced a substantial loss of employment between 2001 and 2006. The job loss in the Ballan SLA between 2001 and 2006 was principally reflected in reduced commuting from the neighbouring Bacchus Marsh SLA. The job losses in the Brunswick and Coburg SLAs were reflected in reduced commuting flows from a range of Outer North, Middle North and Outer West SLAs.

Do areas with strong jobs growth draw workers from the same set of places as previously, or do they draw workers from an expanded range of places? For many of the jobs growth SLAs—including Berwick, Wyndham North and Melton East—the mix of locations from which workers were drawn was relatively stable between 2001 and 2006. However, some of the jobs growth SLAs experienced a significant change in the mix of places from which workers were drawn:

- The proportion of Waverley East jobs filled by residents of Waverley East declined from 34 to 26 per cent between 2001 and 2006 and the average commuting distance to a place of work in this SLA correspondingly increased from 12.6 to 14.2 kilometres.

- While 49 per cent of jobs in Wyndham West were filled by Wyndham West residents in 2001, this had dropped to 39 per cent by 2006, with Wyndham North residents boosting their share of Wyndham West jobs. Reflecting this change, the average commuting distance to a place of work in Wyndham West increased markedly from 9.7 to 12.9 kilometres from 2001 to 2006.
- In contrast, the proportion of Wyndham South jobs filled by residents of Wyndham South increased from 32 to 40 per cent over the period, with Wyndham North residents having a reduced share of Wyndham South jobs in 2006. The average commuting distance to a place of work in Wyndham South declined from 13.8 to 12.0 kilometres between 2001 and 2006.
- The Craigieburn SLA experienced a decline of about 1 kilometre in average commuting distance between 2001 and 2006, reflecting an increase in employment self-containment for the SLA.

Thus, in some SLAs, strong jobs growth was associated with greater commuting distances as workers were increasingly drawn from further afield, while in other SLAs the strong jobs growth was associated with a reduction in commuting distances as jobs were increasingly filled from within the local area. There was no systematic tendency for rapid jobs growth to be associated with either an increase or decrease in the average distance travelled to work in the SLA.

Commuting and the decision to move residence or place of work

The spatial distributions of residential growth and jobs growth reflect the choices made by individuals and families about whether to move residence, change jobs or stay put. An ABS survey on *Residential and workplace mobility and implications for travel* gathered detailed information about these decisions for Melbourne residents (ABS 2009g), and provides important insights into the connections between commuting and the decision to move residence or place of work. Some key messages from this survey are highlighted below.

Commuting considerations were important for at least one-fifth of people moving house in Melbourne.

- Of those who moved residence in the three years prior to October 2008, 20 per cent nominated 'work—better access or prospects' as a reason for the move. About 7 per cent identified access to public transport as a reason for moving (ABS 2009g).

People who move house often prioritise housing affordability, lifestyle or proximity to friends and relatives above commuting considerations.

- Factors commonly identified as reasons for a move in ABS (2009g) include housing cost and characteristics, neighbourhood attractiveness, proximity to family and friends, lifestyle and access to services (e.g. schools).
- Melbourne Institute (2009) found that those who move house but not job actually increased their average commuting time, while those who moved job but not house, reduced their commuting time.

- Housing cost was nominated as a reason for moving residence by 36 per cent of those who lived more than 20 kilometres from work, compared to 20 per cent for the 10 to 20 kilometre range, 14 per cent for the 5 to 10 kilometre range and 7 per cent for those living within 5 kilometres of work. Over two-thirds of those who identified housing cost as a reason for their move commuted more than 10 kilometres to work each day (ABS 2009g).
- Inbakaran and Shin (2010) found that a couple with two children needs to spend around $3000 more on transport each year if they live in the outer suburbs compared to the inner suburbs of Melbourne, with the increased cost of travelling to work from the outer suburbs being the principal contributor to this difference. However, they concluded that in the context of spatial differences in housing costs, this $3000 difference 'may be too small to make a substantial difference to households' choice of location' (ibid, p.13).

While people changed jobs largely for job-related reasons, commuting considerations were important for about one-sixth of people changing their suburb of employment.

- People who took up a job in a different suburb typically reported doing so for job-related reasons (e.g. type of work available, transferred by employer). However, 17 per cent identified being close to home or close to public transport as a reason for changing jobs (ABS 2009g).

People's decisions about whether to move house and/or jobs, and where to move, impact on commuting distance and mode share

- ABS (2009g) identifies a strong relationship between the commuting distance after the move and the reason for moving house. Thirty four per cent of movers who lived within 5 kilometres of work nominated work access/prospects as a reason for their move, compared to 21 per cent of those who lived between 5 and 10 kilometres, 13 per cent of those who lived between 10 and 20 kilometres and 9 per cent of those who lived more than 20 kilometres from work.
- A subgroup representing about 9 per cent of movers chose to move house to improve access to work and subsequently commuted less than 5 kilometres to work each day.
- People who lived within 5 kilometres of work (after their job change) were much more likely to have reported changing their suburb of employment to be close to home/public transport (37 per cent), compared to those who lived between 5 and 10 kilometres (16 per cent), 10 to 20 kilometres (8 per cent) or more than 20 kilometres away (3 per cent).
- About 10 per cent of those who changed their suburb of employment did so to improve access and subsequently commuted under 5 kilometres to work.
- Those who reported moving house or changing jobs for the purpose of improving access from home to work were much more likely to subsequently cycle or walk to work than people who moved for other reasons or non-movers. It is likely that cycling and/or walking to work has become a more feasible option, following the move (ABS 2009g).

These results highlight the interconnected relationship between residential/jobs growth and changes in commuting behaviour. The spatial residential and jobs growth patterns summarised in Chapters 3 and 4 reflect the accumulated effect of thousands of decisions by individuals and families about where they wish to live and work. Roughly 20 per cent of decisions to move house/job were specifically undertaken with the aim of improving access between home and work. Once these moves occurred, there were tangible effects on commuting distances and mode shares, with these moves particularly likely to result in short commuting distances and travel to work by cycling or walking. The effects of this group of commuting-focused movers on average commuting distance and mode shares is, however, likely to be outweighed by the majority who moved house and/or job for reasons unrelated to commuting.

Travel cost

The cost of travel between any two locations is another potentially important driver of commuting flows. The cost of travel between two areas depends on the opportunity cost of the time spent undertaking the journey as well as direct costs such as petrol, tolls, public transport fares and parking fees. The journey time depends on the distance between the two areas and average speed, which in turn depends on transport infrastructure and the level of congestion. The ABS-VicRoads estimates of the road distance between any origin-destination pair[49] should serve as a useful proxy for travel time and for some of the direct costs, such as petrol. The expected relationship is that a greater distance between any origin-destination pair will generally be associated with a greater travel cost and a greater impediment to travel between those two regions.

Table 8.3 presents the results of a simple correlation analysis across all of the origin-destination pairs in the Melbourne working zone. The results show that the distance between an origin-destination pair is significantly negatively correlated with the number of people commuting between those SLAs and with the change in commuter flows between those SLAs. The correlation statistics do not differ depending on whether a straight line or road network based measure of distance is used. The 2001 correlations are a little lower than the 2006 correlations.

The negative correlation between distance and the change in the number of people commuting between any two SLAs suggests that the extent to which distance impedes travel may have increased over the period. This would be consistent with the sharp increase in automotive fuel prices between the September quarters of 2001 and 2006 (ABS 2009e).

49 The ABS-VicRoads dataset is described in Chapter 7. For some of the less travelled orig n-dest nation pairs the ABS-VicRoads dataset provides no estimate of distance. The ABS-VicRoads dataset is also restricted to the Melbourne SD, so does not provide estimates of distance for origin-dest nation pa rs nvolv ng a Peri Urban SLA. BITRE has imputed the road distance for these pa rs based on the straight l ne distance between the population weighted centroid of the origin SLA and the job weighted centroid, and by apply ng the overall relationship that existed between the straight l ne and road distance est mates, i.e. for 2006

Imputed Road distance = 1.13 + 1.23 * Straight line distance (R-squared = 0.989).

T8.3 Correlation analysis of relationships between commuting flows and distance, 2001 and 2006

Commuting flow variable	Correlation with road distance	Correlation with straight line distance
Number of persons commut ng between origin-dest nation pair n 2006	–0.32	–0.32
Number of persons commut ng between origin-dest nation pair n 2001	–0.30	–0.30
Change n number of persons commuting between orig n-dest nation pa r, 2001 to 2006	–0.16	–0.16

Note: Correlation calculated across all 8281 SLA pa rs for 2006 and all 7396 pa rs for 2001 and change analysis.

Source: BITRE analysis of ABS 2001 and 2006 Census of Population and Hous ng commut ng flows matrix, ABS-VicRoads road distance between each origin-destination pair and BITRE estimates of straight line distance between each origin-dest nation pair.

The extent to which distance acts as an impediment to travel is likely to depend on the mode of travel. For example, in peak period, commuting times by rail can be substantially quicker than by car. Where this is the case (e.g. in Perth, see BITRE 2010 p.202), the impact of distance may be less pronounced for origin-destination pairs that have a direct rail connection than for those that are reliant on the road network. This relationship will be investigated through estimation of a gravity model of commuting flows, to be presented later in the chapter.

Travel speeds during the morning peak period tend to be much quicker on freeways than on arterial roads (VicRoads 2010b). Consequently, the impact of road distance may be less pronounced for origin-destination pairs that are connected by Melbourne's freeway network than for those that are not. This relationship will also be explored through the gravity model, with results presented later in the chapter.

Transport infrastructure

This section considers the relationship between changes in commuter flows and major transport infrastructure investments[50], focusing on the 2001 to 2006 period. The analysis focuses on new infrastructure, and does not examine the impact of any increase in public transport services using existing infrastructure.

50 Major transport nfrastructure nvestments were selected based on their potential to have sign ficantly altered spatial commut ng flows and their total cost. A threshold of $150 million was used to ident fy major road infrastructure projects, while a lower threshold of $25 million was used for public transport projects, to enable mult ple public transport projects to be included in the analysis.

Between the 2001 and 2006 censuses, the main investment in the metropolitan train network was the electrification of the rail line between St Albans and Sydenham in 2002. The extension of the Broadmeadows rail line to Craigieburn was not finalised until 2007, after the 2006 census was conducted, and so is not considered further here. The completion of the larger scale Regional Fast Rail project was followed by marked increases in patronage on the Geelong, Ballarat and Bendigo lines. However, as the most pronounced impact[51] occurred following the introduction of new, more frequent, timetables on these lines in September 2006 (i.e. after the 2006 census was conducted), the Regional Fast Rail project is not investigated further here.

The main expansions to Melbourne's tram network between 2001 and 2006 were the extension of the Mont Albert line to Box Hill in 2003 and the extension of the Burwood Highway tram service to Vermont South in 2005. Improvements in bus transport also potentially have an impact on changes in commuter flows. However, due to the small proportion of Melbourne commuters who use buses (1.4 per cent) and the modest and dispersed nature of network expansions between 2001 and 2006, changes in bus routes and timetables have not been investigated in this study.

Important road infrastructure investment projects costing more than $150 million and completed between the 2001 and 2006 censuses include:

- The Geelong Road (Princes Freeway) upgrade was completed in 2002—in the context of commuter travel within the Melbourne working zone, this project would be expected to improve the Wyndham LGA's connectivity to the centre of Melbourne and to locations along the Western Ring Road.
- The Hallam Bypass extended the Monash Freeway from Doveton to Berwick and was completed in 2003—this was expected to reduce congestion and improve travel times (Bracks 2003), both in the local area and through improved connectivity of the Casey-Cardinia Growth Area to middle suburban locations along the Monash Freeway (e.g. Monash University, Mount Waverley, Chadstone Shopping Centre) and the inner city. The strong growth in commuting flows from the Berwick SLA to the Hallam and Waverley East SLAs and the Greater Dandenong LGA, which was highlighted in Table 8.1, may be linked to completion of the Hallam Bypass, although Berwick's strong residential growth is likely to be the dominant driver.
- The Craigieburn Bypass extended the Hume Freeway to the Metropolitan Ring Road and was completed in 2005—this was expected to ease congestion on Sydney Road (old Hume Highway) in the Broadmeadows SLA, provide improved access to local industrial estates (Bracks 2001) and improve connectivity of the Craigieburn, Whittlesea North and Mitchell South SLAs to locations along the Western and Metropolitan Ring Roads (and vice versa). Thakur (2009) found that the Craigieburn Bypass was the source of a significant improvement in relative accessibility between 2001 and 2006 for the Craigieburn, Whittlesea North and Whittlesea South West SLAs.

51 Although the new Vlocity tra ns did commence operation on the Geelong, Ballarat and Bendigo l nes between December 2005 and February 2006, according to VL ne (2007), total patronage grew by just 6 per cent in the year ended June 2006 compared to 29 per cent n the year ended June 2007. Most of the increased patronage probably relates to the regional cities of Geelong, Ballarat and Bendigo (which lie outside the scope of the regression analysis) but increased patronage would also be expected for some Peri Urban locations n the Me bourne work ng zone (e.g. Melton, Sunbury).

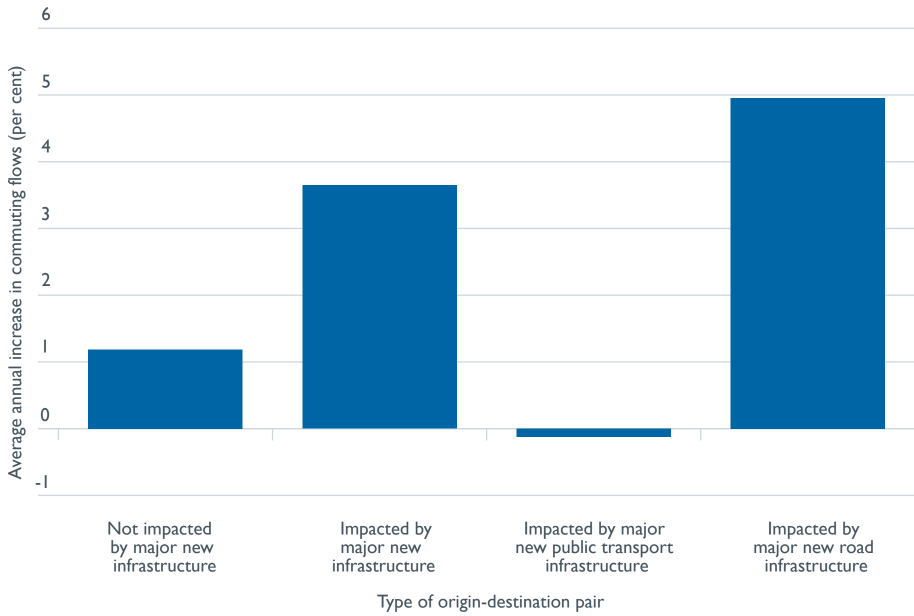
For the purposes of exploring drivers of change in commuter flows, a dummy variable has been constructed covering the major infrastructure projects that were completed between 2001 and 2006.[52] The six infrastructure projects considered are the electrification of the rail line to Sydenham, the Box Hill and Vermont South tram extensions, the Geelong Road upgrade, the Hallam Bypass and the Craigieburn Bypass.

Figure 8.1 shows that the origin-destination pairs that were impacted by at least one of these major infrastructure projects experienced more rapid growth in commuting flows between 2001 and 2006 than those that were not. However, while origin-destination pairs impacted by new road infrastructure experienced rapid growth, those impacted by public transport infrastructure did not. This may reflect the concentration of the road projects in outer suburban growth areas and the public transport projects in the slower growing middle suburbs. The regression analysis later in the chapter will attempt to assess whether these infrastructure extensions had a statistically significant impact on spatial change in commuting flows, after controlling for the effects of population growth and jobs growth.

Two very large scale road infrastructure projects were completed between 1996 and 2001—the Western Ring Road and CityLink. The main aim of the CityLink project was to reduce congestion by building a link between key freeways that bypassed the CBD (Muhammad and Low 2006). According to the Allen Consulting Group (2003, p.6), CityLink 'provided a significant lift in connectedness for the Melbourne urban arterial system', such that 'for example, trip times between Malvern or Strathmore and Southbank are now on average around 10-15 minutes shorter than they were prior to the opening of CityLink'. This is contested by Odgers (2009 p.1) who argues that 'an increase in average travel speeds, has not to date eventuated in Melbourne's urban road network during the years under review'. Thakur (2009) shows that the relative accessibility of Melbourne's north-east, north-west and western suburbs improved significantly between 1996 and 2001, which he attributes to the completion of the Western Ring Road and CityLink during this period. Rasmussen (2010) highlights the role of the Western Ring Road in reducing travel times and expanding the spatial labour market of the West Industrial Node (Sunshine, Altona, Maribyrnong and Wyndham North SLAs) and the North Industrial Node (Craigieburn and Broadmeadows SLAs). According to Thakur (2009, p.2), the 'Western Ring Road and CityLink, have managed to redress what several planning strategies over the last 3 decades could not, that is to redirect growth to west and north west Melbourne'. Other commentators consider the economic impacts to be much more limited (Mees 2001, Dodson and Berry 2004).

52 In construct ng the dummy variable, each SLA pair in Me bourne was categorised by BITRE as either having been d rectly mpacted by the relevant nfrastructure project or not impacted. The previous set of dot points provides nformation about which SLA pa rs were judged to have been mpacted by each freeway extension. For the rail/tram extensions, commut ng between the SLA where the l ne extension occurred (e.g. Box Hill for the Box Hill traml ne) and other SLAs on that rail/tram l ne were judged to have been mpacted.

F8.1 Growth in commuting flows and transport infrastructure investment, Melbourne working zone, 2001 to 2006



Note: The public transport infrastructure projects analysed were the electr fication of the rail l ne to Sydenham, the Box Hill and Vermont South tram extensions, The road nfrastructure projects analysed were the Geelong Road upgrade, the Hallam Bypass and the Craigieburn Bypass. Infrastructure projects completed prior to the 2001 census (e.g. CityL nk, Western R ng Road) are not considered.

Source: BITRE analysis of ABS 2001 and 2006 Census of Population and Hous ng commuting flows matrix.

The commuting impacts of residential and jobs growth between 2001 and 2006 will be captured in the regression analysis of commuting change presented later in the chapter. In the regression analysis, dummy variables have been constructed[53] to control for the impact of any delayed reduction in commuting times and costs flowing from CityLink or the Western Ring Road. It is certainly possible that the impacts of CityLink on commuting times were not fully realised by the time of the 2001 census, given it was first opened in December 2000 and was then partially closed for repair work to Burnley Tunnel between 19 February and 16 June 2001 (TransUrban CityLink Limited 2001).

Other significant road infrastructure investments were completed after the 2006 census (e.g. Pakenham bypass in 2007, EastLink in 2008, Deer Park Bypass in 2009) or are ongoing (e.g. Ring Road upgrade, Monash-City Link-West Gate upgrade). Rawnsley and Spiller (2010) note that Eastlink has improved accessibility to the key centres of Ringwood, Dandenong and Frankston. According to the owner-operator ConnectEast Group (2009), travel time savings of over 40 per cent are available on Eastlink compared to the alternate routes, but 'while Eastlink has eased congestion on the alternative routes, travel times have not greatly reduced' on those alternate routes.

53 In construct ng these infrastructure dummy variables, each SLA pa r in Melbourne was categorised by BITRE as either hav ng been directly impacted by the relevant nfrastructure project or not mpacted. The CityLink impacts are assumed to relate pr marily to the inner city (see Odgers 2009) and to SLAs along the Monash, WestGate and Tullamarine Freeways. The Western Ring Road mpacts are assumed to relate primarily to SLA pa rs that lie along the Western and Metropolitan R ng Roads.

Industry and skills

Industry and skills related factors play an important role in shaping commuting flows between different parts of the city and how they change over time. In the context of the Sunshine Coast, Trendle and Siu (2005) show that distance has less of a deterrent effect in the commuting decision for more educated workers. BITRE's forthcoming commuting study for Sydney finds that the deterrent effect of distance also varies across industries, being greater for spatially dispersed industries such as Retail trade and Health care and social assistance, than for spatially concentrated industries such as Information, media and telecommunications and *Finance and insurance* (BITRE forthcoming).

Other things equal, commuting flows are likely to be greater for origin-destination pairs which have good alignment between the industry (skills) mix of employed residents in the origin SLA and the industry (skills) mix of jobs in the destination SLA. To investigate the influence of skills and industry on commuting flows, BITRE has developed a measure of industry mismatch for 2001 and 2006 as well as a measure of skills mismatch for 2001 and 2006.[54] These measures identify the proportion of employed residents of the origin SLA who would need to change industries (skill categories) to match the industry (skill) mix of the destination SLA.

The **industry mismatch index** was calculated based on the single digit ANZSIC 1993 industry classification for both 2001 and 2006. The industry mismatch index can theoretically take values between 0 and 1, but in practice no Melbourne origin-destination pair has an industry mismatch index over 0.7 and the median index value is 0.26 in both years. In 2006, industry mismatch was greatest for the SLA pairing of Cardinia South and Melbourne Inner and at its lowest for commutes within the Baw Baw Part B West SLA.

The **skills mismatch index** was calculated in a parallel manner to the industry mismatch index. It was based on three qualifications categories: no post school qualification, certificate level qualification and higher qualification.[55] While the skills mismatch index can theoretically take values between 0 and 1, in practice no Melbourne origin-destination pair has a skills mismatch index over 0.5 for 2006 and the median index value is 0.12. In 2006, skills mismatch was lowest for the origin-destination pair of Camberwell North and Melbourne Inner and greatest for the pairing of Yarra North and Casey South. Other things equal, it is expected that SLA pairs with a high score on the skills mismatch index will have lower commuting flows.

Table 8.4 presents the results of correlation analysis. As expected, the greater the extent of the industry or skills mismatch, the lower the observed commuting flow. The results also suggest that a high degree of skills mismatch may negatively affect the change in commuting flows. While both sets of correlations are modest in magnitude, the skills mismatch index is more closely linked to commuting patterns than the industry mismatch index.

54 An alternate method for investigat ng the influence of skills and ndustry is to estimate gravity models of commuting flows which are disaggregated by skills (as per Trendle and Siu 2005) or industry (as per BITRE forthcom ng). BITRE does not have access to commuting matrices disaggregated by industry or education for Melbourne, which would be needed to undertake disaggregated regression analysis of this type.

55 Constra nts on data availability meant a slightly d fferent classification was used to construct the 2001 ndex: no post school qualifications above Certificate Level II; Cert ficate III or IV qualification; higher qual fication.

T8.4 Correlation analysis of relationships between commuting flows and industry and skills mismatch, 2001 and 2006

Commuting flow variable	Industry mismatch index	Skills mismatch index
Number of persons commut ng between orig n-dest nation pa r in 2006	–0.09	–0.12
Number of persons commut ng between orig n-dest nation pa r in 2001	–0.12	–0.11
Change in number of persons commuting between origin-destination pair, 2001 to 2006	–0.03	–0.08

Note: Correlation calculated across all 8281 SLA pairs for 2006 and all 7396 pairs for 2001 and change analysis.

Source: BITRE analysis of ABS 2001 and 2006 Census of Population and Housing commuting flows matrix, industry and educational qual fications data.

Table 8.5 provides an illustration of the role that skills and industry mismatch could potentially play. It shows six origin-destination pairs that have been selected because they are very much equivalent in terms of having a commuting distance of about 10 kilometres, around 20 000 employed residents in the origin SLA and about 30 000 jobs in the destination SLA (the three shaded columns). However, while the first three listed pairs are very well aligned in terms of their skills mix (and to a lesser extent their industry mix), the latter three pairs have greater skills and industry mismatch. The initial three origin-destination pairs also have greater commuting flows than the latter three pairs, which is consistent with the hypothesis that, other things equal, commuting flows are likely to be greater for origin-destination pairs which have a high degree of skills and industry alignment. It is of course possible that other factors lie behind these differences, such as transport connections. The gravity model analysis in the following section will assess whether industry and skills mismatch have a statistically significant influence on commuting flows in Melbourne.

T8.5 Exploring the link between commuter flows and skills and industry mismatch, selected origin-destination pairs in Melbourne, 2006

Origin SLA	Destination SLA	Employed residents of origin SLA	Jobs in destination SLA	Average road distance (kilometres)	Skill mismatch index	Industry mismatch index	Number of commuters
Moonee Valley West	Mar byrnong	18 246	29 245	9.2	0.03	0.19	1175
Coburg	Yarra North	20 894	32 733	10.5	0.09	0.19	670
Camberwell North	Yarra North	20 071	32 733	10.4	0.09	0.18	601
Brunswick	Mar byrnong	21 745	29 245	10.1	0.24	0.28	407
Brunswick	Preston	21 745	28 827	9.3	0.25	0.25	450
Port Phill p West	Mar byrnong	19 253	29 245	9.9	0.27	0.35	239

Source: BITRE analysis of ABS 2001 and 2006 Census of Population and Housing commuting flows matrix, ndustry and educational qual fications data, and ABS-VicRoads road distance between each origin-destination pa r.

Between 2001 and 2006, specific industries were responsible for large changes in several Melbourne SLAs. These changes provide an opportunity for investigating the impact of industry shocks on commuting flows.

Employment in the Craigieburn SLA's Transport and storage industry increased from 4900 persons in 2001 to 8100 persons in 2006, and this industry accounted for over two-thirds of Craigieburn's jobs growth during the period. Strong employment growth occurred at Melbourne Airport and also in the Campbellfield-Somerton precinct which has a strong focus on road transport and logistics operations. The SLA also experienced strong residential growth over the period. Residents of Craigieburn were more likely to work locally in 2006 than 2001, with the self-containment rate rising from 17 to 19 per cent, while the proportion of locals commuting to work in the City of Melbourne declined slightly. About 15 per cent of Craigieburn's jobs were filled by residents of the SLA in 2001, but this rose to 18 per cent in 2006. The set of locations from which Craigieburn drew its workers remained very diverse, although the Middle West sector was a somewhat less important source of workers in 2006 than in 2001. These shifts in commuting patterns resulted in the average road distance travelled to a place of work in the Craigieburn SLA declining from 22.0 to 20.8 kilometres between 2001 and 2006. However, this was insufficient to influence the average commuting distance of Craigieburn residents, which remained unchanged at 18.4 kilometres.

A contrasting change in employment can be seen in the Maribyrnong SLA, where Manufacturing employment declined from 7900 jobs and 26 per cent of the SLA's employment in 2001 to 5000 jobs or just 17 per cent of employment in 2006. This was particularly due to textile, clothing and footwear manufacturing jobs, which are concentrated in Maribyrnong and more than halved between 2001 and 2006, reflecting the ongoing effect of tariff reductions (Rasmussen 2010). There was offsetting jobs growth in other industries, particularly Health and Community Services, but Maribyrnong nevertheless had about 900 fewer jobs in 2006 than in 2001. Between 2001 and 2006, the proportion of local residents who worked within the Maribyrnong SLA declined from 23 to 21 per cent, while the proportion working in the City of Melbourne rose from 29 to 32 per cent, and average commuting distance increased by 0.4 kilometres. This shift in commuting patterns is linked to the process of gentrification of the Maribyrnong SLA, with significant in-migration of high income households to Yarraville and other suburbs (Atkinson et al 2011). With the decline in Manufacturing employment in the Maribyrnong SLA, there was a rise in the proportion of jobs filled by residents of the SLA from 17 to 18 per cent, coupled with reduced commuting to Maribyrnong from the Middle West SLAs of Sunshine, Keilor and Altona and a 0.3 kilometre reduction in the average commuting distance to a place of work in Maribyrnong. As was the case for the Craigieburn example, very substantial changes in the area's industry structure of employment have flowed through to create modest changes in commuting patterns.

A gravity model of commuting

This chapter has identified several factors which are likely to be important drivers of spatial commuting flows in Melbourne. A wide range of other factors are also likely to have an influence, such as age, occupation, home ownership, income and gender (Trendle and Siu 2005).

This section estimates a gravity model for origin-destination commuting flows that occur within the Melbourne working zone. The regression analysis is not intended to be comprehensive. The purpose of the model is:

- to quantify the influence that residential growth, jobs growth and distance have on spatial patterns of commuting in Melbourne
- to explore the effect of transport infrastructure on spatial patterns of commuting in Melbourne
- to enable comparisons across Australia's largest capital cities through adoption of a common model specification across all cities.

Explaining origin-destination commuter flows

Gravity models are often used to explain spatial variation in commuter flows. Gravity models relate passenger flows between origin and destination zones to the relevant population total in the origin and destination zones and to distance. The basic structure of a gravity model of commuting flows is:

$$C_{ij} = \alpha \, R_i^{\,\beta} \, W_j^{\gamma} \, / \, D_{ij}^{\delta}$$

C_{ij} = commuting flow from zone i to zone j

R_i = the number of employed residents of zone i

W_j = the number of people working in zone j

D_{ij} = the distance or commuting time between zones i and j

α, β, γ and δ are the model parameters to be estimated

The state transport departments have typically developed far more sophisticated models of spatial commuting flows (e.g. the Victorian Department of Transport's *Melbourne Integrated Transport Model*), which reflect more disaggregated flow data and more detailed information on transport infrastructure, mode usage and relative prices. Such models have been progressively improved over many years and have the capability of addressing a much broader set of questions (see, for example Alford and Whiteman 2009). More information on these state government models is provided in BITRE (2011b). The relatively simple gravity model presented in this paper nevertheless provides a useful introduction to some of the principal drivers of spatial differences in commuter flows within the Melbourne working zone.

Melbourne regression analysis for 2001 and 2006—base model

The gravity model is traditionally estimated in logarithmic form using ordinary least squares (OLS) estimation. The following model was estimated for each time period (t).

$$lnC_{ijt} = \alpha + \beta lnR_{it} + \gamma lnW_{jt} - \delta\, lnD_{ijt}$$

The analysis is based on a measure of road distance between each SLA pair, derived from the ABS-VicRoads dataset, and described in Chapter 7. Appendix C presents model results which instead use a straight line distance measure, consistent with the method used to estimate the gravity model for Perth in BITRE (2010).

The regression analysis is undertaken for two geographic areas:

- for the 91 SLAs in the Melbourne working zone
- for the 79 SLAs that make up the Melbourne SD (i.e. excluding the 12 Peri Urban SLAs).

With 91 SLAs, there is a potential sample of 8281 origin-destination pairs in 2006 (i.e. 91 X 91), but all sample observations which took a value of either zero or three were excluded from the analysis.[56] [57] This resulted in a sample of 5866 observations for 2006 and 5120 for 2001. For the Melbourne SD regressions, the sample is about 10 per cent smaller.

Initial testing of the model identified some issues with heteroskedasticity and non-normality of errors. Following Chen et al (2003), robust standard errors were derived and the resulting robust t-values have been presented throughout this chapter. As a rule of thumb, robust t-values which have an absolute value of more than two should be considered statistically significant. Using robust standard errors had minimal impact as all of the explanatory variables in the base model remained highly significant and the robust standard errors remained low.

Table 8.6 summarises the base gravity model results for 2001 and 2006. Some key points to note include:

- The gravity model has high explanatory power, with the three independent variables explaining between 69 and 76 per cent of all variation in origin-destination commuter flows.
- The model has considerably higher explanatory power when the focus is restricted to SLAs within the Melbourne SD.[58] The results suggest that the relationship between commuter flows and the three drivers (particularly employed residents) is different for Peri Urban areas than it is within the Melbourne SD.
- All three explanatory variables are highly significant and have the expected signs. The amount of people commuting between an origin-destination pair tends to increase with the number of employed residents in the origin SLA and the number of jobs in the destination SLA. Greater road distance between an origin-destination pair is associated with smaller commuting flows.

56 Values of three and zero are generated by randomisation techniques applied by ABS to protect confidentiality, and should not be relied upon.

57 Values of zero create estimation problems when using a logarithmic formulation. Using a poisson model allows the retention of observations with a zero value—a poisson model was est mated in BITRE's forthcoming Sydney study, and while some of the specific estimates differ between the poisson and logarithmic models for Sydney, the conclusions proved to be generally robust to the alternate model specification. The key difference was that the distance penalty was of a smaller magnitude n the poisson model.

58 Similarly, the regression analysis for Sydney SD had higher explanatory power than that for the more encompassing Sydney Greater Metropolitan Area (BITRE forthcoming).

- The coefficient for employed residents is consistently lower, and less statistically significant, than the jobs coefficient.
- The 2001 model has slightly lower explanatory power than the 2006 model, perhaps related to boundary changes reducing the level of spatial disaggregation of the 2001 model and requiring the application of concordances, or reflecting the greater data quality problems with the 2001 journey to work matrix.

T8.6 Estimation of base gravity model of origin-destination commuter flows, Melbourne, 2001 and 2006

	2001		2006	
	Working zone	Statistical Division	Working zone	Statistical Division
Sample	5120	4655	5866	5152
Adjusted R-squared (per cent)	69.9	73.6	72.7	75.3
Parameter estimates				
Constant	–2.12	–5.6	–0.61	–4.84
Log of number of employed residents n origin SLA	0.40	0.69	0.24	0.54
Log of number of jobs in destination SLA	0.78	0.85	0.81	0.95
Log of road distance between origin and dest nation SLA	–1.53	–1.57	–1.60	–1.66
Robust t-value				
Constant	–5.4	–13.4	–1.7	–11.7
Log of number of employed residents n origin SLA	14.7	23.0	9.6	17.1
Log of number of jobs in destination SLA	43.6	45.7	48.5	59.1
Log of road distance between origin and dest nation SLA	–69.0	–75.4	–81.3	–79.5

Note: The dependent variable is the log of the number of persons commut ng from the orig n SLA to the destination SLA n the given year.

Sources: Est mated by BITRE using SAS OLS est mation and robust standard errors. Based on ABS Census of Population and Hous ng data 2001 and 2006 commuting matrices and ABS-VicRoads road distance est mates for orig n-dest nation pa rs (as detailed in Chapter 7).

A comparison of the regression results based on the road distance and straight line distance estimates (Table 8.6 and Table B.1) reveals that using the road distance measure results in a model with slightly greater explanatory power. While the parameter estimates on the distance variable obviously differed depending on which distance measure was used, model results were otherwise robust to measurement of distance.

From Table 8.6 it can be seen that the parameter estimate for the road distance variable became increasingly negative between 2001 and 2006—this change was statistically significant at the 1 per cent probability level in both the SD and WZ models. The extent to which distance impedes travel has increased over the period, a result which presumably reflects the sharp increase of 55 per cent in automotive fuel prices between the September quarters of 2001 and 2006 (ABS 2009h). In the straight line distance specifications presented in Appendix C, the change in the distance parameter between 2001 and 2006 was only borderline statistically significant (i.e. significant at 10 per cent probability level, but not at 5 or 1 per cent levels), reflecting the lesser precision with which the parameter is estimated when based on straight line distance data rather than road distance data.

The coefficients on the jobs and employed residents variables were not particularly robust to changes in model specification and time period. The reduction from 2001 to 2006 in the magnitude of the employed residents' coefficient was statistically significant in both the SD and WZ models. The increase in the magnitude of the jobs coefficient was only statistically significant in the SD model.

The sum of the coefficients on the jobs and employed residents variables exceeds one in each of the unconstrained model specifications in Table 8.6. If the coefficients sum to more than one, an equi-proportional increase in workers and jobs in all SLAs would be predicted to result in a greater increase in the number of commutes. For the gravity model to be useful for predicting future commuting flows, the parameters should sum to one.[59] To better grasp the influence of these coefficients, a restricted model was estimated for the Melbourne SD with the jobs and employed residents parameters constrained to sum to one. This reduced the 2006 model's explanatory power slightly from 75.3 per cent to 73.9 per cent, with the distance coefficient remaining relatively stable at –1.70.[60] Thus, even in this restricted model, almost three-quarters of the variation in origin-destination commuter flows can be explained by reference to just three key factors—distance plus the spatial distribution of employed residents and jobs.

The largest commuting flows are predicted to occur for origin-destination pairs which have a very large number of employed residents in the origin SLA, a very large number of jobs in the destination SLA and a very short distance between the two SLAs. To see how the model works in practice, some examples are provided below based on the 2006 parameter estimates for the SD model:[61]

- For an origin-destination pair which is located 10 kilometres apart, where each has 10 000 employed residents and jobs, commuting flows are predicted to be 157 persons.
- A doubling of the size of the two SLAs to 20 000 employed residents and jobs (leaving distance unchanged) results in predicted commuting flows of 442 persons.
- If the two SLAs with 20 000 employed residents and jobs are located 20 kilometres apart, the predicted commuting flow is 140 persons. It is 71 persons if they are located 30 kilometres apart.

Melbourne regression analysis for 2001 and 2006—extended model

This basic gravity model formulation assumes that employees are homogenous (Trendle and Siu 2005). In practice, employees have different skills and educational attainment and vary in their suitability for employment in different industries. BITRE has attempted to capture this heterogeneity through inclusion of the skill mismatch variable, which was described in the previous section. An industry mismatch variable was also trialled, but it was omitted as it was sufficiently closely correlated with the skill mismatch variable (correlation=0.5 in 2006) to pose multicollinearity risks, but had lower explanatory power.

59 Note that the unconstrained models presented n Table 8.6 are not ntended to be used to predict future commuting flows.

60 In this constra ned model, the employed residents parameter was est mated at 0.19 and the jobs parameter at 0.81.

61 Calculated as $[-4.84 + 0.54 \ln R_i + 0.95 \ln W_j - 1.66 \ln D_{ij}]$

One of the aims of this modelling exercise is to explore the effect of transport infrastructure on spatial patterns of commuting in Melbourne. There is some evidence that the negative impact of road distance on commuting flows may be less pronounced for origin-destination pairs that are connected by the freeway network or by the rail network, than for those that are not (VicRoads 2010b, BITRE 2010). This has been investigated through inclusion of two variables which identify the impact of Melbourne's rail network and freeway network on commuting patterns:

- A rail-distance interactive term has been included to identify whether the distance penalty is reduced for origin-destination pairs which have a direct rail connection compared to origin-destination pairs that are only connected by the road network. Only stations on the same metropolitan or regional train line are considered to have a direct rail connection, with all stations served by metropolitan trains considered to have a direct rail connection to all stations on the City Loop. This variable takes a value of zero if the origin-destination pair does not have a direct rail connection, and is set equal to the log of the distance between the origin-destination pair if there is a direct rail connection.
- A freeway-distance interactive term has been included to identify whether the distance penalty is reduced for origin-destination pairs which can be travelled between without leaving the freeway system, compared to origin-destination pairs that require travel on arterial roads. This variable takes a value of zero if the origin-destination pair is not fully connected by the freeway network, and is set equal to the log of the distance between the origin-destination pair if the two SLAs can be travelled between without leaving Melbourne's freeway network. Changes to the freeway network between 2001 and 2006, such as the Hallam Bypass and the Craigieburn Bypass, significantly impact upon this variable, by linking in some previously disconnected freeways to the main Melbourne freeway network. As a result, the variable differs for 2001 and 2006.

Table 8.7 presents an extended gravity model, which allows for skills heterogeneity of workers and the rail and freeway networks to impact on origin-destination commuter flows within Melbourne. The inclusion of these three variables leads to a 2 to 3 percentage point increase in the model's explanatory power, compared to the base model specifications in Table 8.6. The parameter estimates for the employed residents and jobs variables undergo little change in response to the inclusion of additional variables in the regression. The three additional variables are all statistically significant in both the 2001 and 2006 regressions and signs are in accordance with expectations.

As expected, the existence of a direct rail connection between an origin-destination pair has the effect of reducing the distance penalty and boosting commuter flows. Consider an origin-destination pair located ten kilometres apart which each have 20 000 employed residents and jobs and for which there is no freeway connection and no skills mismatch. The 2006 SD model predicts that if they have no direct rail connection there will be a commuter flow of 508 people, while the commuter flow will be higher (686 persons) if these SLAs are directly connected by the rail system.

Similarly, the existence of a freeway connection between an origin-destination pair also has the effect of reducing the distance penalty and boosting commuting flows, reflecting the greater average travel speeds on the freeway network. The magnitude of this effect is, however, smaller than that of the rail variable. Consider the hypothetical origin-destination pair located ten kilometres apart, with 20 000 employed residents and jobs, no direct rail connection and no skills mismatch—the 2006 SD model predicts that if they are not fully connected by the freeway network there will be a commuter flow of 508 persons, compared to 570 persons if the two SLAs can be travelled between on the freeway network.

The skills mismatch variable is a highly significant addition to the gravity model of commuter flows. When an origin-destination pair has a large degree of skill mismatch, commuter flows are predicted to be significantly lower than if the supply and demand for skills is well aligned between the two SLAs. If we take the hypothetical origin-destination pair described above, the predicted 2006 commuter flow falls from 508 persons with no skills mismatch (i.e. perfect alignment) to just 188 persons when the maximum level of skills mismatch is observed.[62]

T8.7 Estimation of extended gravity model of origin-destination commuter flows, Melbourne, 2001 and 2006

	2001		2006	
	Working zone	Statistical Division	Working zone	Statistical Division
Sample	5120	4655	5866	5152
Adjusted R-squared (per cent)	72.9	75.6	75.7	77.4
Parameter estimates				
Constant	–2.45	–5.62	–0.85	–4.59
Log of number of employed residents in origin SLA	0.42	0.68	0.26	0.53
Log of number of jobs in dest nation SLA	0.78	0.85	0.81	0.93
Log of road distance between origin and destination SLA	–1.43	–1.48	–1.52	–1.58
D rect rail connection X Log of distance	0.20	0.17	0.17	0.13
Freeway connection X Log of distance	0.04	0.04	0.05	0.05
Skills mismatch index for origin-destination pa r	–2.65	–2.05	–2.37	–2.08
Robust t-value				
Constant	–6.4	–13.6	–2.4	–11.4
Log of number of employed residents in origin SLA	15.9	22.6	11.0	17.0
Log of number of jobs in dest nation SLA	46.0	47.2	49.3	59.2
Log of road distance between orig n and destination SLA	–65.5	–71.6	–78.8	–76.7
D rect rail connection X Log of distance	16.4	14.3	15.5	11.4
Freeway connection X Log of distance	4.4	4.9	6.8	6.4
Skills mismatch index for orig n-destination pa r	–19.1	–15.0	–23.7	–20.9

Notes: The dependent variable is the log of the number of persons commuting from the origin SLA to the dest nation SLA n the given year. The skills mismatch index was calculated using slightly d fferent categories for 2001 and 2006 so the parameter estimate is not directly comparable across the two models.

Sources: Estimated by BITRE us ng SAS OLS estimation and robust standard errors. Based on ABS Census of Population and Housing 2001 and 2006 commut ng matrices and qualifications data and ABS-VicRoads road distance estimates for orig n-destination pa rs (as detailed in Chapter 7).

62 In 2006, the max mum level of the skills mismatch ndex was 0.48. Greater skills mismatch would be observed f the analysis were undertaken at a more disaggregated geographic scale or us ng a more disaggregated skills class fication.

The freeway and skills mismatch parameters did not change significantly between 2001 and 2006. However, there is some evidence that the effect of a rail connection on commuter flows is reducing over time, as the parameter estimate in the SD model experienced a statistically significant decline (at the 1 per cent probability level) between 2001 and 2006.

Comparison to results for Sydney and Perth

The regression analysis has been designed to eventually enable comparisons across Australia's largest capital cities through adoption of a common model specification across the cities. At this stage, results are available for three cities—Sydney, Melbourne and Perth.

Table 8.8 compares the results of the common base model specification for 2006. To ensure comparability, a straight line measure of distance is used for all three cities. The three explanatory variables are highly significant and have the expected signs in all three city regressions. The Perth model had a higher explanatory power (82 per cent) than the Sydney and Melbourne models (74–75 per cent). The employed residents' variable makes a lesser contribution to explaining variation in commuter flows in the Melbourne model, than it does for the other two cities. The parameter estimate for Melbourne's straight line distance variable is of a larger magnitude than that obtained for Perth, but is broadly similar to that obtained for Sydney. This implies that distance is a lesser impediment to commuter travel in Perth than it is in the two larger cities, a result which is consistent with the greater density and congestion of Sydney and Melbourne.

T8.8 Comparison of base gravity model of origin-destination commuter flows between Sydney, Perth and Melbourne, 2006

	Perth Working Zone	Sydney Working Zone/ Statistical Division	Melbourne Statistical Division
Sample	1359	3864	5152
Adjusted R-squared (per cent)	81.5	74.6	74.1
Parameter estimates			
Constant	–11.48	–14.75	–7.14
Log of number of employed residents n orig n SLA	1.04	1.19	0.60
Log of number of jobs n destination SLA	0.99	1.14	0.99
Log of straight l ne distance between orig n and destination SLA	–1.11	–1.35	–1.39
Robust t-value			
Constant	–33.9	–40.9	–18.2
Log of number of employed residents n orig n SLA	41.1	40.1	19.5
Log of number of jobs n destination SLA	45.4	57.7	60.9
Log of straight l ne distance between orig n and destination SLA	–31.9	–83.8	–54.7

Note: The dependent variable is the log of the number of persons commut ng from the origin SLA to the destination SLA n the given year.

Sources: Perth results sourced from BITRE (2010) T8.5. Me bourne and Sydney results est mated by BITRE us ng SAS OLS est mation and robust standard errors based on ABS Census of Population and Housing 2001 and 2006 commuting matrices and straight l ne distance est mates (as detailed in BITRE 2010 p.180).

Table 8.9 compares the results of the extended model across the three cities—note that the freeway variable has been excluded as it was not part of the Perth study (BITRE 2010). The Perth regression continues to have a higher explanatory power than the regressions for Sydney and Melbourne. Both of the additional variables—capturing rail connections and skills mismatch—were statistically significant for all three cities and had signs in accordance with expectations. However, these two additional variables made a greater contribution to explaining variation in commuter flows in the Melbourne and Sydney regressions, than they did in the Perth regression. A direct rail connection had a proportionately greater positive impact on the magnitude of commuting between origin-destination pairs in Melbourne than in Sydney, while the impact was smaller (but still significant) in Perth. A given level of skills mismatch had a proportionately greater negative impact on the magnitude of commuting between origin-destination pairs in Sydney and Melbourne, than it did for Perth.

For all three cities, the 2006 regressions had consistently higher explanatory power than the comparable 2001 regressions. This probably reflects improvements in journey-to-work data quality and the greater spatial disaggregation underlying the Sydney and Melbourne regressions in 2006.

T8.9 Comparison of extended gravity model of origin-destination commuter flows between Sydney, Perth and Melbourne, 2006

	Perth Working Zone	Sydney Working Zone/ Statistical Division	Me bourne Statistical Division
Sample	1359	3788	5152
Adjusted R-squared (per cent)	82.4	76.8	76.5
Parameter estimates			
Constant	–11.17	–13.90	–6.64
Log of number of employed residents in origin SLA	1.02	1.13	0.59
Log of number of jobs in destination SLA	0.99	1.11	0.96
Log of straight l ne distance between origin and dest nation SLA	–1.07	–1.30	–1.33
D rect rail connection X Log of straight l ne distance	0.11	0.15	0.21
Skills mismatch ndex for origin-destination pa r	–1.26	–1.94	–2.00
Robust t-value			
Constant	–37.5	–44.4	–17.6
Log of number of employed residents in origin SLA	45.4	43.7	19.5
Log of number of jobs in destination SLA	49.6	62.4	60.0
Log of straight l ne distance between origin and dest nation SLA	–31.9	–63.2	–58.5
D rect rail connection X Log of straight l ne distance	5.2	14.7	16.2
Skills mismatch ndex for origin-destination pair	–6.8	–13.8	–19.8

Notes: The dependent variable is the log of the number of persons commut ng from the orig n SLA to the destination SLA in the given year. The skills mismatch ndex was calculated using slightly different categories for 2001 and 2006 so the parameter estimate is not d rectly comparable across the two models.

Sources: Perth results sourced from BITRE (2010) T8.6. Me bourne and Sydney results est mated by BITRE us ng SAS OLS est mation and robust standard errors based on ABS Census of Population and Hous ng data 2001 and 2006 commut ng matrices and qual fications data and straight l ne distance est mates (as detailed in BITRE 2010 p.180).

For Sydney, a range of alternate model specifications were experimented with. The Sydney sensitivity analysis found that:

- The deterrent effect of distance was of smaller magnitude when weighted least squares regression was used.
- The distance penalty was also of smaller magnitude when a poisson model specification was used, enabling origin-destination pairs with zero commuters to be retained.
- Using the spatially disaggregated journey-to-work information available from the Bureau of Transport Statistics website, the gravity model was estimated at the travel zone scale (with a poisson specification), but this had limited impact on parameter estimates with the distance coefficient remaining essentially unchanged (compared to the poisson model estimated at the SLA scale).

There are some implications for the Melbourne results from this sensitivity analysis. In particular, there is a risk that OLS estimation of the Melbourne gravity model may tend to overstate the magnitude of the distance penalty, due to the bias created by excluding origin-destination pairs with a zero commuter flow.[63]

Explaining changes in origin-destination commuter flows

Melbourne regression analysis of change between 2001 and 2006

The main drivers of change in commuter flows can be explored by transforming the gravity model into log difference form:

$$[\ lnC_{ij2006} - lnC_{ij2001}\ ] = \theta + \mu\ [\ lnR_{i2006} - lnR_{i2001}\ ] + \rho\ [\ lnW_{j2006} - lnW_{j2001}\ ] - \varphi\ [lnD_{ij2006} - lnD_{ij2001}]$$

where θ, μ, ρ and φ are the model parameters to be estimated.

The dependent variable in this specification closely approximates the percentage change in commuter flows from zone i to zone j between 2001 and 2006. Thus, the percentage change in commuter flows between zone i and j is expressed as a function of the percentage change in employed residents in zone i, the percentage change in jobs in zone j and the percentage change in distance between zones i and j.

A practical issue with this specification is that the dependent variable tends to take very extreme values for origin-destination pairs which have zero or low commuter flows in one of the two periods. For example, one origin-destination pair increased from 3 to 57 persons over the period, representing 1800 per cent growth. Such observations were highly influential in the regression analysis and detracted from its usefulness. BITRE has dealt with this issue by focusing the analysis on those origin-destination pairs which had non-trivial commuter flows in both periods. Origin-destination pairs with less than 100 commuters in either period were

63 Such pairs need to be excluded from OLS est mation, because the dependent variable is in log form and the log of zero is undefined.

excluded from the analysis.[64] This resulted in a sample of 1790 observations for the Melbourne SD and 1856 for the Melbourne working zone.

The change in road distance between origin-destination pairs is measured using the ABS-VicRoads dataset, which provides separate estimates of the road distance between an origin-destination pair for 2001 and 2006. The road distance estimates for a particular origin-destination pair may change over time because of new infrastructure or because the mix of travel zone origins and/or destinations within an SLA has changed. The median change in road distance between 2001 and 2006 was zero for the regression sample, while the mean value was –30 metres, and more than 90 per cent of origin-destination pairs in the sample had a change of between –1 and +1 kilometres. In practice, differences in the quality and comparability of the 2001 and 2006 data, such as the greater spatial disaggregation of 2006 travel zones, are likely to be driving many of the apparent changes in the road distance measure.

Table 8.10 presents the base model regression results for the percentage growth in commuter flows between 2001 and 2006. Initial testing of the model identified some issues with heteroskedasticity and non-normality of errors. Following Chen et al (2003), robust standard errors were derived and the resulting robust t-values have been presented.

The regressions explain a little over two-thirds of variation in the dependent variable. While the SD model has slightly higher explanatory power than the WZ model, the two sets of regression results are highly consistent with one another. The higher the growth rate of employed residents in the origin SLA and the higher the growth rate of jobs in the destination SLA, the greater is the predicted rate of growth in commuter flows between those two SLAs. Both of these explanatory variables are highly significant and their parameter estimates are of roughly equal magnitude. However, while the distance growth term has the expected sign[65], it is statistically significant only at the 10 per cent probability level (not at the 5 or 1 per cent levels). The marginal significance is not unexpected given the minimal change that occurred in road distance for most origin-destination pairs between 2001 or 2006 and the likely impact of boundary changes on the measure of change.

64 The analysis was repeated us ng a cutoff of 50 commuters, which gave a sample of 2434 observations for the Me bourne SD. The explanatory power was 3 percentage points lower than for the model with a cutoff of 100, and n qualitative terms the model results were very similar. While the regression based on a cutoff of 50 commuters performed well for Me bourne, the results presented are based on the cutoff of 100 commuters to preserve comparability with the Perth and Sydney results.

65 f the road distance between two SLAs has narrowed, due for example to new road nfrastructure, growth n commuter flows is expected to be higher, hold ng other factors constant. Thus, the expected sign is negative.

T8.10 Estimation of base regression model of growth in origin-destination commuter flows from 2001 to 2006, Melbourne

	Working zone	Statistical Division
Sample	1856	1790
Adjusted R-squared (per cent)	67.7	68.9
Parameter estimates		
Constant	–0.062	–0.062
Growth rate of employed residents in origin SLA	0.876	0.876
Growth rate of jobs in dest nation SLA	0.879	0.903
Growth rate of road distance between origin and dest nation SLA	–0.271	–0.268
Robust t-value		
Constant	–11.6	–11.7
Growth rate of employed residents in origin SLA	19.8	19.6
Growth rate of jobs in dest nation SLA	21.6	22.2
Growth rate of road distance between origin and dest nation SLA	–1.8	–1.7

Note: The dependent variable is essentially the percentage change n the number of persons commut ng from the orig n SLA to the destination SLA between 2001 and 2006. Based on orig n-dest nation pa rs that have a commuter flow of at least 100 persons n both 2001 and 2006.

Sources: Est mated by BITRE us ng SAS OLS estimation and robust standard errors. Based on ABS Census of Population and Housing 2001 and 2006 commuting matrices and ABS-VicRoads road distance estimates for origin-destination pairs (as detailed n Chapter 7).

This base regression model of change has been extended in three ways:

- In recognition of the earlier result that the deterrent effect of road distance on commuting flows was significantly higher in 2006 than in 2001 (see Table 8.6), a road distance variable has been included to specifically test for its impact on the observed change in commuting flows. The variable is expected to be negatively signed, with more distant origin-destination pairs expected to experience lesser growth in commuter flows, controlling for other influences.
- The skills mismatch variable is added to the regression analysis to test for whether origin-destination pairs with a high degree of skills mismatch tend to experience lesser growth in commuting flows. An industry mismatch variable was also trialled, and produced similar results.
- An 'infrastructure investment between 2001 and 2006' variable is added to capture any impact that major road and rail infrastructure investments have had on growth in commuter flows during the period. The variable is set equal to one for origin-destination pairs impacted by one of the six major road and public transport infrastructure projects identified previously (see "Transport infrastructure" section earlier in this chapter) and zero for all other origin-destination pairs. An additional variable relating to 'infrastructure investment between 1996 and 2001' is included to control for any potential lagged effect of the very large scale Western Ring Road and CityLink projects completed in 1999 and 2000, respectively. Origin-destination pairs that became better connected due to road or public transport infrastructure investment would be expected to have more rapid growth in commuting flows.

Table 8.11 summarises the regression results. The inclusion of the four additional variables has only marginally boosted explanatory power. The parameter estimates on the employed residents and jobs growth variables are robust to the inclusion of the additional variables.

The 2001 road distance variable is negatively signed (as expected) and statistically significant. Holding other factors constant, the further apart an origin-destination pair was, the lower the growth in commuting flows. As previously noted, this most probably reflects the effect of the rapid growth in petrol prices over the period, which would favour short distance commutes over long distance commutes.

The 2001 skills mismatch variable is also negatively signed (as expected) and was statistically significant at the 5 per cent level of probability, although not at the 1 per cent level of probability. Holding other factors constant, origin-destination pairs where the skills available in the origin region were very well aligned with the skills required in the destination region tended to experience more rapid growth in commuting flows than pairs which had poor skills alignment (i.e. substantial mismatch).

While it might be expected that major infrastructure investments would have a positive impact on commuter flows by improving connectivity and reducing travel times, neither of the infrastructure variables was statistically significant in Table 8.11 and the contemporaneous infrastructure variable actually had a negative coefficient. Thus, while origin-destination pairs impacted by major infrastructure investment had higher growth in commuting flows between 2001 and 2006 (see Figure 8.1), this was no longer the case once population and jobs growth were controlled for. The lack of significance of the contemporaneous infrastructure variable may reflect the simplistic dummy variable approach used, the relatively modest scale of the infrastructure projects that were completed in Melbourne between 2001 and 2006, the limited set of transport projects considered, or the use of origin-destination data on commuter flows (as opposed to detailed route data). However, the lack of significance is also consistent with a scenario in which transport infrastructure expansions are largely reactive, in that they represent a response to anticipated or realised increases in demand (which are in turn driven by spatial patterns of residential and jobs growth), rather than an attempt to directly mould spatial commuting patterns.

The lagged infrastructure variable, covering CityLink and the Western Ring Road, was included to allow for the possibility that any reduction in commuting times and costs flowing from these projects may not have been fully realised as of August 2001. The lagged infrastructure variable was not a statistically significant determinant of growth in commuting flows for the 2001 to 2006 period. However, According to DT (2010), the Western Ring Road fundamentally altered the economic landscape in Melbourne's west—Chapter 4 provides some support for this argument by identifying the West Industrial Node (at the southern end of the Western Ring Road) as Melbourne's major cluster of jobs growth outside of the City of Melbourne LGA. If the Western Ring Road did alter commuting flows by encouraging jobs growth in Melbourne's west, this effect would operate through the jobs growth variable in the regression analysis, rather than through the lagged infrastructure variable.

T8.11 Estimation of extended regression model of growth in origin-destination commuter flows from 2001 to 2006, Melbourne

	Working zone	Statistical Division
Sample	1856	1790
Adjusted R-squared (per cent)	68.2	69.4
Parameter estimates		
Constant	–0.003	–0.013
Growth rate of employed residents in origin SLA	0.882	0.883
Growth rate of jobs in dest nation SLA	0.879	0.903
Growth rate of road distance between origin and dest nation SLA	–0.272	–0.270
Log of road distance between origin and dest nation SLA in 2001	–0.018	–0.013
Skills mismatch ndex in 2001	–0.080	–0.095
Infrastructure investment between 2001 and 2006	–0.007	–0.011
Infrastructure investment between 1996 and 2001	0.002	0.002
Robust t-value		
Constant	–0.3	–1.1
Growth rate of employed residents in origin SLA	19.4	19.4
Growth rate of jobs in dest nation SLA	20.0	20.5
Growth rate of road distance between origin and dest nation SLA	–1.7	–1.7
Log of road distance between origin and dest nation SLA in 2001	–3.6	–2.8
Skills mismatch ndex in 2001	–2.2	–2.6
Infrastructure investment between 2001 and 2006	–0.6	–1.1
Infrastructure investment between 1996 and 2001	0.3	0.3

Note: The dependent variable is essentially the percentage change n the number of persons commut ng from the orig n SLA to the dest nation SLA between 2001 and 2006. Based on orig n-dest nation pa rs that have a commuter flow of at least 100 persons n both 2001 and 2006.

For the 2001 to 2006 period, the follow ng major infrastructure nvestments were captured: the electrification of the rail line to Sydenham, the Box Hill and Vermont South tram extensions, the Geelong Road upgrade, the Hallam Bypass and the Craigieburn Bypass. The 1996 to 2001 infrastructure nvestment variable captures only the Western Ring Road and CityLink projects.

Sources: Est mated by BITRE using SAS OLS est mation and robust standard errors. Based on ABS Census of Population and Hous ng 2001 and 2006 commuting matrices and qual fications data and ABS-VicRoads road distance est mates for origin-destination pairs (as detailed n Chapter 7).

The rationale for transport infrastructure investments in cities is typically focused on improving productivity and reducing costs (e.g. reduced congestion and travel time). The effect of transport infrastructure on commuting costs in Melbourne was illustrated in Table 8.9, which showed that distance served as less of an impediment to commuting between origin-destination pairs that were directly connected by Melbourne's rail network or freeway network. The significance of the direct rail and freeway connection variables in the 2001 and 2006 snapshot regressions shows that the current rail and freeway network, built over many decades, plays an important role in shaping current commuting flows. The insignificance of the contemporaneous transport infrastructure variable in the change regression analysis suggests that the program of incremental infrastructure expansions that occurred between 2001 and 2006 did not significantly alter the overall spatial pattern of commuting in Melbourne during the period. While the six selected major infrastructure investments cost hundreds of millions of dollars in total, this represents a relatively minor proportion of Melbourne's existing stock of transport infrastructure, and so should not be expected to fundamentally alter the spatial patterns of commuting throughout the city.

Comparison to results for Sydney and Perth

Table 8.12 compares results from the base regression model of growth in commuter flows for three cities—Melbourne, Sydney and Perth. A consistent model specification has been adopted for all three cities, which assumes that the distance between origin-destination pairs was stable between 2001 and 2006. For all three cities, the analysis is focused on origin-destination pairs with at least 100 commuters in both years.

Both the residential growth and jobs growth variables are statistically significant and positively signed in each of the three cities. However, the Melbourne change model has considerably higher explanatory power than the change models for Perth and particularly Sydney. The Melbourne model is also more symmetric, with the residential and jobs growth parameters of roughly equal magnitude. The coefficient on the growth rate of jobs tends to be higher than the coefficient on the growth rate of employed residents.

T8.12 Comparison of base regression model of growth in origin-destination commuter flows between 2001 and 2006 for Sydney, Perth and Melbourne

	Perth Working Zone	Sydney Working Zone/ Statistical Division	Melbourne Statistical Division
Sample	621	1734	1790
Adjusted R-squared (per cent)	51.8	39.8	68.7
Parameter estimates			
Constant	–0.06	–0.03	–0.06
Growth rate of employed residents in orig n SLA	0.55	0.82	0.88
Growth rate of jobs n dest nation SLA	1.04	1.03	0.90
Robust t-value			
Constant	–6.3	–7.6	–11.9
Growth rate of employed residents in orig n SLA	7.9	15.9	19.7
Growth rate of jobs n dest nation SLA	23.0	25.2	21.5

Note: The dependent variable is essentially the percentage change in the number of persons commuting from the orig n SLA to the destination SLA between 2001 and 2006. Based on origin-destination pa rs that have a commuter flow of at least 100 persons in both 2001 and 2006.

Sources: Perth results sourced from BITRE (2010) T8.7. Me bourne and Sydney results estimated by BITRE using SAS OLS estimation and robust standard errors based on ABS Census of Population and Hous ng data 2001 and 2006 commut ng matrices.

While not shown in the above table, the skills mismatch variable proved to be a statistically significant predictor of the change in commuter flows for Sydney (at the 1 per cent probability level) and for Melbourne (at the 5 per cent probability level), but not for Perth (BITRE 2010 p. 212). The skills mismatch parameter was negatively signed in all three cities.

A variable capturing major transport infrastructure investments between 2001 and 2006 was included in the change regression for all three cities. This variable proved insignificant in the Melbourne and Perth regressions. However, the transport infrastructure variable was statistically significant at the 5 per cent probability level (but not at the 1 per cent probability level) and positively signed in the Sydney change regression. The major transport infrastructure investments captured for Sydney are the Westlink M7, the M5 East Freeway and the Cross City Tunnel. These infrastructure projects are much larger in scale (costing around $3 billion altogether) than the projects that were completed in Perth[66] and Melbourne[67] during the period, and thus are rather more likely to be associated with significant change in the spatial patterns of commuting within the city. This set of regression results indicates that large scale transport infrastructure investments—such as the series of freeway and tunnel investments that occurred in Sydney between 2001 and 2006—can significantly reshape commuting flows within a city.

Summary

This chapter uses gravity models to explain variation in origin-destination commuter flows within Melbourne, and to identify some of the key drivers of recent change in these commuter flows.

About three quarters of spatial variation in Melbourne's commuting flows can be explained by reference to just a few key factors, namely:

- the number of employed residents in the origin SLA
- the number of jobs in the destination SLA
- the distance between the two SLAs
- whether there is a direct rail or freeway connection between the SLAs
- the degree of alignment between the skills available in the origin SLA and the skills demanded in the destination SLA.

There are two fundamental drivers—namely growth in employed residents in the origin SLA and growth in jobs in the destination SLA—that together are capable of explaining about two-thirds of the observed variation in the growth rate of commuting flows throughout Melbourne. Factors such as the distance between an origin-destination pair and the degree of skills alignment between the origin-destination pair also made a minor contribution to explaining the rate of growth in commuting flows between 2001 and 2006.

66 The spec fic transport infrastructure nvestments reflected in the 2001 to 2006 change regression for Perth were the opening of the Thornlie spur line, the extension of the northern rail line to Clarkson, and the extensions of the Roe, Tonkin and Kwinana freeways. The Mandurah rail l ne was opened n December 2007.

67 The most substantial project completed in Melbourne between 2001 and 2006 was the Craigieburn bypass. CityL nk and the Western R ng Road were much larger scale projects, with greater potential to substantially alter the spatial patterns of commut ng in Me bourne, but any such impacts would be expected to be concentrated in the pre-2001 period. Allen Consulting Group (2003) and Thakur (2009) present evidence that these projects did substantially boost connectivity n relevant parts of Melbourne dur ng the 1996 to 2001 period. The other relevant larger scale project—Eastlink—was completed n 2008, so any mpacts would need to be assessed us ng more recent data.

CHAPTER 9

Outlook

Key points

- Melbourne's population is projected to grow annually by 1.2 per cent, to reach a population of 5 million people by 2025 and over 6.7 million by 2056.
- Population projections suggest that the Inner and Outer sectors will continue to increase at faster rates than the Middle sector, but all are expected to increase.
- Two thirds of the Melbourne working zone's population growth between 2007 and 2026 is projected to occur in the Outer sector (corresponding to 831 000 new residents), 19 per cent in the Middle sector, 10 per cent in the Inner sector and 6 per cent in Peri Urban areas.
- Population projections at the SLA scale show that strong population growth is expected in Melbourne's Growth Areas through to 2026, particularly in the Whittlesea North SLA which is projected to add about 109 000 new residents, and in the Pakenham, Craigieburn, Cranbourne and Wyndham North SLAs, which are all projected to increase their population by between 80 000 and 85 000 people.
- Just under 500 000 new dwellings are the projected requirements for Melbourne SD through to 2024, with most being built in the Outer sector (58 per cent), particularly in the Outer Southern subsector of the city.
- Melbourne SD is projected to increase its level of employment by 915 000 workers from 2006 to 2036. The Outer sector's employment is expected to grow faster than the other sectors, at 1.6 per cent per annum, but not keep pace with residential growth in the Outer sector. The Inner and Middle sectors' employment is projected to grow at a rate of 1.3 and 1.0 per cent annually over the same period.
- The LGAs that are expected to experience the most jobs growth through to 2036 are Melbourne (167 000 additional workers), Dandenong (62 500), Monash (52 500) and Wyndham (52 500).
- The Property and business services and Health and community services industries are projected to experience the largest increases in employment to 2036, while Manufacturing jobs are expected to decline.

- Should these population and employment projections be realised, commuter flows within the Outer Southern subsector are likely to account for more than one-sixth of all additional commuter flows, reflecting the large projected increases in the number of residents and jobs in that subsector through to 2026. Commutes within the Inner, Outer Northern and Outer Western sectors, and from the Outer West to the Middle West and Inner sectors, are also expected to make important contributions to the growth in Melbourne's commuting flows. It is also expected that average commuting distance will rise, as long distance commutes become more prominent.
- The 2008 *Victorian Transport Plan* projects strong growth for all public transport modes, but metropolitan trains are predicted to accommodate the majority of the increased demand.
- Melbourne's congestion costs have been projected to double between 2005 and 2020, with growth in delay costs in the morning peak expected to be most pronounced within 15km of the CBD, in the Casey and Greater Dandenong LGAs, and on freeways and highways.

Context

This chapter considers the future population, employment and commuting patterns of Melbourne. The chapter begins with an analysis of population projections from both the Commonwealth and State governments, and then goes on to investigate the spatial dwellings projections for the city. Information is also presented about projected employment growth in Melbourne, and the industries which are expected to experience the most jobs growth. The implications of these population and employment projections for future spatial patterns of commuting within Melbourne are then considered. Finally, the chapter summarises the results of other studies which have considered the future outlook for public transport, congestion and travel times within Melbourne.

Projected population growth

ABS (2008d) population projections anticipate that Melbourne will continue to have strong population growth with an average annual rate of growth of 1.2 per cent from 2006 to 2056 (Table 9.1). Both Brisbane and Perth are expected to grow significantly faster than the capital cities as a whole, with Adelaide the lowest at 0.7 per cent. The population projections chosen from the ABS were Series B as it largely reflects 2006 'trends in fertility, life expectancy at birth, net overseas migration and net interstate migration' (ABS 2008d, p.3) and represents the central series amongst the three sets of projections. In relative terms, the projections also indicate, that by 2056, each of the cities will retain their current rankings in terms of total residential populations.

T9.1 Population projections for Australia's largest capital cities and for Australia, 2006 to 2056

	Population ('000)					
	Perth	Sydney	Me bourne	Brisbane	Adelaide	All capital cities
2006	1518.7	4282.0	3743.0	1819.8	1145.8	13163.3
2010	1661.8	4496.6	3998.2	1980.7	1194.2	14023.4
2026	2267.6	5426.3	5038.1	2681.1	1384.5	17624.7
2056	3358.4	6976.8	6789.2	3979.3	1651.8	23787.5
Average annual growth rate (per cent)	1.6	1.0	1.2	1.6	0.7	1.2

Note: Figures n the last column are the totals for the 5 largest cities and for Hobart, Canberra and Darwin
Source: ABS (2008d) Cat. 3222.0 Population Projections Australia, 2006 to 2101 (Series B projections).

Melbourne @ 5 million incorporated the new population projections for Melbourne from *Victoria in Future 2008*. These projections indicated that the city could possibly reach 5 million before 2030. This is broadly consistent with the ABS' projections for Melbourne which suggest Melbourne will reach 5 million by 2025.

The assumptions for the two sets of population projections are similar and are based on the 2006 *Census of Population and Housing*, with only a few very minor variations. The assumptions include:

- *Victoria in Future 2008* fertility assumptions are based on the medium assumption from the ABS national and state projections released in 2008.
- *Victoria in Future 2008* mortality assumptions are based on the ABS assumption from the ABS national and state projections released in 2008.
- Net overseas migration is assumed to be 200 000 persons per annum for the first three years, followed by 180 000 persons per annum thereafter, with 26.5% of net overseas migration moving to Victoria. However, the ABS projections assume that 180 000 persons per annum migrate to Australia over the entire projection period.
- Interstate migration is assumed to be a loss of 2000 persons per annum for the first three years, followed by a loss of 6000 persons per annum thereafter. However, the ABS projections assume a loss of 6000 persons per annum over the entire projection period.

Thus, the population projections generated by the ABS and the Victorian Government are very similar with minimal spatial difference, as illustrated by Tables 9.2 and 9.3 at the sector level.

The projections suggest that the Inner and Outer sectors will continue to increase at faster rates than the Middle sector, but all are expected to increase. The two sets of projections are very similar. Each projects that the Melbourne working zone will have an average annual growth of 1.5 per cent. One exception to the similarity is that the Inner sector is projected to grow faster than the Outer sector in the DHA estimates (0.4 percentage points per annum higher over the entire period). In contrast, the Outer sector grows 0.3 percentage points per annum faster than the Inner sector for the State government projections.

The Victorian Government's projections estimate that 66 per cent of Melbourne's population growth from 2007 to 2027 will occur in the Outer sector (corresponding to 831 000 new residents), 19 per cent in the Middle sector, 10 per cent in the Inner sector and 6 per cent in Peri Urban areas (DPCD 2008b). Both sets of spatial projections have the Outer sector growing strongly, particularly in the Western section of the city which has previously lagged behind in terms of development. The city's pre-existing skew towards the east is also reflected in the projections for the Outer Eastern areas of the city to grow slowly.

The strong recent population growth has implications and in the *Affordable, accessible and sustainable homes* housing strategy report it states that 'Melbourne will need at least 30 000 more homes each year just to keep up with demand' (Victorian Government 2010 p.6).

T9.2 Federal Government population projections by sector, Melbourne working zone and subsectors, 2007 to 2027

	Population ('000)	Population projections ('000)			Change in population, 2007 to 2027 ('000)	Average annual growth rate (per cent)
Sector	**2007**	**2011**	**2021**	**2027**		
Inner	296	330	423	480	184	2.4
Middle	1 857	1 928	2 091	2 187	330	0.8
Middle North	399	414	444	462	62	0.7
Middle South	413	431	473	499	86	1.0
Middle East	601	620	664	690	89	0.7
Middle West	444	463	510	536	92	1.0
Outer	1 653	1 804	2 198	2 435	782	2.0
Outer Northern	354	385	465	513	160	1.9
Outer Southern	689	749	903	995	306	1.9
Outer Eastern	400	412	439	452	52	0.6
Outer Western	210	259	391	475	265	4.2
Peri Urban	159	168	189	201	41	1.2
Me bourne work ng zone	3 965	4 231	4 902	5 303	1 338	1.5

Source: Department of Health and Ageing (2009).

T9.3 State Government population projections by subsector, Melbourne working zone, 2007 to 2026

Sector	Population 2007 ('000)	Projected population 2026 ('000)	Change ('000)	Average annual growth rate (per cent)
Inner	302	430	128	1.9
Middle	1 854	2 088	234	0.6
Middle North	400	455	56	0.7
Middle South	413	464	51	0.6
Middle East	604	675	71	0.6
Middle West	437	494	57	0.6
Outer	1 651	2 482	831	2.2
Outer Northern	353	568	216	2.5
Outer Southern	688	998	310	2.0
Outer Eastern	401	440	39	0.5
Outer Western	209	476	267	4.4
Peri Urban	160	231	71	1.9
Melbourne working zone	3 966	5 231	1 264	1.5

Source: (DPCD 2008b) Victoria in Future 2008 population projections

The state government's population projections are also broken down by age illustrating a degree of spatial variation in the age profile of the sectors. Several features include:

- A substantial increase in the number of persons aged over 65 is expected for the Melbourne working zone to 2026, with an increase of 46 per cent from 2006. The largest increase has been projected to occur in the Outer Western subsector with an increase of 79 per cent; the lowest is forecasted for the Middle North subsector at a 22 per cent increase.
- Marked differences at the sector level are projected for those in the working age bracket of between 15 and 65 years. The Melbourne working zone is projected to have an increase in the number of persons aged 15 to 65 years of 27 per cent. Yet, in the Middle sector this age group is expected to growth by only 8 per cent, substantially lower than the Inner, Outer, and Peri Urban sectors at 44, 42 and 34 per cent respectively. There is one exception to the overall growth of persons aged 15 to 65 years, with the Outer Eastern subsector projected to decline by 2 per cent from 2006 to 2026.
- The number of persons aged 14 and under is expected to grow strongly in the Outer Western subsector at an increase of 135 per cent from 2006 and 2026, which is substantially higher than the Melbourne working zone overall at 26 per cent. Two subsectors are projected to have declines in the number of youngsters with the Middle West and Outer Eastern subsectors having declines of 2 and 10 per cent respectively.

It should be noted that the most recent Estimated Residential Population (ERP) release has the 2010 Melbourne SD population estimate standing at 76 000 persons higher than the 2010 series B projections released in 2008 (ABS 2011; 2008d). The projections deviate from current population trends because of the stronger than anticipated population growth that has occurred in Melbourne between 2006 and 2010. The Melbourne working zone grew at an annual rate of 2.1 per cent from 2006, which is higher than the updated state projections that estimated Melbourne's working zone population would grow annually by 1.8 per cent over the same period (ABS 2011, DPCD 2008b). A sector that grew much faster than projected was the Middle sector with all Middle subsectors growing faster than expected, particularly the Middle West with a annual growth rate of 1.6 per cent in comparison to the projected 0.7 per cent, from 2006 to 2010 (ABS 2011, DPCD 2008b).

Map 9.1a and b present the percentage change in the projected population by SLA, from 2006 to 2026. The anticipated concentration of residential growth in the designated Growth Areas of Wyndham, Melton-Caroline Springs, Whittlesea, Hume and Casey-Cardinia is evident in these maps. Most SLAs are expected to grow up to 25 per cent, but strong population growth is expected in Melbourne's Growth Areas as illustrated by several SLAs such as Whittlesea–North, Casey-South, Melton Balance and Wyndham–West. Specifically, the Whittlesea North SLA is projected to add about 109 000 new residents, while the Pakenham, Craigieburn, Cranbourne and Wyndham North SLAs are all projected to increase their population by between 80 000 and 85 000 people by 2026 (DPCD 2008b). Only one SLA is projected to decline—Yarra Ranges–Dandenongs, from a population of 30 452 in 2006 to a population of 30 192 in 2026.

Projected growth in dwellings

It has been projected that a net additional 600 000 dwellings will be required for metropolitan Melbourne over the next 20 years from 2008, with established areas expected to increase by 316 000 new dwellings (DPCD 2009g). This projected demand for dwellings has been revised upwards due to an increase in the fertility rate and higher overseas migration (DPCD 2009g).

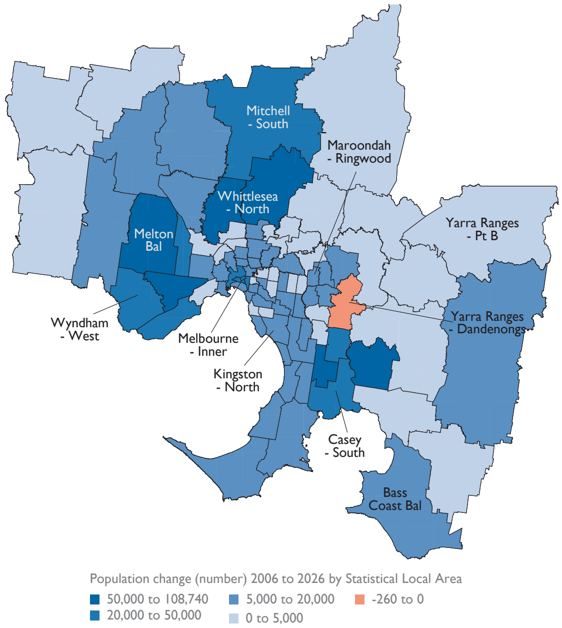
Table 9.4 presents the projected dwelling requirements by sector, from 2010 to 2024 by the DPCD (2009g). Most projected new dwellings are to be built in the Outer sector with just under 60 per cent of the projected growth between 2010 and 2024. The largest increase in dwelling numbers is projected to be in the Outer Southern subsector with over 115 000 new dwellings.

The dwelling projections by sector have different rates of increase over time. The Inner and Outer sectors have declining five yearly average annual dwelling requirements, with the Outer sector projected to increase by 20 119 dwellings annually from 2010 to 2014 while from 2020 to 2024 it is projected to increase annually by 17 962 dwellings. In contrast, the Middle sector is projected to increase its number of dwellings at an increasing rate from 9071 dwellings annually (from 2010 to 2014) to 9510 dwellings annually (from 2020 to 2024).

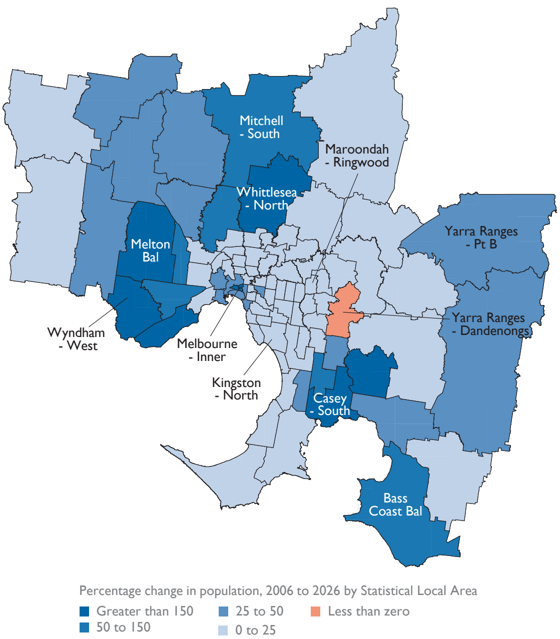
Dwelling projections have been completed for the Growth Area LGAs for Melbourne (see Table 9.5). As a proportion of the total number of projected new dwellings for Melbourne, the Growth Area municipalities share is forecast to be 45 per cent. Wyndham is expected to have the largest increase in the number of dwellings, gaining 48 615 dwellings from 2010 to 2024, with the largest increase occurring the five year period between 2010 and 2014. The Cardinia LGA is projected to add almost as many dwellings between 2010 and 2024 (46 820). Relatively low proportional growth is projected for the Casey and Hume LGAs. Most of the growth in the City of Hume is expected to occur in the SLA of Hume–Craigieburn with 21 727 dwellings added over the entire period, representing 78 per cent of the growth within the LGA of Hume.

M9.1 Percentage and absolute change in projected population by SLA, Melbourne working zone, 2006 to 2026

(a)



(b)



Source: (DPCD 2008b) Victoria in Future 2008 population projections

T9.4 Projected dwelling requirements by subsector, Melbourne SD, 2010 to 2024

Sector	Average annual projected dwellings requirements			Total number of dwellings 2010 to 2024	Proportion of dwelling distribution (per cent)
	2010 to 2014	2015 to 2019	2020 to 2024		
Inner	4 506	4 502	4 394	67 013	13.6
Middle	9 071	9 313	9 510	139 487	28.4
Middle East	2 895	2 872	2 855	43 104	8.8
Middle North	2 013	2 104	2 197	31 580	6.4
Middle South	2 180	2 269	2 306	33 788	6.9
Middle West	1 983	2 068	2 152	31 015	6.3
Outer	20 119	18 975	17 962	285 293	58.0
Outer Eastern	1 380	1 368	1 356	20 519	4.2
Outer Northern	4 758	4 430	4 130	66 597	13.5
Outer Southern	8 107	7 655	7 261	115 116	23.4
Outer Western	5 874	5 522	5 215	83 061	16.9
Me bourne SD	33 696	32 790	31 866	491 793	100.0

Source: (DPCD 2009g)

T9.5 Projected dwelling requirements by subsector, Melbourne SD, 2010 to 2024

Growth Areas LGAs	Average annual projected dwellings requirements			Total number of dwellings 2010 to 2024	Proportion of dwelling distribution (per cent)
	2010 to 2014	2015 to 2019	2020 to 2024		
Melton	2 465	2 309	2 115	34 446	7.0
Wyndham	3 409	3 213	3 100	48 615	9.9
Hume	1 960	1 738	1 889	27 942	5.7
Whittlesea	2 599	2 489	2 035	35 617	7.2
Casey	1 742	1 640	1 697	25 393	5.2
Cardinia	3 528	3 137	2 699	46 820	9.5
Growth Areas total	15 703	14 526	13 535	218 833	44.5
Me bourne SD	33 696	32 790	31 866	491 793	100.0

Source: (DPCD 2009g)

Projected changes in place of work

Melbourne SD is projected to increase its level of employment by 915 000 employed persons from 2006 to 2036 (DT 2008a). This estimate was derived by SGS (DT 2008a) by utilising the ABS Census Journey to Work data to estimate employment in Melbourne's LGAs. The Journey to Work estimates have then been benchmarked to the 2006 Labour Force Survey. From there, the industry employment trends between 2001 and 2006 were used to project short term employment estimates to 2016. Hence, it is assumed that employment trends between 2001 and 2006 are expected to continue short term.

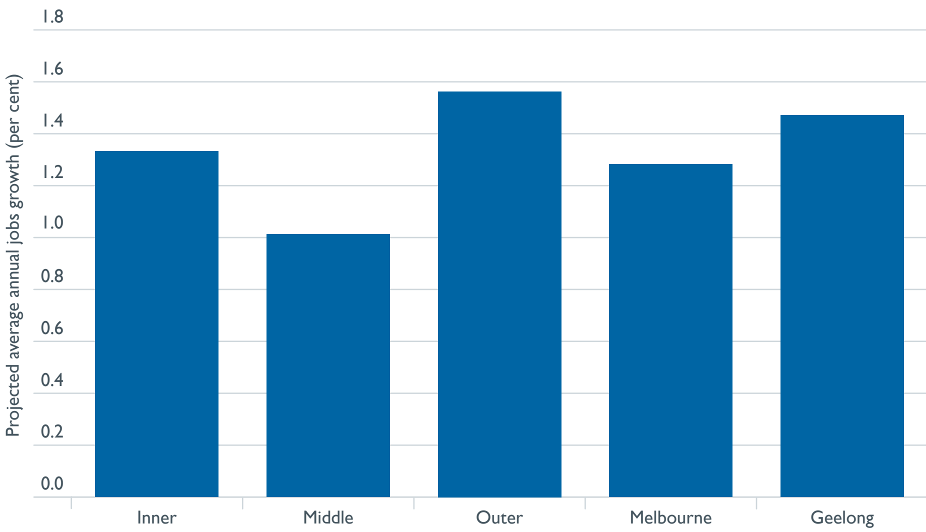
The long term projections through to 2036 were based on a 'factor analysis' which grouped LGAs into subregions that have homogenous industries and considered issues such as land availability, infrastructure projects and government policy (DT 2008a). The report conceded that overall the factors 'only had a marginal impact on the distribution of employment in 2036' (DT 2008a, p.14).

At a more spatially disaggregated level, Figure 9.1 presents the employment projections for metropolitan Melbourne and Geelong by sector from 2006 to 2036. The SGS projections anticipate that the Outer sector will grow substantially faster than the other sectors, at an average growth rate of 1.6 per cent per annum. The slowest growth is projected to occur in the Middle sector, which is 0.3 percentage points below the city's expected growth rate of 1.3 per cent per annum. Forty per cent of jobs growth is expected to occur in the Outer sector, yet despite the above-average rate of jobs growth projected in the Outer sector, this jobs growth is not expected to keep pace with population growth in Outer Melbourne which is projected to average 2.2 per cent per annum (DPCD 2008b).

Comparing the projections of employment growth with the census place of work employment (between 2001 and 2006), reveals that the projected employment for Melbourne SD is expected to grow more slowly (from 2006 to 2036), in comparison with the previous five years. The largest difference is in the Outer sector which is expected to slow to an annual rate of 1.6 per cent from an annual average employment growth rate of 2.5 per cent from 2001 to 2006. In contrast, the Inner and Middle sectors are expected to grow marginally faster at 1.3 and 1.0 per cent respectively, from an annual growth rate of 1.1 per cent in Inner and 0.9 in the Middle sector between 2001 and 2006.

Geelong's LGA has been included due to its important links with Melbourne's economy. Indeed, the projections for Geelong are for stronger average annual growth than Melbourne. Within Melbourne, the LGAs that are expected to grow strongly include the City of Melbourne (167 000 additional workers), Greater Dandenong (62 500 workers), Monash (52 500 workers) and Wyndham (52 500 workers) (DT 2008a). In contrast, Moreland (2500 extra persons employed), Nillumbik (6000 workers) and Manningham (6000 workers) are projected to have low increases (DT 2008a).

F9.1 Employment projections for Melbourne sectors and Geelong, 2006 to 2036



Note: Excludes the Peri Urban region and nclude Geelong LGA

Source: BITRE analysis of DT (2008a).

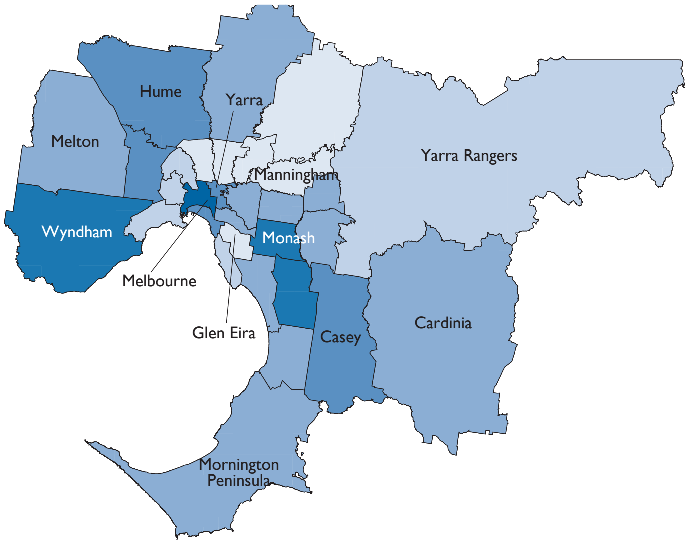
The projected labour force participation rate follows a similar decreasing pattern to Treasury's projection from the 2010 Intergenerational report, that 'the labour force participation rate for people aged 15 years and over is projected to fall to less than 61 per cent by 2049–50, compared with 65 per cent today' (Department of Treasury 2010, p. ix).

Map 9.2a and b present the projected employment growth by Local Government Area in terms of both number of employees and percentage change, from 2006 to 2036. The maps illustrate the spatial contrast in the projected employment growth. For example, at the LGA scale strong growth is projected for the Melbourne LGA, Greater Dandenong and Port Phillip (DT 2008a), while Moreland, Nillumbik and Manningham are projected to have low increases. Moreover, differences are apparent by considering the percentage change in projected employment. Melbourne LGA is expected to have the largest increase in employment with 167 000 workers but has a percentage change of 47 per cent. The largest proportional increases in projected employment are expected to occur in the Growth Areas, with Melton (125 per cent), Wyndham (118) and Cardinia (100) at or over 100 per cent.

The projections of employment and population (by age) imply that over the 2006 to 2026 period the employment self-sufficiency ratio will decline for the Inner sector and rise for the Middle sector. Variation is evident at the sector level, with the Middle East, Middle West and Outer East projected to improve their self-sufficiency, while self-sufficiency is projected to decline in the Outer West and Outer North as jobs grow less rapidly than the working age population.

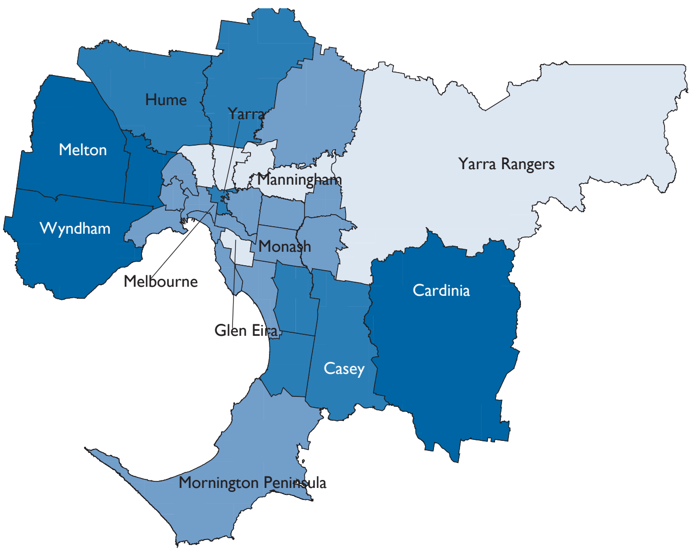
M9.2 Percentage change and absolute change in projected employment by LGA, Melbourne, 2006 to 2036

(a)



Projected employment growth (number) by Local Government Area, from 2006 to 2036
Greater than 100,000
50,000 to 100,000
25,000 to 50,000
15,000 to 25,000
10,000 to 15,000
Less than 10,000

(b)



Projected employment growth (per cent) by Local Government Area, from 2006 to 2036
Greater than 75
50 to 75
25 to 50
Less than 25

Source: (DT 2008a)

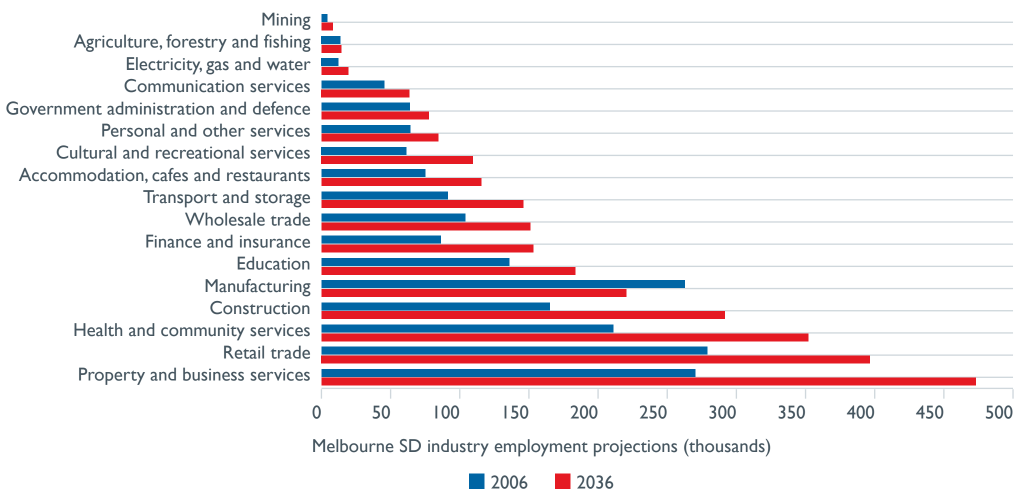
Industry employment

At the national level, industries projected to have the most substantial employment growth through to 2014–15 are Health care and social assistance (211 500 new jobs), Construction (120 800) and Education and training (119 000) (Skillsinfo 2010). This is slightly different for Melbourne's industry employment projections, with the largest growth occurring in the Property and business services and Retail trade industries to 2016 (DT 2008a). However, Manufacturing is expected to decline in both Melbourne and in the national economy (Skillsinfo 2010, DT 2008a).

Taking industry employment projections over a longer period, from 2006 to 2036, for the Melbourne SD suggest that strong employment growth will occur in most industries, particularly in the Property and business services, Retail trade, Health and community services and Construction industries (see Figure 9.2) (DT 2008a). Conversely, one industry is projected to decline, Manufacturing with a loss of 42 100 jobs but this industry still remains an important employer for the city (DT 2008a).

Considering the average annual projected industry employment growth for Melbourne between 2006 and 2036 provides a slight different picture than the absolute numbers. For example, mining is the smallest industry employer for Melbourne, yet it is projected to have the highest average annual growth rate at 2.2 per cent per annum (DT 2008a). Other industries projected to grow strongly are the Cultural and recreational services and *Finance and insurance* industries both at 1.9 per cent per annum (DT 2008a). Again, Manufacturing is projected to decline at a loss of 0.6 per cent per annum, from 2006 to 2036. Melbourne overall is projected to increase employment by 1.3 per cent annum over the same period (DT 2008a).

F9.2 Industry employment projections, Melbourne SD, 2006 to 2036



Note: Excludes the Peri Urban region.

Source: DT (2008a)

What are the implications of these projections for commuting patterns?

These spatial projections of the residential population and of employment have implications for spatial patterns of commuting within Melbourne through to 2026.

Chapter Eight showed that over two-thirds of the observed variation in the growth in commuting flows could be explained by just two factors—growth in employed residents in the origin SLA and growth in jobs in the destination SLA. This change model for the Melbourne SD (see Table 8.12) serves as a device for identifying the commuting implications of the available population and employment growth projections.

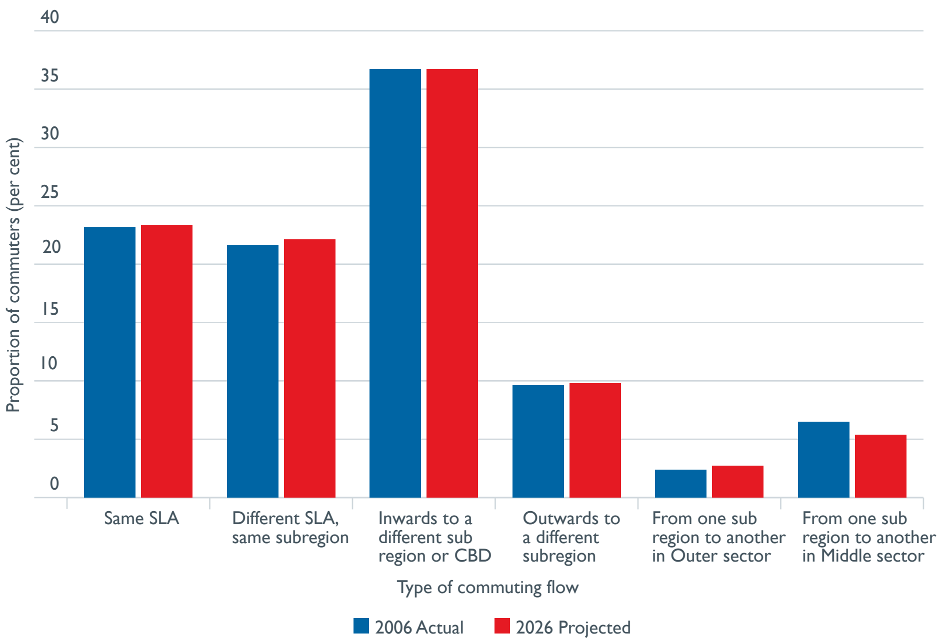
This exercise is undertaken for exploratory purposes only, and is not intended to be predictive. The available projections of residential and jobs growth are inputted into BITRE's model of change in commuting flows to provide some indicative information about likely outcomes in terms of spatial commuter flows *if the population and jobs growth projections are realised*. The approach involves several assumptions:

- The change model for the 2001 to 2006 period explains about two-thirds of the observed variation. All other factors that may influence origin-destination commuter flows—apart from residential and jobs growth—are assumed constant.
- The parameters in the change model are assumed to remain stable over time. The model was estimated for a short term time horizon (i.e. 2001 to 2006), but is being applied to a much longer time period (i.e. 2006 to 2026), over which fundamental changes in the nature of the relationship are likely.
- In calculating average commuting distance, the road distance between each origin-destination pair is assumed to remain unchanged.

First, we will consider the implications of the *Victoria in Future 2008* population projections (DPCD 2008b) combined with the SGS employment projections (DT 2008a). Both sets of projections relate to the 2006 to 2026 period. The growth in employed residents between 2006 and 2026 is assumed to equal the growth rate of the working age population (15 to 64 year olds) for the SLA. While BITRE's change model and the Victorian government population projections are at the SLA scale, the employment projections are only available for SLAs. For the purposes of exploring the commuting implications of these projections, each SLA's projected employment growth rate for 2006 to 2026 has been assumed to equal the projected employment growth rate from DT (2008a) for the LGA to which that SLA belongs.

Figure 9.3 presents information on the estimated change in different types of commuting flows between 2006 and 2026, should the population and employment projections be realised. The chart conveys a picture of stability in the overall structure of commuting flows within the Melbourne SD.[68] There is, however, a slight reduction in the relative importance of commuting from one subregion to another in the Middle sector, reflecting the relatively low rates of projected population and jobs growth in that sector between 2006 and 2026. The self-containment rate, measured at the subsectoral scale, is also expected to rise by about 1 percentage point, due to growth in the relative importance of commuting flows to a different SLA in the home subsector.

F9.3 Estimated commuting flows in 2026 (compared to 2006) if spatial population and employment projections are realised, disaggregated by type of flow, Melbourne working zone



Note: Relates to Melbourne Statistical Division.

Source: BITRE analysis of DT 2008a and DPCD 2008b us ng Me bourne regression results from Table 8.12.

Table 9.6 highlights the origin-destination combinations of sectors that are expected to account for a large proportion of growth in commuting, should these spatial projections of population and employment be realised. The six origin-destination pairs in the table together account for about half of the increase in commuter flows between 2006 and 2026 implied by the Victorian Government's spatial projections of population and jobs. Commuter flows within the Outer Southern sector are expected to account for more than one-sixth of all additional commuter flows, reflecting the large projected increases in the number of residents and jobs in that sector through to 2026 (see Tables 9.3 and 9.6). Commuter flows within the Inner, Outer Western and Outer Northern sectors are each expected to account for between 7 and 9 per cent

68 This can be contrasted to the situation for Perth (see BITRE 2010) where the projections involved more of a departure from the existing spatial distribution of population/jobs and were associated with a greater expected change in the spatial structure of commuting flows between 2006 and 2031 (away from inward commutes and towards commutes within the home SLA).

of the increase in the number of commuters. While within-sector flows dominate growth, commuting from the Outer Western sector to both the Middle West and Inner sectors is also expected to make a notable contribution to growth in commuting flows, under this scenario.

T9.6 Principal expected contributors to growth in commuting flows, Melbourne SD, 2006 to 2026

Subsector of residence	Subsector of work	Actual proportion of commuting flows, 2006 (per cent)	Estimated proportion of commuting flows in 2026 if population and employment projections are realised (per cent)	Estimated share of total change in number of commuters, 2006 to 2026 (per cent)
Outer Southern	Outer Southern	10	13	18
Inner	Inner	7	7	9
Outer Western	Outer Western	2	4	8
Outer Northern	Outer Northern	4	5	7
Outer Western	Middle West	1	3	5
Outer Western	Inner	1	2	4

Source: BITRE analysis of DT 2008a and DPCD 2008b us ng Melbourne regression results from Table 8.12.

At the more detailed LGA scale, the implications of the available spatial projections of population and employment are for growth in commuters to be concentrated:

- Within the Wyndham LGA (more than 5 per cent of growth)
- Within the Casey, Melbourne and Hume LGAs (3 to 4 per cent of growth each)
- For commuting from Casey to Dandenong and from Wyndham to the City of Melbourne (2 to 3 per cent of growth each).

Thus, the spatial projections of population and employment imply substantial growth in commuter travel for these origin-destination pairs, which would involve increased demand for public transport and road infrastructure that facilitates these commutes between now and 2026. Some of the implications of this growth have been recognised in the Victorian Government's infrastructure planning. Relevant examples include the $1.9 billion Outer Suburban Arterial Roads program and the $4.3 billion Regional Rail Link project, which is intended to 'free up critically needed space for additional suburban services on the Werribee, Sunbury and Craigieburn lines' to the city (DT 2011a). While rail infrastructure is likely to play an important role in accommodating increased commuting to the CBD, the expanding volume of shorter distance commuting flows *within* the Wyndham, Casey and Hume LGAs is likely to require investment in road infrastructure and expanded bus services.

Another implication of these population and employment projections is that average commuting distance is likely to rise between 2006 and 2026, primarily because the projections for strong outer suburban growth are associated with an increase in the relative importance of journeys to work which involve a road distance of more than 30 kilometres.[69]

69 The est mated increase of 4 per cent is conservative as we have not factored in the effect that expand ng urban sprawl could have on ncreasing the average road distance involved in travelling from a spec fic outer suburban SLA to an nner or middle SLA over this period of t me. Instead, in calculat ng average commut ng distance, the road distance between each orig n-dest nation pa r is assumed to remain unchanged.

The Australian Government Department of Health and Ageing (2009) has produced an alternate set of population projections, which was used to test the sensitivity of these findings. The commuting implications were robust to the choice of population projections, which is not surprising given the two sets of population projections are broadly similar. There were some minor differences, with the Department of Health and Ageing (2009) projections, relative to the DPCD (2008b) projections, implying that:

- Commuting flows within the Inner sector account for a greater proportion of the overall increase in commuter flows (12 per cent, compared to 10 per cent under DPCD 2008b). Growth in commuter flows within the City of Melbourne LGA was the major contributor to this result.
- Commuting flows within the Outer Northern and Outer Southern sectors account for a slightly lower proportion of the overall increase in commuter flows.
- Average commuting distance would still increase from 2006 to 2026, but due to more rapid growth in the inner suburbs, the increase would be less than under DPCD (2008b).

Transport projections

The *Victorian Transport Plan 2008* (DT 2008b) presented a range of transport-related projections. These projections relate to all sources of transport demand, with the journey to work being just one component of overall demand. Commuter travel is however a very important component of overall transport demand, particularly during peak periods. According to the VTP,

> 'In the next 25-30 years, we expect to have an additional 1.7 million people living in Melbourne. This means that the network will need to support over 6.6 million extra car trips and one million extra public transport trips every day.' (DT 2008b, p.87)
>
> 'If no action is taken, many of Melbourne's major roads will be at or over capacity by 2020 and the metropolitan train network will "hit the wall" by 2014' (ibid p.22).

The VTP predicts strong growth in patronage for all public transport modes through to 2036, but metropolitan trains are predicted to accommodate the majority of the increased demand. As shown in Figure 9.4, metropolitan train patronage is forecast to double between 2010–11 and 2020–21. Regional train patronage is predicted to grow very rapidly through to 2036, off a low base.

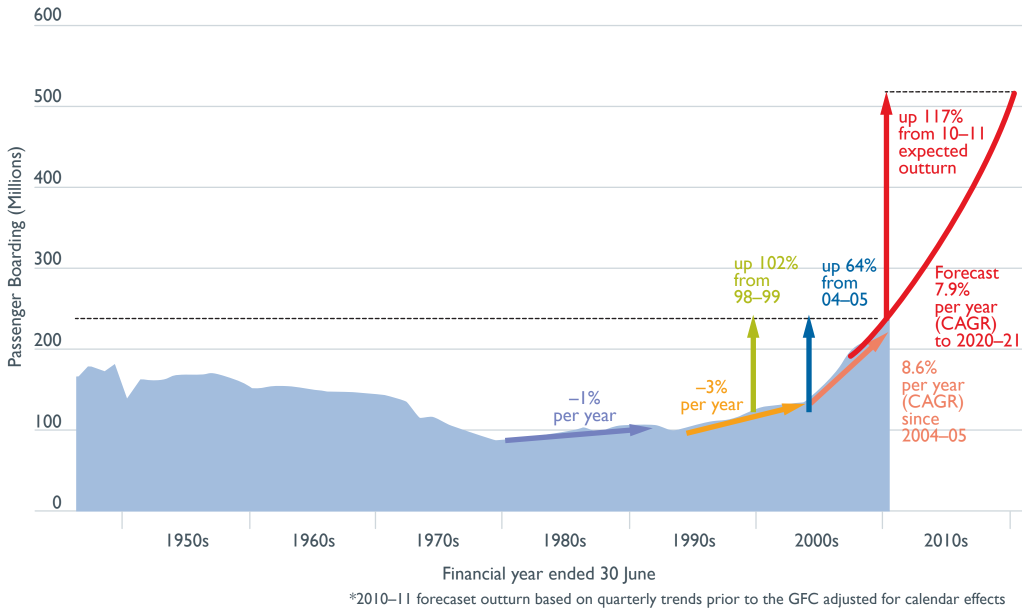
Chapter 6 presented evidence that the substantial increase in petrol prices, combined with population growth, densification of inner Melbourne and shifts in environmental attitudes, were key contributors to the recent increase in public transport patronage in Melbourne. These factors may continue to be important drivers of mode choice over the next two decades, potentially creating significant shifts in mode shares over time.

A study commissioned by the Australian Sustainable Built Environment Council (ASBEC) contained projections that the average distance travelled per person per day in the Greater Melbourne area[70] will increase marginally through to 2041 (see Table 9.7). The study also suggested that 'people in South East Queensland and Greater Melbourne will see their travel time increase by approximately 26 and 23 per cent, respectively, by 2041' (ASBEC 2010, p.iii).

70 ASBEC (2010) defines the Greater Melbourne area as including the Melbourne SD along with Geelong, Bendigo and Ballarat.

Moreover, the study concludes that 'our urban centres will become more transport intensive and less transport efficient' as a result, 'congestion will worsen, travel times become longer and transport related greenhouse gas emissions increase' (ASBEC 2010, p.1).

F9.4 Metropolitan train patronage, 1946 to 2021



Source: Victorian Department of Transport.

T9.7 Estimated travel time and distance, Greater Melbourne Area, 2006 to 2041

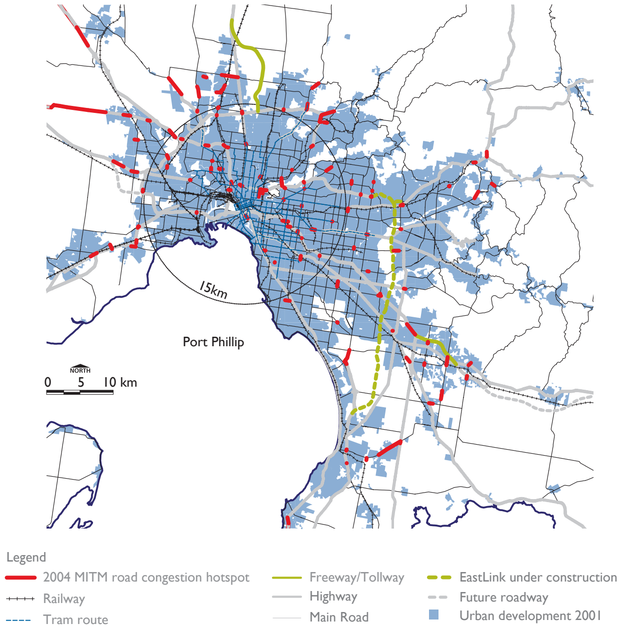
	2006	2021	2026	2031	2036	2041
T me spent travelling (m nutes per person per day)	55	62	64	65	67	68
Kilometres travelled (per person per day)	43.0	45.6	46.3	46.9	47.4	47.9

Source: ASBEC (2010, p.42).

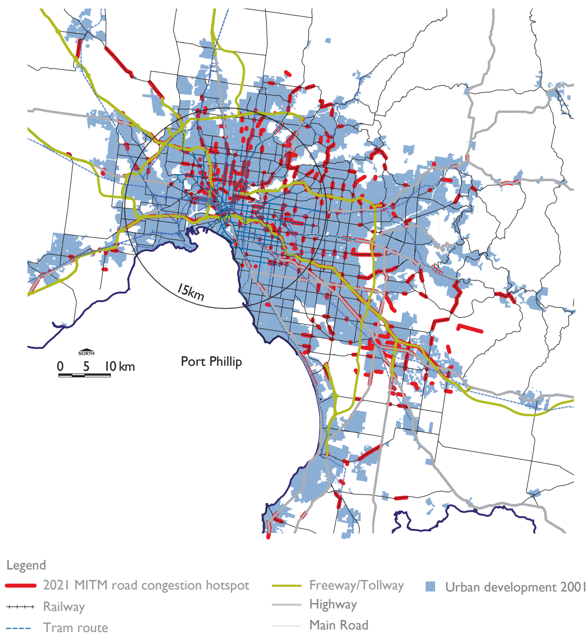
Congestion costs in Melbourne have been projected to double between 2005 and 2020 to reach $6.1 billion (BITRE 2007). Based on the results of Victorian Government modelling, Map 9.3 displays the spatial distribution of Melbourne's congestion hotspots during the morning peak in 2021 and how it compares to the situation in 2004. Clearly, the congestion hotspots are much more extensive in the 2021 map. VCEC (2006) notes that congestion delay costs are expected to increase in all areas of Melbourne, but the greatest growth is expected within 15 kilometres of the CBD. Potential emerging congestion problems are evident in the Casey and Greater Dandenong LGAs in the Outer Southern subsector (see Map 9.3). Freeways and highways are expected to account for a rising proportion of congestion delay costs, and this pattern is particularly pronounced for Melbourne's western suburbs (VCEC 2006).

M9.3 Modelled congestion hotspots on arterial roads in Melbourne (am peak), 2004 and 2021

(a) 2004



(b)2021



Note: Modell ng of congestion hotspots has a number of l mitations. See VCEC (2006) for further detail.

Source: Figures 3.2 and 3.3 from VCEC (2006) p.72–73

Urban scenarios

In 2009, the Victorian Department of Transport also published a report entitled *Macro-Urban Form, Transport Energy Use and Greenhouse Gas Emissions: An Investigation for Melbourne*. The report's aim was 'to establish the potential over the longer term for reducing transport energy needs and GHG emissions, specifically in Melbourne, by modifying urban forms and transport infrastructure' (DT 2009e, p.9).

The report considered ten different scenarios[71] which correspond to different visions for the development of Melbourne to 2031, 'according to how, in the future, population growth may be distributed, and its transport infrastructure shaped' (DT 2009e, p.55). Hence, these scenarios provide a vision of very different urban outcomes for the city[72]. The assumed scenarios include:

- The Non-intervention scenario which has little variation from the base case with stronger population and employment growth occurring in selected outer suburbs.
- A scenario that focuses growth in activity centres and the designated Growth Areas illustrates strong population and employment growth exclusively in these selected areas whilst negative growth dominates elsewhere.
- The Super CBD and the Inner city scenarios have a greater share of the population and employment in the inner region, which is far more pronounced under the Super CBD scenario. In terms of employment both scenarios have high growth in both the inner and middle regions of the city.
- Both polycentric scenarios illustrate strong population and employment growth in the designated centres that have been chosen.

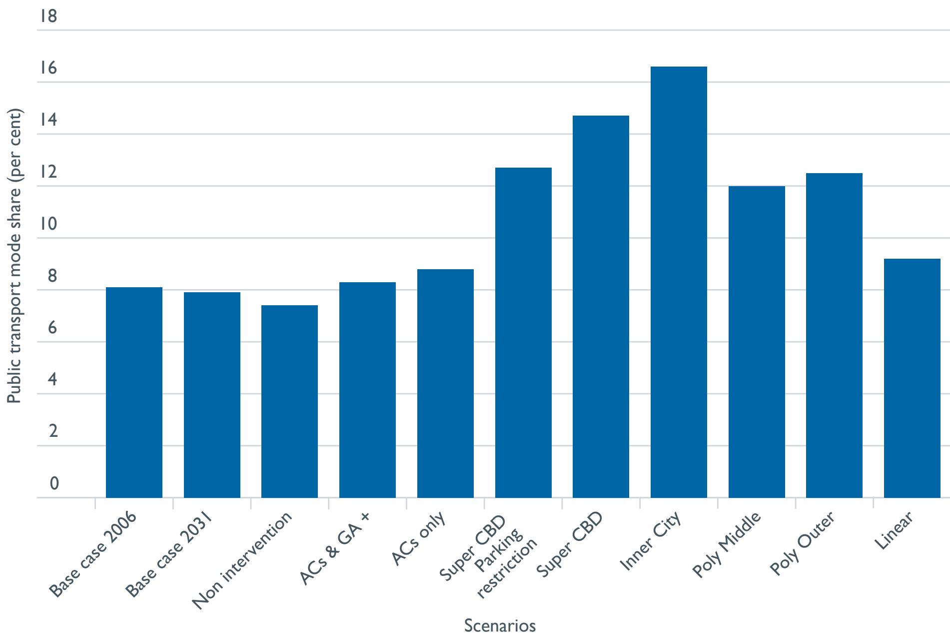
These different scenarios illustrate the variation that can occur in terms of relevant outcomes. For example, the projected public transport mode share in 2031 varies depending on the scenario (see Figure 9.5). The base case remains around 8 per cent for trips taken by public transport. The largest increase in public transport use is expected in the Inner city scenario with a rise of over 8 percentage points from the Base case. This is due to the Inner city scenario having a strong focus on building higher density around the tram network, faster tram speeds, and the upgrading of the tram network. Only the Non-intervention scenario is expected to result in a decline in public transport use.

While the report focus is on reducing transport energy needs and GHG emissions, an argument is raised that 'on the basis of the scenario modelling, that to effectively reduce private car VKT…in Melbourne, significant urban development is required not just in inner areas, but also in middle and/or outer suburban activity centres' (DT 2009e, p.177).

71 The ten scenarios were: Current trend/base case; Non-intervention; focus on Activity centres and Growth areas; focus on Activity centres only; Super CBD; Super CBD–Parking prohibition variant; Inner city; Polycentric–Outer centres; Polycentric–Middle centres; and Linear development (DT 2009e, p.55).

72 The report provides a series of maps on the differences in the population and employment for each scenario.

F9.5 Public transport mode share for all scenarios, 2006 and 2031



Note: Scenario results relate to 2031.

Source: DoT (2009e, p.130) replication of chart

Summary

This chapter summarises the outlook for Melbourne in terms of spatial projections of population, dwelling and employment over the next 15 to 30 years.

Melbourne's population is projected to growth annually by 1.2 per cent, to accommodate over 6.7 million residents by 2056. Population projections by sector suggest that the Inner and Outer sectors will continue to increase at faster rates than the Middle sector, but all are expected to increase. Just under 500 000 new dwellings are likely to be required to accommodate the growth in Melbourne's population, with most being built in the Outer sector (58 per cent), particularly in the Outer Southern subsector of the city.

Melbourne SD's employment is projected to increase by 915 000 workers from 2006 to 2036. The Outer sector's employment is expected to grow faster than the other sectors, at 1.6 per cent per annum. The Inner and Middle sectors employment is projected to grow at a rate of 1.3 and 1.0 per cent annually over the same period.

Should these population and employment projections be realised, BITRE's change model suggests the overall structure of commuting flows will be stable in terms of the mix of inward commutes, outward commutes, same SLA commutes etc. Commuter flows within the Outer Southern subsector are expected to account for more than one-sixth of all additional commuter flows, reflecting the large projected increases in the number of residents and jobs in that subsector through to 2026. It is expected also that average commuting distance will rise.

CHAPTER 10
Reviewing the evidence

The aim of this report has been to provide key stakeholders with an evidence base on the spatial nature of changes in population, jobs and commuting flows in Melbourne in the post-2001 period. This chapter presents an overview of the main findings of the analysis. It begins with a summary of shifts in the spatial distribution of population and employment as well as a description of commuter use of different transport modes in Melbourne.[73] This is followed by analysis of the spatial patterns of commuting in Melbourne and a discussion of how commuting behaviour has responded to the observed changes in employment and population. Finally, some observations are made about the extent to which there has been progress against key urban policy goals that relate to shaping the spatial distribution of population, employment and commuting in Melbourne.

Residential and jobs growth

Historical overview of residential and jobs growth

While Melbourne is Australia's second most densely populated city, its suburbs are distinctive for an 'emphasis on low density houses in garden settings' (Birrell et al 2005, p. 05–1). The population of the Melbourne SD grew from 501 580 in 1901 to 2.8 million in 1981, and by 2006 it had added a further 936 715 people to reach 3.7 million (ABS 2008a). The average annual rate of population growth was 1.2 per cent between 1981 and 1991 and 1.0 per cent between 1991 and 2001 (ABS 2008a), but has been higher than this in recent years, with growth averaging 1.8 per cent from 2001 to 2010 (ABS 2011).

The Outer sector has grown rapidly since 1971, and accounts for 78 per cent of the Melbourne SD's total population increase between 1981 and 2006 (DPCD 2008d). The Outer Southern sector experienced the largest population increase, but the Outer Western sector grew more rapidly, averaging 5 per cent growth per annum. Melbourne's Inner and Middle sectors experienced population losses between 1981 and 1991, but since 1991 all three sectors have experienced positive growth, with the Inner sector growing more rapidly than the Outer sector since 1996 (ibid).

73 The evidence presented about spatial changes n population, employment, transport and commut ng is based on the BITRE analysis of the ABS Census of Population and Hous ng, ERP, the Department of Transport's VISTA survey and the ABS-VicRoads dataset, as presented n the body of this report, unless another source is specified.

Since 1961 there has been considerable dispersal of employment away from the inner city and towards the middle and outer suburbs. In 1961, 55 per cent of jobs were located in the Inner sector, but this fell to 28 per cent by 2001 (O'Connor 2006). The City of Melbourne LGA's employment share fell from 31 to 19 per cent between 1971 and 2001, while the Monash, Hume, Kingston and Dandenong LGAs emerged as significant employment hubs (DPCD 2008a).

The principal trends impacting on Melbourne's industry structure over these last few decades have been the decline of the manufacturing industry and the rise in consumer and business services. With decentralisation, jobs moved from the inner suburbs to larger sites in the outer suburban LGAs of Hume, Greater Dandenong and Knox (DPCD 2008a). All LGAs experienced growth in Property and business services employment between 1971 and 2001, particularly the City of Melbourne and Port Phillip LGAs (ibid). While the inner city has maintained its dominance of new economy employment, the middle and outer suburbs have come to offer an increasingly diverse range of job opportunities (O'Connor and Rapson 2003).

Residential growth, 2001 to 2010

The population of the Melbourne working zone increased by 628 000 persons from 2001 to 2010, to reach 4.25 million[74], which represents an average annual growth rate of 1.8 per cent (ABS 2011). The average annual growth rate increased from 1.5 per cent in the pre-2006 period to 2.2 per cent in the post-2006 period (ibid).

As of 2010, 46 per cent of the city's population lives in the Middle sector, 43 per cent in the Outer sector, 7 per cent in the Inner sector and 4 per cent in Peri Urban areas. Between 2001 and 2010, the annual rate of population growth was greatest for the Inner sector (3.0 per cent), followed by the Outer sector (2.6 per cent), the Peri Urban sector (1.8 per cent) and the Middle sector (1.0 per cent). The Outer Western sector experienced very rapid population growth, averaging 7.3 per cent growth per annum. The average annual rate of population growth was highest in Wyndham South (25 per cent), Southbank-Docklands (17 per cent), Whittlesea North (15 per cent) and Melton East (15 per cent), reflecting a shift in the focus of growth to the north and west of the city.

Melbourne's increased population was accommodated largely through expanded residential development on the urban fringe but also through redevelopment of some existing suburbs, particularly in the Inner sector. Fifty eight per cent of the city's population growth between 2001 and 2010 occurred in the Outer sector, 26 per cent in the Middle sector, 12 per cent in the Inner sector and 4 per cent in Peri Urban areas. The Outer Southern sector contributed 23 per cent of growth, while the Outer Western sector contributed 20 per cent. At the SLA scale, Melton East added the most people (41 600), followed by Whittlesea North (33 800), Wyndham North (33 400), Casey–Cranbourne (32 600) and Casey–Berwick (32 200) (ABS 2011).

As a whole, the Outer sector recorded strong population growth from 2001 to 2006, but there were also some significant concentrations of population loss in some of the more established outer suburbs (e.g. St Albans, Frankston, Broadmeadows). Major focal points of population growth over this period include the suburbs of Point Cook, Caroline Springs and Taylors Hill (on the city's western fringe), Narre Warren South and Berwick (in the outer south-east), South Morang (on the northern fringe), as well as the suburb of Melbourne.

74 The 2010 ABS ERP figures presented n this section rema n prel minary.

The population density of the Melbourne urban area increased from 1455 to 1566 persons per square kilometre between 2001 and 2006, with the largest increases occurring in the Inner sector, particularly in the suburbs of Melbourne, Southbank and Carlton. This reflects a shift towards higher density forms of housing. Over two-thirds of Melbourne's suburbs raised their population density between 2001 and 2006, sometimes by a very substantial amount.

Employed residents accounted for 53 per cent of Melbourne's population increase between 2001 and 2006. The number of employed residents grew more rapidly than population, with an average annual growth rate of 1.8 per cent, compared to 1.5 per cent for population. However, the areas that experienced the largest population growth also typically recorded very substantial growth in employed residents.

Employment growth, 2001 to 2010

Melbourne's employment is concentrated in the inner suburbs, while population is concentrated in the middle and outer suburbs. In 2006, the Inner sector accounted for just 8 per cent of the Melbourne working zone's population, but 28 per cent of employment. The Middle sector contained 47 per cent of population and 39 per cent of jobs, while the Outer sector had 42 per cent of population and 31 per cent of jobs.

The City of Melbourne LGA, with 297 300 jobs in 2006, accounts for 19 per cent of Melbourne's employment. Other major contributors to employment are Kingston North (61 300 jobs) and Port Phillip West (48 000 jobs). To Melbourne's west the recently developed SLAs of Melton East and Wyndham West are essentially dormitory suburbs, offering less than one job for every five employed residents.

The Outer sector accounted for 51 per cent of Melbourne's jobs growth between 2001 and 2006 and grew by 2.5 per cent per annum, which exceeded the Melbourne average of 1.5 per cent. Jobs growth was strongest in the Outer Western (6.6 per cent) and Outer Southern (2.8 per cent) subsectors and slowest in the Middle North (0.4 per cent) and Middle South (0.5 per cent).

Melbourne's jobs growth was widely dispersed throughout the metropolitan area. The major contributors to jobs growth were Southbank-Docklands which added 10 500 jobs between 2001 and 2006, Wyndham North (+8100) and Greater Dandenong Balance (+5500)—the latter two results reflect very strong jobs growth in the West and South Industrial Nodes. Melbourne Airport and the Monash University/Health Research Precinct also made important contributions to jobs growth. The most rapid rates of jobs growth occurred in the Outer sector SLAs of Melton East, Wyndham South and Wyndham West. However, significant job losses did occur in Moreland–Coburg (–1600 jobs), Moreland–Brunswick (–1100 jobs) and Stonnington–Prahran (–1000 jobs).

In 2006, the major employing industries in Melbourne were Retail trade (14.8 per cent of employment), Manufacturing (14.0 per cent), Property and business services (12.9 per cent) and Health and community services (10.7 per cent). Property and business services was the major employing industry for the Inner sector, Retail trade was the major employer for the Middle and Peri Urban sectors, while Manufacturing was the major employer in the Outer sector. Melbourne's SLAs each had their own distinctive mix of industries. Some were specialised in manufacturing (e.g. Kingston North, Broadmeadows), and others in transport (e.g. Wyndham North, Craigieburn) or health (e.g. Yarra North, Heidelberg).

From 2001 to 2006, jobs growth was greatest for Health and community services (which added 29 400 jobs), Construction (23 200) and Government administration and defence (21 500). Manufacturing employment declined by 20 400 jobs within the Melbourne working zone.

The industry drivers of jobs growth varied across Melbourne. Government administration and defence was the largest contributor to jobs growth in the Inner sector, while Health and community services was the major contributor in the Middle, Outer and Peri Urban sectors. The Transport and storage industry also played an important role as the major contributor to jobs growth in the Middle West and Outer Northern subsectors. The strong jobs growth in Southbank-Docklands was primarily attributable to the Finance and insurance industry. Going against the city-wide trend, the substantial jobs growth in Wyndham North and Greater Dandenong Balance was primarily due to the Manufacturing industry.

Melbourne maintained strong employment growth between 2006 and 2010, averaging 2.5 per cent per annum growth (ABS 2010a). The Accommodation and food services industry has emerged as a key contributor to Melbourne's recent jobs growth and there have been continued increases in education, health and retail employment (ibid). The City of Melbourne LGA grew particularly rapidly, adding more than 50 000 jobs between 2006 and 2008 (City of Melbourne 2009).

Future growth projections

According to official population projections (ABS 2008b), Melbourne is projected to increase its population by 1.2 per cent per year, on average, between 2006 and 2056. This is a considerably lower projected growth rate than Perth and Brisbane, but higher than projected growth in Sydney and Adelaide. Melbourne is projected to reach a population of 5 million people by 2025 (ibid).

The Victorian Government's spatially disaggregated population projections (DPCD 2008b) estimate that 66 per cent of the Melbourne working zone's population growth from 2007 to 2026 will occur in the Outer sector, 19 per cent in the Middle sector, 10 per cent in the Inner sector and 6 per cent in Peri Urban areas. The Outer sector is projected to add 831 000 new residents, 310 000 in the Outer South, 267 000 in the Outer West and 216 000 in the Outer North. The Whittlesea North SLA is projected to add about 109 000 new residents, while the Pakenham, Craigieburn, Cranbourne and Wyndham North SLAs are all projected to increase their population by between 80 000 and 85 000 people by 2026 (ibid). The federal government has produced an alternate set of spatial population projections (DHA 2008), which are broadly similar, but do project greater consolidation of population within the established inner and middle suburbs.

Between 2010 and 2024, the Victorian Government has projected that 492 000 new dwellings will be required within the Melbourne SD to house this growing population (DPCD 2009g). The projections indicate that 58 per cent of these new dwellings will be in the Outer sector, largely in the six designated Growth Area LGAs (ibid).

According to employment projections prepared for the Victorian Government (DT 2008a), the Melbourne SD is projected to gain 915 000 jobs between 2006 and 2036, reflecting average annual growth of 1.3 per cent per annum. The Property and business services and Retail trade industries are projected to experience the largest increases in employment, while Manufacturing is expected to decline (ibid).

Forty per cent of jobs growth is expected to occur in the Outer sector, which is expected to grow substantially faster than the other sectors, at an annual average growth rate of 1.6 per cent per annum. Nevertheless, jobs growth in the Outer sector is not expected to keep pace with population growth, with average annual growth rates of 1.8 per cent and 2.2 per cent respectively through to 2026 (DT 2008a, DPCD 2008b). Employment in the Middle sector is expected to grow relatively slowly, averaging 1.0 per cent per annum from 2006 to 2036 (DT 2008a). Within Melbourne, the LGAs that are expected to grow strongly through to 2036 include Melbourne (167 000 additional workers), Dandenong (62 500), Monash (52 500) and Wyndham (52 500) (DT 2008a).

Transport usage

Melbourne is a car dependent city, with 77 per cent of employed residents travelling to work by private vehicle in 2006, while 13 per cent used public transport, 4 per cent walked and 1 per cent cycled. Residents of the Outer sector were most car dependent, with 85 per cent travelling by private vehicle. Access to Outer sector jobs was even more reliant on private vehicles (88 per cent).

Inner Melbourne had the highest proportion of employed residents travelling to work by public transport (26 per cent), bicycle (4 per cent) and by foot (16 per cent). It also had the highest proportion of jobs accessed by public transport (38 per cent) and bicycle (3 per cent), but jobs in Peri Urban areas were more likely to be accessed by foot (6 per cent). Only 1 per cent of Peri Urban jobs and 3 per cent of Outer sector jobs were accessed by public transport.

While only 19 per cent of Melbourne's employment was located in the City of Melbourne LGA, 65 per cent of commuter public transport usage involved travel to a workplace in the City of Melbourne and 78 per cent involved travel to a workplace in the Inner sector. This reflects the city's radial rail and tram networks. Although the Outer sector has an employment share of 31 per cent, less than 6 per cent of commuter use of public transport was to a workplace in the Outer sector.

The overall public transport mode share declined in Melbourne from the late 1970s through to the mid 1990s, but since then public transport patronage has grown and the mode share has been rising strongly from 2005 to 2009 (BITRE 2011a). Returning the focus to commuting trips, between 2001 and 2006, the public transport mode share rose from 12.4 to 13.2 per cent, while the private vehicle mode share declined from 78.2 to 76.7 per cent. There was also a clear shift towards cycling and walking for the journey to work. The reduction in private vehicle mode share was most pronounced amongst Inner sector residents, with public transport use also declining, while the walking and cycling mode shares rose strongly. Middle sector residents switched away from private vehicles towards public transport and walking, but mode shares remained stable in the Outer sector. On a place of work basis, the reduction in the private vehicle mode share was heavily concentrated in the Inner sector—from 2001 to 2006 there was an increase in the proportion of Outer and Peri Urban jobs that were accessed by private motor vehicle.

The *Victorian Transport Plan 2008* projects strong growth in public transport patronage through to 2036, with trains predicted to accommodate the majority of the increased demand (DT 2008b). However, scenario modelling work done by DT (2009e) demonstrates how the future public transport mode share will depend on policy actions regarding urban form and infrastructure investment. For example, the modelled 2031 public transport mode share ranges from a low of 7 per cent under a non-intervention scenario to a high of 16 per cent under a scenario in which population and employment are heavily concentrated in the Inner City and the tram network is substantially upgraded (DT 2009e).

Commuting flows

Overview of Melbourne commuting flows in 2006

About 1.6 million workers commuted to a known place of work within the Melbourne working zone in 2006. Melbourne attracts about 23 600 workers or 1.4 per cent of its workforce from regional Victoria, particularly from Geelong, Ballarat, Latrobe Valley and Bendigo. Just over 18 000 Melbourne residents commuted to a place of work in another working zone.

Turning to commuting flows *within* the Melbourne working zone, we find that trips to work in an inward direction dominate those in an outward direction (37 and 9 per cent respectively), while 24 per cent of all commutes occur within the home SLA and a further 22 per cent of commutes are to a different SLA within the home subsector. The most common form of inward commutes is journeys to a workplace in the CBD (i.e. the Melbourne Inner SLA). The probability of commuting to the CBD exceeds 20 per cent for employed residents of nearby areas (e.g. Southbank-Docklands, Prahran), but is under 5 per cent for many urban fringe SLAs (e.g. Berwick, Melton Balance, Pakenham, Whittlesea North).

Almost 765 000 people worked in their home subsector denoting a *self-containment rate* of 44 per cent. Self-containment was highest for the Inner sector (68 per cent) and lowest for the Middle North (29 per cent) and Outer West (30 per cent). The Inner sector drew 77 per cent of its workers from beyond its boundaries, compared to 51 per cent for the Middle sector, 32 per cent for the Outer sector and just 20 per cent for the Peri Urban sector. There were strong commuting flows from the Middle sector to the Inner sector, with between 28 and 33 per cent of employed residents of each Middle subsector commuting to a place of work in the Inner sector. Outer Western residents had a relatively high likelihood of commuting to a place of work in the Inner sector (22 per cent of residents) and the Middle West sector (24 per cent).

At the SLA scale, the ten most common commuter journeys were all trips within the home SLA (e.g. 12 963 Kingston North residents travelled to a workplace in Kingston North). The most common inter-SLA flows were typically journeys to work in the CBD from nearby areas such as Melbourne Remainder, Yarra North and Prahran. Other substantial flows, with between 4000 and 5000 daily commuters each, were Craigieburn to Broadmeadows, Kingston South to Kingston North, and Frankston East to Frankston West. Residents of Southbank-Docklands and Melbourne Remainder had a very high probability of commuting to a place of work in the CBD (29 and 24 per cent, respectively), while residents of Wyndham West had a similarly high probability of commuting to neighbouring Wyndham North (28 per cent).

Average commuting distances are relatively low for Inner and Middle sector residents (7.5km and 12.5km respectively), and higher for Outer sector residents (19.0km), particularly those who live in the Outer West (22.8km). There is less variation in average commuting distance by place of work. However, those with jobs in the Inner sector travel a longer average road distance to work (16.5km) than do Middle North workers (11.9km).

The average time taken to commute to work in the Melbourne SD was 36 minutes in 2006, implying an average door to door commuting speed of 31 kilometres per hour across all modes of transport. Only a modest difference of 6 minutes exists between the average commuting times of Inner and Outer sector residents. However, those who work in the Inner sector have a much more time-consuming journey to work (48 minutes, on average) than those who work in the Middle (33 minutes) or Outer sectors (28 minutes).

Changes from 2001 to 2006

With regard to longer distance commutes, there has been a greater increase in the number of Melbourne residents commuting to Geelong, than in commutes from Geelong to Melbourne, in part reflecting the expansion of Avalon airport during the period. Similarly, the number of Melbourne residents commuting to work in the Latrobe Valley has expanded significantly more than commutes in the opposite direction.

The spatial structure of Melbourne's commuting flows remained relatively stable between 2001 and 2006. The relative importance of inward flows declined marginally, while outward flows and commutes to a different SLA within the home subsector experienced above-average growth, and commutes from one Outer subsector to another grew particularly rapidly. This reflects the longer term trend towards increased complexity of commuting flows.

Between 2001 and 2006, the self-containment rate increased for the Inner sector, but declined in the Middle North, Middle West and Peri Urban sectors. The proportion of Middle West subsector workers who commuted in from another subsector increased from 46 to 49 per cent over the period, while it fell from 79 to 77 per cent for the Inner sector. This reflects a reduction in the number of people commuting from the Middle East and Outer East to an Inner sector workplace, as well as a significant reduction in the likelihood that an employed resident of the Outer North would commute to the Inner sector.

There were more than 21 200 additional commutes within the Outer South and more than 12 300 additional commutes within the Inner sector from 2001 to 2006, while the Outer West subsector provided a little over 5 500 additional commuters to each of the Inner and Middle West sectors. The origin-destination pairs with the greatest increases were predominantly intra-SLA flows (e.g. flows within the Berwick or Wyndham North SLAs). Flows from Southbank-Docklands to the CBD and from Frankston East to Frankston West both grew by more than 1200 commuters, while flows from Craigieburn to Broadmeadows and Cranbourne to Greater Dandenong Balance both rose by about 1100 commuters.

The rapid population growth experienced by areas such as Wyndham South, Southbank-Docklands, Melton East, Berwick and Cranbourne generated increased commuter flows within the home SLA and to a range of nearby areas (and in some cases, also to the CBD). Areas in which rapid jobs growth was being driven by the Retail and/or Construction industries tended to draw their additional workers largely from within the home SLA, while places which had a different industry driving jobs growth (e.g. Finance, Manufacturing, Transport) tended to draw their workers from a wider range of locations.

Commuting distances appear to have remained quite stable in Melbourne in recent years, with commuters travelling an average road distance of 14.7km in 2001 and 14.8km in 2006. Average commuting times have risen by about half a minute per year, on average, between 1994 and 2006, with roughly a 3 minute increase from 2001 to 2006 (Ironmonger 2006). Alternatively, the HILDA survey identifies an increase in average commuting times of less than one minute between 2002 and 2006 (Melbourne Institute 2009). While average commuting times increased between 2001/2002 and 2006, they remained unchanged for Melbourne between 2007–08 and 2009–10.

Some drivers of commuting flows

In addition to describing spatial patterns and trends in commuting, this project set out to explore how commuting behaviour has responded to recent spatial changes in population and employment. Regression analysis was used to investigate this issue. A simple gravity model of commuter flows explained 70 to 75 per cent of all variation in origin-destination flows in Melbourne.

The number of people commuting between an origin-destination pair tends to increase with the number of employed residents of the origin SLA and the number of jobs in the destination SLA, but declines as the distance between the two SLAs widens. Distance is less of an impediment to travel for origin-destination pairs that have a direct rail connection. Distance is also less of an impediment for pairs that can be travelled between without leaving Melbourne's freeway network, but a freeway connection has less influence than a rail connection. Distance was more of an impediment to travel in Melbourne than in Perth, reflecting the greater density and congestion of Melbourne.

The spatial concentration of industries also has implications for commuting, particularly where workers have specialised skills that tie them closely to specific industries. The greater the alignment between the skills available in the origin SLA and the skills demanded in the destination SLA, the greater the predicted commuting flows between those two places.

Growth in employed residents and jobs both played an important role in explaining *changes* in commuting flows in Melbourne between 2001 and 2006. These two factors alone explain more than two-thirds of the variation in commuting growth rates for origin-destination pairs with non-trivial commuter flows. Spatial patterns of residential and jobs growth reflect the accumulated effect of thousands of decisions by individuals and families about where they wish to live and work. Roughly 20 per cent of decisions to move house or job location were specifically undertaken with the aim of improving access between home and work, but the majority moved for reasons unrelated to commuting. These decisions that people make about moving house and job location are subsequently reflected in changed commuting behaviour.

Origin-destination pairs that had a high degree of skills mismatch tended to experience lower growth in commuting flows between 2001 and 2006. More distant origin-destination pairs also experienced lower growth in commuting, reflecting the impact of rising fuel prices.

The two very large scale road infrastructure projects that were completed just prior to 2001—the Western Ring Road (in 1999) and CityLink (in 2000)—improved the connectivity of Melbourne's road network and influenced spatial growth patterns (Allen Consulting Group 2003, Thakur 2009). However, regression analysis does not support the proposition that the smaller scale expansion's of Melbourne's road and public transport networks between 2001 and 2006 have substantially altered spatial commuting flows.

Outlook

The Victorian Government's spatial projections of population and employment through to 2026 have implications for future spatial patterns of commuting within Melbourne, which in turn have ramifications for future congestion and infrastructure investment. If these population and employment projections are realised, the likely commuting implications include:

- General stability in the spatial structure of commuting (in terms of the mix of inward commutes, outward commutes, same SLA commutes etc)
- A small increase in the self-containment of subsectors
- Commutes within the Outer Southern subsector to contribute at least one-sixth of total commuting growth, with commutes within the Casey LGA and from Casey to Dandenong being prominent contributors to growth
- Commutes within the Inner, Outer Northern and Outer Western subsectors (and specifically within the Melbourne, Hume and Wyndham LGAs) to be key contributors to growth
- Rapid growth in commuting from the Outer Western subsector to the Middle West and Inner Melbourne
- An increase in journeys to work involving a road distance of more than 30 kilometres and an increase in the average commuting distance.

Congestion costs in Melbourne have been projected to double between 2005 and 2020 (BITRE 2007), with growth in congestion delay costs during the morning peak expected to be most pronounced within 15km of the CBD, in the Casey and Greater Dandenong LGAs, and on freeways and highways (VCEC 2006). The average time spent travelling per person per day, across all trip purposes, has been projected to rise from 55 minutes in 2006 to 68 minutes by 2041 (ASBEC 2010).

Shaping the spatial distribution of population, employment and commuting in Melbourne

Commuting flows within Melbourne are driven by the spatial distribution of the residential population and jobs throughout the city. The spatial distribution of population and jobs which we see today reflects the accumulated pattern of development over many decades, but continues to be shaped and influenced by demographic trends, cultural preferences, economic forces and government interventions.

There are a range of mechanisms through which governments attempt to directly influence the spatial allocation of population, jobs and commuting within our cities, including through the development of strategic metropolitan plans, provision of urban infrastructure, management of land release and zoning of land use. Many other social, economic and environmental policy domains also play an important role in shaping our cities, even where that is not the primary aim. As noted by PC (2011, p. xxiii),

> 'In looking at how well our cities are functioning, it is important not to attribute all outcomes to planning. Good planning can create the environment for efficient and effective cities but the outcome is also dependent on the market, governments' investment in infrastructure, and other government policies and actions (such as immigration policy and delivery of services).'

The principal focus of this study has been identifying spatial changes in population, employment and commuting, with a view to providing a solid evidence base about the reality of the trends that have been shaping Melbourne in recent years. A secondary focus has been to provide some contextual information about urban policy directions for Melbourne and to investigate the extent to which the city's spatial distribution of population, employment and commuting has been reshaped in line with the stated policy goals.

The *Melbourne 2030* metropolitan strategy set the overall strategic direction for the growth and development of the metropolitan area from its release in 2002 through to early 2011. Its principal goals included achieving a more compact city by limiting urban sprawl and increasing density, concentrating residential and economic development in centres, reducing car dependence and increasing use of sustainable transport modes. Key mechanisms to achieve these goals include the Urban Growth Boundary, Growth Areas, the activity centre network and an upgraded public transport network. The 2008 release of *Melbourne @ 5 million* introduced some policy changes in response to greater than anticipated population growth. While the previously listed goals remained in place, several additional goals also achieved prominence, including provision of more jobs outside central Melbourne and reduced commuting times. The new Baillieu government, elected in December 2010, has announced that a new outcomes-based metropolitan planning strategy is to be developed, commencing in 2011 (DPCD 2011a).

BITRE has analysed the extent to which progress has been achieved against the relevant metropolitan strategy goals[75] since 2001 and the remainder of this chapter summarises the results. Outcome measures on their own do not provide a reliable indication of how effectively government planning systems are working, due to the many other influences that can impact on outcomes (PC 2011), and so this report does not attempt to evaluate the success of Melbourne's strategic planning system. Rather, the purpose of this analysis is to provide evidence about the actual 'on the ground' changes that have been occurring with respect to these planning objectives, whether such movements are in the desired direction and progressing at the required pace of change. This evidence about the reality of the trends that have been shaping Melbourne's population, employment and commuting flows can then be used to inform future planning initiatives.

Concentrating residential development in centres

Melbourne 2030 and *Melbourne @ 5 million* aim to concentrate residential development at activity centres, in order to achieve a more densely populated and compact city (DI 2002a, DPCD 2008c).

The Central Activities Districts (CADs) and Principal Activity Centres (PACs) together housed 9.8 per cent of the city's population in 2001 and 9.9 per cent in 2006, which suggests there has been minimal change in the extent to which residential development is concentrated in the most strategically important centres. This is supported by the research of Goodman et al (2010 p.6) who concluded that the amount of new housing constructed within 1 kilometre of CADs, PACs and Major Activity Centres (MACs) 'did not increase following the introduction

75 Only those metropolitan plann ng objectives that d rectly relate to the spatial distribution of population, employment and commuting within Me bourne are analysed n this study. As a result it provides only a partial picture of progress aga nst metropolitan plann ng objectives, and does not consider broader issues related to the liveability, sustainability and functionality of Me bourne.

of *Melbourne 2030* and in fact may have slightly declined'. While 6 per cent of Melbourne's population growth from 2001 to 2006 was accommodated within the Melbourne CAD, the contribution of the remaining CADs and PACs was less significant, totalling 4 per cent. This pattern seems to be continuing, with only a handful of suburban CADs and PACs having more than 300 dwellings either recently constructed or under construction (in 2007–08 or 2008–09), namely Prahran-South Yarra, Preston, Coburg, Box Hill and Footscray (DPCD 2010c). Thus, while there has been good progress in concentrating residential development within the CBD since 2001 (and in other inner city activity centres), progress has been limited in the suburban CADs and PACs which have been playing a relatively minor role in accommodating Melbourne's recent population growth.

Increasing population density

Melbourne @ 5 million proposes that higher population densities will be achieved through 'more intense housing development in and around activity centres, along tram routes and the orbital bus routes on the Principal Public Transport Network, in areas close to train stations and on large redevelopment sites' and through 'more efficient use of greenfield land with a target of 15 dwellings per hectare' (DPCD 2008c p. 3,17). Similarly, *Melbourne 2030* aimed to create a shift towards higher density living, particularly at activity centres and strategic redevelopment sites (DI 2002a).

ABS population data shows that Melbourne is now a more densely populated city than it was in 2001—the urban area's population density increased from 1455 to 1566 persons per square kilometre between 2001 and 2006. There was a shift towards higher density forms of housing, with separate houses declining from 75 to 73 per cent of the dwelling stock, because only 50 per cent of new dwellings were separate houses. The main contributor to increased density has been the large-scale redevelopments involving high density housing within the City of Melbourne, with this LGA recording the largest increase in density (of 73 per cent) between 2001 and 2010 (ABS 2011). More modest increases in density have been occurring in other parts of Melbourne, with more than two-thirds of suburbs recording an increase in population density between 2001 and 2006. On the urban fringe, the average size of new lots in Growth Area municipalities has declined from around 620m^2 in 2000 to 520m^2 in 2009 (DPCD 2008h, 2010c, Goodman et al 2010).

Restricting rural residential development

Melbourne 2030 aims to 'reduce the proportion of new housing development provided in rural areas in order to encourage consolidation into existing settlements' (DI 2002a, p.75). Low density rural residential development has previously comprised about 3 per cent of new housing in Melbourne (DI 2002a).

While some new rural residential development did occur in the Melbourne working zone between 2001 and 2006 (e.g. in Mitchell South), the net increase in rural dwellings amounted to less than 1 per cent of Melbourne's increase in dwellings over the period. Rural residential development appears to have been limited in the Melbourne working zone, with 70 per cent of Peri Urban population and dwellings growth consolidated into existing urban settlements and a further 20 per cent into small towns (with a population of 200 to 999).

Shifting the focus of growth to the north and west

The spatial redirection of growth from the south-east to the north and west of Melbourne is recognised as a long term objective in *Melbourne @ 5 million* (DPCD 2008c). ABS population data provides evidence of a significant shift in the focus of growth towards the north and west of Melbourne since 2001. The proportion of population growth occurring in the north and west rose from 38 per cent between 1991 and 2001, to 41 per cent from 2001 to 2006 and 47 per cent from 2006 to 2010 (ABS 2011). The south-eastern corridor continues to account for a substantial, but declining, proportion of Melbourne's population growth.

Directing fringe development to Growth Areas

Melbourne 2030 aimed to 'concentrate urban expansion into growth areas' and slow 'the number of areas that develop with scattered new housing and few services' (DI 2002a, p.63). *Melbourne @ 5 million* set a target that the Growth Areas will accommodate 47 per cent of new dwellings (DPCD 2008c).

The estimated resident population of the six designated Growth Area LGAs rose by 297 000 between 2001 and 2010, contributing 47 per cent of the Melbourne working zone's population growth (ABS 2011). Population growth in Melbourne's Outer Sector between 2001 and 2010 was heavily concentrated in the Growth Area LGAs (81 per cent). Outer suburban dwellings growth has also become increasingly concentrated within the Growth Area municipalities over the past decade—by 2009, the Growth Areas accounted for 79 per cent of outer suburban dwelling approvals (DPCD 2010c).

While urban expansion was largely concentrated in Growth Areas, it was not entirely concentrated in those areas. A range of fringe suburbs in the Outer Southern sector's Frankston and Mornington Peninsula LGAs recorded notable gains in population and dwellings. Excluding the six Growth Area LGAs, the ERP of the Outer and Peri Urban sectors increased by 97 000 persons between 2001 and 2010 and this more scattered growth could potentially pose challenges for service and infrastructure provision.

Limiting urban sprawl

Management of population growth and the city's outward expansion is central to Melbourne's strategic plans. *Melbourne 2030* established 'an urban growth boundary to set clear limits to metropolitan Melbourne's outward development' (DI 2002a p.60). The urban growth boundary has been expanded several times since its introduction, most recently in 2010.

Sixty one per cent of the Melbourne SD's population growth between 2001 and 2010 occurred in the Outer sector (ABS 2011), while 55 per cent of dwelling approvals related to the Outer sector (DPCD 2010d). The Outer sector contains long established suburbs as well as newly developing suburbs, and so not all of this growth will involve outward development. For the 2001 to 2006 period, BITRE has identified 26 'newly developing suburbs' on the urban fringe, 21 of which are located within the Growth Area municipalities. The 'newly developing suburbs' data can be viewed as providing a lower limit on the contribution of greenfield residential development to the city's growth, while Outer sector data provides an upper limit. For the 2001 to 2006 period, BITRE estimates that greenfield development accounted for between

51 and 67 per cent of population growth and between 38 and 59 per cent of growth in dwellings, while DPCD (2007a) reports that 48 per cent of household growth related to greenfield sites. Clearly, urban fringe development has played an important role in accommodating Melbourne's growth from 2001 to 2006, and data on population growth between 2006 and 2010 suggests that this outward movement of residential development is continuing.

Melbourne 2030 proposed that just 31 per cent of new dwellings through to 2030 would be located in greenfield sites, a reduction from the 38 per cent recorded over the previous four years (DI 2002a)[76], but the information presented in the previous paragraph indicates that no such reduction was achieved between 2001 and 2006. Goodman et al (2010, p. 4) similarly conclude that the proportion of new housing built on vacant land in the Growth Areas 'has not declined since the introduction of *Melbourne 2030* in 2002'. In 2008, *Melbourne @ 5 million* introduced a revised target that 53 per cent of new dwellings would be in established areas (DPCD 2008c) and this target is more consistent with Melbourne's recent development outcomes. As the *Melbourne 2030* Audit concludes, 'there are still major pressures for outward movement of residential development' in Melbourne (Moodie et al 2008, p.22). The post-2001 evidence is in line with Birrell et al's (2005 p. 06-3) prediction that 'Melbourne's suburban spread will continue under *Melbourne 2030*'.

Concentrating jobs growth in centres

Melbourne 2030's employment-focused objectives relate largely to concentrating new economic development in centres, including achieving growth across the network of activity centres and restriction of out-of-centre development (DI 2002a). *Melbourne @ 5 million* refined the activity centre hierarchy, but maintained the focus on concentrating jobs growth in centres that are well served by public transport (DPCD 2008c).

BITRE estimates that about 31 per cent of Melbourne's employment in 2006 was located in CADs, PACs or Specialised Activity Centres (SACs), with 14 per cent of jobs concentrated in the Melbourne CAD. These activity centres experienced a lower rate of jobs growth than the rest of Melbourne between 2001 and 2006 (0.9 per cent compared to 1.3 per cent per annum). About one-quarter of Melbourne's jobs growth occurred in these activity centres and their employment contribution declined slightly from 31.1 per cent in 2001 to 30.8 per cent in 2006. Thus, jobs growth was not concentrated in these higher-order activity centres.

This overall picture hides considerable variation. The SACs—such as the Melbourne Airport and the Monash University/Health Research Precinct—recorded rapid jobs growth, while the suburban CADs made a negative contribution to Melbourne's jobs growth between 2001 and 2006. The below-average rates of jobs growth in many suburban CADs and PACs (e.g. Dandenong, Frankston, Coburg), combined with the recent trend towards increasing dispersal, rather than concentration, of employment (Birrell et al 2005), pose a significant forward challenge to achievement of the government's planning objectives for activity centres.

76 Of the rema nder, 67.5 per cent of new dwell ngs would be located n the established urban area (ncluding activity centres and strategic redevelopment sites) and 1.5 per cent in non-urban areas (DI 2002a, p.30).

Strengthen Central Melbourne's role as the primary business hub

Melbourne 2030 aims to 'strengthen Central Melbourne's capital city functions and its role as the primary business, retail, sport and entertainment hub in the metropolitan area' (DI 2002a, p.3). Central Melbourne added 25 000 jobs between 2001 and 2006, and while its employment share declined marginally from 26.9 to 26.6 per cent, it remained the principal employment hub within the metropolitan area. There was a shift to more rapid jobs growth in the City of Melbourne between 2006 and 2008 (City of Melbourne 2009).

Provide more jobs outside Central Melbourne

Melbourne @ 5 million shifted the focus to providing more jobs outside Central Melbourne (DPCD 2008c p.7), so as to address an imbalance between where people live and the location of jobs. Between 2001 and 2006, 86 200 jobs were added outside of Central Melbourne (i.e. in other parts of the Melbourne working zone). More rapid jobs growth occurred outside of Central Melbourne, averaging 1.5 per cent per annum, compared to 1.2 per cent in Central Melbourne.

While there has been substantial jobs growth in suburban Melbourne, much of this growth is occurring outside of the CADs, PACs and employment corridors, where the planners have been aiming to concentrate economic development. This reflects the principal industry drivers of suburban jobs growth from 2001 to 2006, which were Transport and storage (in the Middle West and Outer North), Manufacturing (in the Outer West) and Health and community services (in the remaining Middle and Outer subsectors).

Increasing public transport's mode share

A common goal of the recent state government land use and transport strategic plans, as well as *Growing Victoria Together*, is to increase public transport's share of motorised trips within Melbourne to 20 per cent by 2020 (DI 2002a, DPC 2001).

Census data indicates that the public transport share of motorised commuter trips rose from 14.1 per cent in 2001 to 15.1 per cent in 2006, with 78 per cent of the increase attributable to increased use of public transport to access Inner sector jobs. While the present study focuses on commuter travel, the state government's target is broader, encompassing all purposes of travel. Taking this broader perspective, BITRE's urban passenger transport data and Victorian Government estimates present a consistent picture of solid growth in both public transport patronage and the public transport mode share since 2001, with a growth spurt occurring between 2004–05 and December 2008 (BITRE 2011a, DPC 2010, DT 2010a). However, growth in public transport patronage has been restricted since December 2008 (DT 2009c). The Victorian Department of Transport estimates that public transport's share of motorised trips within Melbourne stood at 10.5 per cent in 2001 and had increased to 14.3 per cent by 2009 (DPC 2010), suggesting that significant progress has been made towards the target of 20 per cent by 2020.

The recent surge in public transport patronage has been dominated by rail patronage and has been associated with reduced consumer satisfaction on metropolitan trains (DT 2010b). Gaymer (2010) shows that this surge has largely been a consequence of an environment conducive to growth in public transport patronage (i.e. rising petrol prices, strong CBD jobs growth and strong population growth), rather than being driven by infrastructure investment or specific transport and land use policies. According to Gaymer (2010 p.15), 'the "next surge" will occur if and only if there are significant service quality improvements on the public transport network'.

Encouraging cycling and walking

Melbourne 2030 encourages a shift towards non-motorised travel (i.e. cycling and walking) for short trips (DI 2002a p.160) through initiatives such as walking and bicycle action plans, development of the Principal Bicycle Network, the Travelsmart program and review of car parking policies.

The cycling and walking mode shares of Melbourne commuters did not change significantly between 2007–08 and 2009–10, according to the VISTA survey. However, between 2001 and 2006, census data reveals a clear shift towards cycling and walking for the journey to work, with cycling increasing its mode share from 0.9 to 1.2 per cent and walking from 2.8 to 3.5 per cent. Attitudinal changes relating to environmental awareness and awareness of health and fitness benefits have contributed to this shift (Gaymer 2010). The 2001 to 2006 shift towards walking is largely due to an increase in short distance walking trips in the Inner sector, linked to increased residential and job densities in the City of Melbourne. The shift towards cycling is mainly due to increased use of cycling to travel from inner and middle suburban residences to a place of work in the inner city. The cycling and walking mode shares did not improve in the Outer and Peri Urban sectors of Melbourne between 2001 and 2006.

Reducing car dependence through development of activity centres

Melbourne 2030 aims to reduce the number of private motorised vehicle trips by concentrating trip-generating activities in activity centres that are accessible via public transport (DI 2002a, p.46).

There was a 1.5 percentage point reduction in the private vehicle mode share for commuting trips in Melbourne between 2001 and 2006, but the number of commuting journeys undertaken by private vehicle continued to grow. Similarly, the proportion of the total motorised passenger task attributable to private motor vehicles has fallen since 2001, with the decrease concentrated between 2005 and 2009, but the aggregate private motor vehicle task still rose from 42 to 44 billion kilometres between 2001 and 2009 (BITRE 2011a).

Reduced car dependence amongst Melbourne CAD workers was responsible for a large part of the observed decline in the private vehicle mode share for Melbourne working zone commuters from 2001 to 2006. There has also been a shift away from private vehicle usage by residents of most of the suburban CADs, but due to their small population base, these mode shifts are not contributing much to the Melbourne-wide results.

Ensuring development is focused in accessible locations

Melbourne 2030 aims to concentrate new residential and economic development into areas which have good public transport access (DI 2002a). The commitment to growth areas being served by high capacity public transport was reaffirmed in *Melbourne @ 5 million* (DPCD 2008c).

Currie (2010) reports that 66 per cent of the area of each Outer Melbourne CCD was within 400 metres of a bus or tram stop or 800 metres of a train station, compared to 91 per cent for Middle Melbourne and 98 per cent for Inner Melbourne. The comparatively low access to public transport of some outer suburbs was confirmed by BITRE's investigation of public transport access within a small number of places that were the focal points for population and jobs growth in Melbourne between 2001 and 2006. While the residential development and jobs growth that is occurring in the Melbourne CAD (i.e. Melbourne Inner and Southbank-Docklands) is extremely well served by public transport, the residential development and jobs growth in Melbourne's outer suburbs is less well served, with about half of population and jobs in the selected areas being more than 500 metres away from a public transport stop with at least half hourly services during the morning peak period. For new housing in the Growth Areas, the median distance to a train station has been gradually rising and reached 3.29 kilometres in 2007 (Goodman et al 2010). Newly developed suburbs with limited public transport access, such as Point Cook, may still have significant public transport usage, as residents are prepared to travel several kilometres from home in order to access the rail network.

Reducing average commuting times and distances

Melbourne @ 5 million aims to reduce commuting times by locating jobs closer to home (DPCD 2008c), an objective that was not previously articulated in *Melbourne 2030*.

There is some evidence from census data that jobs are increasingly located close to home in the Inner sector, where the self-containment rate rose between 2001 and 2006, but self-containment declined in the Middle West and Peri Urban sectors. The average road distance travelled to work by commuters within the Melbourne SD remained essentially unchanged at 14.7 kilometres in 2001 and 14.8 kilometres in 2006. While Outer Western residents experienced a reduction in the average distance travelled to work (–0.7 kilometres), Outer Northern residents recorded an increase (0.5 kilometres) and most subsectors experienced minimal change. Between 2006 and 2009, the proportion of people who travelled over 30 kilometres to work or study increased from 13 to 17 per cent, while the proportion travelling less than 5 kilometres declined (ABS 2006b, 2009f), which suggests average commuting distances may have risen in Melbourne since 2006.

Time-series data on the average duration of a one-way commuting journey point to either a rise of 3 minutes between 2001 and 2006 (Ironmonger 2006) or a rise of under one minute from 2002 to 2006 (Melbourne Institute 2009). Between 2007–08 and 2009–10, average commuting times remained unchanged, according to VISTA. Thus, there is no evidence of any reduction in average commuting times or average commuting distances for Melbourne since 2001.

Overall assessment

Where progress has been made against these metropolitan planning objectives, it has been incremental in nature—longstanding consumer preferences and the accumulated effects of decades of residential and industry development do not reverse in just five or ten years. The different objectives are also highly inter-related and progress against one objective may aid or hinder progress in other areas. For example, providing more jobs outside Central Melbourne could well have a negative effect on public transport's mode share.

The available evidence suggests that there has been some movement in the desired direction for most of these planning objectives since 2001. Good progress was achieved against several of these objectives, such as directing fringe development to the designated Growth Areas, increasing population density, and shifting the focus of residential growth to the north and west of the city. Often the evidence is mixed. For example, a pattern repeated across several objectives—including the activity centre related objectives and encouragement of cycling, walking and public transport—is one of substantial change for the City of Melbourne LGA since 2001, coupled with minimal change in the suburbs. For the recently introduced objective of reducing commuting times, the available evidence suggests that the trend has not been heading in the desired direction.

The spatial changes in population growth, jobs growth and commuting flows in Melbourne since 2001 are largely a result of market forces, demography and people's preferences as to where they live, work and do business. Government planning policies and infrastructure provision have also played a role, but have generally not been the dominant influence. For example, there has been substantial jobs growth in outer suburban Melbourne, reflecting a combination of population-led growth in demand for consumer services and the development of transport and distribution nodes in the outer suburbs, but this growth has not been concentrated in the government's preferred activity centres. Similarly, the increase in public transport usage results largely from an environment conducive to growth in public transport patronage (e.g. rising petrol prices, immigration-led population growth), rather than from specific state government interventions. Goodman et al (2010) reported agreement between planners and developers in Melbourne that while both government policy and developer decisions affected housing supply outcomes, development companies were more influential, with the policies serving as the guidelines within which the developer operated. State and territory governments are of the view that management of greenfield development, accommodation of population growth and transition to higher densities are amongst the factors that are most able to be influenced by planning (PC 2011).

A feature of the preceding assessment is the shifting nature of the Victorian Government's metropolitan planning objectives and targets over the period, particularly as they relate to limiting urban sprawl and centralisation or decentralisation of jobs growth. Further modifications to planning goals are likely with the development of a new metropolitan strategy having recently commenced to replace *Melbourne 2030* (DPCD 2011a).

Future directions

This paper represents one case study in a broader research project which aims to identify the spatial changes in employment and residential patterns in Australia's largest capital cities and how commuting behaviour has responded to those changes. The Perth report has already been released (BITRE 2010) and reports are also being prepared for Sydney and Brisbane. A comparative report will also be produced, which provides an overview of relevant statistics across the cities, pulls out some common themes and differences, and discusses the implications for infrastructure and urban development.

APPENDIX A
Geographic boundaries

TA.1 Classification of SLAs to subsectors of Melbourne's working zone, 2006

SLA reference in Map A.1	SLA code	SLA name	Sector
1	205054601	Me bourne–Inner	Inner
2	205054605	Me bourne–Southbank-Docklands	Inner
3	205054608	Me bourne–Remainder	Inner
4	205055901	Port Phillip–St Kilda	Inner
5	205055902	Port Phillip–West	Inner
6	205056351	Stonn ngton–Prahran	Inner
7	205057351	Yarra–North	Inner
8	205057352	Yarra–Richmond	Inner
9	205101181	Br mbank–Keilor	Middle West
10	205101182	Br mbank–Sunsh ne	Middle West
11	205103111	Hobsons Bay–Altona	Middle West
12	205103112	Hobsons Bay–Williamstown	Middle West
13	205104330	Maribyrnong	Middle West
14	205105063	Moonee Valley–Essendon	Middle West
15	205105065	Moonee Valley–West	Middle West
16	205255251	Moreland–Brunswick	Middle North
17	205255252	Moreland–Coburg	Middle North
18	205255253	Moreland–North	Middle North
19	205300661	Banyule–Heide berg	Middle North
20	205300662	Banyule–North	Middle North
21	205301891	Dareb n–Northcote	Middle North
22	205301892	Dareb n–Preston	Middle North
23	205451111	Boroondara–Camberwell N.	Middle East
24	205451112	Boroondara–Camberwell S.	Middle East
25	205451113	Boroondara–Hawthorn	Middle East
26	205451114	Boroondara–Kew	Middle East
27	205504211	Manningham–East	Middle East
28	205504214	Manningham–West	Middle East
29	205504971	Monash–South-West	Middle East

continued

TA.1 Classification of SLAs to subsectors of Melbourne's working zone, 2006 (continued)

SLA reference in Map A.1	SLA code	SLA name	Sector
30	205504974	Monash–Waverley East	Middle East
31	205504975	Monash–Waverley West	Middle East
32	205506981	Whitehorse–Box Hill	Middle East
33	205506984	Whitehorse–Nunawad ng E.	Middle East
34	205506985	Whitehorse–Nunawad ng W.	Middle East
35	205650911	Bayside–Brighton	Middle South
36	205650912	Bayside–South	Middle South
37	205652311	Glen Eira– Caulfield	Middle South
38	205652314	Glen Eira– South	Middle South
39	205653431	K ngston– North	Middle South
40	205653434	K ngston–South	Middle South
41	205656352	Stonn ngton–Malvern	Middle South
42	205553672	Knox–North-East	Outer Eastern
43	205553673	Knox–North-West	Outer Eastern
44	205553674	Knox–South	Outer Eastern
45	205554411	Maroondah–Croydon	Outer Eastern
46	205554412	Maroondah–Ringwood	Outer Eastern
47	205607451	Yarra Ranges–Central	Outer Eastern
48	205607452	Yarra Ranges–Dandenongs	Outer Eastern
49	205607453	Yarra Ranges–Lilydale	Outer Eastern
50	205607454	Yarra Ranges–North	Outer Eastern
51	205607456	Yarra Ranges–Seville	Outer Eastern
52	205353271	Hume–Broadmeadows	Outer Northern
53	205353274	Hume–Craigieburn	Outer Northern
54	205353275	Hume–Sunbury	Outer Northern
55	205405713	Nillumbik–South	Outer Northern
56	205405715	Nillumbik–South-West	Outer Northern
57	205405718	Nillumbik Bal	Outer Northern
58	205407071	Whittlesea–North	Outer Northern
59	205407075	Whittlesea–South-East	Outer Northern
60	205407076	Whittlesea–South-West	Outer Northern
61	205752671	Gr. Dandenong–Dandenong	Outer Southern
62	205752674	Gr. Dandenong Bal	Outer Southern
63	205801452	Card nia–North	Outer Southern
64	205801453	Card nia–Pakenham	Outer Southern
65	205801454	Card nia–South	Outer Southern
66	205801612	Casey–Berwick	Outer Southern
67	205801613	Casey–Cranbourne	Outer Southern

continued

TA.1 Classification of SLAs to subsectors of Melbourne's working zone, 2006 (continued)

SLA reference in Map A.1	SLA code	SLA name	Sector
68	205801616	Casey–Hallam	Outer Southern
69	205801618	Casey–South	Outer Southern
70	205852171	Frankston–East	Outer Southern
71	205852174	Frankston–West	Outer Southern
72	205905341	Morn ngton P'sula–East	Outer Southern
73	205905344	Morn ngton P'sula–South	Outer Southern
74	205905345	Morn ngton P'sula–West	Outer Southern
75	205204651	Melton–East	Outer Western
76	205204654	Melton Bal	Outer Western
77	205207261	Wyndham–North	Outer Western
78	205207264	Wyndham–South	Outer Western
79	205207267	Wyndham–West	Outer Western
80	220102911	Hepburn–East	Peri Urban
81	220105151	Moorabool–Bacchus Marsh	Peri Urban
82	220105154	Moorabool–Ballan	Peri Urban
83	235204131	Macedon Ranges–Kyneton	Peri Urban
84	235204134	Macedon Ranges–Romsey	Peri Urban
85	235204135	Macedon Ranges Bal	Peri Urban
86	240204854	Mitchell–South	Peri Urban
87	240205622	Murr ndindi–West	Peri Urban
88	255100835	Baw Baw–Part B West	Peri Urban
89	255107458	Yarra Ranges–Part B	Peri Urban
90	255200744	Bass Coast Bal	Peri Urban
91	255206175	South G ppsland–West	Peri Urban

Source: BITRE class fication informed by ABS statistical subdivisions.

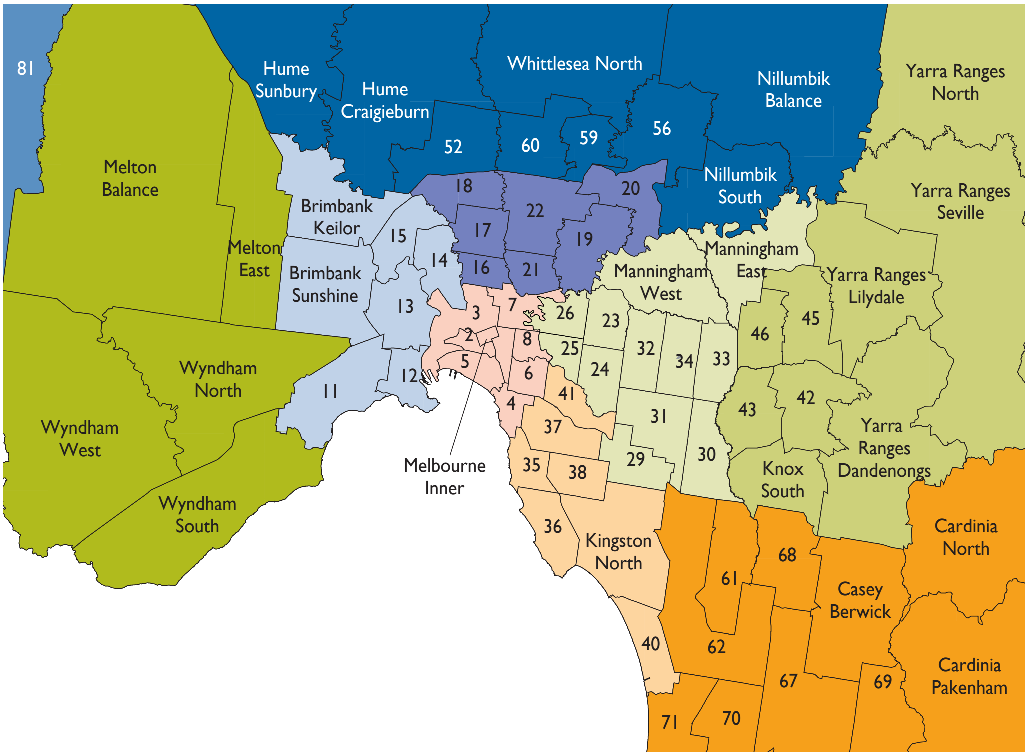
MA.1 SLA boundaries in Melbourne working zone, 2006 (main map)

Sectors and sub-sectors in theMelbourne Working Zone, 2006

- 1. Inner sector
- 2. Middle West sub-sector
- 3. Middle North sub-sector
- 4. Middle East sub-sector
- 5. Middle South sub-sector
- 6. Outer Eastern sub-sector
- 7. Outer Northern sub-sector
- 8. Outer Southern sub-sector
- 9. Outer Western sub-sector
- 10. Peri Urban sector

Source: BITRE based on 2006 ASGC

MA.1 SLA boundaries in Melbourne working zone, 2006 (inset)



Source: BITRE based on 2006 ASGC

APPENDIX B
Straight line distance estimates

Chapter 7 presented information on the average road distance travelled by Melbourne residents in their commute to work, based on the ABS-VicRoads dataset. This appendix presents BITRE estimates of average commuting distances using the straight line distance between origin SLAs and destination SLAs. These estimates are less accurate than calculations based on more spatially disaggregated data such as destination zones or address information (e.g. the ABS-VicRoads dataset). Moreover, the estimated straight line distances are likely to be systematically lower than average distance calculations that reflect actual or simulated travel routes. The straight line distance estimates nevertheless have two advantages—they are available for Peri Urban SLAs (thus enabling comparisons to be made between Peri Urban SLAs and all other Melbourne SLAs) and they enable direct comparisons to be made to the average commuting distance data presented for Perth in BITRE (2010).

BITRE estimates of average straight line commuting distance for 2006

Distance for each origin-destination pair was calculated using MapInfo as the straight line distance between the population-weighted centroid of the origin SLA (calculated using 2006 data for CCDs) and the job-weighted centroid of the destination SLA (calculated using 2006 data for the destination zones). In these calculations, people who worked at home were assigned a distance of zero, while people who worked elsewhere in their home SLA were assigned the straight-line distance between the population-weighted centroid and the job-weighted centroid of the home SLA. The distance between each origin-destination pair was estimated separately for 2001 and 2006.

The average straight line commuting distances within the Melbourne SD was estimated by BITRE to be 11.1km in 2006. This is considerably lower than the VISTA 07 average trip length of 18.5 km and the ABS-VicRoads average trip length of 14.8 km. It is expected that straight line distances will inevitably underestimate actual road distances travelled by commuters.

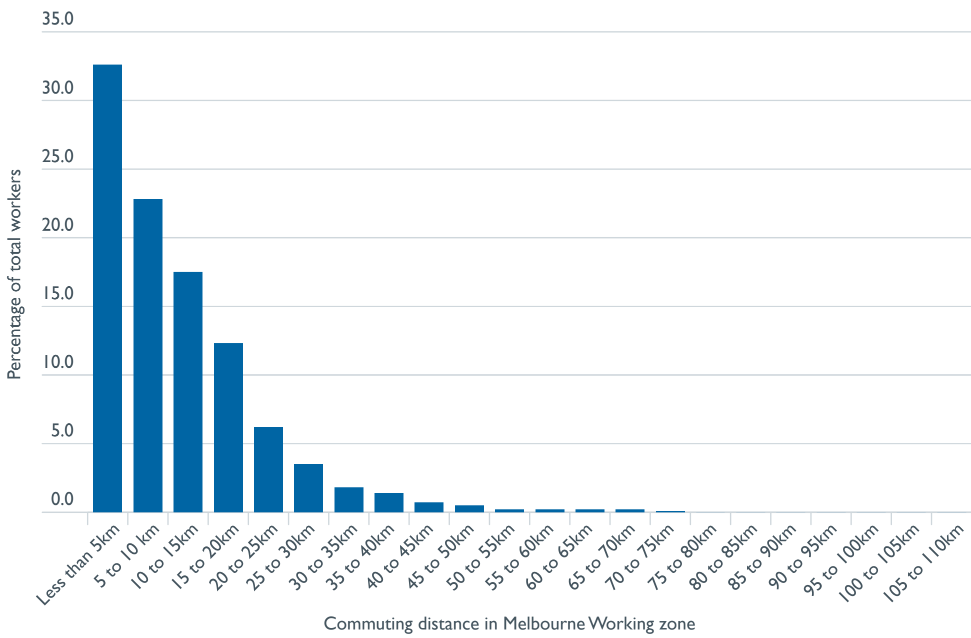
Figure 7.1 shows the distribution of journey to work travel distances within Melbourne based on the straight line distance measure. It shows that 54 per cent of workers travelled less than 10 kilometres to get to a workplace—including 33 per cent that travelled less than 5 kilometres. Those who travelled 10 to 30 kilometres to work belonged to the second largest group (39 per cent of all workers) and the remainder (about 7 per cent) travelled more than 30 kilometres to work.

Table B.1 shows the average commuting distance:

- *from* an origin sector to a workplace in *any destination sector* (column 2); and
- *to* a workplace in a destination sector from any origin sector (column 3).

As shown in this table, the average commuting distances for Inner and Middle sector residents was relatively low (5.6 km and 9.5 km respectively) compared to the corresponding figures for the Outer and Peri Urban sectors or the corresponding figure for the working zone as a whole. On the other hand, the average commuting distance to a place of work in the Inner sector was higher (13.7 km) than the corresponding average distances for the Middle, Outer and the Peri urban sectors. The averages for these three latter sectors were 10.7 km, 11.1 km and 8.1 km respectively and all were lower than the working zone average of 11.6 km. The average commuting distance displayed less variation on a place of work basis than on a place of residence basis.

FB.1 Distribution of workers by journey to work straight line travel distance, Melbourne working zone, 2006



Source: BITRE analysis of ABS Census of Population and Housing 2006 data.

TB.1 Average straight line commuting distance for journey to work, by sector, 2006

Sector	Average commuting distance for residents of sector (km)	Average commuting distance to a workplace in this sector (km)
Inner	5.6	13.7
Middle	9.5	10.7
Middle East	9.7	10.8
Middle North	8.7	9.2
Middle South	9.5	10.3
Middle West	9.9	12.1
Outer	14.4	11.1
Outer Eastern	12.7	9.2
Outer Northern	13.3	12.1
Outer Southern	15.1	11.4
Outer Western	17.6	12.6
Peri Urban	21.9	8.1
Melbourne Working Zone	11.6	11.6

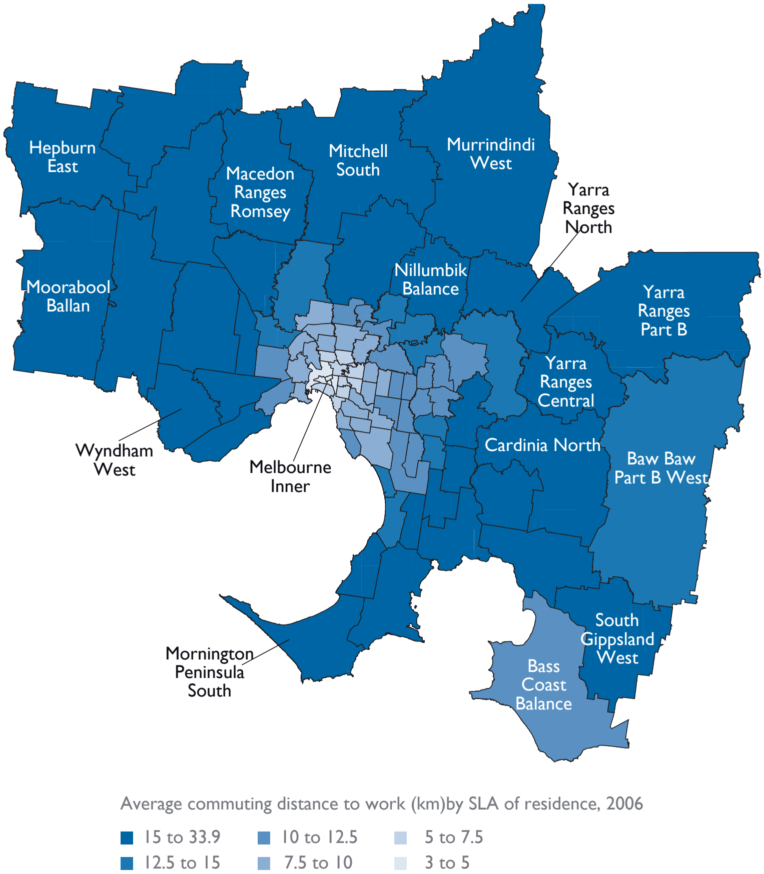
Source: BITRE analysis of ABS Census of Population and Hous ng 2006 data.

Due to lack of data, an analysis of journey to work distances for the Peri Urban sector using VISTA 07 and ABS-VicRoads data was not possible, so the straight line distance estimates in table B.1 represent the only source of information on commuting distances for Peri Urban SLAs. Residents of Peri Urban SLAs tend to commute long distances to work, but those who work in Peri Urban SLAs have a relatively short commute, because they are typically commuting within from the home SLA.

The SLA data in Map B.1 shows a similar commuting pattern to that shown in Map 7.7. The map shows a clear pattern of concentric rings, with average commuting distance relatively low for inner city residents, but tending to rise with distance from the CBD.

Table B.2 lists the SLAs of residence showing the highest and the lowest average distances commuted. While the highest commuting distances originated from SLAs in the Peri Urban sector, the shortest were from SLAs in the Inner sector. Melbourne Inner (CBD) residents commuted the shortest average distance (3 km). The longest distance commuted to a workplace was three times the average for the working zone, with residents of the Peri Urban SLA of Moorabool–Ballan on average commuting a distance of 33 kilometres to get to their workplace.

MB.1 Average straight line commuting distance by SLA of residence, Melbourne working zone, 2006



Note: SLA boundaries as at 2006 ASGC.The averages are of straight line distances between population and employment weighted centroids of SLAs.

Source: BITRE analysis of ABS Census of Population and Housing 2006 data

TB.2 Five longest and shortest average straight line distances travelled to work by SLA of residence, 2006

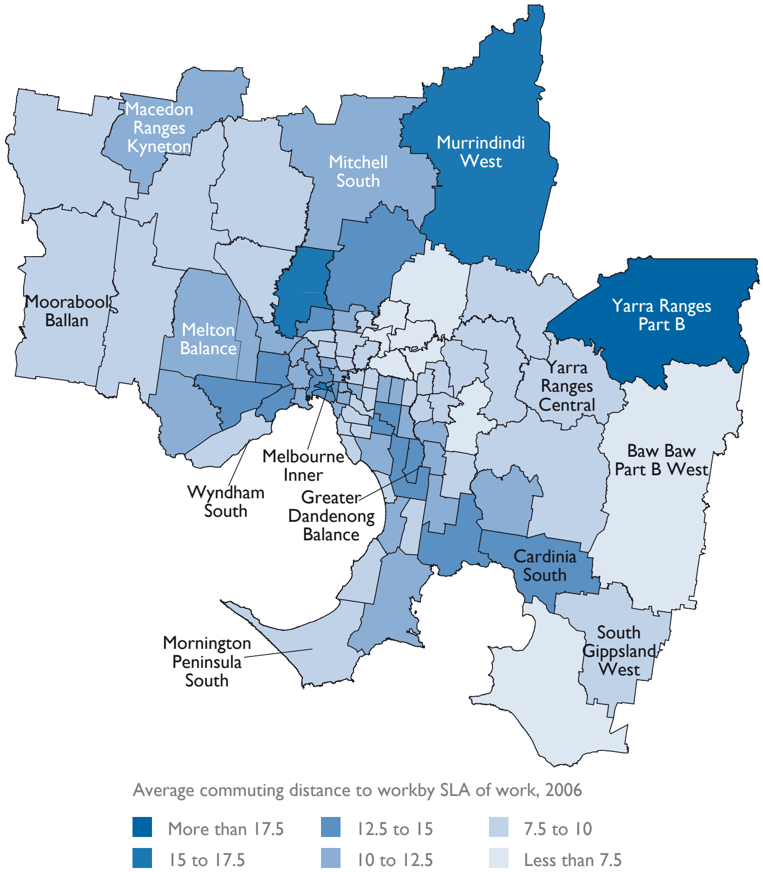
SLA of residence	Average travel distance (km)	SLA of residence	Average travel distance (km)
Moorabool–Ballan	32.8	Melbourne–Inner	3.0
Yarra Ranges–Part B	31.1	Melbourne–Rema nder	4.5
Murrind ndi–West	29.9	Melbourne–Southbank-Docklands	4.7
Macedon Ranges–Romsey	28.9	Yarra–North	5.4
Mitchell–South	27.6	Port Phill p–West	5.6

Source: BITRE analysis of ABS Census of Population and Hous ng 2006 data

Map B.2 depicts the average commuting distance for each SLA of work. Unlike in Map B.1, this map does not show a clear pattern of concentric circles of varying commuting distances spanning out from a strategic location—the CBD. The SLA of Yarra Ranges Part B stands out, but only 70 workers commuted an average distance of 24.5 km to a place of work in this SLA. Several middle and outer suburban employment hubs also stand out as having longer average commuting distances than surrounding SLAs, including Craigieburn, Broadmeadows, Wyndham North, Altona, Monash–Waverley West, Monash South West and both SLAs in the City of Greater Dandenong. Reflecting the nature of the work available in Melbourne and the other surrounding SLAs, the City of Melbourne LGA attracted 290 000 workers (19 per cent). These workers on average commuted a distance of about 14 kilometres.

Table B.3 summarises the SLAs of work which had the highest and lowest average commuting distances.

MB.2 Average straight line commuting distance by SLA of work, Melbourne working zone, 2006



Note: SLA boundaries as at 2006 ASGC. The averages are of straight line distances between population and employment weighted centroids of SLAs.

Source: BITRE analysis of ABS Census of Population and Housing 2006 data

TB.3 Five longest and shortest average straight line distances travelled to work by SLA of work, 2006

SLA of work in Melbourne Working Zone	Longest average travel distance (km)	SLA of work	Shortest average travel distance (km)
Yarra Ranges–Part B	23.6	Baw Baw–Part B West	5.6
Hume–Craigieburn	16.4	Mann ngham–East	5.7
Melbourne–Southbank-Docklands	15.0	Yarra Ranges–Dandenong	6.4
Melbourne–Rema nder	14.5	Nillumbik–South	6.4
Card nia–South	14.5	Nillumbik–South-West	6.4

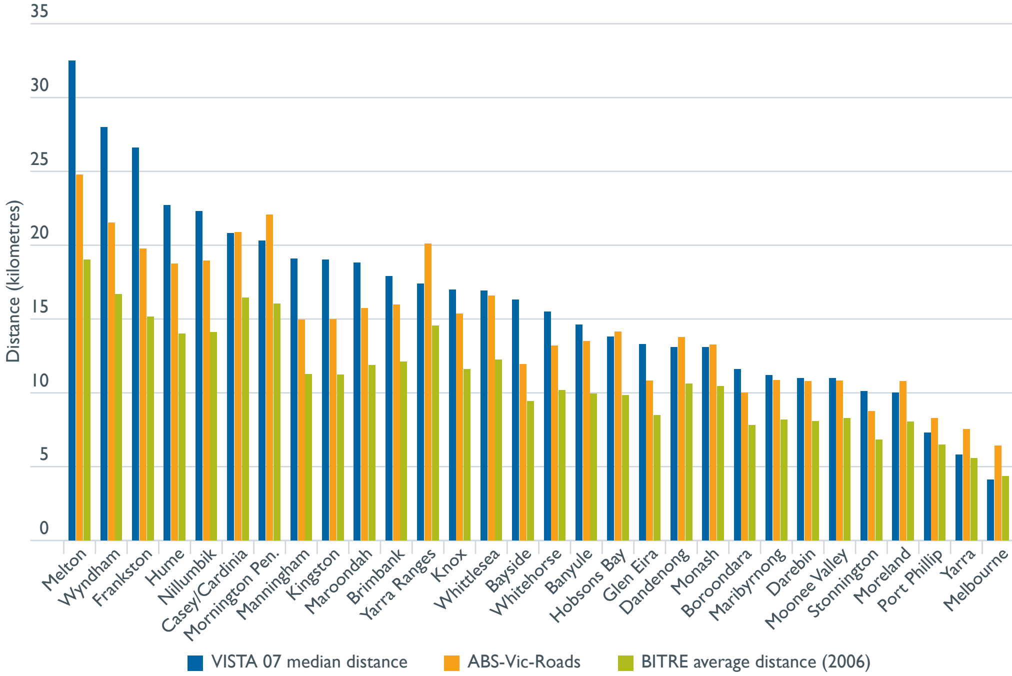
Source: BITRE analysis of ABS Census of Population and Hous ng 2006 unpublished data.

Comparison of VISTA, ABS-VicRoads and BITRE straight line distance estimates

A comparison of the commuting distance estimates from BITRE, VISTA-07 and ABS-VicRoads is in Figure B.2. However note that the data relate to two different time periods as the BITRE and ABS-VicRoads estimates are averages for 2006, while the VISTA estimates are averages for 2007–08. The ABS-VicRoads estimates are based on the shortest road distance between destination zone pairs, the VISTA-07 estimates are based on straight line distances between residential and work addresses factored to reflect road distances, while the BITRE estimates are based on straight line distances between SLA pairs. All data have been presented at the LGA scale, as SLA estimates were not available from VISTA.

Despite these differences, the correlation coefficient and the rank correlation of the estimates by the three methods are very high at 0.9432 and 0.9429 respectively for the BITRE and VISTA-07 pairing and 0.9902 and 0.9954 for the BITRE and ABS-VicRoads pairing. The correlation coefficient and the rank correlation for the VISTA-07 and ABS-VicRoads pairing were a little lower at 0.9338 and 0.9293 respectively. This suggests that the three methods compare favourably in that they present a very consistent picture of spatial variation in average commuting distances. In particular, the BITRE and ABS-VicRoads distance estimates are very closely aligned at the LGA scale.

FB.2 Comparison of average commuting distance between home and work in Melbourne using three data sources, 2006 and 2007



Note: For purposes of comparison with VISTA 07, BITRE straight line distance est mates and ABS-VicRoads est mates were converted to LGA scale.

Sources: BITRE analysis of ABS Census of Population and Housing 2006 unpublished data, ABS-VicRoads data for 2006 and VISTA 07 data

APPENDIX C

Gravity model regression results using straight line distance estimates

This appendix presents a set of gravity model regression results which differ from those presented in Table 8.6 due only to the use of a different measure of distance for each origin-destination pair. The results presented in Table 8.6 were based on average road distance between each origin-destination pair, derived from the ABS-VicRoads dataset. The results presented in Table B.1 below instead use a straight line distance measure derived by BITRE based on the population weighted centroid of the origin SLA and the job weighted centroid of the destination SLA. The results presented in Table B.1 are more directly comparable to those presented for Perth in BITRE (2010), which used the same straight line distance measure.

The gravity model regression has somewhat lower explanatory power when the straight line distance measure is used (Table B.1) rather than the road distance measure (Table 8.6). The difference in explanatory power is a little more pronounced in the 2006 model than in the 2001 model. The coefficient on the straight line distance variable lies in the –1.3 to –1.4 range, while the coefficient on the road distance variable lies in the –1.5 to –1.7 range.

The distance penalty for Melbourne is of a consistently larger magnitude than that estimated for Perth (see BITRE 2010, p. 208), where the distance penalty was –1.05 in 2001 and –1.11 in 2006. This may reflect higher levels of congestion in Melbourne.

TC.1 Estimation of gravity model of origin-destination commuter flows using straight line distance measure, Melbourne, 2001 and 2006

	2001		2006	
	Working zone	Statistical Division	Working zone	Statistical Division
Sample	5120	4655	5866	5152
Adjusted R-squared (per cent)	69.2	72.8	71.6	74.1
Parameter estimates				
Constant	–3.92	–7.39	–2.81	–7.14
Log of number of employed residents in origin SLA	0.44	0.71	0.30	0.60
Log of number of jobs in dest nation SLA	0.81	0.89	0.85	0.99
Log of distance between origin and dest nation SLA	–1.30	–1.32	–1.36	–1.39
Robust t-value				
Constant	–10.2	–18.8	–7.6	–18.2
Log of number of employed residents in origin SLA	16.6	24.5	12.0	19.5
Log of number of jobs in dest nation SLA	44.4	48.2	48.9	60.9
Log of distance between origin and dest nation SLA	–54.5	–54.2	–59.7	–54.7

Note: The dependent variable is the log of the number of persons commut ng from the orig n SLA to the destination SLA in the given year.

Sources: Est mated by BITRE us ng SAS OLS est mation and robust standard errors. Based on ABS Census of Population and Hous ng data 2001 and 2006 commuting matrices and BITRE-derived est mates of the straight line distance between SLAs (as detailed n BITRE 2010 p. 180).

APPENDIX D

Sensitivity analysis of population and employment in activity centres

Activity centres are an important component to the *Melbourne 2030* strategic plan through its key objective of having 'a more compact city' and concentrating new economic development in centres that are well served by public transport. The vision of the *Melbourne 2030* plan is to have activity centres which are 'centres for business, shopping, working and leisure' (DI 2002a p.46). The hierarchy of activity centres consists of:

- Central Activities Districts (CADs)
- Principal Activity Centres (PACs)
- Major Activity Centres
- Specialist Activity Centres (SACs)
- Neighbourhood Activity Centres.

The focus of this report has been on the CADs, PACs and SACs. The seven CADs form the top of the activity centre hierarchy and were created in order to develop Melbourne into a multi centre city. It is designed to be a movement away from a single dominant Central Business District (CBD).

The Victorian Department of Planning and Community Development (DPCD) provided BITRE with two boundary classifications based on the 2006 census collection districts (CCD) and 2006 destination zones (DZ). These two separate DPCD boundary definitions do not exactly overlay each other, as DZs are larger than CCDs and do not provide the same level of disaggregation or refinement. Thus, the geographic area covered by an activity centre can be quite different, depending on whether the DZ or CCD boundary definition is used.

BITRE's activity centre analysis placed a high priority on the maintenance of consistent activity centre boundaries throughout the report, because the focus was on measuring change over time. In practice, this involved three main considerations:

1. That the activity centres have consistent boundaries between the 2001 and 2006 census periods given the focus is on assessing the *change* in population and employment over the period.
2. Activity centres have corresponding CCD and DZ boundaries to retain a consistent definition for analysis of population and employment.
3. The single activity centre definition should give priority to employment considerations given activity centre policy is primarily about achieving economic development in centres.

The starting point for the BITRE defined boundaries were the DPCD's DZ-based activity centre classification for 2006. This definition was then translated to 2001 DZs and then into CCDs for 2001 and 2006. The effect of this is that BITRE's activity centres are more encompassing than the original DPCD boundaries and incorporate a greater area than just the retail precinct.

To provide an analysis of sensitivity to the activity centre definitions, Table D.1 presents the 2006 population and employment estimates based on the DPCD defined boundaries. The main difference between the BITRE (see table 3.13 and 4.6) and DPCD boundaries definitions is that the BITRE estimates are generally larger, especially for population, because the focus was on using one definition throughout the report – based on employment. As a result of basing the estimates on an employment definition the 2006 estimates for the DPCD and BITRE are very similar, with the BITRE estimates being substantially larger in only five activity centres, due to DZ boundary changes between 2001 and 2006. These activity centres include the two CADs of Dandenong and Ringwood and the SACs of Alfred Medical, Deakin University and Monash University.

TD.1 Population and employment estimates for DPCD defined activity centres, 2006

Activity centre types	Population	Employment
Central Activities Districts	53 000	268 600
Me bourne	29 100	216 300
Box Hill (Transit City)	3 300	13 000
Broadmeadows (Transit City)	3 900	5 600
Dandenong (Transit City)	7 000	10 200
Footscray (Transit City)	5 000	6 800
Frankston (Transit City)	1 600	10 000
Ringwood (Transit City)	3 100	6 600
Principal Activity Centres	88 600	115 400
Airport West	2 800	4 300
Camberwell Junction	5 600	8 800
Chadstone	1 500	5 000
Cheltenham, Southland	1 400	4 100
Coburg	6 300	3 000
Cranbourne	6 800	4 800
Doncaster Hill	3 900	4 500
Epp ng (Transit City)	4 900	4 700
Glen Waverley	1 100	5 400
Greensborough	1 500	3 800
Maribyrnong, Highpo nt	1 000	4 300
Moonee Ponds	2 300	4 800
Narre Warren, Fountain Gate	4 300	6 200
Prahran/South Yarra	14 000	16 000
Preston, High Street	8 000	6 700
Preston, Northland	600	7 800

continued

TD.1 Population and employment estimates for DPCD defined activity centres, 2006 (continued)

Activity centre types	Population	Employment
Sunshine	6 900	6 600
Sydenham (Transit City)	5 100	3 000
Want rna South, Knox Central	8 400	8 700
Werribee (Transit City)	2 200	2 900
Specialised Activity Centres	8 900	57 900
Alfred medical research and Education Precinct, Prahran	200	5 900
Aust n Biomedical Alliance Precinct, Heide berg	0	5 500
Deak n University, Burwood	700	2 100
La Trobe Technology Park, Bundoora	2 300	3 800
Melbourne A rport	800	15 600
Monash University/Health Research Precinct, Clayton	800	6 500
Parkville Medical and Bioscience Precinct	1 900	13 800
University Hill Technology Prec nct, Bundoora	1 300	1 800
Victoria University, Footscray	800	1 200
Werribee Employment Precinct	100	1 700
Major Activity Centres	202 500	254 600
All presented activity centres	353 000	696 400
Melbourne SD	3 367 200	1 565 100

Note: Some regional cities have previously been classified as Transit Cities.

Source: BITRE derived estimates of unpublished DPCD activity centre boundaries and unpublished ABS customized data request.

In regards to change over time, only the population estimates can be compared. Table D.2 presents the change in population of activity centres between 2001 and 2006 based on the DPCD boundaries and the BITRE boundaries. The two sets of estimates both show that the CADs and PACs accounted for a relatively minor proportion of Melbourne's population growth between 2001 and 2006, at either 8 per cent (DPCD classification) or 10 per cent (BITRE classification). CADs, particularly the Melbourne CAD, provide very similar results across the two classifications. In contrast, the PAC results are more sensitive to choice of classification. Nevertheless, the overall conclusion—that there has been good progress in concentrating population growth in the CBD, but limited progress in the remaining CADs and PACs (as a group)— remains robust to choice of classification. Thus, while overall the population and employment estimates are somewhat sensitive to the choice of activity centre boundaries, the underlying message of the analysis is not impacted.

TD.2 Change in population of Central Activities Districts and Principal Activity Centres, Melbourne SD, 2001 to 2006

Centre type	Change in population (thousands)	Average annual growth rate (per cent)	Proportion of Me bourne SD's population growth (per cent)
DPCD defined			
Me bourne CAD	14	14.4	6.3
Other CADs	0	0.7	0.0
All CADs	14	6.5	6.3
PACs	4	2.5	1.6
Total of CADs and PACs	18	3.9	7.9
Total PACs and CADs (exclud ng Me bourne CAD)	4	0.7	1.6
Me bourne SD	225	1.3	100.0
BITRE defined			
Me bourne CAD	14	14.0	6.3
Other CADs	–1	–0.3	–0.5
All CADs	13	2.8	5.8
PACs	9	0.8	4.1
Total of CADs and PACs	22	1.3	9.9
Total PACs and CADs (exclud ng Melbourne CAD)	8	0.5	3.6
Me bourne SD	225	1.3	100.0

Note: The numbers n this table are derived from the census and do not correspond to ERP data presented n the rema nder of this chapter.

DPCD provided BITRE with a 2006 DZ based definition for activity centres, which were then used as a starting po nt to define activity centre boundaries that enabled comparable analysis of activity centres for 2001 and 2006. Hence, priority was given to ensur ng maximum consistency between the activity centre boundaries based on 2001 DZs and those based on 2006 DZs, and also with the boundaries based on CCDs. In practice this involved adopt ng relatively encompass ng boundaries which often extended well beyond the retail precinct and definitions provided by the DPCD.

Source: BITRE analysis of ABS 2006 Census of Population and Hous ng data at CCD scale.

Abbreviations and acronyms

ABS	Australian Bureau of Statistics
ACZ	Activity Centre Zones
AEG	Audit Expert Group
AHURI	Australian Housing and Urban Research Institute
ASBEC	Australian Sustainable Built Environment Council
ASGC	Australian Standard Geographical Classification
Bal	Balance
BITRE	Bureau of Infrastructure, Transport and Regional Economics
CAD	Central Activities Districts
Cat.	Catalogue number
CBD	Central Business District
CCD	Census Collection District
CES	Commissioner for Environmental Sustainability
CLUE	Census of Land Use and Employment
CPUR	Centre for Population and Urban Research
DAC	Development Assessment Committee
DEEWR	Department of Education, Employment and Workplace Relations
DHA	Department of Health and Ageing
DI	Victorian Department of Infrastructure
DIAC	Department of Immigration and Citizenship
DIT	Department of Infrastructure and Transport
DPCD	Victorian Department of Planning and Community Development
DSE	Victorian Department of Sustainability and Environment
DT	Victorian Department of Transport
DTF	Victorian Department of Treasury and Finance

DZ	Destination Zone
e.g.	for example
ERP	Estimated Resident Population
etc	etcetera
GAA	Growth Areas Authority
GAIC	Growth Areas Infrastructure Contribution
GAMUT	Australasian Centre for the Governance and Management of Urban Transport
GPO	General Post Office
HILDA	Household Income and Labour Dynamics in Australia
ibid	in the same place
i.e.	that is
JWSLA	Journey to Work Statistical Local Area
LGA	Local Government Area
MAC	Major Activity Centres
MMBW	Melbourne Metropolitan Board of Works
MOTC	Meeting our Transport Challenges
MTPC	Metropolitan Town Planning Commission
NAC	Neighbourhood Activity Centres
No.	Number
OLS	Ordinary Least Squares
PAC	Principal Activity Centres
PC	Productivity Commission
PHI	Prince Henry's Institute
PIA	Planning Institute of Australia
SD	Statistical Division
SGV	State Government of Victoria
SLA	Statistical Local Area
SAC	Specialised Activity Centres
TOD	Transport Oriented Development
UGB	Urban Growth Boundary
URA	Urban Renewal Authority

VATS	Victorian Activity and Travel Survey
VCEC	Victorian Competition and Efficiency Commission
VIC	Victoria
VISTA	Victorian Integrated Survey of Travel and Activity
VTP	Victorian Transport Plan

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