Socio-economic indicators of change: Goulburn-Broken and North East CMA regions

REPORT FOR THE SOCIO-ECONOMIC ANAYSIS PROJECT

GOULBURN-BROKEN AND NORTH EAST CATCHMENT MANAGEMENT AUTHORITIES

Neil Barr - 1st June 2018

Natural Decisions

Contents

1.1 TABLE OF FIGURES

1.2 TABLES

2 INTRODUCTION

Regional Catchment Strategies (RCS) are the overarching six-year strategic plans that guide actions to improve and protect natural resources (land, water and biodiversity) in each of the ten catchment management regions of Victoria. The RCS are a requirement under Victorian legislation (Catchment and Land Protection Act 1994). RCS's are a strategic document for all organisations, groups and individuals contributing to integrated catchment within those regions. The development of RCS is coordinated by the Catchment Management Authorities (CMAs).

The Goulburn Broken and North East CMAs are renewing their RCSs. RCS are renewed every six years. Previous RCS's were released in 1997, 2004, and 2013. Each successive RCS has built on the previous strategy, evolving over time in response to economic, social, environmental and political shifts and requirements of the Victorian Catchment Management Council RCS Guidelines.

The Goulburn Broken and North East CMAs have and will continue to adopt a resilience approach to the renewal of their respective RCSs. The resilience approach acknowledges the ongoing change the catchment is facing and focuses on the connection between people and nature, how these connections change, and what can be done to achieve desired, balanced goals for resilience.

It is within this context that Goulburn Broken and North East CMA have engaged Natural Decisions to undertake a desktop socio-economic analysis of the Goulburn Broken and North East Catchments. This analysis will complement other background information gathered as part of the RCS Renewal project (e.g. RCS Review, ecological trends and conditions, stakeholder perspectives, values and aspirations etc).

This report presents the results of an analysis of Australian Bureau of Statistics' (ABS) census data of current and past trends in land use, industry and employment, and demographics within the two catchments. It identifies some key drivers of change for the two CMA regions and presents a number of objective classifications of urban settlements as well as a subjective classification of rural SA1s as a starting point to inform how the CMAs might segment the two catchments into similar landscapes. The report is a starting point for future conversations and data analysis that will be undertaken as part of the RCS renewal process.

3 METHOD AND CONSTRAINTS

This report is based on ABS census data. There are limitations the data available and scope of the study. These include and are not limited to:

- This report is based upon publicly available archive data, mostly from the Australian Bureau of Statistics. The data sources are described in Appendix 1 and methods of analysis are detailed throughout the report.
- Most ABS data are only available up to 2016. Changes during 2016-2020 will not be capture by the indicators. Data for this period will become available in 2022.
- ABS geographies changed in 2011 so time series data prior to 2011 is not always available.
- In 2016 the ABS changed the minimum size of farm it includes in its reported data from $5,000 to $40,000. This means many of the smallest farms are no longer counted in 2016 data.

- Data for small townships is limited by ABS privacy constraints on data access. For this report this means that towns with less than 200 people have a limited dataset. Towns with less than 100 people have a very limited dataset.
- Data on indigenous status is limited and potentially problematic due to uncertainties over self-identification. The CMA does not see this report as a substitute for direct consultation with Traditional Owners and First Nations peoples. Information included and drawn upon to inform the RCS will be determined in collaboration with Traditional Owners and First Nations peoples.

4 SUMMARY

Drivers of change in the catchment and the CMA operating environment

We see five fundamental forces of change in the structure of communities and economies in catchments across Australia:

- The transition of the Australia towards an economy based upon service industries rather than primary industry or manufacturing.
- A long-term demographic transition from the post-war baby boom pyramidal age structure towards a uniform population structure.
- A changing climate under the influence of inexorably rising carbon dioxide levels in the atmosphere.
- Agricultural innovation leading to both extensification and intensification of farming depending upon the circumstances.

An additional driver identified during the process of compiling this report that's has not been addressed in this document that will be explored further through the RCS renewal process is :

- The strengthening of recognition of Traditional Owners and First Nations peoples leading to the inclusion of Traditional Owners (TO) and First Nations in NRM management, acknowledgement of Traditional Ecological Knowledge (TEK) and TO and First Nations cultural aspirations has and will continue to change the CMA operating environment.

In addition to these underlying drivers of change, there are more acute system shocks that are sometime unpredictable. Examples acting in the study catchments would include:

- The collapse of the sub-prime mortgage market in the US in 2008-09.
- Removal of production quotas for the EU dairy industry, leading to rapid growth in production of dairy products in Ireland, Poland and France.
- The current Covid-19 experience, which is not represented in the data analysis.

Whilst the five main underlying drivers of change are obvious and to an extent predictable, the secondary drivers are the human response to the underlying drivers. These are far more numerous as well as being less predictable (response to fire being a notable example). The secondary drivers interact with each other, with the potential to create unforeseeable outcomes. For catchment managers, there is often little opportunity to influence these secondary drivers. In emergency situations there may be chances to ameliorate their impacts. In more stable times, these secondary

drivers will be changing the stakeholder mix, changing the capacity and incentives of landholders to manage their land and sometimes changing the priorities of catchment managers.

This report presents data for a selection of socio-economic indicators drawn from publicly available data sources. These indicators partially describe some of the secondary drivers of change discussed above.

Key population sub-groups

The population is divided into four groups:

- City, town populations.
- Persons living on farms in a household where there is at least one person whose main
- occupation is farming [Farmers].
- Persons associated with farms where no member of the household has farming as the main
- occupation [Part-time farmers]; and
- Persons living in rural areas not associated with a farm [Rural residents].

The reasons for this division are partly to reflect differing land management roles and landscape stakeholders. A second reason is the differing quality of data available for each group.

Information on town residents is relatively comprehensive. Data for the rural residential population is harder to extract, required some simple modelling to create basic population counts.

Time series data could only be extended to cover two censuses due to changes in boundaries used by the ABS to report data. The short 5-year time span of this data revealed a trend of increasing urbanization in both catchments with the share of the population living in major towns increasing, and the share living in rural areas decreasing.

	Goulburn Broken		North East	
	Count	Per cent	Count	Per cent
Town	134087	74.5%	81388	81.6%
Farmers	5128	2.8%	2083	2.1%
Part time farmers	10532	5.9%	4333	4.3%
Rural residents	30176	16.8%	11934	12.0%

	2011	2016
Town population	77.7%	81.6%
Farm household population	2.8%	2.1%
Part time farmers and rural residents	19.5%	16.3%

Socio-economic indicators

The main body of the report presents indicators for:

- Population
- Migration
- Dwelling occupancy
- Visitation

- Age structure
- Education
- Household composition
- Income
- Industry of employment
- Diversity

These indicators describe towns (generally with a population above 500 persons) and rural SA1s (Statistical Area 1 used by the ABS).

Indicators are presented for persons whose main occupation is farming and for farms by SA2 (Statistical Area 2). Indicators include:

- Farmer population count
- Change in population
- Farmer age
- Change in farmer age
- Farm establishment count
- Median farm size (by Estimated Value of Agricultural Operations)
- Distribution measures of farm size (Area and Estimated Value of Operations)
- Farmland values (by LGA)

Data is presented for the census year 2016. Where possible, data from an earlier period is also presented to provide information of trends. The earliest year presented depends upon availability and usefulness. The series may extend back to 2011, 2006 or 2001.

The reader seeking further detail on any of these indicators is advised to use the Table of Contents to find the relevant section of the report.

Classification analysis of townships

One of the main outcomes of this report is the creation of a series of sub-regions of each catchment using socio-economic data. This is meant to inform the CMA's in assessing the relevance of their own catchment subdivisions. These socio-economic classifications needed to viewed as just one of four perspectives with which one may approach the task of sub-catchment classification.

- Catchment and sub-catchment.
- Ecological structure.
- Social gravity catchment
- Socio-economic characteristics.

Each of these approaches has advantages. Water catchments are clearly sensible for water management. Ecological structures are sensible for management of ecological systems, though it is inevitable they will overlay at right angles to catchments. Social gravity will be how communities construe their regions. The final approach, socio-economic characteristics, combines areas according to socio-economic similarity. It should not be expected to be congruent with any of the other three approaches. A generation ago one would have expected that farming, demographic structure and ecological function would have been closely correlated. Agriculture was a much greater determinant of town and region economic performance. Agriculture would have been mediated by soil and climate characteristics, both of which are linked to ecological function. The passage of time will have gradually de-coupled these relationships with the growth of service employment.

The extensive detail in the urban population indicators is summarized in a number of classification analyses of townships with population greater than 500. The first classification was of main industry of employment for the town population. The identification of main industry of employment is influenced by the aggregation of industry categories, so the interested reader is advised to examine this section of the report in further detail.

The main trend over the past 15 years has been a decline in the share of employment held by manufacturing and a rise in the share of employment in the health and education sectors.

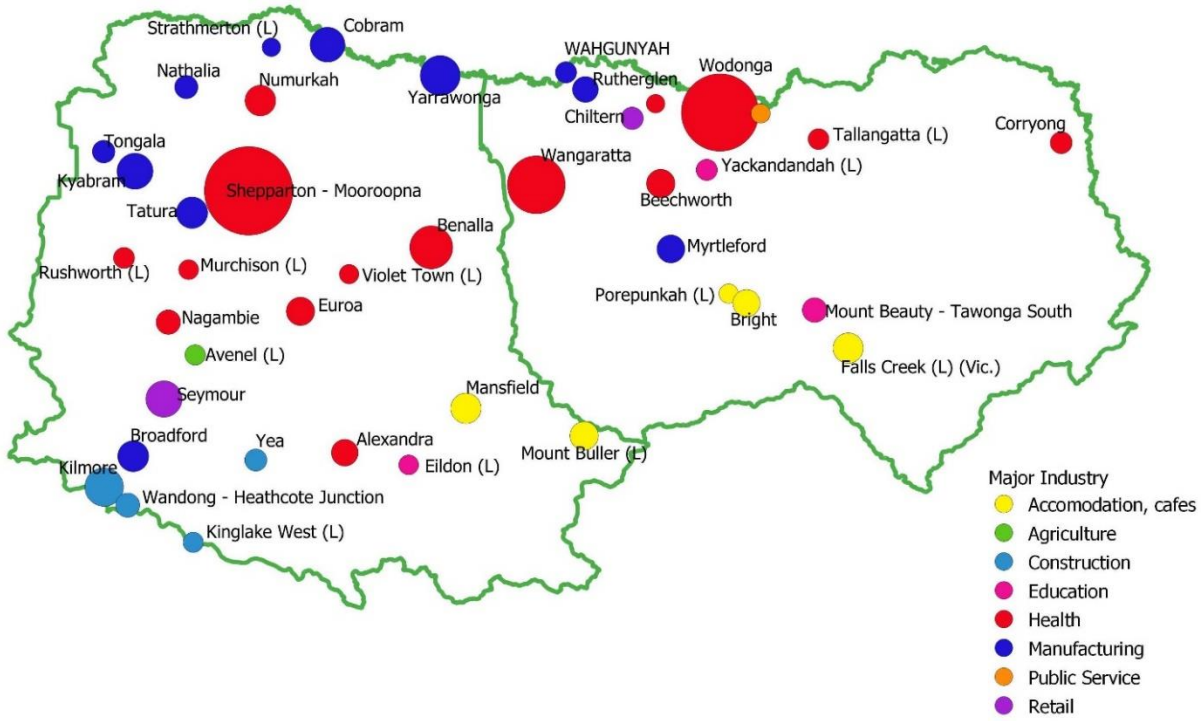
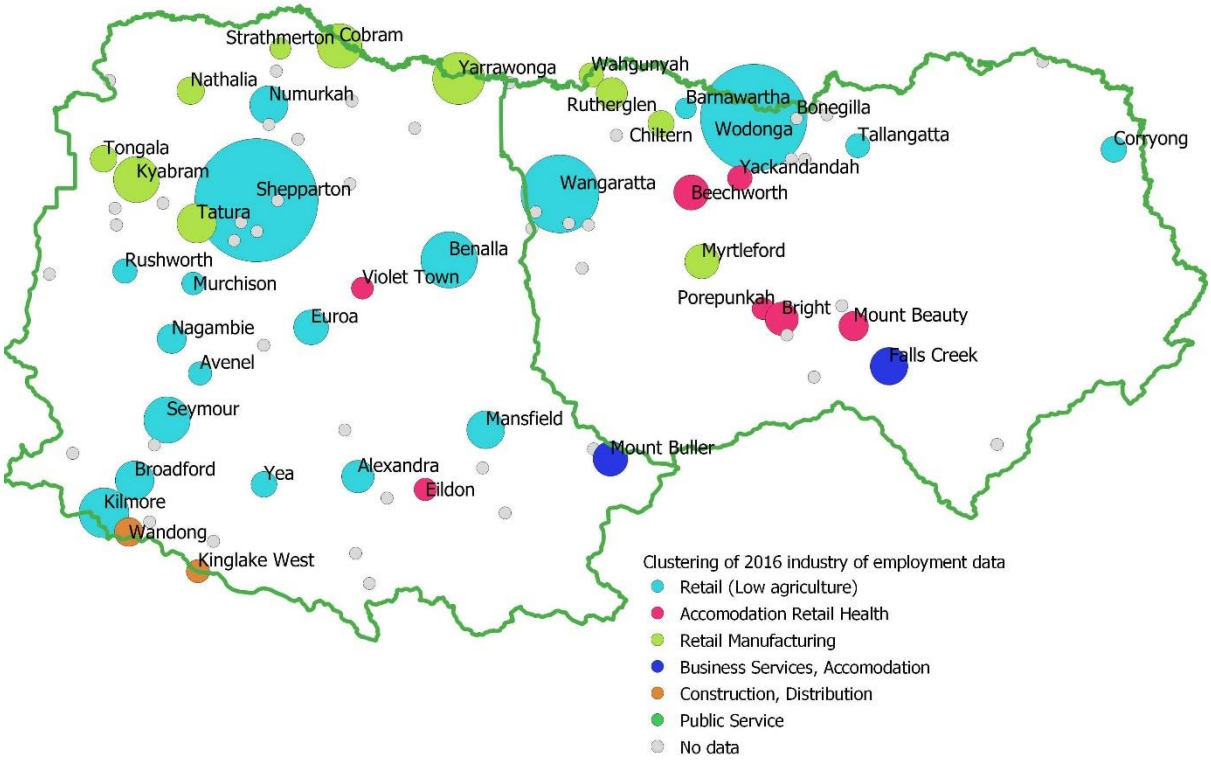


Figure 1 Main industry of Employment in 2016

The second classification describes how the mix of employment in the town differs from the average employment mix in Victorian rural towns. For example, a description of a town as Retail (low agriculture) may not mean that retail is the largest industry in the town. The largest industry may well be something else, such as health and education. However, the town's retail employment is high compared to the State average.



The third perspective of the catchment townships is the pattern of dwelling occupancy. Towns were classified as being residential, accommodation or weekender. Accommodation towns host visitors in non-home accommodation. Weekender towns have a higher proportion of empty dwelling.

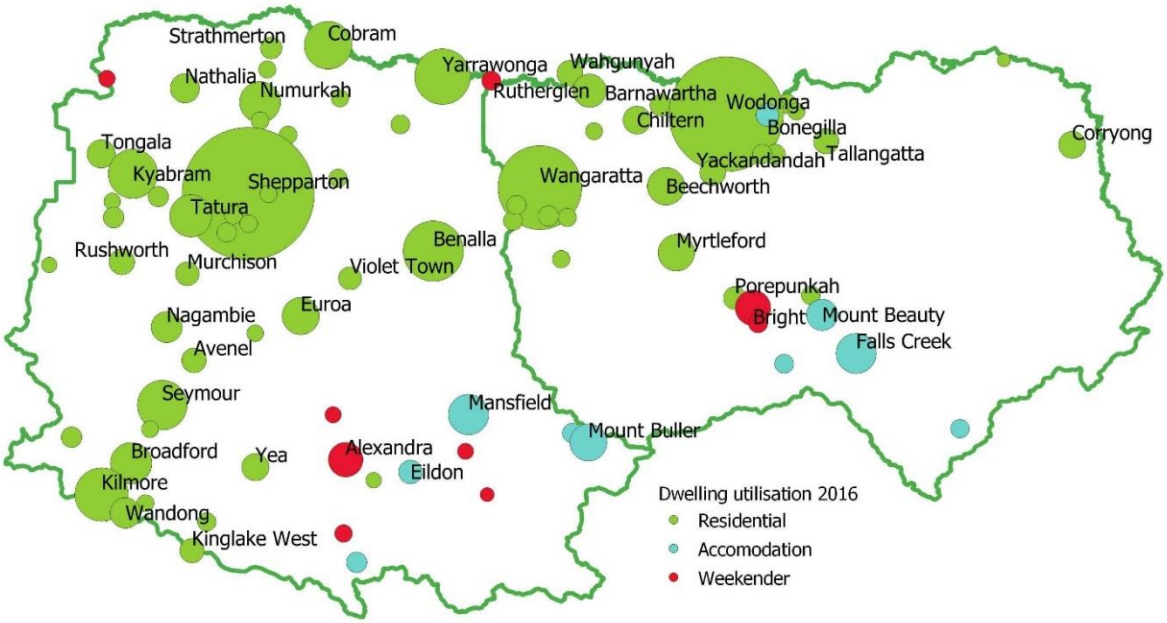


Figure 2 Pattern of dwelling occupancy in 2016.

The next classification of towns is by demographic characteristics. The statistical classification process created four town types- unchanging country towns, rural gentrification towns, ageing towns and family formation towns.

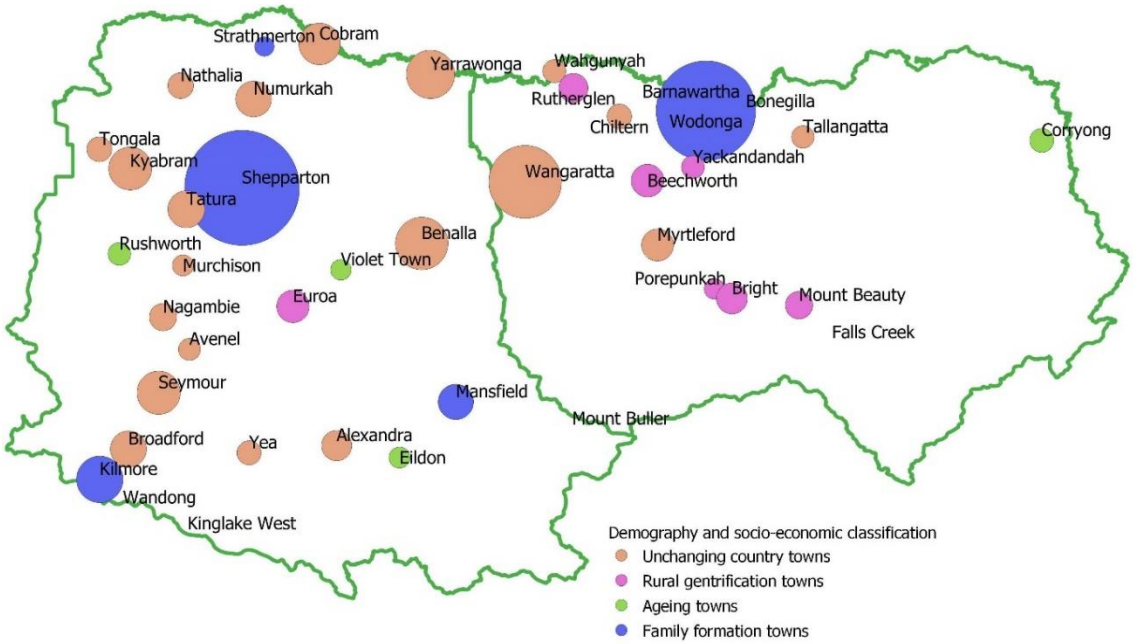


Figure 3 Demographic classification of towns.

The final town classification was by both demographic and economic variables. This produced a more complex classification structure. Categories were: Business as usual, Rapid manufacturing decline, Rapid population growth, Shrinking household size, Gentrification, Ageing towns, Early gentrification and Rise in business employment.

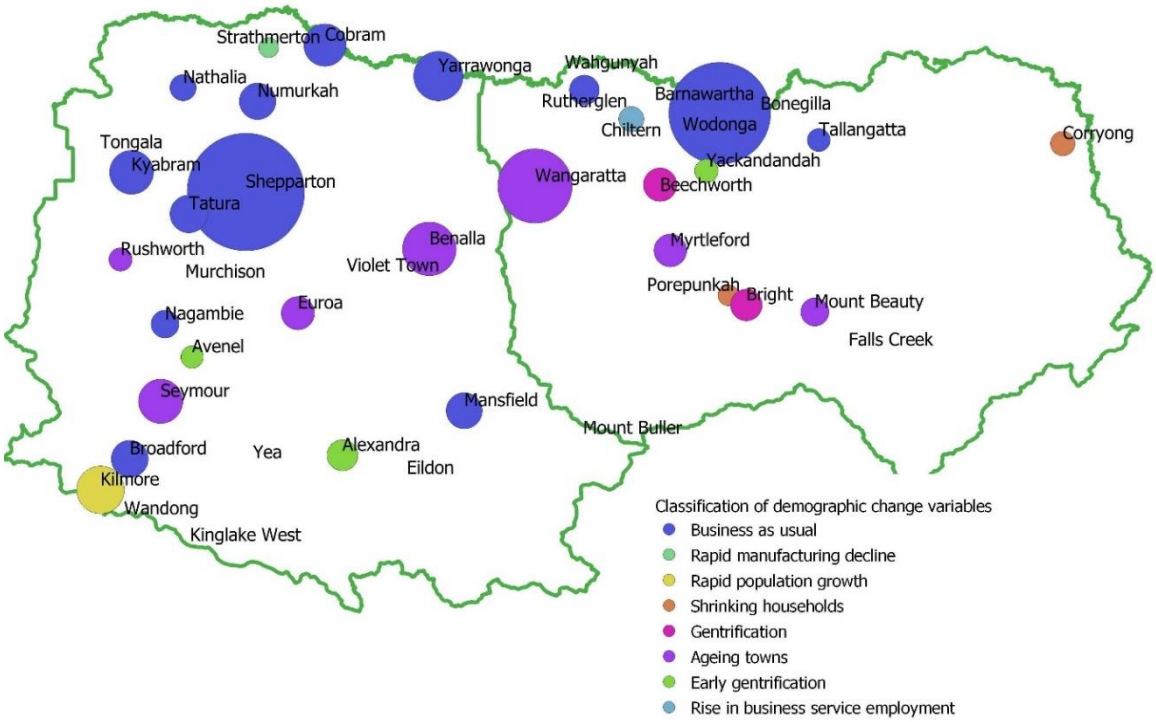


Figure 4 Demographic and economic classification of towns 2016

Classification of rural SA1s

A nested classification of rural SA1s was created using factor analysis followed by a subjective classification by the author. The nested classification is as follows:

Broadacre Dryland Agricultural Regions

The Broadacre Plains: This is the most rural of the regions, extending from the Murray between Cobram and Yarrawonga south almost to Seymour. There are no towns of significant size in the region, and agriculture is relatively important as an employer. The value of land is little influenced by amenity pressures. As a consequence, farms are relatively large.

Goldfields: This still looks to the observer like an agricultural region, but there are some differences compared to the Broadacre Plains. The agricultural quality of the land is lower, and the area is closer to Melbourne. This means that there is an encroachment of visitor services and absentee land ownership, particularly in the sedimentary hill country.

Lower Ovens: Large parts of this region are similar to the Broadacre Plains. However, proximity to the Murray means that aggregate statistics for the area reveal areas of amenity influence, modest population growth and visitation that are absent from the Broadacre Plains region.

The Irrigation Regions

These four regions have in common irrigation production, a relatively younger farmer population and low education levels.

Rural Irrigation: This region is the irrigation equivalent of the Broadacre Plains, being those irrigation areas under the least influence from the irrigation towns of Shepparton, Kyabram, Tatura, Cobram, Tongala, and Echuca (which is just over the catchment border). Agriculture, particularly dairying, remains a dominant industry, and so this region has experienced the greatest impact from low dairy prices, environmental water prices and periodic low allocation seasons.

Shepparton Hinterland: This is the area of rural character surrounding Shepparton. Horticulture plays a larger part in agricultural production. Proximity to the largest town in the catchment means the demographic statistics of these rural areas show some influence from increased rural living and commuting to town.

Kyabram-Tongala: In many ways similar to the rest of the Rural Irrigation region, but under the influence of the two irrigation towns, and so will have felt the impact of the contraction of the manufacturing sector in those towns.

Strathmerton-Cobram: This smaller region closer to the Murray shows less rural character, greater cultural diversity. Like the other irrigation regions it exhibits lower education levels.

Wodonga Region

Two regions where demographic change is driven by growth in the township of Wodonga.

Wodonga hinterland: This region is increasingly becoming a dormitory region for the town of Wodonga. It shows modest growth, little structural ageing and higher education levels. Past population projections show modest to strong growth for Wodonga and if this is borne out, the growth of the surrounding rural areas can be expected to continue subject to the constraints of planning. The sleeper in this is the impact of the Covid-19 pandemic on migration to Australia and how this will change future population growth in regional Victoria.

Beechworth-Yackandandah: The rural areas surrounding these two towns are subject to the impacts of town gentrification – increased rural living, rising land values. The inhabitants of the rural areas surrounding these towns have higher levels of education, higher incomes and exhibit only low rates of structural ageing. Farms are very small.

North East Mountain Valleys

This is the extensive area of mountain valleys to the east and south of Tallangatta. In a social gravity sense these are at least four different communities within this region, each with social and economic linkages to different major (and minor) population centres.

- Omeo-Benambra
- Upper Murray-Corryong
- Mid Mitta
- Mid Kiewa (Dederang)

The Mountain Amenity Regions

The two regions in this grouping share common characteristics that diverge from the more rural regions of the catchments. At the basis of the economies of these regions is mountain-based tourism and recreation – skiing, mountain-biking, walking or just visiting for the scenery. Because of the high land values in parts of these areas, agriculture has shifted towards more intensive small-scale horticulture, gourmet produce and farm visitation. These regions will be currently feeling the greatest impact from Covid-19 restrictions.

Upper Ovens and Kiewa: High levels of amenity visitation, rising land values, higher levels of employment in accommodation and cafés and restaurants. The economy in the upper Ovens, and to an extent the upper Kiewa, is driven by the opportunities for recreation provided by the surrounding mountain ranges. The data shows a gradual increase in absentee land ownership. Agriculture is small scale beef production, or more intensive, often specialized, horticulture, depending in part upon sales from the business. This area has probably felt the impact of Covid-19 restrictions greater than others in the catchment.

Upper Goulburn: The mountain recreation opportunities of Mt Buller and water recreation from Lake Eildon ensure this region has many similarities with the upper Ovens. However, it does have a different character due to the smaller number of ski resorts (just Buller). The visitation economy is concentrated in the Mansfield environs and the roads leading there. Elsewhere the landscape has been gradually transforming into a weekender structure. Almost 50 per cent of properties in the Mansfield Shire are owned by person not resident in the Shire. Unlike the Upper Ovens, the Upper Goulburn is a relatively comfortable distance from the eastern suburbs of Melbourne for weekend stays.

Foothills of the Mountains

These are four small regions that follow the valleys and slopes from the Hume Highway up into the mountains. The four regions have in common a landscape dominated by grazing, mostly beef, few significant centres of population and a structurally ageing population.

Mid King and Ovens – Upper Broken: These two areas have much in common, only being shown separately as they are in different CMA regions. They have characteristics in common with the north east mountain valleys, but the rural population is more highly educated. Proximity to the cities of Wangaratta and Benalla means these areas are far less isolated.

Myrtleford and valleys: The mid ovens and tributary valleys has some of the characteristics of the other two mountain areas, being in a sense a gateway to the mountain areas. However, it has much lower visitation rates, lower education and income levels. Those commenting on the initial draft of this report noted that the Myrtleford district may not have recovered from the closure of its past mainstay, the tobacco industry. The current population structure of the district reflects it tobacco-growing past with a relatively high cultural diversity.

Hume Foothills: This region includes the Strathbogies and the approaches to the upper Goulburn amenity regions. The characteristics of the rural population diverge from the town population. The rural population has a higher education and higher incomes. The area exhibits rapid structural ageing. This may in part be an outcome of the farms being a target for retirement occupation for ex-city professionals.

Hume Corridor

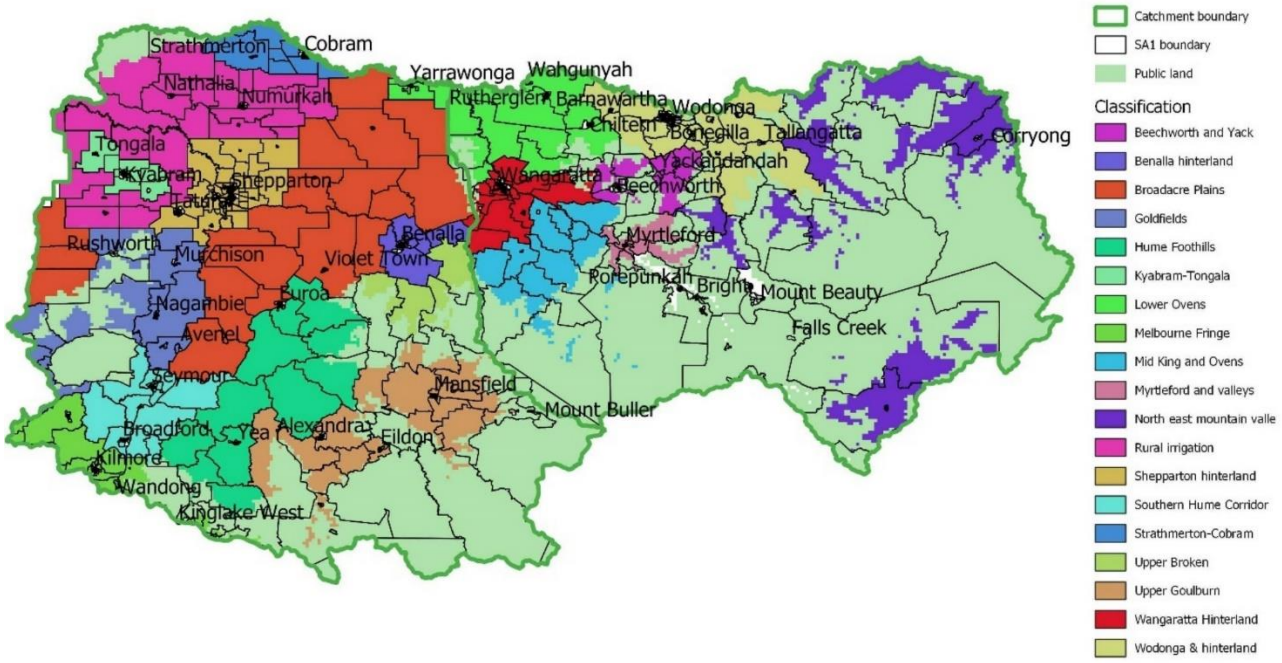
Three regions that have in common their location along the Hume transport corridor and proximity to larger towns that provide services and employment opportunities. Proximity to town is associated with smaller farm scale.

Benalla Hinterland and Wangaratta Hinterland: Both these regions surround their respective cities. As a result, the demographic structure of these rural areas is somewhat urban. Higher education, higher incomes and less dependence upon agriculture as an occupation.

Southern Hume Corridor: The population of this rural area is even more urban in its characteristics, and at the same time quite different to the population of the towns of Seymour and Broadford that it surrounds. High education level, low structural ageing, modest growth rates indicate a connection with the economy of Melbourne to the south.

Melbourne Fringe

The area in the upper catchment that surrounds Kilmore and Wandong is quite different to the rest of the two catchment areas under study. It is a region experiencing strong growth driven by the economic engine of Melbourne, just over the divide. From a demographic and economic perspective, this small region needs to be seen as an extension of Melbourne. Farms in this area are financially small, indicating either small areas or unintensive farming.


Strathmerton
Cobram
Yarrawonga
Wahgunyah
Nathalia
Numurkah
Rutherglen
Barnawartha
Wodonga
Chiltern
Bonegilla
Tallangatta
Corryong
Tongala
Kyabram
Shepparton
Yackandandah
Wangaratta
Beechworth
Rushworth
Benalla
Myrtleford
Murchison
Violet Town
Rolepunkah
Bright
Mount Beauty
Euroa
Nagambie
Falls Creek
Avenel
Seymour
Mansfield
Mount Buller
Broadford
Yea
Alexandra
Eildon
Kilmore
Wandong
Kinglake West
Catchment boundary
SA1 boundary
Public land
Classification
Beechworth and Yack
Benalla hinterland
Broadacre Plains
Goldfields
Hume Foothills
Kyabram-Tongala
Lower Ovens
Melbourne Fringe
Mid King and Ovens
Myrtleford and valleys
North east mountain valle
Rural irrigation
Shepparton hinterland
Southern Hume Corridor
Strathmerton-Cobram
Upper Broken
Upper Goulburn
Wangaratta Hinterland
Wodonga & hinterland

5 DRIVERS OF CHANGE IN THE CATCHMENTS

We see five fundamental forces of change in the structure of communities and economies in catchments across Australia, and in the operating environment of CMAs:

- The transition of the Australia towards an economy based upon service industries rather than primary industry or manufacturing.
- A long-term demographic transition from the post-war baby boom pyramidal age structure towards a uniform population structure.
- A changing climate under the influence of inexorably rising carbon dioxide levels in the atmosphere.
- Agricultural innovation leading to both extensification and intensification of farming depending upon the circumstances.

An additional driver identified during the process of compiling this report that's has not been addressed in this document that will be explored further through the RCS renewal process is the:

- The strengthening of recognition of Traditional Owners and First Nations peoples leading to the inclusion of Traditional Owners (TO) and First Nations in NRM management, acknowledgement of Traditional Ecological Knowledge (TEK) and TO and First Nations cultural aspirations has and will continue to change the CMA operating environment.

5.1.1 The transition to a service-based economy

In 1990 and 2016 the services share of the Australian economy rose from 59% to 68%. This transition to a services economy is common to most high-income economies in the world. It is associated with increasing per capita incomes.

This transition changes the location preferences of businesses. Primary industries have generally been strongly linked to locations which provide raw materials, natural resources and land. Although there are modern exceptions such as high-intensity glasshouse vegetable production, most farm industries are constrained by soil, topography and climate. Manufacturing industries are less constrained by place, but still have historically located where they can gain access to raw materials. Lower skill service industries tend to locate where there is a demand for services. This can lead to the development of semi-exclusive territories of operation.

High skill service industries are quite different. The main input of higher skill service industries is skilled labour. This means businesses base their physical location on the advantages it provides in sourcing labour. This gives rise to agglomeration economies where similar businesses co-locate to increase the shared pool of skilled workers. The most obvious international example is Silicon Valley in the United States, home to countless information technology companies. In Victoria, a more recent example is the consolidation of many consulting engineering firms in the Docklands precinct close to Southern Cross station.

The flow-on impacts from agglomeration economies include:

- Most economic growth in the state being captured within ten kilometres of Melbourne CBD.
- Declining farm populations as other sectors of the economy provide more attractive career prospects for younger rural people.

- Most population growth occurring within commuting distance of Melbourne CBD.
- The migration of young adults from rural Victoria to Melbourne.
- Rising demand for and subsequent price of housing according to ease of commuting to the Melbourne CBD.
- Housing stress in the metropolis leading to displacement of less well-off, and migration events to housing in less metro-connected parts of rural Victoria.
- Increased population density in the metropolis increases amenity demand for rural solitude and recreational experiences from those with high incomes living in the metropolis.
- Gentrification of some rural towns that capture the imagination of urban workers; and
- Shifts in expectations of government regarding natural resources (forest conservation, environmental water, landscape planning). The introduction of a Commonwealth environmental water initiative is the most obvious example of shifting political priorities over the past two decades. It is unlikely such an initiative would have happened without the rapid urbanization of the Australian population and the declining number of rural electorates in Australia. Further detail can be found in the work of Inglehart and others who used World Values surveys to describe culture in two dimensions - Survival values versus Self-expression values, and Traditional values versus Secular-rational values. Urbanisation and income growth often leads to a growth in secular-rational values and self-expression values. These are associated with, amongst other things, a rise in environmental values and recognition of the status of Traditional Owners. To further explore these matters the best place to start is the Wikipedia page (Anon, Inglehart–Welzel cultural map of the world, 2020).

5.1.2 Australia's demographic transition

The long-term demographic transition is the gradual shift of the countries demographic structure from the pyramid shape created during the post-second world war to a more uniform distribution. Fertility decisions made by households in the decade after the Second World War created a pyramidal age structure, with younger Victorians greatly outnumbering working age and older Victorians. Such an age structure is unsustainable as it implies rapid exponential population growth. By the mid-1960s fertility rates had fallen somewhat and fell to replacement levels after oral contraceptives became widely available in the mid-1970s. There has been little relative change in fertility rates since that time. However, the social and economic impacts of the fertility pattern between 1946 and 1972 are still working important drivers of social and economic change. Initially the impacts were felt in the education sector, and an era of public debate about portable classrooms and teacher shortages. Today the impacts are being felt around the transition from workforce to retirement.

The impacts of this trend include:

- A structurally ageing workforce, particularly in rural Australia.
- High migration intake (permanent and temporary) in response to the ageing workforce and subsequent population rise.

- Increased pressure upon urban housing stock due to rapid population increase, leading to increased rental stress, homelessness and housing cost migration.
- Increasing cultural diversity in the metropolis as it attracts most migrants, leaving most of rural Australia relatively mono-cultural.
- Changing patterns of service demand and employment in Australia, particularly for human care positions in regions where the population is structurally ageing at a faster rate (generally rural).
- Changing patterns of demand for Australia's export products driven by similar economic transitions in other countries. Higher beef and lamb prices is one example of this.
- Changing patterns of investment and returns on various classes of investment.

5.1.3 Climate change impacts

Although greenhouse gases are rising gradually and uniformly, the impacts of subsequent climate change may be more acute, being outcomes of more frequent extreme weather events. Unlike the previous two drivers, the impacts often look more like sudden shocks.

Climate change may manifest through impacts including:

- Drought.
- Decreased catchment yield and thus lower water availability.
- Fractious politics deriving from an increased demand for a declining volume of harvestable water.
- Changes in livability, particularly north of the dividing range, ironically in areas with an older population structure.
- Changed bushfire incidence and severity.
- Changed settlement and migration patterns in response to bushfire experience.
- Changed frost and incidence and chilling factors.
- Changing snowfall patterns; and
- Changes in human morbidity and mortality.

5.1.4 Technological innovation in agriculture

One could argue whether agricultural innovation is part of the transition to a services economy. However, it is also true that this has a significant influence on the development of rural economies, so a separate discussion is warranted.

The long-term trend in agriculture has been the replacement of labour with capital, meaning labour saving technology. In cropping this has taken the form of larger and more effective machinery for sowing, weed control, harvest and storage. To take advantage of these innovations farms have needed to increase in scale to lower cost of production - extensification. These pressures for increased scale have been most obvious in agricultural sectors most amenable to mechanization – cropping and horticulture. They have been present, but weaker in livestock industries.

A related and more recent trend has been the intensification of agriculture, the production of more from a given quantum of non-labour resources. Currently this is apparent in some forms of horticulture with a shift towards glasshouse rather than in field production of some commodities such as tomatoes and leafy greens. For many years economists believed that Australia would not head down this path as it had no shortage of land for in-field horticulture. However, intensification is

driven less by reducing land footprint than by gaining better control over the production system through improved pest and nutrient management. One major pressure behind this development is the purchasing power and methods of the major supermarket chains as they continue to shift the risk of variable supply onto producers.

An important form of intensification in the north of Victoria has been the transfer of water towards higher value uses via the operation of a water market. The market was behind a decline in the number of mixed irrigation farms before lower water allocations and environmental water purchases accelerated the process.

Both of the trends discussed above, extensification and intensification, can be expected to further develop as new technologies emerge and are adopted by the farm sector. We can anticipate contributions from domains including gene technology, electronic measurement systems such as GPS as well as areas that we are not aware of at present.

5.1.5 The strengthening recognition of Traditional Owners and First Nations

Significant shifts in the recognition and relationships between Traditional Owners , First Nations and Aboriginal Victorians with Governmentthat will be expored further through the RCS include, but are not limited to :

- Recognition of Traditional Owner's land rights – Settlement Packages and Recognition of Settlement Agreement (RSA)
- Changes in legislation over Traditional Owner inclusion – water management engagement, involvement and participation (NRM participation agreements, Indigenous Land use Agreement)
- Acknowledgement of Traditional Ecological Knowledge (TEK) and TO and First Nations cultural aspirations. Frameworks, Strategies and plans and agreements including for example Water Resource Plans, Victorian Aboriginal Traditional Owner Engagement Strategy, MOU's between Agencies and Traditional Owner Organisations and/or Groups

5.1.6 Acute system shocks - past

In addition to these underlying drivers of change, there are more acute system shocks that are sometimes unpredictable. Examples acting in the study catchments would include:

- Removal of production quotas for the EU dairy industry, leading to rapid growth in production of dairy products in Ireland, Poland and France. This has depressed world dairy prices for a decade, and subsequent rapid restructuring of the Australian dairy industry.
- The collapse of the US sub-prime mortgage market in 2008, leading to a gridlock in world trade for a year, and reduced incomes for many Australian export industries.
- Floods in 2010, 2011 and 2016 and bushfires in 2009 and 2020. It is arguable that these are partly an outcome of long-term climate change.
- Years of extremely low water allocation in the first decade of this century. Again, it is arguable that this is both an acute shock a[1]nd a manifestation of longer-term climate change.

[1] The terms Traditional Owner and First Nations have been applied in this report. We acknowledge that terminology and the meaning of Traditional Owner and First Nations varies significantly depending on its context.

5.1.7 Acute systems shocks – the current Covid-19 situation

At the time of writing the country, indeed the world, is currently navigating through the Corona virus (COVID-19) epidemic. The medium and long-term impact of public health policy responses upon catchment communities is uncertain, but certainly major.

- Nationally the employment impact has been greatest in the accommodation, food services, arts, and recreation industries. The full impact has possibly not been reached yet, ameliorated by the JobKeeper support payments. When these payments end, the full extent of business extinction may become apparent. The unknowns revolve around the period of enforced physical distancing and which businesses will be unviable under this constraint, and the timing of arrival (if at all) of any vaccine for the virus. Pay attention to indicators of towns that depend upon these industries.
- Speculation is rising that one of the longer-term impacts of the COVID-19 event will be an increased interest in migration from cities to regions. Whether this is merely boosterism from the Real Estate industry remains to be seen. What is clear is that if a vaccine does not appear, and physical distancing needs to be maintained, the economic growth of city centres is at risk. The current occupancy rate of high-rise office buildings depend upon lift capacity and open plan office configurations. Greatly reduced lift capacity and office capacity under physical distancing rules will reduce the workforce that can operate in the buildings. Add to this reduced public transport capacity and whole model of central city employment growth must be questioned. In the short to medium term telecommuting may remain a feature of white-collar employment. This may well open opportunities for resettlement in regions if broadband connections have adequate speed, latency and capacity. The quality of connection, together with the social and natural amenity of a region may become its main competitive advantage or disadvantage.
- For a decade Australia has maintained high rates on net inward migration through permanent and temporary visa programs. Whilst demand for migration into Australia is unlikely to fall, continued Covid-19 related entry restrictions to the country will slow Australia's population growth. This will reduce pressure upon housing stock and may reduce the rate of out-migration to regions in response to high housing prices in Melbourne. Some financial institutions are planning for scenarios that include a 35 per cent decline in the value of housing stock.

To the reader coming to this document at some time in the future when the impact of COVID-19 is clearer, the above discussion should be a reminder of how uncertain the future looked at the time of writing. The reader should also keep clearly in mind that the rest of this report is a study of how the world looked according to official statistics in 2016. It is a study of a pre-COVID-19 past.

5.1.8 Exploring drivers using socio-economic indicators

Whilst the four main long-term drivers of change are obvious and to an extent predictable, the secondary drivers are the human response to the underlying drivers; these are far more numerous as well as being less predictable (response to fire being a notable example). The secondary drivers interact with each other, with the potential to create unforeseeable outcomes. For catchment managers, there is often little opportunity to influence these secondary drivers. In emergency situations there may be chances to ameliorate their impacts. In more stable times, these secondary drivers will be changing the stakeholder mix, changing the capacity and incentives of landholders to manage their land and sometimes changing the priorities of catchment managers.

This report presents data for a selection of socio-economic indicators drawn from publicly available data sources. These indicators partially describe some of the secondary drivers of change discussed above. The relationship between indicators and drivers is described in Table 1. There are some important limitations in the suite of indicators.

- Most data for the indicators is only available up to 2016. Changes during the period 2016-20 will not be captured by the indicators. This is important for shocks that include the 2020 bushfires and the policy response to COVID-19.
- Data is available in various ABS geographies. These geographies changed in 2011, so time series data prior to 2011 is not always available.
- The available data does not provide information on all aspects of the drivers discussed above. This is particularly the case for the strengthening recognition of Traditional Owners.

The data sources are described in Appendix 1: Data sources on page 171.

Table 1 Socio-economic indicators and their links with secondary drivers of social and economic change

	Secondary drivers of change arising from the three primary drivers									
Socio-economic indicators	**Service economy transition**				**Demographic transition**		**Climate change**		**Agricultural innovation**	**Acute shock**
	Agglomerative growth	**Net loss of young**	**Declining population**	**Amenity demand and rural gentrification**	**Ageing workforce**	**Cultural change driven by migration**	**Drought/water availability**	**Bushfire**	**Extensification**	**EU dairy de-regulation**
Population urban-rural	X		X							
Population change		X	X					X		
Population turnover	X							X		
Residential address stability	X							X		
Dwelling occupancy Visitation Population in non-private dwellings				X						
Persons aged 0-17 Persons aged 17-24 Persons aged 25-64 Persons aged 65+		X			X					
Average household size Household composition		X	X							
Education – degree Education – diploma Education – no post-secondary	X									

Personal Income Family Income	X			X						
Dwelling tenure	X									
Workforce participation Unemployment rate		X	X		X					
Employment in agriculture									X	
Employment in manufacturing										
Employment in high skill services	X									
Employment accommodation, café, arts, recreation				X						
Employment government service			X							
Employment construction										
Education and Health employment Employment retail			X							
Personal income Family income	X									
Access to private vehicle transport										
Indigenous ratio										
Non-English-speaking households Born overseas						X				
Gender ratio	X									
Employment in agriculture	X						X		X	X

Farmers as per cent. of workforce	X						X		X	X
Median farmer age							X		X	X
Small farm proportion (EVAO) Large farm proportion (EVAO)	X						X		X	

6 KEY POPULATION SUB-GROUPINGS

The population is divided into four groups:

- City, town populations.
- Persons living on farms in a household where there is at least one person whose main occupation is farming [Farmers].
- Persons associated with farms where no member of the household has farming as the main occupation [Part-time farmers]; and
- Persons living in rural areas not associated with a farm [Rural residents].

The reasons for this division are partly to reflect differing land management roles and landscape stakeholders. A second reason is the differing quality of data available for each group. For town residents we can access good demographic data from the Towns in Time database. For farmers reasonable data is accessible about both farmers and farms, derived mainly from customised tables sourced from the ABS. For the last two groups, data is more difficult to extract without the use of detailed customised tables. Much of the analysis will be based upon a simple split of town and rural populations. For more detailed overview of the data sources please refer to Appendix 1: Data sources on page 171.

We used simple modelling to estimate the populations of each of the four groups by catchment (Table 2). These are estimates only based upon the available data and several simplifying assumptions. The assumptions and estimation process are discussed in the appendix on page 172. The absolute numbers should be taken as indicative. The reader is recommended to focus upon the relative population composition.

Table 2 Estimates of population composition of GB and NE catchments in 2016

	Goulburn Broken		North East	
	Count	Per cent	Count	Per cent
Town	134087	74.5%	81388	81.6%
Farmers	5128	2.8%	2083	2.1%
Part time farmers	10532	5.9%	4333	4.3%
Rural residents	30176	16.8%	11934	12.0%

Table 3 Change in catchment Goulburn Broken catchment population composition 2011-2016

	2011	2016
Town population	72.4%	74.5%
Farm household population	3.7%	2.8%
Part time farmers and rural residents	23.9%	22.6%

Table 4 Change in catchment North East catchment population composition 2011-2016

	2011	2016
Town population	77.7%	81.6%
Farm household population	2.8%	2.1%
Part time farmers and rural residents	19.5%	16.3%

Notes on the estimates:

- Both catchments are predominantly urban from a population perspective. At least 75% of the population lives in towns. For this reason, particular attention is paid to town demographic data in this report.
- The population of the rural areas of the catchment is first rural residential, then part-time farming and then main occupation farming. [We will see later with other indicators that the extent of rural residential settlement is not homogenous across the catchment].
- Farming households comprise a small proportion of the total catchment population.
- The population composition of both catchments has been urbanizing during the period between the last two Population and Housing censuses. This is due to strong population increases in the major towns of the catchments, and a decline in the number of farming households. Due to limitations in the 2011 Mesh-Block data, we cannot separate the population of part-time farmers and other rural residents for the 2011 census.

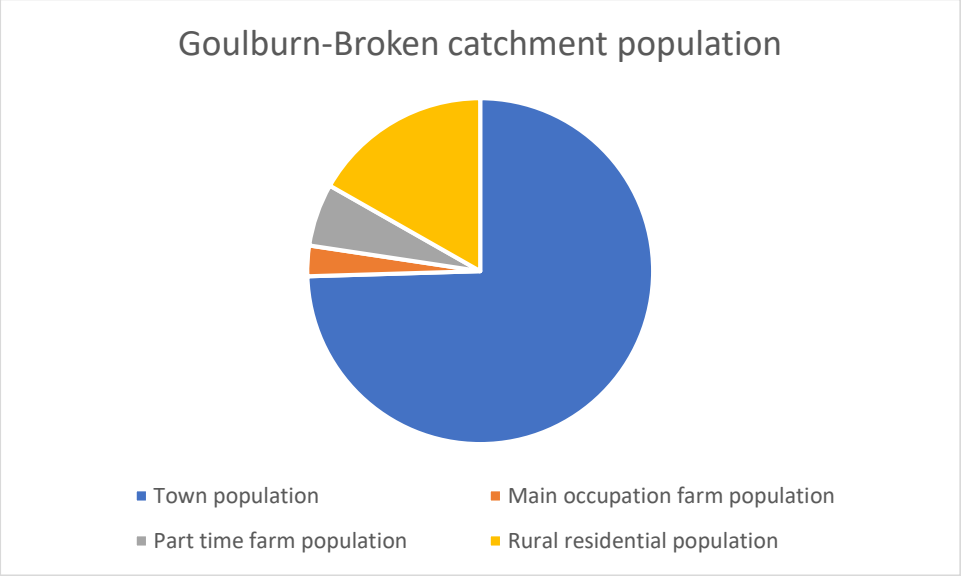


Figure 5 Goulburn Broken catchment population composition - urban, farming, rural residential in 2016

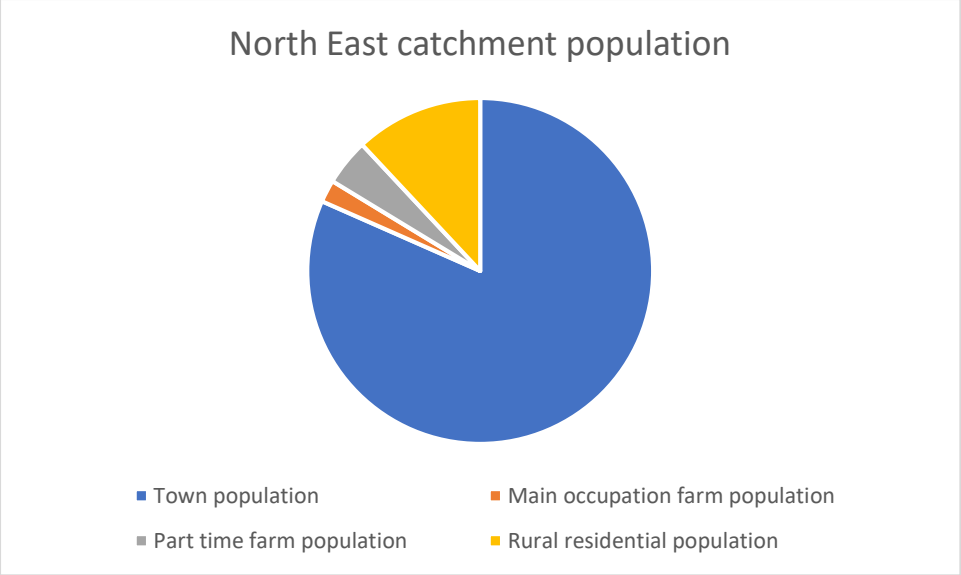


Figure 6 North East catchment population composition - urban, farming, rural residential in 2016

7 INDICATORS

7.1 POPULATION

7.1.1 Population increases across the state

Figure 7 shows the change in population by catchment from 1981-2016. This clearly shows two features:

- The Victorian population has been increasing since 1981, with an acceleration since 2001. Since 2001 the balance of contribution from natural increase and net overseas migration (NOM) has shifted from near equal to 60% NOM (Simon-Davies, n.d.). Increases in NOM have largely been driven by temporary arrivals – workers and students.
- Much of the growth in population has been captured by Melbourne, and to a lesser extent Geelong. Port Phillip and Corangamite catchments have the highest rates of growth of Victorian catchments. This is consistent with the growth of high skill service industries aggregating in larger cities and attracting labour.

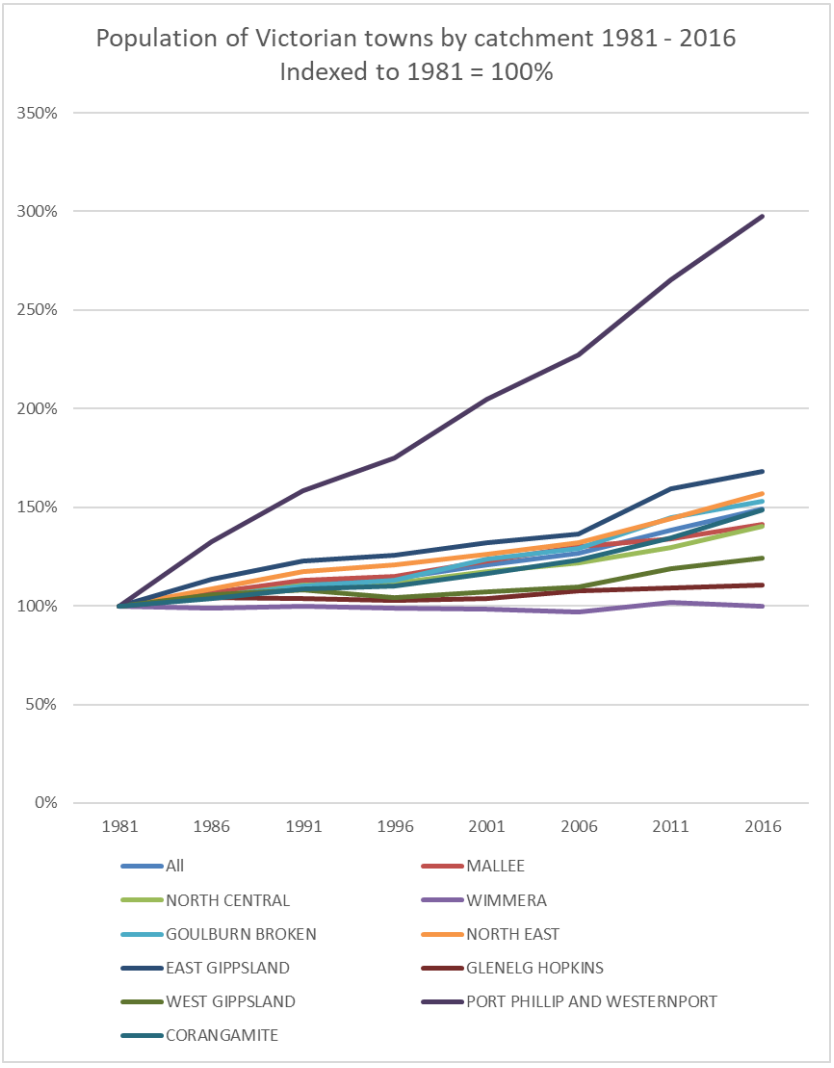


Figure 7 Population of Victorian country towns by catchment 1981-2016, indexed to 1981 = 100%

7.1.2 Town populations

In the Goulburn Broken and North East Catchments population in towns has increased by 50% since 1981, similar to a number of other catchments. The underperformers are Glenelg Hopkins and the Wimmera. Over performers are Port Phillip and East Gippsland.

For the GB-NE catchments

- Largest towns have shown consistent growth.
- Towns along the Murray or adjacent to a large water body with growth-oriented planning schemes show consistent growth (Cobram, Yarrawonga, Wahgunyah, Nagambie)
- Towns within the economic orbit of Melbourne show strong growth unless impacted by bushfire (Kilmore, Broadford, Wandong as opposed to Hazeldene).
- Smallest towns show growth if they are in an attractive landscape and are close enough to a large town to function as a dormitory suburb (Yackandandah, Kiewa, Milawa)
- Population decline is more common with isolation (Corryong, Walwa, Mt Beauty, Eildon, Thornton, Jamison, Goughs Bay) or historically agriculturally or railway dependent towns often in riverine plain setting (Colbinabbin, Rushworth, Girgarre, Stanhope, Merrigum, Glenrowan).
- Three towns of moderate size, Myrtleford, Seymour and Benalla, show long-term population decline. The reasons in each case will be unique to each town. Initial expectation is that Benalla's decline is due to planning constraints and population ageing associated with declining household size. Myrtleford was once the centre of a thriving tobacco industry. Seymour has a history of economic dependence upon the railway and the Puckapunyal army base.
- The impacts of the 2009 bushfires can be seen in population decline in Marysville and Kinglake areas.

Contributions to this variation in growth will include:

- Town size
- Planning constraints to town growth
- Proximity to water bodies or hills
- Proximity to facilities and employment in major centres
- Dependence upon an industry with declining or growing employment
- Bushfire impacts.

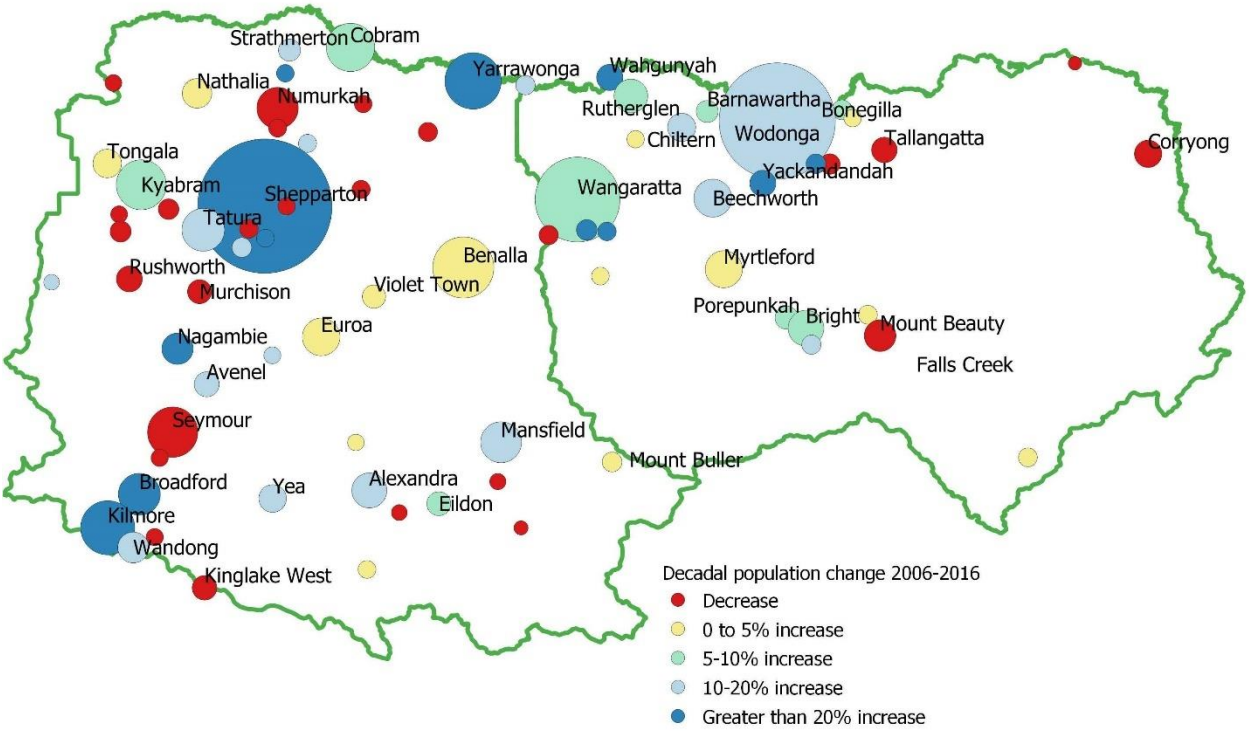


Figure 8 Population change in small towns 2006-2016

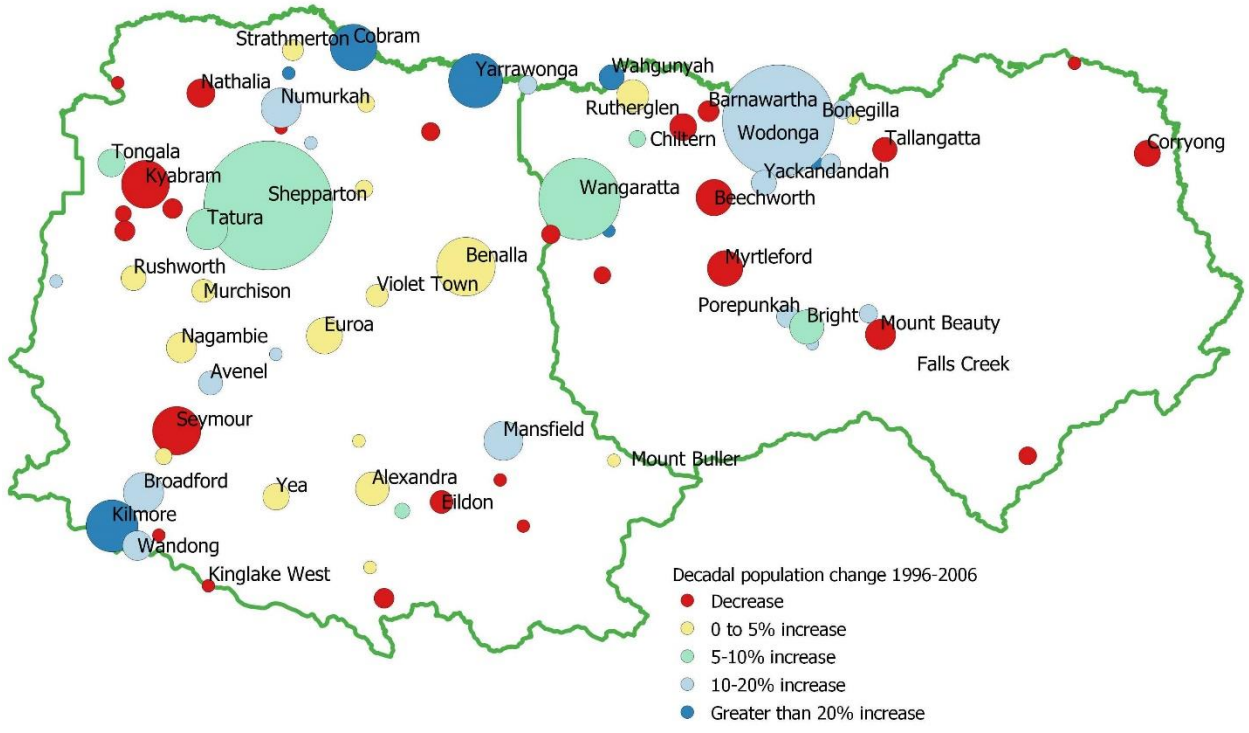


Figure 9 Population change in small towns 1996-2006

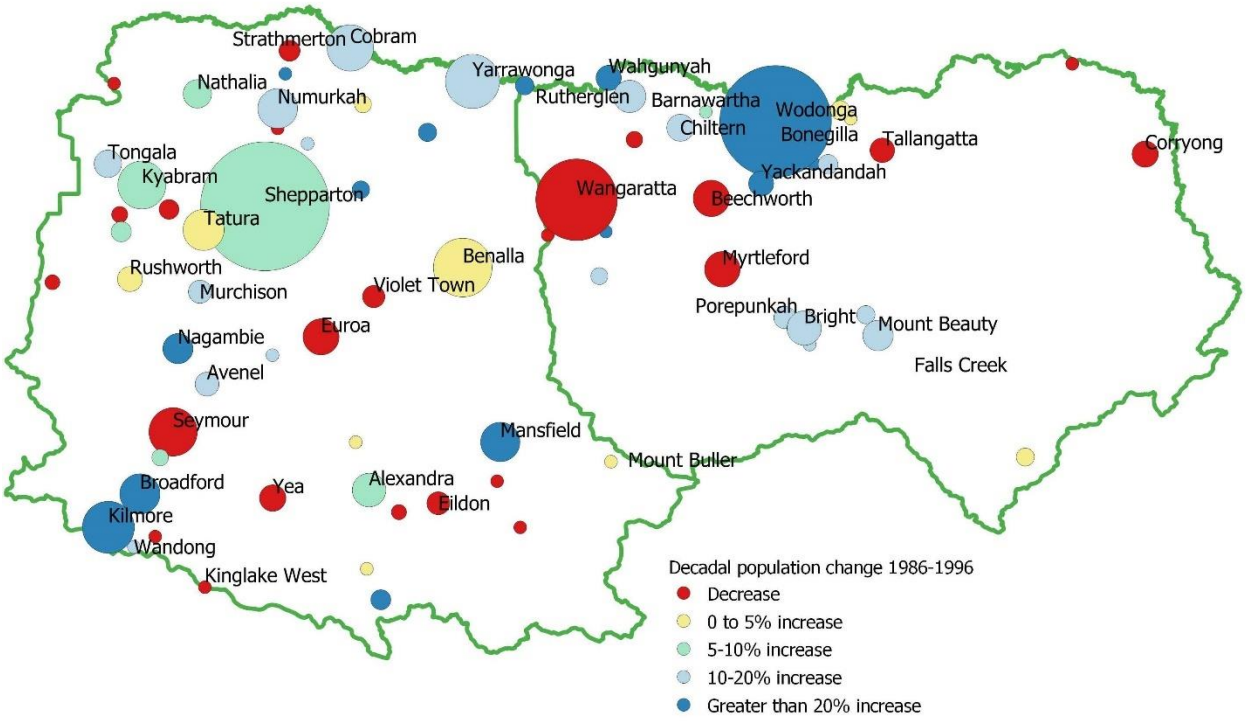


Figure 10 Population change in small towns 1986-1996

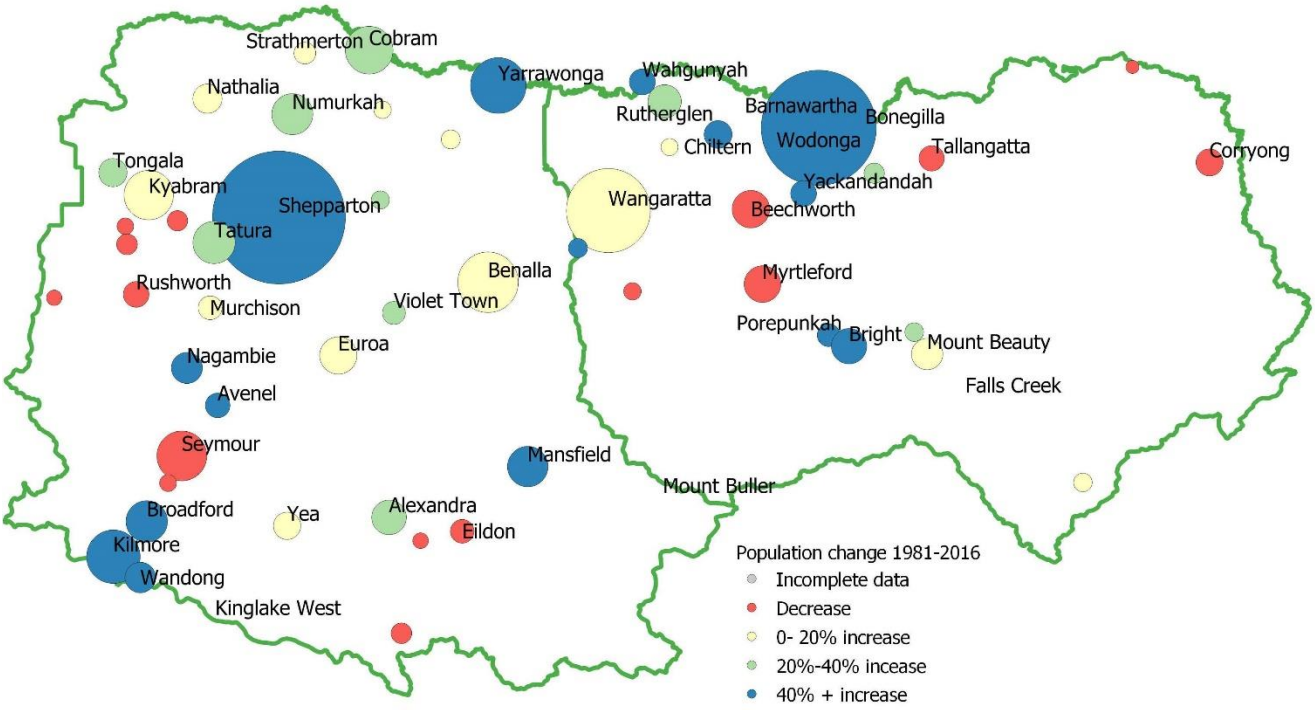


Figure 11 Population change in small towns 1981-2016

7.1.3 Dwellings

The ABS count of dwellings provides a second indicator of growth.

- Over the past 20 years growth has been consistent and strong in the south of the Goulburn catchment in the towns of Kilmore, Wandong and Broadford.
- Growth has been strong in the major centres of Wodonga and Shepparton in the period 2006-16.
- Growth has been low or sometimes negative in many of the smaller more isolated towns at a distance from major centres.

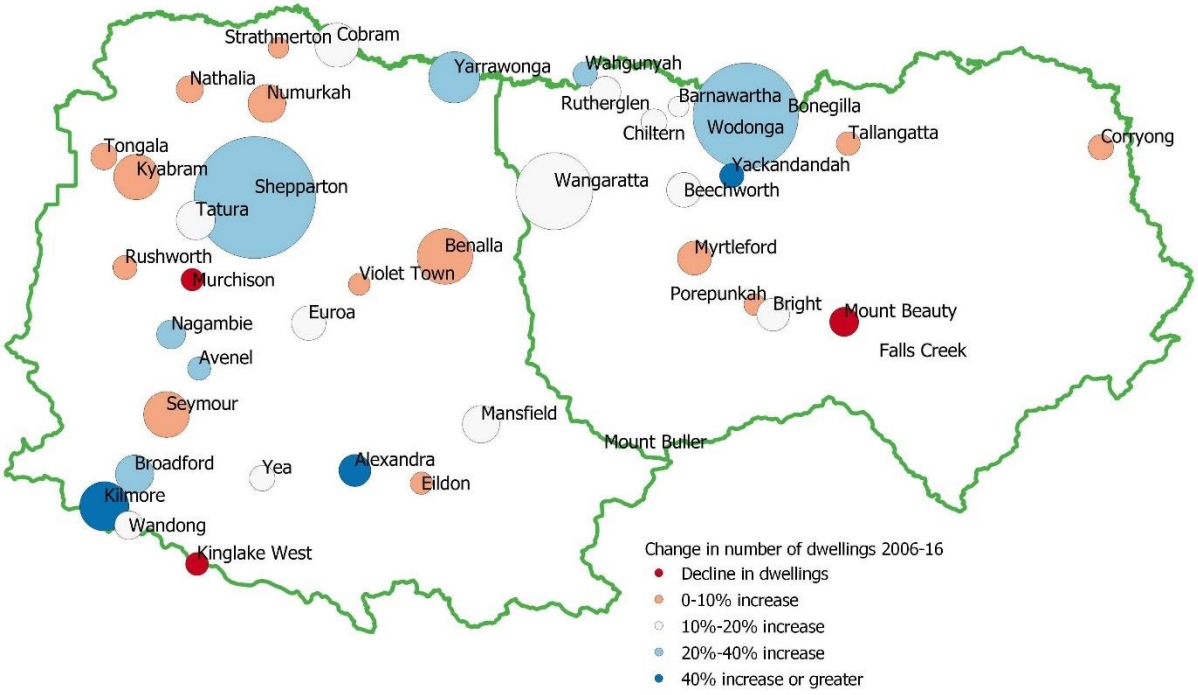


Figure 12 Per cent change in number of private dwellings 2006-16

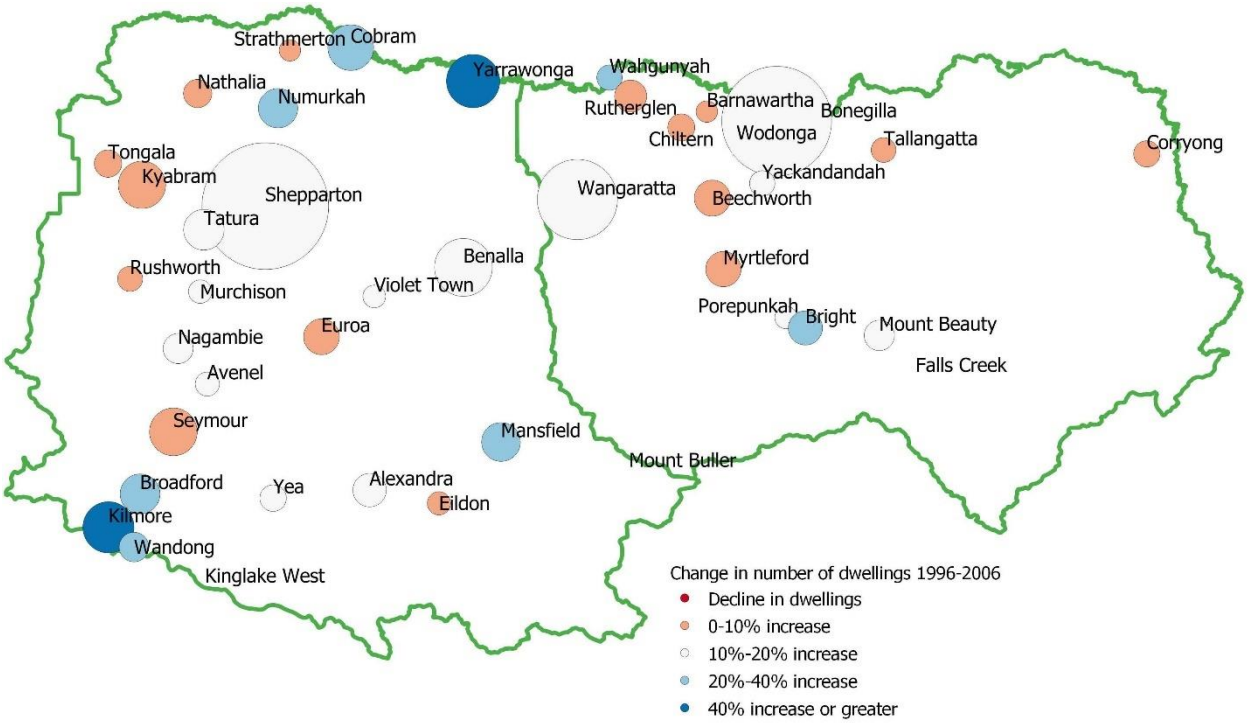


Figure 13 Percent change in number of private dwellings 1996-2006

7.1.4 Rural population

SA1s are created to have similar populations, with less densely populated SA1s being made larger to maintain a similar population size. Rather than mapping population counts, it is more useful to study the population density of SA1s (Figure 14). This shows clear clustering of settlement around the major towns, on the fringe of Melbourne in the closer settled GMID and in some mountain valleys that are tourism destinations. Low density can be seen in the mixed farming corridor from Avenel north to Yarrawonga, the Strathbogie plateau and in the more isolated mountain valleys of Towong, Omeo valley and the Mitta and mid-Kiewa.

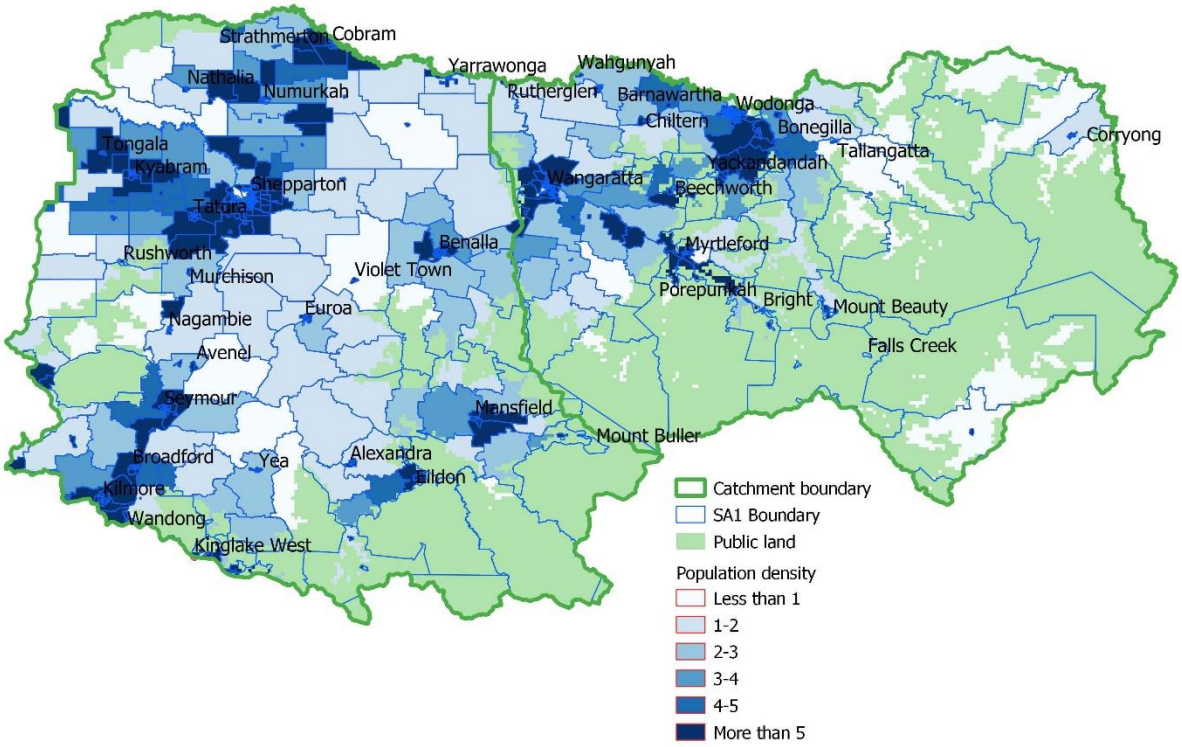


Figure 14 Rural population density in persons per square kilometre by SA1 2016

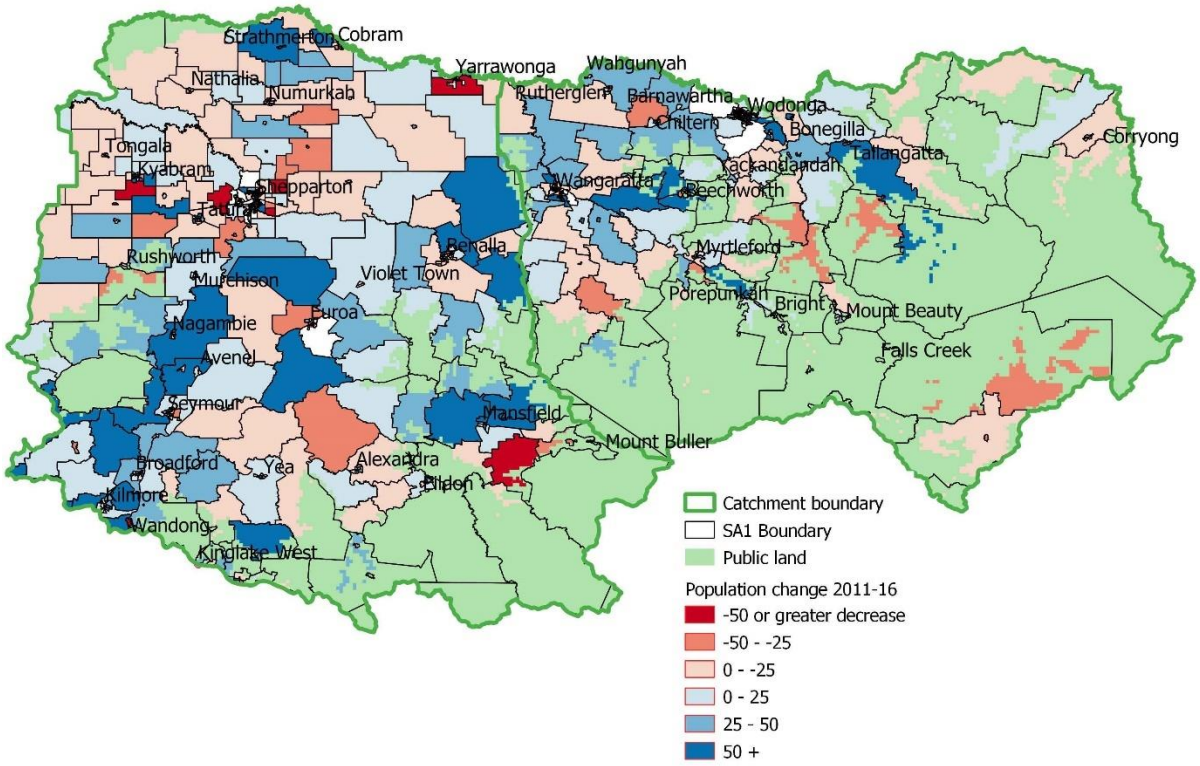


Figure 15 Change in population 2011 to 2016 by SA1

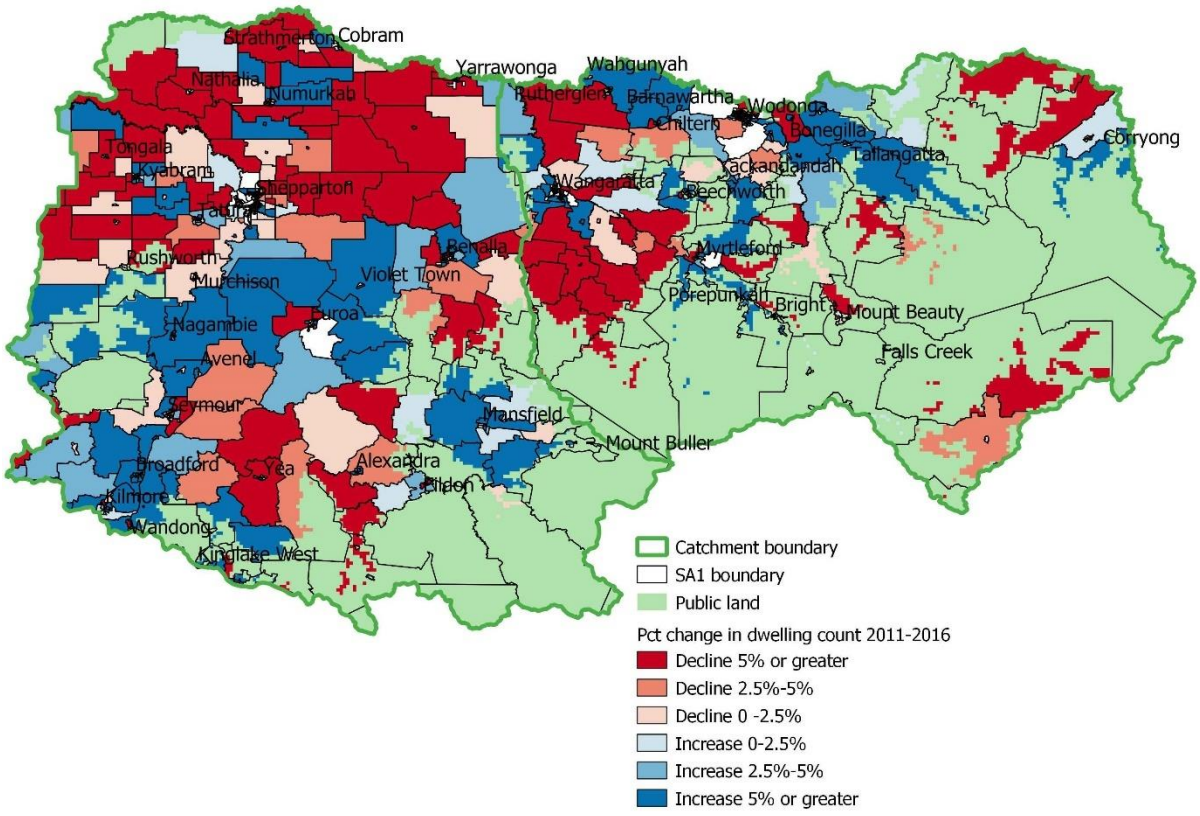


Figure 16 Change in dwelling count 2011-2016 as a per cent of SA1 dwelling count in 2011

7.2 MIGRATION AND VISITATION

In this section we consider a set of indicators that describe mobility between residences, both long-term and short-term:

- Change of usual address over the past 5 years.
- Short term visitors.
- Persons staying in non-private dwellings (e.g. motels, hotels, barracks); and
- Unoccupied dwellings.

7.2.1 Migration and population stability

The population census has variables that count the number of persons who were living at the same address five years ago. The obverse statistic, those living at a different address five years ago, is a combined count of those who have moved residence within the town and those who have shifted to the town from elsewhere. It provides a rough estimate of population stability if used with caution and combined with data on growth of population. We drew town data on address change from the Towns in Time database. When combined with data on population change, the following inferences can be drawn:

- Towns with low population growth and a higher proportion of residents at the same address five years previously can be assumed to have high population stability.
- Towns with low population growth and a low proportion of residents at the same address five years previously can be assumed to have low population stability.
- Towns with high rates of population growth and a low proportion of residents at the same address five years previously can be assumed to have a low rate of population stability due to population growth.
- Towns with high rates of population growth and a higher proportion of residents at the same address five years previously can be assumed to high fecundity. One would not expect to find many examples of these towns.

Why this might matter to organisations and groups working in natural resource management? High population turnover will mean that community knowledge and familiarity with local organisations and groups and its work will more rapidly dwindle in a low stability environment.

The maps of address stability in 2016 show few surprises. Changing place of residence in the previous five years is more common in the larger centres with a growing population – Wodonga, Shepparton and Kilmore. Address change is also more common in the mountain resort towns such as Mansfield, Buller, Falls Creek and Bright. It is lower in smaller towns with stable or declining populations. The outlier is Bonegilla with a rapidly changing population. Rural address mobility is much lower than in towns. The two maps needed different scales to portray the heterogeneity in each.

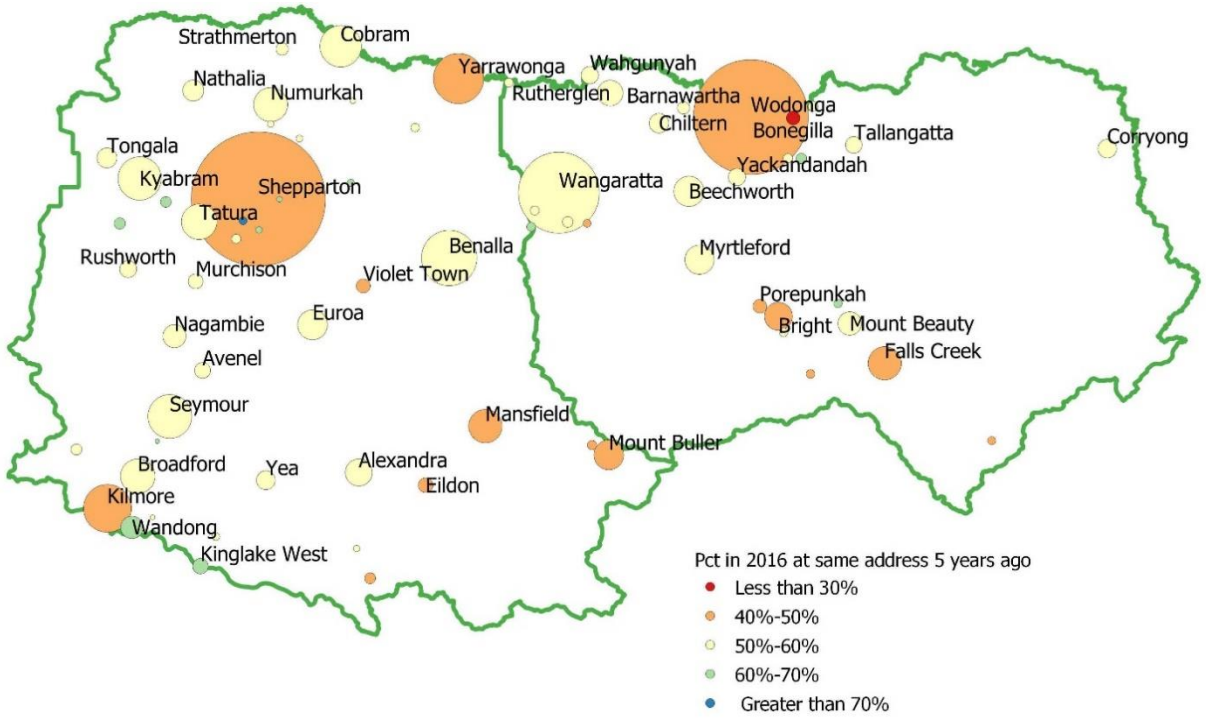


Figure 17 Per cent of persons in 2016 at same address five years previously

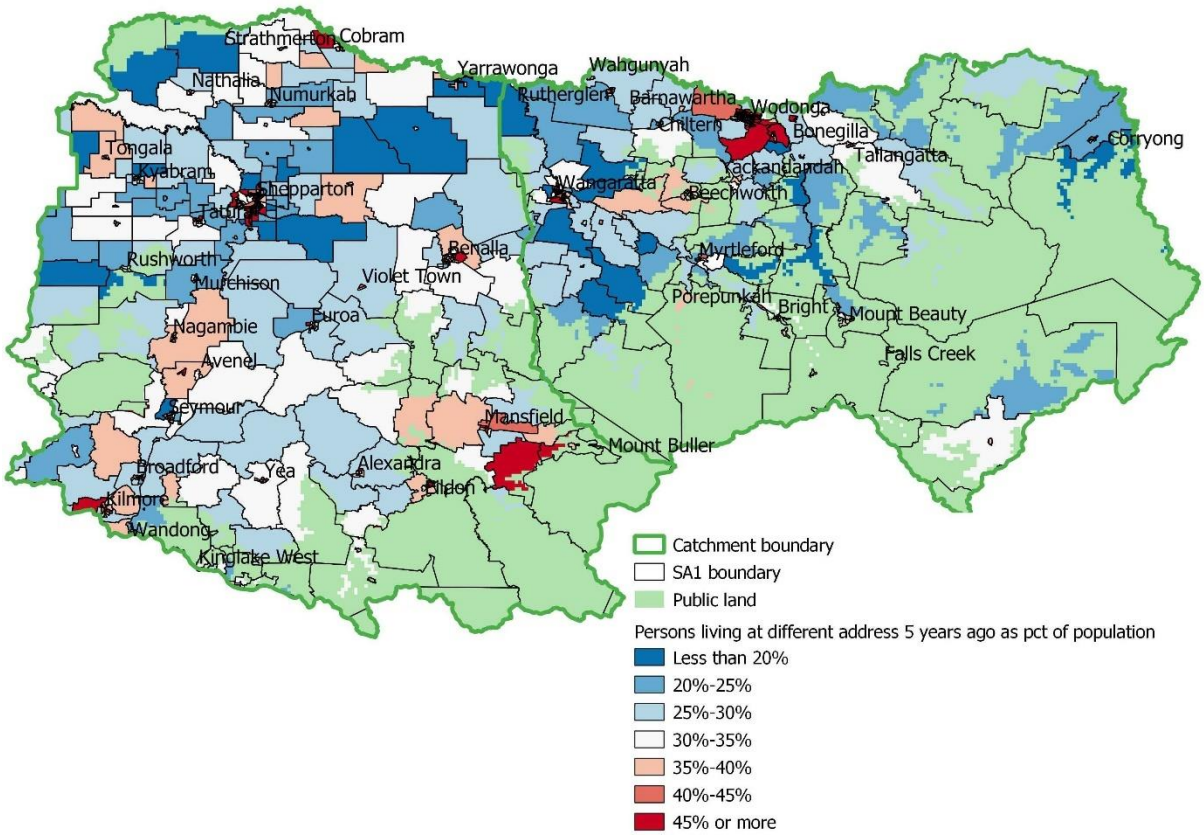


Figure 18 Persons living at a different usual address 5 years ago as a per cent of SA1 population 2016

7.2.2 Pattern of dwelling occupancy

Three variables concerning dwelling occupancy and visitation were available for most towns with a population over 100 persons. These variables were:

- Number of visitors enumerated on the census;
- Number of persons staying in non-private dwellings on census night; and
- Number of unoccupied dwellings on census night.

For towns, a binary variable was created for each of these three as follows:

- Number staying in non-private dwellings was greater than 8% of enumerated population;
- Visitor count greater than 10 per cent of enumerated population; and
- More than 30 per cent of private dwellings were vacant.

These thresholds were chosen based upon natural breaks in the distribution curve of each variable.

These binary variables were used to create three classes of town occupancy:

- Residential – low visitation and high private dwelling occupancy;
- Accommodation towns – higher per cent of enumerated population in non-private dwellings or high numbers of visitors and high levels of occupancy of private dwellings; and
- Weekender towns – low per cent of person in non-private accommodation and low rates of occupancy of private dwellings.

The results of this classification are shown in Figure 19. It must be borne in mind that the use of binary thresholds will disguise the gradual transition between categories. Two towns require mentioning in this regard. Both Bright and Alexandra are shown as weekender towns. Data from 2011 shows Bright as an accommodation town and Alexandra as a residential town. The transition across the boundaries between categories in the 2016 data probably indicates a gradual shift in the function of each town. Data from the next census may confirm this as a trend rather than an outcome of data noise.

Other than those two cases, the results show little surprise. Accommodation towns include the ski-fields and towns servicing the ski-fields, and some towns on the Murray or Lake Eildon. There is a cluster of weekender town in Mansfield Shire. This is consistent with the findings of work undertaken by Fiona McKenzie who measured absentee rate-payer ownership at 50 per cent in the Shire (MacKenzie, 2016). These tend to be smaller towns with limited facilities (e.g. Buxton, Thornton).

The maps of SA1 rural areas show a pattern consistent with the town data. The exception may be the Omeo valley which has a high proportion of unoccupied dwellings. Rather than being a sign of weekender activity, this may be a legacy of the 1990s Kennett era policy of enhancing agricultural adjustment in the valley through targeted property amalgamation.

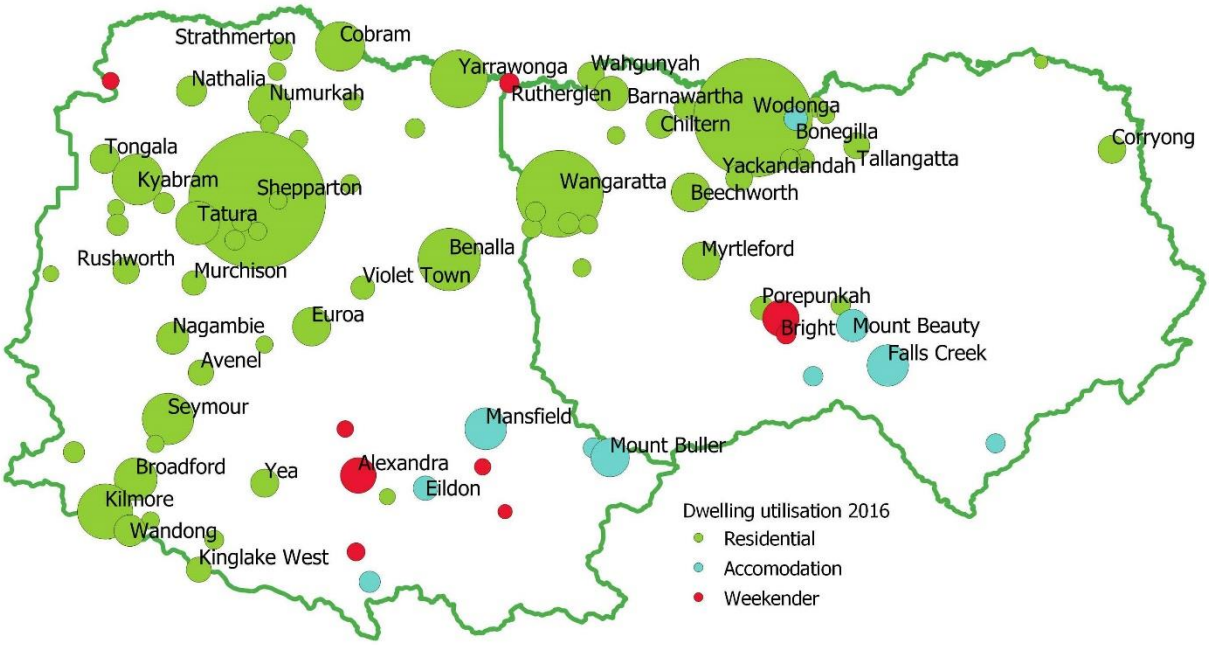


Figure 19 Pattern of dwelling occupancy in towns 2016

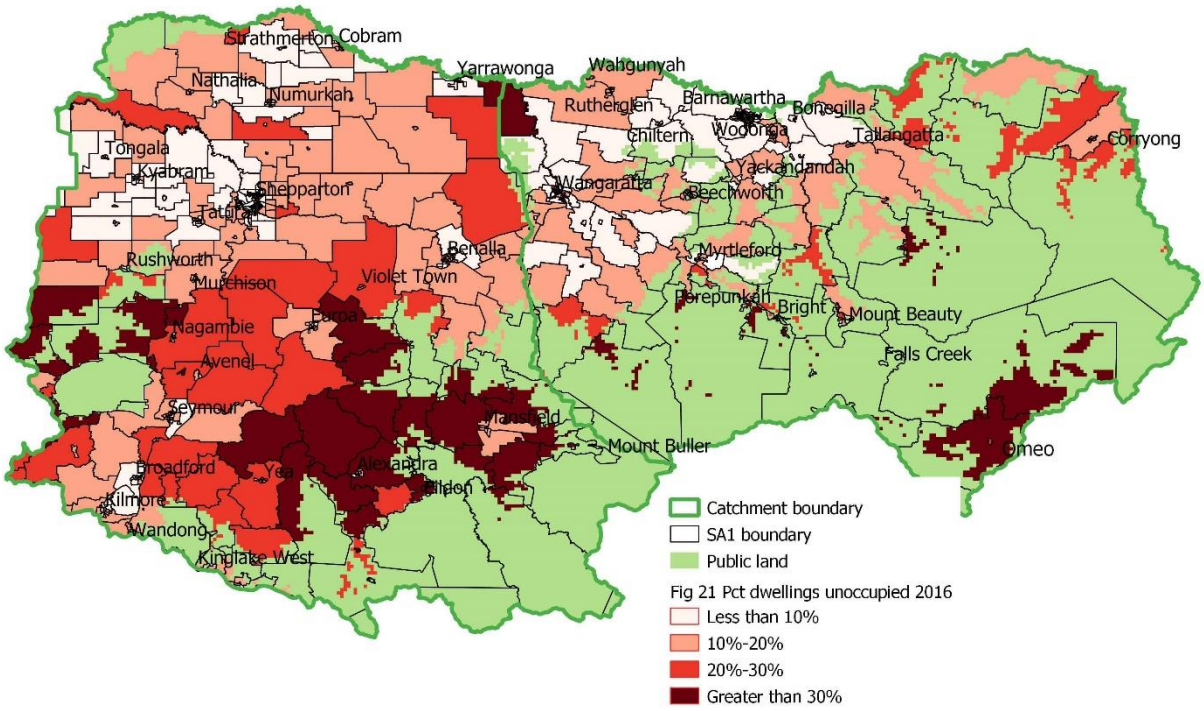


Figure 20 Dwellings unoccupied on census night as a per cent of SA1 dwellings 2016

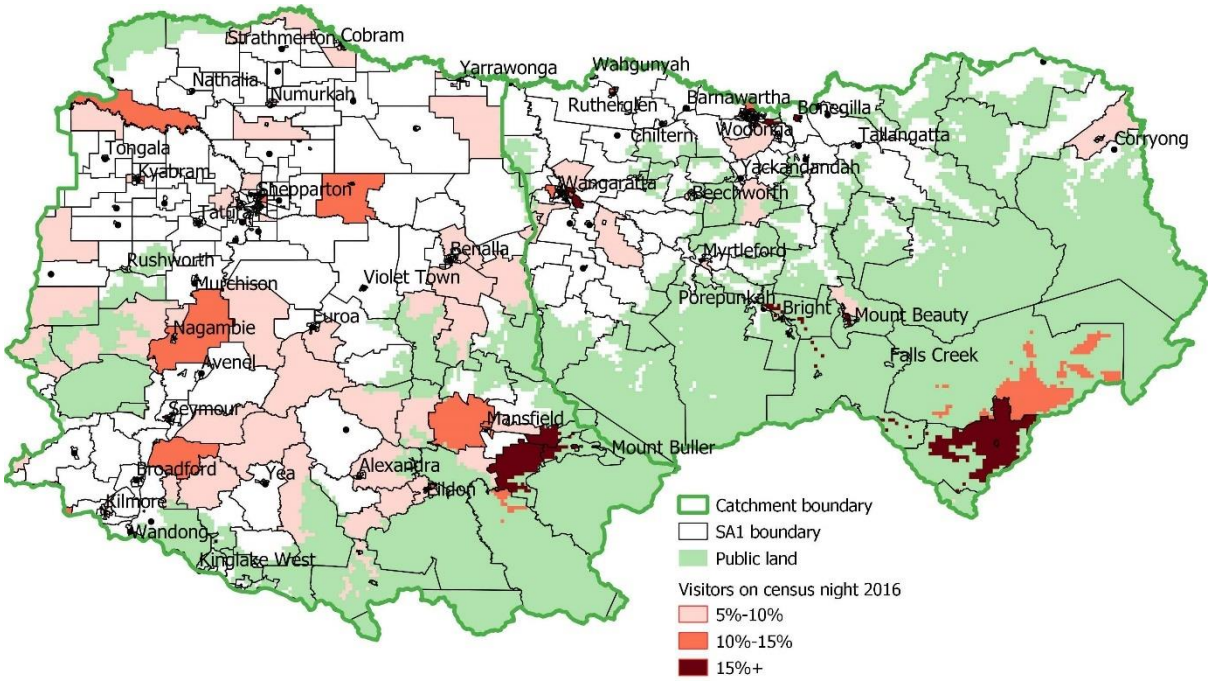


Figure 21 Visitors as a per cent of enumerated population on census night 2016

7.3 AGE STRUCTURE

The dataset for towns with population greater than 200 persons includes an age structure with six categories:

- 0-17 years
- 18-24 years
- 25-44 years
- 45-64 years
- 65-74 years
- 75 years or greater.

This age categorization is probably too coarse to provide reliable estimates of median age. Instead, analysis aggregated the available age structure into four categories, each of which is studied individually:

- 0-17 years
- 18-24 years
- 25-64 years
- 65+ years.

In the first group most persons counted will be financially dependent upon parents or guardians. The second group is the age in which migration from rural to urban areas is most common. The third group approximates the working age population. The final group approximates the post-working age population and the standard age-dependency ratio.

The ABS dataset for SA1s includes an estimate of median age based upon unpublished age categories. This shows a clear relationship between higher median age and SA1s more distant from major towns – the farmland midway between Seymour and Benalla, much of Towong Shire and the Omeo valley.

It also appears that median age is increasing fastest in two situations:

- More isolated grazing areas with a high median age generally have increasing median ages.
- Rural areas surrounding major towns- Shepparton, Kilmore, Benalla, Wangaratta, and part of the Wodonga hinterland. Presumably, this reflects a process of farmland gentrification (the transfer of land from commercial farm use to rural residential and part-time farming. See page 128).

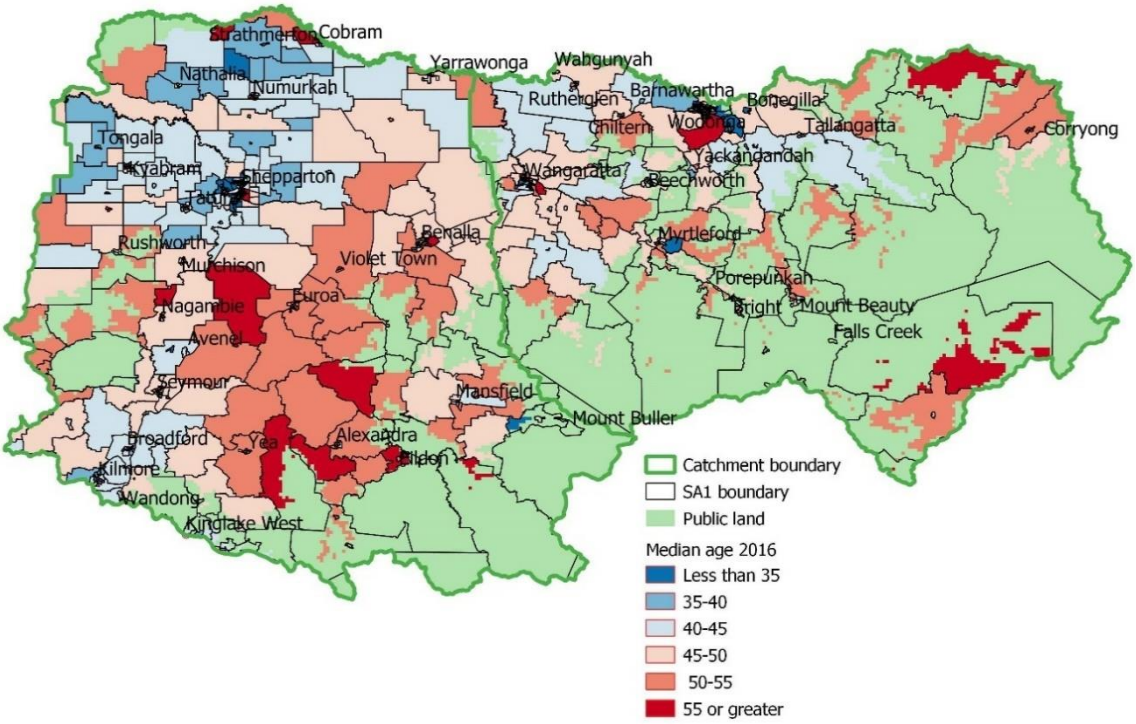


Figure 22 Median population age of SA1 in 2016

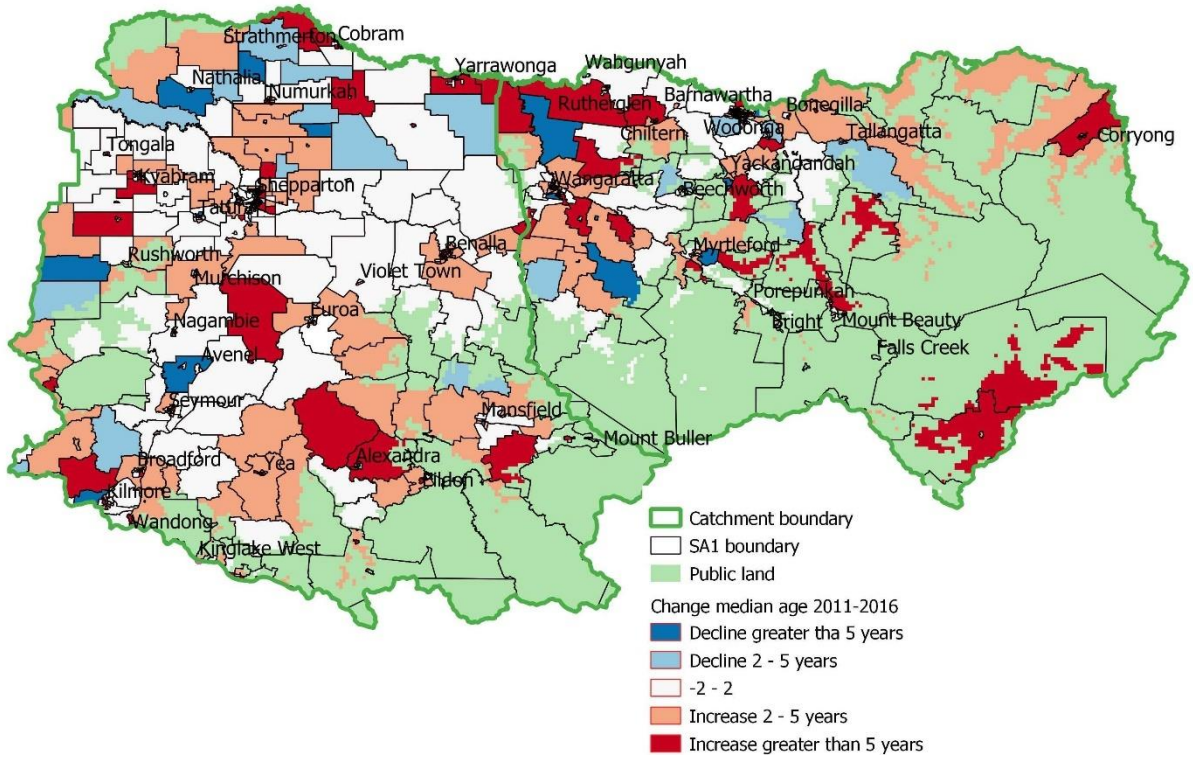


Figure 23 Change in SA1 population median age 2011-2016

7.3.1 Persons aged 0-17

A decline in the proportion of the population aged 0-17 is almost universal across all Victorian country towns, and from the beginning of the time series in 1981. Figure 24 portrays the change in composition for 261 Victorian towns with full data available. In only five was there an increase in the proportion of persons aged 0-17. All were coastal communities in south Gippsland or the Surf Coast. These all appear to be towns which have experienced population growth as their function has changed from retirement and holiday destinations to dormitory towns. The average fall in the proportion of persons aged 0-17 was 9%.

The maps in Figure 25 Map of the change in the number of persons aged 0-17 between 1986 and 2001 as a per cent of total town population in 1986 – Goulburn Broken and North East Catchment towns and Figure 26 Map of persons aged 0-17 as a per cent of town population in 2016 - Goulburn Broken and North East towns with population greater than 200 show that the decline in the under 18 share of town population has been common across the catchments. In 2016 those under 18 comprised a larger share of town population in the largest three towns and their satellite dormitories, along the Murray and close to the Melbourne fringe.

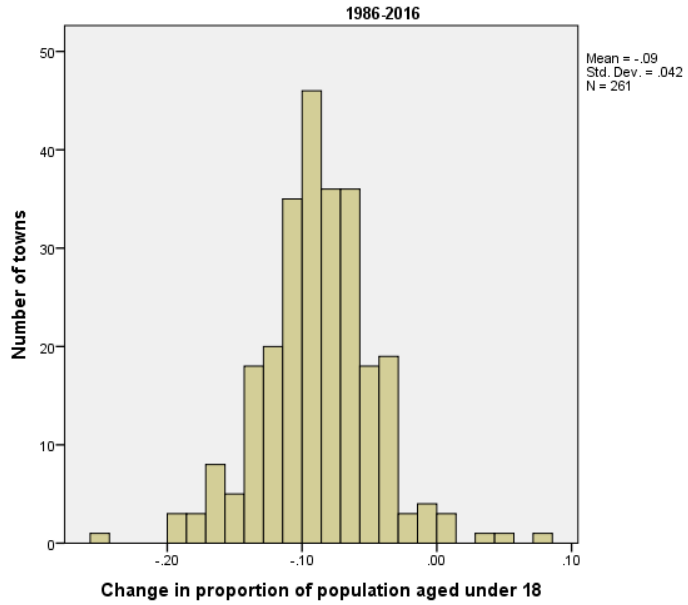


Figure 24 Change in the proportion of town population aged 0-17 between 1986 and 2016 for Victorian towns with population greater than 200 in 2016

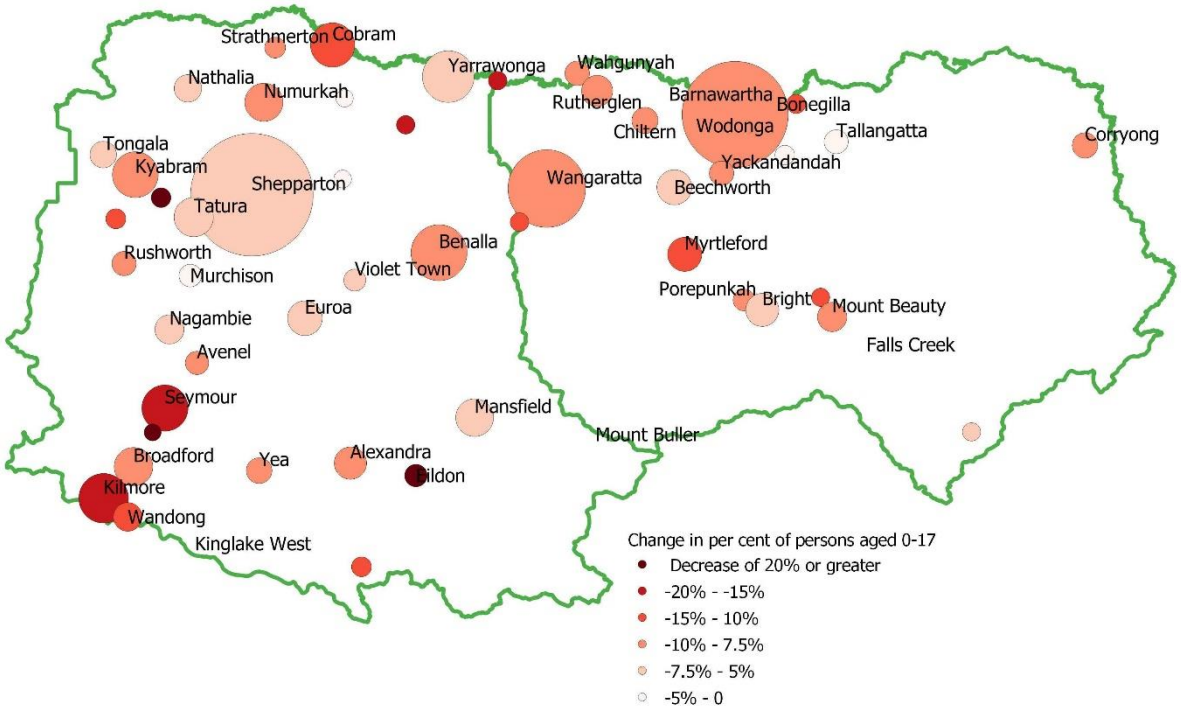


Figure 25 Map of the change in the number of persons aged 0-17 between 1986 and 2001 as a per cent of total town population in 1986 – Goulburn Broken and North East Catchment towns

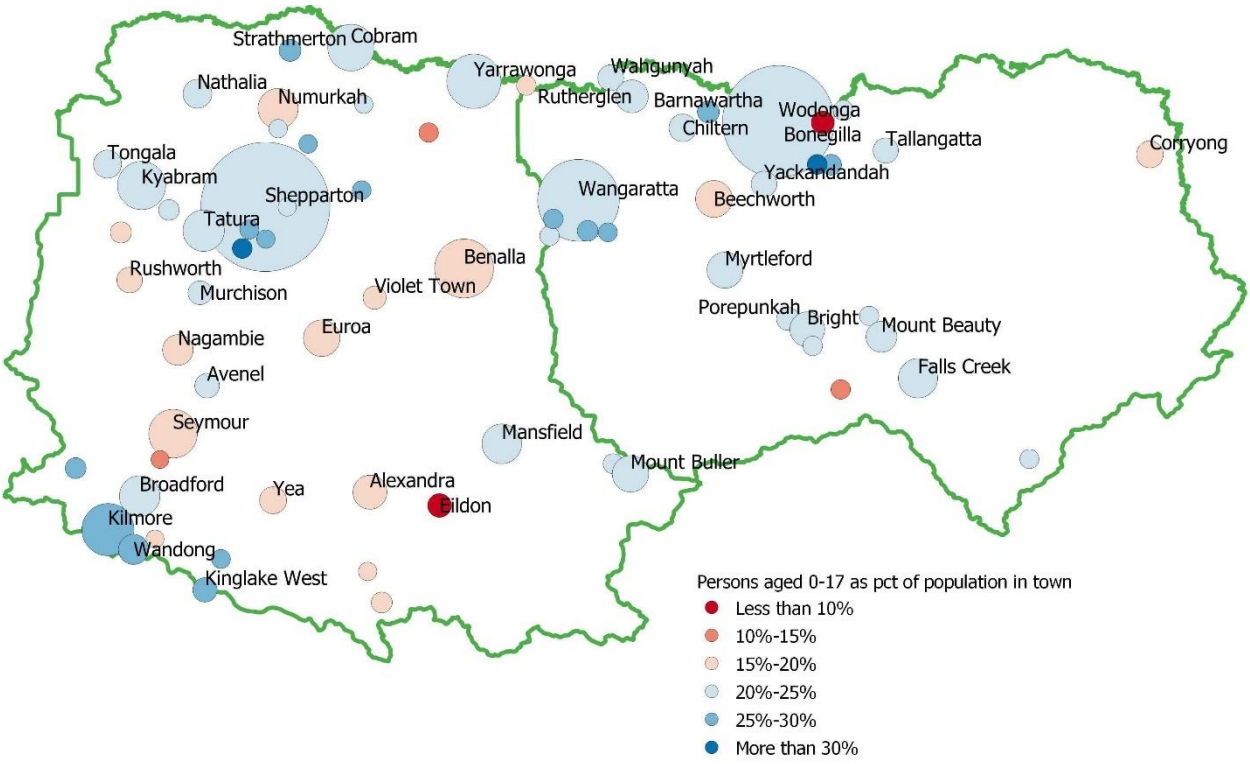


Figure 26 Map of persons aged 0-17 as a per cent of town population in 2016 - Goulburn Broken and North East towns with population greater than 200

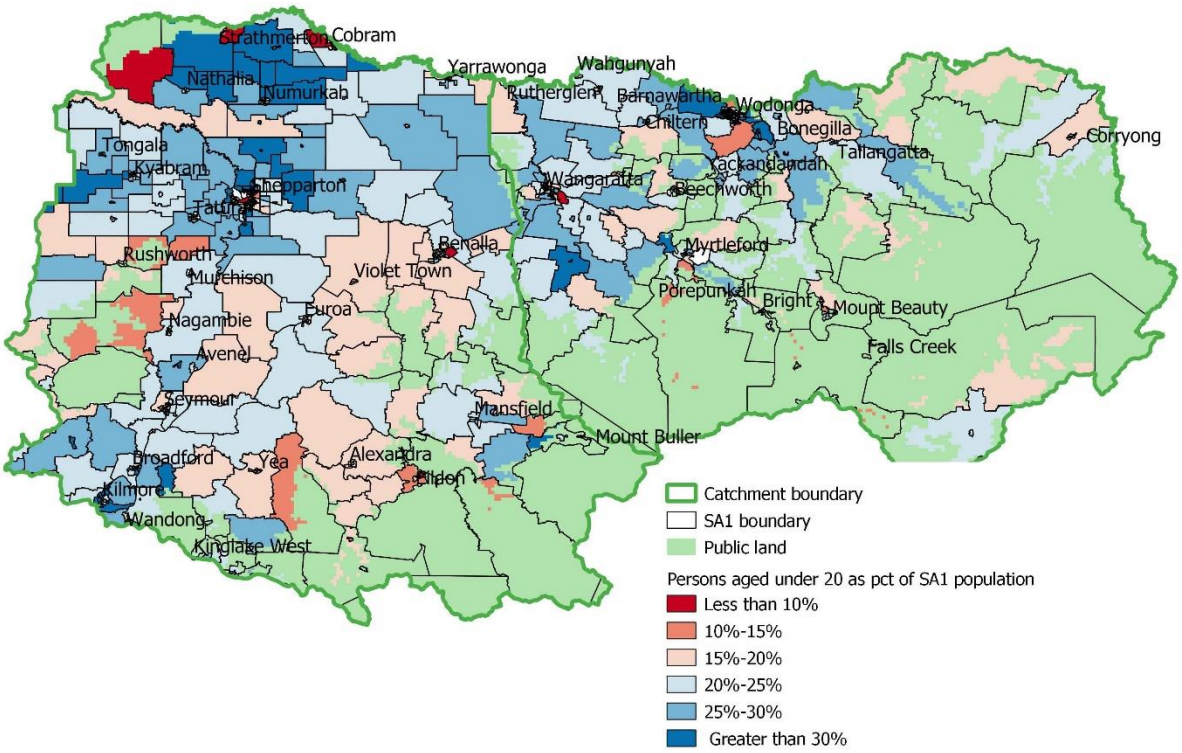


Figure 27 persons aged 0-19 as a per cent of SA1 population in 2016

7.3.2 Persons aged 18-24

A decline in the proportion of persons aged 18-24 is quite common across Victorian towns (80% of those with data) (Figure 28). Where increases occurred, they were generally small.

Across our two catchments decreases in the 18-24 composition were common. The exceptions were Kilmore and Wandong, and a handful of small towns.

In 2016 persons aged 18-24 were most likely to be found in settlements close to the Melbourne fringe, the three major towns and their satellites, and in ski fields and associated towns. They were least likely to be found in the more isolated rural areas, particularly those where agriculture is based upon grazing. The reasons for this absence are discussed in detail in *The House on the Hill* (Barr, 2009).

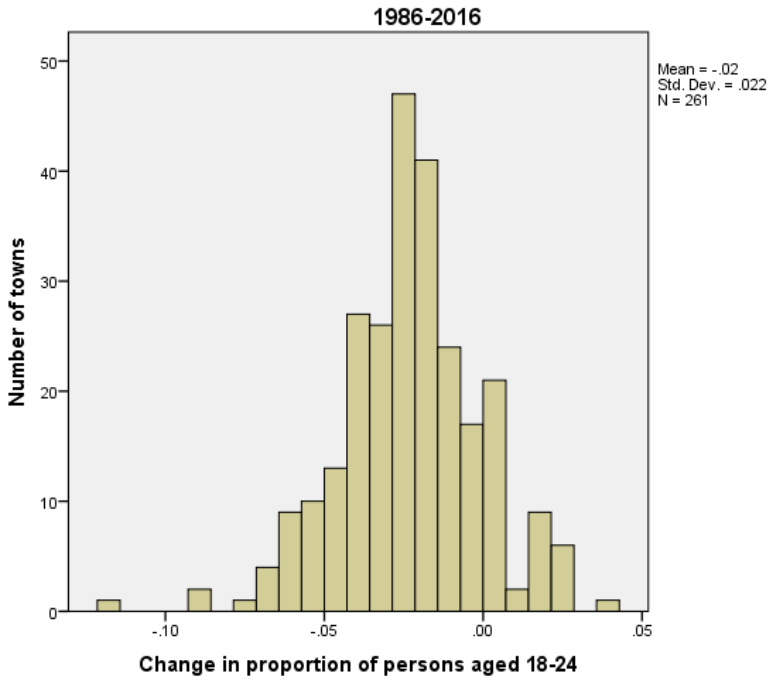


Figure 28 Change in the proportion of town population aged 18-24 between 1986 and 2016 for Victorian towns with population greater than 200 in 2016

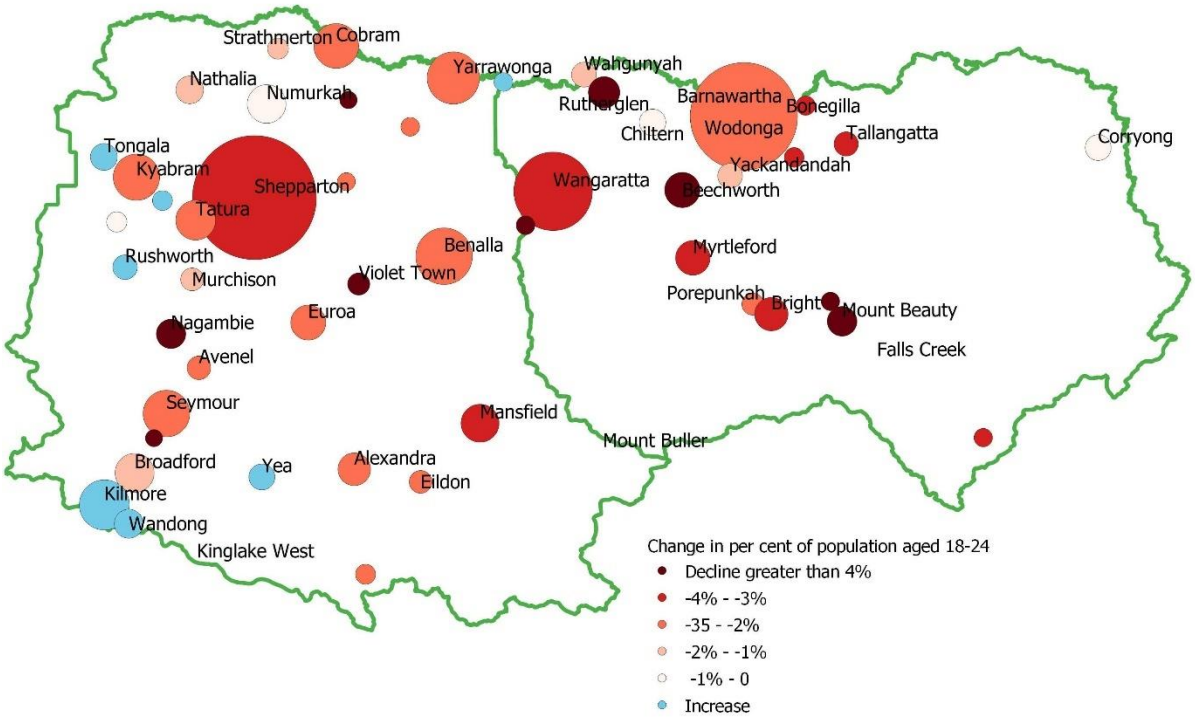


Figure 29 Map of the change in the number of persons aged 18-24 between 1986 and 2001 as a per cent of total town population in 1986 – Goulburn Broken and North East Catchment towns

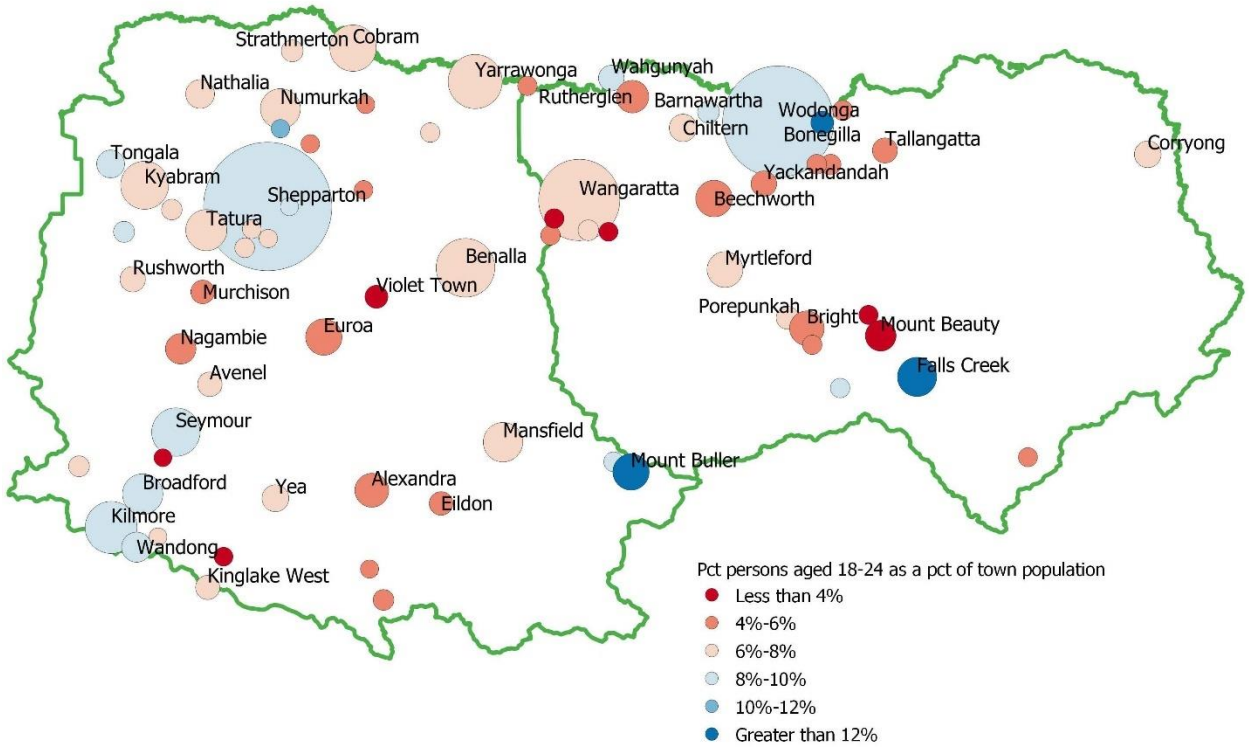


Figure 30 Map of persons aged 18-24 as a per cent of town population in 2016 - Goulburn Broken and North East towns with populations greater than 200

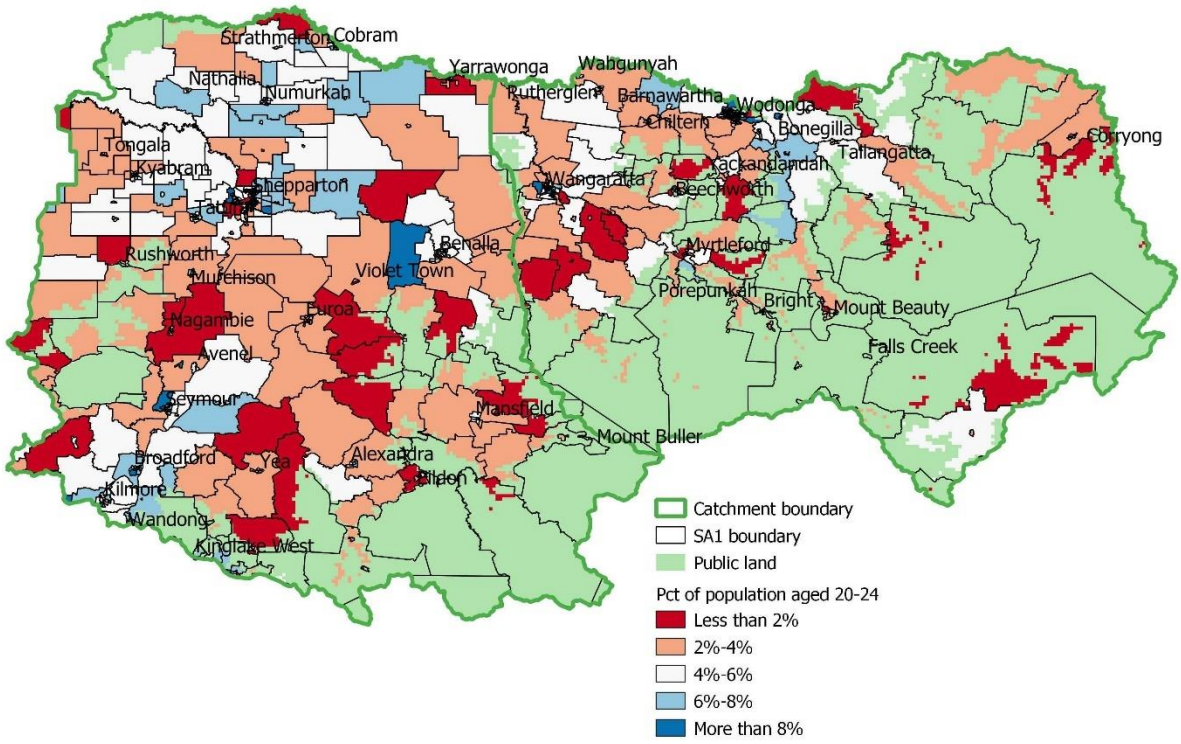


Figure 31 Persons aged 20-24 as a per cent of SA1 population 2016

7.3.3 Persons aged 65 and over

For the 261 Victorian towns with complete age data, only four experienced a decrease in the proportion aged over 65 between 1986 and 2016 (Figure 32). The share of the population aged over 65 has risen gradually during this thirty-year period. This is a long-term, apparently inexorable trend driven in part by the general ageing of the Australian community and part by the differential migration of the young away from rural areas.

Within the Goulburn Broken and North East catchments, all towns with full data experienced a rise in the proportion of population aged 65 and over between 1986 and 2016 (Figure 33 Map of the change in the number of persons aged 65+ between 1986 and 2001 as a per cent of total town population in 1986 – Goulburn Broken and North East Catchment towns). Again, the trend was gradual over this 30-year period.

By 2016, towns with a share of the 65+ population under 20 per cent could be found on the Melbourne fringe, Shepparton and Wodonga and their dormitory satellites, and the ski-fields.

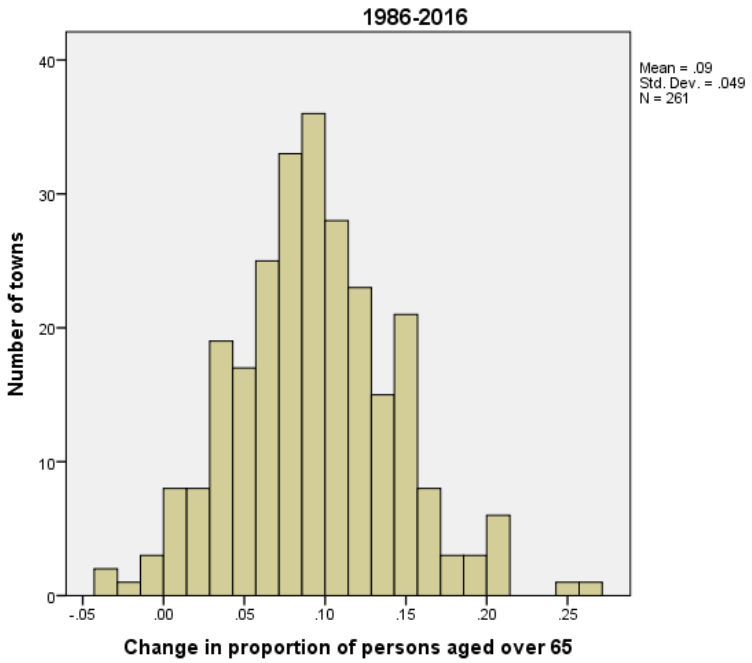


Figure 32 Change in the proportion of town population aged 65+ between 1986 and 2016 for Victorian towns with population greater than 200 in 2016

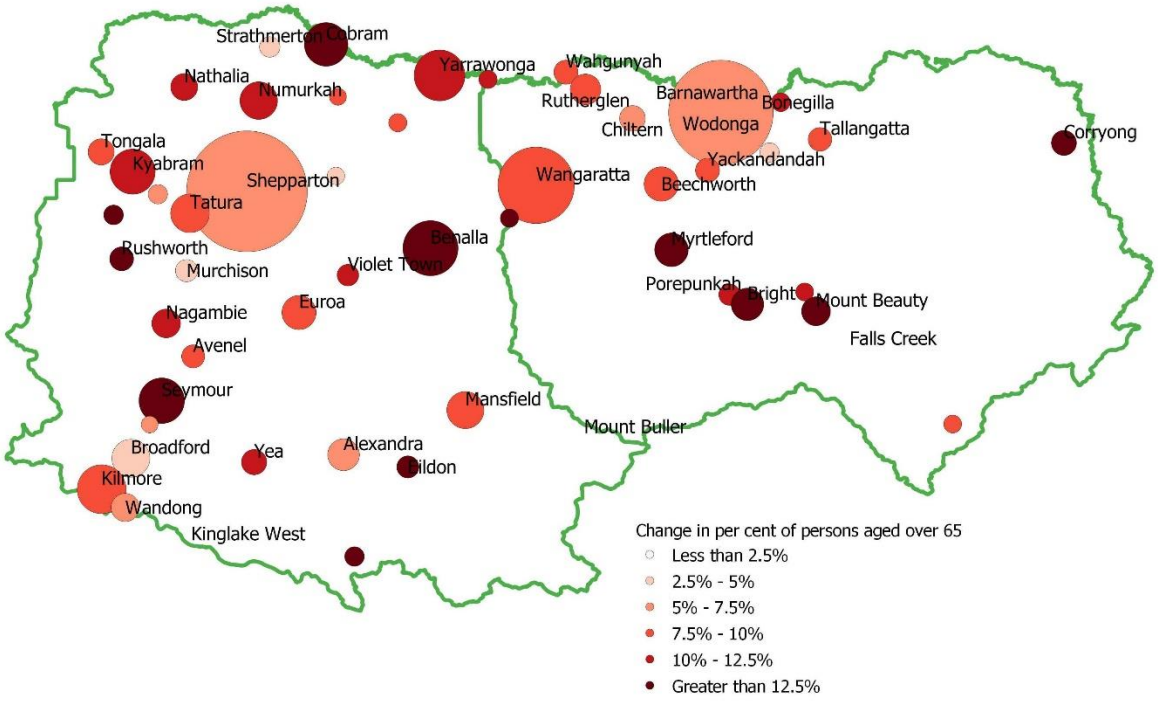


Figure 33 Map of the change in the number of persons aged 65+ between 1986 and 2001 as a per cent of total town population in 1986 – Goulburn Broken and North East Catchment towns

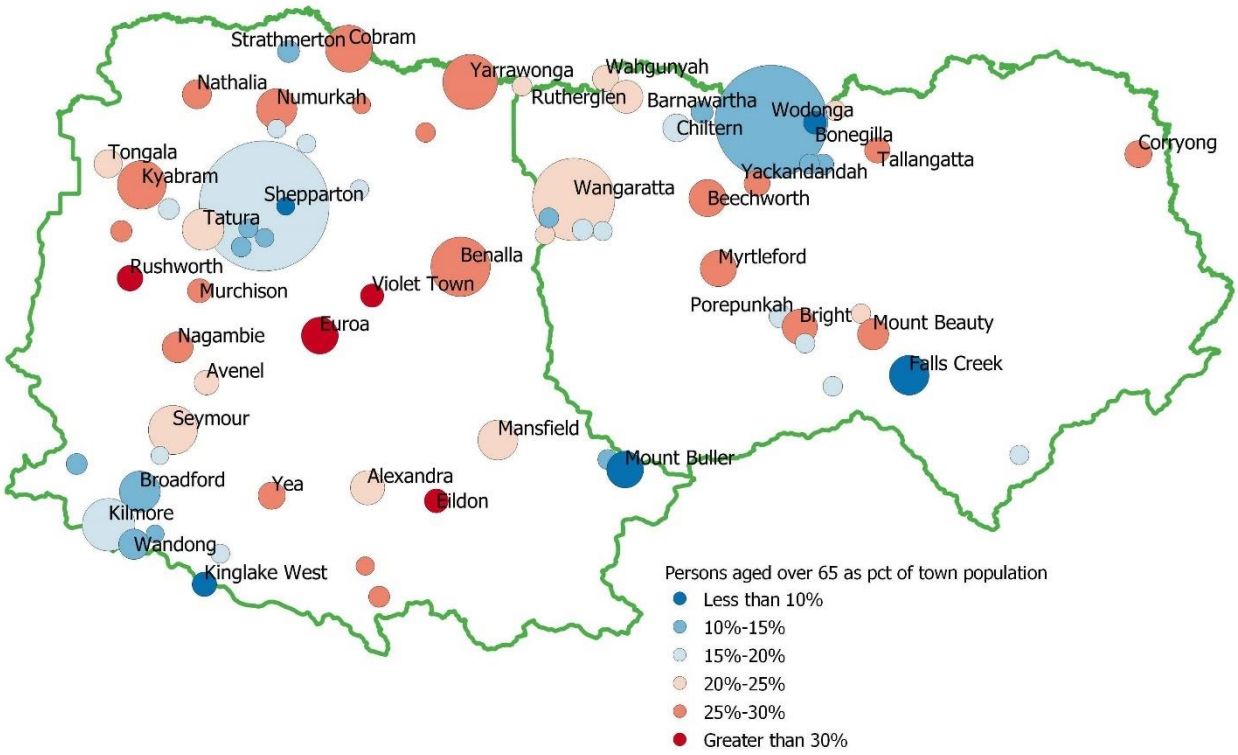


Figure 34 Map of persons aged 65+ as a per cent of town population in 2016 - Goulburn Broken and North East towns with population greater than 200

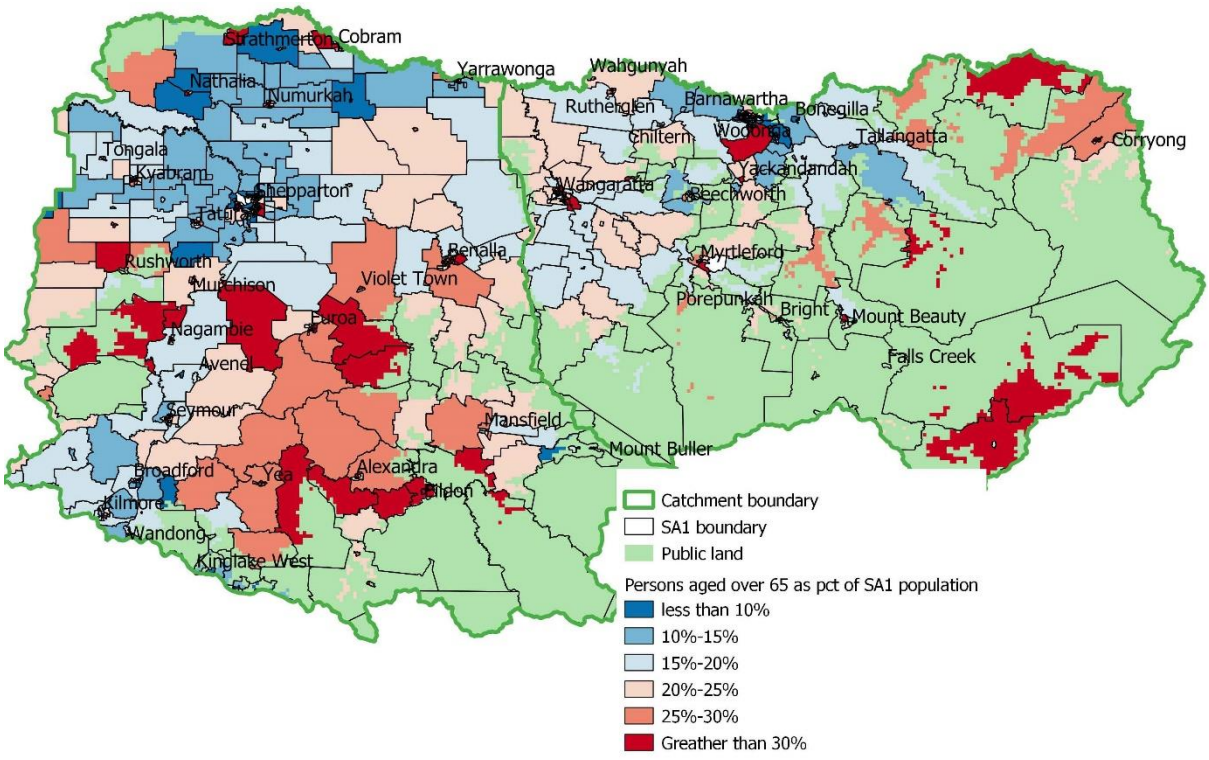


Figure 35 persons aged 65+ as a per cent of SA1 population in 2016

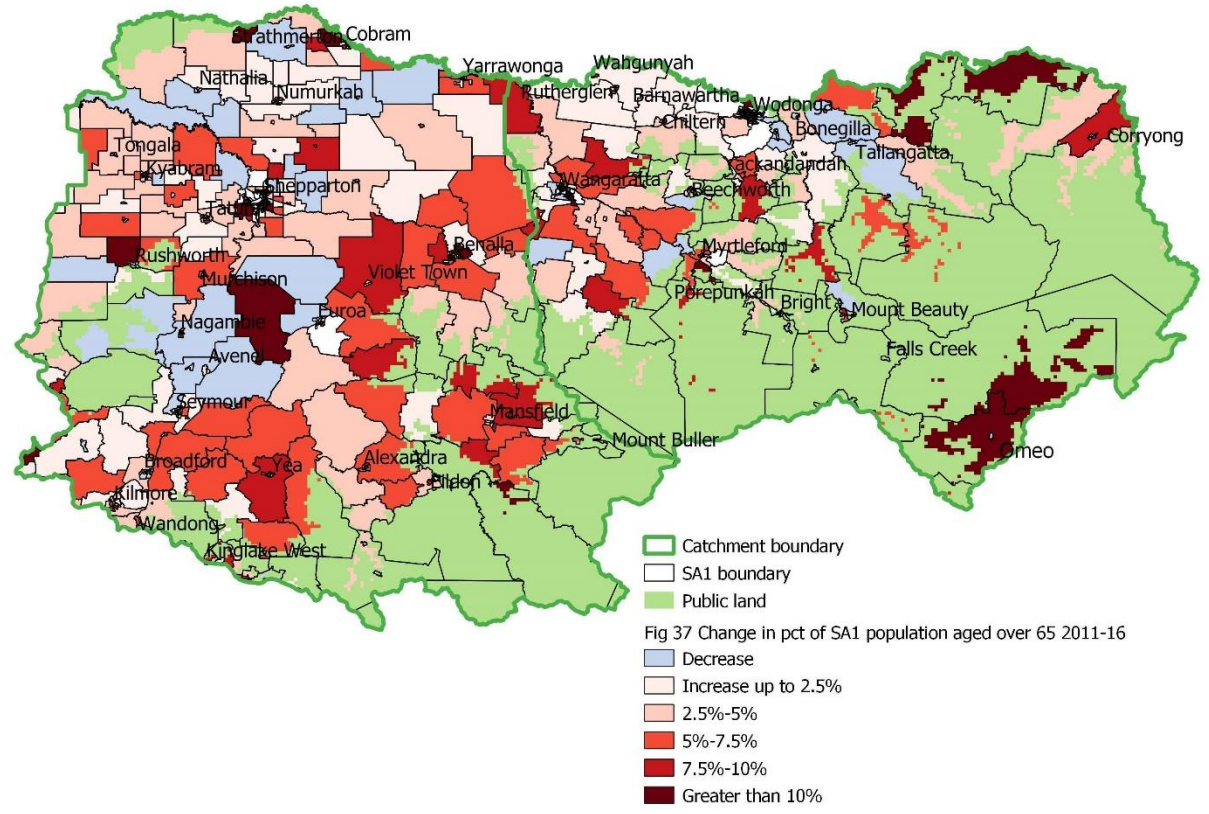


Figure 36 Change in persons aged 65+ as composition of SA1 population 2011-2016

7.3.4 Persons aged 25-64

The age group 25-64 corresponds roughly with the prime working years of the workforce. Unlike the previous three age-based indicators, changes in this indicator are heterogenous. For the 261 Victorian towns with full age data, 165 have experienced an increase in the share of the population within this age range. Seventy have experienced a decreased share and 26 no change (Figure 37).

Within the Goulburn Broken and North East catchments, the distribution of increases and decreases in the population share of this age group follows what should be by now a familiar pattern. Increases have occurred in the Melbourne fringe zone, the two major population centres and their dormitory settlements (Figure 33 Map of the change in the number of persons aged 65+ between 1986 and 2001 as a per cent of total town population in 1986 – Goulburn Broken and North East Catchment towns). Towns with the highest proportion of persons aged 25-64 in 2016 included those listed above (Melbourne fringe, Wodonga, Shepparton and satellites, and the ski-fields).

In rural areas the more isolated rural SA1s have the lowest composition of their population in this age group.

Figure 37 Change in the proportion of town population aged 25-64 between 1986 and 2016 for Victorian towns with population greater than 200 in 2016

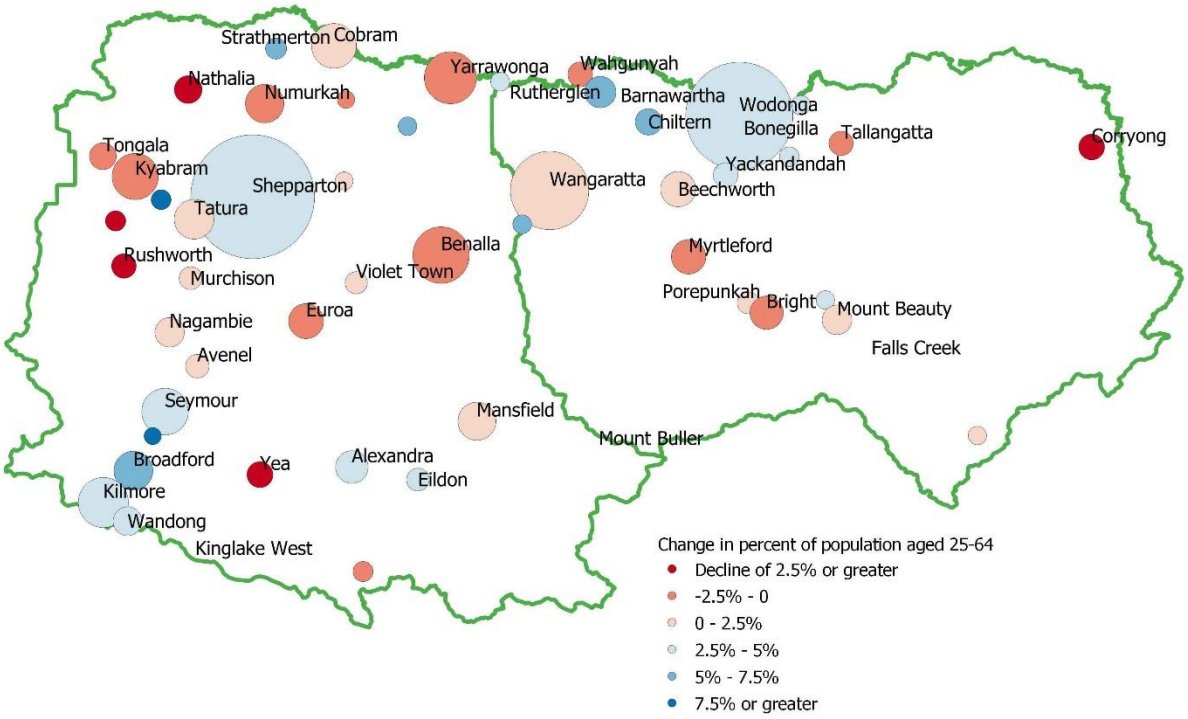


Figure 38 Map of the change in the number of persons aged 25-64 between 1986 and 2001 as a per cent of total town population in 1986 – Goulburn Broken and North East Catchment towns

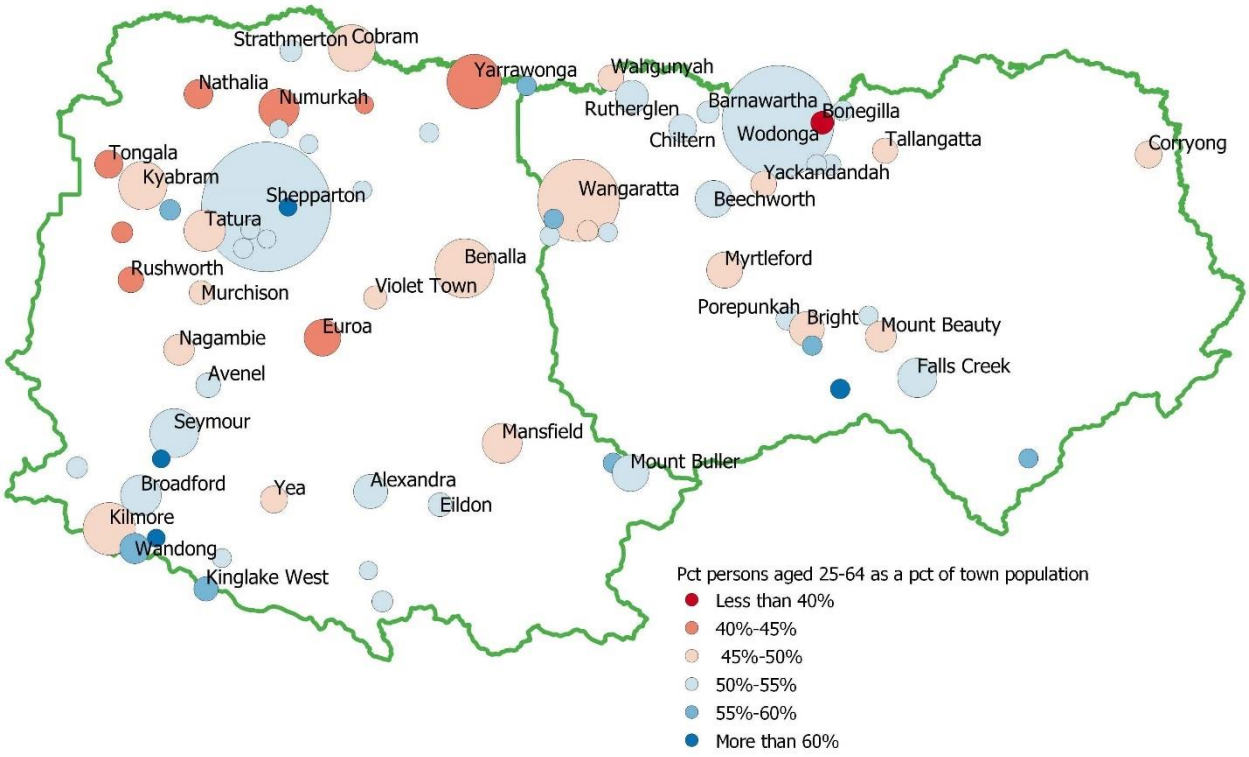


Figure 39 Map of persons aged 25-64 as a per cent of town population in 2016 - Goulburn Broken and North East towns with population greater than 200

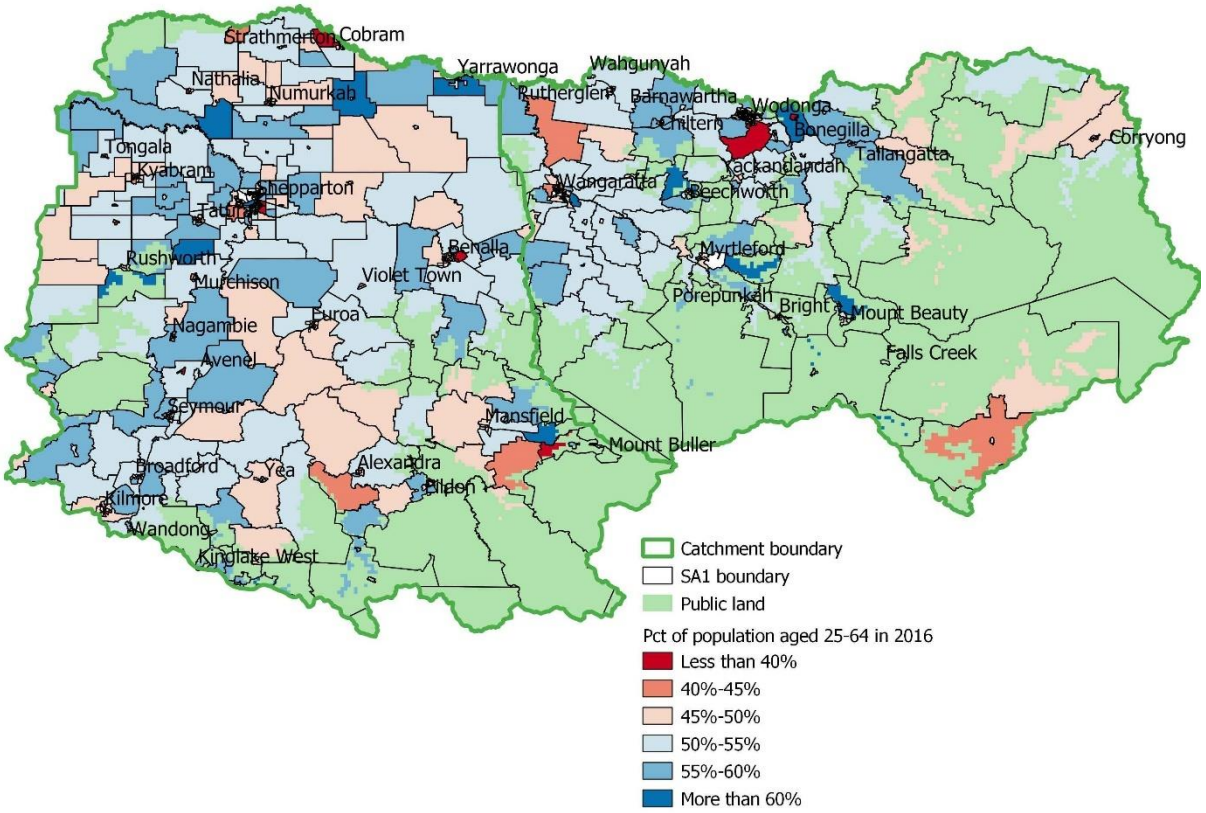


Figure 40 Persons aged 25-64 as a per cent of SA1 population in 2016

7.4 HOUSEHOLD AND FAMILY COMPOSITION

7.4.1 Average Household Size

Indicator: Average number of persons living in households in the town.

- Household size higher in the south of the Goulburn catchment (Melbourne fringe) and in snow resorts.
- Household size lower in the smaller rural towns and SA1s, particularly where they are more isolated. This is consistent with the older age of residents in these locations.
- Household size has been declining consistently over the past 20 years. This is a phenomenon partly driven by the changing demographic structure of the country. On top of this is the impact of population decline and structural ageing in smaller country towns.

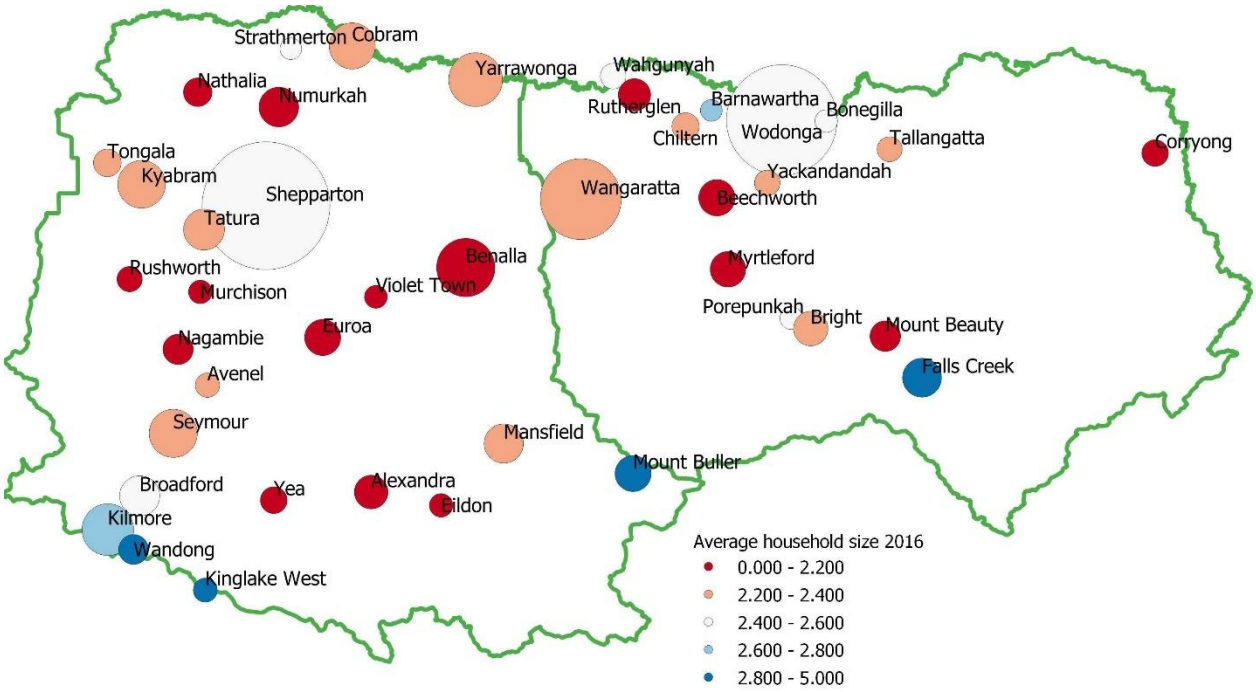


Figure 41 Average town household size 2016

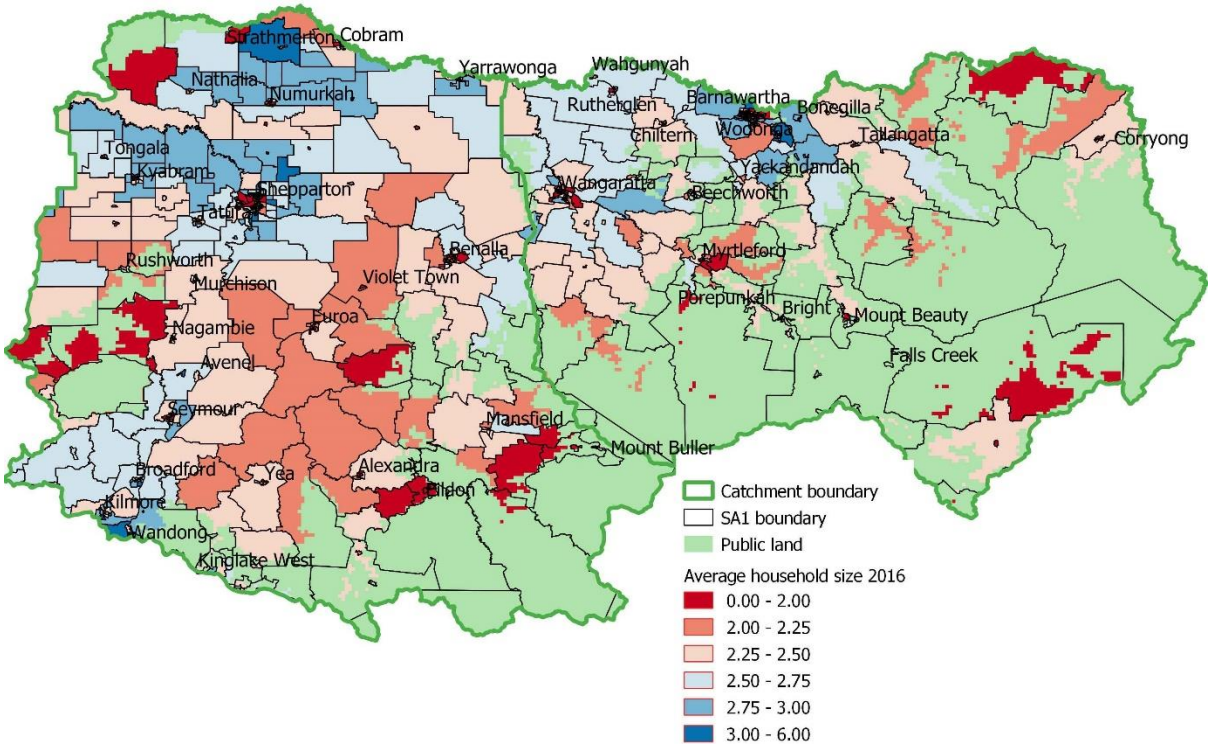


Figure 42 Average SA1 household size in 2016

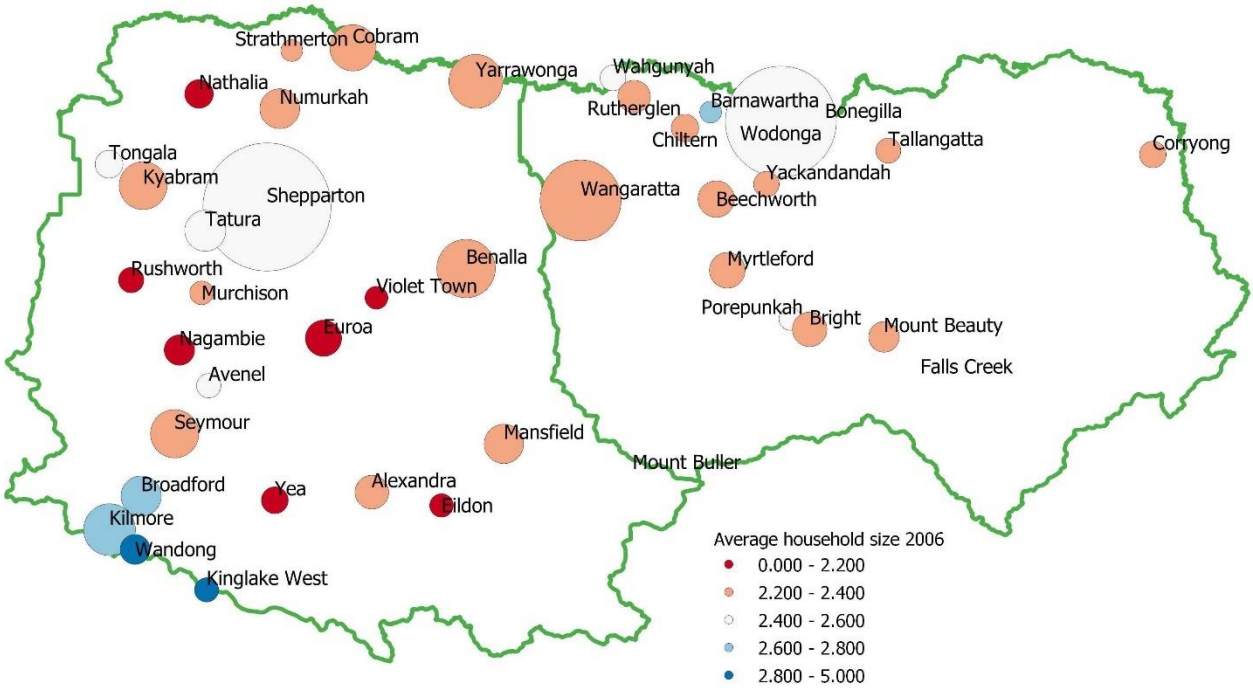


Figure 43 Average household size 2006

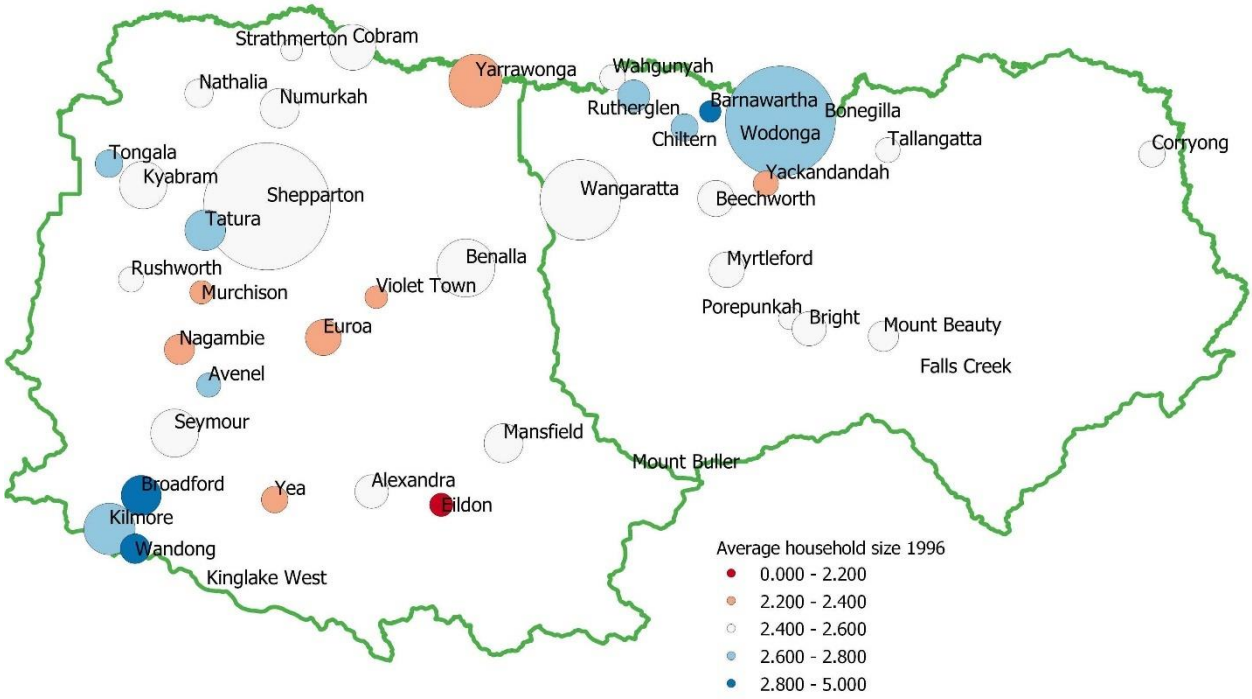


Figure 44 Average household size 1996

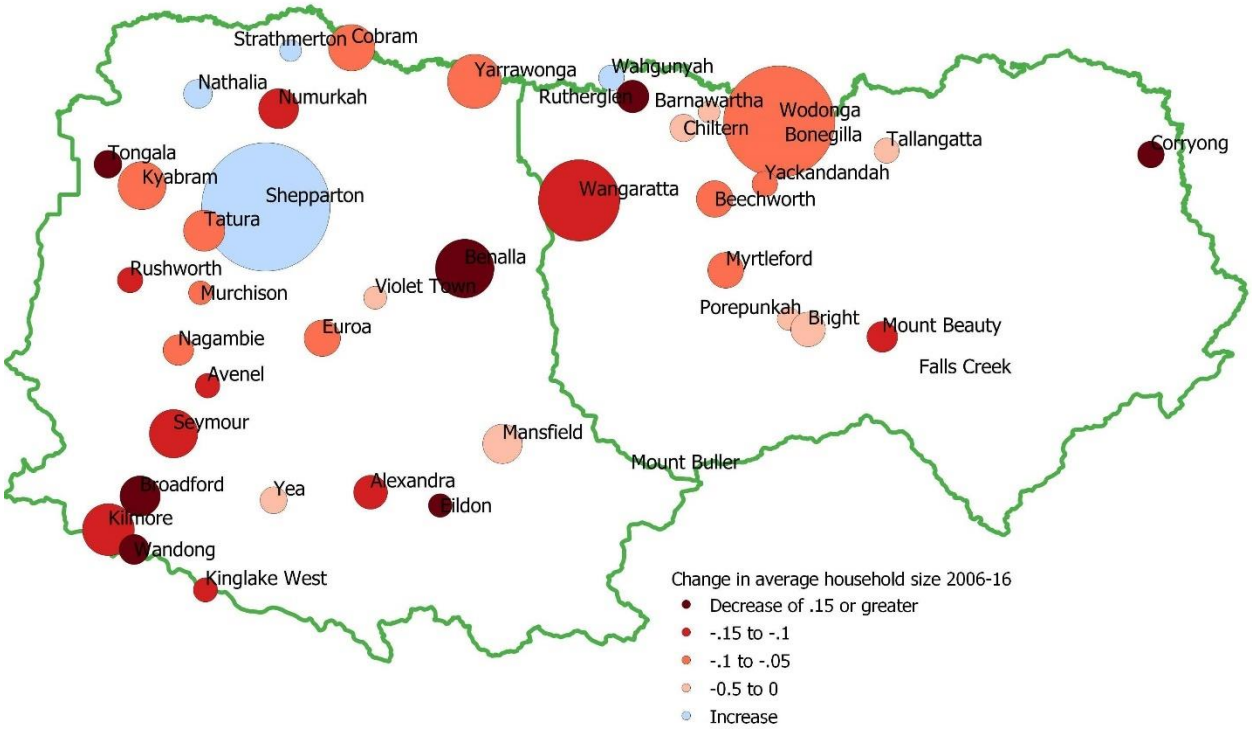


Figure 45 Change in average household size 2006-2016

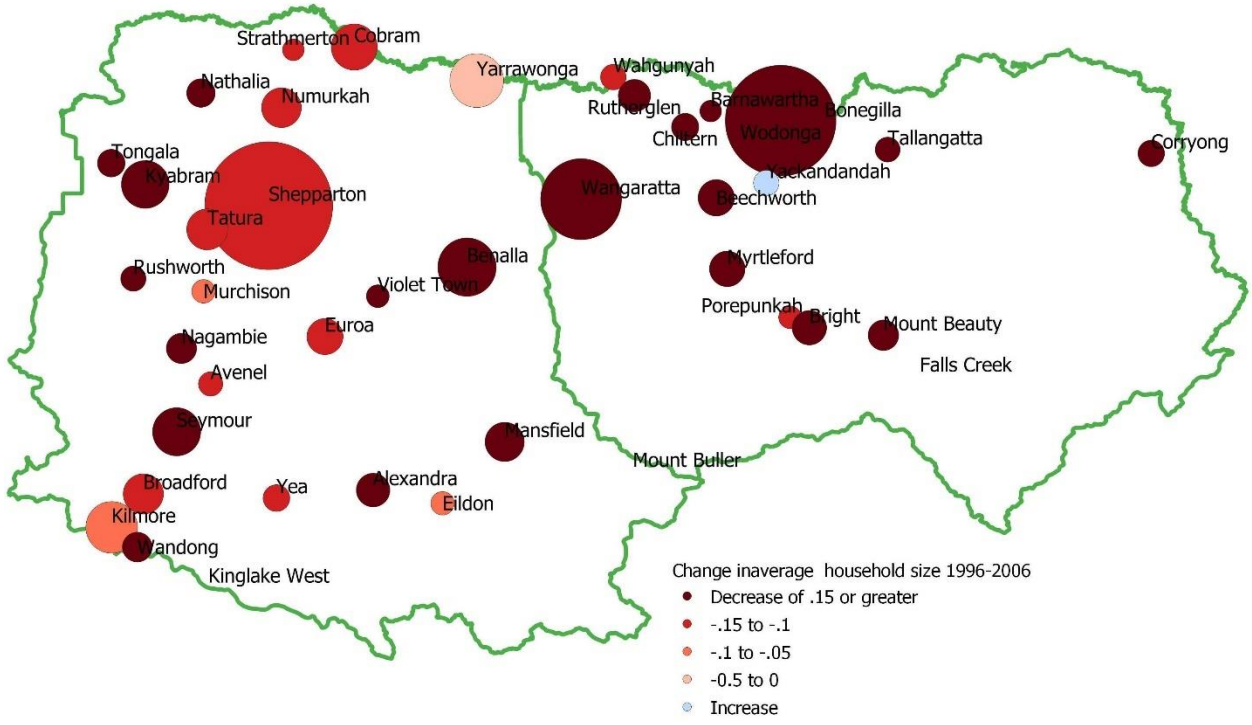


Figure 46 Change in average household size 1996-2016

7.4.2 Family – Couples with children

Towns on the Melbourne fringe have the greatest proportion of couple with children families.

Long term trend has been for a decline in the proportion of families that are a couple with children. This trend is gradually slowing. The proportion declined in all towns for which we have data, apart from Yackandandah, where there was a small increase.

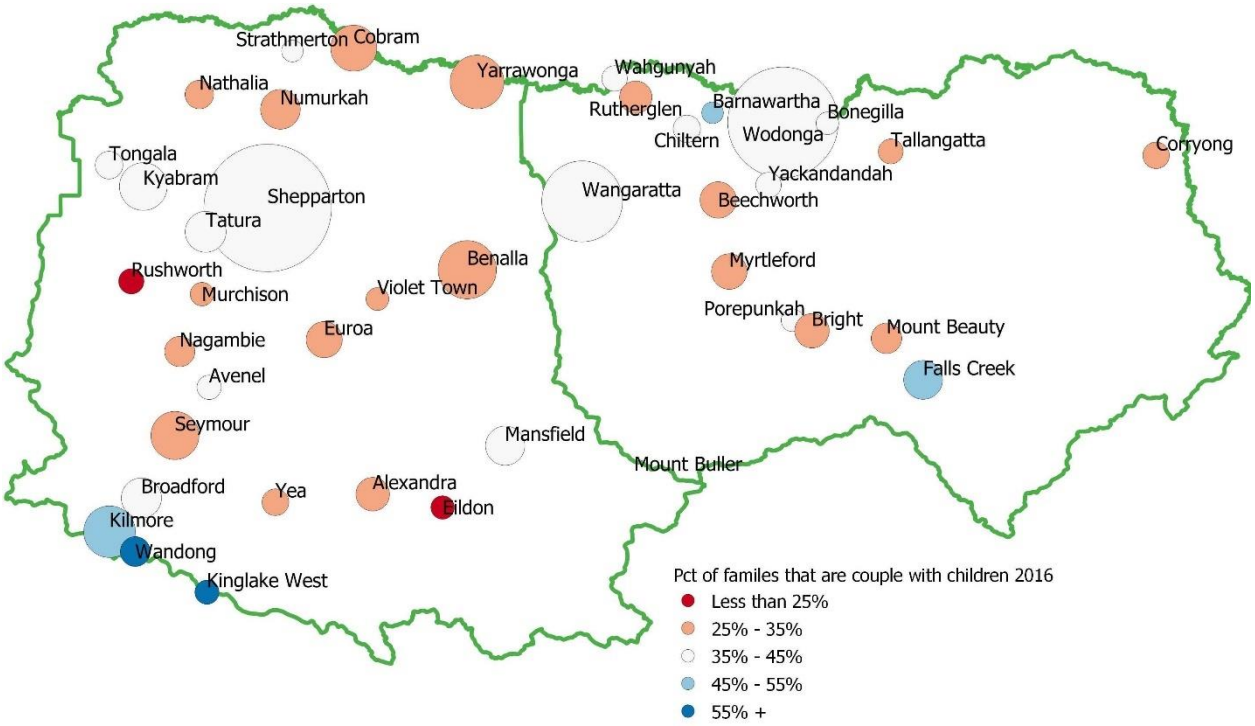


Figure 47 Per cent of families that are composed of a couple with children 2016

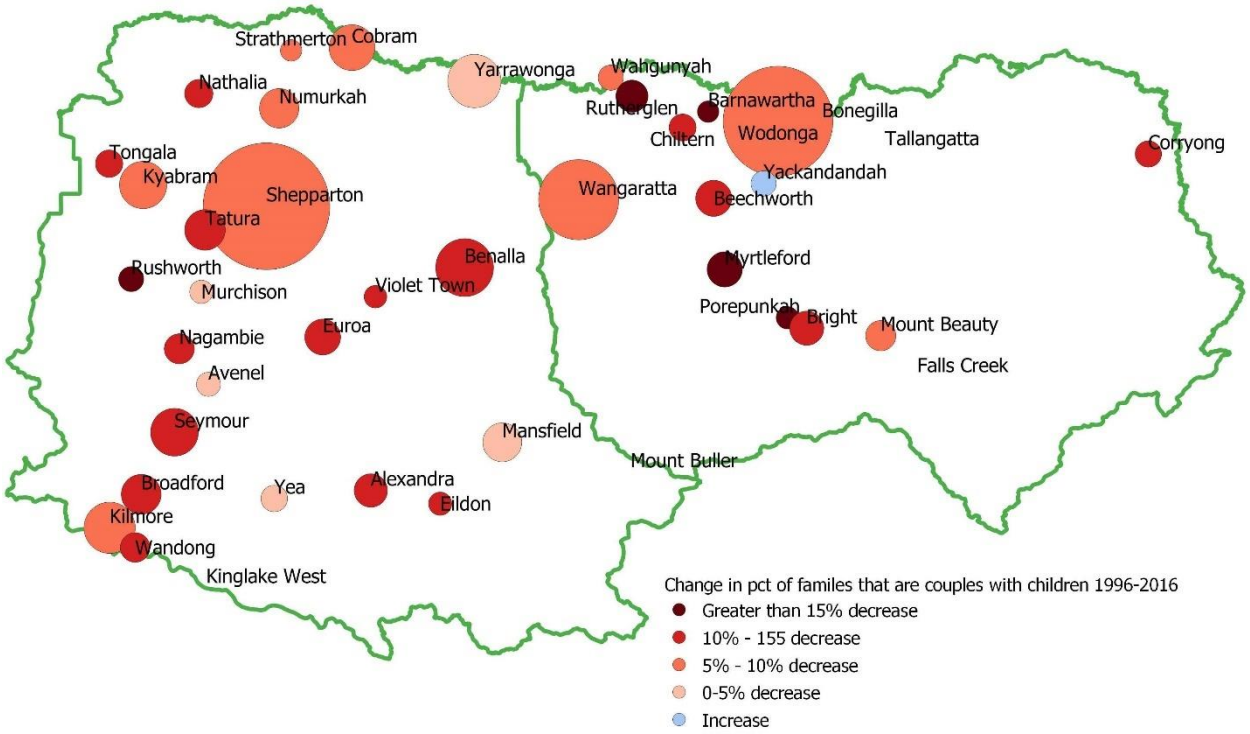


Figure 48 Change in per cent of families that are composed of a couple with children 1996-2016

7.4.3 Family – Sole parent with children

There is a long-term trend of an increasing proportion of families being composed of sole parent with children. The trend is gradually slowing.

The increase is evident in all towns for which data is available except Murchison.

In 2016 the towns with a higher proportion of sole parent families were Seymour, Broadford, Shepparton and Numurkah. Mount Buller and Falls Creek is possibly related to the high visitation rate.

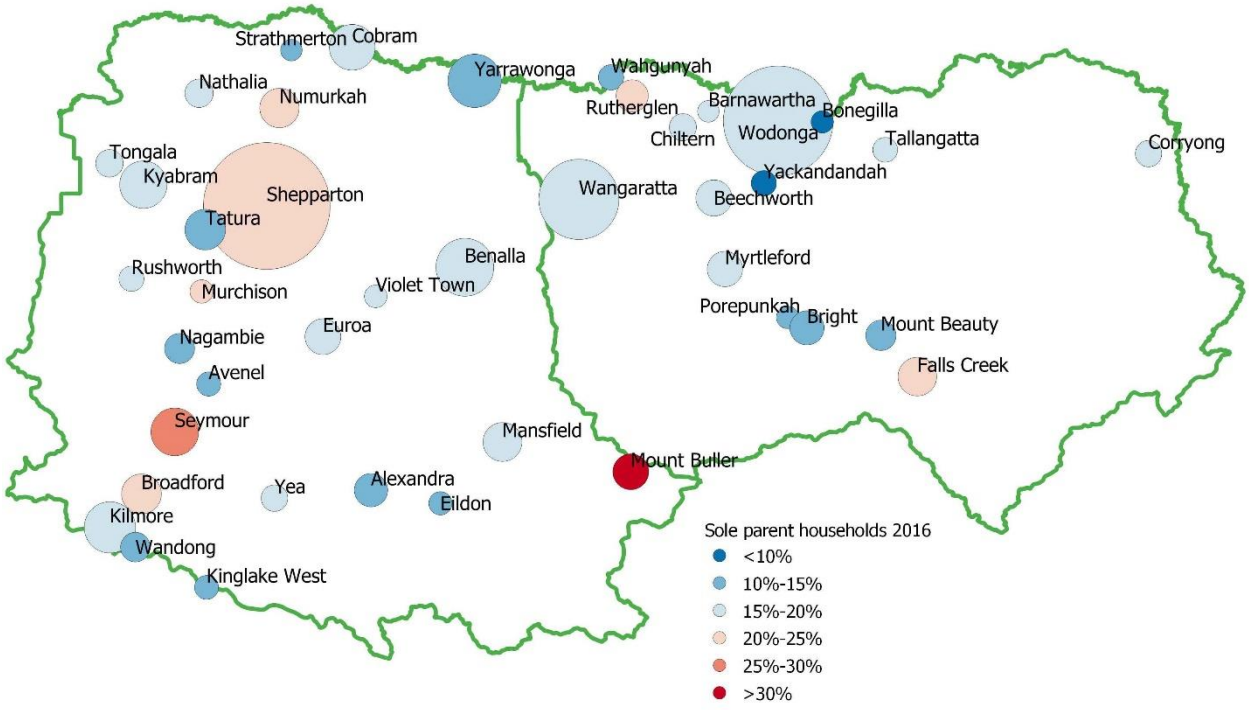


Figure 49 Per cent of families that are composed of a one parent with children 2016

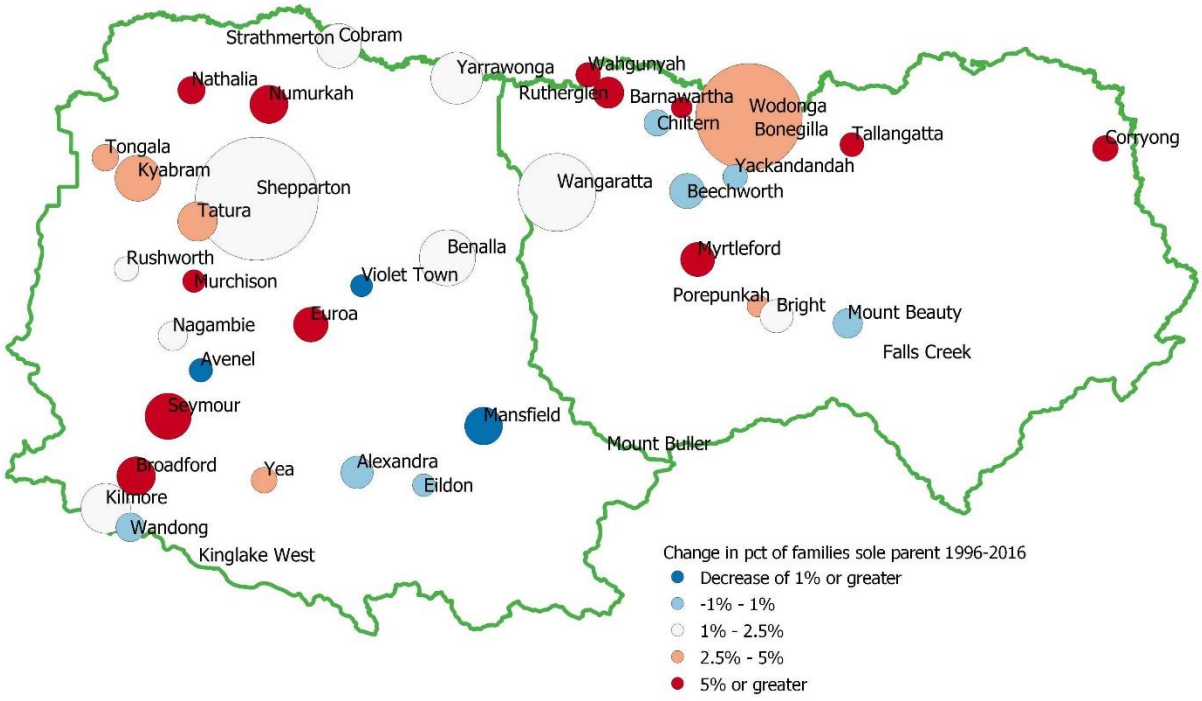


Figure 50 Change in per cent of families that are composed of a one parent with children 1996-2016

7.4.4 Family – Couples without children

Once again, there is longer term national trend of an increasing proportion of families being composed of couples without dependent children. This trend is slowing.

The trend is evident in all towns except Murchison.

The proportion of families that are couples without children is highest in the smaller towns more distant from major population centres.

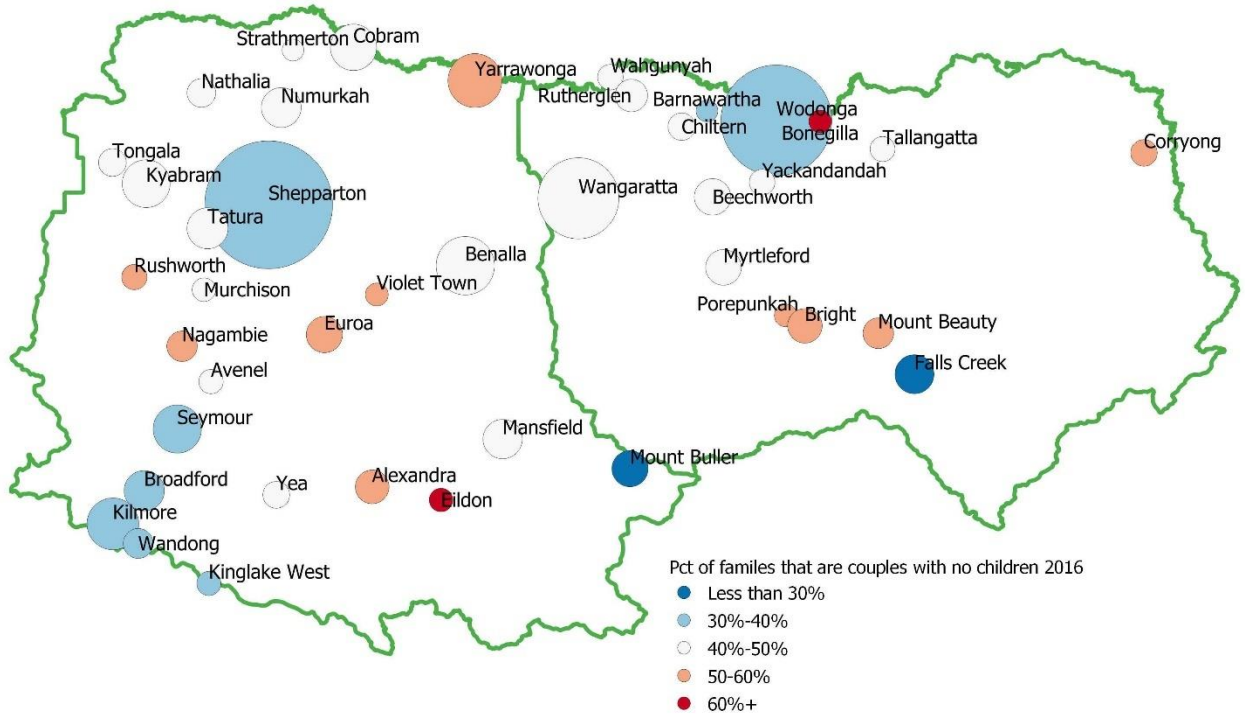


Figure 51 Per cent of families that are composed of a couple with no children 2016

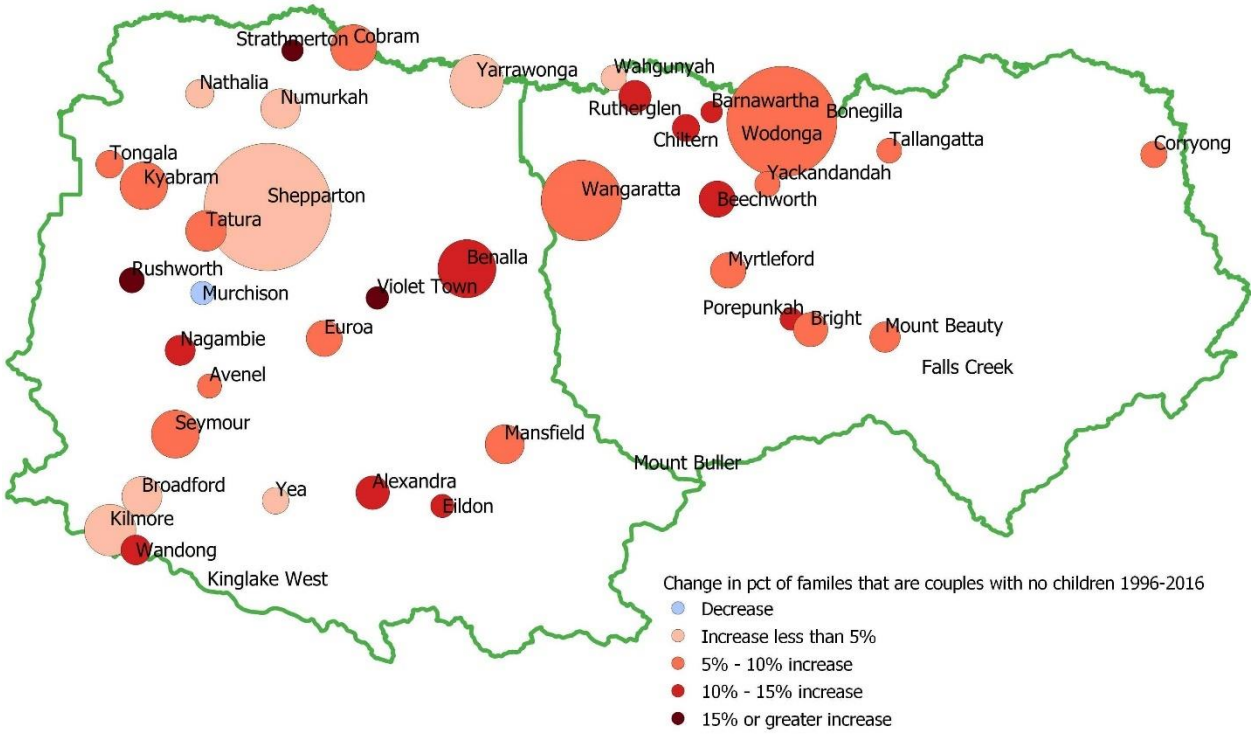


Figure 52 Change in per cent of families that are composed of a couple with no children 1996-2016

7.5 EDUCATION

7.5.1 Education – degree status

There has been a significant rise in proportion of the Australian population with degree level education over past 30 years. This is reflected in data from the two catchments, but with some important spatial variation.

Spatial differences:

- The major cities have seen a rise in the population holding degrees that matches the average across all Victorian towns.
- Mountains seem to attract the more highly educated. This can be seen in the gentrification of the satellite towns of Wodonga – Beechworth, Yackandandah and the mountain towns of Bright, Mt Beauty, Alexandra, and the ski fields. The increase in degree holding in Yackandandah is striking. In 1986 some 7% of persons had achieved degree education. This rose steadily over the next 30 years to reach 30% in 2016.
- There is a corridor of higher education attainment in the SA1s along the Hume Highway, stretching almost unbroken from Kilmore in the south to Wodonga in the north. This may reflect purchase into rural properties by those with a higher education and higher income.
- In contrast, there has been little change in many small more isolated rural towns. Whilst all these small towns have seen a rise in the proportion of degree holders, the rise is in most cases below the average for Victorian country towns.
- Degree status is relatively uncommon in the rural irrigation districts not adjacent to Shepparton.

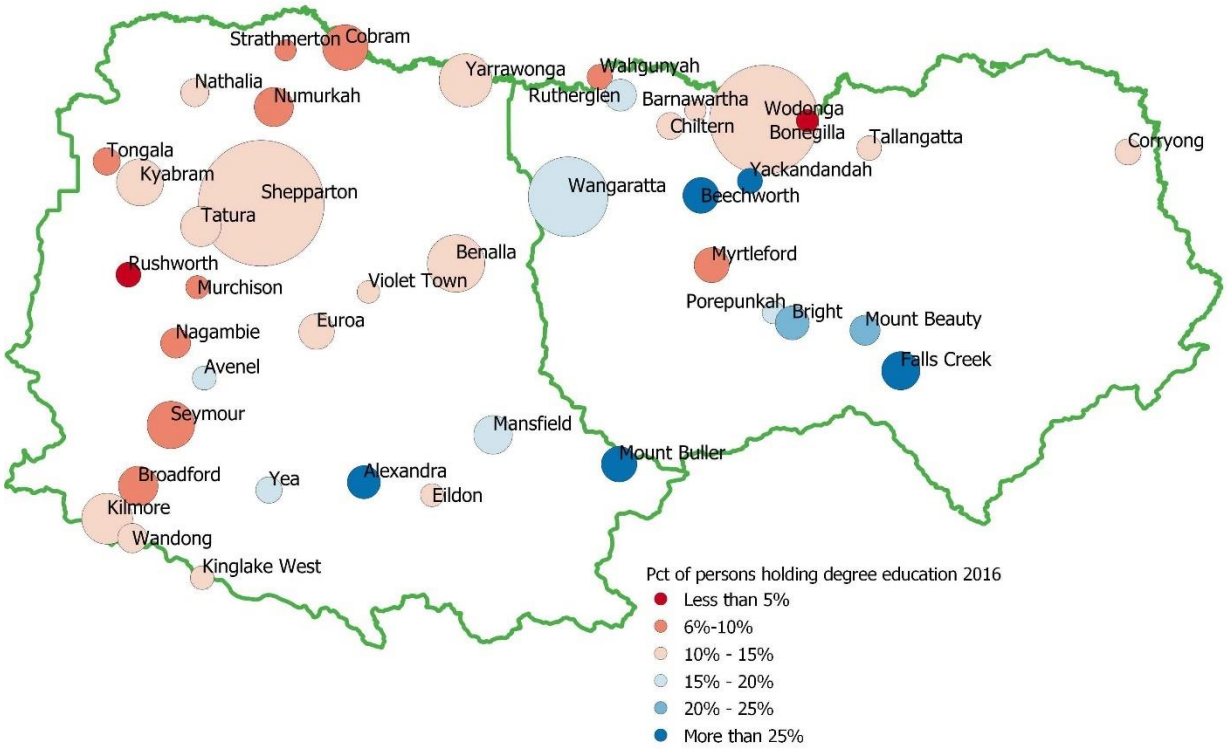


Figure 53 Persons aged over 15 with degree education as a per cent of all persons in town aged over 15 2016

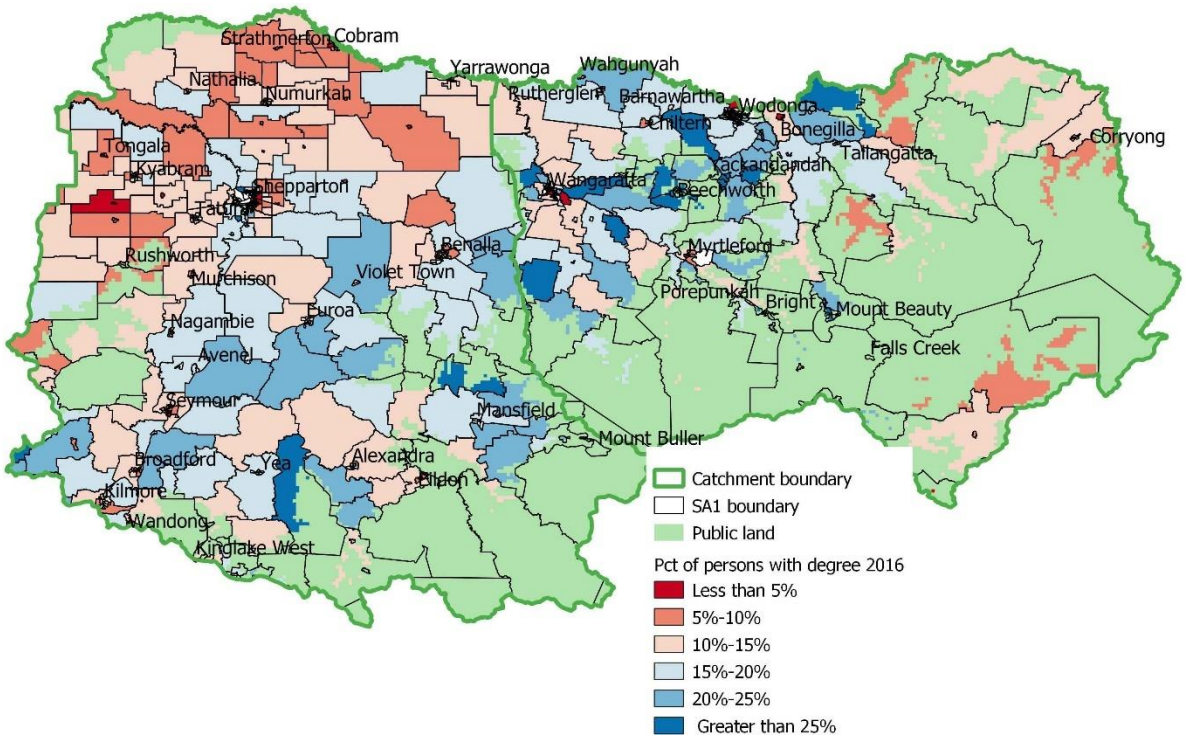


Figure 54 Persons aged over 15 with degree education as a per cent of all persons in SA1 aged over 15 2016

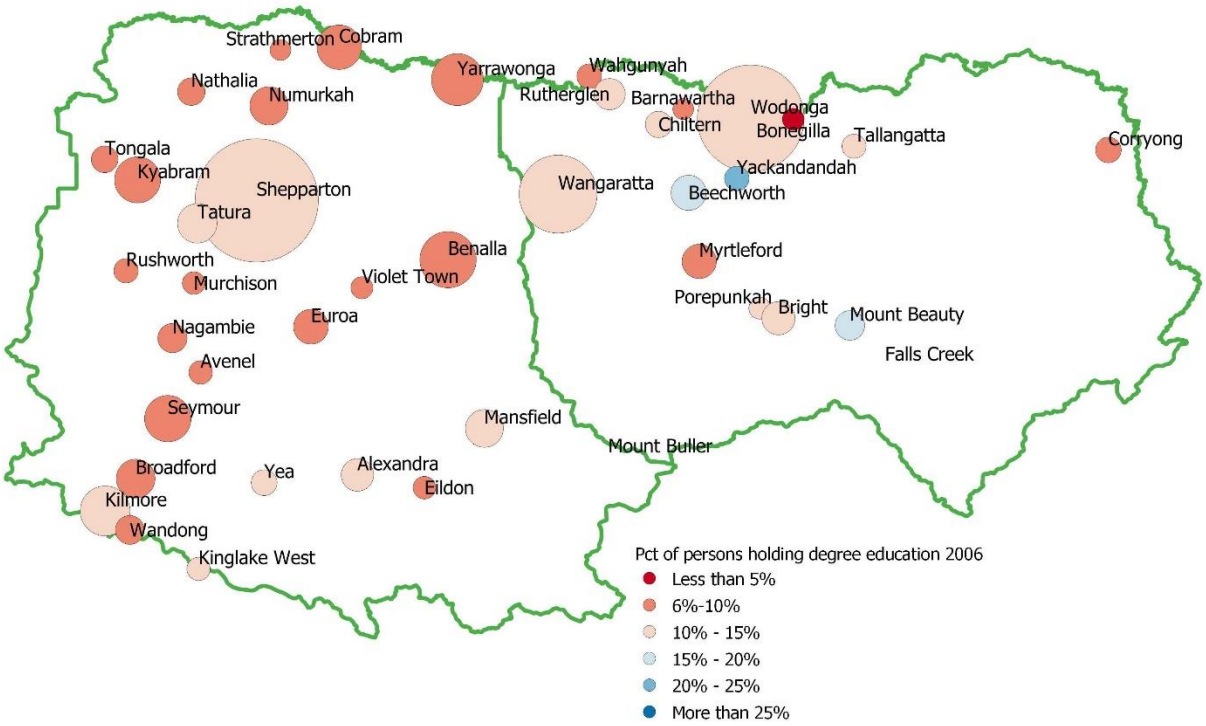


Figure 55 Persons aged over 15 with degree education as a per cent of all persons in town aged over 15 2006

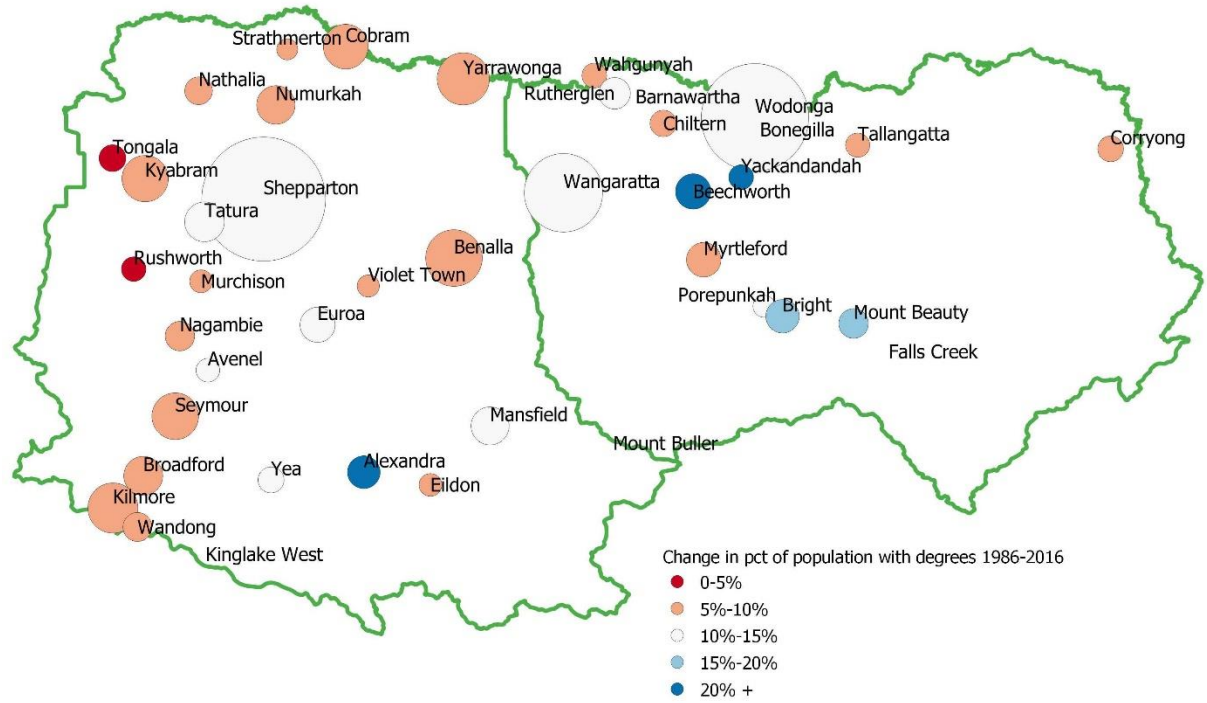


Figure 56 Change in percentage of persons aged over 15 with degree education 1986-2016

7.5.2 Education - Diploma education

The data for diploma education explains the differences between the degree education and no-post secondary education maps. This indicator counts the number of persons with a diploma as their highest level of post-secondary education.

- The average increase for diploma education across all Victorian country towns is 12 per cent. This is represented by white circles in Figure 59. The towns of Kilmore, Wandong and Broadford have seen a well above average increase in the share of persons with diploma education.
- The most concentrated fall in per cent with diploma as highest educational achievement is in some of the towns surrounding Wodonga. Here diploma achievement has been replaced by degree achievement.
- There has been an average increase in many of the smaller isolated towns.
- Diploma attainment is relatively high in the dryland farming SA1s and relatively low in irrigation farming SA1s.

The most important feature of this map is the difference between City of Wodonga and its satellites, and the city of Shepparton and its satellites. The former has above average levels of diploma education. The latter has below Victorian country town average levels of diploma attainment.

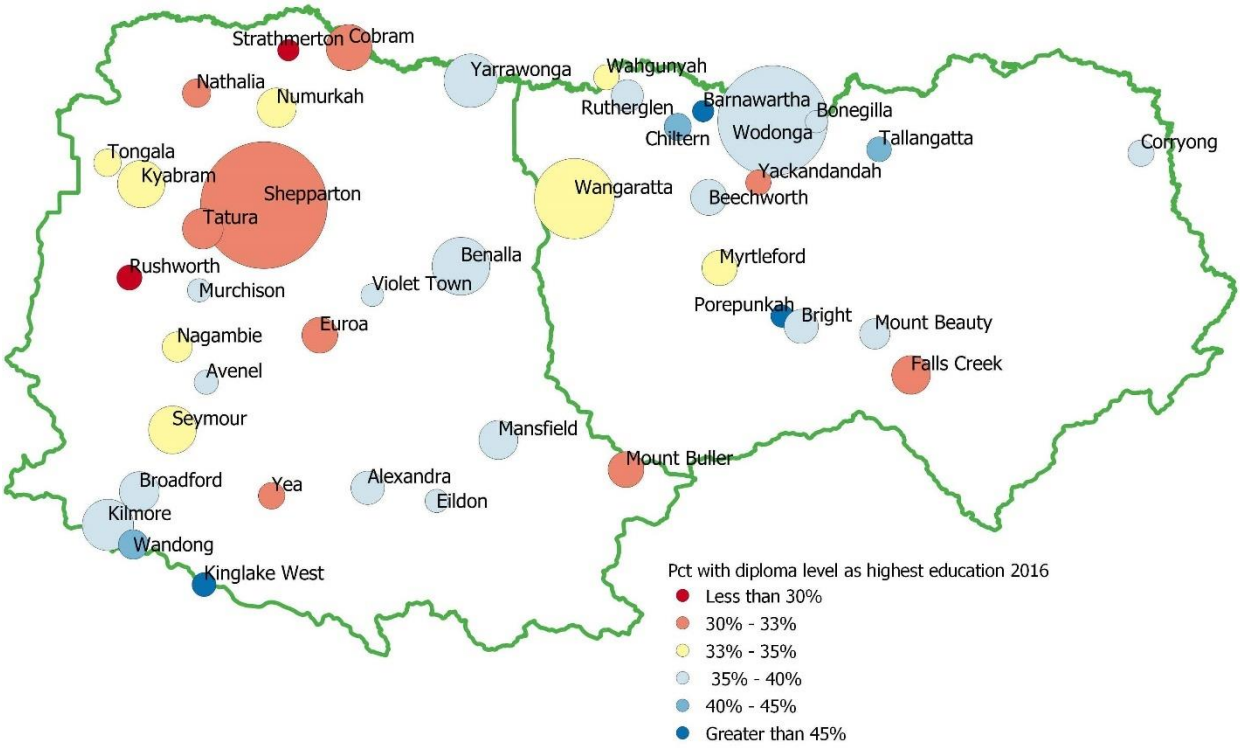


Figure 57 Percent of persons aged over 15 with diploma as highest level of educational achievement as per cent of all persons aged over 15 in town 2016

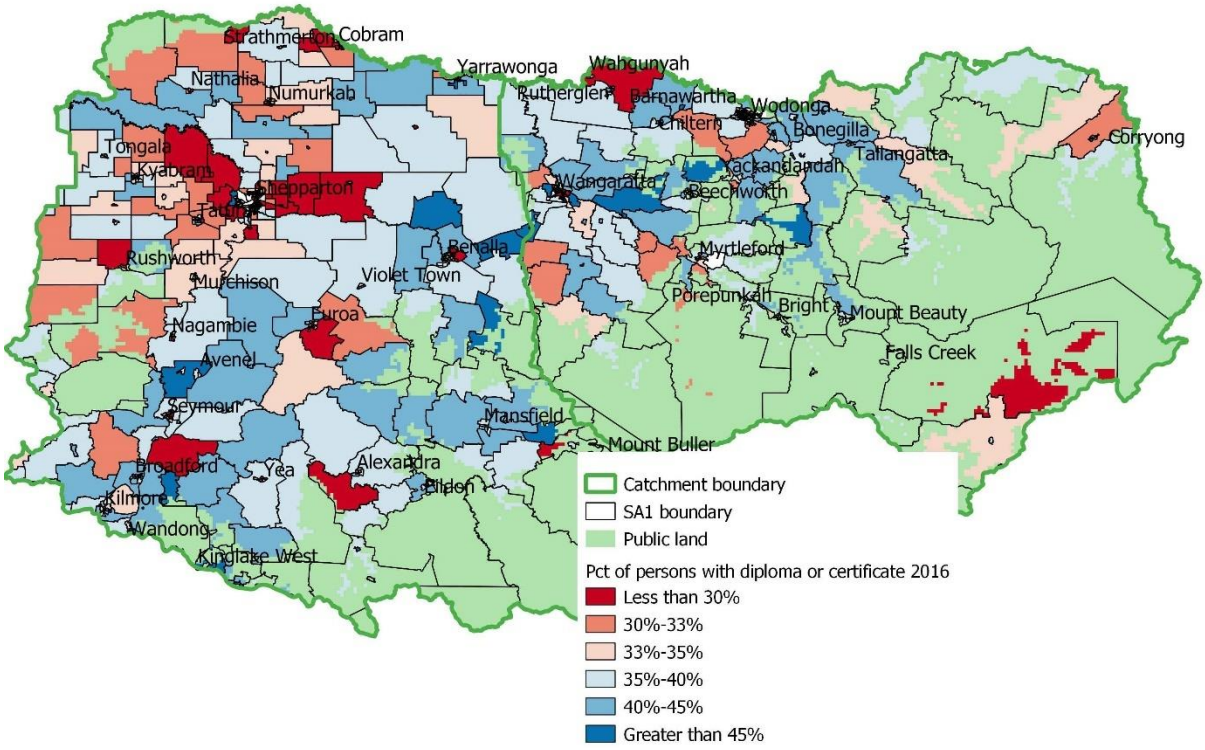


Figure 58 Percent of persons aged over 15 with diploma as highest level of educational achievement as per cent of all persons aged over 15 in SA1 2016

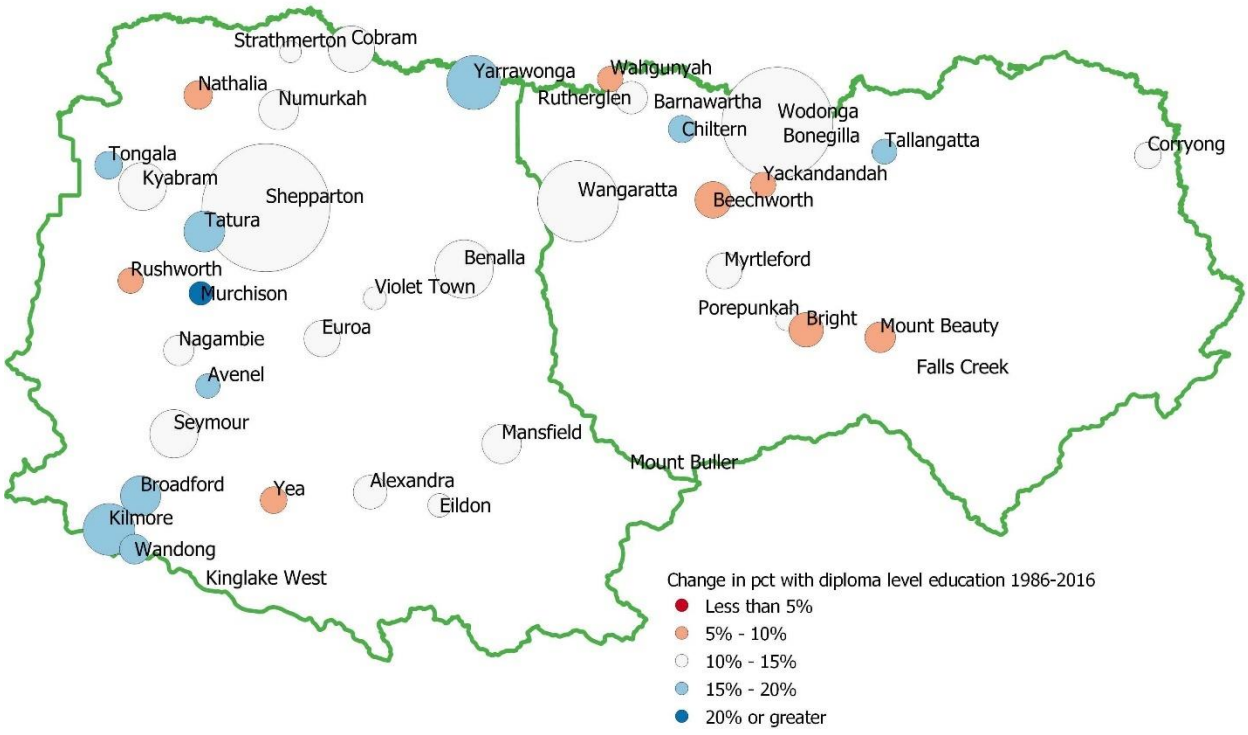


Figure 59 Change in percent of persons with diploma as highest level of educational achievement 1986-2016

7.5.3 Education - No post-secondary education

The data for persons with no post-secondary education partially mirrors the degree level education data, but in reverse. Many spatial differences are repeated. Similarities include:

- Mountain towns have a low proportion of population with no post-secondary educational attainment.
- Many of the smaller isolated country towns are red or dark red. This means they have a higher proportion with no post-secondary education compared to the average for Victorian country towns. The Victorian country town average is 50 per cent.
- The difference between Wodonga and Shepparton. The latter has a higher proportion than the state country town average.
- Again, irrigation SA1s and remote mountain SA1s have an above average share of persons with no post-secondary qualification.

The current situation is, like the case for degree education, a result of a long-term change across the country.

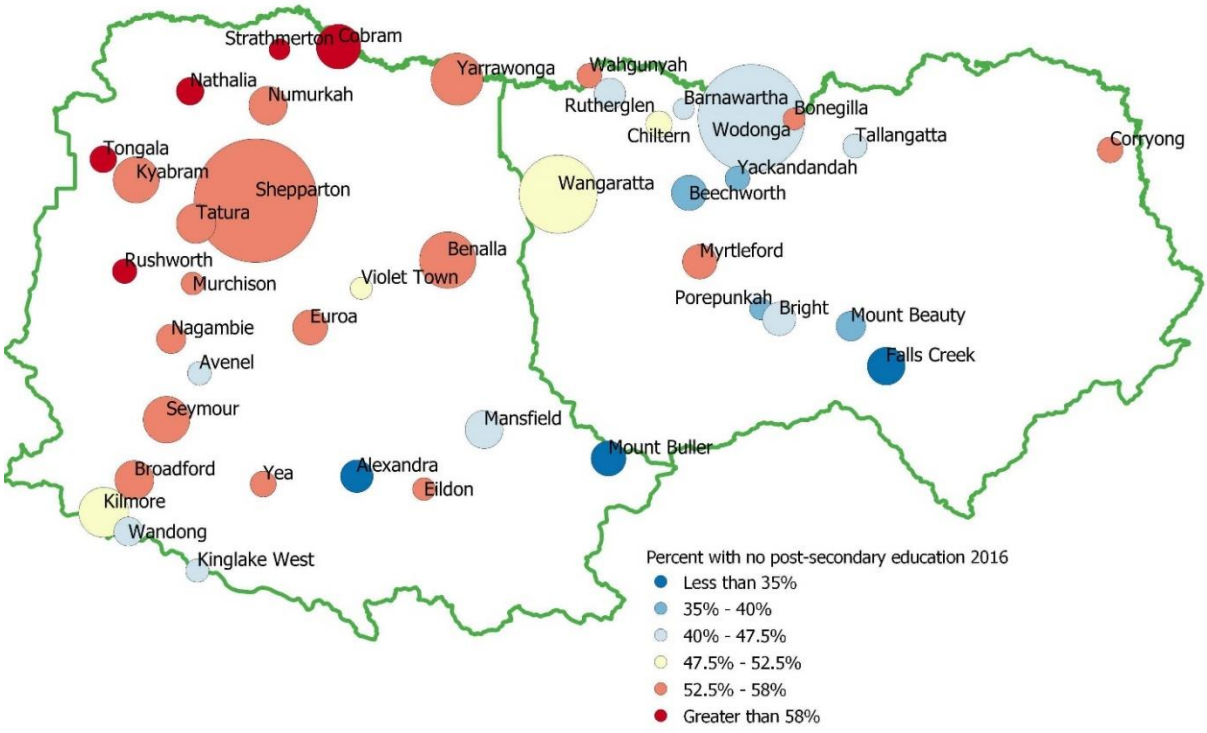


Figure 60 Persons aged over 15 with no post-secondary education as a per cent of all persons

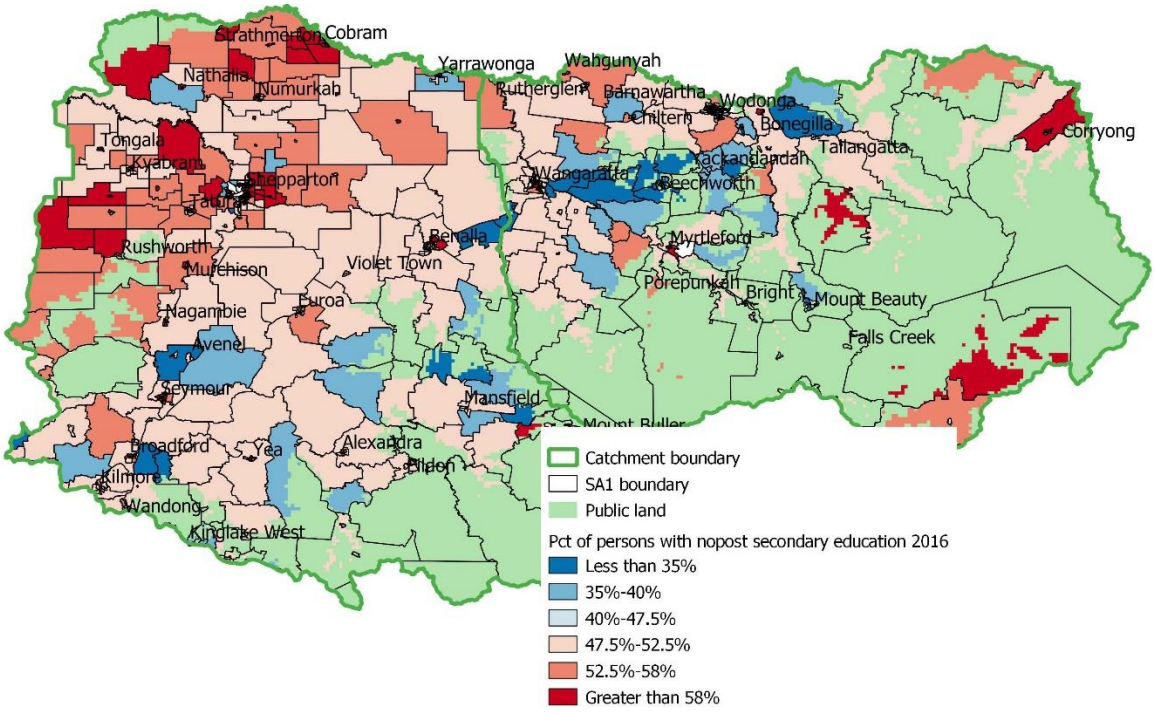


Figure 61 Persons aged over 15 with no post-secondary education as a per cent of all persons aged over 15 in SA1 - 2016

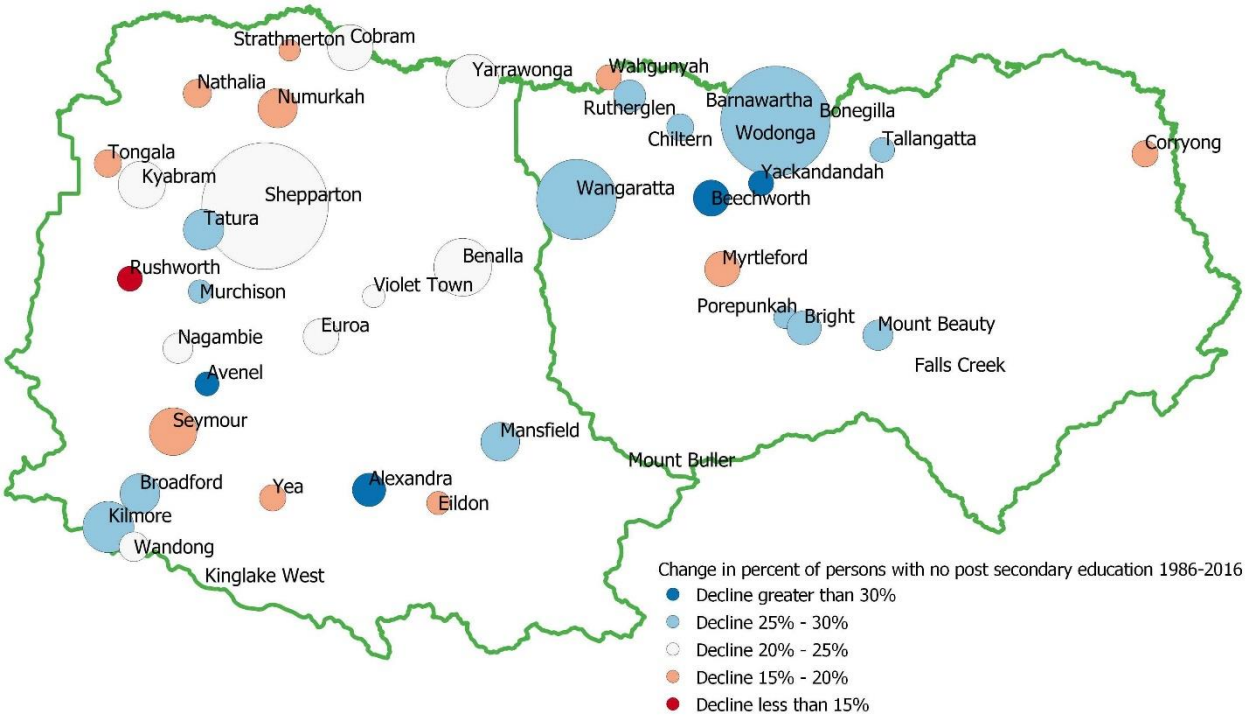


Figure 62 Change in per cent of persons aged over 15 with no post-secondary education 2011-2016

7.6 INCOME AND WELFARE

7.6.1 Personal income

Personal income in the Towns in Time database is not measured in dollars but as relative to the income distribution of Australia. The two indicators we have chosen to utilise in this report are:

- The proportion of persons in the town whose income is in the lowest quartile of Australian incomes. A town that was similar to the Australian population as a whole would be expected to have a score of 25%. In 2016 this was an individual income of $743 or less per week.
- The proportion of persons whose income is within the highest Australian income quartile. Again, a town that matched the Australian income distribution would be expected to have a score of 25%. A score lower than 25% indicates the town has fewer people with high incomes that the national average. In 2016 this was an individual income of $2,434 or higher per week.

There are two advantages that come from using this relative income indicator:

- This removes the problem of dealing with inflation when reporting income through time.
- Work in psychological economics indicates that in high income economies relative income rather than absolute income is more important for well-being (Frey, 2008) (Layard, 2005) (Marmot, 2015) (Wilkinson, 2009).

Lowest quartile incomes are over-represented in both catchments. A town with an income distribution matching Australia's would score 25%. Only 6 of 41 towns have fewer than 25% of the population in the lowest income quartile.

Those towns with a lower quartile score lower than 25 are small or have temporary visitor populations. These include Wandong and Kinglake on the outskirts of Melbourne, and Bonegilla and Barnawartha on the outskirts of Wodonga. Each functions to some extent as a dormitory town dependent upon the economic activity in a much larger centre, Melbourne to the south, and Albury-Wodonga in the north east.

The other two towns with a score below 25% are the two main ski-resorts of Buller and Falls Creek. These are not locations that provide living opportunities for those on lower incomes, other than a limited number of itinerant workers.

Eleven towns score 40% or higher, indicating a relatively large proportion of the population with lower incomes. These tend to be towns more distant from the major population centres and distant from accommodation and visitation towns – Corryong and Myrtleford in the North East and places such as Rushworth, Euroa and Yea in the Goulburn Broken. The largest town in this group is Benalla.

There has been little change in this measure of relative income over the past 20 years. In the decade 2006-2016 the only notable shifts were a decrease in the relative prevalence of low incomes in the Bright-Porepunkah area, and an increase in Benalla and Euroa. The former is probably associated with a gradual gentrification of the town and growth in absentee ownership.

The spatial pattern shown in the map of low-income quartiles is basically repeated in the map of high-income quartiles. The only towns with a greater high-income population share than the national average are Wandong, on the Melbourne fringe, and the two major ski resorts. All other towns in the two catchments have less than a pro-rata share of high-income individuals. The only other settlements that come close to the national average are Bonegilla, Yackandandah in the north

east, and Kilmore and Kinglake in the Goulburn Broken. The high-income quartile share has remained relatively unchanged over the past 20 years. Again, one notable exception has been a rise in the indicator for Bright-Porepunkah in the 2006-2016 period.

We used a different statistical collection to provide a measure of median individual and family income for Statistical Area 1 geography. This collection does not provide a comparable indicator to that found in the town data. Rough comparisons can be made using Table 5. The first quartile pint is roughly $320 per week. The last quartile point is roughly $1200 per week.

In the rural SA1s the higher incomes can generally found closest to the larger towns – Wodonga, Shepparton, Melbourne.

Table 5 Cumulative distribution of personal income from Census of Population 2016

	Share of population aged over 15
Negative income	0.6%
Nil income	10.4%
$1-$149 ($1-$7,799)	15.0%
$150-$299 ($7,800-$15,599)	22.8%
$300-$399 ($15,600-$20,799)	32.1%
$400-$499 ($20,800-$25,999)	41.1%
$500-$649 ($26,000-$33,799)	49.3%
$650-$799 ($33,800-$41,599)	57.6%
$800-$999 ($41,600-$51,999)	66.5%
$1,000-$1,249 ($52,000-$64,999)	75.7%
$1,250-$1,499 ($65,000-$77,999)	82.0%
$1,500-$1,749 ($78,000-$90,999)	87.3%
$1,750-$1,999 ($91,000-$103,999)	91.0%
$2,000-$2,999 ($104,000-$155,999)	96.6%
$3,000 or more ($156,000 or more)	100.0%

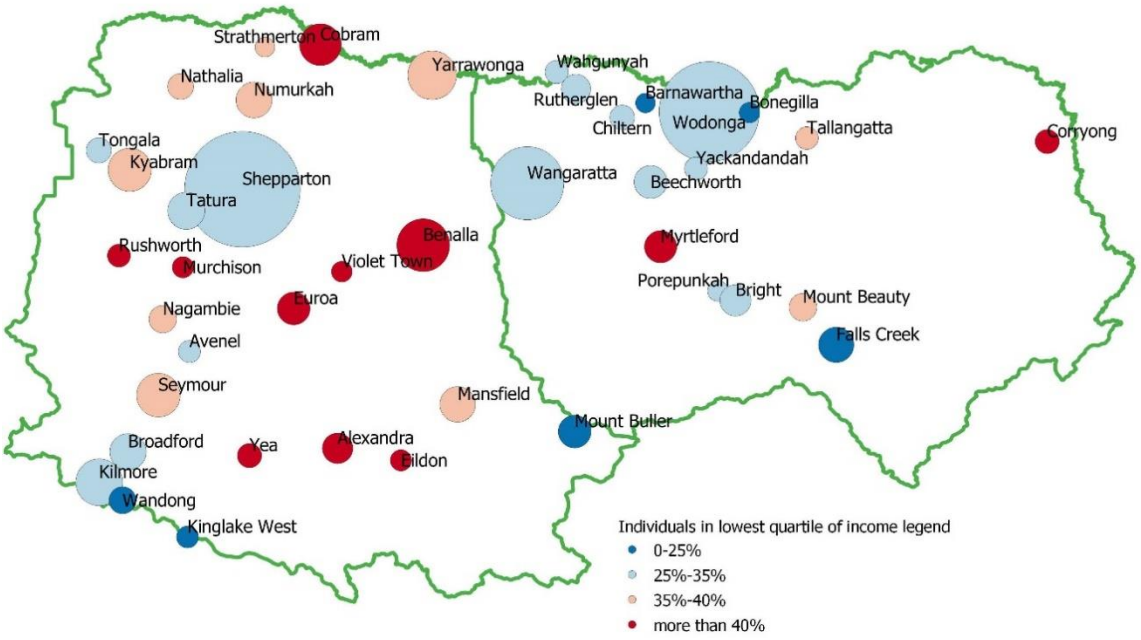


Figure 63 Percentage of town population with incomes within Australia's lowest income quartile 2016

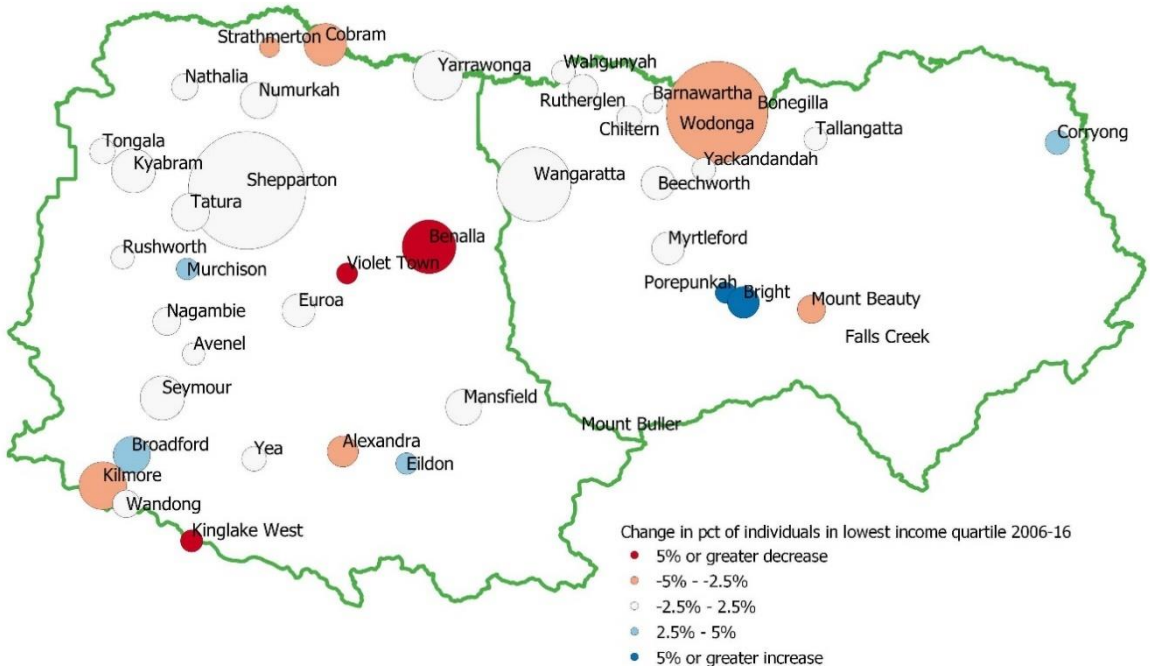


Figure 64 Change in per cent of town population with personal income in lowest income quartile 2006-2016

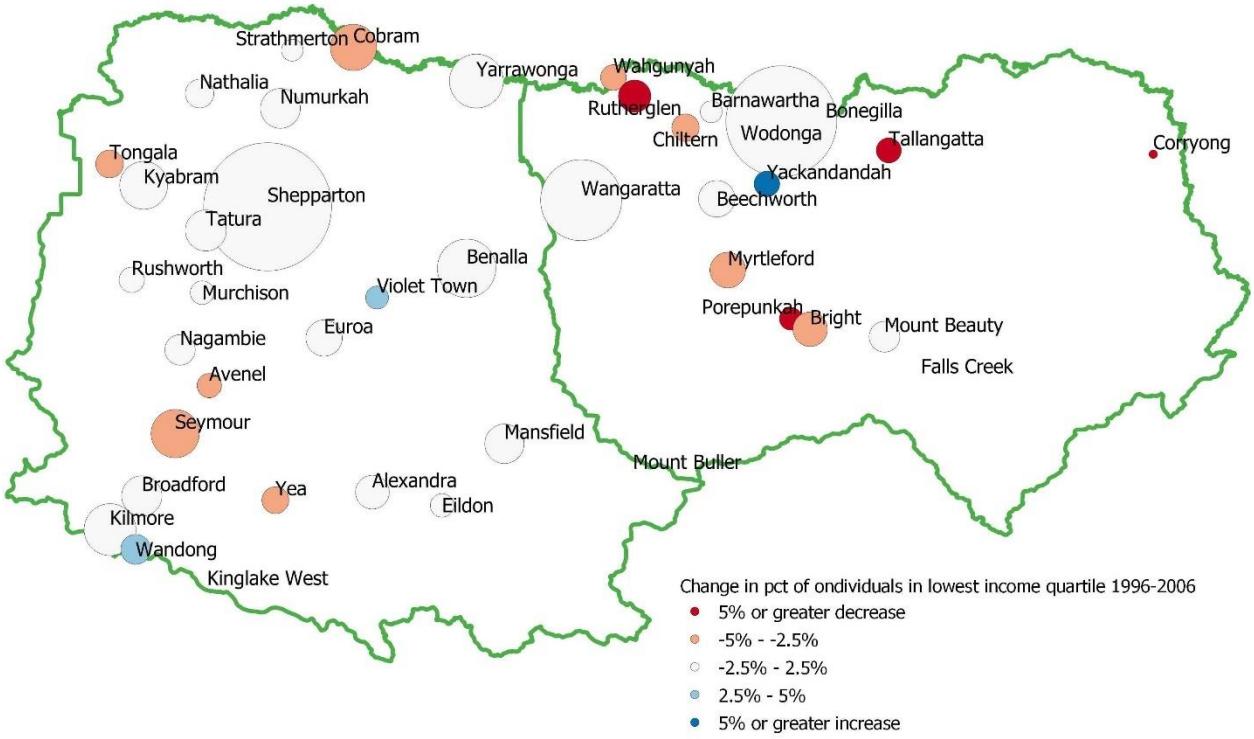


Figure 65 Change in per cent of town population with personal income in lowest income quartile 1996-2006

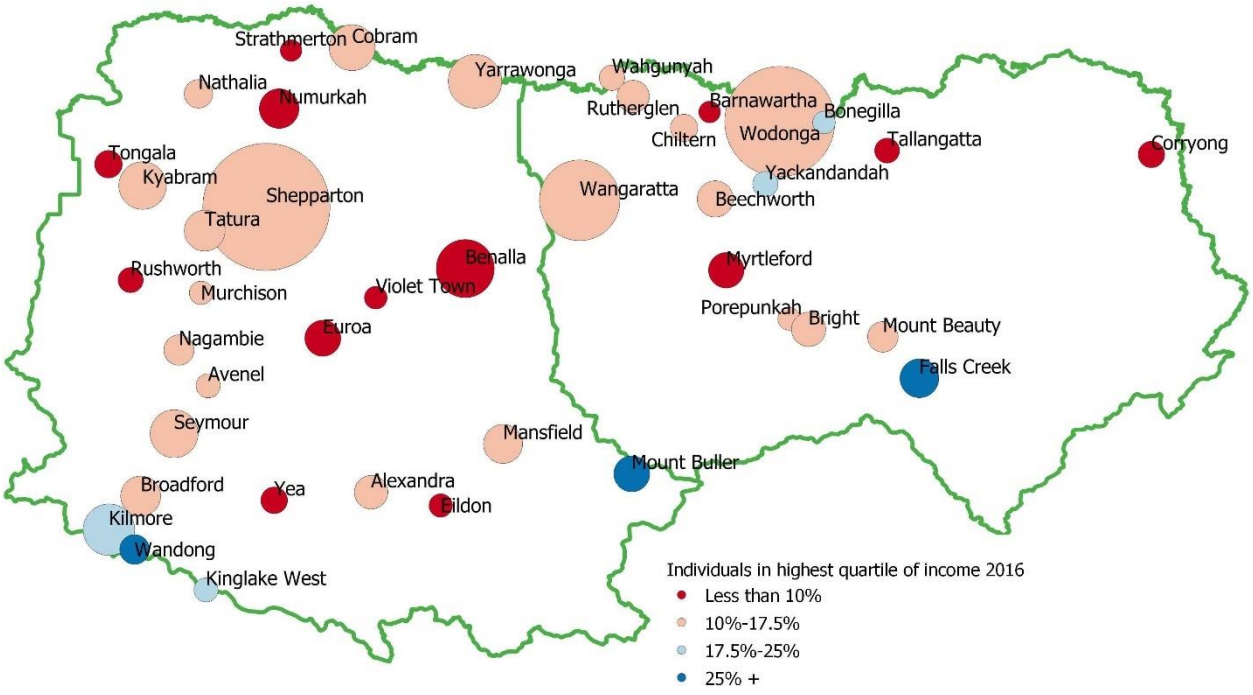


Figure 66 Percentage of town population with incomes within Australia's highest income quartile 2016

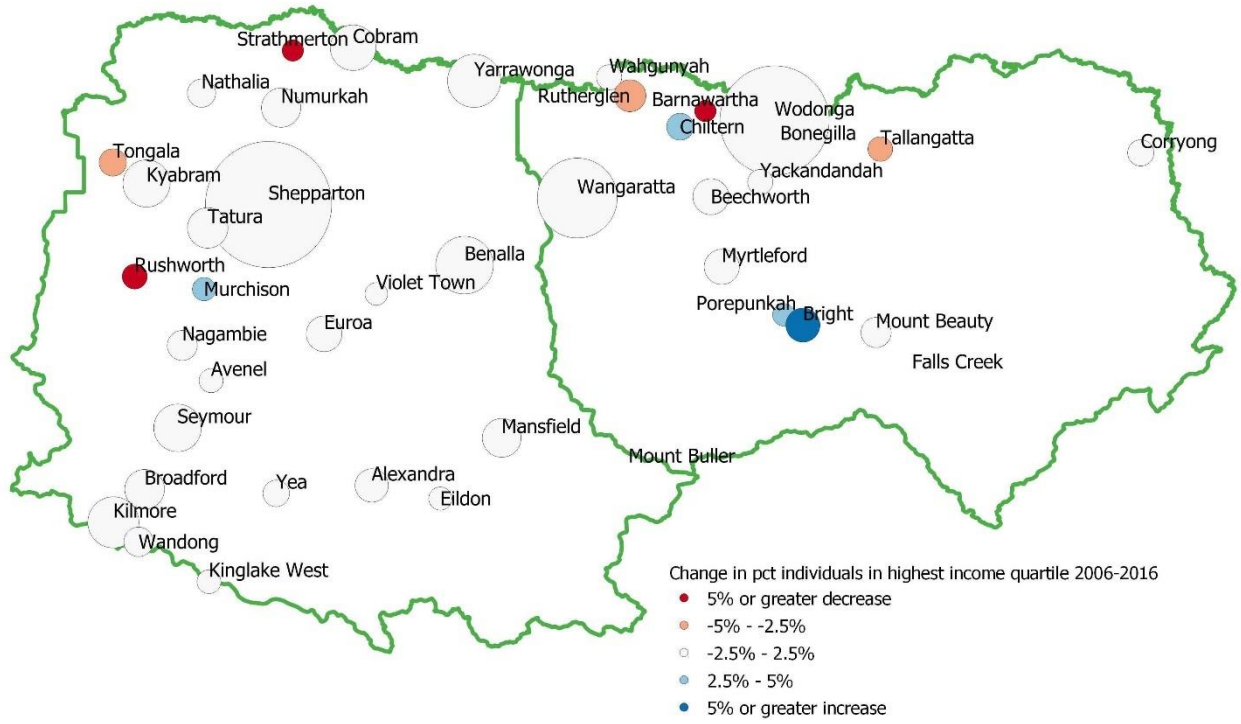


Figure 67 Change in per cent of town population with personal income in highest income quartile 2006-2016

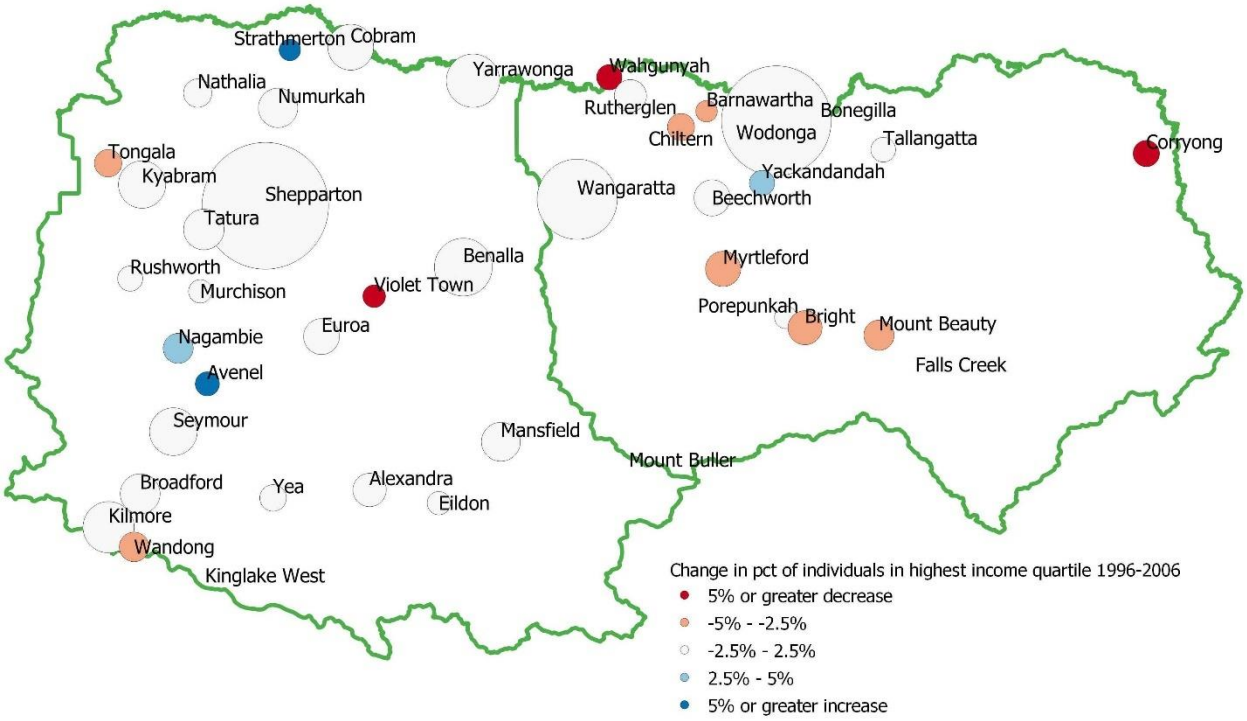


Figure 68 Change in per cent of town population with personal income in highest income quartile 1996-2006

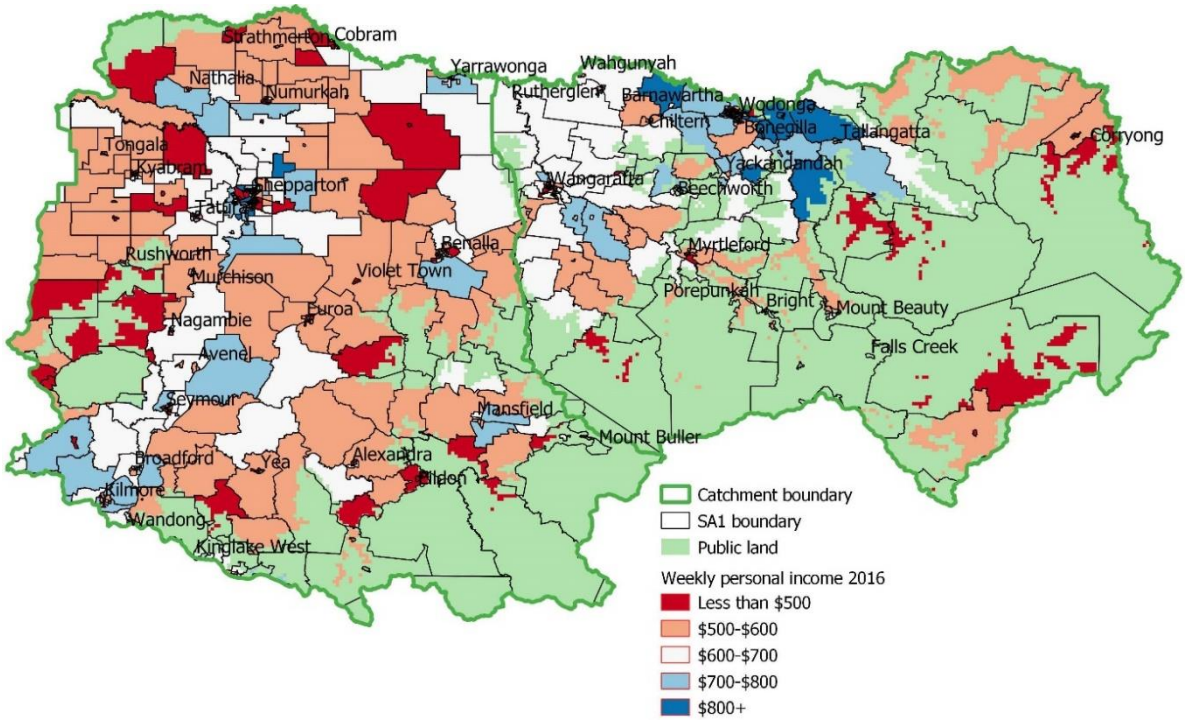


Figure 69 Median SA1 weekly individual income 2016

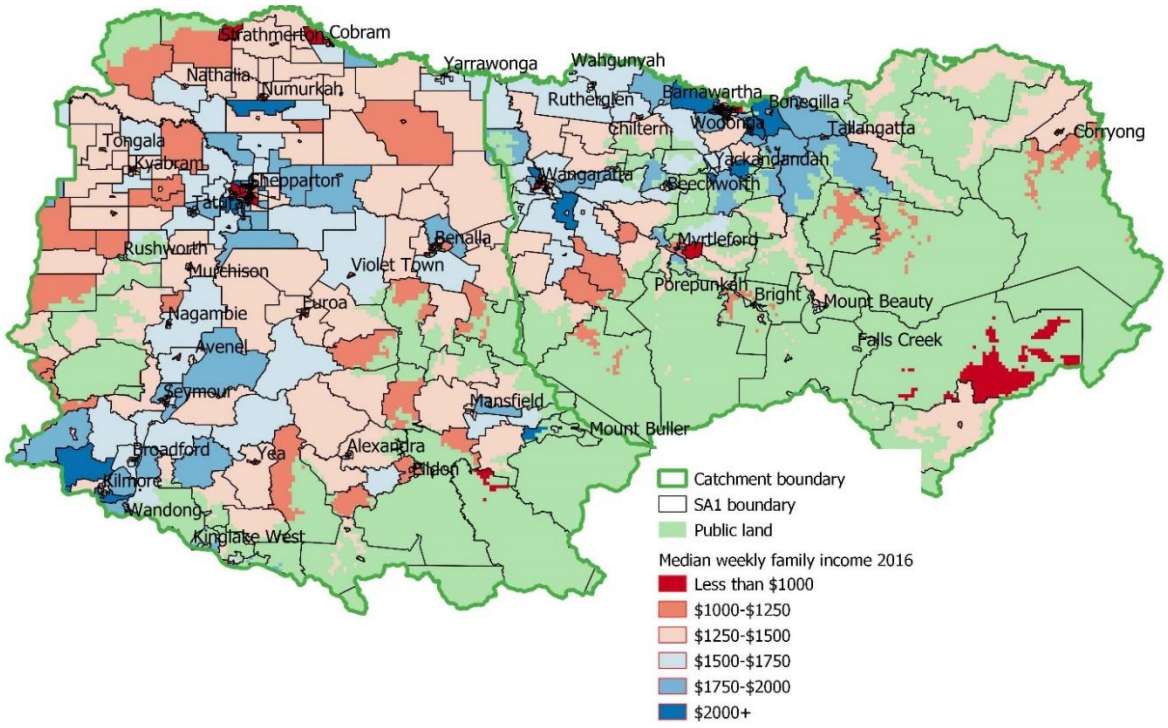


Figure 70 Median SA1 weekly family income 2016

7.6.2 Dwelling Tenure

The take-home message from statistics on dwelling tenure is quite simple. Tenure in larger towns is much more likely to be rental. Tenure in smaller towns and rural SA1s is much more likely to be full or part ownership by the resident. One can draw a couple of inferences from this simple observation:

- Low incomes in larger towns are likely to be much more stressful because of the cost of rental.
- Migration to smaller country towns will reduce housing stress for those who do not need to be in the workforce.

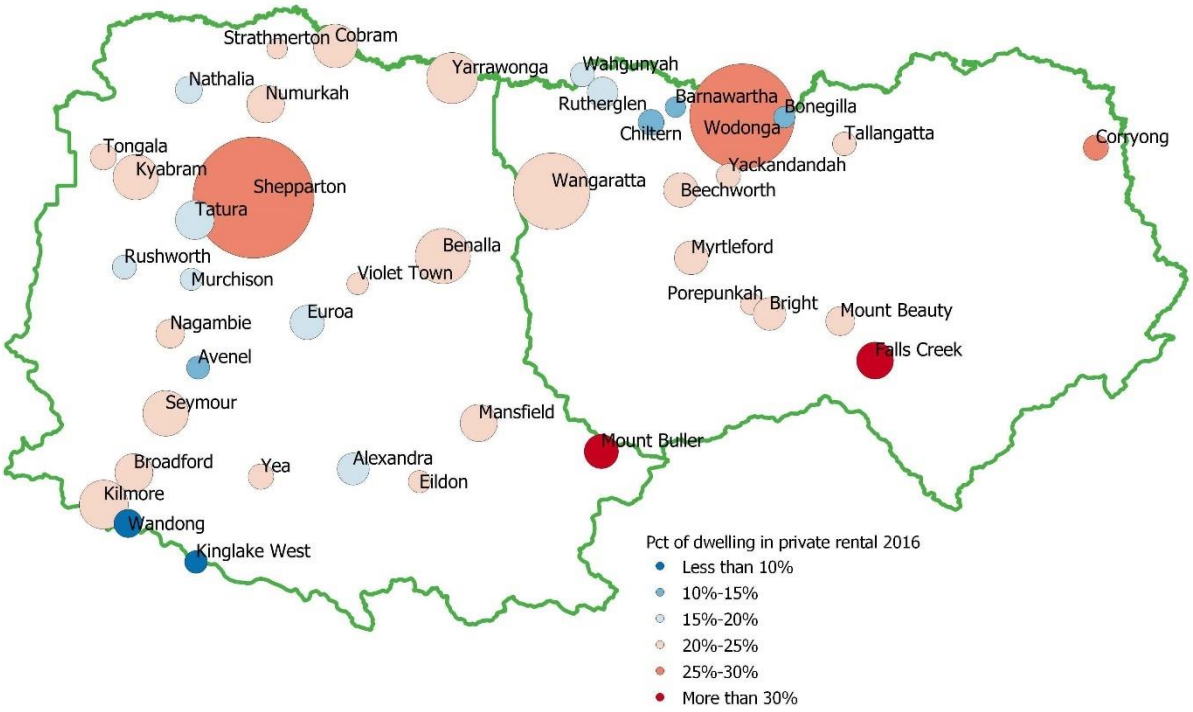


Figure 71 Per cent of private dwellings privately rented 2016

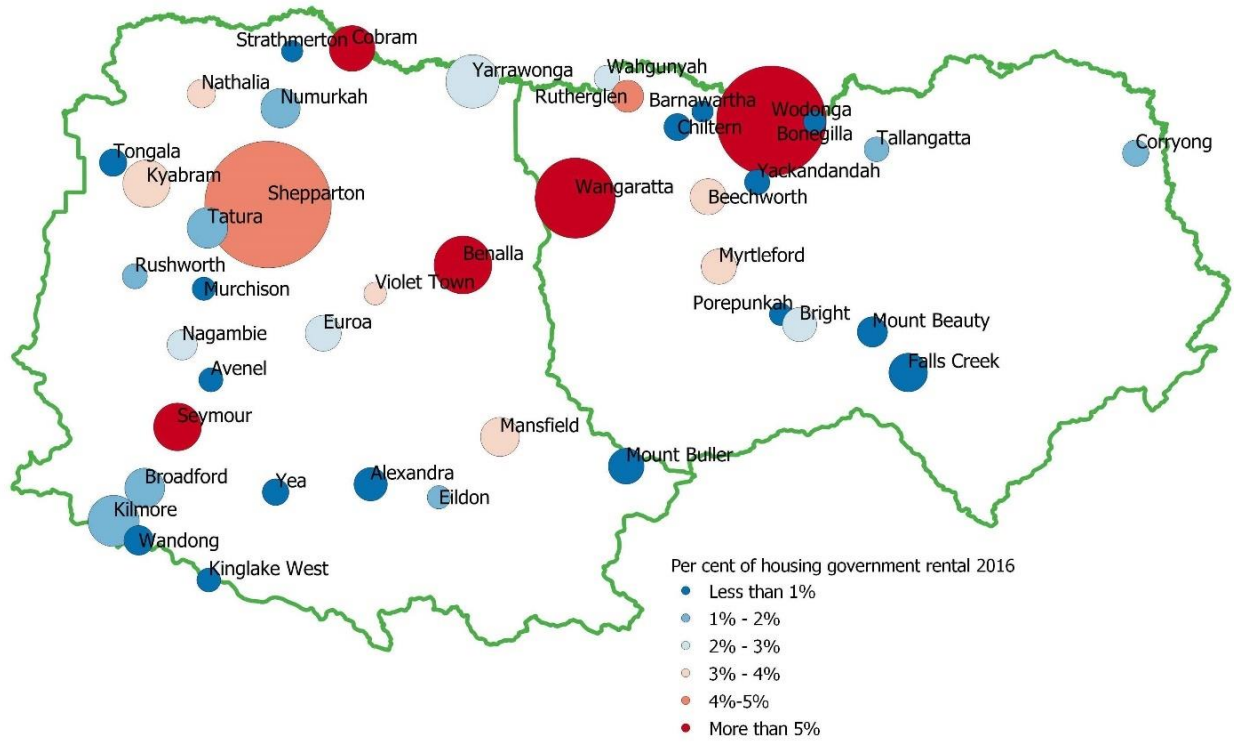


Figure 72 Per cent of private dwellings rented from government 2016

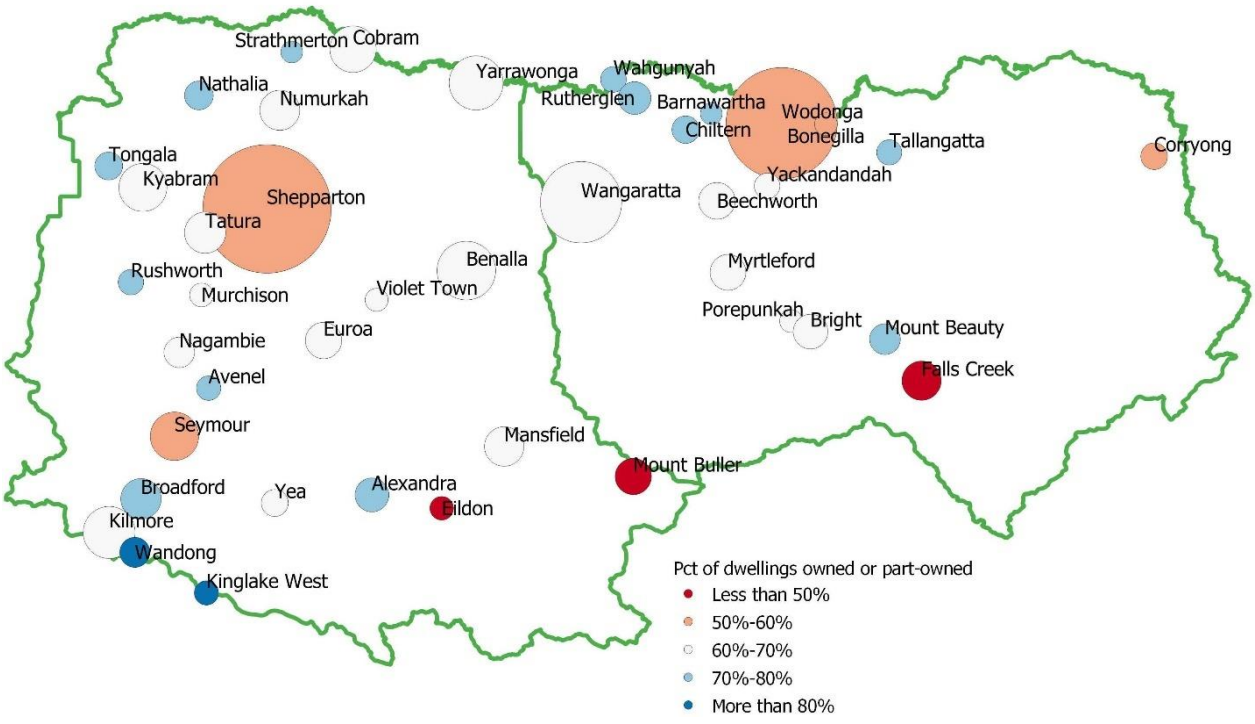


Figure 73 Per cent of private dwellings owned or partially owned by resident. 2016

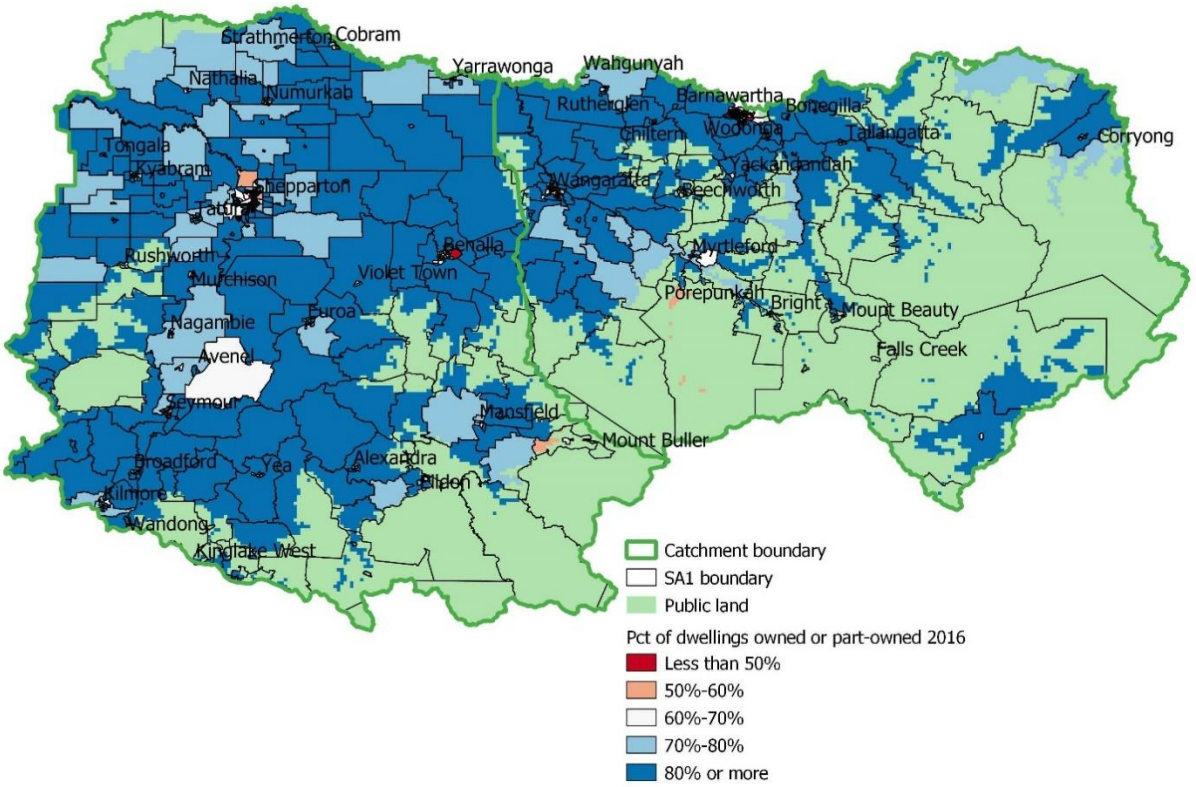


Figure 74 Dwellings owned or partially owned by resident as a per cent of SA1 dwellings in 2016

7.7 EMPLOYMENT AND INDUSTRY

7.7.1 Workforce participation

Unlike the unemployment rate, workforce participation is a stable measure which seems, at least in the focus catchments, to change gradually through time, if at all. To reflect this, two maps of towns are presented, one for 2016 and one for 1986. This choice magnifies the changes that can be observed.

- In 2016, participation rates are almost universally lower in the smaller towns in the riverine plain and rolling hill landscapes of the Goulburn Broken catchment. This has changed little since the 1986 data.
- Participation rates are higher in the major cities of Shepparton and Wodonga. This again is a consistent with the data from 1986.
- Two areas show a rise in participation rates between 1986 and 2016. One is the Melbourne fringe towns of Kilmore and Wandong. This probably reflects a changing town under influence from an expanding Melbourne to the south, shifting from a typical older population rural settlement to one more connected with employment opportunities to the south as well as within the town.
- The other area showing interesting change are the towns surrounding Wodonga – Barnawartha, Yackandandah, Chiltern and Beechworth. Presumably, growth in Albury - Wodonga has shifted the structure of these towns some way towards acting as dormitory suburbs.

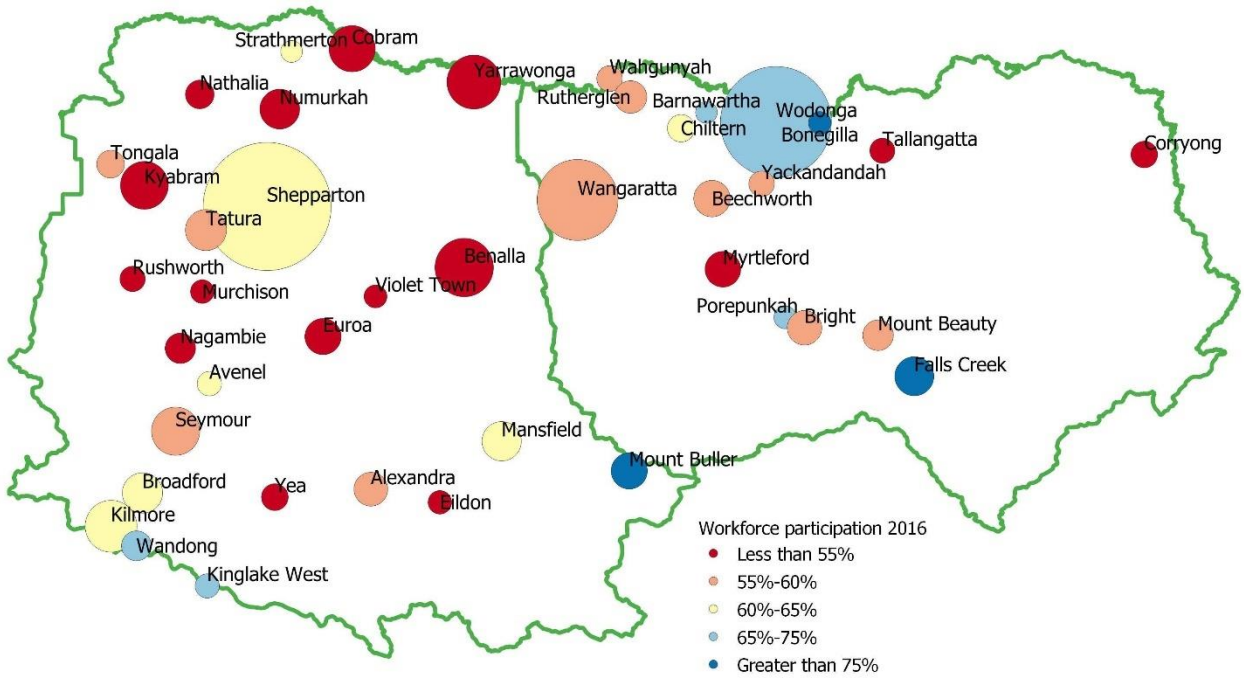


Figure 75 Map of workforce participation rate 2016

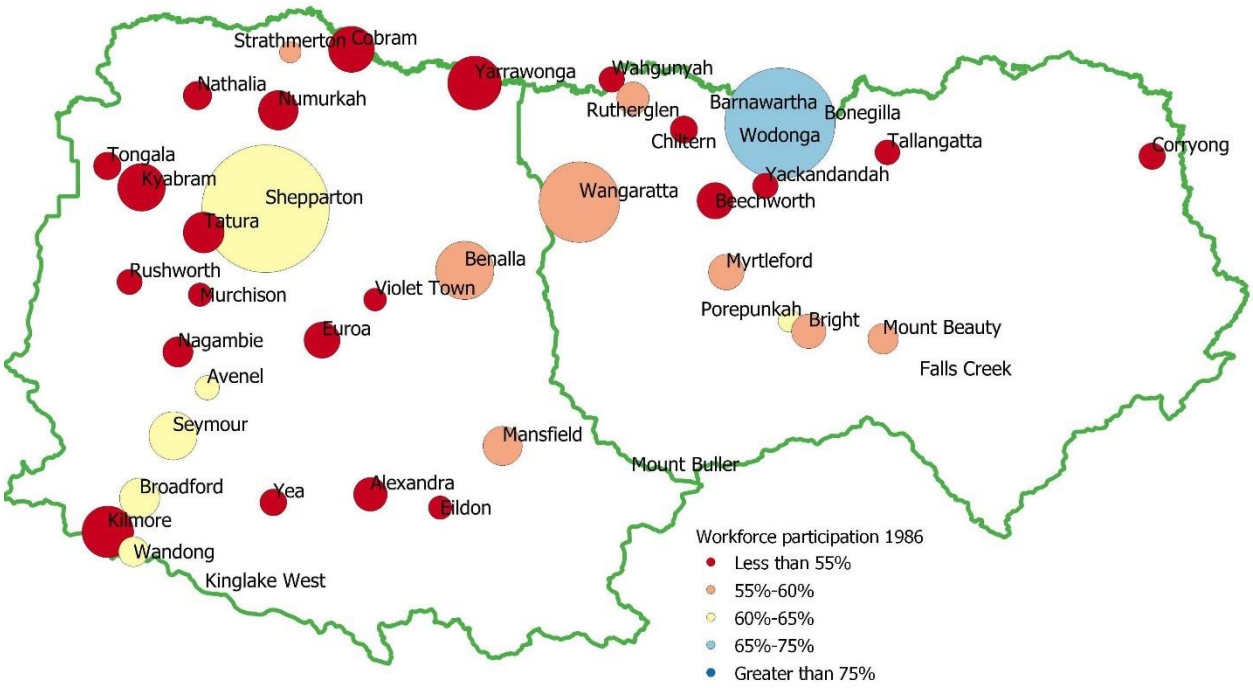


Figure 76 Map of workforce participation rate 1986

7.7.2 Unemployment

The unemployment indicator is volatile with economic conditions. Unemployment peaked in the 1990s, fell and stabilized over the period 2006 till now. (Anyone's guess what it is now).

Despite the volatility of the measure, there are some consistent geographic trends:

- Unemployment remains consistently higher in the major centres of Wodonga and Shepparton, as well as Seymour and Broadford. This was the case in the 1996 data, with unemployment reaching double digits in all these towns. This is not shown on the map because of the choice of using a consistent scale through the time series.
- Unemployment remains generally lower in the mountain resort towns such as Bright and Mansfield.
- Unemployment is generally lower in rural SA1s. This is less a reflection on the availability of employment than of the preference of those seeking work to move to larger towns where there is greater chance of finding employment.

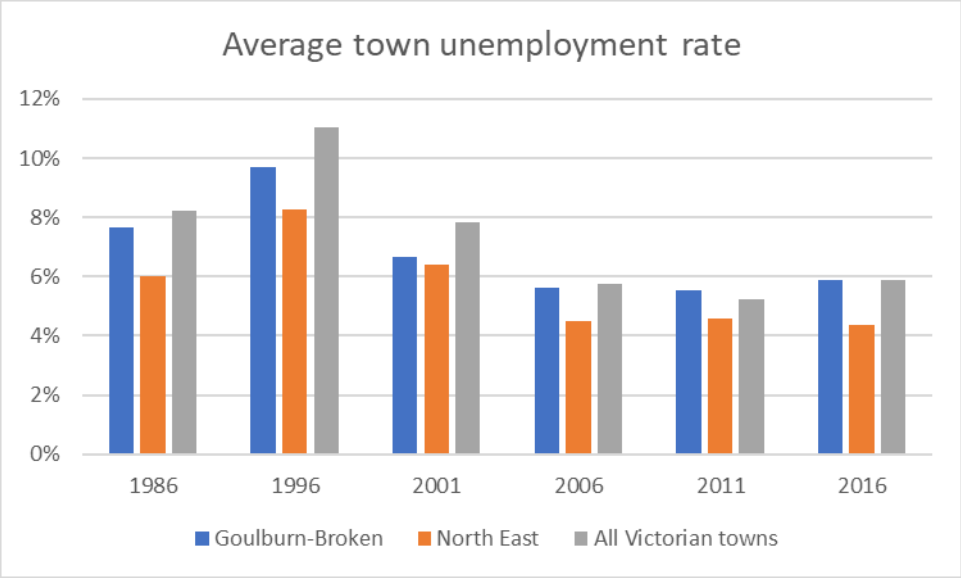


Figure 77 Average unemployment in towns 1986-2016 for Goulburn Broken, North-East and all Victorian regional towns

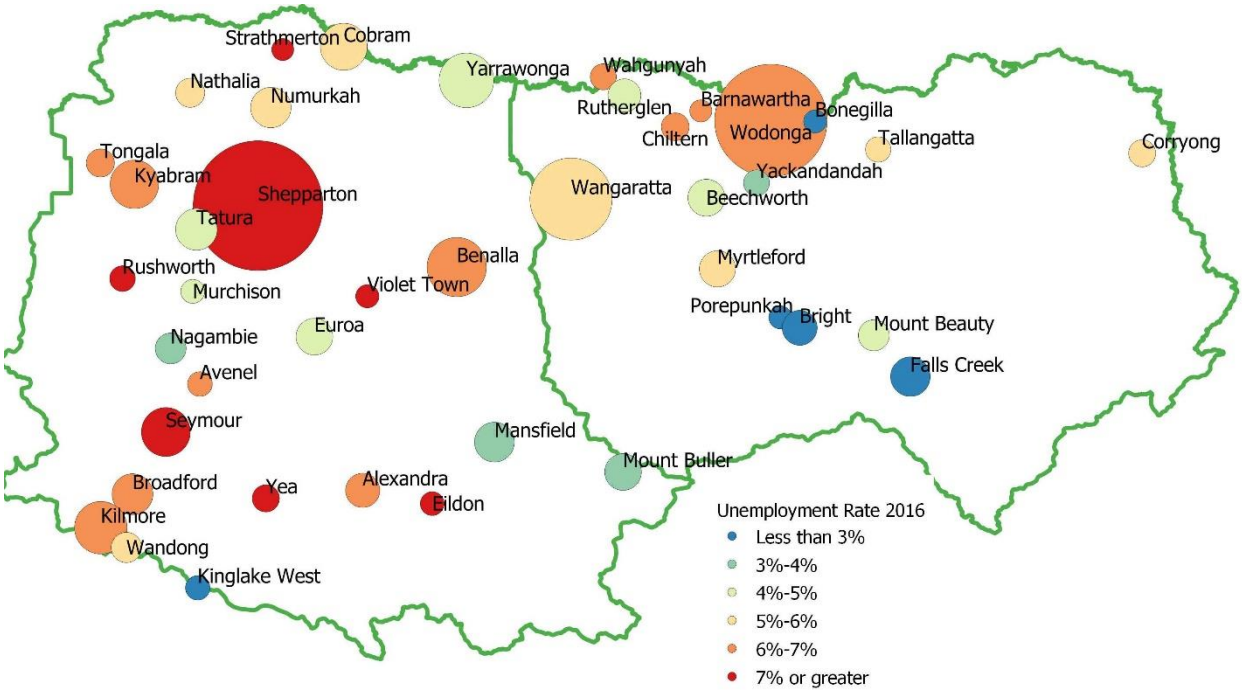


Figure 78 Town unemployment rate 2016

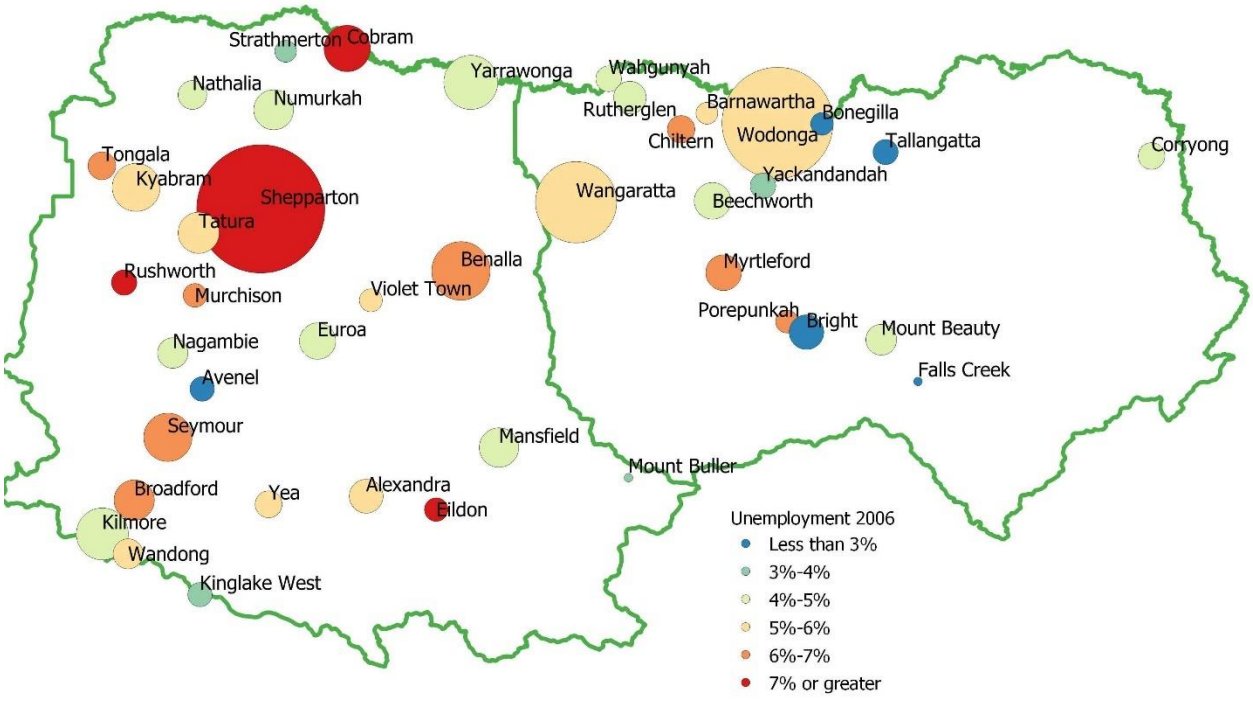


Figure 79 Town unemployment rate 2006

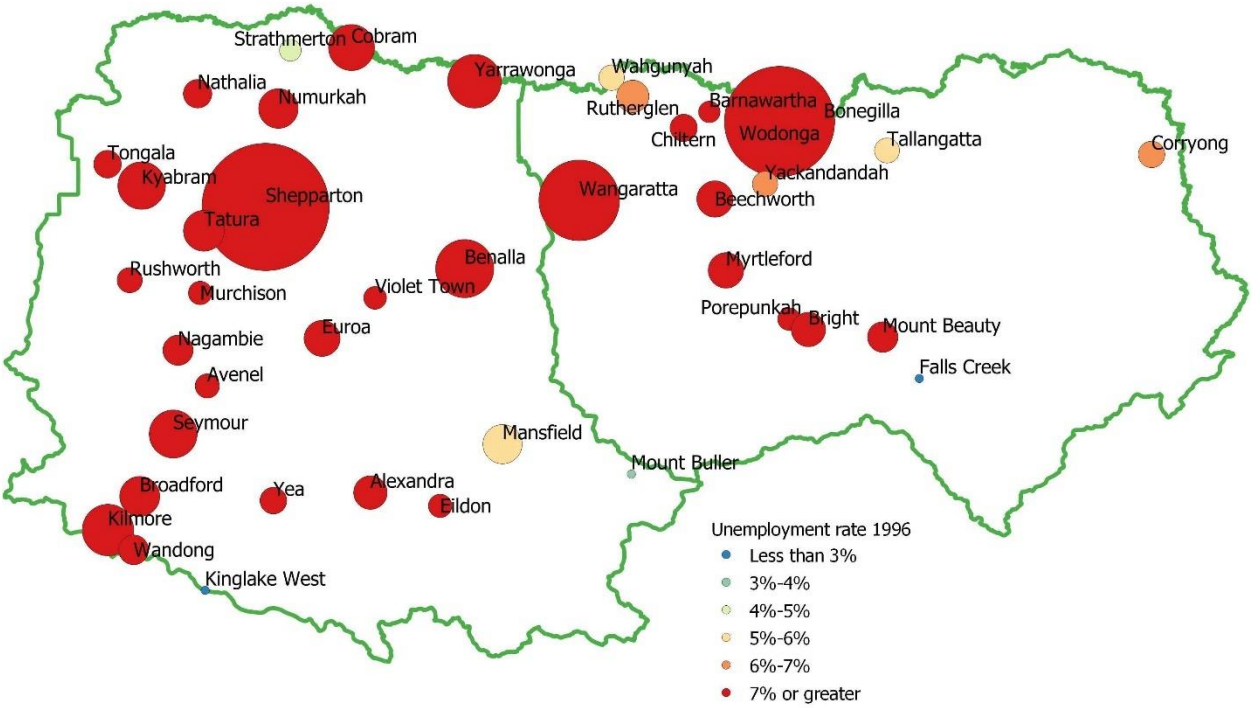


Figure 80 Town unemployment rate 1996

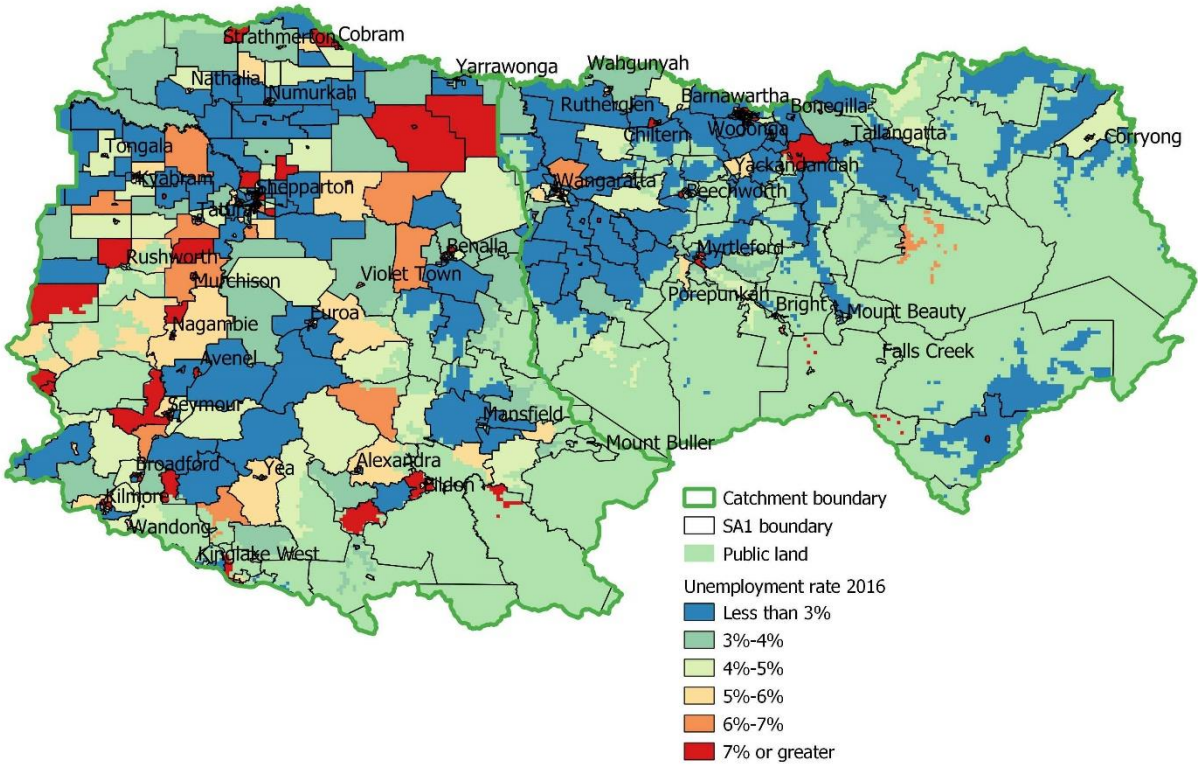


Figure 81 Unemployment rate for SA1s 2016

7.7.3 Industry and Employment

The Towns in Time database presents employment data by 19 industry sectors. To simplify further analysis, we used factor analysis to assist in the aggregation of these categories into 11, based upon the co-location of sectors in towns. For example, transport and wholesaling employment tend to be co-located. Details of this factor analysis can be found in Appendix 3: Industry data reduction using factor analysis on page 174. These 11 sectors are:

- Agriculture
- Construction
- Manufacturing
- Retail
- White collar – IT, Finance, Rental, Real Estate, Professional
- Public Service
- Accommodation, Cafes, Recreation, Arts
- Health and Education
- Distribution services - transport and wholesaling
- Utilities and Mining
- Other

In towns across both catchments the three largest sectors of employment are health, retail and manufacturing.

IMPORTANT TECHNICAL ISSUE: The counts from the Towns in Time Database are according to where people live, not where they work. This may result in what look like unusual results, such as showing accommodation and food employees in dormitory suburbs which do not provide accommodation or food services. This is observed in the Wodonga hinterland region in particular.

The major difference between the two catchments is in public service and agricultural employment in towns. The public service share of employment in the North East is twice that of Goulburn Broken. The agricultural share of employment in the Goulburn Broken is twice that of the North East, though in neither catchment could the share be called large.

Retail, accommodation, cafes arts and recreation, education and agriculture have been highly impacted by COVID-19.

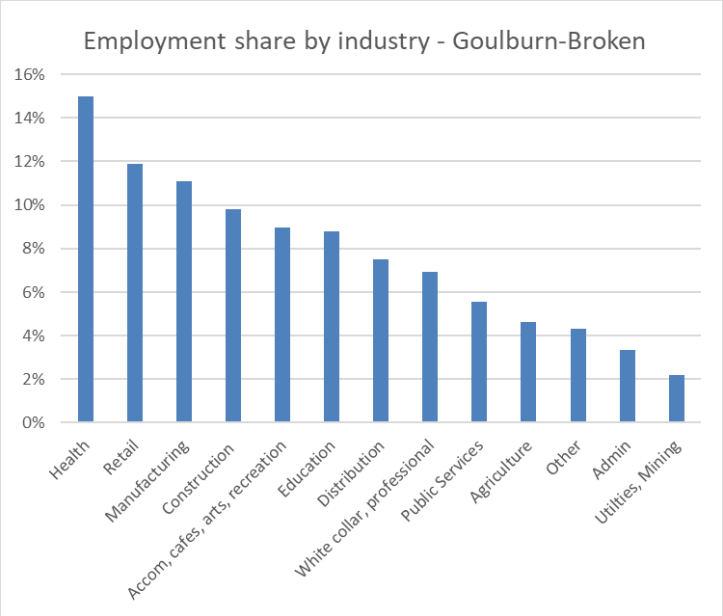


Figure 82 Share of employment in towns with greater than 500 population by selected sectors in 2016 - Goulburn Broken catchment

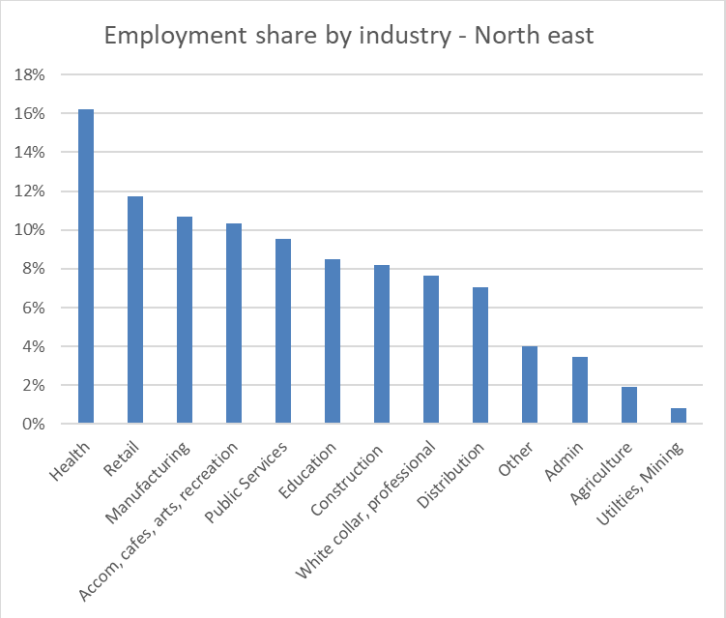


Figure 83 Share of employment in towns with greater than 500 population by selected sectors in 2016 - North East catchment

7.7.3.1 Main industry of employment

We calculated the main industry of employment for each town. This is shown in Figure 84. This is only an indicative statistic. The reader must bear in mind two issues:

- The choice of industry classification combinations will influence the outcome. For example, if education and health had not been combined, they would feature as the largest employer in fewer towns.
- The difference between largest employment sector and next largest can be small. The average share of the largest sector varies across Victoria between 10% and over 30% (Figure 85). Towns with a main industry at close to 10 per cent share of employment will have many similarly sized sectors, and small shifts in the data will change the main industry result.

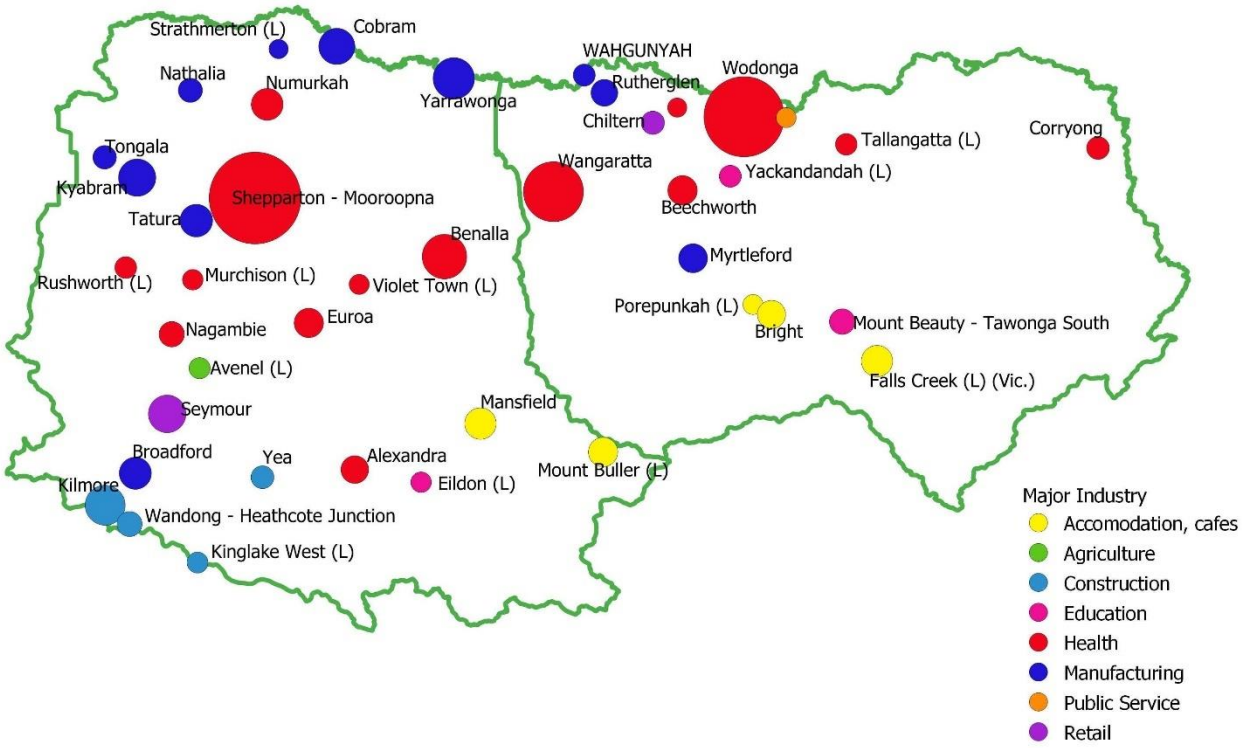


Figure 84 Map of GB and NE major towns showing relative size and major industry 2016

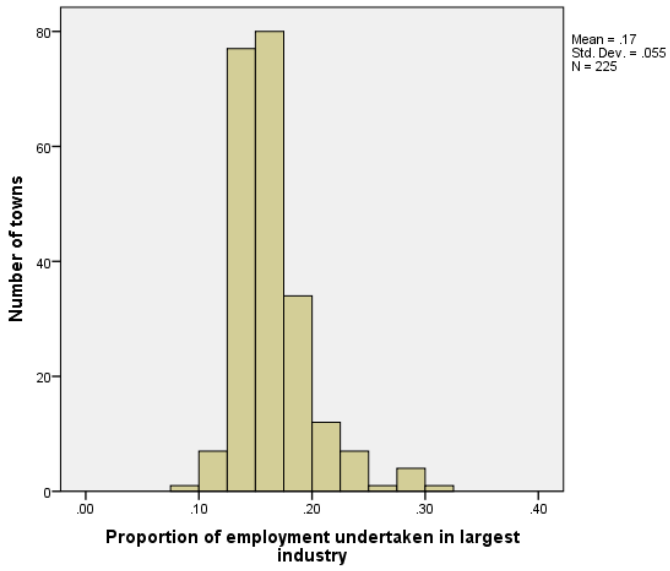


Figure 85 Per cent of employment in main industry - Victorian towns 2016

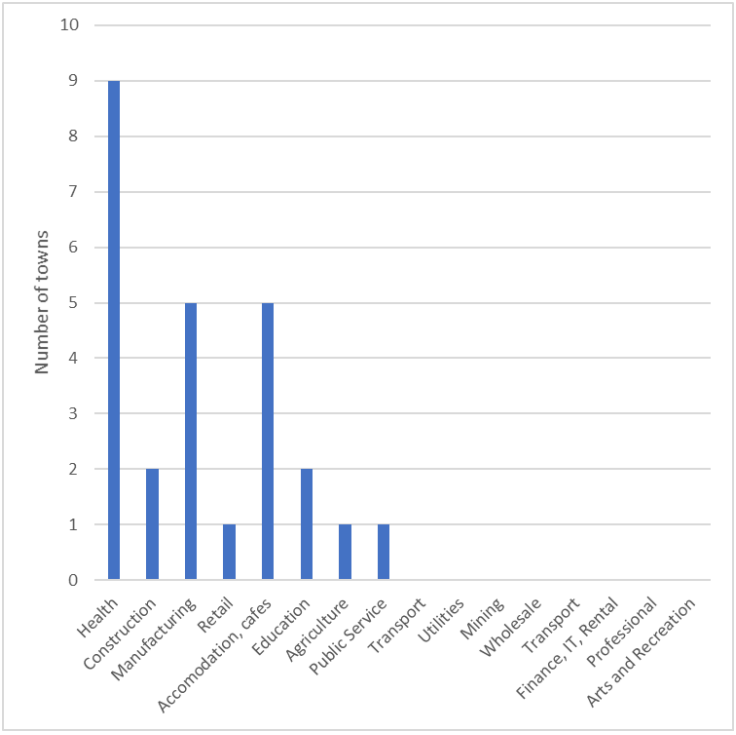


Figure 86 Count of GB and NE towns by main industry of employment in 2016

7.7.3.2 Employment by industry sector

We next mapped the extent of employment in these 8 measures across the two catchments for 2016 data. The purpose of mapping is to detect important clustering of characteristics which may be useful for a classification of towns. The following clustering is apparent to the casual observer:

- Accommodation, cafes, recreation, arts in the mountain south-east.
- Agricultural employment in the area around Euroa and Nagambie.
- Construction in the south west fringes of the Goulburn.
- Manufacturing in the north of the Goulburn catchment.
- Public service employment in the Wodonga region; and
- Utility-mining employment associated with irrigation management and hydro power-generation.

None of these observations should be surprising. These are an indication that a subsequent classification analysis should include these employment variables and omit variables such as retail which show a homogenous spread across the larger towns of the two catchments.

Agriculture, and to a lesser extent education and health, are the main industries of employment in rural SA1s. The only exception are SA1s close to major centres which act as a dormitory, and resort areas where tourism provides employment.

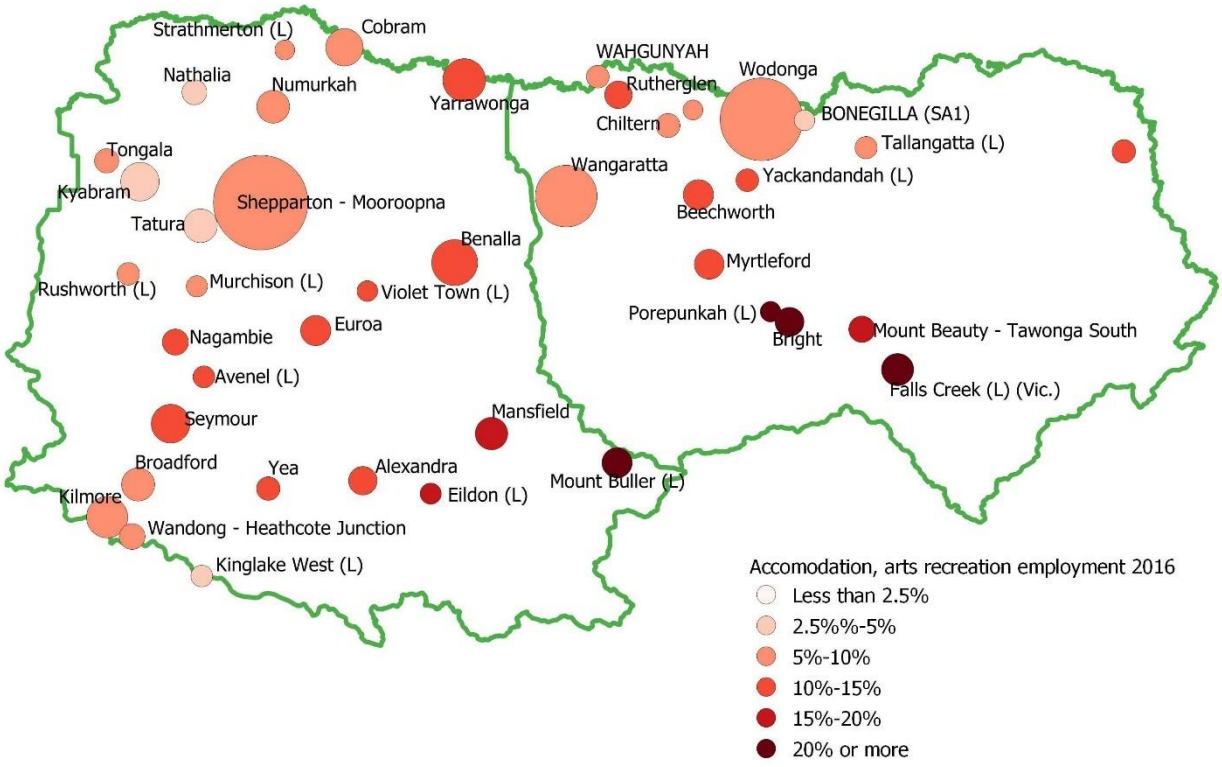


Figure 87 Persons employed in accommodation, cafe, food, art, recreation as a per cent of town workforce 2016

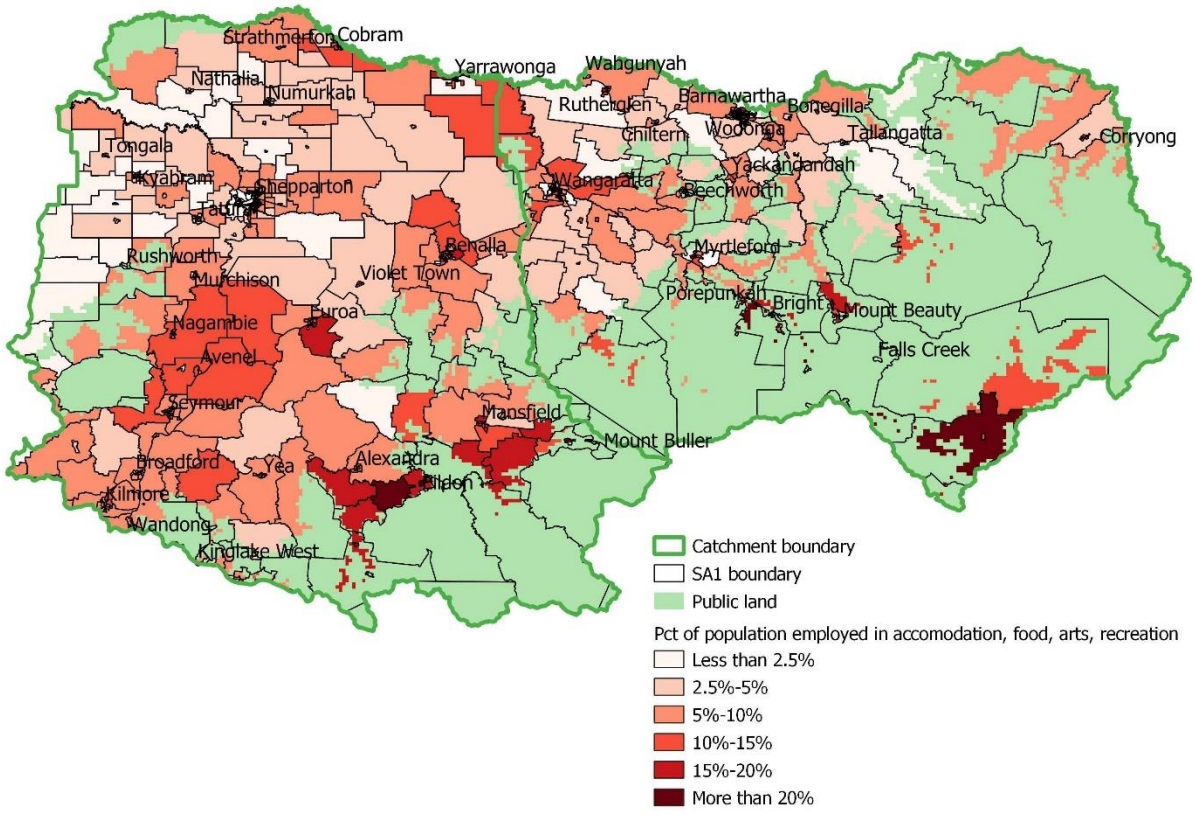


Figure 88 Persons employed in accommodation, cafe, food, art, recreation as a per cent of SA1 workforce 2016

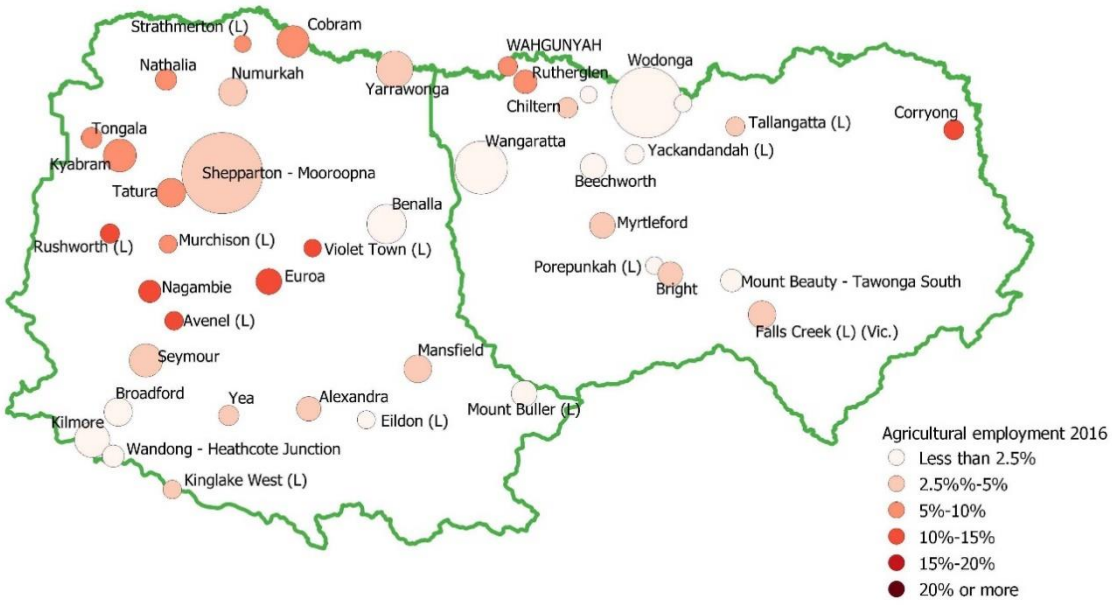


Figure 89 Persons employed in agriculture, fisheries, and forestry as a per cent of town workforce 2016

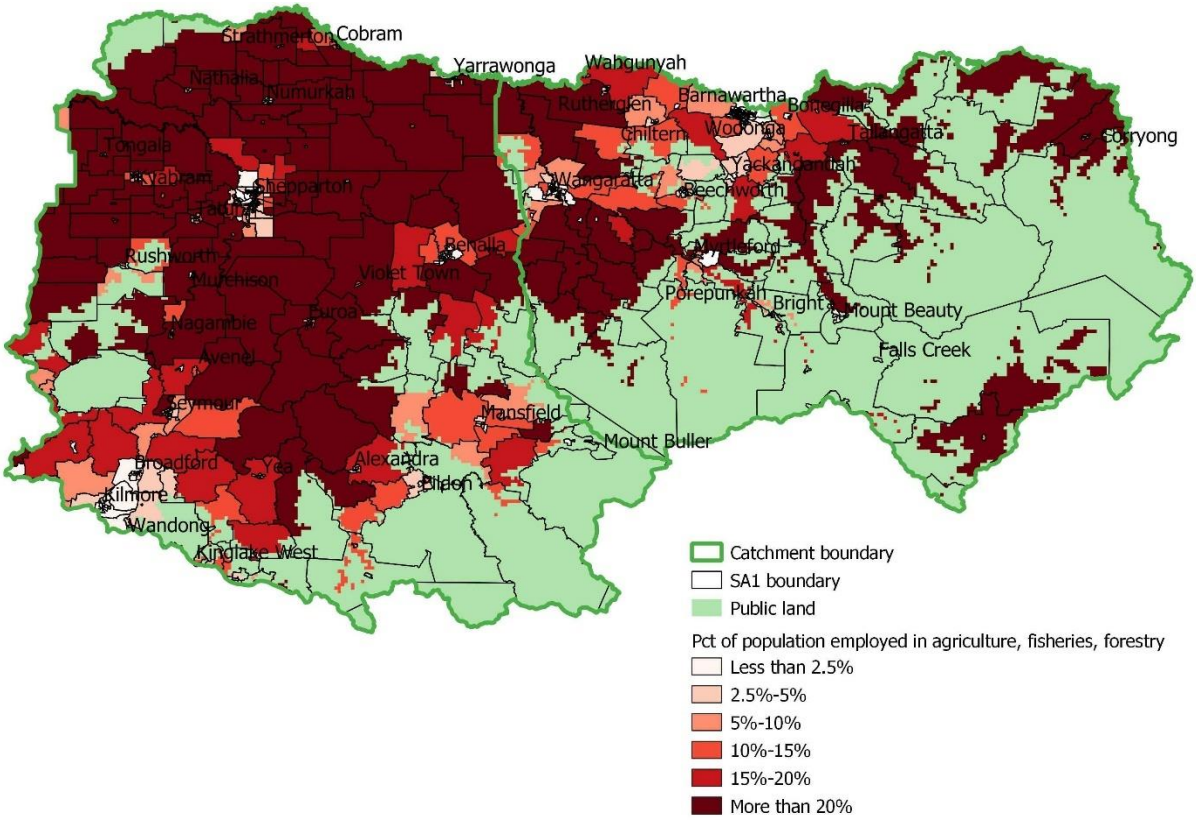


Figure 90 Persons employed in agriculture, fisheries, and forestry as a per cent of SA1 workforce 2016

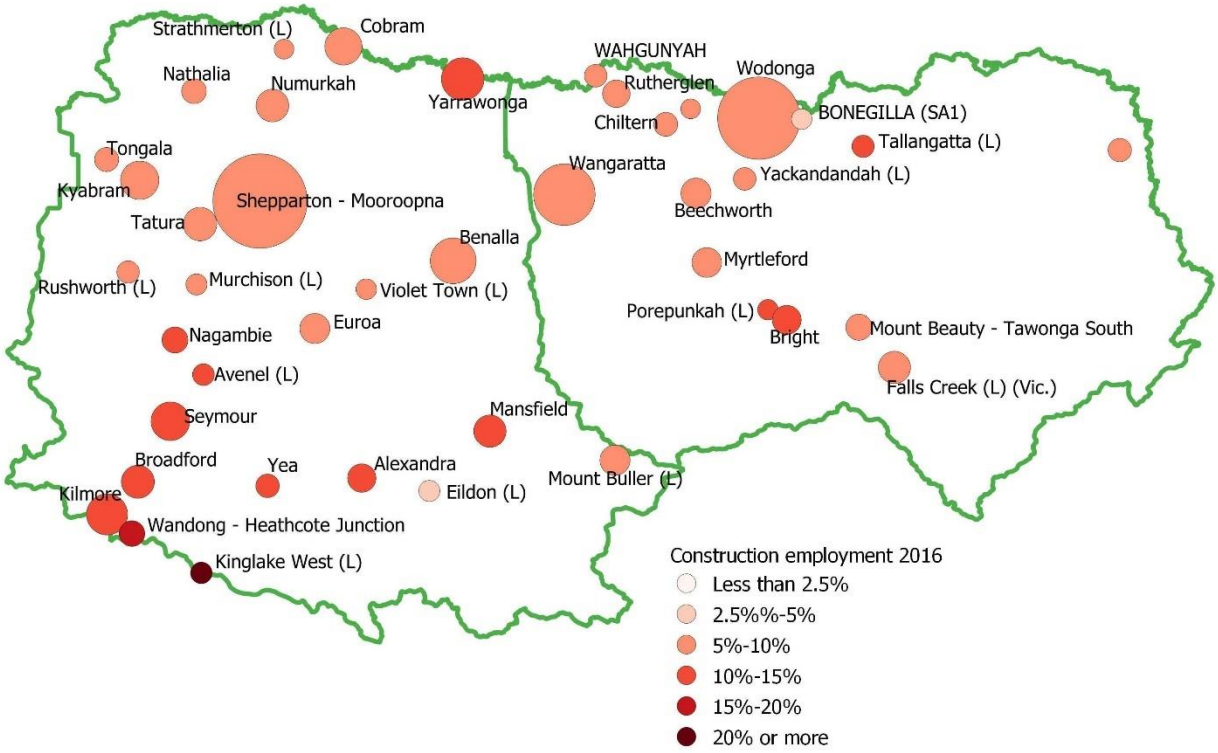


Figure 91 Persons employed in construction as a per cent of town workforce 2016

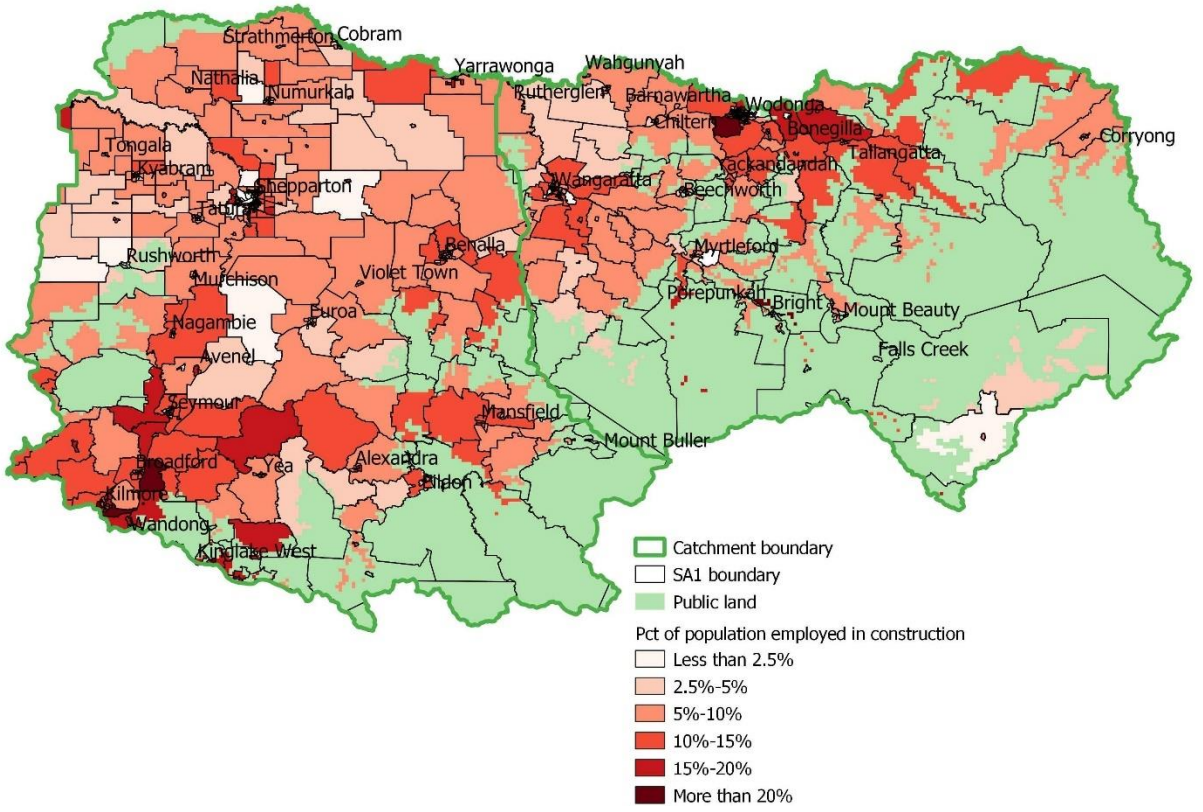


Figure 92 Persons employed in construction as a per cent of SA1 workforce 2016

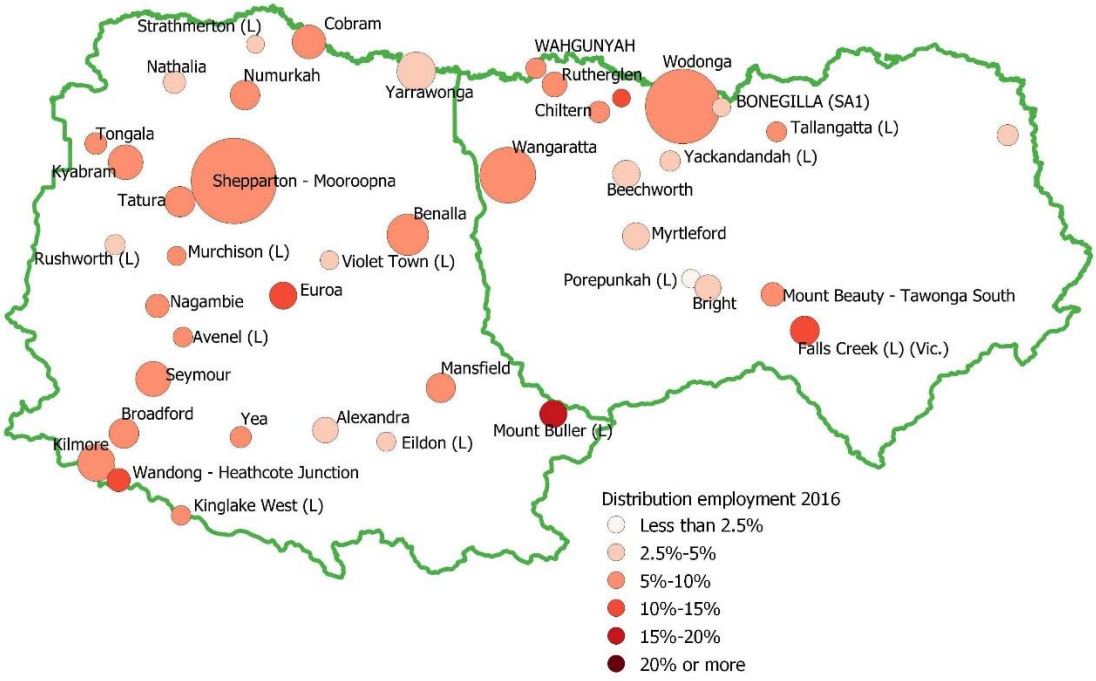


Figure 93 Persons employed in wholesaling, transport as a per cent of town workforce 2016

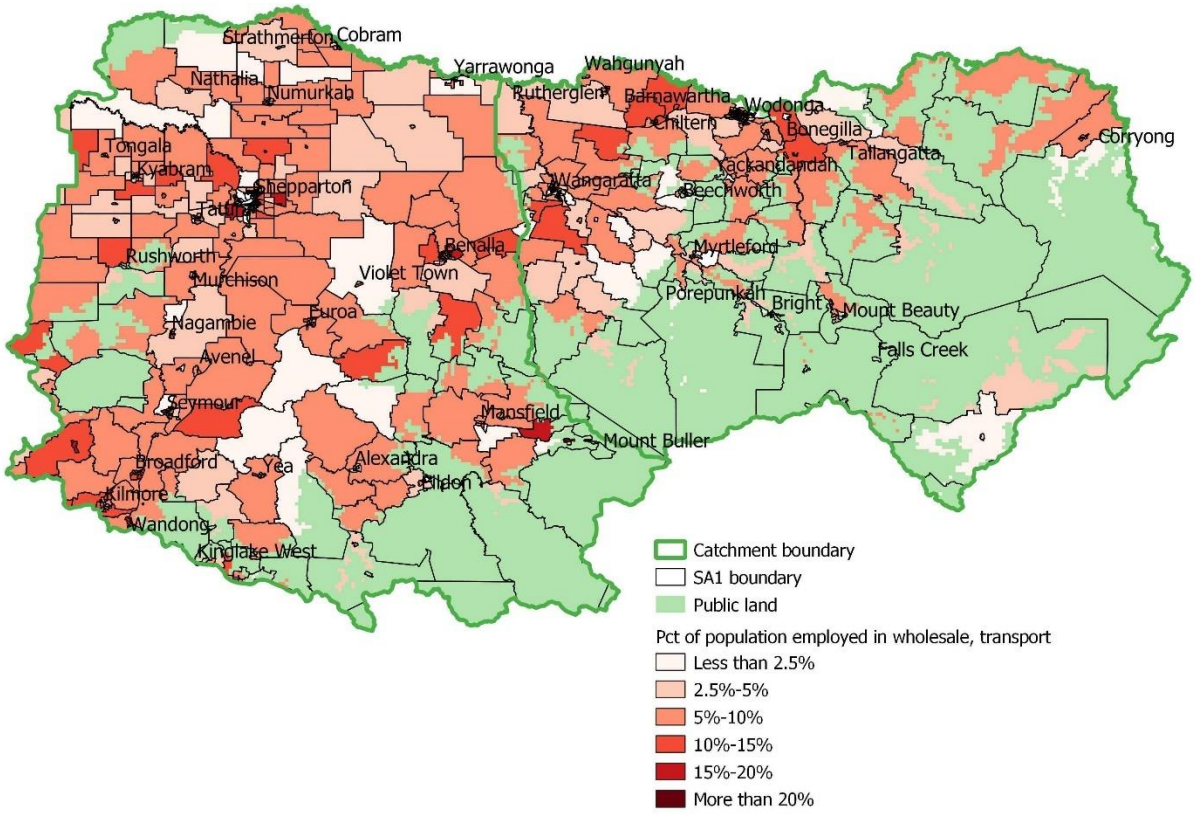


Figure 94 Persons employed in wholesaling, transport as a per cent of SA1 workforce 2016

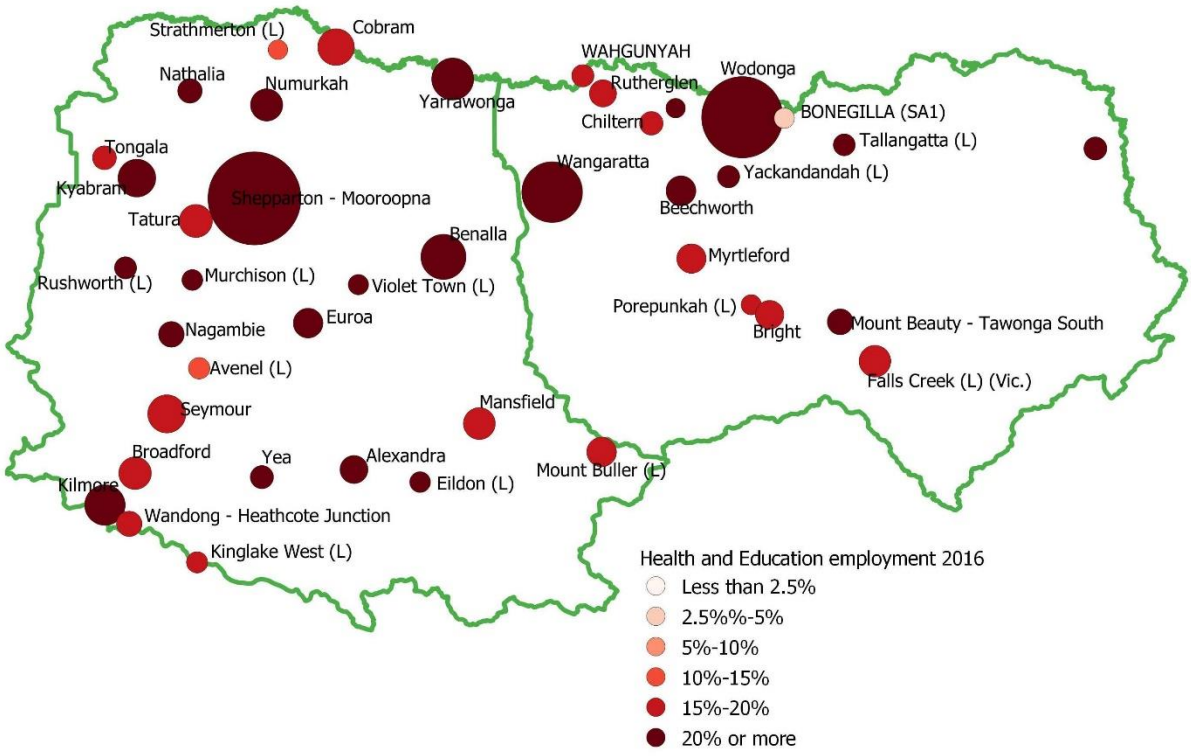


Figure 95 Persons employed in education, health services as a per cent of town workforce 2016

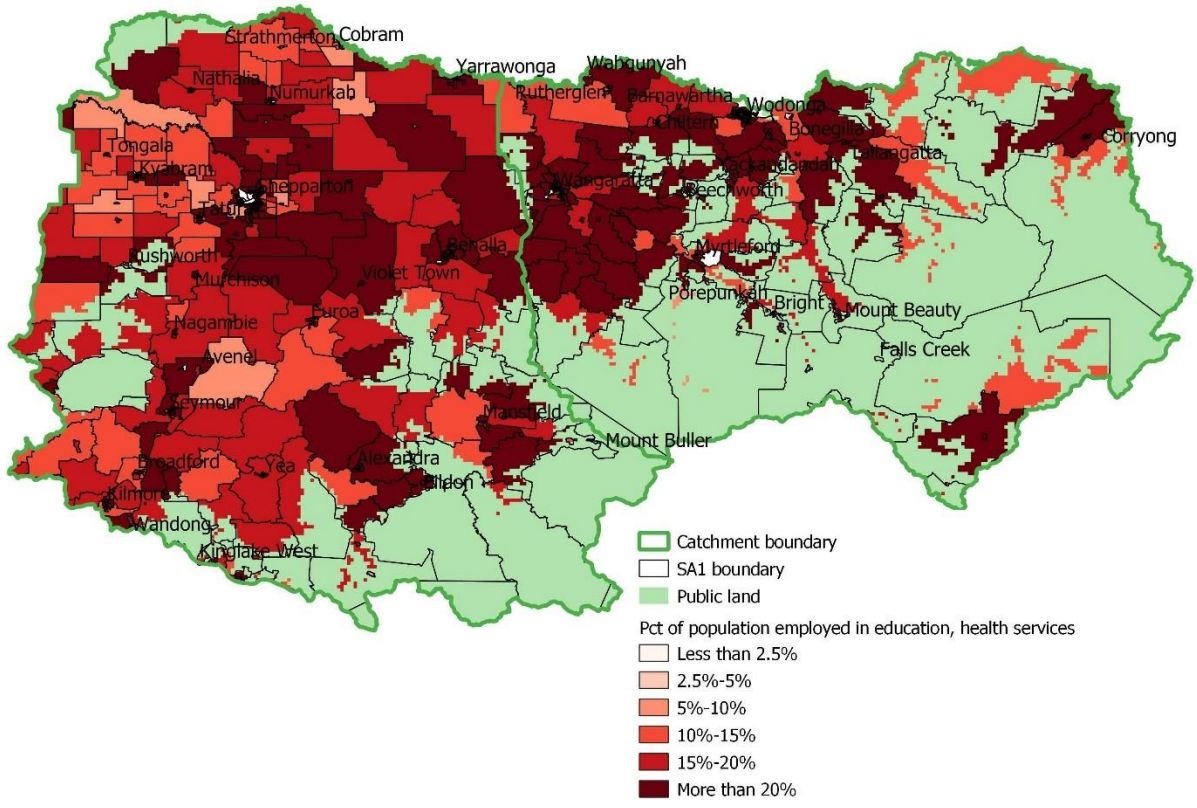


Figure 96 Persons employed in education, health services as a per cent of SA1 workforce 2016

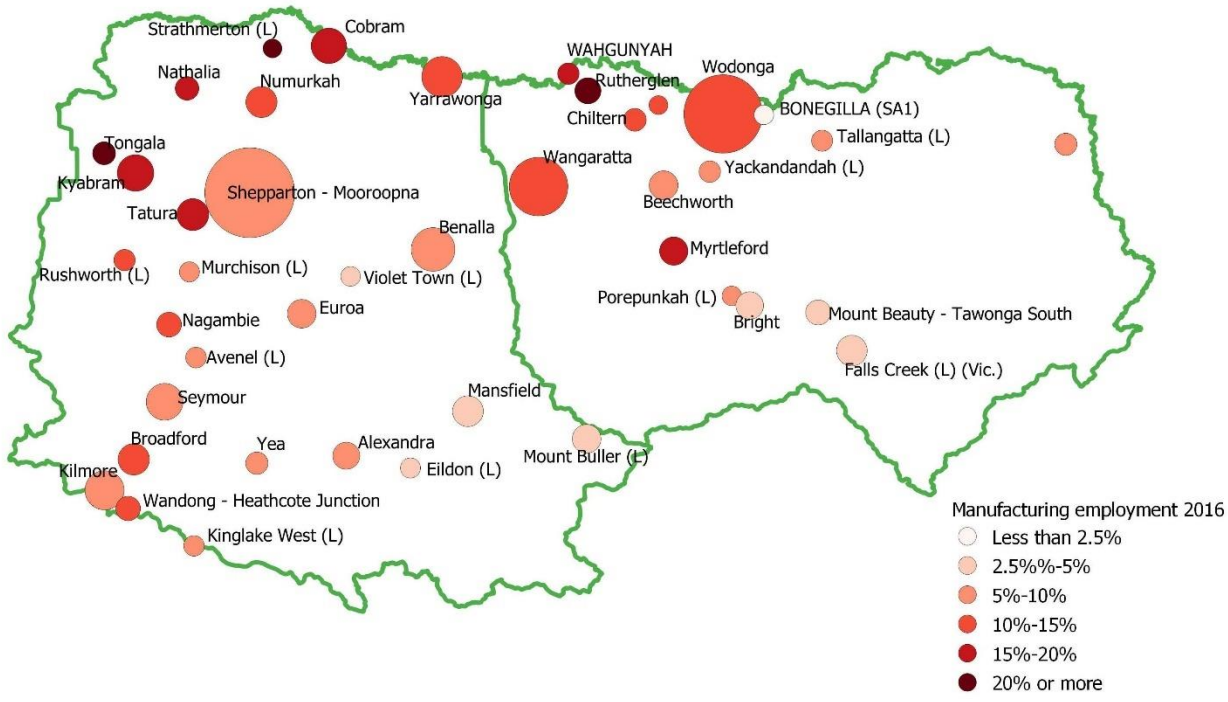


Figure 97 Persons employed in manufacturing as a per cent of town workforce 2016

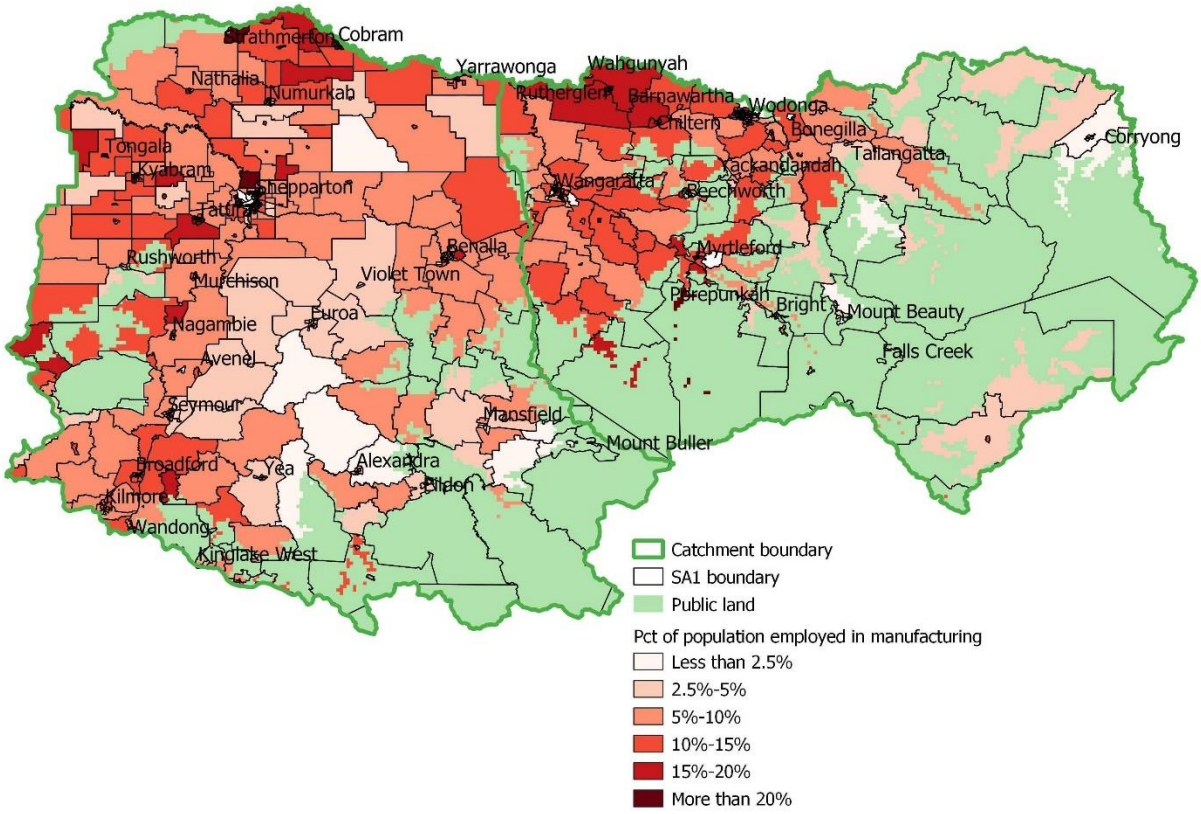


Figure 98 Persons employed in manufacturing as a per cent of SA1 workforce 2016

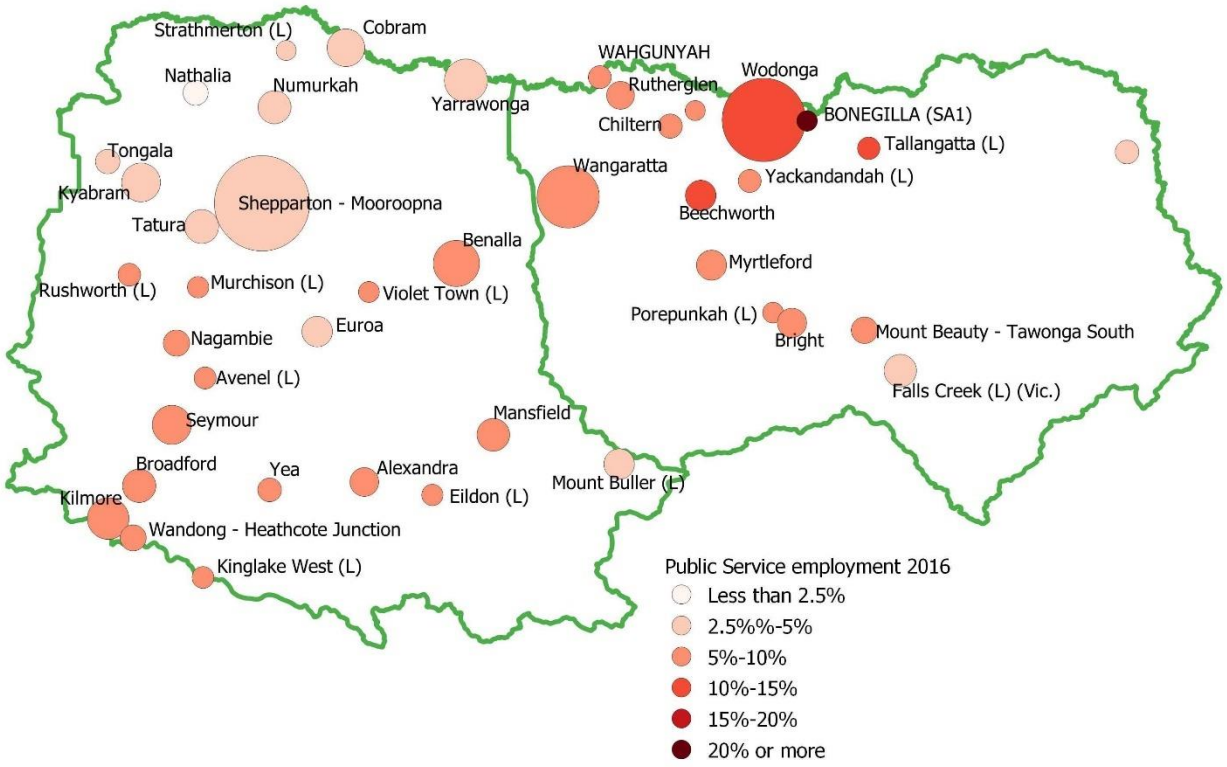


Figure 99 Persons employed in public services as a per cent of town workforce 2016

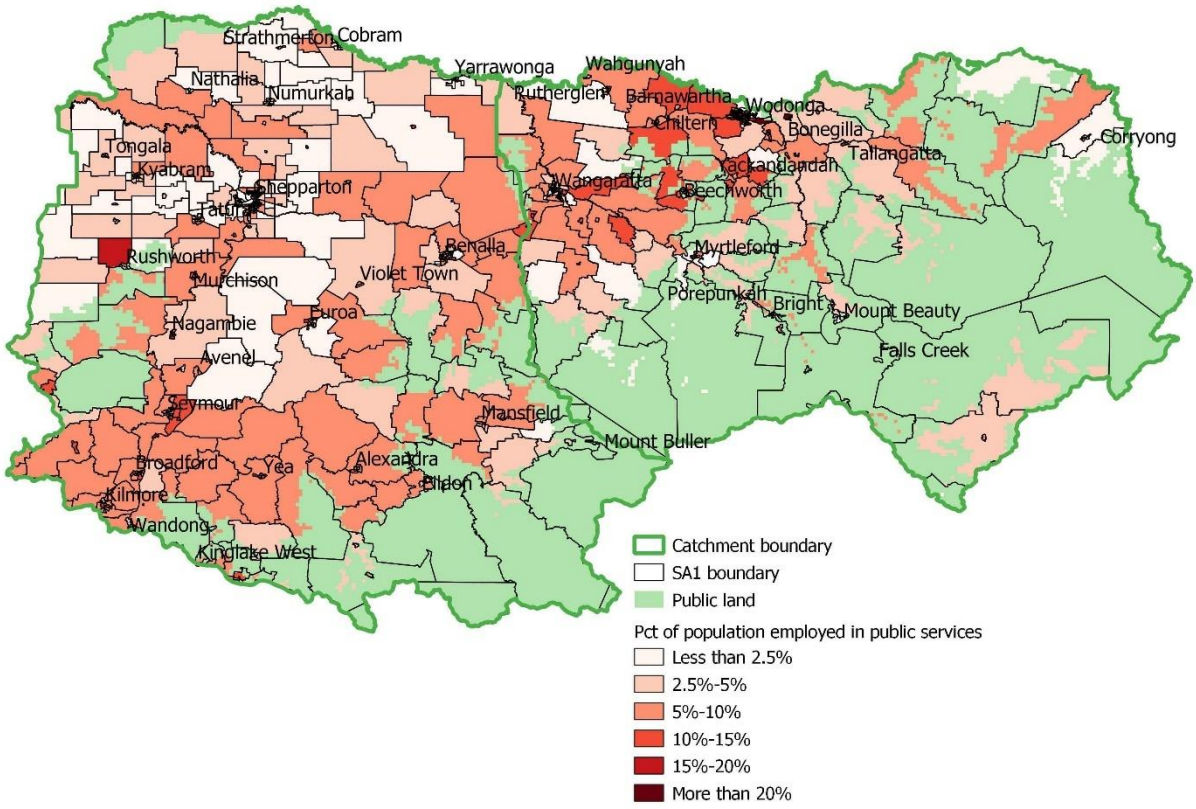


Figure 100 Persons employed in public services as a per cent of SA1 workforce 2016

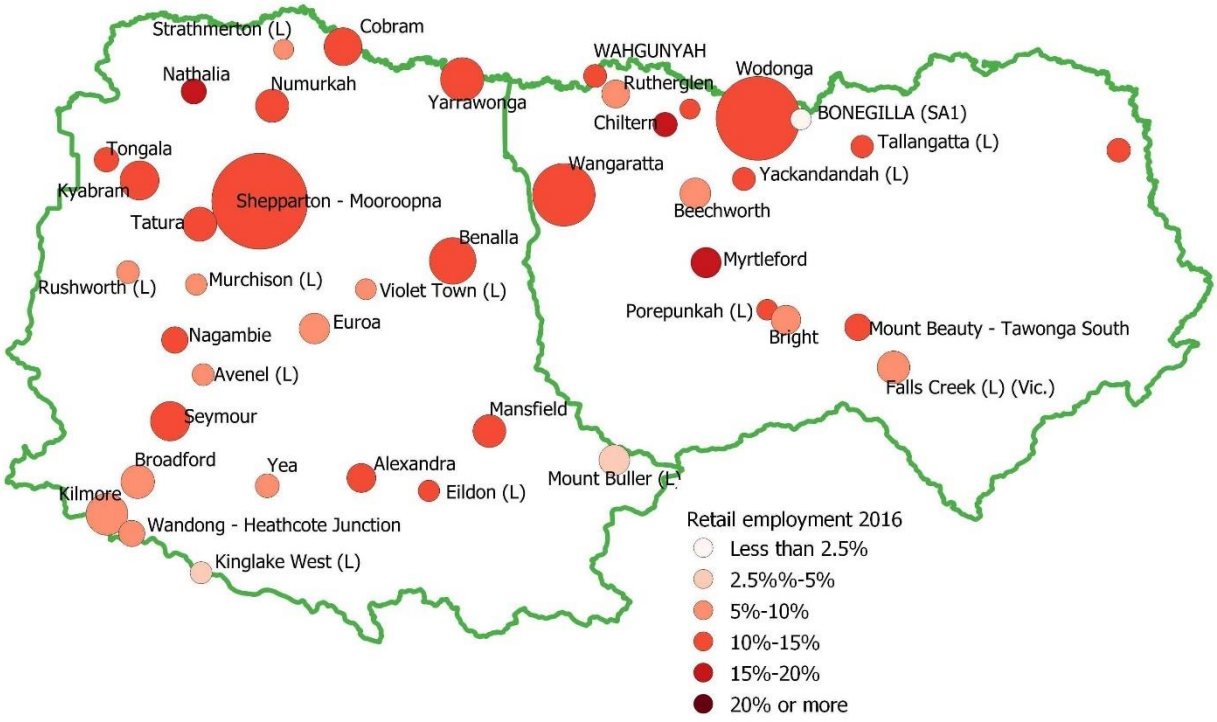


Figure 101 Persons employed in retail as a per cent of town workforce 2016

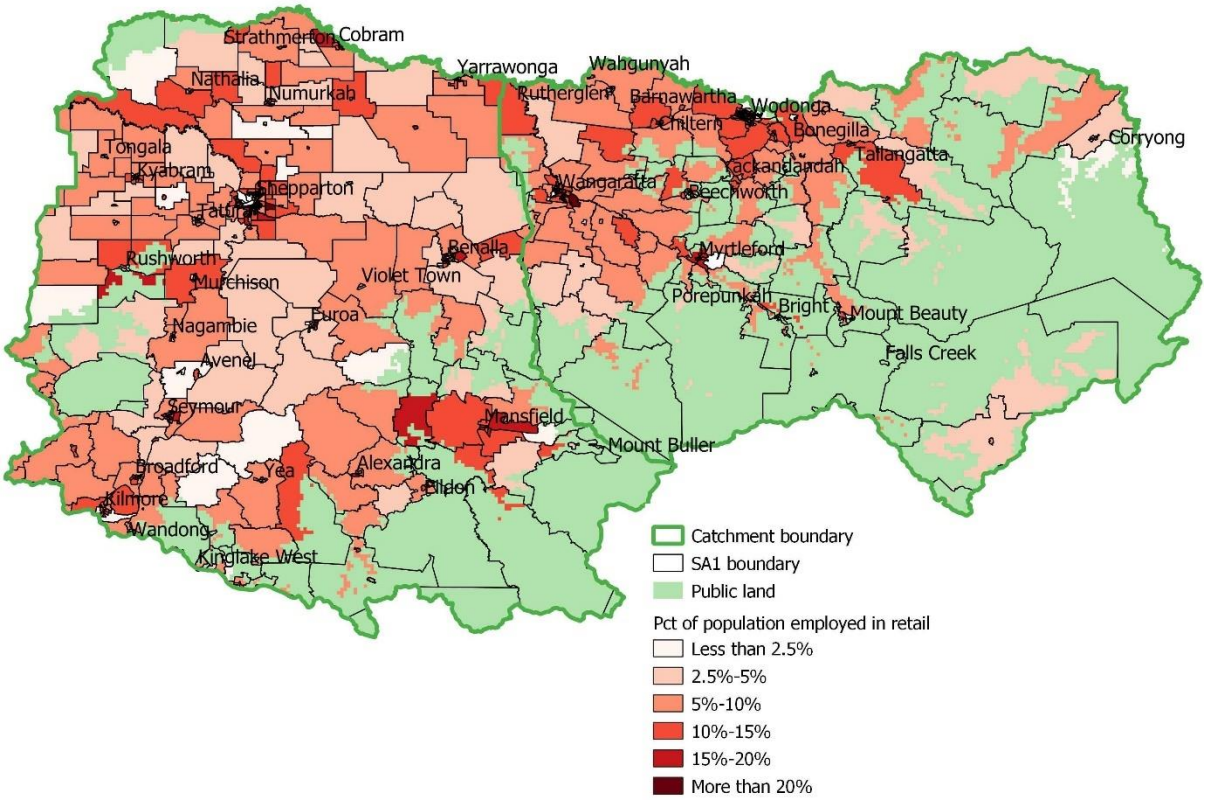


Figure 102 Persons employed in retail as a per cent of SA1 workforce 2016

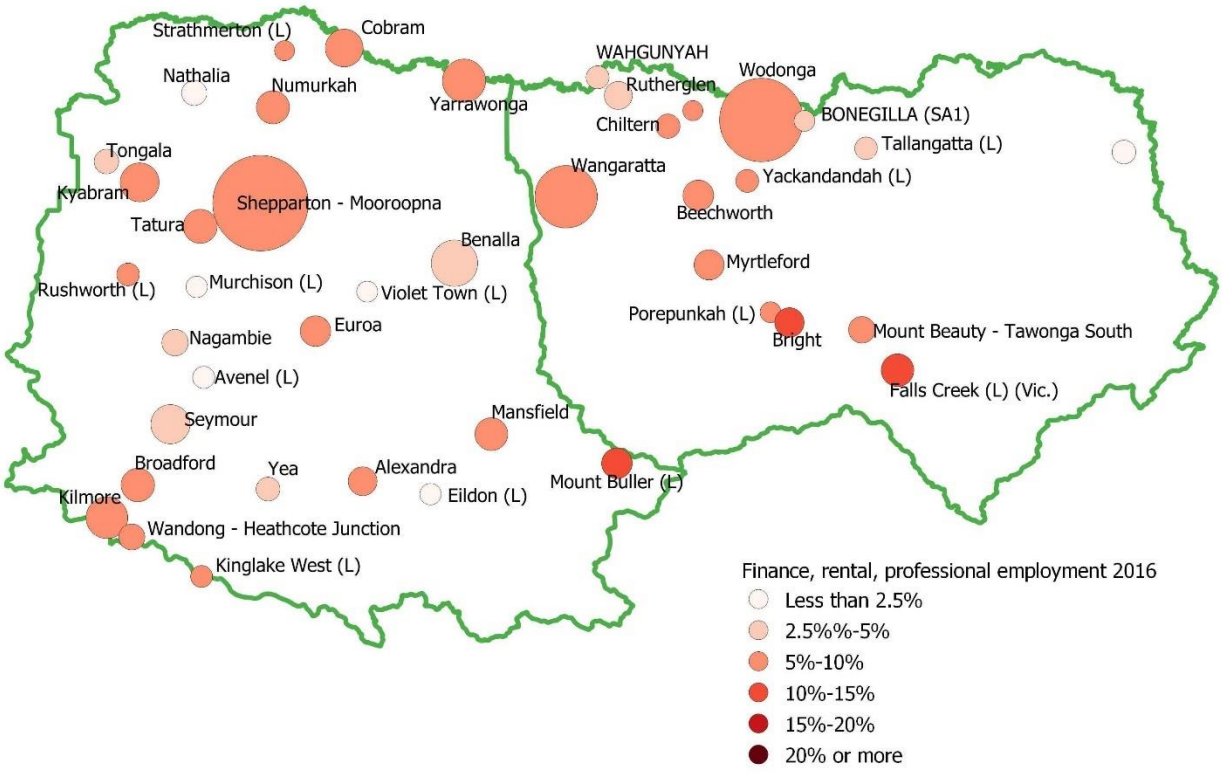


Figure 103 Persons employed in business services as a per cent of town workforce 2016

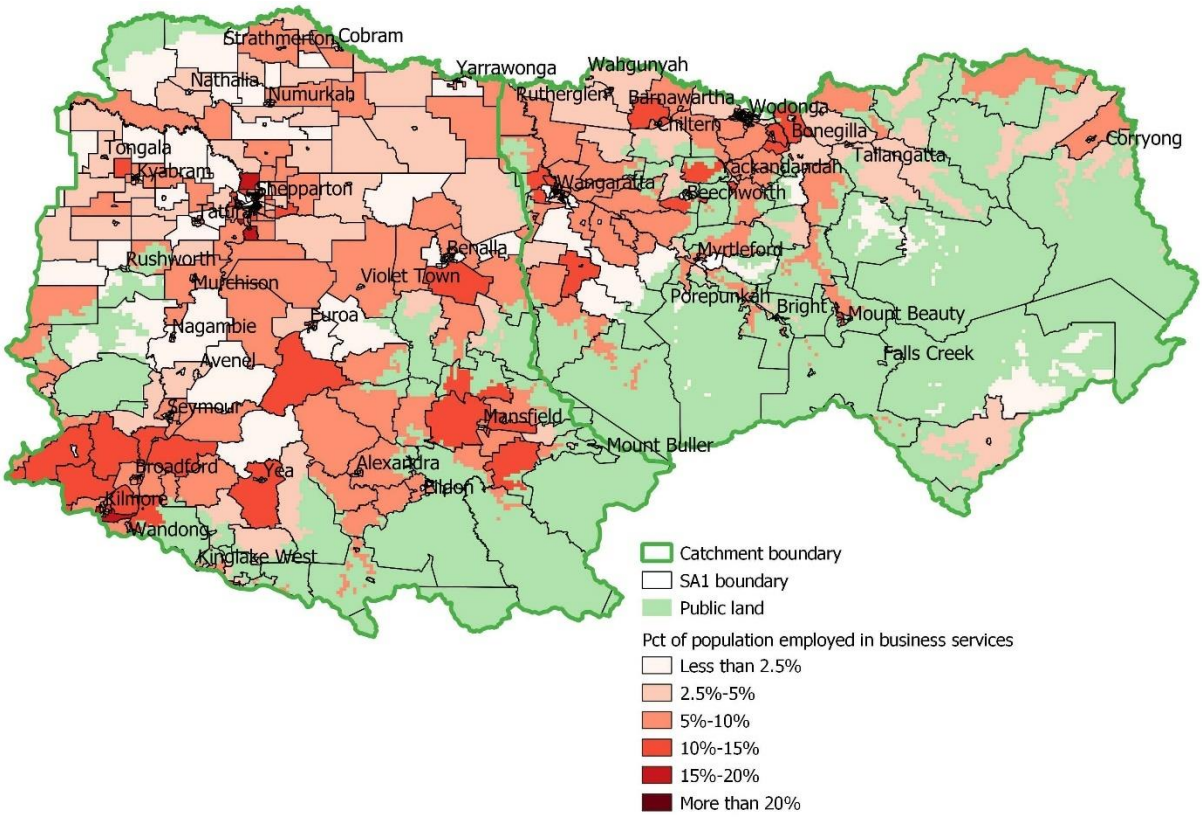


Figure 104 Persons employed in business services as a per cent of SA1 workforce 2016

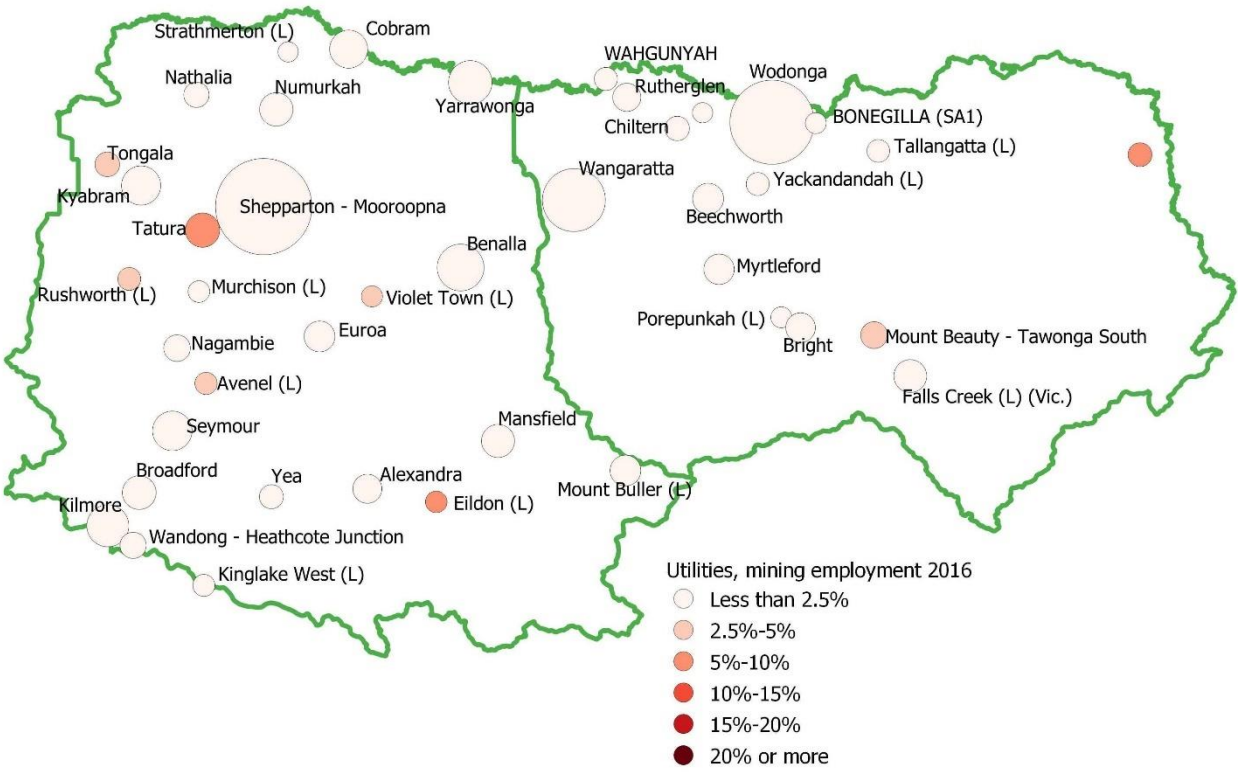


Figure 105 Map of utilities, mining employment 2016

7.7.4 Changes in industry of employment over time.

Industry of employment data for individual towns can be noisy. Overall trends are best observed first at a catchment level.

The period from 1986 there have been three distinct periods of economic change, each with growth in employment despite its own unique employment shock in a at least one industry.

- 1986-2001 - A fifteen-year period with modest growth in employment. The major employment shock during this period was a sharp decline in public sector employment and publicly owned utilities. In each catchment this was equivalent to 5 per cent of total employment in 1986. This fall was matched by a rise in employment in other sectors including manufacturing, retail, accommodation, white collar, and health industries. Those who worked through this era will quickly associate these observations with the implementation of a “smaller government” ideology that was sweeping the English-speaking world.
- 2001-2006 – a more rapid rise in employment, despite a decline in white collar employment.
- 2006-2016 – the period of the mining construction boom, a high Australian dollar and resulting competition difficulties for manufacturing. During this period manufacturing employment in each catchment fell by over 3 per cent of total employment in 2006. These changes resulted in a striking shift in the employment share of manufacturing and health-education.
- The available data ends in 2016. The country is clearly experiencing an economic shock in 2020 that dwarfs any evident in the data between 1986 and 2016. The extent of this at the catchment level will become available in census data likely to be released in early 2022.

There are some sectors of employment that have provided consistent employment growth over the period covered by the data. These are accommodation-cafes-arts-recreation, education, and particularly health care.

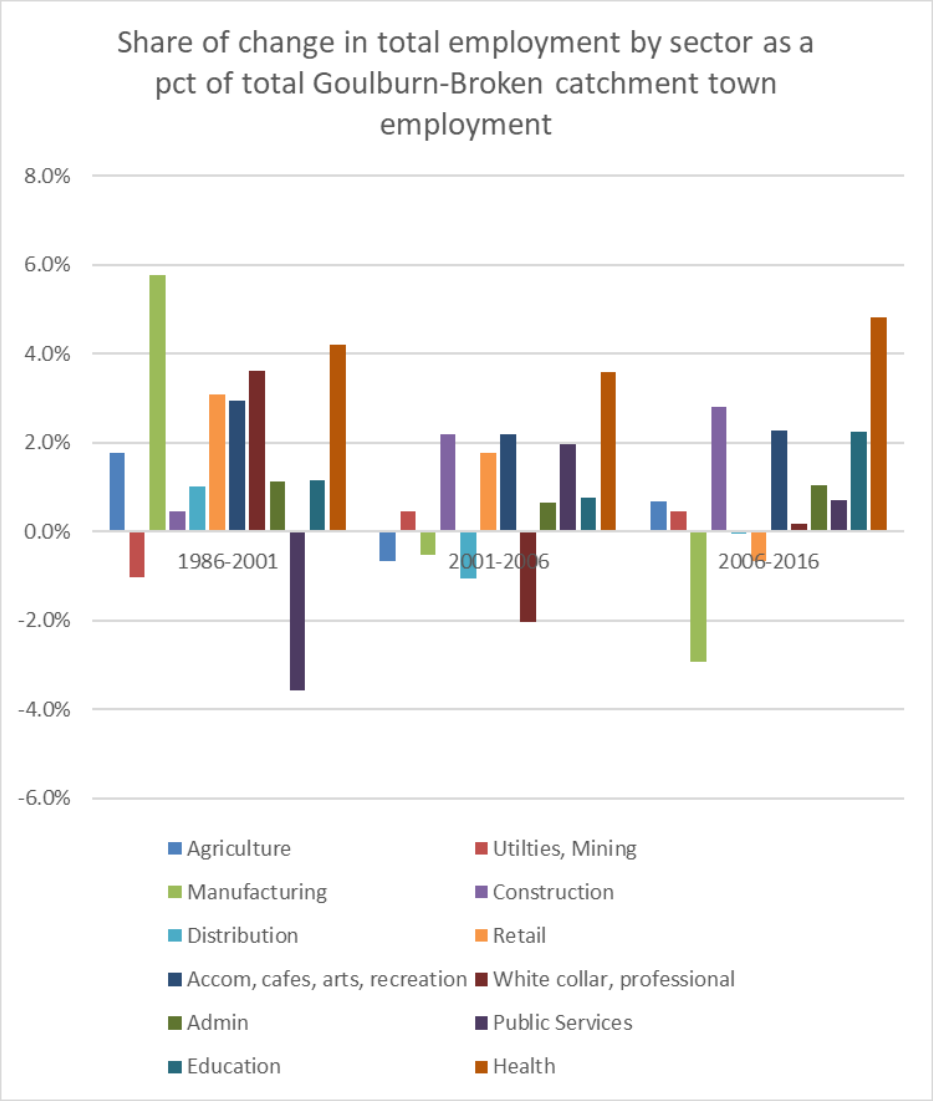


Figure 106 Change in employment in selected industries as a per cent of total employment in catchment for selected time period - Goulburn Broken catchment

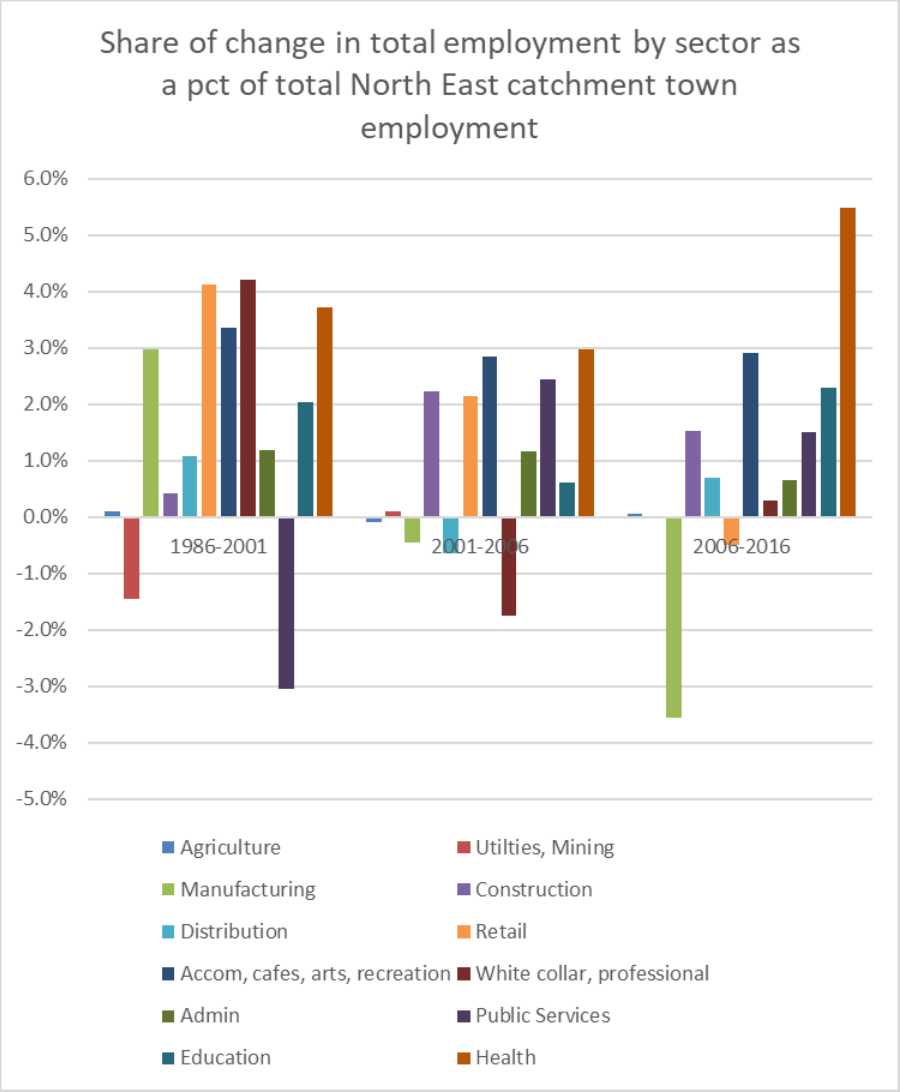


Figure 107 Change in employment in selected industries as a per cent of total employment in catchment for selected time period - North East Catchment

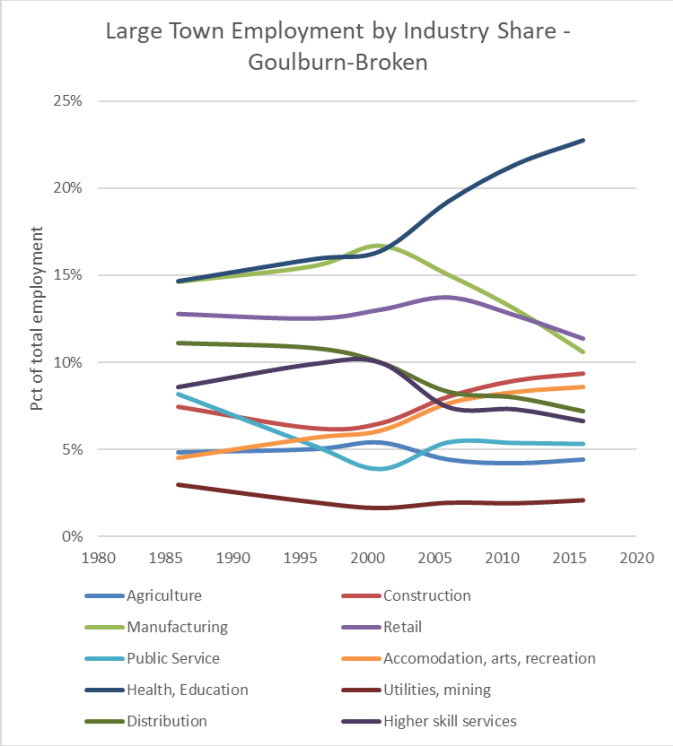


Figure 108 Industry employment share in larger towns, 1986-2016 Goulburn Broken

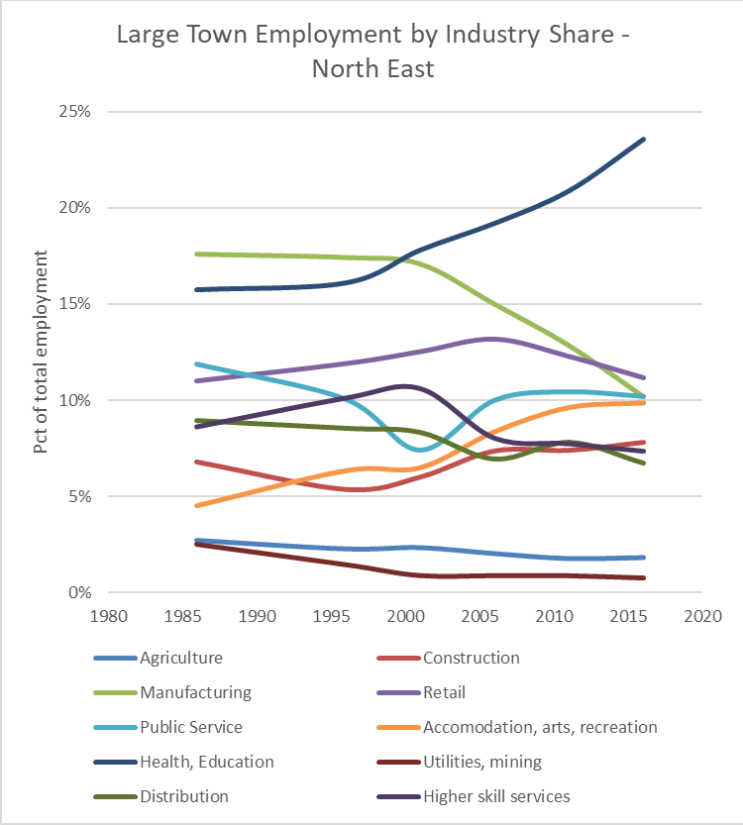


Figure 109 Industry employment share in larger towns, 1986-2016 North East

7.7.5 The geography of employment change

One might think that the manufacturing decline is mainly associated with employment in milk processing employment because of reduced milk production and intense international competition

in the dairy industry. However, the map of manufacturing industry employment change portrays a generally homogenous shift in manufacturing employment across the two catchments. It is certainly not associated with just changes in dairy manufacturing. These changes are part of a nation-wide trend towards employment in services and away from manufacturing.

The shift to a services-based economy is associated with a concentration of higher skill and higher remuneration employment in larger cities and towns. This is most obvious in the growth of employment opportunities withing 10 kilometres of the centre of Melbourne. In rural and provincial Victoria, the main impact is the growth of employment in health and education occurring mainly in the larger centres – Wodonga, Shepparton, Wangaratta and Benalla.

The growth in accommodation, café, arts and recreation employment is geographically heterogenous. Three aspects merit noting:

- The traditional recreation industry towns associated with the snow fields have not seen a meaningful increase in the share of employment for this sector.
- Some increases in share for this sector are associated with increased travel along the Hume corridor.
- Small rural towns in the mid Goulburn catchment show an increased employment share for this industry group. Towns such as Rushworth, Violet Town and Murchison are not generally perceived as either destination towns, nor as overnighting towns for travelers. Perhaps what we are seeing here is an example of the Richard Florida thesis that regeneration driven by recreation and culture is attracted to towns and cities where land is relatively inexpensive. In the North East we can see the same trends in towns including Yackandandah, Myrtleford and Barnawartha.

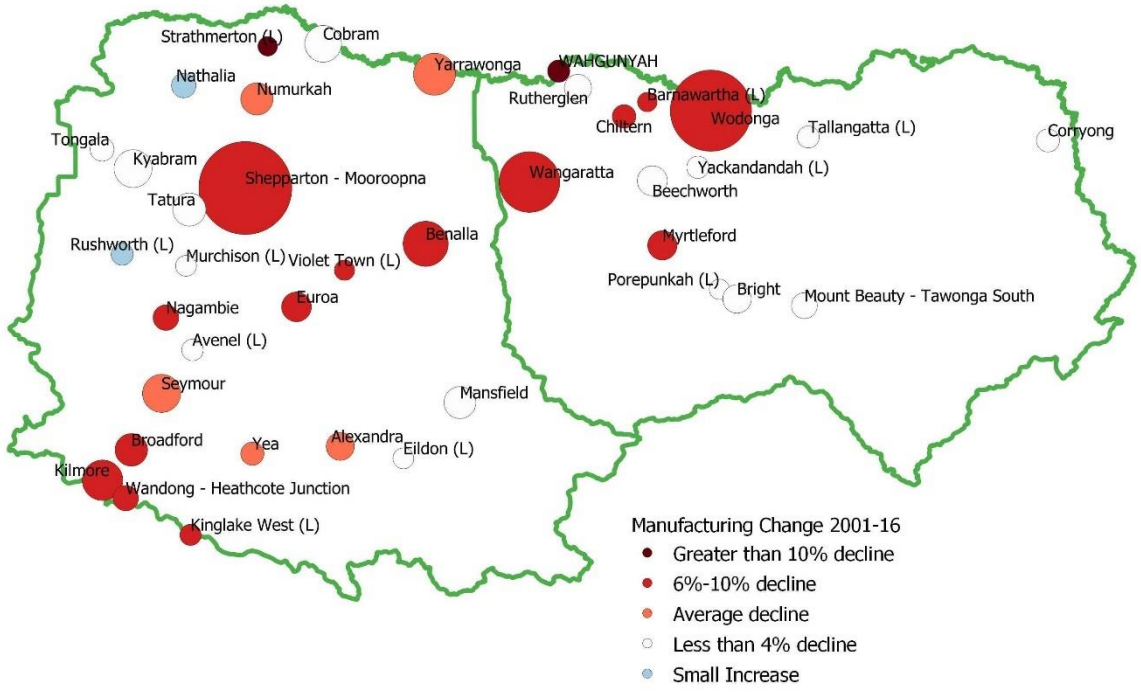


Figure 110 Change in manufacturing share of employment by larger town 2001-2016

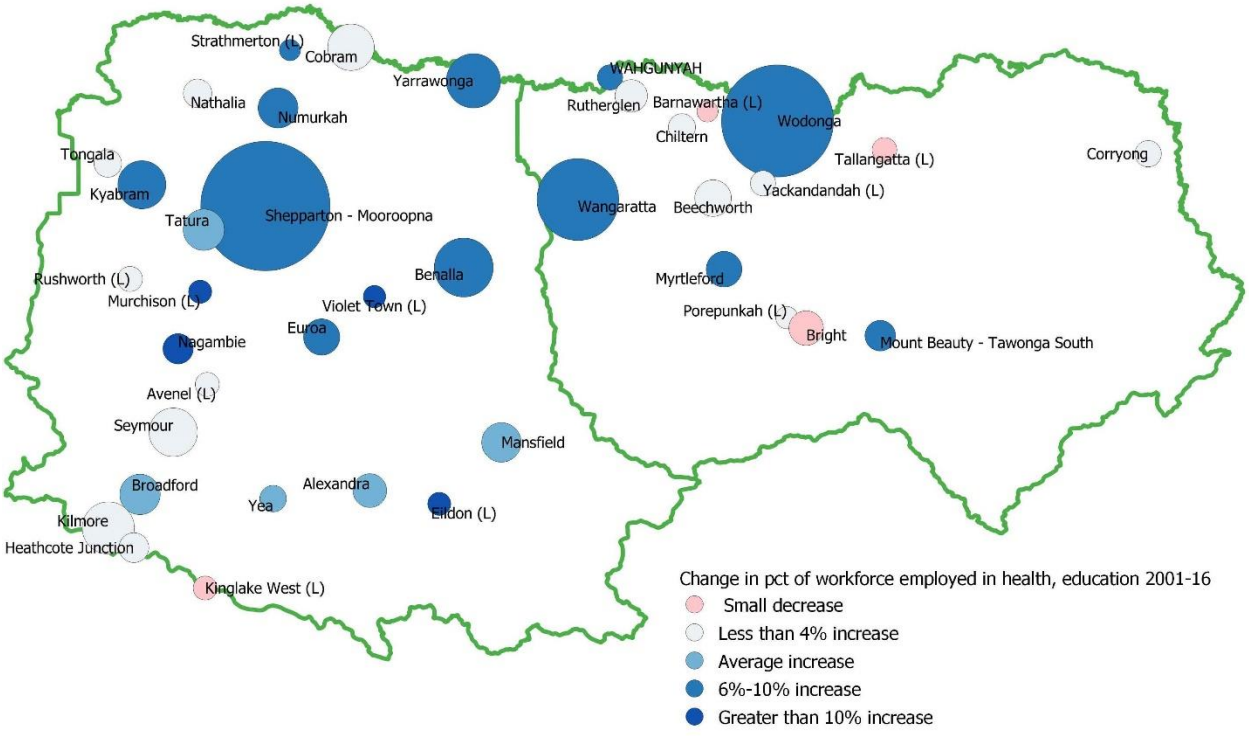


Figure 111 Change in health, education share of employment by larger town 2001-2016

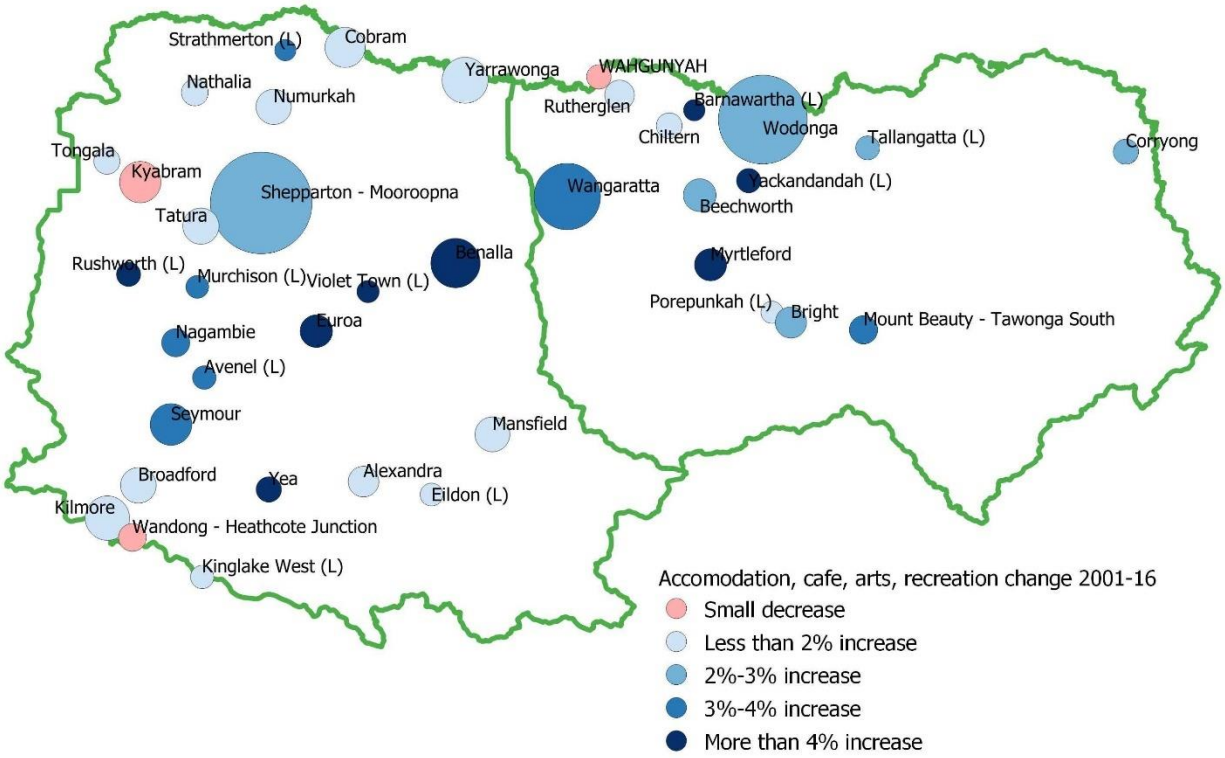


Figure 112 Change in accommodation, café, arts, recreation share of employment by larger town 2001-2016

7.8 DIVERSITY

7.8.1 Diversity - Gender

Gender data is drawn from the Census of Population and Housing, which provides a binary choice option for gender identification – male or female. We acknowledge that these two options do not fully account with the self-identified genders that may be in the community. Unlike many other census questions, the ABS does not provide a code for "No Response" so we do not have even this as a guide to whether respondents would have preferred to opt out of the two available options.

The gender ratio in ABS statistics (expressed as males as a per cent females and limited to binary gender designations) shows a greater proportion of women than men in most towns.

The ratio is most unbalanced towards women in the towns of Wangaratta and Benalla, and in the smaller towns of Beechworth and Yackandandah. In the former two towns this may be a result of community structural ageing and the choice of these towns as a later life home. The latter two towns this may reflect cultural migration preferences. To make sense of this one would need to investigate the gender balance amongst older age groups.

In rural areas the gender mismatch is less pronounced.

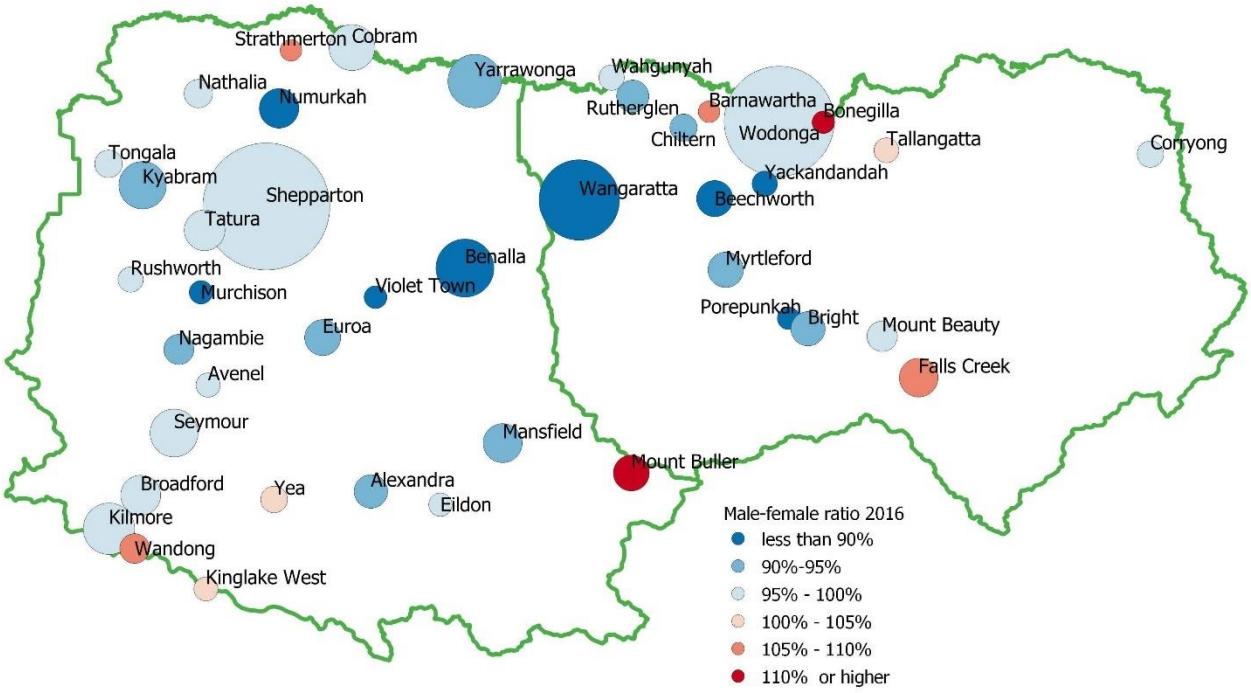


Figure 113 Male to female ratio 2016

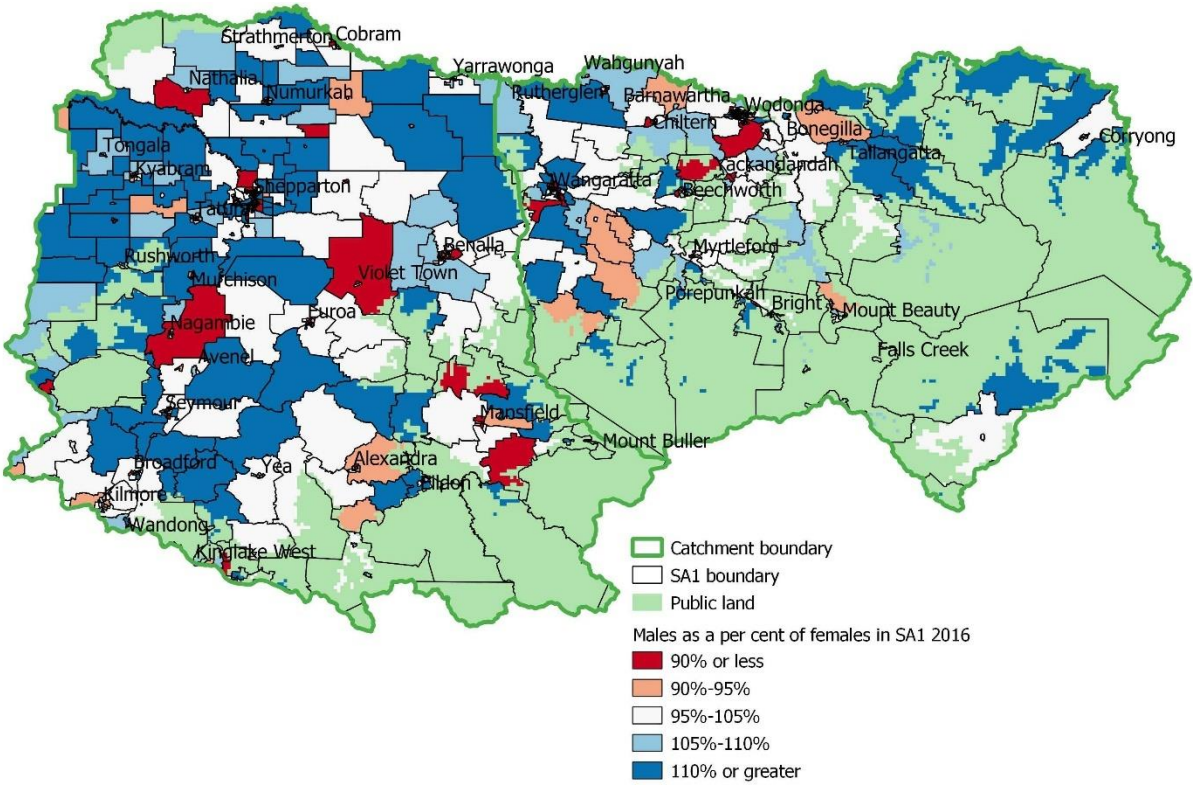


Figure 114 Males as a per cent of SA1 female population in 2016

7.8.2 Diversity - Indigenous population

Data on indigenous status is drawn from self-identifying responses to the Population census. It is acknowledged that using census data to determine the change in indigenous populations is highly limited as it does not involve consultation with Traditional Owners and Aboriginal Victorians and Traditional Owner boundaries are not identified on CENSUS data maps. . Information included and drawn upon to inform the RCS will be determined in collaboration with Traditional Owners and First Nations Victorians.

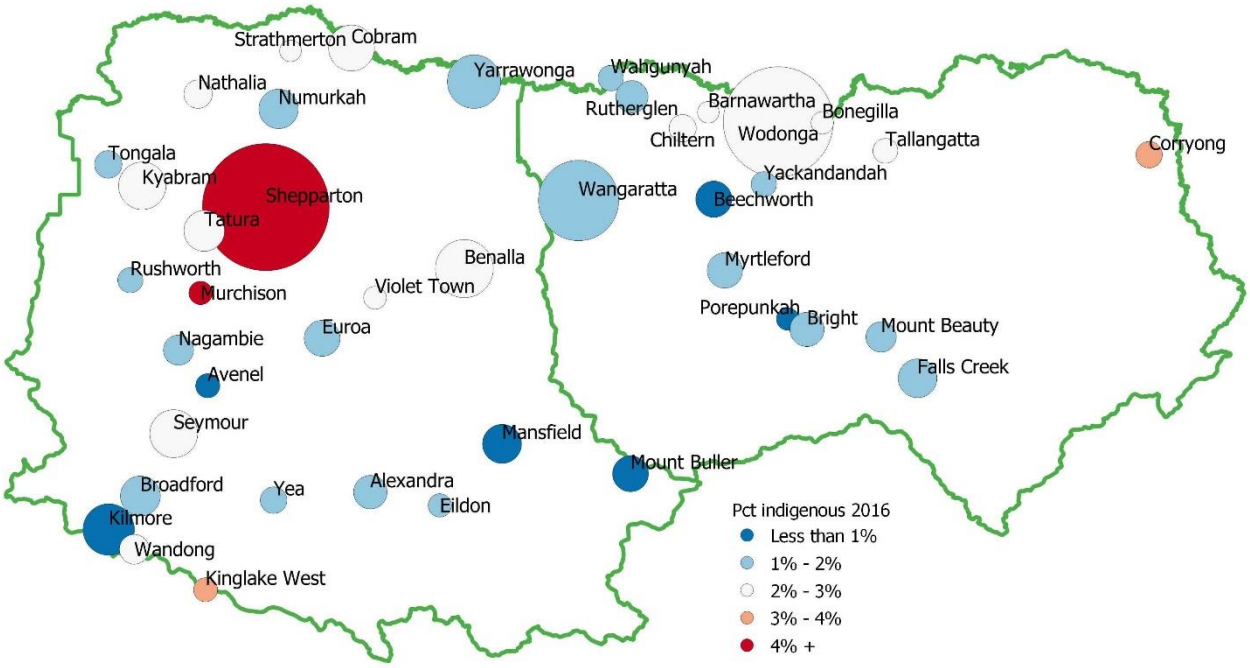


Figure 115 Persons of indigenous culture as a per cent of town population 2016

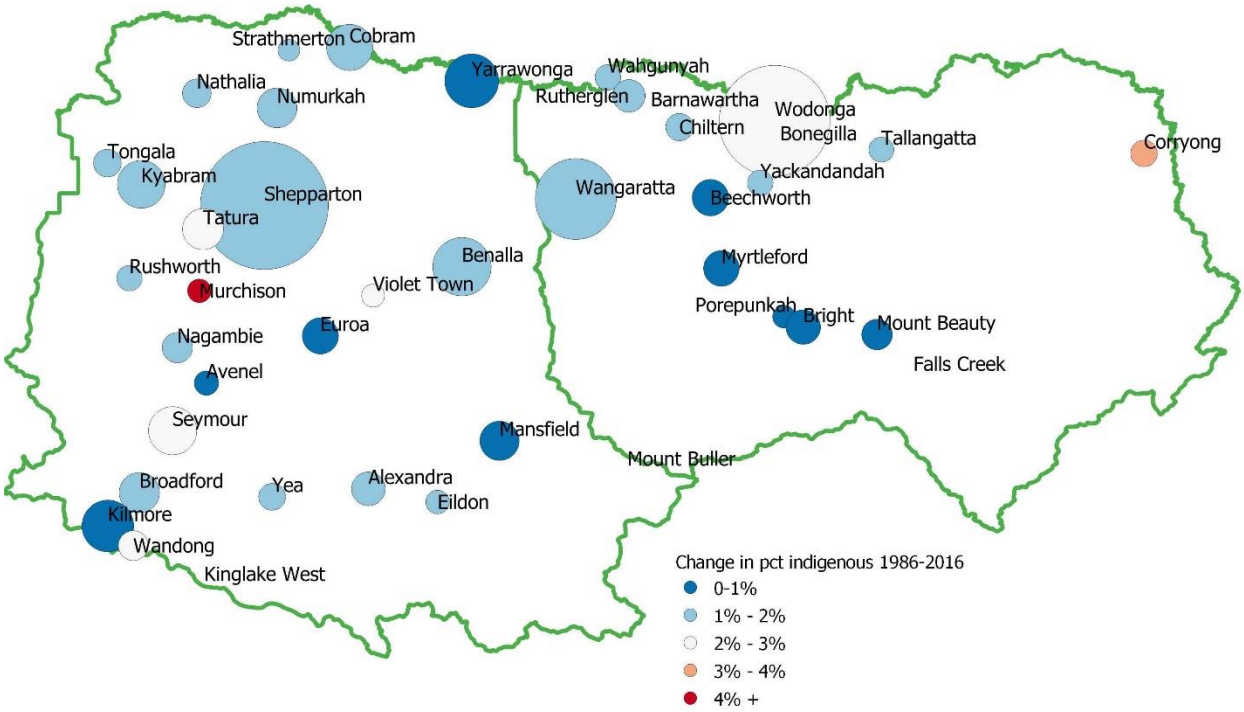


Figure 116 Change in per cent of persons of indigenous culture 1986-2016

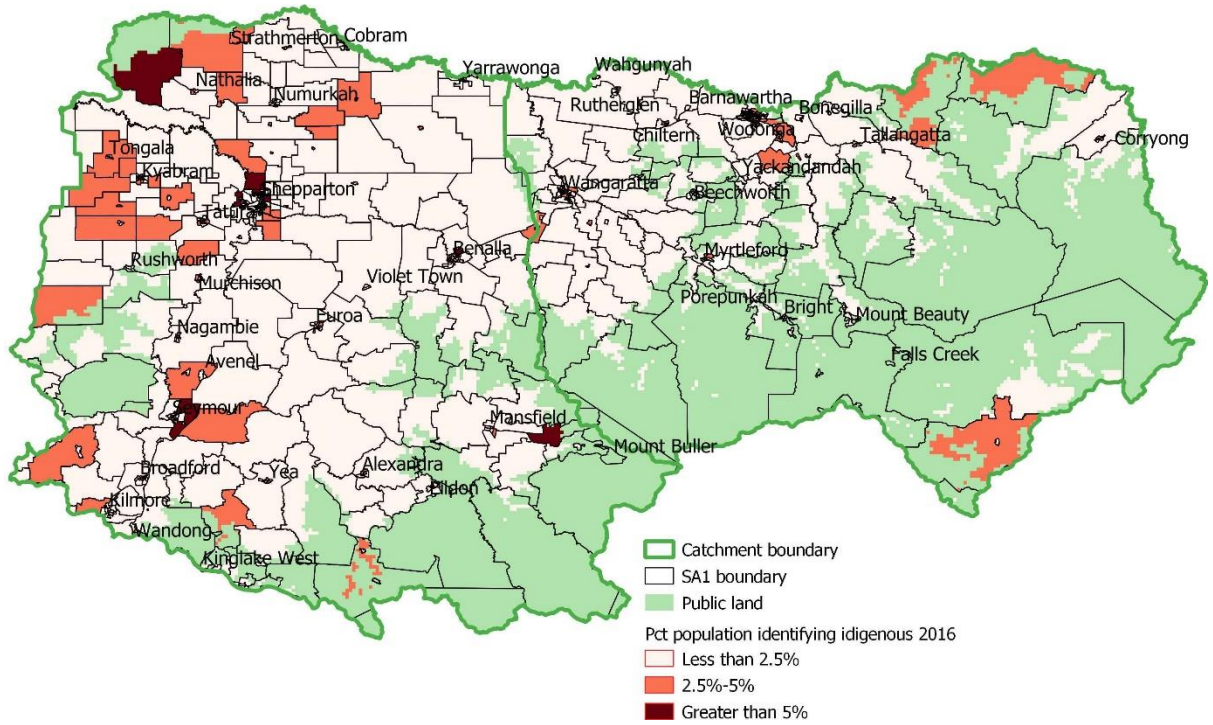


Figure 117 Persons identifying as indigenous as a per cent of SA1 population in 2016

7.8.3 Diversity - Born overseas

There are two centres of overseas migration in the two catchments – Shepparton and Myrtleford. Most broadacre farming areas are close to monocultural.

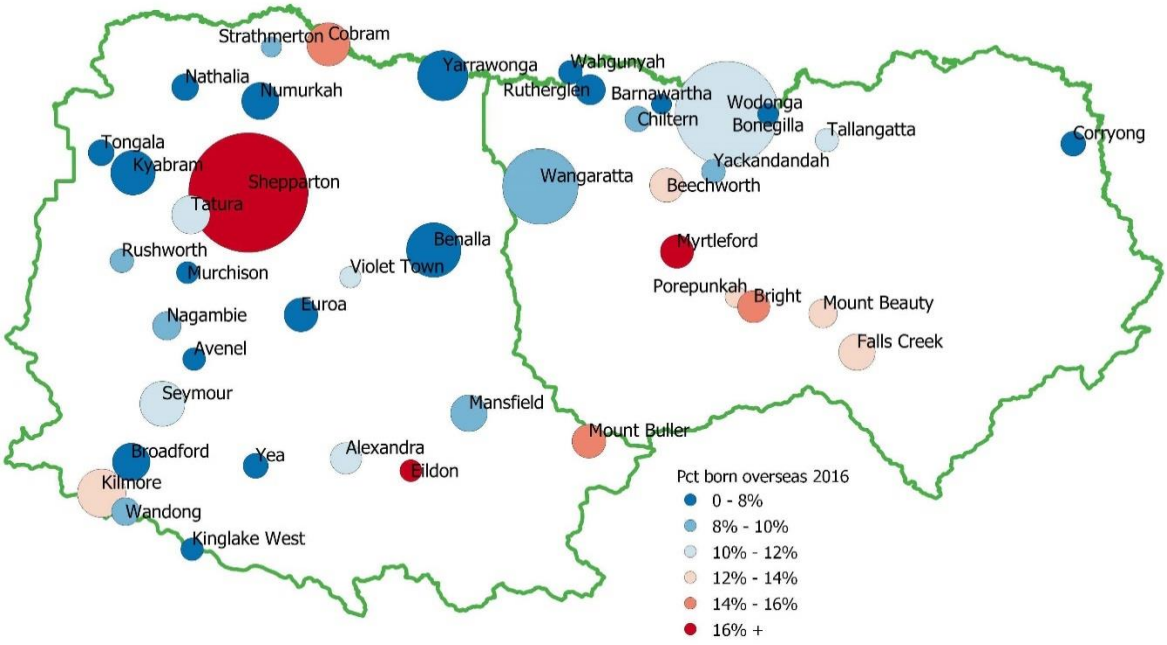


Figure 118 Per cent of persons born overseas 2016

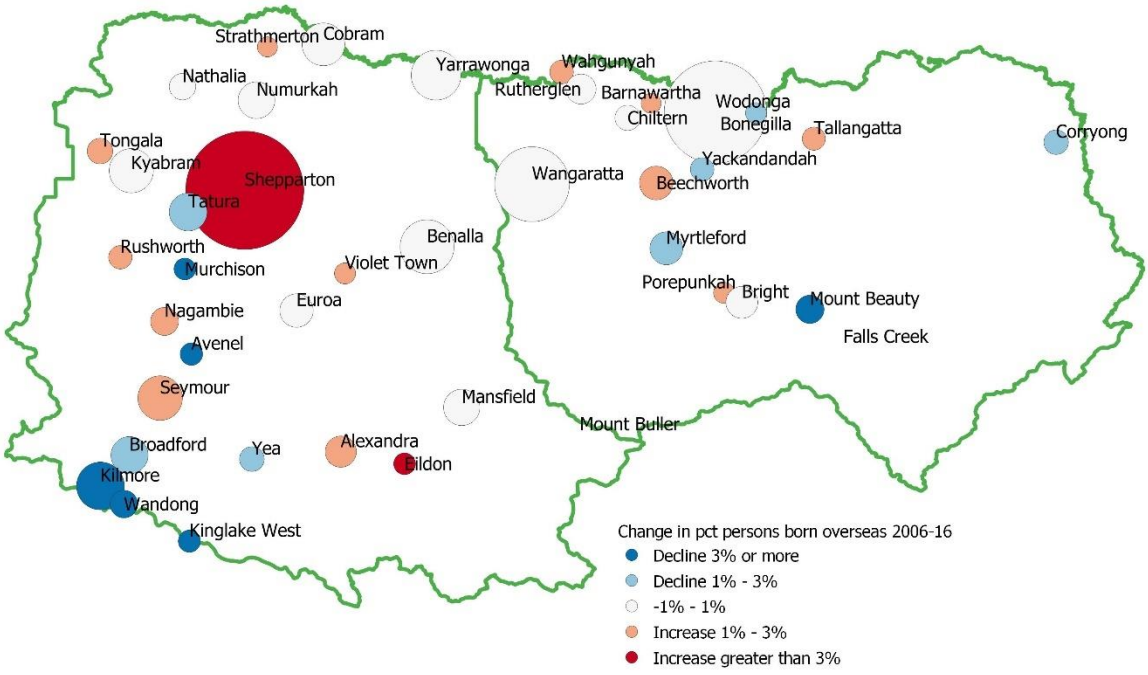


Figure 119 Change in per cent of persons born overseas 2006-2016

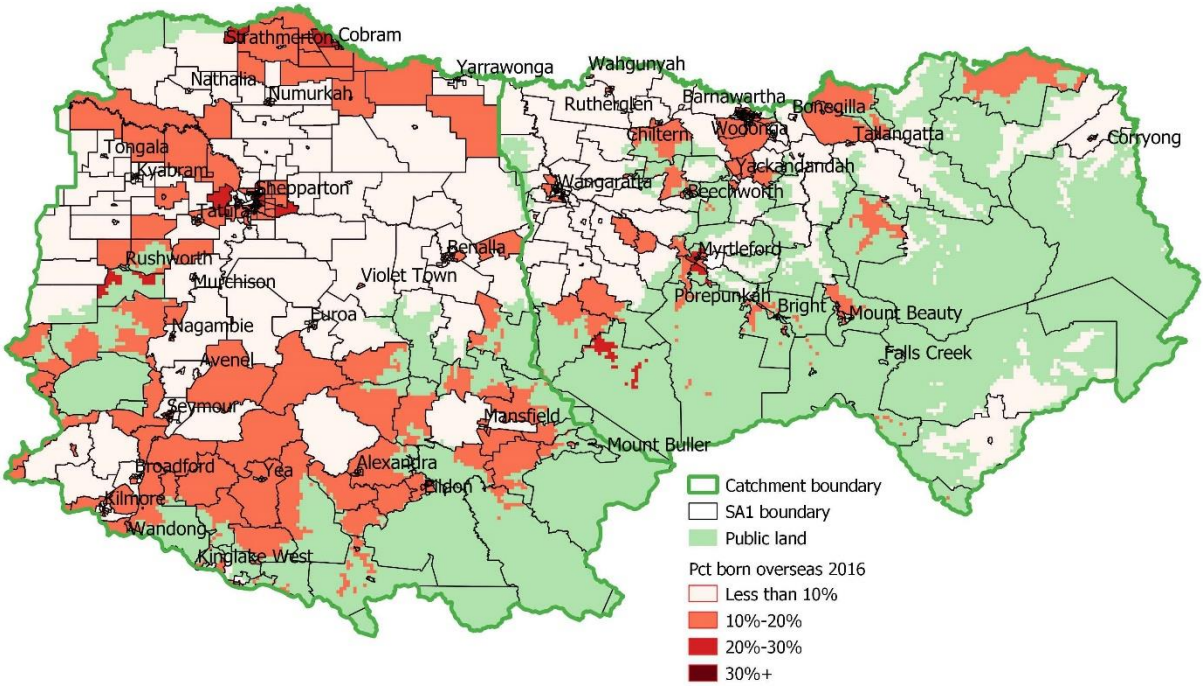


Figure 120 Persons born overseas as a per cent of SA1 population 2016

7.8.4 Diversity - Language Spoken

The places where home language is other than English generally match those places identified in the previous section as having a high proportion of persons born overseas. The exception is the rural areas south of Seymour, which had a relatively higher proportion of overseas born. Here it appears that the migrants were English-speaking.

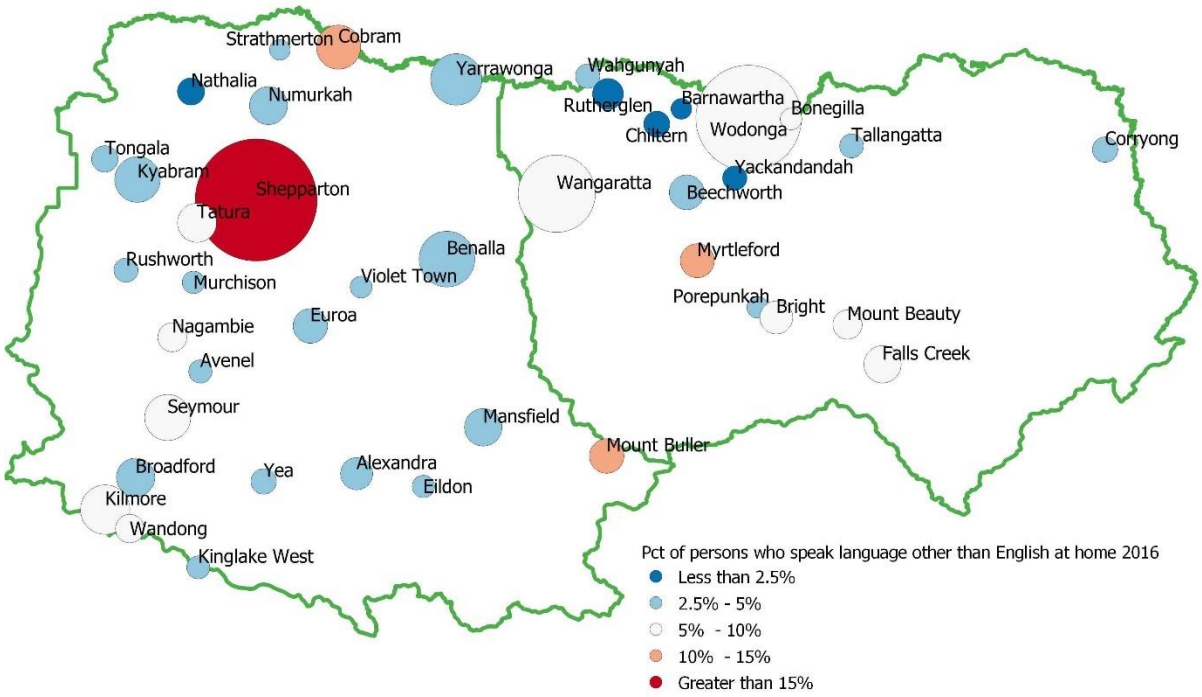


Figure 121 Change in per cent of persons speaking a language other than English at home 2016

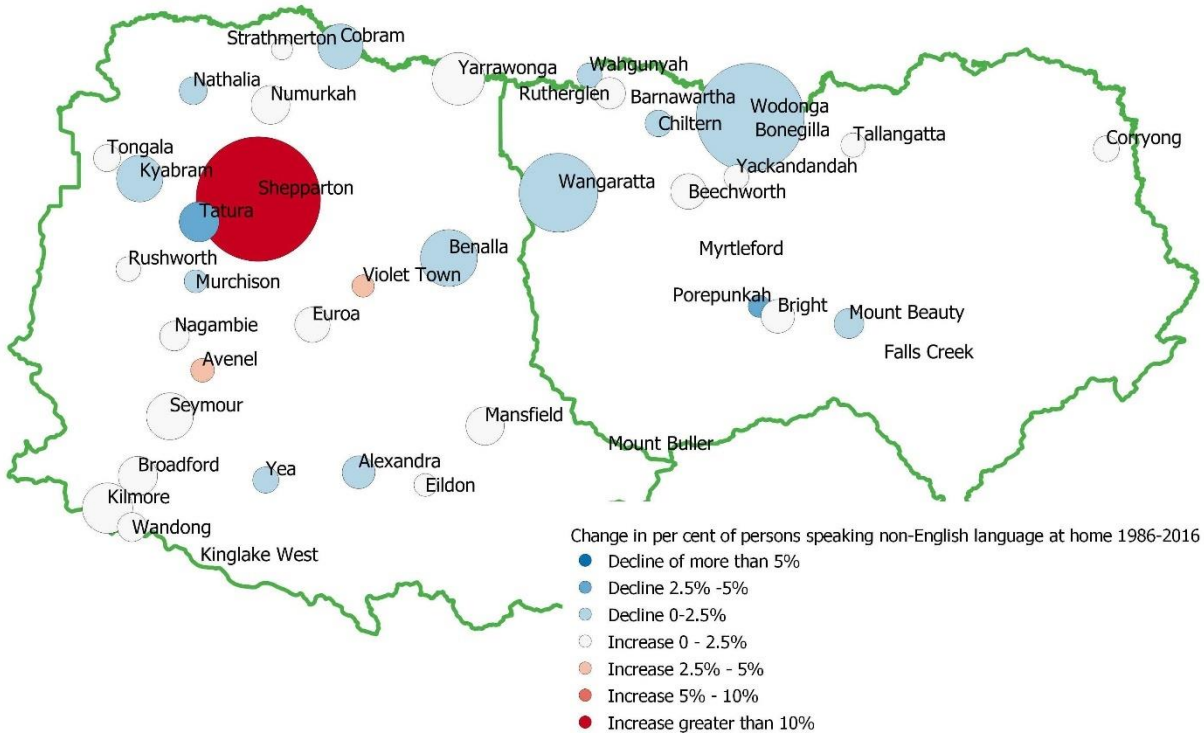


Figure 122 Per cent of persons speaking a language other than English at home 1986-2016

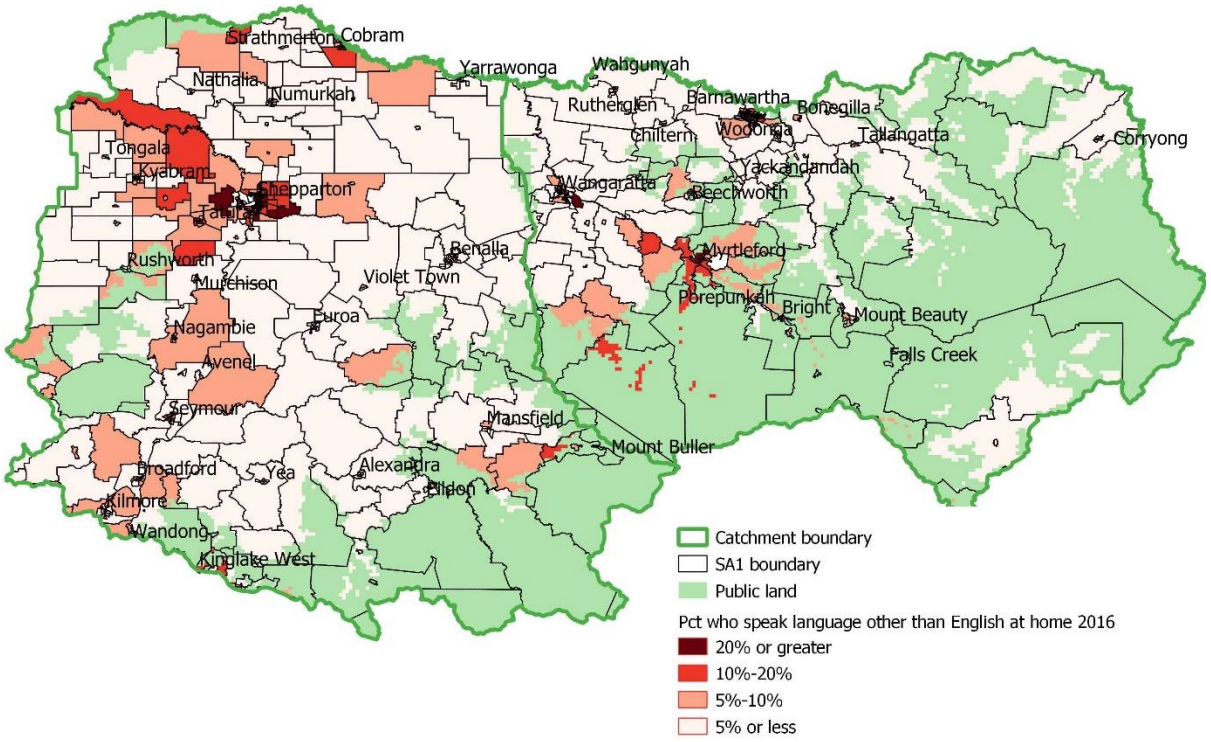


Figure 123 Persons speaking a language other than English at home as a per cent of SA1 population 2016

8 INDICATORS FOR FARM POPULATION

8.1 CHANGE IN CATCHMENT COUNT OF FARMERS

There are multiple ways to define whether someone is a farmer. Elsewhere I have calculated Victorian counts for the following types of farmer (Barr, 2018):

- Owns and manages farm as main occupation;
- Employed as a farm manager;
- Working as a "farmer" on the family farm without ownership stake or remuneration; and
- Owns and manages a farm but has a separate main occupation.

Data for the first three categories of farmer is available from the Census of Population and Housing and is shown for the years 2006, 2011 and 2016 below (Figure 124 Count of farmers by employment type 2006-2016 - Goulburn Broken Catchment, Figure 125). The data is derived from the ABS TableBuilder website but has been adjusted to account for increasing non-response counts in more recent censuses. This pro-rata reallocation is described in (Barr, 2019).

Across both catchments there appears to be an inter-censal decline in the count of owner-managers main occupation farmers of 15 per cent (3 per cent per annum). This appears to be a continuation of the long-term trend to of declining farmer populations, particularly in the dairy industry (Barr, 2011).

This rate was exceeded in the Goulburn Broken during the 2006-11 intercensal period when the count of owner-managers declined by 24% (almost 5 per cent per annum). This era included low water allocation and the 2009 crash in the dairy price. During this period nearly half of all dairy farms in the Goulburn-Murray irrigation system ceased milking cows (HMC Property Group, 2010).

The count of employed farm managers is a fraction of the count of owner-manager farmers. However, this population is not declining and therefore is a gradually increasing share of the total farmer population. This is consistent with medium-term trends across the Australian farm sector (Barr, 2019).

We have attempted to calculate the share of the total catchment population that might be accounted for by farm households. The number of owner-manager farmers was transformed into a farm household count by using a conversion factor developed in a report for DEDJTR. This conversion is necessary to overcome the double-counting when two persons in a household both described themselves as owner-manager farmers (Barr, 2018). The estimate of farm households is then multiplied by the average household size for the relevant Statistical Area 2. Farm households comprise 2 per cent of the North East catchment population and almost 4 per cent of the Goulburn Broken catchment population.

Table 6 Estimate of farm household population

	Goulburn Broken	North East
Owner-manager farmers	2784	1195
Population living in owner-manager households	4994	2029
Per cent of total catchment population	3.8%	2.0%

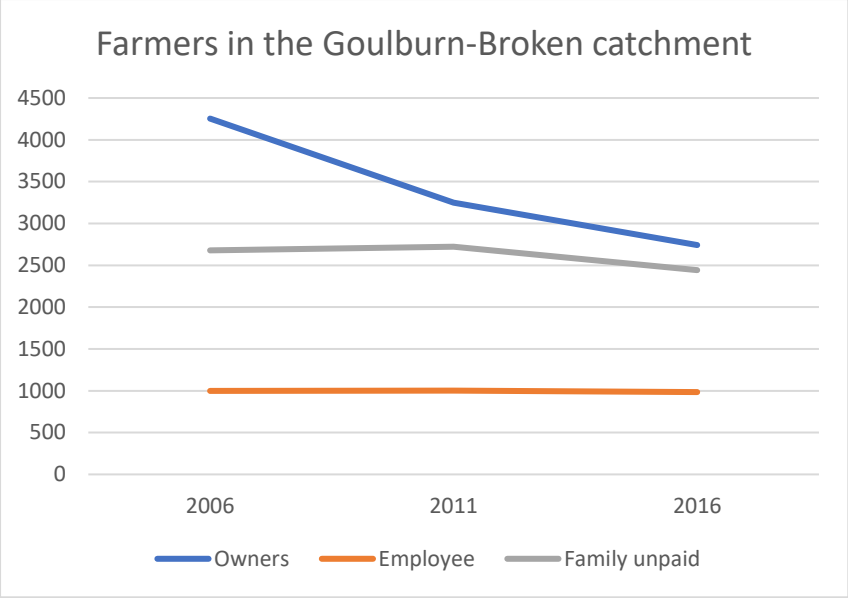


Figure 124 Count of farmers by employment type 2006-2016 - Goulburn Broken Catchment

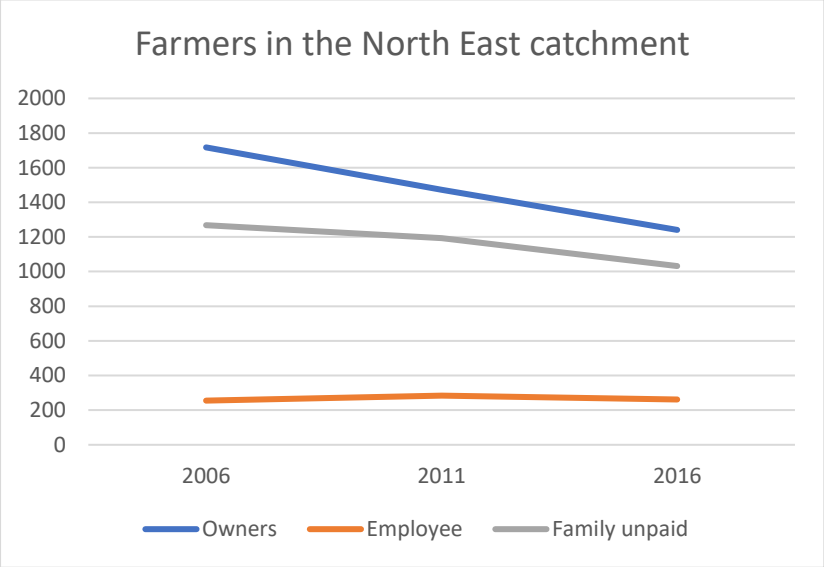


Figure 125 Count of farmers by employment type 2006-2016 – North East catchment

8.2 SPATIAL ANALYSIS OF FARMER COUNTS

Mapping the demographics of farm populations is limited by the major change in statistical geography implemented by the ABS in 2011. Maps below are presented mainly using Statistical Area 2 (SA2) geography. This is only available for 2011 and 2016. Mapping 2006 data would require extensive work to concord the old Statistical Local Area (SLA) boundaries to match SA2 boundaries. This was not within the project budget. Spatial time series is limited to the years 2011 and 2016.

SA1 data can give a good estimate of farmer count by using persons employed as managers in agriculture, fishing, and forestry. This estimate includes owner-managers, employed farm managers and persons working without remuneration of the family farm. The actual split between the three types of "farmer "is 58% owner-manager, 26% unpaid family and 16% employed manager. Using custom tables at SA3 level we confirmed that this substitute indicator is within 99% of the actual farmer count across the catchment. We used this indicator to calculate a proxy measure of the per cent of employed persons in an SA1 that are engaged in farming (Figure 129).

The mapping of owner-operator farmers comes in three forms – farmer count, change in number of farmers and per cent change in number of farmers.

- Owner-operator farmers are much more numerous in the north rather than south of the catchment. This includes Towong Shire, the irrigation areas north and west of Shepparton, and Wangaratta rural.
- The greatest absolute decline in the count of owner-manager farmers is in these same areas with larger counts of farmers.
- When we consider per cent decline in farmer counts, a different picture emerges. Those areas with the greatest per cent decline are in the areas with lower farmer counts – the Melbourne fringe area in the south of the Goulburn, the higher amenity mountain valleys near ski-fields and close to some cities such as Wodonga.

These observations suggest a simple five zone classification of SA2s according to farmer counts and changes in the count:

- Irrigation areas with larger owner-operator counts and larger absolute count declines
- Remote mountain agriculture with high counts of owner operators and higher decline in absolute counts.
- Mixed farming zone with low rates of decline in farmer numbers.
- Amenity commuting zones with lower farmer counts and more rapid rates of decline in the count (Wallan, Wodonga fringe)
- Ski-field valleys with fewer farmers and more rapid rates of decline (Bright, Mansfield)

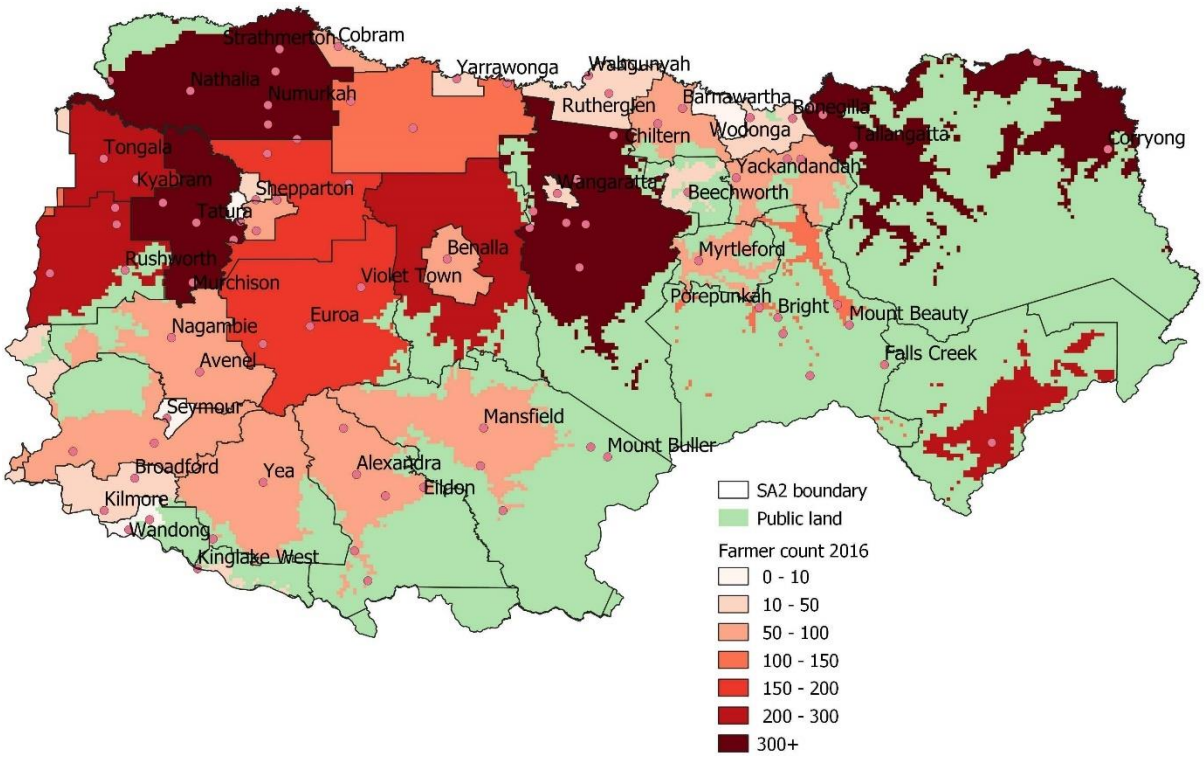


Figure 126 Census count of owner-operator farmers 2016

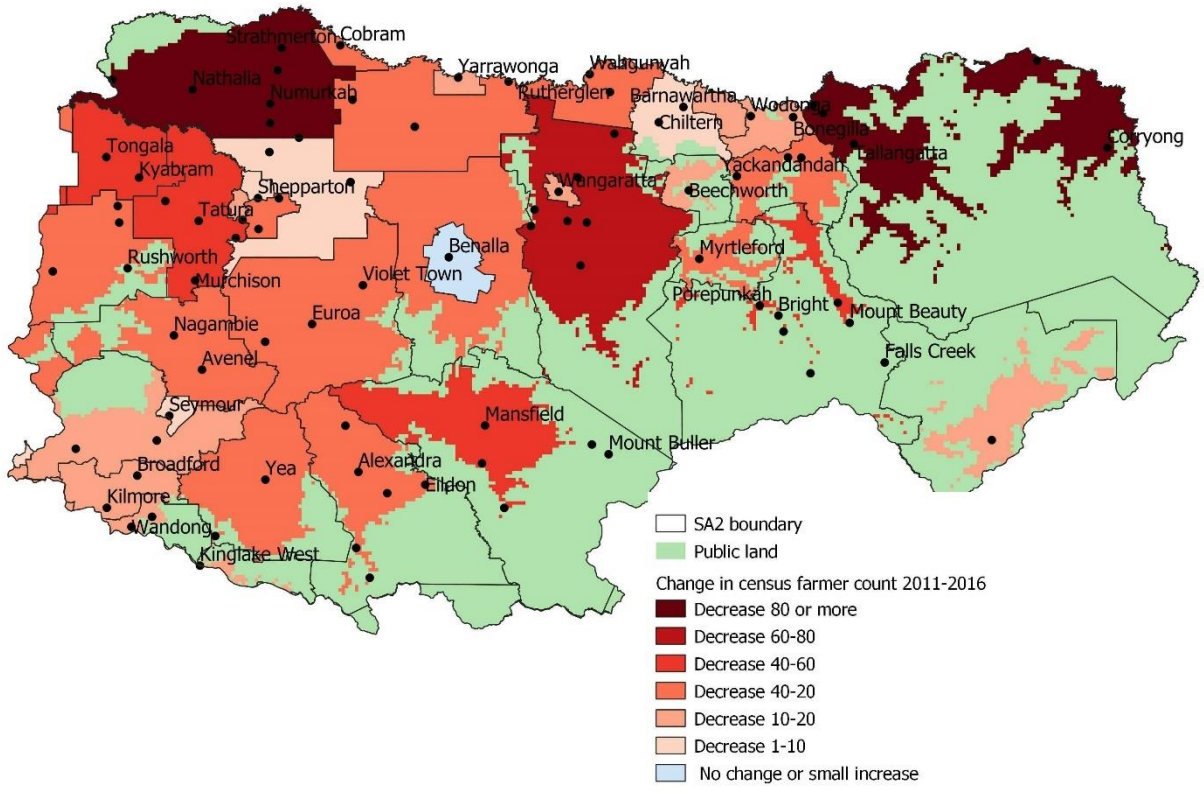


Figure 127 Change in census count of owner-operator farmers 2011-16

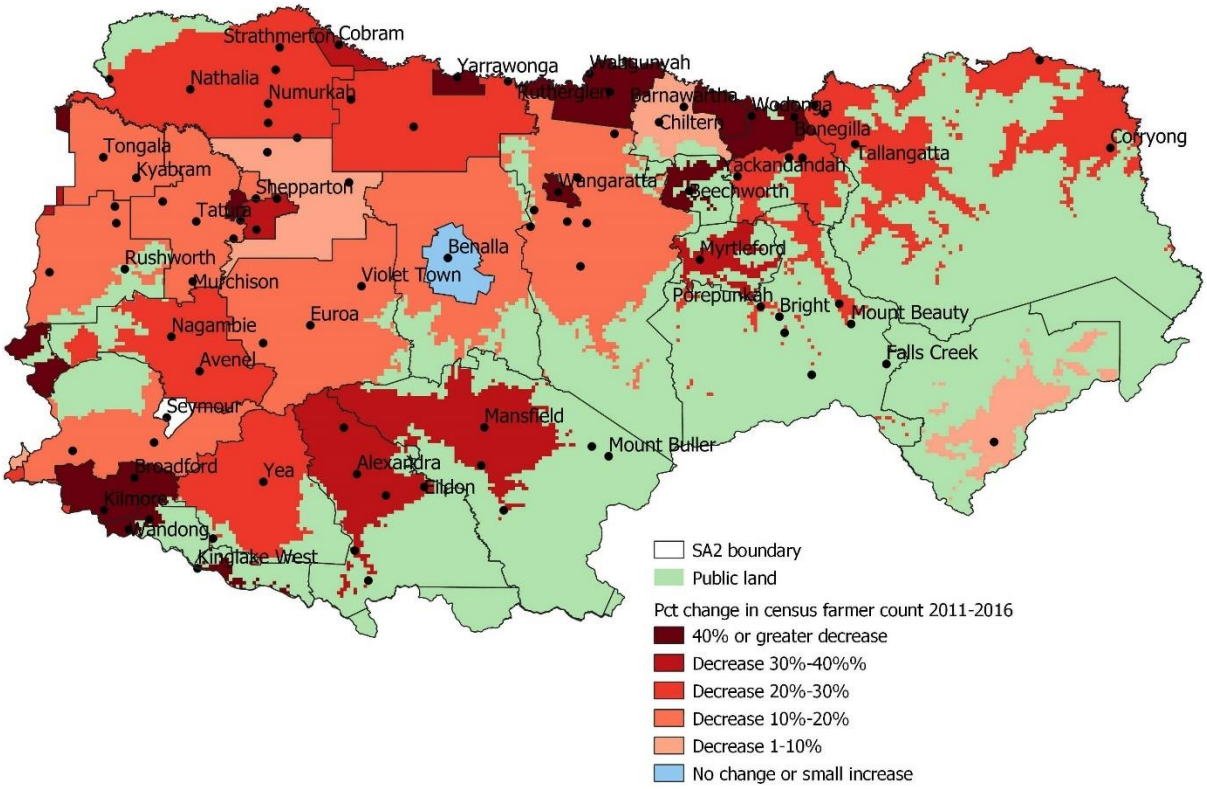


Figure 128 Per cent change in count of owner-operator farmers 2011-16

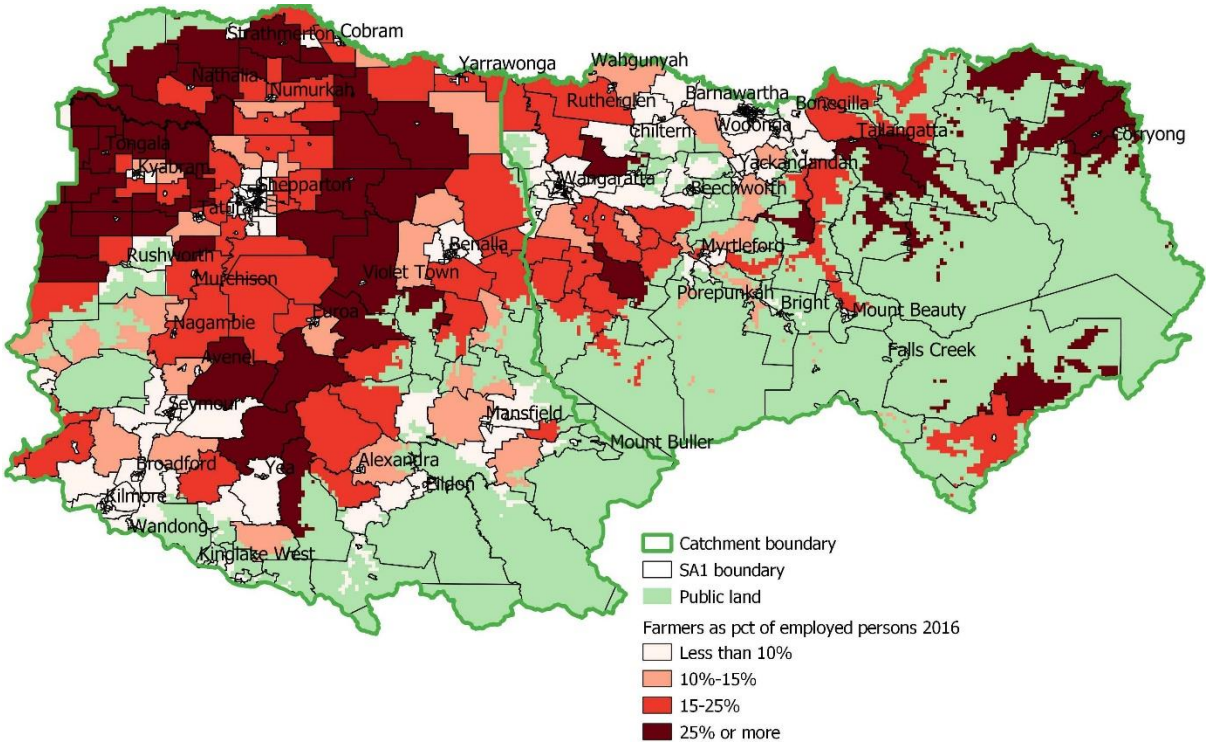


Figure 129 Estimate of farmer count as a per cent of SA1 workforce 2016

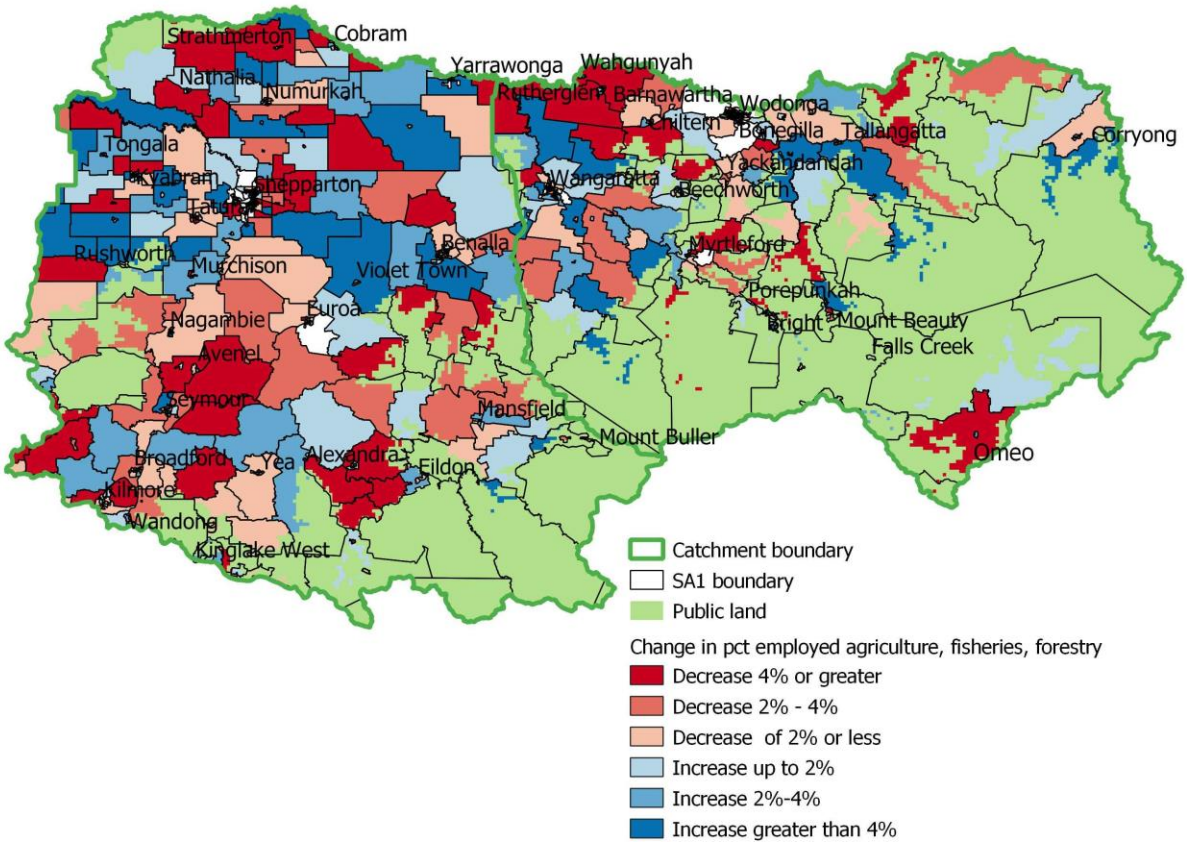


Figure 130 Change in per cent of persons aged over 15 employed in agriculture, fisheries, and forestry 2011-2016

8.3 SPATIAL MAPPING OF OWNER-OPERATOR FARMER AGE

The map of farmer age shows farmer age decreasing with greater distance from mountain country. This is consistent with past work on the influence of amenity pressure on farming businesses, whether amenity is related. Amenity land purchasers raise land prices. Higher land prices reduce the capacity of farm business to expand scale as a strategy to maintain competitiveness. Lesser scale reduces recruitment of younger farmers or increase pressure on them to take an off-farm income. Median age of the owner-manager farm community increases (Barr, 2014).

This observation of age distribution can be easily fitted into the spatial classification suggested in the previous section:

- Irrigation areas with larger owner-operator counts, younger farmers and larger absolute count declines
- Remote mountain agriculture with high counts of owner operators, an older and ageing farmer population and higher decline in farmer numbers.
- Mixed farming zone with a low rate of decline in farmer numbers, and an ageing farmer population.
- Amenity commuting zones with lower farmer counts, older farmers, and more rapid rates of decline in the count (Wallan, Wodonga fringe)
- Ski-field valleys with fewer and older farmers and more rapid rates of decline (Bright, Mansfield)

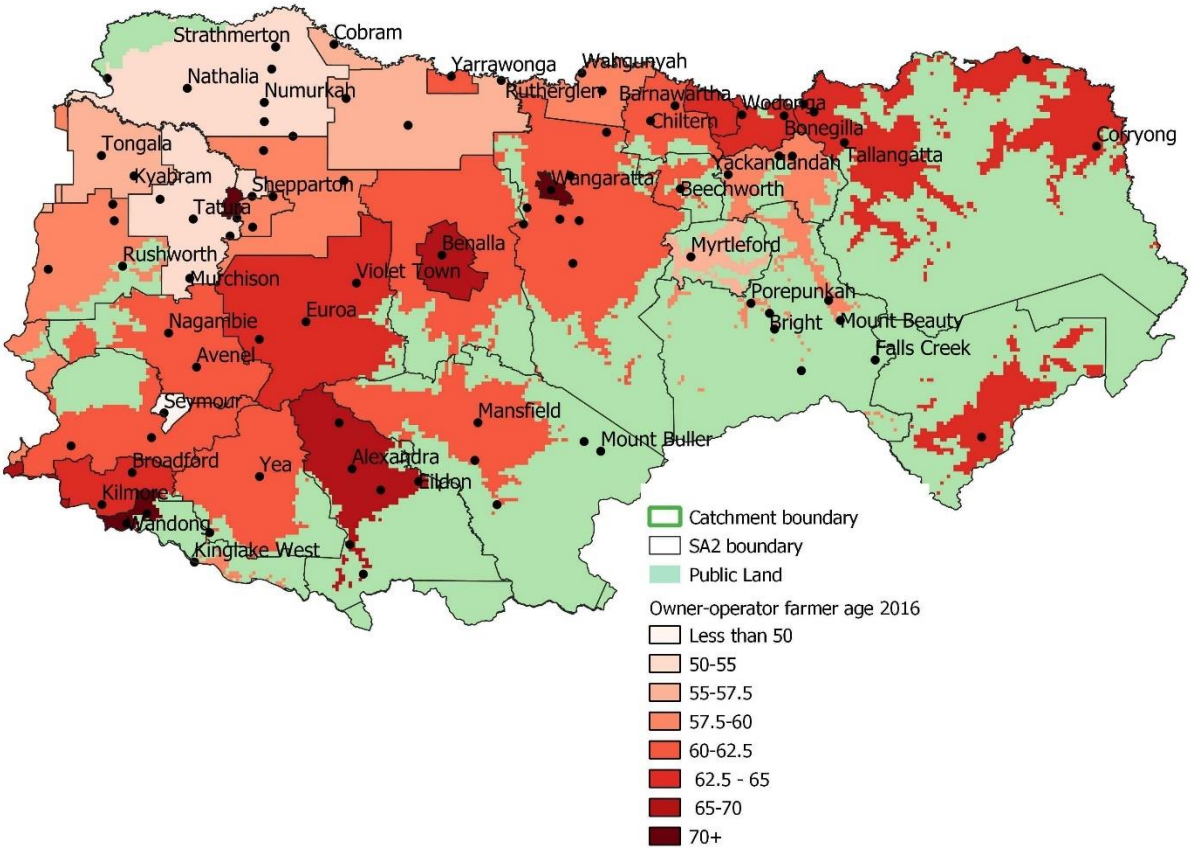


Figure 131 Median age of owner-operator farmers 2016

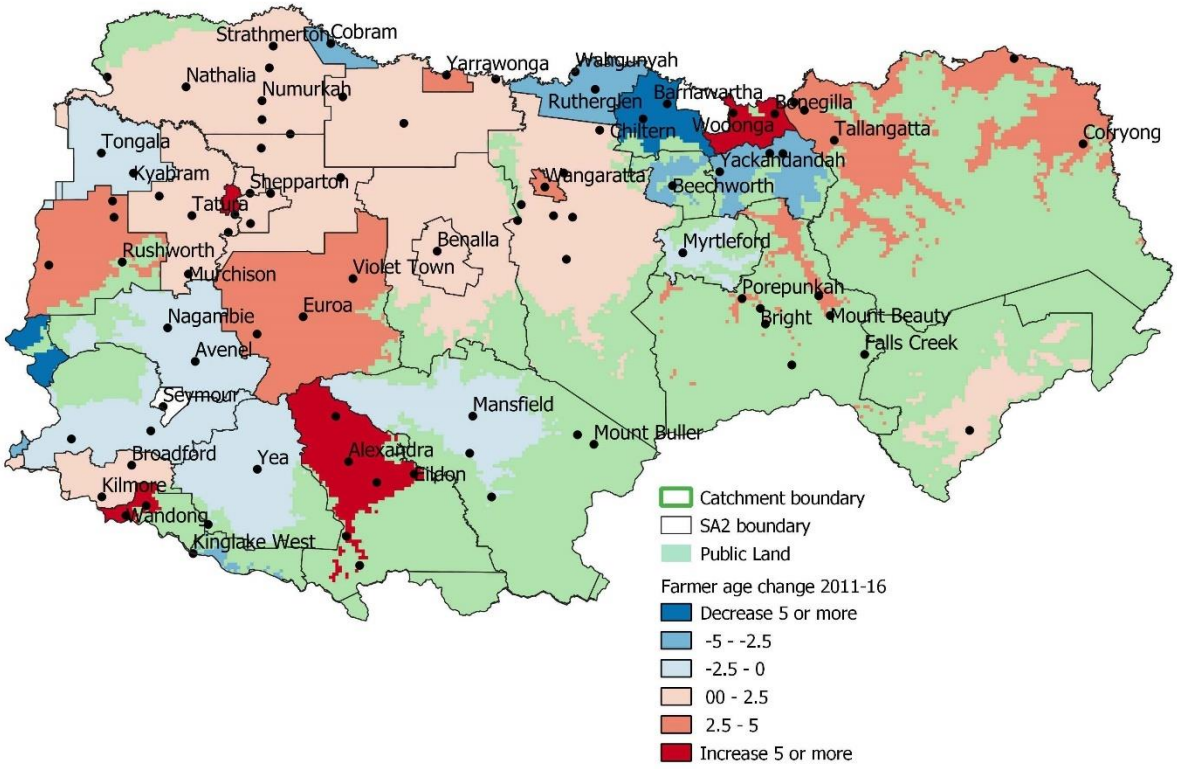


Figure 132 Change in median age of owner-operator farmers 2011-16

8.4 FARMS ESTABLISHMENT COUNTS

In this section we use the Agricultural census of 2016 to provide counts of farms by major industry within each catchment. Some initial explanations and caveats.

- ABS boundaries are based upon population gravity (social catchment) rather than water catchment. The statistical areas relate to major population centres with which the area interacts. This means that the Omeo/Benambra area is part of an East Gippsland SA2 which extends southward to the Gippsland Lakes. The following data does not include farm counts for the Omeo-Benambra area. To overcome this would require modelling and concordance work which was not within scope of the contract.
- The non-agricultural farm category refers to businesses which generate most of their income from non-farming activities, but which have a farming component. An example might be a milk factory which runs stock on land used for waste-water disposal by irrigation.

The data shows two quite different catchments. The Goulburn Broken has a diverse agricultural base. The North East is mostly a beef producing region, with 54 per cent of farms being beef producers, occupying 55 per cent of the area of farmland.

Table 7 Farm establishment count by farm industry in 2016

	Dairy	Beef	Sheep	Grains	Horticulture	Other	Non-agriculture
GOULBURN BROKEN	1604	1293	1215	933	700	695	92
	24.6%	19.8%	18.6%	14.3%	10.7%	10.6%	1.4%
NORTH EAST	394	1481	313	109	243	156	23
	14.5%	54.5%	11.5%	4.0%	8.9%	5.7%	0.8%

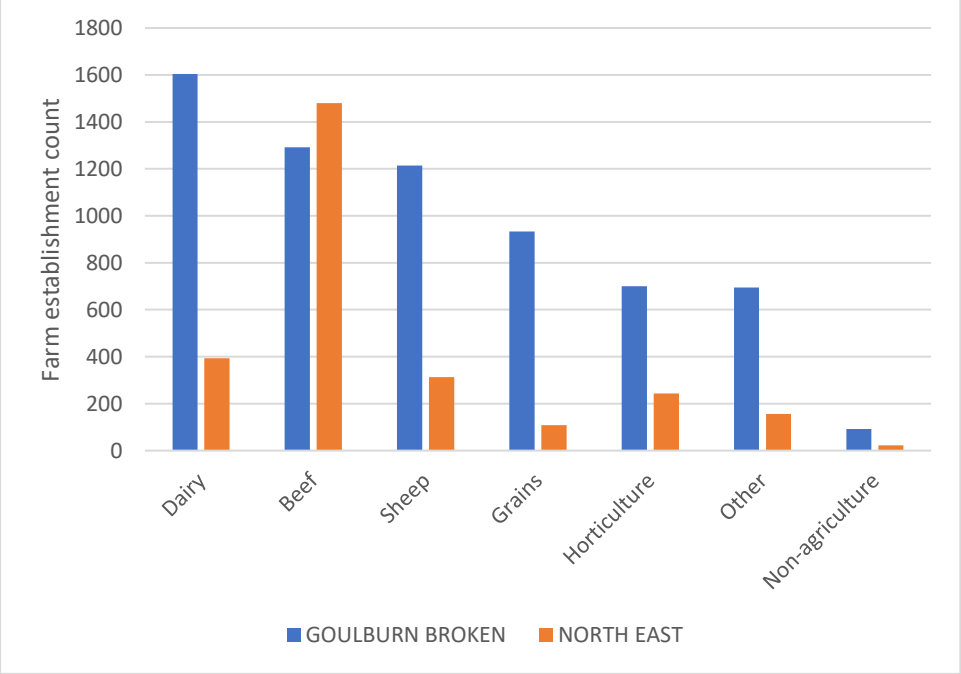
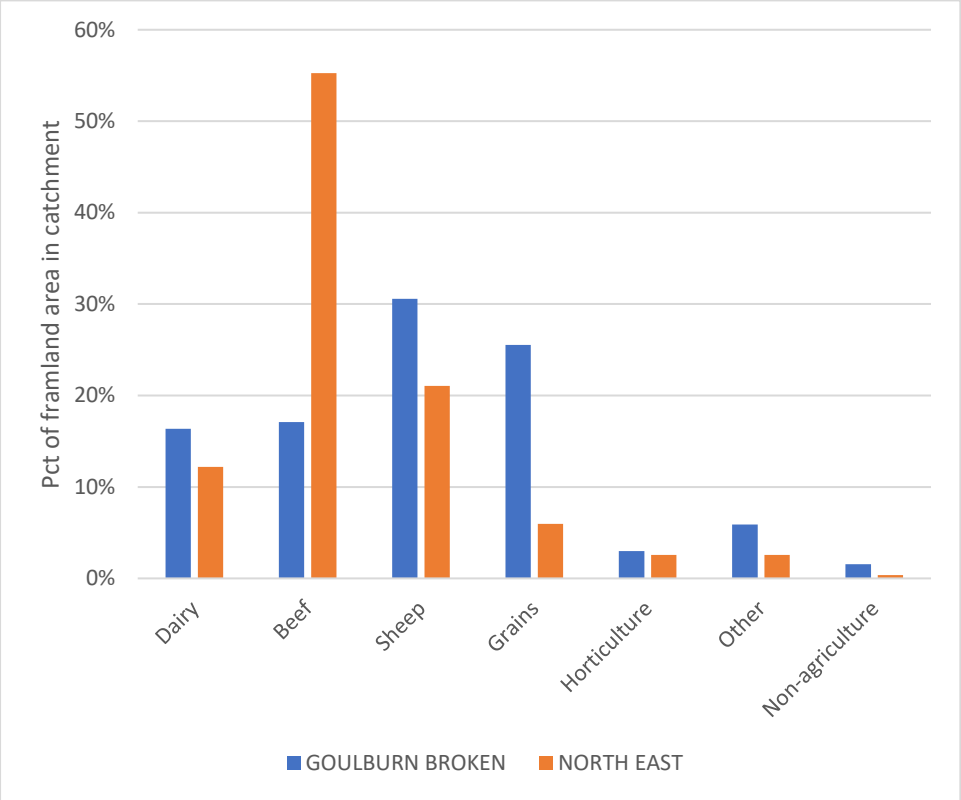


Figure 133 Farm establishment counts by farm industry in 2016

Table 8 Farm establishment area by farm industry 2016

	Dairy	Beef	Sheep	Grains	Horticulture	Other	Non-agriculture
GOULBURN BROKEN	16%	17%	31%	26%	3%	6%	2%
NORTH EAST	12%	55%	21%	6%	3%	3%	0%

Table 9 Farm establishment area by farm industry 2016



8.5 FARMS SCALE AS MEASURED BY EVAO

Estimated Value of Agricultural Operations (EVAO) is a measure of farm scale that is independent of farm area. As the name implies, it is a proxy measure of the value of farm gross income derived from reported sales of farm produce. This measure allows comparison between different farm types, particularly extensive industries such as beef cropping and intensive industries such as horticulture.

In 2016 the ABS changed the minimum size of farm it includes in its reported data from $5,000 to $40,000. This means many of the smallest farms are no longer counted. This obscures the extent of small-scale farming in beef producing areas.

Median farm EVAO is shown for SA2s in Figure 134. The largest median EVAO is in the irrigation areas north and west of Shepparton. Intermediate median EVAOs are found in the north of the catchment away from the influence of Wodonga. Median farm EVAO decreases towards the south of the Goulburn catchment and along the Hume corridor. The smallest median EVAOs are around Wodonga and Kilmore/Wallan. This is consistent with past analysis showing the impact of amenity on farm scale.

Figure 135 shows the percentage of farms in the lowest national farm scale quartile. An SA2 with average national characteristics would be expected to have 25 per cent of its farms in this quartile. SA2s with an over representation of small quartile farms are shown in yellow, orange and red. Farms with an underrepresentation are shown in blue. The latter includes the remote mountain valleys where lack of off-farm income opportunity leaves little place for small farms.

Figure 136 shows the proportion of farms in the SA2 which are within the largest national farm size quartile. The only areas with an over-representation of large farms are the irrigation areas around Shepparton. All other areas have an underrepresentation of large farms, particularly near Wodonga, Wangaratta, and Wallan/Kilmore.

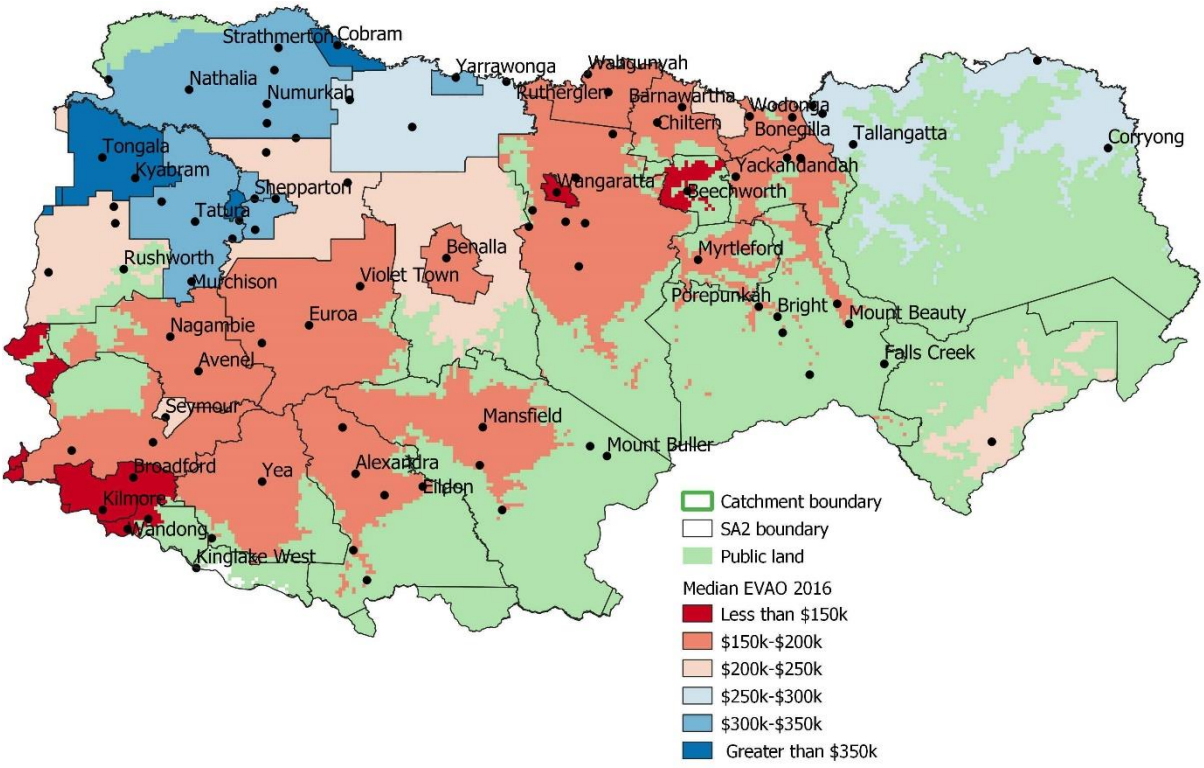


Figure 134 Median farm EVAO by SA2 in 2016

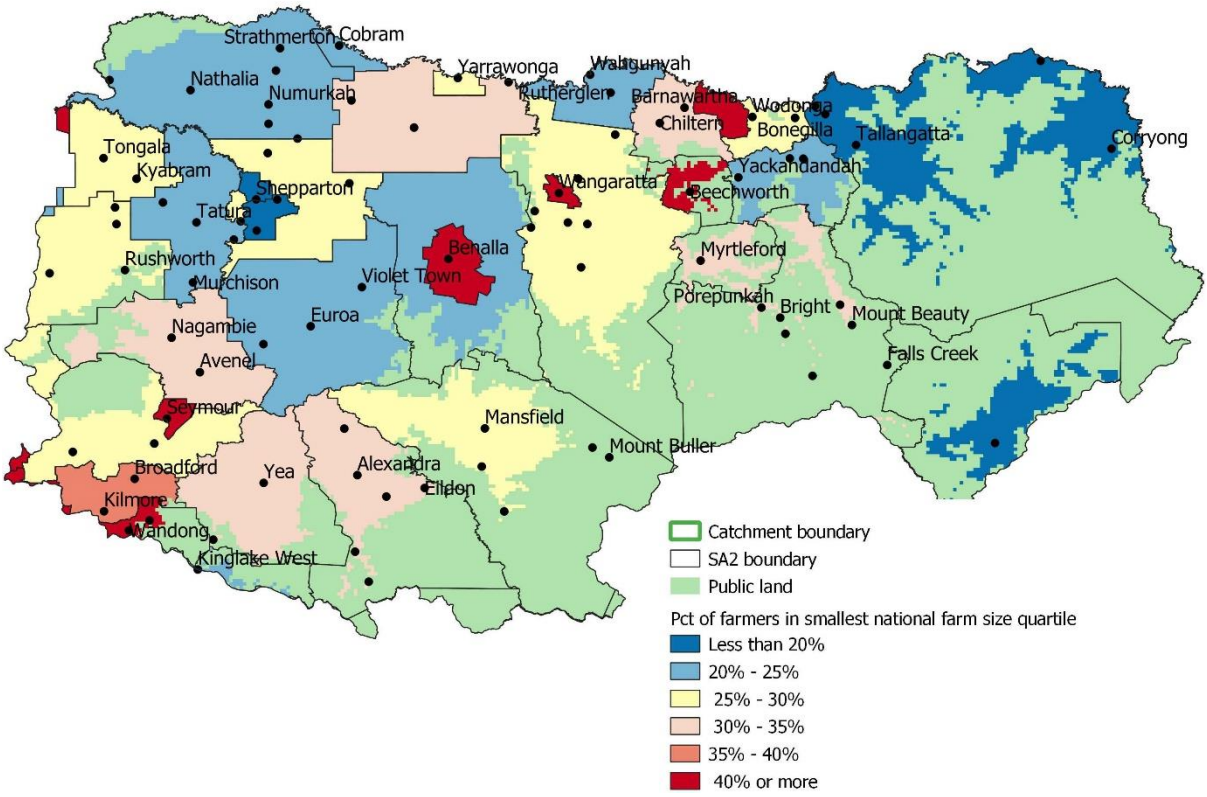


Figure 135 Farms in the lowest national farm size quartile as a per cent of farms in SA2 2016

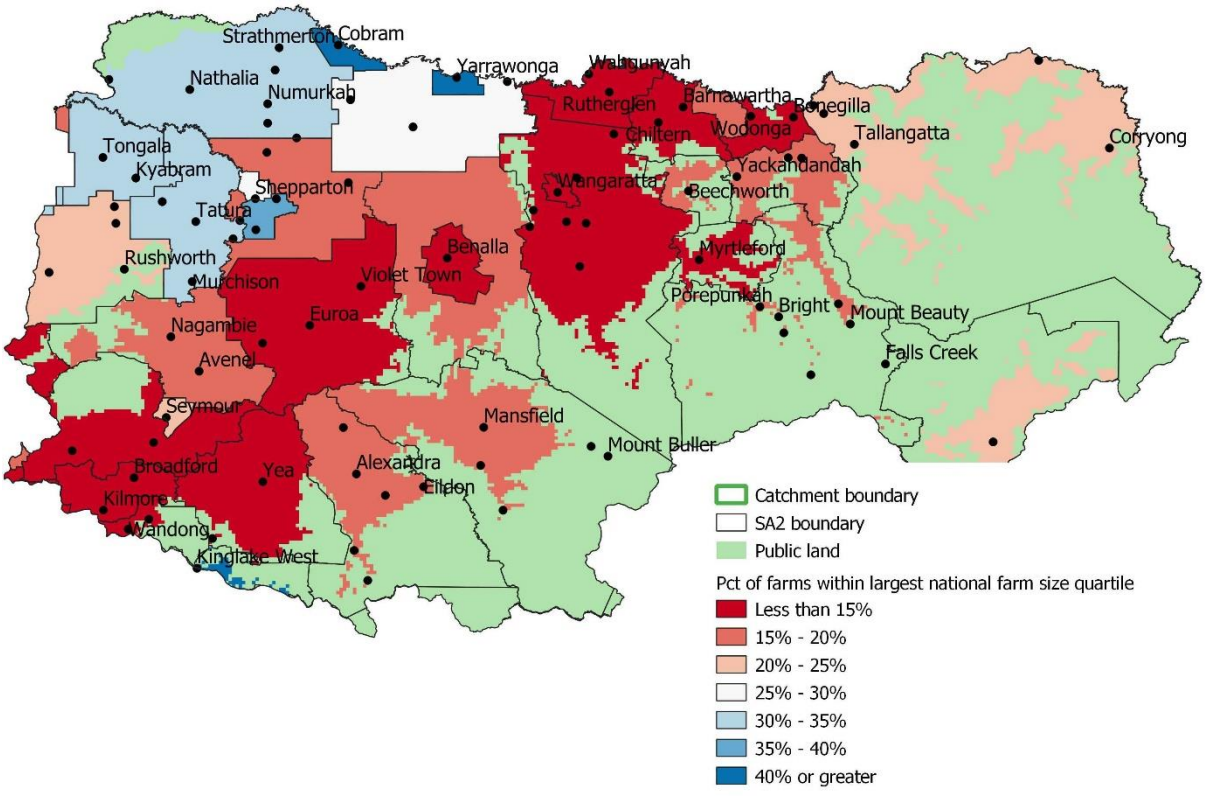


Figure 136 Farms in the largest national farm size quartile as a per cent of farms in SA2 2016

8.6 FARM COUNTS AND FARM SCALE DISTRIBUTIONS – APPRECIATING THE IMPLICATIONS OF THE PARETO CURVE

At this point it is helpful to reflect upon the differences in the counts of farmers, farm size and farm area. Table 10 makes clear an important distinction between counts of farmers, farm area and farm output value. This data is for Victoria as a whole, but it will still be relevant for the North East and Goulburn Broken catchments. Farmer counts are dominated by the operators of small farms. Their numbers have a large influence upon demographic measures such as median age. However, many farms make a relatively small contribution to farm output and control a relatively small share of agricultural land. The smallest half of farms in Victoria manage 20 per cent of the State's farmland and produce 12 per cent of the total value of output. The largest 10 per cent of farms manage 25 per cent of the land and produce approximately half of the value of agricultural output. These figures are based upon 2016 Agricultural Census data and so undercount the number of small farms. The land share and output share of the larger farms is probably underestimated in this table.

The approach one takes to these indicators depends upon the policy objective of government.

- For a policy objective related to household welfare in the farming community, straight counts of farmers and farm households are valuable.
- For objectives related to changing land management, then larger farms are more likely to be a target of interest, if only for reasons of transactional efficiency.
- For policy objectives related to increasing farm production, then the largest farms are most likely to be of interest, as these have the capacity to invest and to adopt capital intensive technologies.
- The choice of indicator becomes more complicated when the policy objective is something related to "maintaining the farming character of the landscape". A fully commercial farming landscape will be populated by a smaller number of larger farms and may well have aspects of an industrial farming character. But a desired farming landscape may well have features of small farm gentrification that inhibit commercial farm development. The tradeoffs are discussed in the next section.

Table 10 Relationship between farm scale and share of farm area and farm value of output: Victoria 2016

	Pct of total farm area	Pct of total farm value of output
Smallest 50% of farms	20%	12%
Largest 25% of farms	50%	70%
Largest 10% of farms	25%	50%

These observations about the uneven nature of farm scale distribution apply more to the Goulburn Broken catchment than to the North East. In general, the North East catchment has relatively few large scale farm businesses, and those that it does have occupy less than 10 per cent of the area of the catchment, as opposed to the Goulburn Broken where similarly large businesses occupy a third of the catchment area. This can be attributed to the domination of North East agriculture by the beef industry, which has proved remarkably resistant to the pressure for increasing farm scale observed in most other farm industries.

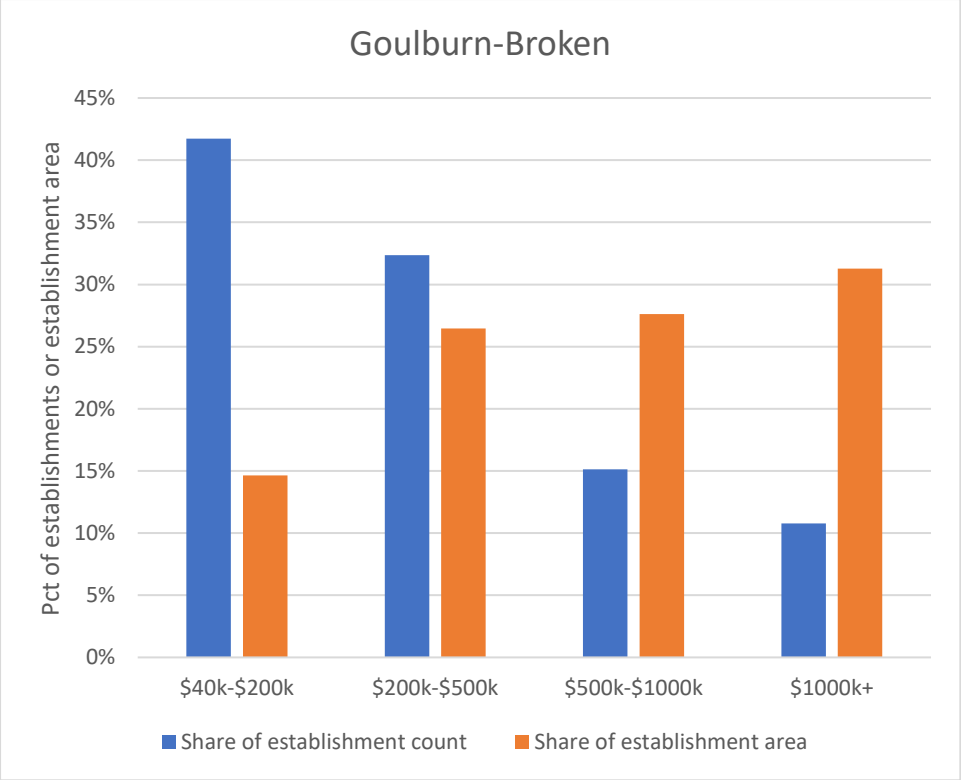


Figure 137 Share of establishment counts and total establishment area by farm size (EVAO) - Goulburn Broken 2016

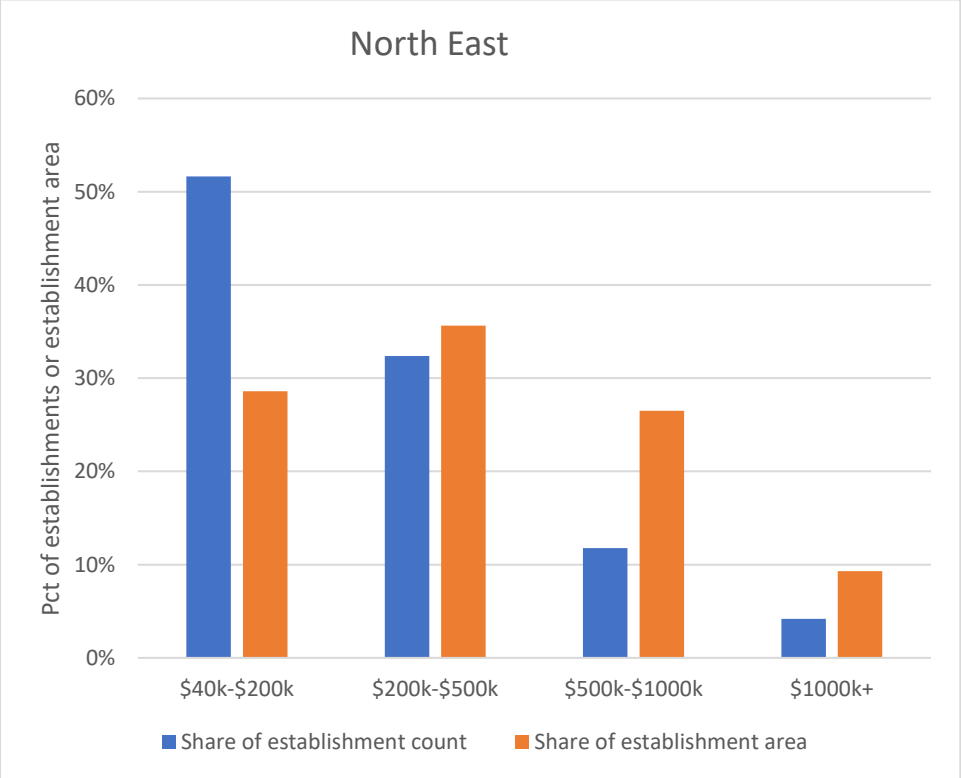


Figure 138 Share of establishment counts and total establishment area by farm size (EVAO) – North East 2016

8.7 FARM LAND VALUES AND FARM CONSOLIDATION

In 2002 the Department of Agriculture published a report that featured a map of Victorian parishes coloured according to the ratio of land value to production value (Barr N., 2002). This clearly showed that land close to scenic areas or close to centres of employment is more highly valued in comparison to the value of agricultural production coming from that land. The difference across Victoria was greater than fourfold. These differences cannot be explained by differences in agricultural profitability. They are explained by the size of land parcels and their potential for use for housing. Where the index value is high, land parcels (and farms) are smaller and there is greater demand for rural living. The value of housing and the potential for housing comprise a greater proportion of the value of land. Areas of land to the south of the Hume Highway (in both the North East and Goulburn Broken catchments) and within commuting distance of Melbourne had some of the highest scores on this index. High farmland values act as a break upon farm consolidation, normally a business strategy to respond to declining terms of trade. This leaves two general strategies for farm businesses facing declining terms of trade – intensification of off-farm income.

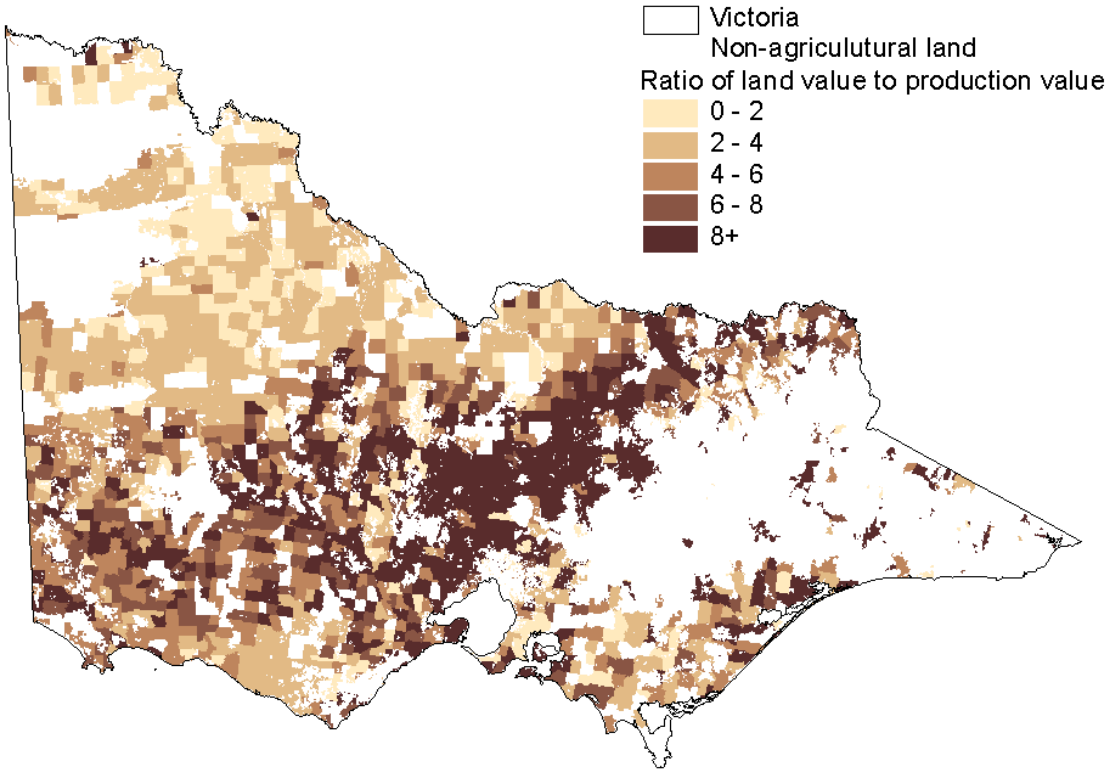


Figure 139 Ratio of land value to value of production in 1997 (based upon parish data supplied by ABS and the Victorian Valuer General's office)

This map was a statistical once-off, unable to be updated with more recent values. In 2001 the ABS ceased supplying Agricultural Census data at parish level, reverting to Statistical Local Areas. This data allowed the map to be recreated at SLA or LGA geography. Updated maps showed the same spatial pattern (Barr, 2008). However, in 2011 the ABS shifted to an entirely new population geography based upon population gravity rather than local government boundaries. Since then the matching of land value and production value data become much more challenging, well beyond the scope of this project.

Despite the challenges of matching census and land value data, we can infer that there will have been little change in the relative scores for the land to production value ratio since the 1997 data. Table 11 is drawn from the land value report of the Rural Bank (Rural Bank, 2020). It shows the median value of farmland per hectare for each LGA in the North East and Goulburn Broken catchments, as well as the annualized rise in value over the last five years. Alpine and Mansfield LGAS have the highest land values and are only surpassed by LGAS such as Cardinia on the outskirts of Melbourne. Indigo and Mitchell are the next highest. All but four LGAS have farmland values above the state average. Three SLAs have values below the State average – Moira, Towong and Strathbogie. For two of these LGAS isolation rather than amenity appears to be a partial explanation.

There have been two periods of rapid capital gain in farmland during this century. The first was the period 2001-2005. The second was between 2015 and 2019. In both cases the growth was reasonably consistent across industries and regions, indicating that the explanation lies not in the performance of agriculture but in the financial world, specifically low interest rates. The annual growth data shows higher annual growth in most of the higher amenity LGAs. Alpine stands out with an annual growth rate of over 16 per cent over five years. Little weight can be placed on the growth for Wodonga as there were very few transactions. Lower growth rates were observed in Towong, Moira and Strathbogie. This suggests that, if anything, the most recent inflation in farmland values has increased the gap between high and low amenity districts – an acceleration of farmland gentrification.

Table 11 Rural land values by LGA in 2019 (Source: Rural Bank)

LGA	Price per hectare	5yr annual growth (%)
Alpine	$ 12,182	16.6
Mansfield	$10,508	7
Indigo	$9,681	8.1
Mitchell	$ 9,652	12.3
Wodonga	$ 8,945	0.5
Murindindi	$8,852	9.7
Wangaratta	$8,388	10.4
Benalla	$8,022	7.4
Shepparton	$7,756	8.5
Victoria	$7,587	9.1
Moira	$7,371	6.5
Towong	$6,706	4.7
Strathbogie	$6,138	7.8

9 INDICATORS FOR NON-FARM RURAL RESIDENTS

We produced counts of rural residents using the following process:

- Sourcing population counts for Mesh Blocks classified as Agricultural. Mesh Blocks are the smallest geographical scale in the ABS statistical geography. Population and dwelling counts are the only available data. The ABS classify Mesh Blocks according their function. Agriculture is one classification and it means not residential, industrial, park etc. It probably looks like paddocks and crop land from the air. It is not necessarily commercial farmland.
- Aggregating Mesh Block counts to SA2 size. This gives a count of persons living in "agricultural areas" of each SA2.
- Subtracting the estimated owner-operator farm household population for each SA2. This population was explained in the previous section.
- The result is an estimate of the number of persons living in an SA2 who do not live in a town and who do not live in a household that includes someone for whom owner-operator farming is their main occupation.

The resulting estimates of the rural residential population are shown in Table 12. In both catchments rural residents greatly outnumber the farmer owner-manager farmer population. There is great spatial variation in the rural residential share of the rural population. At one extreme is the Omeo and Benambra area where this indicator suggests only 2 per cent of rural dwellers are rural residential. At the other extreme are the areas close to Wodonga, Kilmore, Beechworth and the Mansfield shire where rural residential makes up over 90 per cent of rural dwellers. The GMID, Towong shire and the mixed farming plains fall somewhere between these two extremes.

Table 12 Estimated to count of rural residents by catchment in 2016

North East		
	2011	2016
Rural residents	15996	18492
Per cent of rural population	85.9%	90.1%
Per cent of catchment population	17.4%	18.4%

Goulburn Broken		
	2011	2016
Rural residents	38843	39919
Per cent of rural population	86.0%	88.9%
Per cent of catchment population	23.4%	23.1%

To further explore the phenomenon of amenity influence in rural areas, there is one more map. This is of the ratio of unoccupied dwellings to all dwellings for SA1s of the catchment (Figure 141). This seems to show the influence of two different trends. In the Goulburn Broken catchment there is a relatively low level of occupancy in the mountain valleys leading to Mt Buller, and in the relatively unproductive farming lands surrounding the box-ironbark forests. In both cases it is probable this

represents weekender ownership. Occupancy increases in the north of the catchment. In the North East catchment, the higher levels of unoccupancy are in the Omeo and Towong regions. This is probably less a weekender effect but rather an outcome of farm aggregation and home abandonment. The extent of this trend is less pronounced than in the even more isolated grazing regions of the Gelantipy plateau to the east where aggressive farm aggregation strategies have depopulated the region.

These observations are consistent with the earlier identification of weekender and remote mountain regions as part of an overall geographic classification.

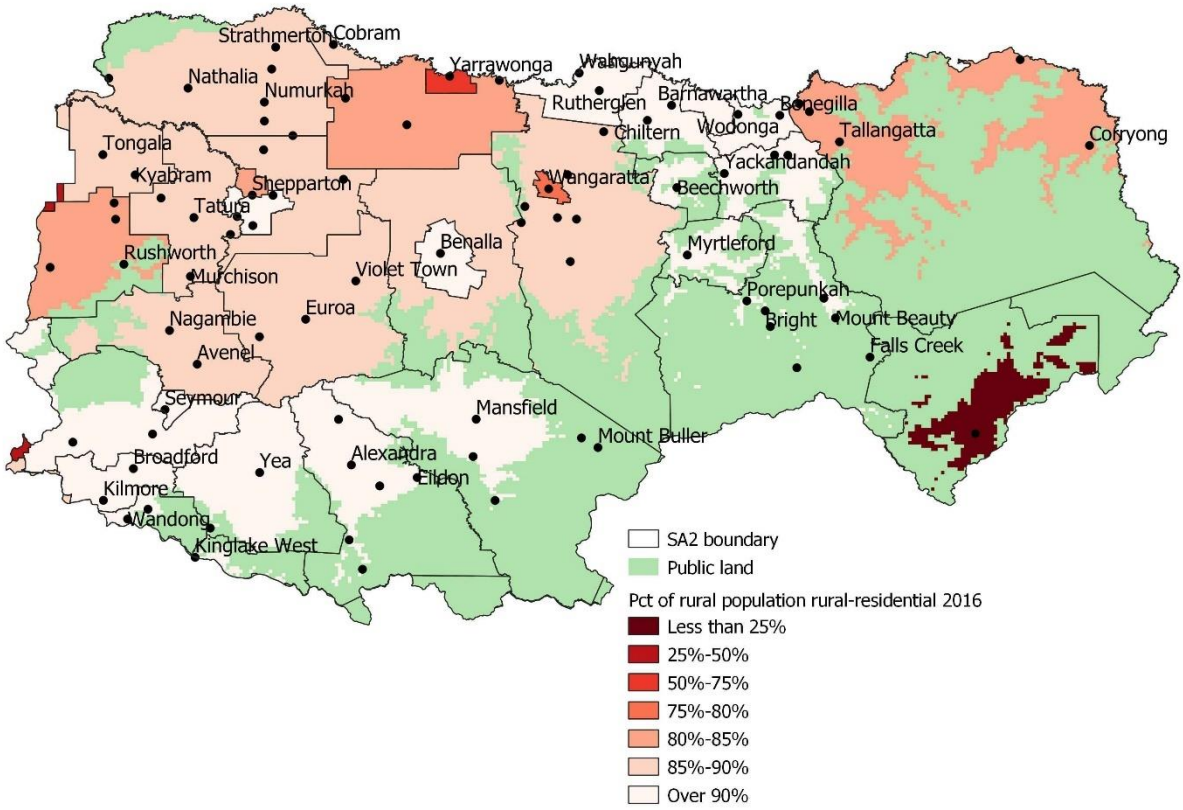


Figure 140 Rural residential residents as a per cent of all rural residents in SA2 2016

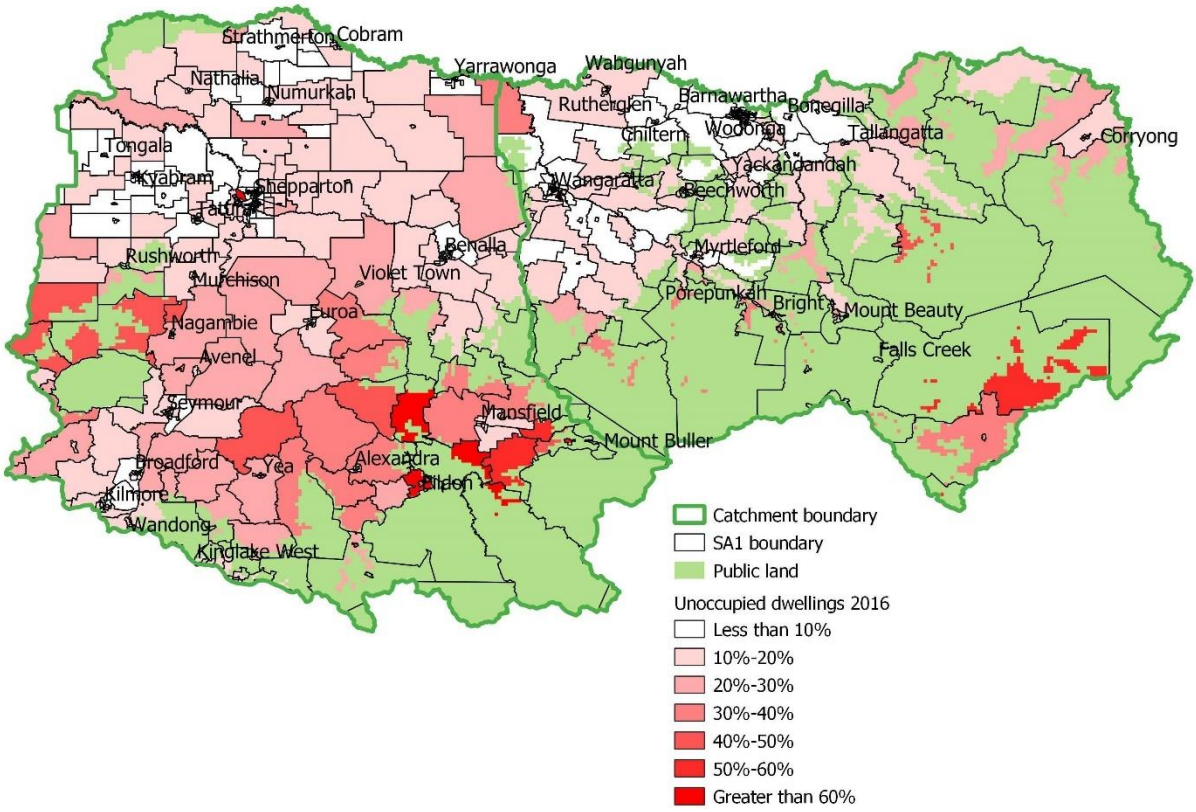


Figure 141 Unoccupied dwellings as a per cent of all dwellings by SA1 2016

10 TOWNSHIP CLASSIFICATIONS

The previous section was an unavoidable but dense recounting of a series of socio-economic indicators. In this section we try to combine the information in the indicators into a series of summary classifications.

One of the main outcomes of this report is the creation of a series of sub-regions of each catchment using socio-economic data. This is meant to inform the CMA's in assessing the relevance of their own catchment subdivisions. These socio-economic classifications needed to be viewed as just one of four perspectives with which one may approach the task of sub-catchment classification.

- Catchment and sub-catchment.
- Ecological structure.
- Social gravity (based upon travel connections)
- Socio-economic characteristics.

Each of these approaches has advantages. Water catchments are clearly sensible for water management. Ecological structures are sensible for management of ecological systems, though it is inevitable they will overlay at right angles to catchments. Social gravity will be how communities construe their regions. The final approach, socio-economic characteristics, combines areas according to socio-economic similarity. It should not be expected to be congruent with any of the other three approaches.

We have chosen to create four classifications, based upon different areas (towns or rural SA1s) and different choices of input variables. The four presented in this report represent the results of many attempts to classify the data, most of which were not reported. The four reported classifications are:

- Selected industry of employment variables for towns for 2016.
- Selected other demographic and socio-economic variables for towns for 2016.
- Change of state variables (industry of employment, demographic and socio-economic) for towns for various periods leading to 2016.
- Classification of "Primary Production" SA1s with an area greater than 10 square kilometres.

The classification process for towns was as follows –

- Elimination of variables that showed little geographic variation (subjective based upon mapping undertaken in the previous section) or showed too great a level of spatial variation. Useful indicators are those which display spatial "nuggetiness". These are indicators with meaningful spatial differences across the map, but whose spatial distribution is not random but instead shows clustering of adjacent towns (or SA1s).
- Data reduction via factor analysis (principle components analysis, varimax rotation, factor scores extracted via regression method) of data for all Victorian towns or SA1s.
- Clustering of factor scores using hierarchical cluster analysis (Euclidean distance) for towns in the North East and Goulburn catchments.
- Mapping of resulting cluster options to subjectively determine the number of clusters.

This combination of factor analysis and classification analysis is a standard procedure for the exploration of socio-economic data. The first factor analysis stage reduces the number of variables by grouping together variables which co-vary. As an unrelated example, measures of body weight and waist circumference can be generally expected to co-vary. Someone of higher weight will tend to have a larger waist size. In contrast, weight, and eye colour will generally not co-vary. Data reduction via factor analysis is important to a classification analysis as it reduces the number of variables and ensures that those which are fed into the cluster process are independent and are not

double counting the same underlying feature. There is a four minute read linked in the references section for those who wish to better understand the process (Anon, n.d.).

Hierarchical cluster analysis starts with the full number of cases and successively joins cases into groups based upon how similar (or close together) they are using the classification variables. This is a much more computationally intensive process so the classification was limited to towns within the two catchments, rather than all Victorian towns.

10.1 TOWN INDUSTRY OF EMPLOYMENT CLUSTERING

The results of the factor analysis are shown in

Table 13. There are four orthogonal factors. High scores for a variable indicate that it provides a high contribution to the factor score. The factors could be summarized as follows:

- Factor 1: High end services own -Relatively low agricultural employment, relatively high employment in business services, construction;
- Factor 2: Manufacturing town - relatively high employment in manufacturing, relatively low employment in education and health;
- Factor 3: Retail Town - Relatively high employment in retail, low public sector employment; and
- Factor 4: Distribution services town - Relatively high employment in distribution services.

Table 13 Factor analysis of industry of employment variables for 2016

Rotated Component Matrix[a]

	Component			
	1	2	3	4
Percentage employed in agriculture 2016	**-.813**	-.162	.075	.088
Percentage employed in manufacturing 2016	-.172	**.805**	.210	-.085
Percentage employed in construction 2016	**.609**	.239	.133	.391
Percentage employed in retail 2016	-.222	.243	**.655**	-.235
Percentage employed in public services 2016	-.129	.133	**-.888**	-.196
Percent employed in higher skill business service industries 2016	**.782**	-.192	-.075	.026
Percent employed in accommodation, cafes, arts, recreation in 2016	**.543**	-.337	.003	-.406
Percent employed in health and education 2016	**-.310**	**-.687**	.238	-.240
Percent employed in transport, warehousing distribution 2016	-.026	.004	-.007	**.886**

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 8 iterations.

These four factors were used for a “guided” hierarchical clustering process. This resulted in six clusters. The differences in these clusters are based upon the relative share of each industry in employment counts. The “relative” is important. For example, a town with a retail classification may have a high level of employment in another sector. However, it differs from the average Victorian town because of its retail share.

- Retail and low agriculture – 21 towns with relatively high compositions of retail and relatively low agricultural employment. Retail will be a much more dominant industry in each.
- Retail, manufacturing – 11 towns with relatively high shares of employment in retail and manufacturing and a low share in public service.
- Accommodation etc., retail, education and health – 7 towns with a higher share in the accommodation-café-art-recreation sector, as well as retail, education and health.
- Distribution and construction – two towns with a high share of distribution and construction employment in the south of the Goulburn catchment.
- High business services and accommodation – the two ski fields of Buller and Falls Creek.
- A single outlier with high public service employment – Bonegilla with its army facilities.

In viewing the map, one must keep firmly in mind that this maps difference between towns in the catchments, not absolute numbers of employment. For many towns in the retail and agriculture cluster, the main industry is health and education. However, high employment in these sectors is common across most towns in the catchments. For this reason, the map of the cluster is presented together with the map of main industry.

Perusing Figure 142 and Figure 143 some spatial clustering is apparent:

- An arc of towns to the north and west of Shepparton with greater reliance upon manufacturing, including food manufacturing.
- Some small clusters of accommodation-retail towns as well as some isolated examples.
- Construction and distribution on the Melbourne fringe.
- Outliers in the ski resorts (business services associated with visitation) and Bonegilla.

This result is not enough to develop a full clustering of the catchment towns but can be an important contribution to the subjective assessment needed to create a useful spatial cluster.

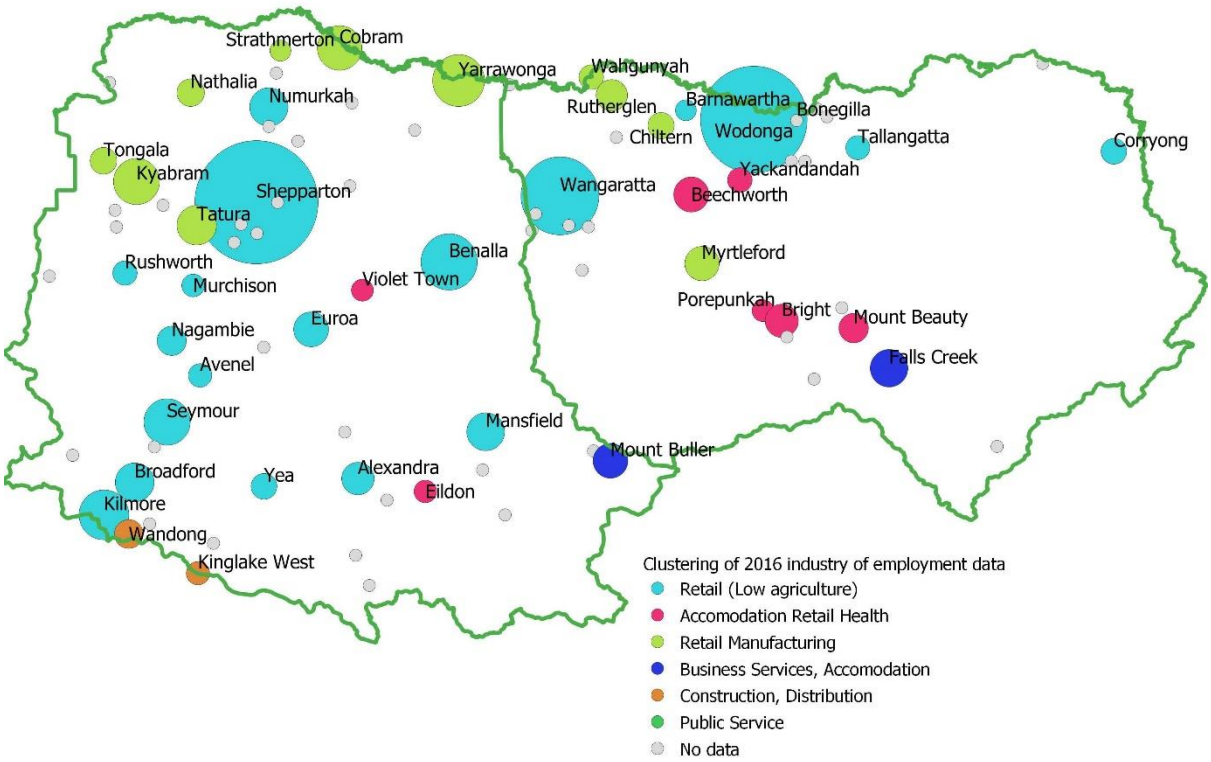


Figure 142 Results of cluster analysis of industry of employment data for 2016

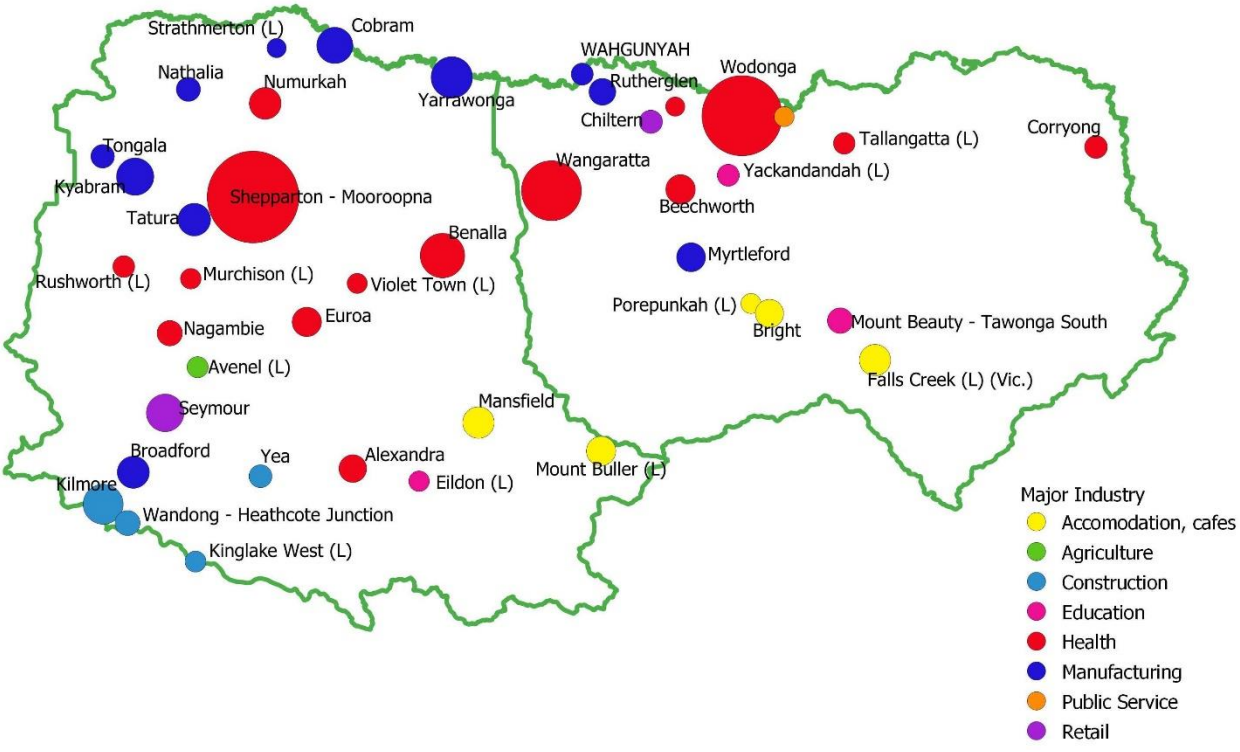


Figure 143 Main industry of employment in 2016

10.2 CLASSIFICATION OF TOWNS BY DEMOGRAPHIC AND SOCIO-ECONOMIC INDICATORS FOR 2016

The second factor analysis used socio-demographic variables other than main industry. It produced six orthogonal factors (Table 14). The factors could be summarized as follows:

- Factor 1: Family formation - High scores on families with children, household size, participation rate, per cent in highest income quartile, number of vehicles. Low scores on persons aged over 65, couples with no children.
- Factor 2: Household instability - Relatively high scores on per cent dwellings privately rented, visitors as per cent of population, per cent of enumerated population in non-private dwellings. Low scores on dwellings owned or part-owned by residents, usual residents at same address 5 years ago.
- Factor 3: Disadvantage – High scores on unemployment, persons with no post-school qualification, indigenous identification. Low scores on degree qualifications, unoccupied private dwellings.
- Factor 4: Education - Relatively high scores on degree education.
- Factor 5: Welfare – High scores on government rental, single parents.
- Factor 6: Migration – High scores on non-English speaking and birth overseas.

Factor 4 was dropped from the cluster analysis due to the low number of variables scoring highly on the factor and the high number of variables scoring moderately. Attempts to use this variable in the clustering complicated the interpretation. Factors 5 and Factor 6 were also dropped due to the low number of highly weighted variables. The first three factors account for 64% of the variance in the data set. The last three factor eliminated from further analysis account for only 15 per cent of the total variance.

Table 14 Factor analysis of demographic and socio-economic variables for 2016

Rotated Component Matrix[a]

	Component					
	1	2	3	4	5	6
Unemployment rate 2016	-.131	-.070	**.857**	.060	.010	.004
Workforce participation rate 2016	**.885**	-.009	-.177	.318	-.005	-.040
Percent in lowest national income quartile 2016	**-.900**	.201	.205	-.099	.032	-.038
Percent in highest national income quartile 2016	**.780**	-.204	-.371	.156	.038	.160
Average household size 2016	**.943**	-.210	.081	-.069	-.091	.091
Single parents as percent of families in 2016	-.020	.036	.244	-.226	**.841**	-.084
Couples with children as percent of families 2016	**.932**	-.141	.007	-.044	-.186	.001
Couples with no children as percent of families 2016	**-.854**	.076	-.173	.187	-.321	.044
Percent of persons aged over 15 with degree qualification 2016	.007	.083	**-.598**	.611	-.110	.077
Percent of persons aged over 15 with no post-school qualification	-.188	-.016	**.610**	**-.646**	.161	.001
Percent of persons who speak non-English language at home 2016	.169	.179	.085	-.084	.240	**.897**
Percent of persons born overseas	-.094	.285	-.085	.274	-.132	**.858**
Percent of persons identifying as indigenous 2016	.081	.123	**.608**	-.024	.236	.112
Percent of private dwellings owned or part-owned by residents	.234	**-.775**	-.079	.012	-.375	-.251
Percent of private dwellings rented from government by residents	-.017	.337	.044	-.059	**.797**	.213
Percent of private dwellings privately rented by residents	-.097	**.878**	-.016	-.082	.275	.080
Average vehicles per household 2016	**.678**	-.509	.040	.027	-.425	-.092
Percent of enumerated population in non-private dwellings	-.422	**.624**	-.150	-.199	-.222	.096
Percent of private dwellings unoccupied 2016	-.469	.101	-.055	**.697**	-.249	.076
Visitors as percent of enumerated population 16	-.149	.460	-.558	.180	.050	.242
Per cent persons aged between 0 and 17 in 2016	**.881**	-.015	.001	-.148	-.028	-.059
Per cent persons aged between 18 and 24 in 2016	**.609**	.152	.403	-.141	.417	-.009
Per cent persons aged between 25 and 64 in 2016	.462	-.137	.097	**.764**	-.064	.098
Per cent persons aged 65 plus in 2016	**-.912**	.040	-.164	-.290	-.064	-.017
Percent of usual residents in 2016 at same address 5 years ago	.023	**-.899**	-.016	-.155	-.002	-.119

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

These four factors were also used for a “guided” hierarchical clustering process. The two ski resort towns were excluded so the characteristics of the mainly visitor population did not influence the clustering process. This resulted in four clusters and two outliers.

- Unchanging country towns – 21 towns characterized by being unremarkable. These towns scored low on factor 2, household instability. They scored high on residents being at same address five years ago and having higher levels of home ownership. Low scores for rental, overseas born and visitation.
- Rural gentrification towns – 7 towns with low scores on factors 2 and 3 (instability and disadvantage). They scored high on measures of higher income, higher education, home ownership, overseas born, visitation and address stability. They scored low on measures of unemployment, low education, non-English speaking households, rent, indigenous and persons aged 18-24.
- Aged towns – 4 towns with a low score on factor 1 (family formation.). They had high scores on measures of unemployment, low education, over 65 years of age, unoccupied buildings. They scored low on measures of workforce participation, household size and education and vehicle ownership. These towns may be a special case of the first group due to a relatively high population in aged care facilities.
- Family formation towns – 6 towns with high scores on factors 1 and 2 (family formation and household instability). These towns scored high on measures of workforce participation, higher incomes, household size, children, rental and vehicle ownership. They score low on measures of low income, older persons, address stability and unoccupied dwellings.
- There were two clear outliers – Bonegilla with its high proportion of younger employed persons associated with the army, and Wandong-Heathcote Junction. The latter appears to be because of a remarkably high proportion of children, so it makes sense to consider this an extreme example of a family formation town.

Perusing Figure 144 some spatial clustering is apparent:

- An arc of towns in the riverine plain are in the first and largest cluster.
- The gentrification towns are where one would expect, being closer to both mountains and to the major population centre of Albury-Wodonga.
- Family formation towns are the two major population centres, as well as the Kilmore-Wandong area to the south. Mansfield is somewhat of an outlier.

This result is not enough to develop a full clustering of the catchment towns but can be an important contribution to the subjective assessment needed to create a useful spatial cluster.

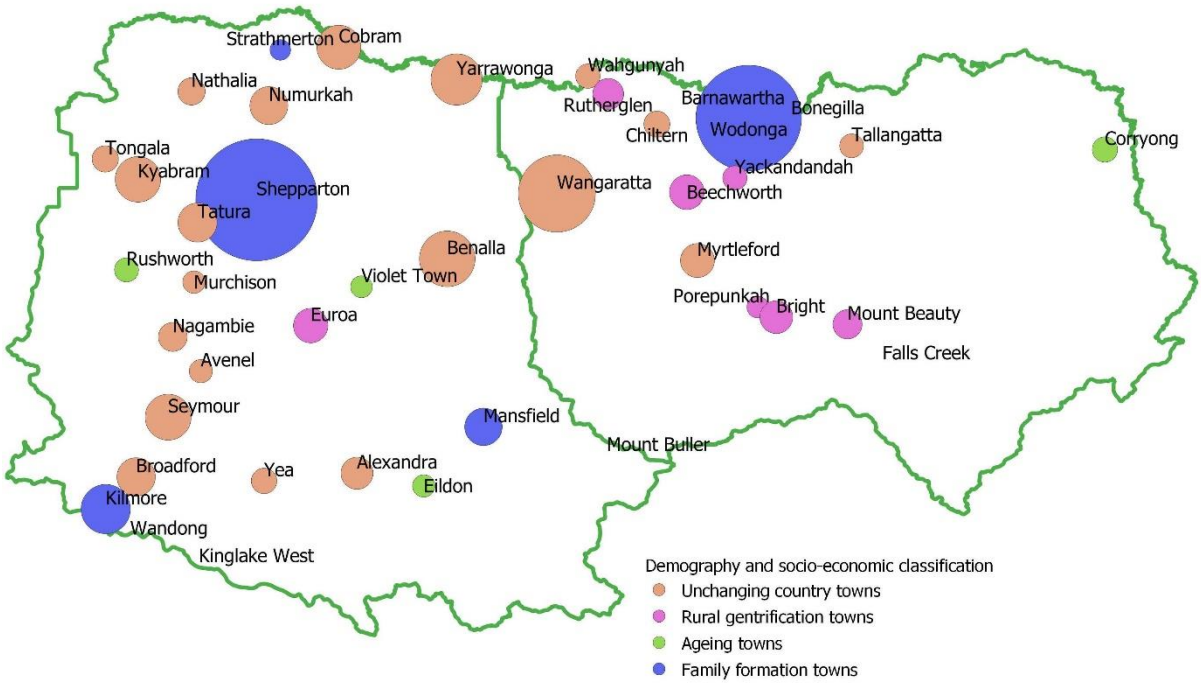


Figure 144 Classification of towns by demographic and socio-economic variables for 2016

10.3 CLASSIFICATION OF TOWN DEMOGRAPHIC AND SOCIO-ECONOMIC CHANGE INDICATORS

The results of the third factor analysis are shown in (

Table 15). There are five orthogonal factors accounting for 77% of the variance in the variables chosen for analysis. High scores for a variable indicate that it provides a high contribution to the factor score. The factors could be summarized as follows:

- Factor 1: Shift to a services economy – this factor has high weightings for increase in employment in business services, decrease in proportion of older persons, increased workforce participation, increase in population aged 15-64 and a decrease in manufacturing employment share.
- Factor 2: Population growth – This factor has high weightings for increased population in both 2006-2016 and 1996-2016, and for an increase in dwelling count between 2006 and 2016.
- Factor 3: Increasing education level – This factor has high loadings on increased proportion holding degrees and decreased proportion with no post-secondary education.
- Factor 4: Decreased relative income – This factor associated with a growth in per cent in lowest national income quartile, decline in the proportion in highest national income quartile, increased share of employment in health and education, decline in share of employment in manufacturing.
- Factor 5: Family formation – This factor associated with an increase in proportion of households that are couples with children, a decrease in the proportion of households that are couples with no children, and a decrease in share of employment in accommodation, cafes, arts, recreation.

All five factors were used in the cluster analysis. This produced five groupings and five outliers. The five groupings were as follows –

- Business as usual - The largest of 14 towns was distinguished by increased employment share for health and education, increased family formation, and no increases in employment in accommodation or business services category. This included the two largest towns, together with many of the mid-sized towns on the riverine plain.
- Shrinking households - A group of two, Corryong and Porepunkah, with declining household size, declining population but also a declining proportion with low incomes. Post the 2019/20 fire season the situation in Corryong will have changed.
- Gentrification – Another small group of two towns, Beechworth and Bright. Increasing share of higher income earners, rising education levels, no shift in economy towards education and health.
- Early gentrification – 3 towns with rising education levels, increasing population but less associated with rising share of high-income earners. This might be considered an example of early gentrification as described in Richard Florida's "Creative Class" model (Florida, 2003).
- Ageing towns – 5 towns with a structurally ageing population, decreasing workforce participation, increasing proportion in the lowest income quartile, increasing share of employment in health, education, and accommodation etc.

The five outlier towns were Chiltern, Strathmerton, Kilmore, Rushworth and Bonegilla. The reasons for each being outliers are quite different. Once again for Bonegilla it is army employment. For Kilmore it is rapid population growth. For Strathmerton it is a greater decline in manufacturing employment. For Chiltern it is the greatest rise in business services as a share of employment. For

Rushworth it is a combination of much more rapid structural ageing, a decline in education levels and decline in participation rates. It could be considered an extreme example of the ageing towns grouping.

Table 15 Variable loadings on factor analysis of demographic and socio-economic change variables

Rotated Component Matrix[a]

	Component				
	1	2	3	4	5
Change in per cent employed manufacturing 2001-2016	**-.671**	.003	.239	**-.582**	.061
Change in percent employed in accomm, café, arts, recreation 2001-06	-.165	-.157	.107	.373	**-.634**
Change in percent employed in education and health 2001-2006	.120	-.028	-.202	**.630**	.172
Change in labour participation rate 1986-2016	**.691**	.127	.247	-.255	.170
Change in number of dwellings 2006-2016	.221	**.830**	.386	.041	-.062
Change in per cent of couples with dependent children 2006-2016	.140	.092	.121	.193	**.878**
Change in per cent of couples with no dependent children 2006-2016	.076	-.009	.120	-.169	**-.903**
Change in per cent of persons with degree education 1986-2016	.089	.044	**.955**	-.074	-.059
Change in per cent of persons with no post-school qualification 1986-2016	-.241	-.257	**-.847**	.221	.050
Per cent change in population 2006-2016	.199	**.845**	.236	.128	.131
Per cent change in population 1996-2006	.056	**.896**	-.186	-.047	.144
Change in per cent of persons aged 15-64 1986-2016	**.745**	.273	.293	.119	.016
Change in per cent of persons aged 65 or over 1986-2016	**-.837**	-.249	-.176	.031	-.097
Change in per cent of persons in lowest national income quartile 2006-2016	-.108	.150	.233	**.847**	.181
Change in per cent of persons in highest national income quartile 2006-2016	-.047	-.026	.362	**-.658**	.186
Change in per cent employed in IT, real estate, finance, professional 2006-2016	**.823**	-.025	-.087	.107	.004

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

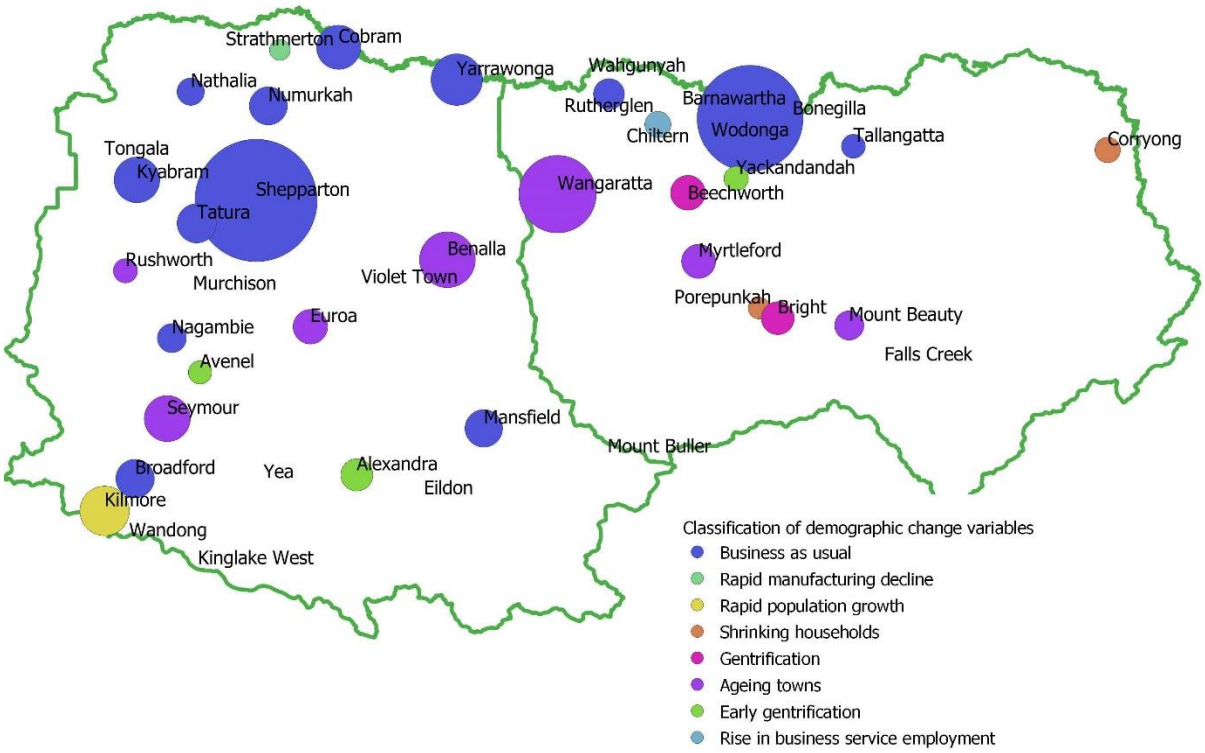


Figure 145 Classification of demographic and socio-economic change variables

10.4 ISSUES WITH TOWNSHIP CLUSTERING

10.4.1.1 Spatial clustering

We have explored indicators and created three different classification analyses. The results have provided mixed progress in identifying a geographic classification of the socio-economic condition of the catchment. A subjective gathering of the threads of the empirical analysis suggests maybe eleven geographic zones:

- Wodonga – Growing population, high workforce participation, residential migration
- Shepparton – similarities to Wodonga, but lower incomes, greater cultural diversity
- River resort towns
- Remote mountain towns – Corryong, Cudgewa, Tintaldra. Limited data, but that which exists shows gradual structural ageing and population decline.
- Mountain weekender hamlets – smaller settlements with a high absentee population.
- Tourist accommodation towns – main examples Beechworth and Bright. High education, rising incomes, slow population growth suggesting displacement of lower income population over time.
- Ski resorts – Buller, Hotham, Falls Creek
- Melbourne fringe – Kilmore and surrounds. High population growth, larger households, construction industry employment.
- Hume corridor – Seymour, Benalla, Wangaratta. Gradual economic decline suggested by data. Some significant pockets of low income, falling incomes, and structural ageing. Employment in accommodation for travelers rather than tourists.
- Murray irrigation towns – historic dependence upon dairy manufacturing. Declining employment in manufacturing since 2001 associated with shrinkage of dairy production due to drought, competition for water and international competition lowering milk prices.
- Small towns in the mixed farming zone – generally south of Shepparton and north of the Hume. Structural ageing, smaller households, lower workforce participation, retail, health and education are the main employers.

10.4.1.2 Spatial Heterogeneity

These areas have been listed rather than mapped at this stage. The indicator analysis reveals an important degree of heterogeneity in town function. These regions often overlap, and there are quite a few outlier towns who have a different function to their neighbours. Any classification needs to deal with this heterogeneity. One approach could be to think in terms of regional function rather than town function. An example is Wodonga and its satellite dormitories. The towns of Yackandandah, Bonegilla, Barnawartha and Tamgambalanga are each quite different from the other. However, their existence is dependent upon the centre of Albury-Wodonga. They reflect different cultural groups who often commute to Wodonga.

A second example is outlier towns like Myrtleford, functionally quite different to nearby accommodation towns such as Bright and Beechworth.

A final example will be experienced in comparing the rural residents of surrounding Seymour with the town of Seymour itself. There will be important differences in socio-economic status measures of the two populations which would be hidden by any analysis which averaged data for the region.

10.4.1.3 Decoupling from productive landscapes and socio-ecological function

Part of the thinking behind this project was an interest in the concept of "socio-ecological landscapes". The results so far suggest that at least for urban and town populations, the influence of ecological landscape is declining. A century ago, the ecological function of the landscape influenced the agricultural possibilities, and agricultural possibilities shaped town development. Since that time agriculture has occupied a gradually shrinking share of the national economy, and of the economies of these two catchments. Much of what happens in rural Victoria today is shaped by three factors:

- The gradual conversion of the economy into one where wealth is increasingly generated by high skill services. This leads to an aggregation of high skill service businesses in major population centres. The location of population centres is generally a result of history of trade, transport, and settlement. Distance from centres of employment becomes more important to social and economic development than ecological function.
- The gradual structural ageing of the Australian population, leading to increased employment in human services. Human services are located according to population rather than ecological function.
- Increasing urban incomes creating demand for recreation and amenity experiences. This creates gentrification pressures in towns such as Beechworth, and weekender patterns of settlement within a few hours' drive of Melbourne. The impact of these pressures on agricultural viability is documented elsewhere (Barr, The House on the Hill: The transformation of Australia's Farming Communities, 2009) (Barr, 2008).

These influences will mean that linking socio-economic function to ecological function will increasingly become mediated by the historic influence of ecological function rather than its contemporary influence.

11 CLASSIFYING "PRIMARY PRODUCTION" SA1S

11.1 PROCESS OF DATA RESTRUCTURING

The classification of rural areas was conducted as follows:

- Only used data for Victorian SA1s classified by the ABS as Primary Production and with an area greater than 10 square kilometres.
- Omitted variables which were not nuggety – i.e. lack obvious spatial diversity and clustering. This left 25 variables.
- Performed a factor analysis for all Victorian SA1s that met the above criteria.
- Used the resulting factor scores and selected individual indicators to subjectively form a 20-group cluster of the rural areas of the two catchments. This path was followed as attempts to use hierarchical cluster analysis failed to create meaningful spatial clusters. If time permitted, we would have tried a spatially constrained clustering process.

11.2 SUMMARISING THE INDICATORS – SIX FACTORS AND MAPS

The factor analysis produced six factors. The scree plot of eigenvalues suggests that the first five would have been suitable for clustering. The factor scores for the six factors are shown in Table 16. Maps of the factor scores are also shown in the following figures. The reader interested in a limited set of indicators might consider these to be another form of classification of the catchments.

Our interpretation of the meaning behind the factors is:

- Factor 1: Structural ageing in the catchment. Eight variables loaded highly on this factor. Four of these related to age. The other four related to income and household size. A low score on this factor implied more older residents, fewer younger residents, smaller household size and lower income. A high score means more younger persons, larger households, and higher incomes. These latter areas show up around Kilmore, Shepparton and Wodonga.
- Factor 2: This factor is about education and its benefits. Areas that scored high on this factor had a high proportion of the population with degrees, a low proportion with no post-school education, greater employment in white collar industries and higher incomes. SA1s along the Hume Highway were generally the high scorers on this factor, together with the Mansfield area. Low scores were on the periphery around Shepparton and Corryong.
- Factor 3: This factor measures the agricultural or urban nature of the SA1. Areas with high scores have a higher proportion in retail, manufacturing, and construction employment. Those scoring low have low employment in these areas and a higher share of agricultural employment. Clustering of high scores can be found in proximity to larger population centres.
- Factor 4: This factor measures growth. SA1s scoring high on this factor have experienced population increase, dwelling count increases, higher population density and have higher levels of residential mobility. The map of this factor is more heterogenous than the previous factors. The clear winners in growth are Wodonga and Kilmore areas.
- Factor 5: Visitation and amenity. SA1s that score low on this factor have a higher proportion of visitors, people in non-private housing, unoccupied dwellings and employment in accommodation, cafes, arts, and recreation. There are some expected areas that score low (as in high visitation) on this factor – the upper Ovens, Mansfield and along the Murray

resorts. However, some unexpected SA1s also pop up – Omeo and Nagambie. One can overlook the impact of nearby high mountains or large water impoundments.

- Factor 6: Multiculturalism. This factor has high scores on non-English home language and being born overseas. The high scoring SA1s are in parts of the GMID, Myrtleford, the King valley and around Cobram.

Table 16 Factor scores for factor analysis of rural SA1s

Rotated Component Matrix[a]

	Component					
	1	2	3	4	5	6
Farmers as per cent of workforce 2016	.028	-.360	**-.842**	-.106	.187	-.119
Median population age 2016	**.896**	.004	.015	-.199	.110	-.107
Per cent population aged over 65 in 2016	**.888**	-.107	.014	-.091	.074	.017
Per cent population aged under 20 in 2016	**-.725**	-.016	-.007	.099	.166	-.270
Average household size 2016	**-.742**	.165	.277	-.012	.216	.171
Population density in 2016	-.262	.189	.314	**.626**	.012	.267
Per cent of dwelling unoccupied 2016	.527	-.023	-.316	.075	-.453	-.079
Per cent change in number of dwellings	-.080	.066	-.006	**.937**	.095	.108
Per cent population aged between 20 and 24 in 2016	-.469	-.054	.071	-.030	-.318	.433
Per cent population employed in accom, cafe, arts, recreation in 2016	.198	.089	.298	.085	**-.687**	-.044
Per cent population employed in IT, finance, real estate, professions in 2016	-.001	**.657**	.300	.061	.066	.122
Per cent population with degree 2016	.096	**.880**	-.010	.098	-.097	-.034
Per cent population with no post-school education 2016	.005	**-.819**	-.136	-.108	.080	.202
Per cent of persons visiting on census night in 2016	-.097	.027	-.094	-.032	**-.793**	.083
Per cent persons in private dwellings	.035	-.042	.149	.025	**.715**	-.306
Median family income 2016	-.500	**.671**	.176	-.024	-.035	.174
Per cent persons speaking English language at home in 2016	.053	.089	-.101	-.214	.066	**-.831**
Per cent workforce employed in manufacturing 2016	.027	-.085	.547	-.045	.171	.149
Per cent of persons living at same address 5 years ago	.171	-.071	-.175	**-.653**	.343	-.054
Median personal income 2016	-.507	**.664**	-.016	.082	-.008	.072
Per cent persons born overseas 2016	.208	.143	.212	.214	-.191	**.780**
Per cent change in population 2011-16	-.090	.073	-.007	**.936**	.066	.100
Per cent workforce employed in agriculture in 2016	.015	-.401	**-.837**	-.111	.177	-.083
Change in per cent persons aged 65 or over 2011-16	.578	-.023	.099	-.306	.087	.158
Per cent workforce employed in retail 2016	-.039	-.071	**.654**	.146	.081	-.134
Per cent workforce employed in construction 2016	-.122	.193	**.640**	.003	.010	.159

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

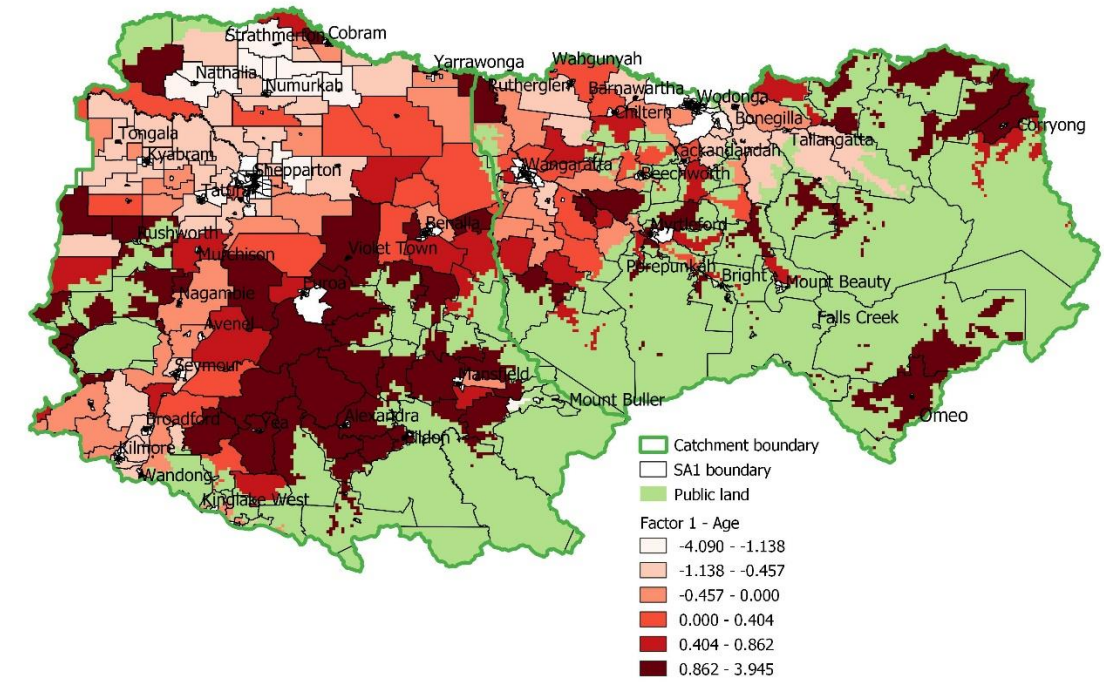


Figure 146 SA1 factor analysis factor 1 Structural ageing

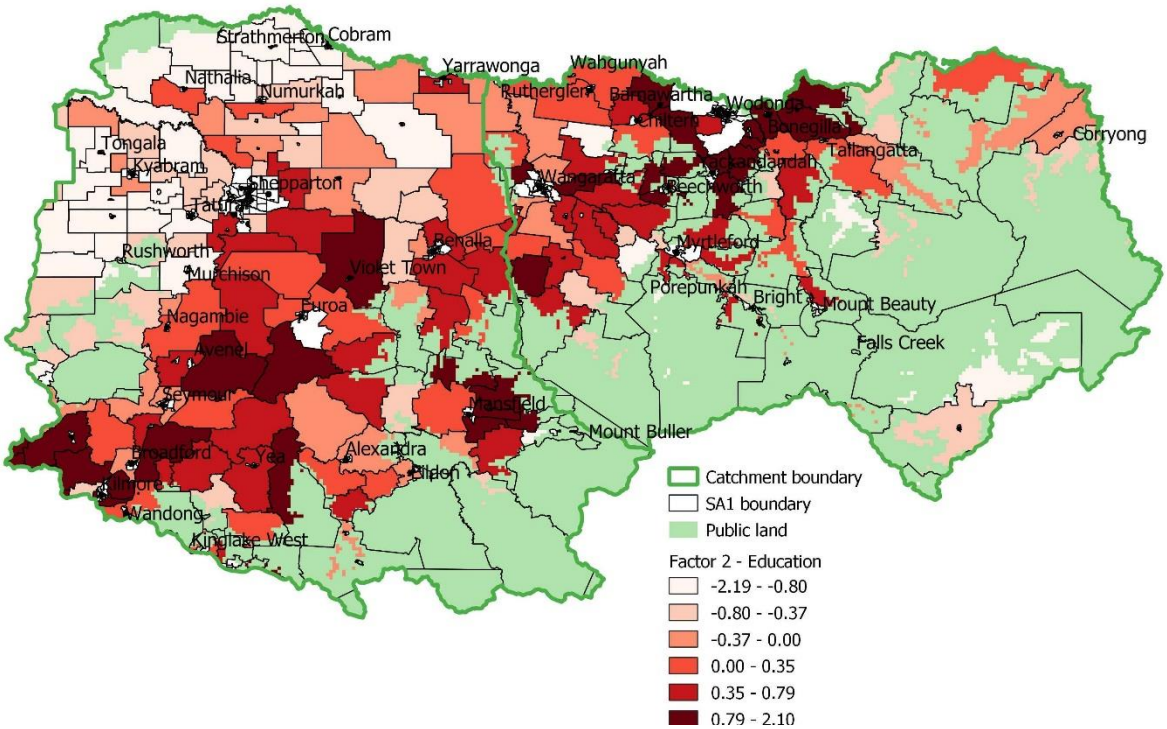


Figure 147 SA1 factor analysis factor 2 – education and its benefits

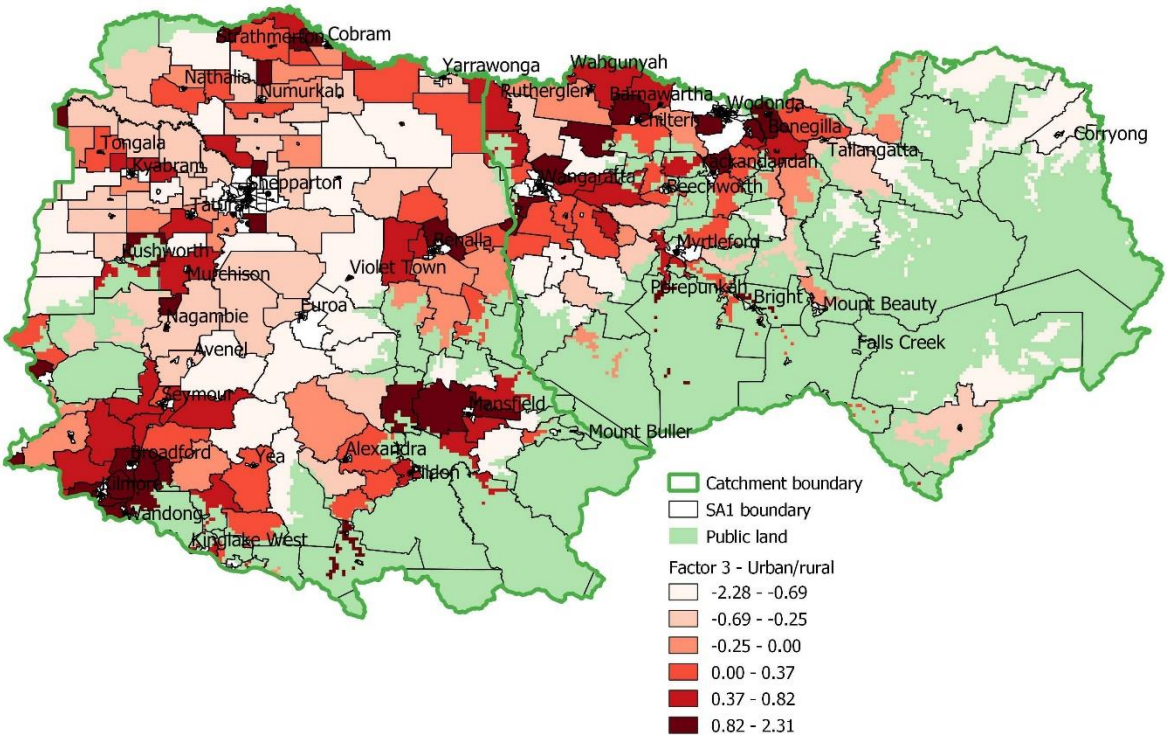


Figure 148 SA1 factor analysis factor 3 – rural/urban

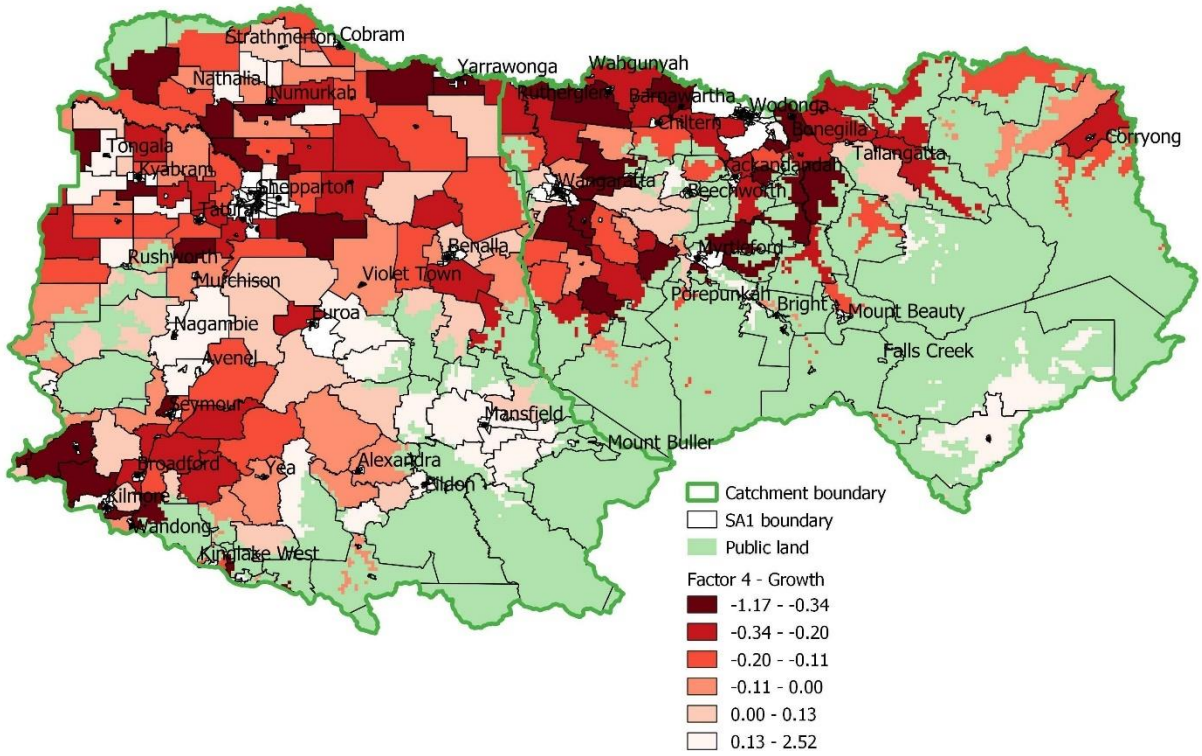


Figure 149 SA1 factor analysis factor 4 – growth

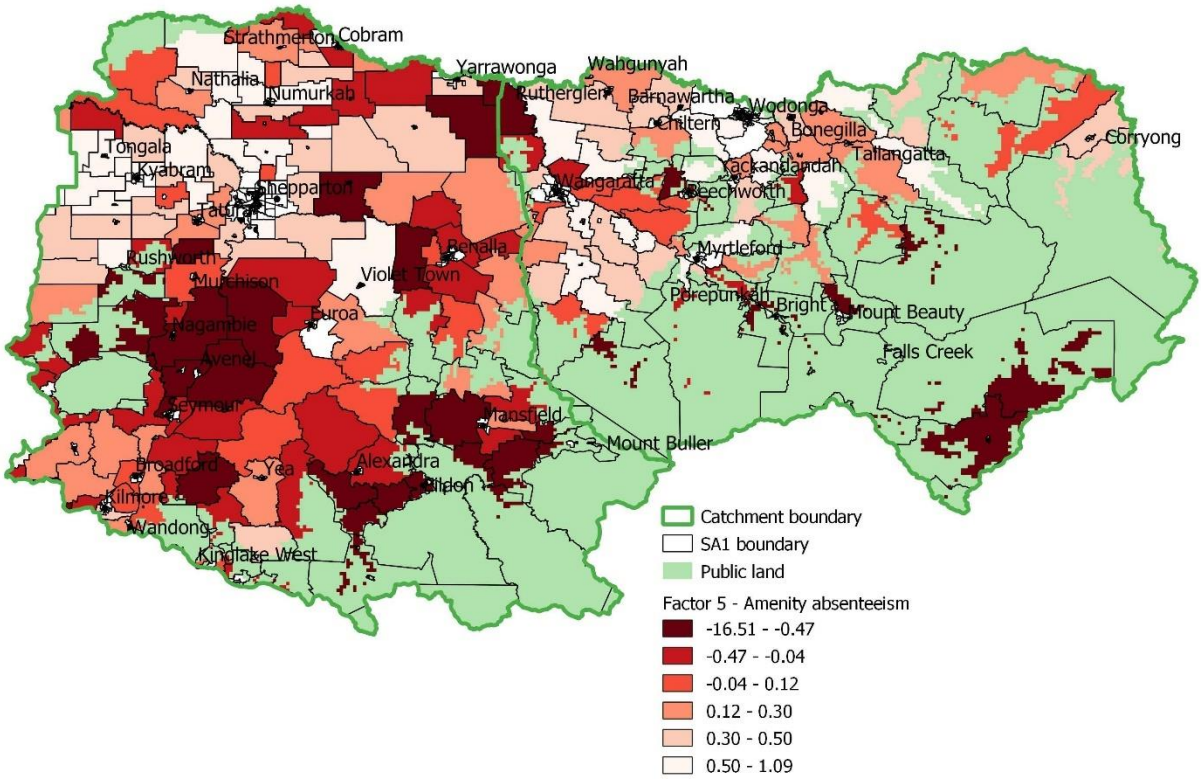


Figure 150 SA1 factor analysis factor 5 – visitation and amenity

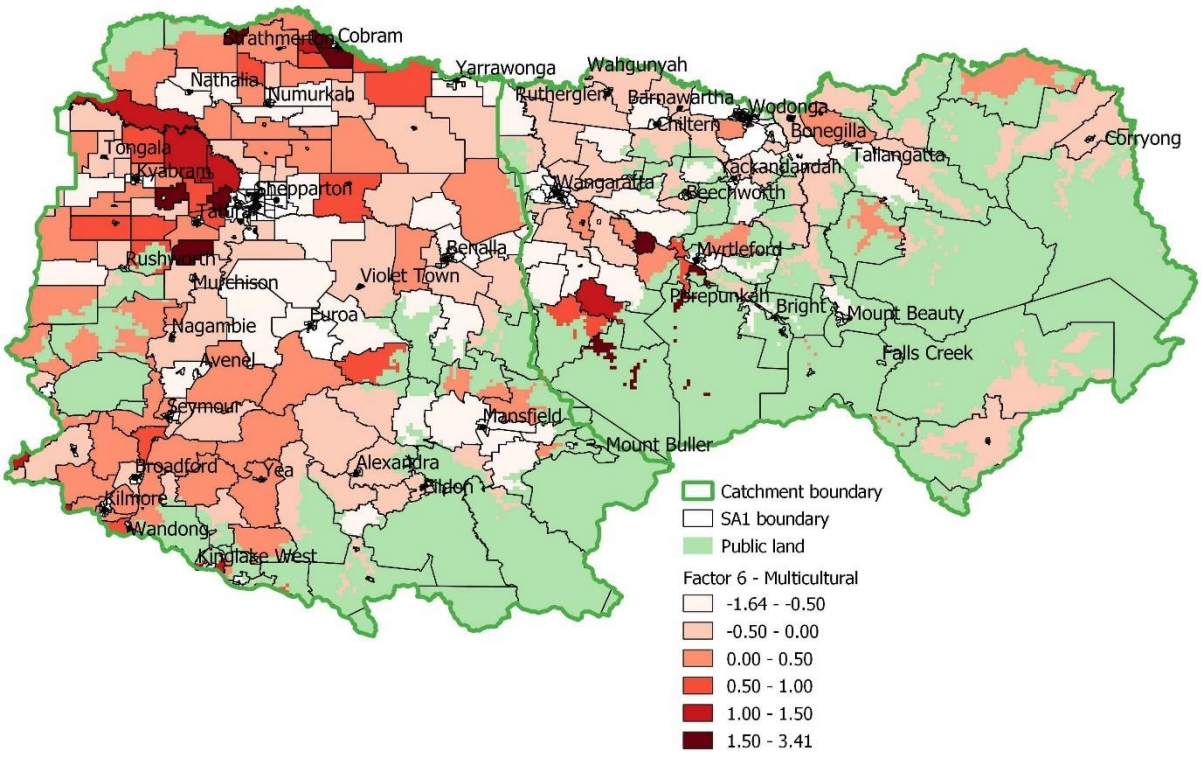


Figure 151 SA1 factor analysis factor 6 - multicultural

11.3 A SUBJECTIVE CLUSTERING OF RURAL SA1S

Attempts at an unguided empirical clustering failed to produce useful clustering. This could be taken of a sign of the heterogeneity in the catchment, or that we were not using the best tool. The best tool might be spatially constrained clustering of some form. Lacking the time to implement a spatially constrained clustering algorithm, the alternative path of subjective clustering was followed. This was based upon the six factor scores and the nuggety individual indicators.

There are 20 regions in this cluster – 8 in the north east and 13 in the Goulburn Broken. The classifications can be nested to form a more generalized classification. As always, greater generalization will mask heterogeneity between sub-regions.

The characteristics of each region can be discovered in Table 17. This shows the average SA1 factor score for each of the 20 regions. The factor scores are based upon the characteristics of all Victorian SA1 with an area greater than 10 square kilometres. Factor scores have a mean of 0 and standard deviation of 1. A score of 0 means that the region is on the state average. A score of 1 means that it is one standard deviation away from the state average.

In the table scores that differ meaningfully from the catchment distribution are bolded. These bolded scores tell us how each SA1 might differ from the average rural Victorian SA1.

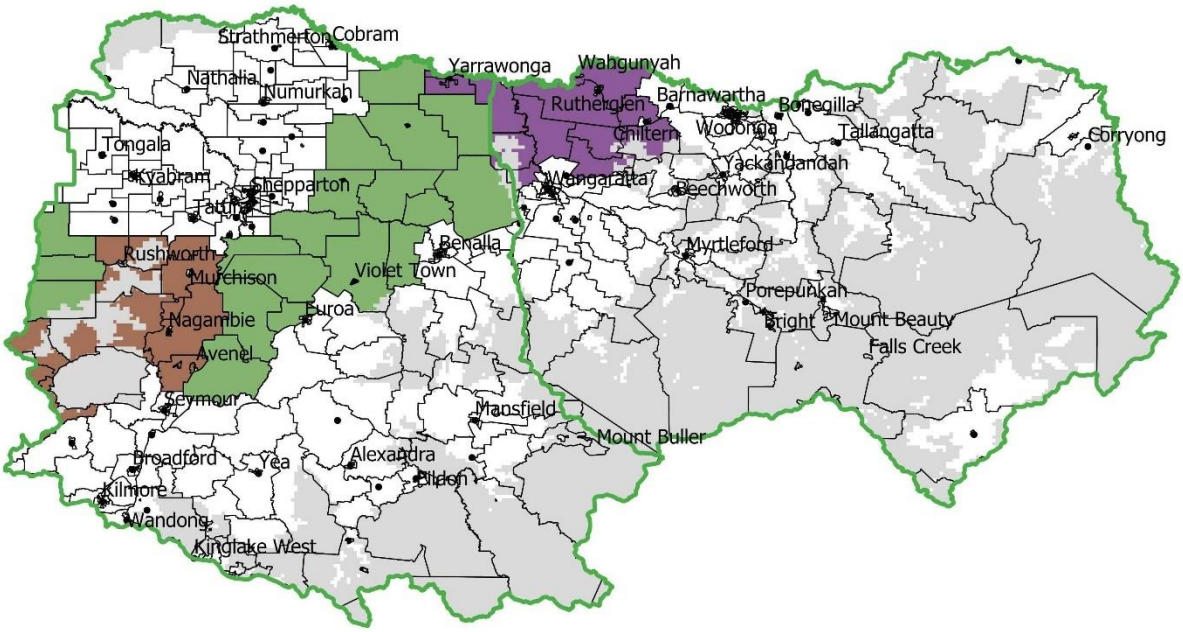
In the following pages each nested group of regions is displayed in a map and succinctly described.

11.3.1 Broadacre Dryland Agricultural Regions

The Broadacre Plains *(shaded green on the map below):* This is the most rural of the regions, extending from the Murray between Cobram and Yarrawonga south almost to Seymour. There are no towns of significant size in the region, and agriculture is relatively important as an employer. The value of land is little influenced by amenity pressures. As a consequence, farms are relatively large.

Goldfields *(shaded brown on the map below):* This still looks to the observer like an agricultural region, but there are some differences compared to the Broadacre Plains. The agricultural quality of the land is lower, and the area is closer to Melbourne. This means that there is an encroachment of visitor services and absentee land ownership, particularly in the sedimentary hill country.

Lower Ovens *(shaded purple on the map below)*: Large parts of this region are similar to the Broadacre Plains. However, proximity to the Murray means that aggregate statistics for the are reveal areas of amenity influence, modest population growth and visitation that are absent from the Broadacre Plains region.



11.3.2 The Irrigation Regions

These four regions have in common irrigation production, a relatively younger farmer population and low education levels.

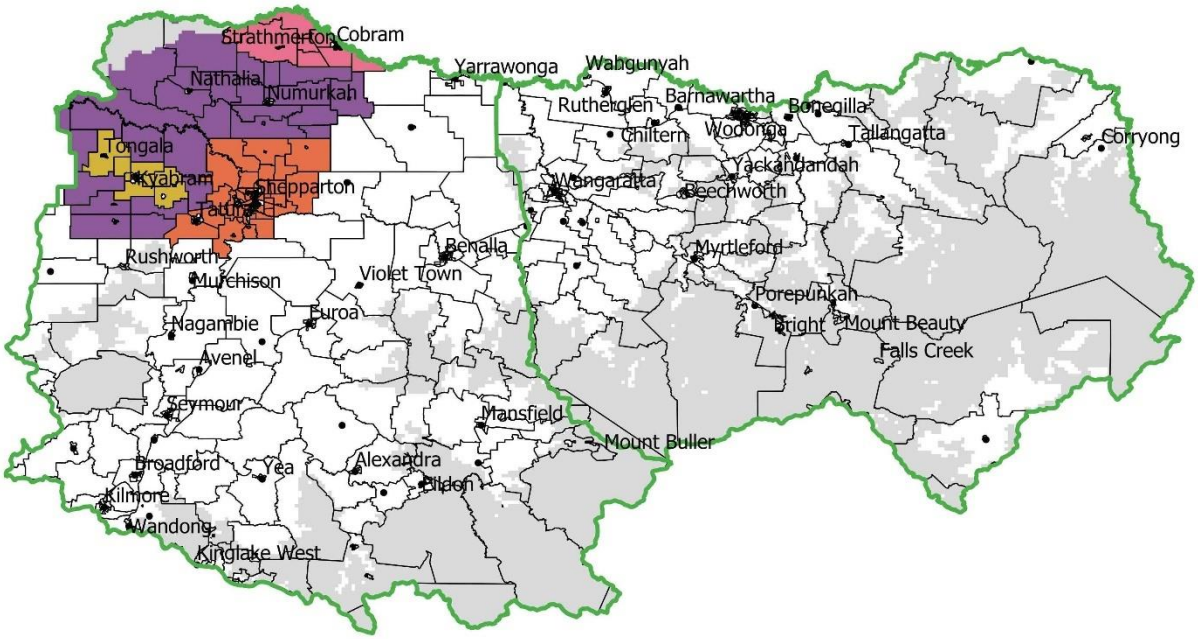
Rural Irrigation *(shaded purple on the map below):*: This region is the irrigation equivalent of the Broadacre Plains, being those irrigation areas under the least influence from the irrigation towns of Shepparton, Kyabram, Tatura, Cobram, Tongala, and Echuca (which is just over the catchment border). Agriculture, particularly dairying, remains a dominant industry, and so this region has experienced the greatest impact from low dairy prices, high water prices and periodic low allocation seasons.

In the east this district falls within the gravity of Echuca. Data for Echuca has not been analysed in the body of this report, so here is a short summary of recent trends in this town. Echuca grew at a rate of 1.5% per annum during the fifteen years leading up to the 2006 census. Employment growth was strong in accommodation and food services. In the ten years following 2006, population growth slowed to 0.5% per annum. Employment growth in accommodation and hospitality slowed, manufacturing employment fell, to be replaced by growth in health and personal care services. These changes suggest that the power of Echuca to drive growth in the nearby rural districts may have waned.

Shepparton Hinterland *(shaded brown on the map below)*: This is the area of rural character surrounding Shepparton. Horticulture plays a larger part in agricultural production. Proximity to the largest town in the catchment means the demographic statistics of these rural areas show some influence from increased rural living and commuting to town. The area also exhibits a higher level of multicultural backgrounds than is evident in most other rural regions.

Kyabram-Tongala *(shaded gold on the map below):*: In many ways similar to the rest of the Rural Irrigation region, but under the influence of the two irrigation towns, and so will have felt the impact of the contraction of the manufacturing sector in those towns.

Strathmerton-Cobram *(shaded pink on the map below):*: This smaller region closer to the Murray shows less rural character, greater cultural diversity. Like the other irrigation regions it exhibits lower education levels.

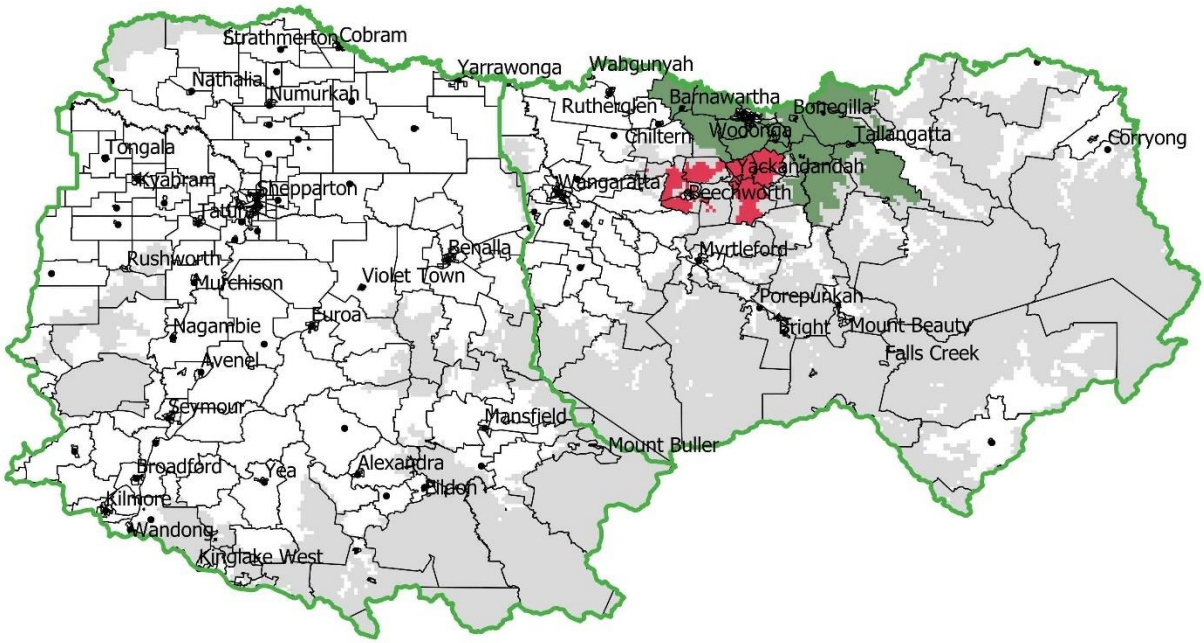

Strathmerton
Cobram
Yarrawonga
Wahgunyah
Nathalia
Numurkah
Rutherglen
Barnawartha
Corowa
Chiltern
Wodonga
Tallangatta
Corryong
Tongala
Kyabram
Shepparton
Wangaratta
Yackandandah
Beechworth
Benalla
Myrtleford
Rushworth
Violet Town
Murchison
Porepunkah
Bright
Mount Beauty
Nagambie
Euroa
Falls Creek
Avenel
Seymour
Mansfield
Mount Buller
Broadford
Alexandra
Kilmore
Wandong
Kinglake West

11.3.3 Wodonga Region

Two regions where demographic change is driven by growth in the township of Wodonga.

Wodonga hinterland *(shaded green on the map below)*:: This region is increasingly becoming a dormitory region for the town of Wodonga. It shows modest growth, little structural ageing and higher education levels. Past population projections show modest to strong growth for Wodonga and if this is borne out, the growth of the surrounding rural areas can be expected to continue subject to the constraints of planning. The sleeper in this is the impact of the Covid-19 pandemic on migration to Australia and how this will change future population growth in regional Victoria.

Beechworth-Yackandandah *(shaded pink on the map below)*:: The rural areas surrounding these two towns are subject to the impacts of town gentrification – increased rural living, rising land values. The inhabitants of the rural areas surrounding these towns have higher levels of education, higher incomes and exhibit only low rates of structural ageing. Farms are very small.

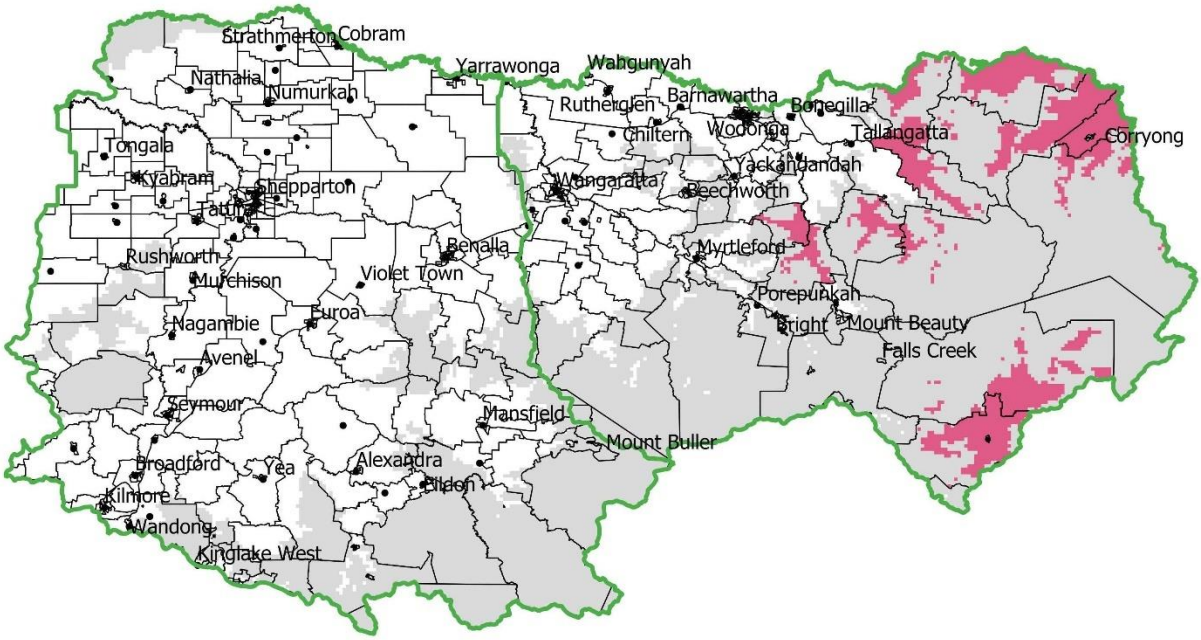


11.3.4 North East Mountain Valleys

This is the extensive area of mountain valleys to the east and south of Tallangatta. In a social gravity sense these are at least four different communities within this region, each with social and economic linkages to different major (and minor) population centres.

- Omeo-Benambra
- Upper Murray-Corryong
- Mid Mitta
- Mid Kiewa (Dederang)

The separation of these sub communities has been forged by the barriers of mountain ranges, such as the Mt York range between the mid Mitta and mid Kiewa or the Alpine National Park between Omeo and the Upper Murray. The aggregation of these different communities into one region is not a statement of common community, but rather of similar function. Each community is dependent upon agriculture notably the beef industry, has low economic diversity, is subject to structural ageing and population decline. Historically there were cultural links between some of the communities across the ranges forged by the shared task of cattle mustering on the High Plains. These links no longer exist or are transformed by a shared stake in the ski industry. The social gravity of the different communities today falls towards Corryong, Albury-Wodonga or Bairnsdale depending upon the location.

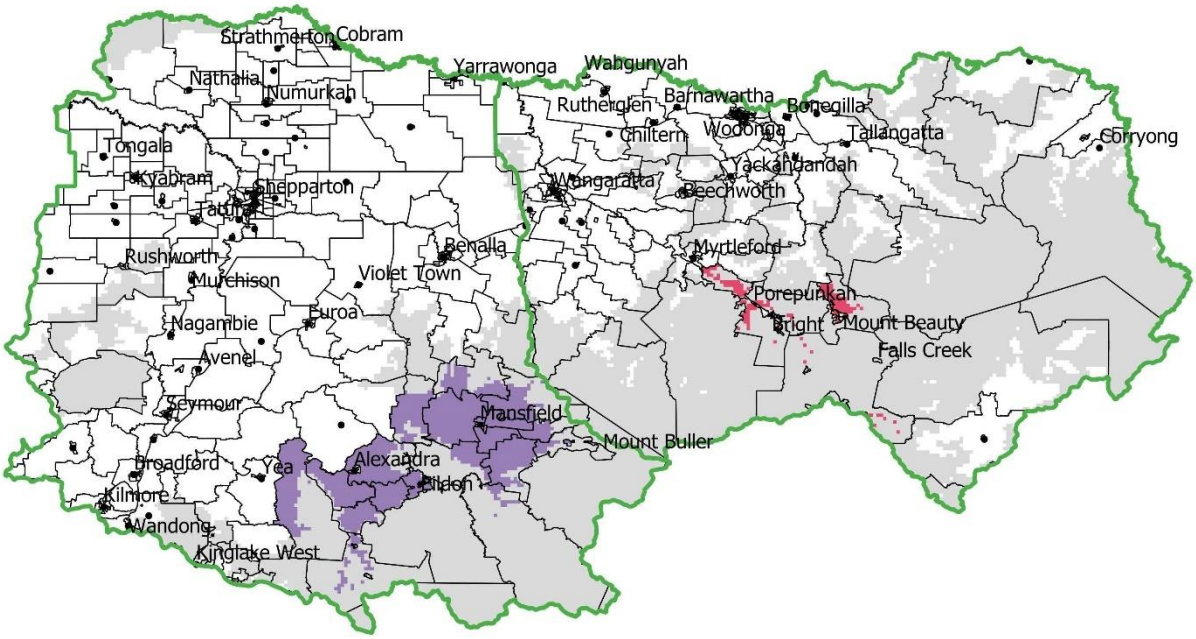


11.3.5 The Mountain Amenity Regions

The two regions in this grouping share common characteristics that diverge from the more rural regions of the catchments. At the basis of the economies of these regions is mountain-based tourism and recreation – skiing, mountain-biking, walking or just visiting for the scenery. Because of the high land values in parts of these areas, agriculture has shifted towards more intensive small-scale horticulture, gourmet produce and farm visitation. These regions will be currently feeling the greatest impact from Covid-19 restrictions.

Upper Ovens and Kiewa: High levels of amenity visitation, rising land values, higher levels of employment in accommodation and cafés and restaurants. The economy in the upper Ovens, and to an extent the upper Kiewa, is driven by the opportunities for recreation provided by the surrounding mountain ranges. The data shows a gradual increase in absentee land ownership. Agriculture is small scale beef production, or more intensive, often specialized, horticulture, depending in part upon sales from the business. This area has probably felt the impact of Covid-19 restrictions greater than others in the catchment.

Upper Goulburn: The mountain recreation opportunities of Mt Buller and water recreation from Lake Eildon ensure this region has many similarities with the upper Ovens. However, it does have a different character due to the smaller number of ski resorts (just Buller). The visitation economy of concentrated in the Mansfield environs and the roads leading there. Elsewhere the landscape has been gradually transforming into a weekender structure. Almost 50 per cent of properties in the Mansfield Shire are owned by persons not resident in the Shire. Unlike the Upper Ovens, the Upper Goulburn is a relatively comfortable distance from the eastern suburbs of Melbourne for weekend stays.



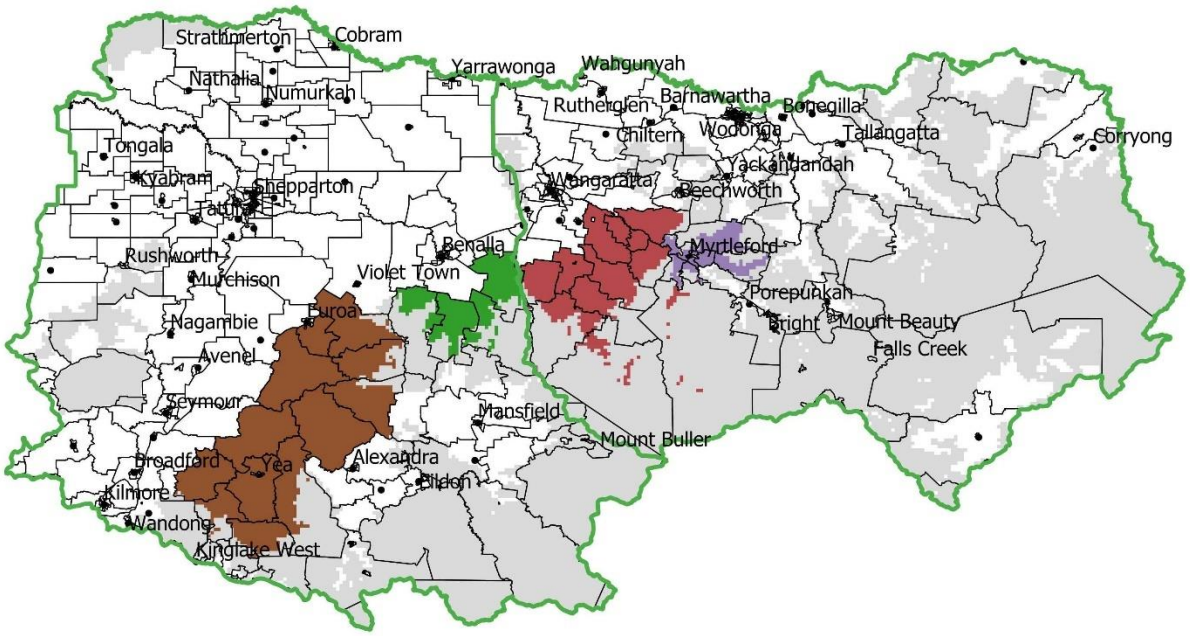
11.3.6 Foothills of the Mountains

These are four small regions that follow the valleys and slopes from the Hume Highway up into the mountains. The four regions have in common a landscape dominated by grazing, mostly beef, few significant centres of population and a structurally ageing population.

Mid King and Ovens – Upper Broken: These two areas have much in common, only being shown separately as they are in different CMA regions. They have characteristics in common with the north east mountain valleys, but the rural population is more highly educated. Proximity to the cities of Wangaratta and Benalla means the areas are far less isolated.

Myrtleford and valleys: The mid ovens and tributary valleys has some of the characteristics of the other two mountain areas, being in a sense a gateway to the mountain areas. However, it has much lower visitation rates, lower education and income levels. Those commenting on the initial draft of this report noted that the Myrtleford district may not have recovered from the closure of its past mainstay, the tobacco industry. The current population structure of the district reflects it tobacco-growing past with a relatively high cultural diversity.

Hume Foothills: This region includes the Strathbogies and the approaches to the upper Goulburn amenity regions. The characteristics of the rural population diverge from the town population. The rural population has a higher education and higher incomes. The area exhibits rapid structural ageing. This may in part be an outcome of the farms being a target for retirement occupation for ex-city professionals.

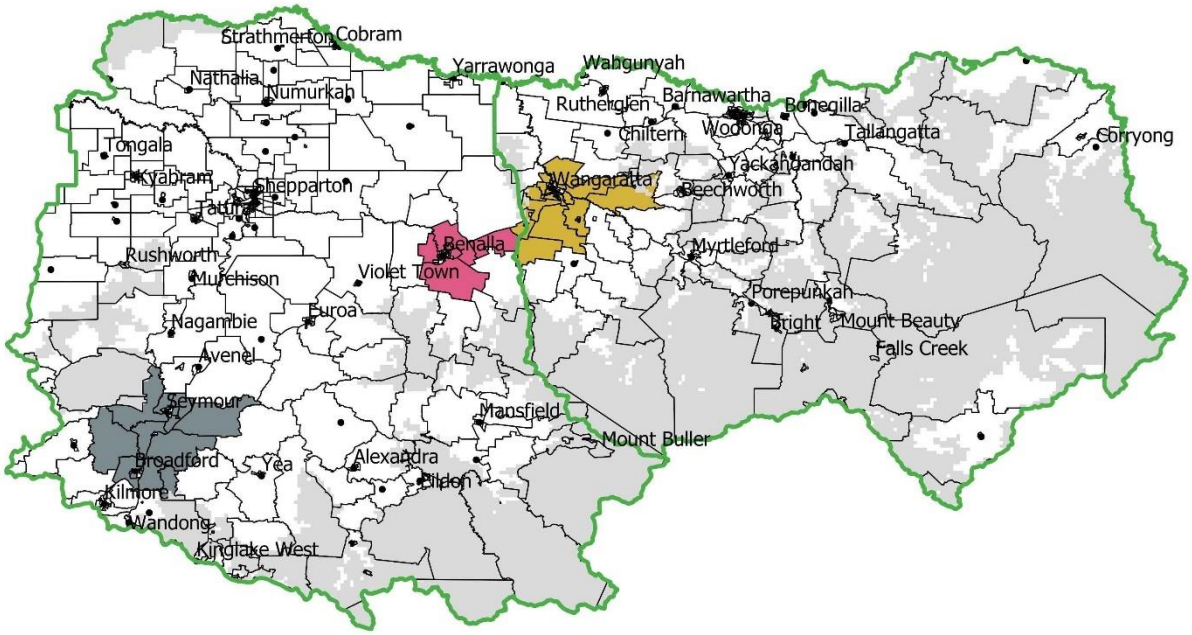


11.3.7 Hume Corridor

Three regions that have in common their location along the Hume transport corridor and proximity to larger towns that provide services and employment opportunities. Proximity to town is associated with smaller farm scale.

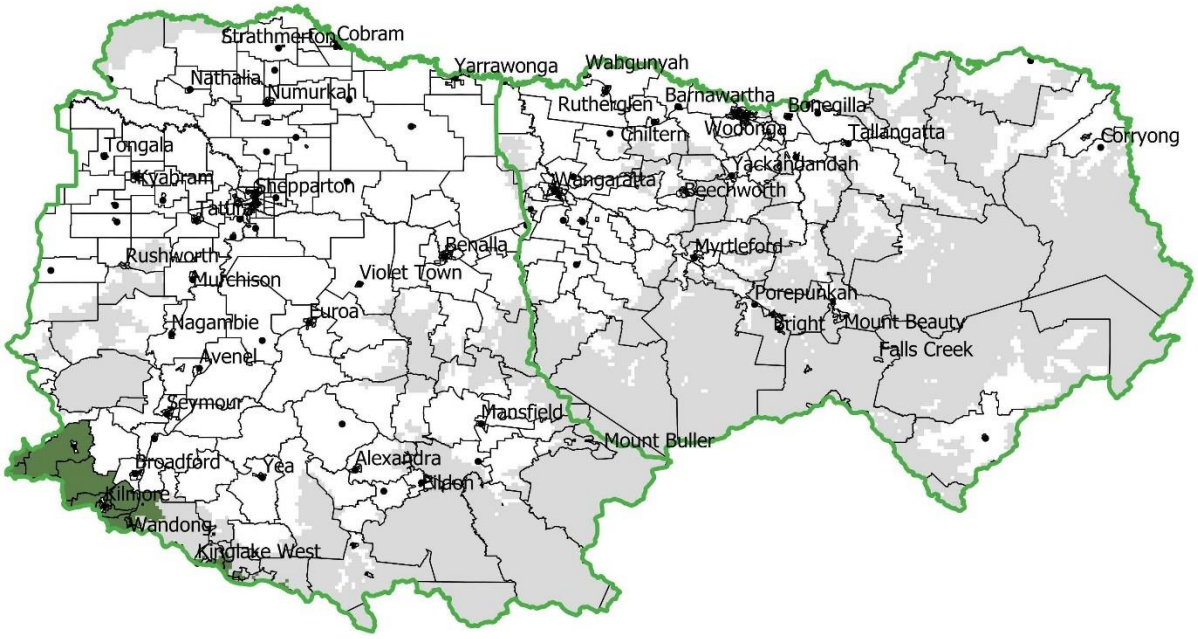
Benalla Hinterland and Wangaratta Hinterland: Both these regions surround their respective cities. As a result, the demographic structure of these rural areas is somewhat urban. Higher education, higher incomes and less dependence upon agriculture as an occupation.

Southern Hume Corridor: The population of this rural area is even more urban in its characteristics, and at the same time quite different to the population of the towns of Seymour and Broadford that it surrounds. High education level, low structural ageing, modest growth rates indicate a connection with the economy of Melbourne to the south.



11.3.8 Melbourne Fringe

The area in the upper catchment that surrounds Kilmore and Wandong is quite different to the rest of the two catchment areas under study. It is a region experiencing strong growth driven by the economic engine of Melbourne, just over the divide. From a demographic and economic perspective, this small region is functionally part of Greater Melbourne. Farms in this area are financially small, indicating either small areas or unintensive farming.



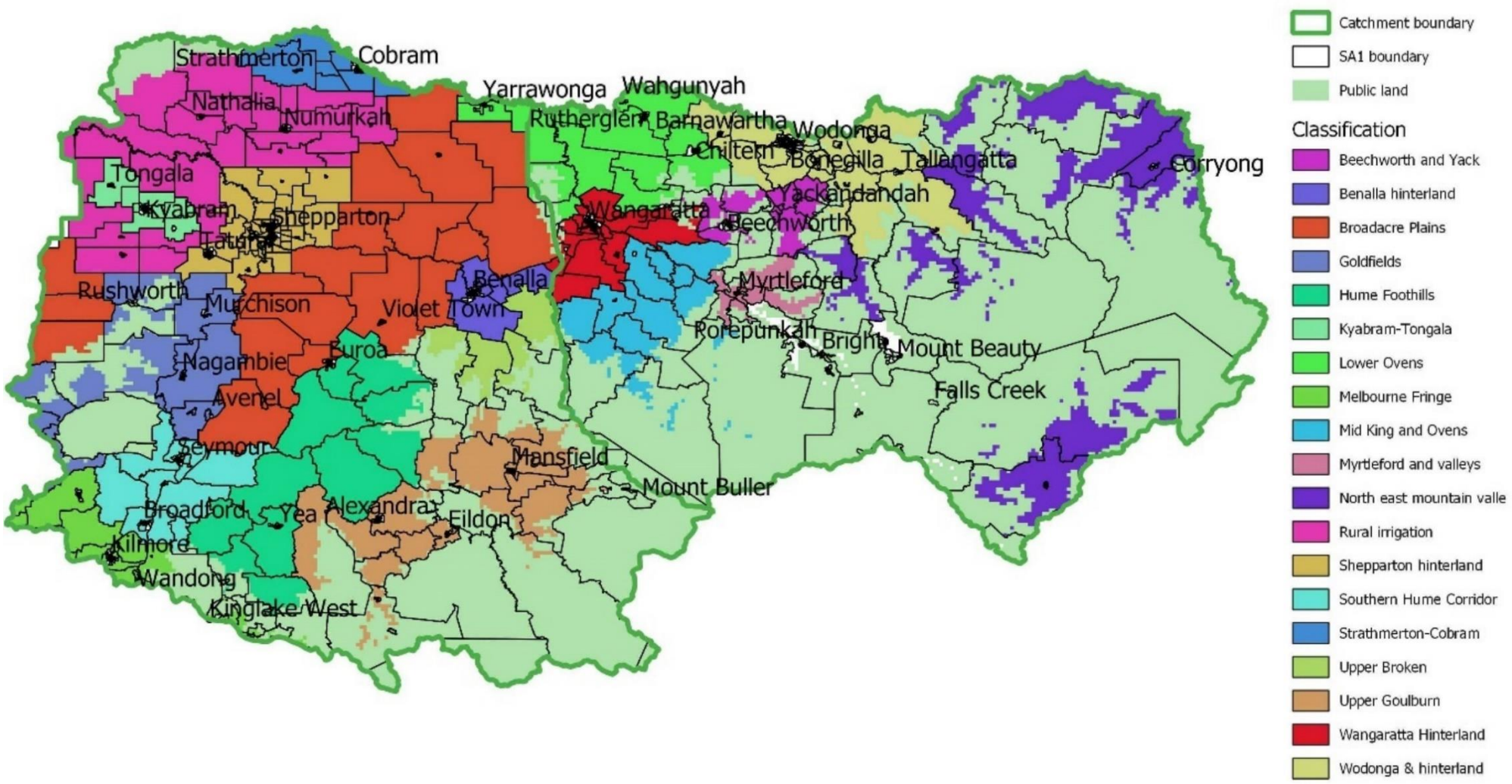


Figure 152 A subjective clustering of rural SA1s

Table 17 Factor scores for regions generated in subjective clustering process

	Catchment	Structural Ageing	Education	Rural-Urban	Growth	Amenity visitation	Multicultural
Broadacre Plains	GB	0.3	-0.15	**-0.77**	-0.09	0	-0.25
Goldfields	GB	**1**	**-0.61**	0.12	**0.22**	-0.31	0.08
Hume Foothills	GB	**1.41**	0.31	-0.56	0.16	-0.08	-0.11
Kyabram-Tongala	GB	**-0.67**	**-0.59**	0.11	-0.16	**0.5**	0
Melbourne Fringe	GB	-0.34	**0.66**	0.47	-0.17	-0.08	0.19
Rural irrigation	GB	**-0.68**	**-0.91**	**-0.49**	-0.13	0.38	-0.06
Shepparton hinterland	GB	**-0.82**	-0.48	0.05	**-0.31**	0.36	**0.57**
Southern Hume Corridor	GB	-0.2	0.18	0.55	-0.2	-0.18	-0.04
Strathmerton-Cobram	GB	0.54	**-1.39**	**0.72**	0	0.13	**0.84**
Upper Broken	GB	0.71	0.07	-0.14	0	0	**-0.64**
Upper Goulburn	GB	**1.25**	0.16	-0.03	**0.39**	**-1.93**	-0.39
Beechworth and Yack	NE	-0.04	**1.28**	**0.21**	-0.11	0.13	-0.43
Benalla hinterland	NE	0.59	0.26	0.17	-0.08	-0.13	**-0.52**
Lower Ovens	NE	0.2	0.06	0.26	**-0.24**	0.26	**-0.55**
Mid King and Ovens	NE	0.63	-0.07	-0.28	-0.12	0.33	0.14
Myrtleford and valleys	NE	0.75	0	0.36	-0.15	**0.59**	**0.64**
North east mountain valleys	NE	**1.13**	-0.47	-0.98	-0.14	-0.04	-0.18
Upper Ovens and Kiewa	NE	0.76	-0.05	0.3	0.11	**-1.49**	**-0.54**
Wangaratta Hinterland	NE	-0.03	0.28	0.47	**-0.23**	0.13	**-0.53**
Wodonga & hinterland	NE	**-0.67**	**0.72**	0.08	**-0.23**	0.39	-0.44

Table 18 Key characteristic differences of classification areas compared with state averages

	Points of difference
Broadacre Plains	Very rural character
Goldfields	Ageing and low education
Hume Foothills	Rapid ageing
Kyabram - Tongala	Younger, lower education, low amenity visitation
Melbourne Fringe	Urban, high education
Rural irrigation	Younger, low education, low growth
Shepparton hinterland	Younger, low education, multicultural
Southern Hume Corridor	Low in rural character
Strathmerton-Cobram	Low education, non-rural character, multicultural
Upper Broken	Monocultural, ageing
Upper Goulburn	High amenity visitation, growth, ageing
Beechworth and Yack	High education, modest growth
Benalla hinterland	Modest ageing, modest monoculturalism
Lower Ovens	Modest growth, monocultural
Mid King and Ovens	Modest ageing
Myrtleford and valleys	Multicultural, lower amenity visitation
North east mountain valleys	Low growth, structural ageing
Upper Ovens and Kiewa	High amenity visitation, monocultural
Wangaratta Hinterland	modest growth, monocultural
Wodonga & hinterland	High education, low ageing, modest growth

12 APPENDICES

12.1 APPENDIX 1: DATA SOURCES

12.1.1 Towns in Time

The Towns in Time database is provided by the Planning Division of DELWP. The web site provides a time series data set for Victorian towns over 200 persons in population in 2016. There is a reasonably comprehensive set of indicators for towns with a population over 500. For smaller towns the dataset is limited. The data is based upon a combination of UCL, Mesh Block and SA1 data derived from the ABS. For most towns there is a time series extending back to 1981. The data come sin the form of a pdf or a spreadsheet for each town.

https://www.planning.vic.gov.au/land-use-and-population-research/census-2016/towns-in-time

12.1.2 Census of Population and Housing – TableBuilder Pro

Census TableBuilder Pro allows the user to extract user-designed census data tables from the 2006, 2011 and 2016 censuses. An annual subscription and on-line training are required prior to the granting of access.

12.1.3 Mesh block count data

Mesh Blocks are the smallest geographical area for which the ABS provides data. The public data is limited to population and dwelling counts and an ABS assessment of the main land use of the Mesh Block. These are a tool used by the ABS to create a wide range of geographies.

2074.0 - Census of Population and Housing: Mesh Block Counts, Australia, 2016,

2074.0 - Census of Population and Housing: Mesh Block Counts, 2011

12.1.4 Australian Agricultural Census - EVAO data

Every five years the ABS conducts a census of agricultural businesses. The main items collected are production and land use. In some censuses a limited number of demographic data has been collected. Using production data, the ABS estimates the value of output produced by each farm (EVAO). Distributions of this data are not publicly available. The author has maintained a comprehensive database of EVAO distributions dating back to 1986.

12.1.5 SA1 Datapacks

The ABS releases ABS designed data sets for SA1s on their web site. Because of the small populations of SA1s, user defined data tables often come up against issues with small cell counts which conflict with confidentiality rules. Therefore, it is easier to, if possible, use the ABS designed tables in the Datapacks.

https://www.abs.gov.au/websitedbs/D3310114.nsf/Home/2016%20DataPacks

12.1.6 Australian Census Longitudinal Database

The ABS maintains a 5% subset of census data that is probabilistically between census years, with an estimated linkage success rate of 95-97%. It is also linked with several other official datasets. This dataset does not allow exploration of small areas but is a powerful tool for exploring matters such as the structure of farm households.

12.2 APPENDIX 2: ESTIMATING CATCHMENT SUB-POPULATION COUNTS.

Town population – calculated using mesh block population counts for 2011 and 2016 (ABS, 2017) (ABS, 2012). Each mesh block is classified according to it land use. Mesh blocks with classifications residential, commercial, educational, hospital, industrial and transport were deemed urban.

Farm population – calculated using the following steps:

- Count of persons with farming as main occupation by SA derived from Census TableBuilder Pro;
- Count adjusted by a concordance based upon private land area to deal with SA2s that overlap catchment boundaries.
- Count of households with at least one person having main occupation of farming made by adjusting with a factor of .77. This is necessary because a significant number of farming families have two partners nominating as main occupation farmers in the census. The conversion factor was derived from an analysis of farm household structure using data from the Australian Census Longitudinal Database. The ACLD has synthetic linkages not available in the usual census interrogation tool TableBuilder. However, because the ACLD is based upon a 5% sample of the census, this conversion factor could only be calculated at a state level. The conversion factor is an average which overlooks the difference between beef and dairy farm households. We can expect dual farm occupation households to be more common in dairy households. Thus, this process may be overestimating the number of dairy household and underestimating the number of beef households.
- The farm household count was multiplied by the average household size for the relevant SA2. This provided an estimate of the population living in households with at least one person having farming as the main occupation. The household size estimate was derived from public ABS data in SA2 Datapacks (ABS, 2020).

Part-time farming population count- estimated using the following steps:

- Count of farm establishments for SA2s derived from the 2016 and 2011 agricultural census.
- Count adjusted by a concordance based upon private land area to deal with SA2s that overlap catchment boundaries.
- In 2016 the ABS changed its minimum farm size (Estimated Value of Agricultural Operations - EVAO) from $5000 to $40,000. In 2016 counts of farm establishments smaller than $40,000 EVAO only included farms that had been above the $40,000 threshold in 2011. Our 2016 estimate of farm establishments include the ABS 2016 count of establishments with an EVAO above $40,000, and an estimate of the count of establishments below $40,000. This latter component was based on the 2011 count of establishments with an EVAO below $40,000 reduced in line with the reduction in the count for business with a higher EVAO.
- The number of part-time farms was estimated by subtracting the count of main occupation farming households from the count of farm establishments. This will be a close approximation to the number of farm households in which no member has farming as a main occupation. There is an assumption of a one to one relationship between farm households and farm establishments. Given the nature of farming in each catchment, this assumption will only introduce minor deviations from the real number. Further investigation of this assumption can be found in (Barr, 2055.0 The Micro-Dynamics of Change in Australian Agriculture, 2004).
- The farm household count was multiplied by the average household size for the relevant SA2. This provided an estimate of the population living in households with at least one

person having farming as the main occupation. The household size estimate was derived from public ABS data in SA2 Datapacks (ABS, 2020).

Rural Residential population count – estimated using the following steps:

- Total rural population taken from mesh block counts where mesh block is classified as Primary Production.
- Estimated household production for both forms of farming (main occupation and part-time) was subtracted from the mesh block total. The residual population count is assumed to represent the rural residential population.

Besides the assumptions noted above, there was also the issue of how to handle mesh block populations classified as “Other’. As it was not clear of these were rural or urban, they were not included in the analysis. As this classification accounted for less than 2 per cent of the total catchment population, the absence of this data will not have a meaningful impact on the estimates of the relative population composition of each catchment.

12.3 APPENDIX 3: INDUSTRY DATA REDUCTION USING FACTOR ANALYSIS

Produced 6 orthogonal factors, 4 bipolar and 2 unipolar.

Rotated Component Matrix[a]

	Component					
	1	2	3	4	5	6
Percentage employed in agriculture 2016	-.770	-.172	.066	.061	.139	-.102
Percentage employed in mining 2016	-.108	.092	-.127	-.115	-.092	.726
Percentage employed in manufacturing 2016	-.024	-.328	-.712	.180	-.246	-.117
Percentage employed in utilities 2016	.010	-.121	.130	.048	-.052	.789
Percentage employed in construction 2016	.720	-.151	-.102	.168	.232	.048
Percentage employed in wholesale 2016	.294	-.364	.050	.183	.602	-.079
Percentage employed in retail 2016	-.200	-.147	-.209	.636	-.252	-.042
Percentage employed in accomodation, cafes etc 2016	.036	.798	.068	.025	-.201	-.015
Percentage employed in transport 2016	-.156	.023	-.120	-.125	.722	-.120
whitecollarp16	.667	.157	.108	-.059	-.019	-.204
Percentage employed in Proffessional services 2016	.652	.291	.288	-.101	-.052	-.153
Percentage employed in Administrative services 2016	.203	.554	-.179	.220	.360	-.004
Percentage employed in public services 2016	-.058	-.154	-.084	-.861	-.161	.037
Percentage employed in education 2016	.087	-.084	.770	.000	-.242	-.074
Percentage employed in health services 2016	-.499	-.120	.477	.282	-.193	.008
Percentage employed in arts and recreation services 2016	.374	.599	.126	-.102	-.019	-.041

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 11 iterations.

Summary of industry factors:

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
	High skill services	Recreation	Manufacturing	Retail	Distribution	Water industry
Positive loading	White collar Professional services Construction Health	Accomodation and cafes Arts and Recreation	Manufacturing Education Health	Retail	Wholesale Transport	Utiltities Mining
Negative loading	Agriculture			Public Services		

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