2018 - 2028

Determining the Future Demand, Supply and Skills Gap

for Surveying and Geospatial Professionals

Report prepared by BIS Oxford Economics
for Consulting Surveyors National

Consulting Surveyors National

BIS Oxford Economics welcomes any feedback concerning the forecasts or methodology used in this report as well as any suggestions for future improvement.

Job No: I6891

BIS Oxford Economics contact:

Adrian Hart
Associate Director
Construction and Maintenance

Michael Wu
Economic Analyst

Liam Gilroy
Research Assistant

BIS Oxford Economics Pty Limited
Level 8, 99 Walker Street
North Sydney NSW 2060
Australia
T: +61 (02) 8458 4200
F: +61 (02) 9959 5795

ahart@bisoxfordeconomics.com.au
mwu@bisoxfordeconomics.com.au

Consulting Surveyors National is the peak body representing consulting surveying businesses who employ surveyors and allied professionals across Australia. Surveyors are actively involved in major infrastructure and housing projects across the nation.

Surveyors define, manage and protect the space around us. From the smallest plot to multi-million dollar developments, the world in which we live is organised and legal ownership parameters are determined through the expertise of surveyors.

Registered/Licensed Surveyors are the only practitioners warranted with direct management of our land boundary system. They are the pre-eminent experts in their field and do far more than just measure space. These surveying professionals interpret and navigate legal aspects of land ownership. They provide a comprehensive understanding of land, water and the air above it, its surrounds and its environment; thus protecting development from impediments and unlocking latent value.

Consulting Surveyors National is committed to ensuring that the surveying industry is kept updated with the statistics that have such an impact on our profession.

This report is the third study into the workforce gap for surveying and geospatial professionals. BIS Oxford Economics (previously BIS Shrapnel) were engaged to review the economic drivers for Australia and each State and Territory to determine the surveying and geospatial skills required to meet the demand in the property and construction sectors.

This report identifies a current and on-going significant shortage of skills across our industry, similar to those predicted in previous reports.

However, it would seem that the work of the state-based Surveying Taskforces with Industry Promotion groups and the associated “A Life Without Limits” brand has begun to have a real impact on the numbers of young people entering the profession. This study now includes data from our Tertiary Education providers.

The report includes research on every State and Territory thanks to the support from various Surveying and Spatial Information Associations and Institutions around the country. It is important that the industry continues to work together to bridge this gap and we look forward to doing what we can at Consulting Surveyors National for the private sector of surveying, which we now know makes up 87% of the workforce.

Consulting Surveyors National is committed to supporting our members and we will continue to advocate on their behalf in the area of education and skills.

Gerry Shone
President

Michelle Blicavs
Chief Executive Officer

A special thank you to those who contributed towards this research project

2018 - 2028

Determining the Future Demand, Supply and Skills Gap

for Surveying and Geospatial Professionals

Report prepared by BIS Oxford Economics
for Consulting Surveyors National

Consulting Surveyors National

BIS OXFORD ECONOMICS

CONTENTS

Executive Summary

EXECUTIVE SUMMARY

Introduction

This is the third workforce capability report prepared by BIS Oxford Economics for surveying and geospatial professionals and published by Consulting Surveyors National (CSN).

The first report was prepared in 2012 and focused exclusively on New South Wales and Victoria. An update delivered in 2014 utilised the new Census and education data, with the analysis extended to Queensland and South Australia. This third report updates the earlier studies by including the latest workforce data from the 2016 Census and subsequent quarterly labour force surveys, as well as improved education data. **For the very first time, this third report provides a workforce capability state of play and outlook for every state and territory of Australia.**

These reports seek to explain current and future demand and supply for surveying professionals in Australia based on the fundamental drivers including:

- End-use sector demands across the property, construction and mining industries
- Education enrolments and qualification completions
- Demographic ageing of the existing workforce and its impact on retirement within the surveying profession; and
- Productivity growth driven by new technologies, practices and systems.

Situations where measures of workforce demand *exceed* currently available supply are referred to as **workforce gaps**. This report highlights where and when workforce gaps are likely to be observed over the coming decade for each state and territory. Where these gaps are unlikely to be filled by new supply at a *national* level from the education system, a **capability deficit** arises.

Workforce gaps create distinct challenges and pressures for the profession that may (at least partially) be resolved through the hire of new graduates – recognising that graduates cannot replicate the skills and productivity of a retiring surveyor with decades of experience – productivity improvements, or through shifting employment from low to high demand regions. A capability deficit, however, represents a higher order challenge. This suggests that there is a more substantial long run imbalance between workforce demand and supply that will not be easily or quickly resolved. It is important to note that, in practice, capability deficits are not directly observable. Either workforce supply rises to meet the demand challenge (e.g. through an increase in unplanned work effort or productivity) or demand is constrained to the maximum level of available supply (e.g. activities requiring unavailable surveying skills are delayed) with consequent negative impacts on end use sector activity and the broader economy.

BIS Oxford Economics' workforce capability reports inform the work of constituent members of CSN in regard to long term workforce planning and capability building. They also provide data that can be used in working with stakeholders and tertiary education providers in relation to course structure and student numbers, and provide a sound basis for engagement with government agencies, infrastructure bodies and other peak bodies.

Key findings of this report

It has been over four years since the release of the previous workforce capability study for the surveying profession. In that time there have been significant developments on both the *demand* and *supply* side for the profession, affecting the state of play and outlook for workforce gaps (at the state level) and workforce capability (at the national level).

Critically, this report finds that surveying and spatial scientists will be in a capability deficit position at the national level for the next five years to FY2023 as shown in Table A below. The surveying profession is currently experiencing significant workforce gaps in key jurisdictions such as New South Wales, Victoria, Queensland and South Australia which will not be completely met from new supply or shifting employment from other jurisdictions. The capability deficit is peaking in FY2019 and, while the size of the deficit will shrink in coming years in accordance with industry activity and labour demand, it will not be until the mid-2020s when the capability deficit sustainably swings back towards surplus.

Table A: National Workforce Capability Position

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Surveyors & spatial scientists	Deficit					Surplus				
	1428	605	(6)	129	438	(75)	(571)	(1004)	(1398)	(1491)
Surveying & spatial science technicians	Surplus					Surplus				
	(40)	(281)	(507)	(696)	(836)	(1013)	(1171)	(1384)	(1602)	(1769)

Source: BIS Oxford Economics

It is important to note, however, that workforce demand forecasts beyond the next five years are riskier and may be revised upwards in future as new (currently unknown) projects across building, infrastructure and mining are developed. As such, the surplus capability position from the mid-2020s is provisional, based on today's projections of both known and unknown work, and may be revised in future reports. In particular, BIS Oxford Economics forecasts of end use sector activity in the second five-year period tend to show a reversion towards trend growth in activity following very strong levels of activity in the FY2018 to FY2023 period. A continuation of the strong growth in activity during this period would, by contrast, likely see much smaller measures of capability surplus in the surveying profession. Consequently, it remains vital to continue to improve and expand pathways into the surveying profession to ensure future workforce demands can be sustainably met.

New South Wales and Victoria are currently experiencing the largest workforce gaps of all states and territories in Australia, as shown in Table B. However, analysis for this report reveals that there are also substantial gaps currently in Queensland, South Australia, Tasmania and the ACT also. By contrast, the supply of surveyors in Western Australia and the Northern Territory are expected to be able to meet demand from end-use sectors through much of the coming decade.

Table B: Workforce Gap Outcome: Surveyors and Geospatial Professionals States and Territories

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
New South Wales	Shortage					Shortage				
	819	312	115	321	510	247	59	(63)	(111)	(91)
Victoria	Shortage					Shortage				
	567	321	245	306	411	349	254	166	146	214
Queensland	Shortage					Shortage				
	327	253	326	470	571	430	272	248	234	286
South Australia	Shortage					Shortage				
	141	67	(13)	15	73	60	36	18	8	2
Western Australia	Surplus					Surplus				
	(215)	(8)	(181)	(348)	(263)	(89)	95	57	(118)	(176)
Tasmania	Shortage					Shortage				
	69	69	56	64	62	42	33	26	19	19
Northern Territory	Surplus					Surplus				
	(15)	(8)	(10)	6	(13)	(5)	(9)	(13)	(10)	(6)
Australian Capital Territory	Shortage					Surplus				
	47	21	(1)	(2)	(0)	(27)	(38)	(37)	(32)	(25)

Source: BIS Oxford Economics

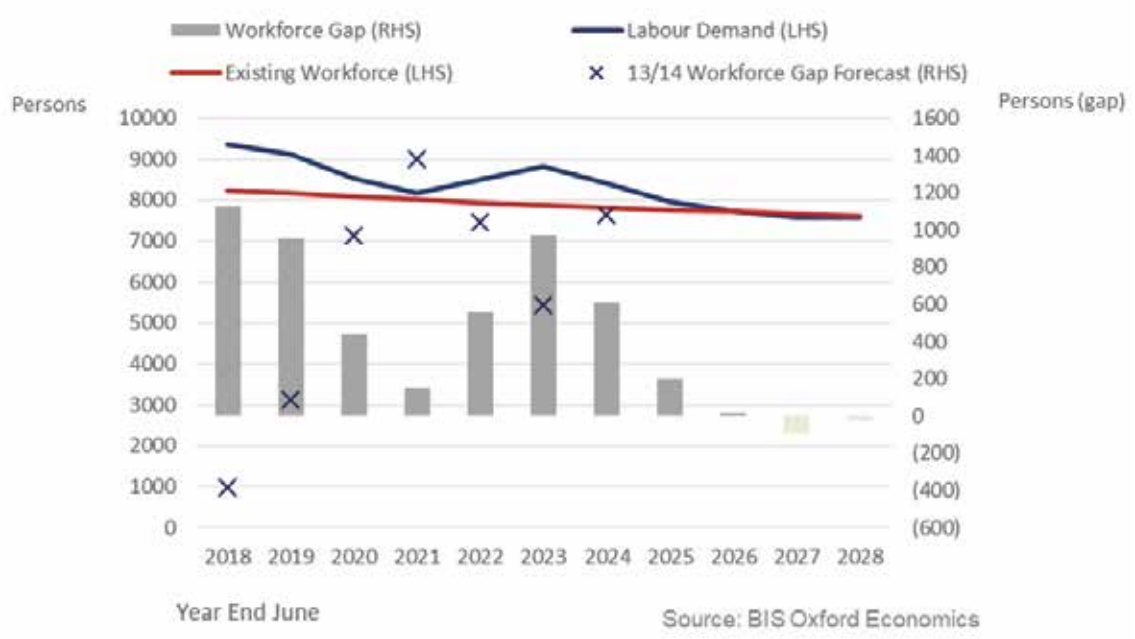
Workforce gaps for surveyors in FY2018 and FY2019 are higher than anticipated in the previous (2014) report as shown in Chart C. With changes in workforce supply relatively more stable than demand, changes in the workforce gap for surveyors over time is mostly driven by cyclical demand side drivers – in particular, the timing of cycles in investment in property, building, infrastructure and mining.

In our 2014 study, we had forecast that the emerging upturn in housing activity would peak in FY2016 and start to decline again in FY2017 and FY2018. Instead an increasingly speculative, investor-driven boom in housing took hold, driving residential activity to a new record peak by FY2018, boosting demand for cadastral surveyors. The outlook for residential activity is now, however, more negative than previously forecast. The shallow boom and bust of the 2014 forecast has been replaced with a much larger cycle, with sharply falling residential activity now expected over the next few years (instead of the previous report's timing of recovery). Importantly, much of this decline is focused in the metropolitan high-density apartment market (where investor activity was most pronounced), although the downturn is still expected to affect the (relatively more surveyor demand-intensive) subdivisional housing market.

The 2014 forecast also underestimated surveying demand from the emerging boom in infrastructure investment, particularly in roads and rail work, that would be a feature of construction industry demand by FY2019. While an upswing was predicted, it has been stronger and more sustained than anticipated in 2014 as governments used asset sales to 'turbo charge' infrastructure spending, while stronger than expected revenues from royalties and property taxes also contributed. Although *growth* in infrastructure investment is now slowing, activity here is forecast to remain at very high levels – and surge again in the early 2020s – and remains a key driver of demand for surveyors over the next five years.

The fall in the Australian dollar combined with an acceleration of growth in the global economy also saw larger than expected investments in trade-exposed segments of the non-residential building market, such as accommodation, entertainment, recreation and education. An emerging boom in office building in New South Wales and Victoria, as well as rising public education and health investment to meet the needs of a growing population, will also be key drivers of demand for surveyors over the next five years. Finally, following a long period of decline, mining investment is also started to rise again and this is anticipated to support (rather than subtract from) surveyor demand in the near term.

Chart C: Forecast of Workforce Gap for Total Surveyors – Australia (1.5% Productivity Growth)



While demand for surveyors has been stronger than anticipated in the previous report, there have also been welcome developments on the supply side which have helped the profession meet the challenge. In particular, since the 2014 report, there has been renewed growth in enrolments and completions in pathway qualifications into the profession. Commencements of undergraduate geomatics engineering degrees (incorporating surveying and spatial science degrees) have risen from 174 in 2011 to 344 in 2016, although fell back to 285 in 2017. Completions have steadily increased from a trough of 122 in 2013 to 178 by 2017. Meanwhile, the number of students coming through the VET sector is also rising, with diploma level and above completions in geomatics engineering up from 194 in 2013 to 312 by 2016. Consequently we have raised our forecasts of new graduates joining the profession each year compared to the 2014 study. Here, surveying associations and the broader profession can take credit for initiatives such as "A Life Without Limits"[1] to foster greater interest in surveying as a career amongst young people and provide clearer guidance regarding pathways into the profession.

While rising numbers of new surveying graduates is a positive, there are still challenges on the supply side which threaten the sustainability of the surveying profession. Education statistics reveal that studying surveying and spatial sciences is still very much a male-oriented activity. While enrolments in geomatic engineering courses are up strongly in recent years, this increase is almost exclusively male. The share of women in undergraduate geomatic engineering degrees has fallen from around 15% in the early 2000s to 4% between 2013 to 2017. The share may be even lower for graduates who enter the surveying profession given that women may be more attracted to other spatial sciences professions where the gender imbalance may not be as pronounced. Further research is required here to examine why so few women are choosing geomatics engineering and to determine how many move into surveying roles.

The surveying profession has also been able to boost supply, albeit perhaps temporarily, as older surveyors have stayed in the profession for longer. Despite rising numbers of new graduates, the surveying profession continues to age, according to a comparison of the two most recent Censuses (2011 and 2016). The 2016 Census reveals that a higher proportion of the profession is aged between 30-49 years than before with now over 10 per cent of the profession aged over 60 years (compared to around 7 per cent in 2011). While not a sustainable long-term strategy, it will be important to ensure that there remain ways that older, more experienced, surveyors stay in the profession if they choose, as well as offering vital training and mentoring support to younger members of the profession.

Implications and Recommendations

The key finding of this report is that the surveying profession is currently experiencing substantial workforce gaps at the national level (larger than were anticipated in the previous 2014 study). Furthermore, workforce gaps are likely to remain over the next five years despite a correction in residential activity as governments roll out more transport infrastructure and as the private sector increases investment in non-residential building and mining.

While the modelling for this report suggests that demand and supply for the surveying workforce will be more balanced beyond FY2023, this is by no means certain. If higher levels of public and private investment are sustained in the long term, rather than reverting towards trend – or if the current increase in education enrolments is not sustained – the surveying industry may yet face further workforce challenges through the second half of the 2020s.

Consequently, the profession will need to focus on ways to maintain a sustainable workforce supply/demand balance. This includes:

- **Continuing its successful promotion of the profession to younger people** – particularly those in secondary education – and encouraging enrolment in pathway qualifications at universities and the VET sector. Here, however, more may need to be done to examine why few women are entering current education pathways and what strategies could be put in place to improve these outcomes. Furthermore, with the emergence of 'big data' and widespread use of new technologies and systems such as Building Information Modelling (BIM), demand for spatial data analysts is expected to grow very strongly.[2] This will likely provide strong competition to the surveying industry for graduates in the 'spatial sciences'.

1 https://www.alifewithoutlimits.com.au
2 This has also been noted in separate BIS Oxford Economics analyses of workforce gaps in the road and rail industry sectors through 2018.

- **Strengthening workforce retention strategies at all stages of employment,** from the new graduate level, to those with middling experience as well as those at risk of leaving the profession through retirement. Each of these different workforce career stages require different solutions to strengthen retention. At the entry level, solutions may involve ensuring quality, dynamic starter roles that provide a range of experiences – and more general recognition of the wide variety of roles and applications of expertise available across the profession. This means that when young people decide to change careers,[3] they will be more likely to stay within the surveying profession rather than shifting to other sectors including transport, finance and biotechnology, amongst others, to make use of their spatial skills and data analytics. For "middle skilled" workers, retention strategies may include strengthening options for ongoing training and development, a positive workplace culture and promotion of a healthy work/life balance. Finally, while not all potential retirees (i.e. those aged 60+) may yet be in a strong financial position to retire, this may change in coming decades. Here, it will become increasingly important for organisations and businesses in the industry to offer highly skilled older staff opportunities to continue in ongoing part-time or mentorships roles.

- **Utilising technologies and systems to maximise productivity.** The surveying profession has achieved large productivity gains in recent decades through adoption of new labour-saving technologies and systems, and this has helped the profession meet strong increases in demand with a similarly sized workforce. While achieving similar productivity gains over the coming decade may be challenging, professions such as surveying remain at the forefront of new developments in spatial data and technologies.

- **Focusing on flexible strategies to meet emerging demands from key sectors and regions.** While this report indicates that surveying demand from residential activities is likely to ease in the near term, a strong pipeline of transport and social infrastructure investment coupled with new private investment in non-residential buildings and mining is expected to keep demand for surveying at strong levels through the next five years. Meeting this demand will mean having flexibility strategies in place so that the profession can be agile in a sectoral sense, as well as regionally, as new demand drivers play out over the coming years. It is hoped that the forecasts for end use sector demand for each state and territory in this report provide guidance as to where the profession should be targeting growth, but strategies need to be put in place to make this happen.

Finally, effective strategic workforce planning for the surveying profession also requires better, more meaningful, occupation and industry data from the Australian Bureau of Statistics (ABS), as well as matching education data from universities and the VET sectors. Better data will enable more accurate, detailed analysis which should lead to better decisions. Currently, there is no uniform way of referring to the surveying industry across occupation, industry and education data, and so we use 'piecemeal' datasets and approaches to estimate the size of the profession, the industries it assists, and where new graduates are coming from.

There also needs to be a stronger distinction in the data between surveyors and spatial scientists, what the key functions and roles within each occupation are best defined, and how they are changing with new data technologies – especially since the last revisions to the ABS occupation definitions were in 2013. With the current growth in mashing 'big data' with 'spatial data' there will likely be an increasing need for more training in data analytics and data science within the surveying profession which, in turn, will open up opportunities, overlap and competition for spatial skills across a greater number of fields.

3 According to research by the Foundation for Young Australians (FYA), young people are likely to have 17 changes of employment during their working life across five different careers.

Notes

Chapter One

Introduction

1. INTRODUCTION

1.1 Background

In August 2012, BIS Oxford Economics (formerly BIS Shrapnel) was engaged by Consulting Surveyors National (CSN) to undertake research into the workforce capacity constraints that are likely to be faced by the surveying and geospatial industry over a 10-year period from 2011/12 to 2012/22. The report informed the work of constituent members of CSN regarding long-term workforce planning and capability building. They also provide data and insights that can be used in working with various stakeholders, particularly with education providers of surveying and geomatics engineering courses. Additionally, it provides a sound basis for engagement with government agencies, infrastructure bodies and other peak bodies.

In August 2014, BIS Oxford Economics undertook the same study on behalf of CSN to update the initial report on skills gap analysis for surveyors and surveying-related professionals. The results suggest that the surveying profession was likely to face a capability shortfall at the start of the next decade (2020 onwards). While this shortfall is partially mitigated by the new supply of surveying workers from local training authorities, we noted that the time delay to develop new graduates to a point of high capability means that the workforce should actively build up their stock of competent surveying professionals while the skills shortage is not as severe.

This update report builds on the previous two studies in providing an updated analysis and forecast of the labour market for the surveying and geospatial profession. We incorporate the latest Australian Census data (2016), as well as our updated projection of 'end-use' sector activity that drive the labour demand for surveying and geospatial professionals. In this update we also extend the forecast horizon by another 4 years to 2028. Additionally, our analysis and forecast has now been expanded to cover all eight states and territories in Australia. The updated report will help ensure that the workforce planning of constituent members is informed by the most current data.

1.2 Scope of research

Similar to previous research, the aim of this update is to:

1. Estimate the size of the surveying and geospatial professional workforce in 2017/18 based on the most recent Census and labour market data;
2. Forecast skills demand for the profession based on the outlook of the industries serviced;
3. Compare the demand forecast for skills against the outlook for the existing workforce to identify potential workforce gaps by state and national level;
4. Contrast any measured workforce gaps against the outlook for new skills supply through university and TAFE graduates, which will identify any potential capability shortfall for the profession over the coming decade (2017/18 - 2027/28);
5. Highlight the implications of the results for the profession and the broader economic impact, especially if measured capability gaps were to materialise.

1.3 Methodology and terminology

This update draws on the same methodology of the previous two studies, with some minor revisions, to allow for consistent comparison over time. The methodology involves several steps as described below:

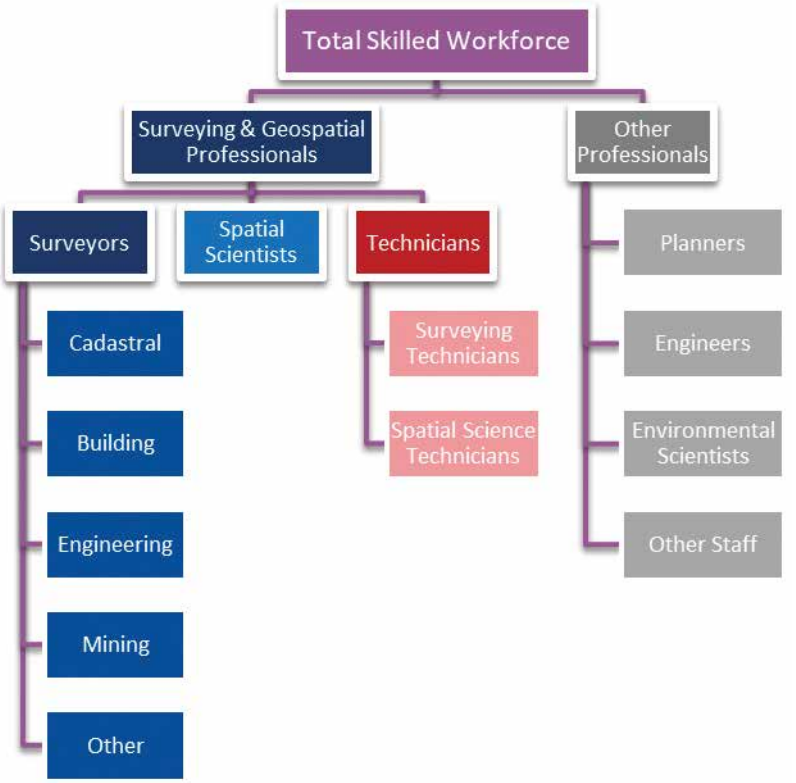
Step 1: Define and estimate the current skilled surveying and surveying-related workforce

To quantify the skills capability gap we need to first classify and define the skills being considered in the workforce capability study. The present update largely adopts the same workforce classification as the previous studies, categorising the overall surveying and geospatial workforce into several occupation groups by main areas of specialisation, level of qualification and other supporting professions in surveying firms.

We did, however, modify the naming convention of one of the surveying sectoral activating (i.e. 'building' instead of 'construction') for better clarity in interpreting the results (see Table 1.1 on page 18 for a description of workforce breakdown, also illustrated in Chart 1.1 on page 17). Particularly, we note that while we distinguished several key sectoral drivers under the surveyor's occupation group, we acknowledge that surveyors often engage in projects across multiple construction sectors and are not restricted to just one sector. Nonetheless, we devised such categories to form a comprehensive picture of labour demand for surveyors across multiple industry sectors. Consequently, unlike the previous update we now refer to surveyors as different *types of surveyors* (e.g. 'building surveyors' and 'engineering surveyors'), but rather refer to the demand for surveying skills by different *types of construction sectors.*

To estimate the size of each occupation group, we first obtained the employment figures of surveyors and spatial scientists, technicians and other surveying-related professions from the 2016 Census conducted by the Australian Bureau of Statistics (ABS). We then adjusted the employment figures using the ABS' quarterly labour force statistics to estimate the size of the overall surveying population in the base year (i.e. 2017/18). This estimated surveying population was then disaggregated into the pre-defined occupation groups using proportions obtained from our industry survey.

Chart 1.1: Workforce Classification



Reference to Surveyors - Building, in this report refers to Land Surveyors engaged on building sites and projects, not Building Surveyors who assess building plans under the Building Code of Australia.

Table 1.1: Description of Key Occupation Groups

OCCUPATION GROUP	DESCRIPTION
Surveyors	Plans, directs and conducts survey work to determine, delineate, plan and position tracts of land, natural and constructed features for the following sectors: • **Cadastral**: boundary surveys relating to land title ownership, new subdivision layout and design. • **Building**[4]: multi-residential and non-residential building projects including commercial, industrial and institutional building. • **Engineering**: infrastructure projects such as roads, dams, pipelines and harbours. • **Mining**: mining and underground works. • **Other**: other surveying work including geodetic, hydrographic and photogrammetric etc.
Spatial scientists	Acquires, analyses, interprets and distributes information about locations in space and time, and develops related equipment, software and services.
Surveying technicians	Collects, records and evaluates spatial information and prepares databases, maps, charts and plans in support of surveyors.
Spatial science technicians	Collects, records and evaluates spatial information and prepares databases, maps, charts and plans in support of spatial scientists.
Urban and regional planners	Develop and implement plans and policies for the controlled use of urban and rural land, and advise on economic, environmental and social factors affecting land use.
Engineers	Includes civil engineering professionals, mining engineers and other engineering professionals.
Environmental scientists	Study, develop, implement and advise on policies and plans for managing and protecting the environment, flora, fauna and other natural resources.
Other staff	Other professional staff employed by surveying firms.

Step 2: Forecast the skilled labour demand for surveyors and surveying-related professionals

Similar to the previous two reports, we adopt a labour multiplier approach in estimating demand where we assume a relationship exists between end-use sector activity and manpower demand for the occupation groups as previously defined. This relationship is quantified by **'usage coefficients'** which are estimated as the ratio between the estimated size of an occupation group in a given time period and its corresponding end-use sector activity at the same time.

The end-use activity indicators chosen for the occupation groups are as follows:

- Private house commencements for surveyors engaged in the cadastral sector.
- Private multi-residential and non-residential buildings for surveyors engaged in the building sectors.
- Utilities and transport construction for surveyors engaged in engineering construction sectors.
- Mining and heavy industry construction[5] plus mining exploration investment for surveyors in mining sectors.
- Total construction (sum of residential, non-dwelling and engineering construction) for surveyors engaged in other sectors, as well as spatial specialists, technicians and other professionals employed at surveying practices.

For each occupation in each state and territory, a 'usage coefficient' was calculated by dividing the estimated size of each occupation group by the pertinent end-use activity level across multiple years. A weighted average of these annual 'usage coefficients' is then applied to our forecasts of end-use activity levels to project the level of labour demand for different occupation groups. We also allowed for 'dynamic' usage coefficients to incorporate labour productivity growth into our model (assumed at 1.5% per annum).

4 Previously referred as 'Construction'.
5 Less oil and gas sector activity to remove unnecessary volatility.

The model therefore assumes that future demand for skilled labour in the surveying and geospatial industry are driven by 1) changes in the activity of pertinent end-use sectors, and 2) labour productivity growth over time.

The forecasts of the key determinants of labour demand were sourced from BIS Oxford Economics' publications, including *Building in Australia, Engineering Construction in Australia, Mining and Heavy Industry Construction in Australia, Mining in Australia, Long Term Building Work Done Forecasts,* as well as other unpublished forecasts and from BIS Oxford Economics internal research.

Step 3: Model existing workforce attrition and workforce gap

To account for **attrition of existing workforce** due to retirement, we estimated the age profile of the workforce in each state using the 2016 Census data and calculated the likelihood of retirement for each age group using ABS' *Retirement and Retirement Intentions* report.

The retirement assumptions for each age group are shown in Table 1.2 and are used uniformly across all states and territories. The expected workforce attrition will vary in each state and territory, however, according to the size and age profile of workforce in each region.

The changing demand for surveying and surveying-related skills (due to changes in end-use sector activity) and the loss of personnel due to retirement will likely result in a "**workforce gap**", which is defined as the difference between labour demand and the existing workforce. This is shown conceptually in Chart 1.2.

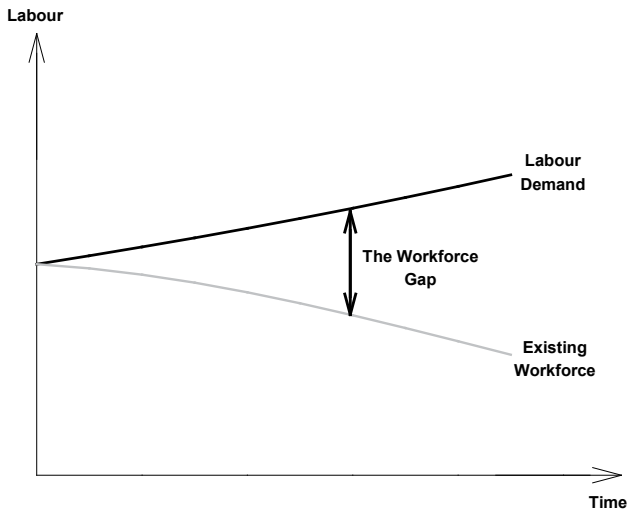
A **positive workforce gap** indicates a **shortage of skilled labour** in meeting demand and vice versa. The workforce gap, when positive, will need to be met by additional labour supply if forecast levels of end-use sector activity are to be met.

Table 1.2: Surveying and Geospatial Workforce Retirement Assumptions

Age Bracket	Proportion intending to retire in their age group (%)
45-54	6%
55-59	6%
60-64	8%
65-69	27%
70+	52%

Source: ABS

Chart 1.2: The Workforce Gap



Step 4: Modelling new labour supply

Our forecast of new skilled labour supply is based on the projected number of new graduates from local training authorities which is split into two groups:

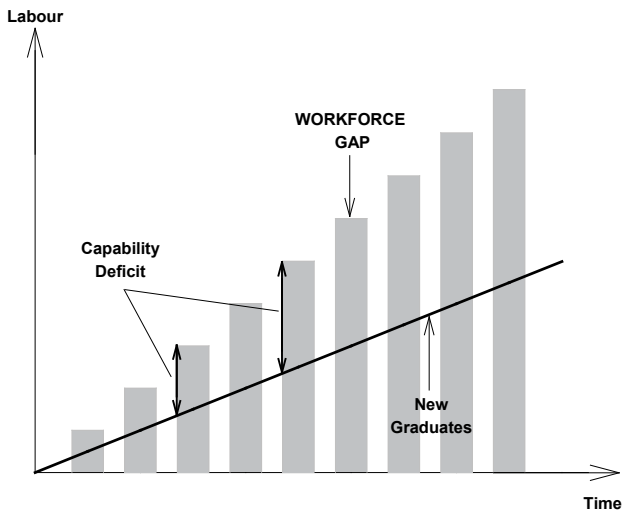
1. **Higher Education:** students completing an undergraduate geomatic engineering degree are assumed to join the surveying and geospatial workforce as surveyors or spatial scientists.
2. **Vocational Education and Training (VET):** students completing a Diploma (or equivalent) in geomatics engineering are assumed to join the workforce as surveying or spatial science technicians.

In forecasting the supply of new surveyors and spatial scientists, we utilise the higher education statistics supplied by the Department of Education and Training (DET), particularly enrolment and completion figures for undergraduate geomatics engineering degrees. Forecast for the supply of new technicians is based on enrolment and completion figures of geomatics engineering vocational courses (diploma or associate degree), supplied by the National Centre for Vocational Education Research (NCVER).

Step 5: Quantify a capability shortfall or surplus

We forecast the capability shortfall or surplus for the surveying industry over the next ten years (i.e. through to 2028). This is defined as the difference between the workforce gap (quantified in Step 3) and the supply of additional skilled labour (via new graduates). This is illustrated in Chart 1.3 below. **A positive capability gap implies the presence of a capability shortfall in the future**; the surveying and geospatial industry will need to attract additional labour above that expected to be sourced from new graduates if it is to meet forecast levels of future construction activity. A negative capability gap, on the other hand, implies either the absence of a shortfall or an excess of workers in the surveying and geospatial workforce. In other words, the available skilled labour meets or even exceeds the future labour demand.

Chart 1.3: The Capability Shortfall/Surplus



It is important to note that the capability shortfall (or surplus) is a theoretical construct. In reality there will be no observable capability shortfall. Either labour demand (and construction activity) will fall back to meet the constrained level of labour supply — implying that some future construction activity will need to be cut back or foregone — or measures will be put in place that will boost labour supply to meet projected construction activity.

Although a theoretical construct, calculating the capability deficit provides important insights. First and foremost, it provides a simple measure of how much more labour is required through initiatives such as migration, education and re-training to meet current expectations of future construction activity. Alternatively, a capability shortfall could be used to measure the "cost" of the labour constraint in terms of the value of the construction activity foregone if supply were not augmented. Given the high 'multiplier' effects of construction activity — as well as costs associated with the presence of inadequate infrastructure delivery, this cost would have even stronger flow-on effects on the broader economy.

Due to interstate mobility of new graduates, *we only provide a capability shortfall/surplus analysis on the national level*. On the state level, we provide an analysis of potential workforce shortage prior to new labour supply (i.e. up to step 3).

Key assumptions used in the model

As stated, we have had to make several broad assumptions in constructing the model. Some of these assumptions are more important than others in terms of their impact on the working of the model and the results generated. In our view, the key assumptions are:

1. The choice of end-use activity indicators,
2. Movement and supply of new graduates based on historical numbers, and
3. The rate of labour productivity growth.

In addition to these, the results of the model also hinge on the accuracy of our construction activity forecasts. As mentioned above, these are sourced from several BIS Oxford Economics reports.

Skills Demand Study – Key Terms and Conventions

Surveying and geospatial workforce comprises surveyors, spatial scientists, and surveying and spatial technicians.

Total skilled workforce constitutes skilled surveying and geospatial workforce plus the number of planners, engineers, environmental scientists and other staff employed at consulting surveying firms.

Existing skilled workforce is defined as the current size of the skilled workforce. This is adjusted for natural attrition through ageing over the forecast horizon.

Demand for skilled labour is based on BIS Oxford Economics' forecasts of the key determinants of skilled workforce.

Workforce gap is defined as the difference between the **demand for labour and the size of the existing workforce**. If labour demand exceeds the size of the existing workforce, then we have 'positive' workforce gap. A positive workforce gap implies that the existing workforce will be insufficient to cover for expected future demand. Conversely, if the size of existing workforce exceeds the demand for skilled labour, then a 'negative' workforce gap arises, implying that the existing workforce will more than cover for the expected future skills demand.

New labour supply is defined as the additional labour supply from new graduates, net migration from overseas and other labour supply boosting initiatives (re-training, productivity improving measures, slower rates of attrition etc.). Only the first source is considered explicitly in this report.

Net capability position is the difference between the estimated **workforce gap and the new supply of skilled labour** via new graduates. If the net capability position is positive, we refer to it as a 'capability shortfall'. This implies that the surveying and geospatial industry needs to attract additional labour on top of expected levels of new graduates if it is to achieve forecast levels of construction activity. Conversely, a negative capability position reflects a 'capability surplus' which implies the industry has more than enough capacity to undertake the expected future levels of activity.

1.4 Structure of report

The structure of the report is as follows:

- **Chapter 2** discusses the characteristics of the surveying and geospatial workforce in Australia, including employment trends, industries, earnings, education levels, demographic characteristics and labour mobility.
- **Chapter 3** presents the output of the skills demand and supply model for Australia. We first provide an outlook of Australia's general economic environment and key industry sectors. This is followed by discussion on the estimated size of the current skilled surveying and geospatial workforce in Australia. Subsequently, we present our forecast of labour demand, workforce attrition and the resulting workforce gap, as well as our projection of new labour supply and Australia's workforce capability position.
- **Chapters 4 – 11** present the results of the workforce gap model for New South Wales, Victoria, Queensland, South Australia, Western Australia, Tasmania, Northern Territory and Australian Capital Territory respectively.
- **Chapters 12** presents other key information from our national industry survey conducted for this present update.
- **Chapter 13** summarises the results of our forecast,

1.5 What's new in this update

- Forecast horizon has been extended by another 4 years to FY2028 and results updated with our latest research on key construction sectors as well as the latest Australian Census data (2016).
- Workforce analysis and forecast has now been expanded to cover all eight states and territories in Australia (previously only New South Wales, Victoria, South Australia and Queensland).
- Included a new chapter detailing the workforce characteristics of the surveying profession in Australia (chapter 2).

Chapter Two

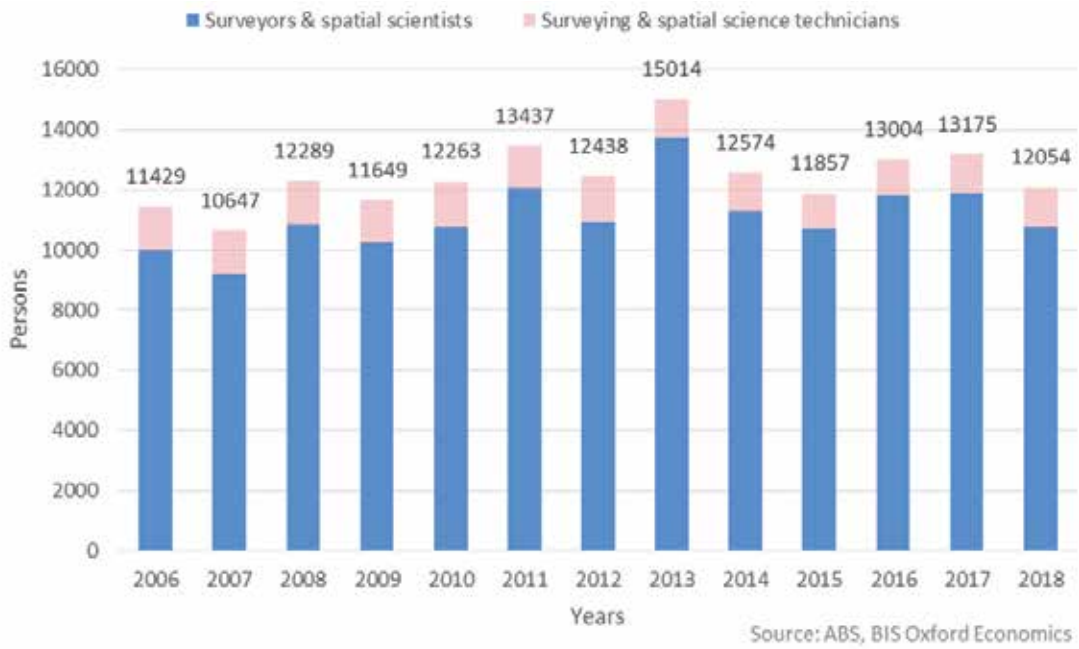
Workforce Characteristics

2. WORKFORCE CHARACTERISTICS

2.1 Employment

2.1.1 Employment trend

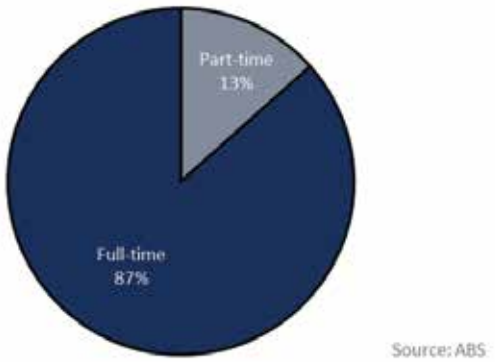
Chart 2.1: Employment of Surveying and Geospatial Professionals



The size of the skilled surveying and geospatial workforce steadily rose from 2006 to 2013 by 31%. This corresponds to the steady growth in construction activity by 20% within the same period. However, the weakened construction levels after 2013 saw the workforce size to diminish from 15,014 workers in 2013 to 11,857 in 2015 (-21%). Surveying and geospatial employment somewhat picked up in 2016-2017 as construction activity recovered from its trough in 2015. Nevertheless, our current estimates suggest the workforce size has dropped to roughly the same employment levels in 2015.

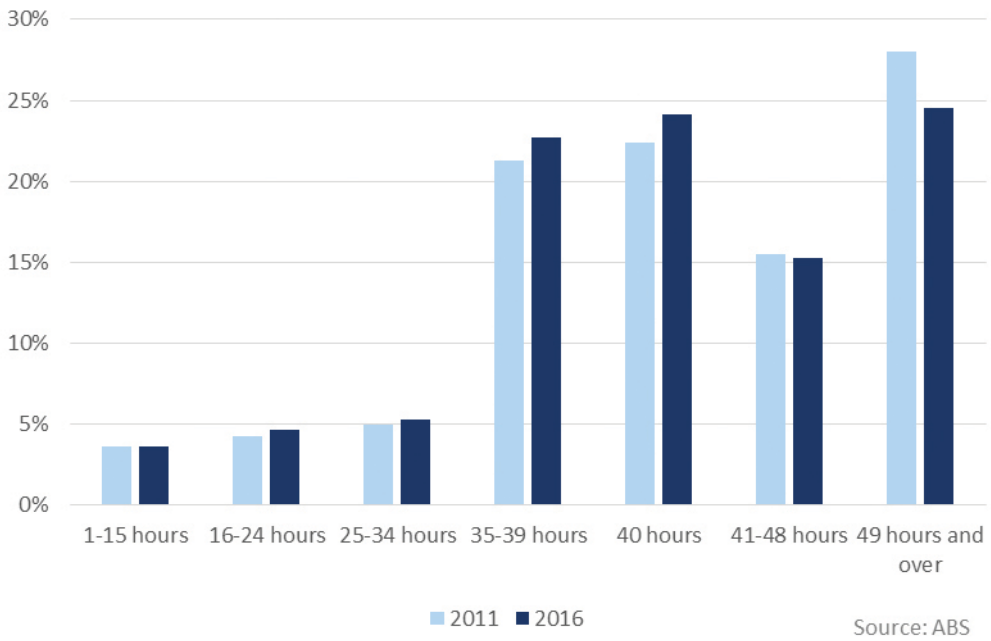
According to ABS Census data, surveying or spatial science technicians represent around 11% of surveying workforce. The full-time/part-time status of surveyors and spatial scientists have remained largely the same between 2011 and 2016, with 87% of the workers working full-time and 13% part-time (compared to 65% of all occupations in 2016)[6]. Average work hours for surveyors and spatial scientists have however decreased slightly from 43.3 hours per week in 2011 to 42.1 hours in 2016.

Chart 2.2: Surveyors and Spatial Scientists by Employment Status (2016 Census)



6 ABS defines part-time employed persons as those who usually work less than 35 hours per week and full-time employed persons as those who usually work 35 hours or more per week.

Chart 2.3: Surveyors and Spatial Scientists by Hours Worked Per Week

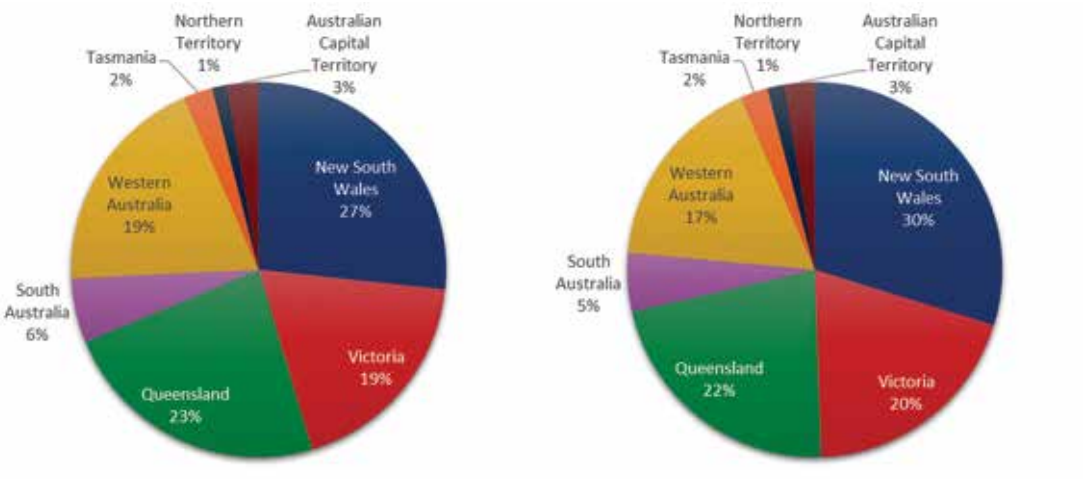


2.1.2 Workforce breakdown

State breakdown

The largest employing state of the surveying profession is New South Wales (30%), followed by Queensland (22%), Victoria (20%) and Western Australia (17%).

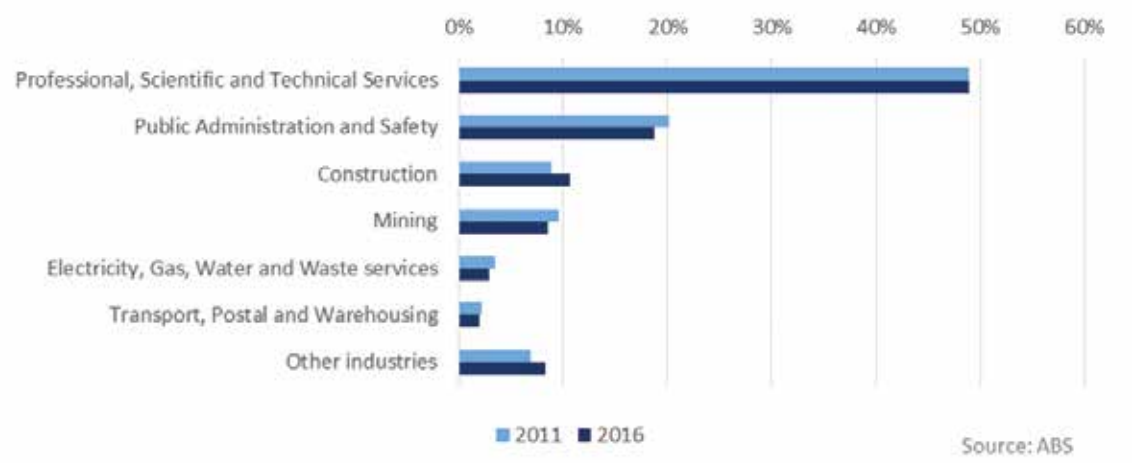
Chart 2.4: Breakdown of Skilled Surveying and Geospatial Workforce by State: 2011 (left) and 2016 (right)



Industry breakdown

The skilled surveying and geospatial workforce are predominantly employed in the professional, scientific and technical services (49%), particularly in architectural, engineering and technical consultancy services (unsurprisingly). This is followed by public administration and safety (19%), construction (11%), mining (9%) and electricity gas, water and waste services (3%), and transport, postal and warehousing (2%).

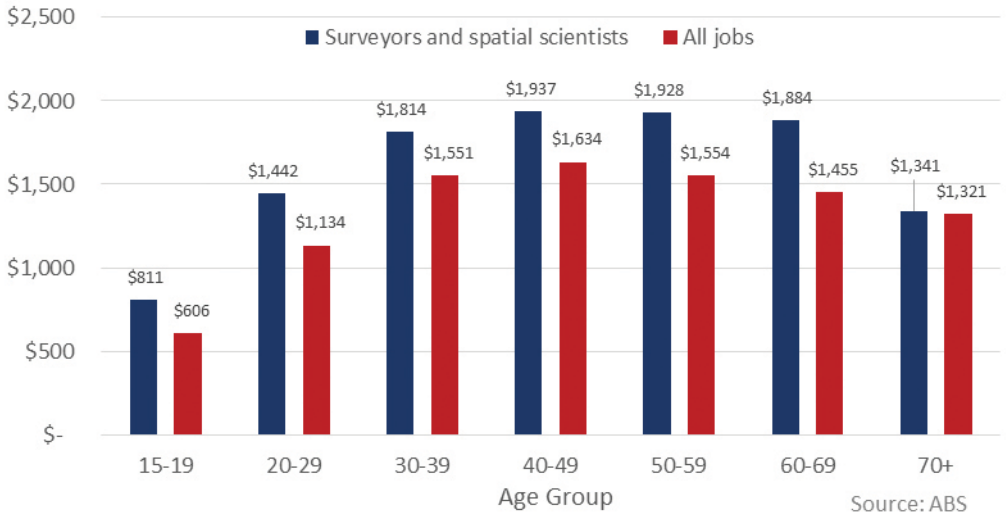
Chart 2.5: Breakdown of Skilled Surveying and Geospatial Workforce by Industry



2.2 Earnings

According to the latest Census data, the average earnings of a full-time surveyor or spatial scientist is $1,798 per week (~ $93,500 per annum) which is 9.6% higher than all occupations' average earnings. Surveyors earn relatively higher earnings than their peers. Particularly, young workers aged 15-29 in the surveying profession earns 30% higher than their peers in other professions.

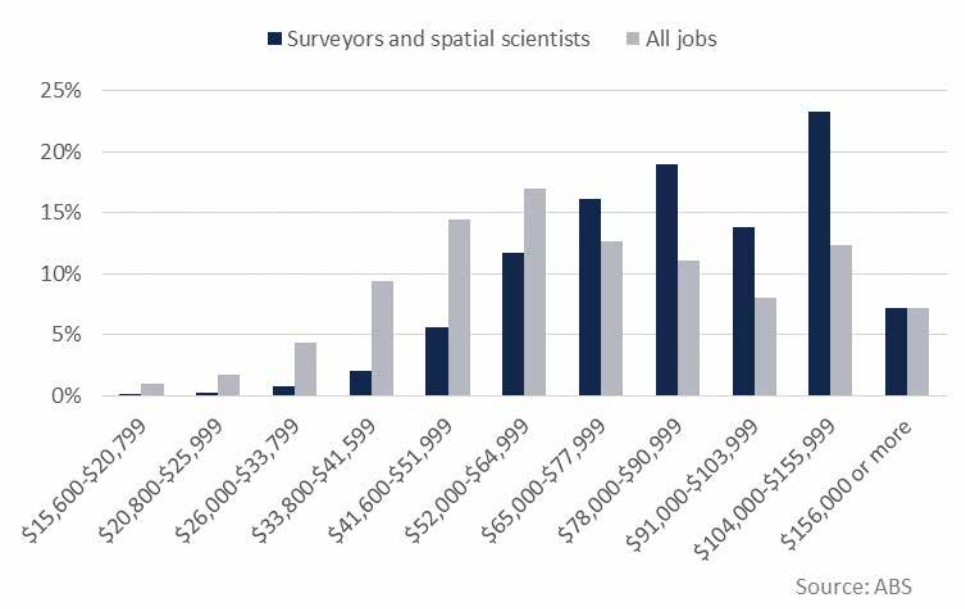
Chart 2.6: Full-time Weekly Earnings by Age Group



Young surveying professionals (aged 15-29) earn 30% higher than their peers in other professions.

Occupation group	Average full-time weekly earnings
Surveyors & Spatial Scientists	$1,798
All jobs	$1,641

Chart 2.7: Distribution of Annual Full-time Earnings



63% of surveyors earn above $78,000 per year; vs 39% of all jobs.

2.3 Age & Gender

In 2016, around 65% of the surveying workforce were greater than 35 years old, compared to 67% for all occupations. 7% of the workforce were aged less than 24 years, compared to 16% for all occupations. The average age of the workforce is estimated to be around 41.6 in 2016, a slight increase from 40.7 in 2011 (ABS 2011 & 2016).

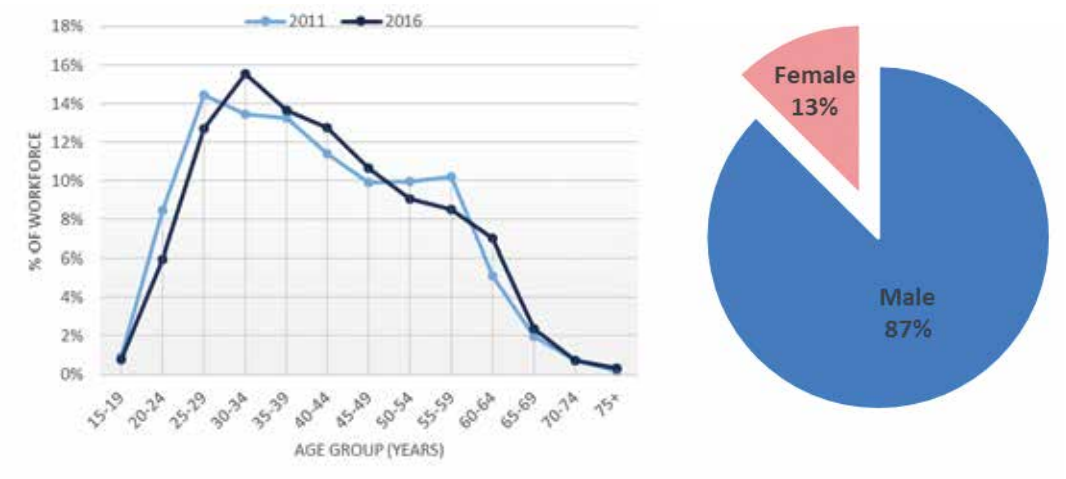
Surveying workers are predominantly male. Over 87% of the surveying workforce are male compared to around 52% for all occupations. (ABS Census 2016)

Table 2.1: Average Age of Occupation Groups

Occupation group	Average age
Surveyors and spatial scientists	41.6
Professionals	41.7
All jobs	45.9

Source: ABS

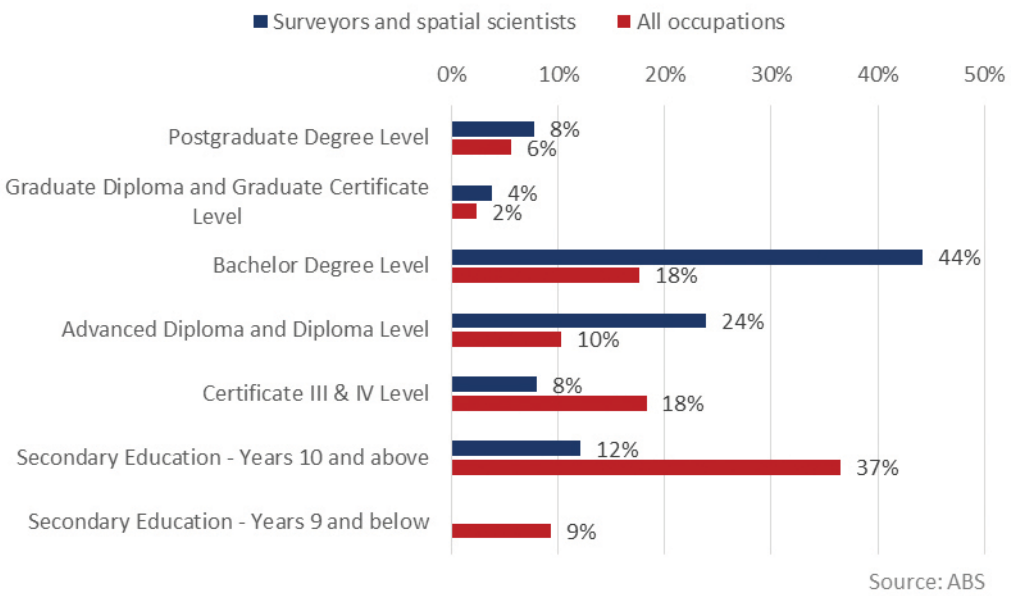
Chart 2.8: Age and Gender Profile of Surveyors and Spatial Scientists



2.4 Education Attainment and Registration

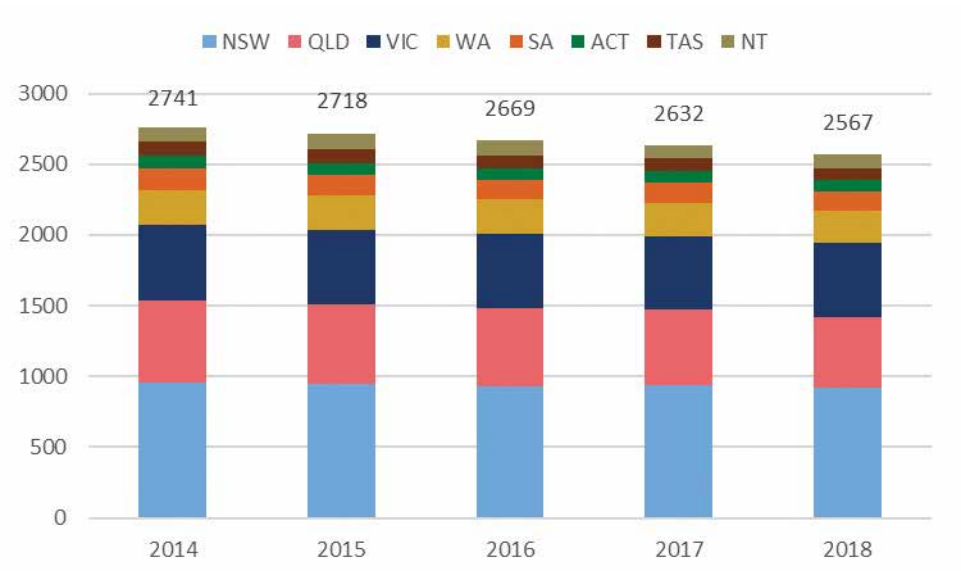
In 2016, 89% of surveyors and spatial scientists had completed the highest level of secondary school (i.e. Year 12), compared to 52% for all occupations. Around 44% of the workforce had also attained a bachelor's degree and 28% had undertaken some form of Certificate III and above course. In 2018, we estimate that there are 2,567 registered surveyors nationwide, representing 31% of all surveyors in Australia.

Chart 2.9: Level of Highest Education Attainment



Source: ABS

Chart 2.10: Number of Registered Surveyors in Australia



Source: CRSBANZ

2.5 Labour Mobility

2.5.1 Interstate migration

According to 2016 Census, 720 surveyors and spatial scientists (6% of workforce) indicated a change of residence to another state in Australia between 2011 and 2016. The number of inflows, outflows and net inflows for each state are shown in Table 2.2.

Table 2.2: Flow of Surveyors & Spatial Scientists by State (2011 to 2016)

State	Total Inflow	Total Outflow	Net Inflow
NSW	230	153	77
VIC	120	122	-2
QLD	178	184	-6
SA	23	52	-29
WA	79	107	-28
TAS	15	37	-22
NT	44	29	15
ACT	31	36	-5

Source: ABS

2.5.2 Temporary visas for skilled surveying and geospatial workers

Chart 2.11 and 2.12 shows the national figures of visa holders and visa grants in skilled surveying and geospatial occupations, either through the Temporary Skill Shortage (subclass 482) visa or Temporary Work (subclass 457) visa. Employment of overseas skilled surveying labour has been in decline since 2013. As of June 2018, there were 137 surveying and geospatial workers on temporary visa (1.1% of workforce), approximately one-third of what it was in 2013.

Chart 2.11: Visa Holders

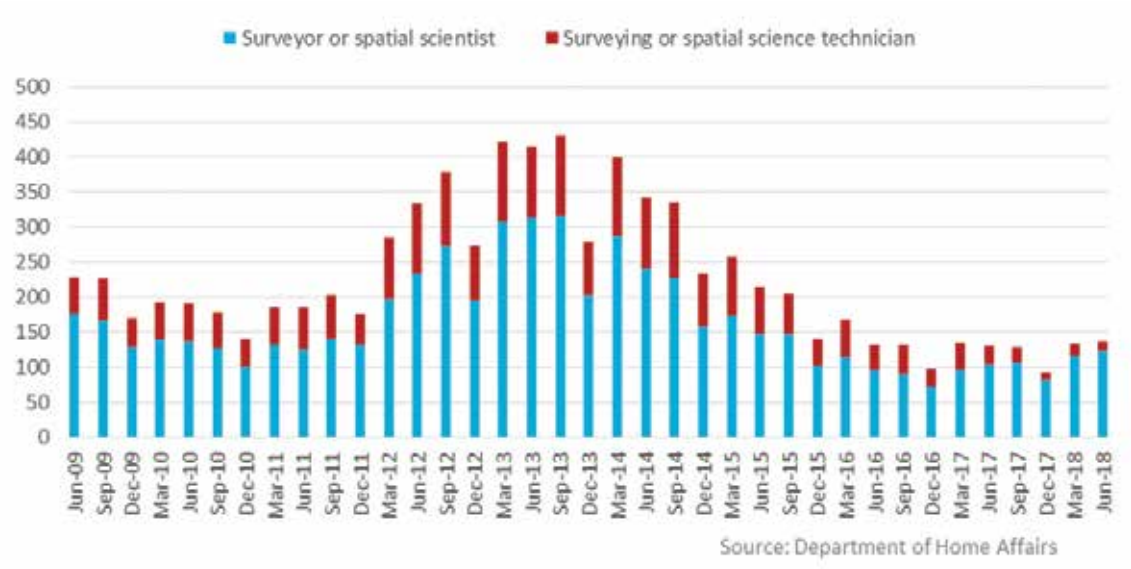
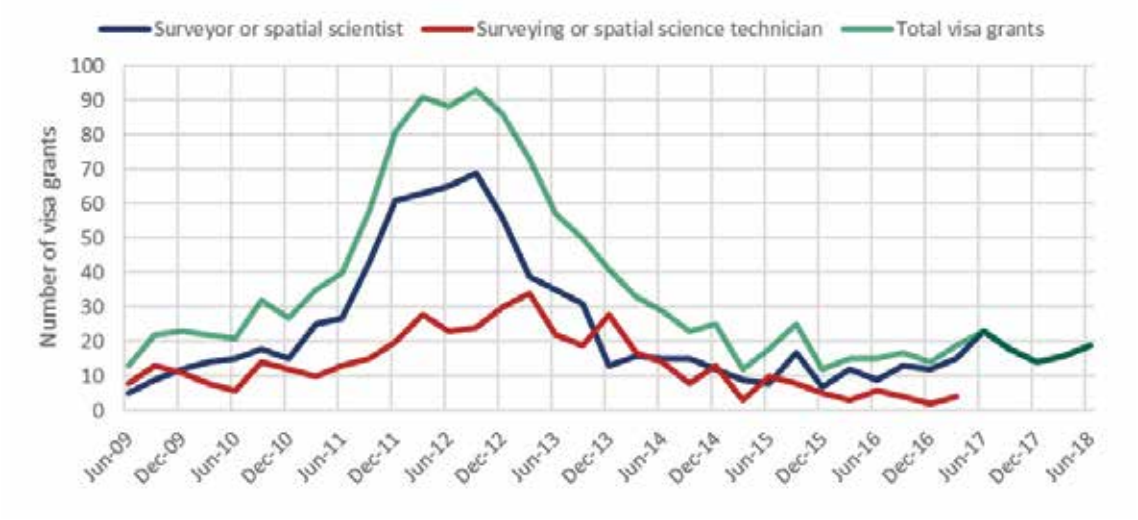


Chart 2.12: Visa Grants

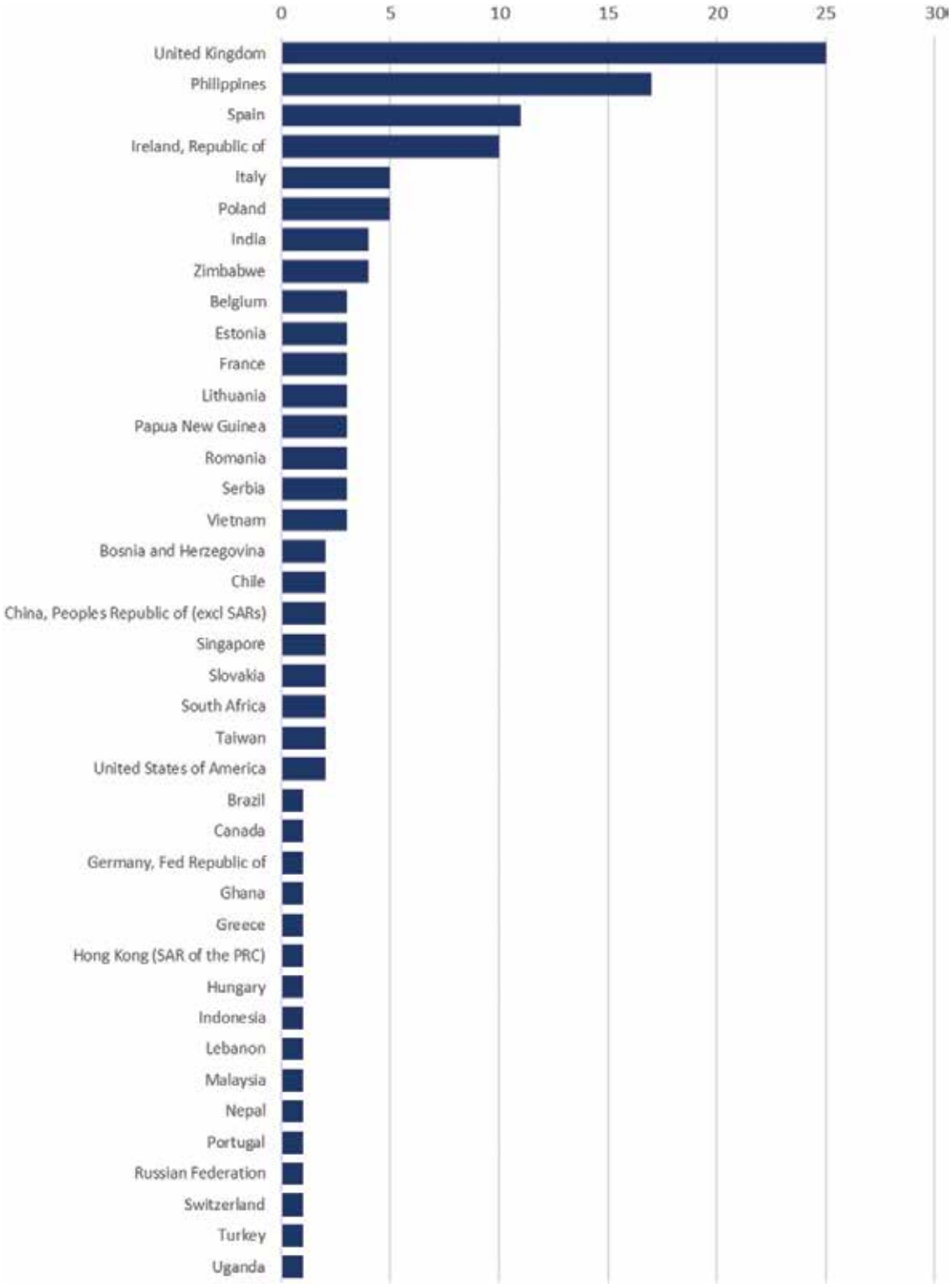


Since 2014/15, the state employing the most overseas skilled surveying and geospatial workers is New South Wales, followed by Western Australia, Queensland and Victoria (see Table 2.3). As at June 2018, the majority of surveying or surveying-related workers on temporary visas are from United Kingdom, followed by the Philippines, Spain and Ireland.

Table 2.3: Visa Grants Since 2014/15 by State

State	Visa grants
New South Wales	107
Western Australia	79
Queensland	45
Victoria	36
Australian Capital Territory	9
Northern Territory	5
South Australia	3
Tasmania	1
Total	**285**

Chart 2.13: Visa Holders by Citizenship Country (as of June 2018)



Chapter Three

Forecasts of Labour Demand, Workforce Gap and Capability Shortfall for Australia

3. FORECASTS OF LABOUR DEMAND AND WORKFORCE GAP FOR AUSTRALIA

3.1 Economic and industry outlook

3.1.1 General economic environment

Australia's economic growth has bounced back over the past year, with GDP growth increasing to 2.8% on average through FY2018, following only 2.1% in FY2017 and an average of 2.5% over the past 6 years. The current momentum in overall growth is expected to be maintained over the next year before slowing again in FY2020. Support for growth will come from net exports, government infrastructure projects and non-mining business investment activity (which is building momentum at a faster pace than previously expected), but it will be offset by subdued consumer spending and a downturn in residential dwelling construction.

After continuing softness into FY2020, the economy is set to strengthen appreciably from the turn of the decade as investment cycles synchronise underpinning stronger economic growth. The downturn in dwelling construction will see the re-emergence of a rising undersupply driving the next pick up in new dwelling activity, which will coincide with the ongoing accelerating in non-mining sector investment and a turn in mining investment. The public sector will also undergo another round of investment at both the state and federal levels.

This will generate an acceleration in employment and wage growth (driven by a tightening in the labour market), which will drive household spending. Although exports growth is forecast to moderate as the incremental increase in LNG production fades, the lower Australian dollar will work to improve competitiveness and stimulate the dollar-exposed industries, especially in the service sector. A stronger GDP will return from FY2021, increasing to 3.2% by FY2022.

Over the long run, the weaker outlook for population growth will weigh on growth in labour supply and employment. But this trend will be partially offset by increases in labour force participation and continued strength in net overseas migration, and we see GDP growth averaging 2.7% over the decade to 2033.

Wages growth has continued to disappoint, with growth momentum in the Wage Price Index stubbornly stuck at 2.1% y/y. Recent experience suggests that it will be some time before we see an acceleration in wage growth, with spare capacity in the labour market and structural shifts combining to limit upward pressure. As a result, we expect inflation to remain low in the near term. Core inflation is not expected to reach 2.5% until FY22 (although headline inflation is likely to move into the top half of the RBA's target band slightly sooner due to tobacco excise hikes and other one-offs).

With wage inflation not picking up at all over the last year we now see the RBA holding the cash rate at 1.5% until the June quarter 2020. We continue to see a gradual, steady path for rate 'normalisation', given the level of household debt and underlying pace of trend growth in the economy. These structural shifts have also resulted in a materially lower terminal rate for the cash rate than previously seen – we expect it to reach 3.25% in the long run.

Table 3.1: Australia – Key Economic Indicators, Financial Years

Year Ended June	2014	2015	2016	2017	2018	Forecast 2019	2020	2021	2022	2023
Selected Expenditure Categories										
Private Investment										
– Dwelling Investment	6.6	8.9	9.5	2.5	0.1	1.7	-8.7	-3.7	2.8	2.7
– New Non-Dwelling Building (+)	7.0	10.0	0.7	-5.9	9.4	6.8	9.9	4.3	5.1	0.1
– New Engineering Construction (+)	-3.7	-21.2	-24.5	-16.6	4.5	-11.8	0.8	3.4	1.8	2.8
– New Business Investment (+)	-4.5	-7.5	-11.5	-6.2	8.6	1.1	6.0	8.1	9.8	4.2
New Public Investment (+)	-5.4	-7.6	5.6	10.3	10.1	3.2	-3.2	0.8	2.8	4.1
Total Building and Construction (+)	-0.2	-5.7	-3.0	-1.4	3.5	1.3	-2.5	0.2	3.1	2.7
Gross National Expenditure (GNE)	0.9	1.2	1.4	2.2	3.3	2.0	2.0	2.9	3.7	2.9
GDP	**2.6**	**2.3**	**2.8**	**2.3**	**2.8**	**2.7**	**2.5**	**2.6**	**3.0**	**2.8**
Inflation										
CPI (Yr Avg)	2.7	1.7	1.4	1.7	1.9	1.7	2.1	2.6	2.8	2.8
Wage Price Index (Yr Avg)	2.6	2.4	2.1	1.9	2.1	2.5	2.7	3.4	3.7	3.7
Average Weekly Earnings (Yr Avg)	2.7	1.3	1.7	1.6	2.3	2.7	3.2	3.6	3.7	3.9
	1.8	1.1	0.9	1.7	2.0	2.5	2.9	3.6	4.2	4.4
Employment										
Employment Growth (Yr Avg)	0.6	1.3	2.2	1.5	3.1	2.1	1.2	1.3	1.5	1.5
Unemployment Rate (%)	6.1	6.0	5.7	5.6	5.3	5.0	5.0	4.9	4.8	4.8
Labour Productivity (%Ch)	1.9	1.0	0.6	0.6	-0.2	1.3	1.5	1.4	1.1	1.4
Exchange Rates										
US$ per A$ (Yr Avg)	0.92	0.83	0.73	0.75	0.77	0.74	0.76	0.78	0.79	0.79
Trade Weighted Index of A$ (June Qtr)	70.5	67.1	61.9	64.8	64.5	62.4	62.0	62.8	63.1	63.3

Source: Australian Bureau of Statistics, Reserve Bank of Australia, Haver Analytics, BIS Oxford Economics.

+Expenditure on new assets (or construction work done). Excludes sales (or purchases) of second hand assets.

3.1.2 Cadastral sector - Private house commencements

Residential dwellings can be either private houses or multi-residential dwellings. In the forecast model, the former is selected as the key determinant of labour demand for surveyors in the cadastral sector and the latter (combined with non-dwelling buildings) as the key determinant for surveyor demand in the building sector.

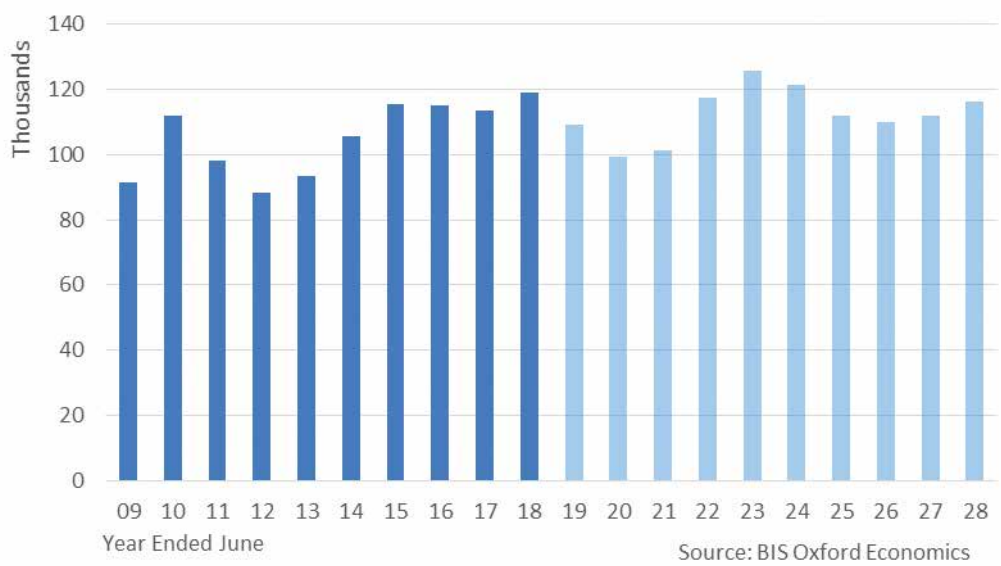
Nationally, after a trough in FY2012, the private house construction sector has experienced a period of significant growth over recent years. Private houses commencements came in at 118,979 in 2017/18 (+4.6% from previous year), supported by strong fundamentals surrounding owner-occupier demand. Compared to our previous forecast in the 2013/14 update, dwelling commencements remained relatively strong for a longer period than projected. As a result, actual commencements in 2017/18 is 24% higher than initially projected.

However, the residential sector now finds itself facing several headwinds. Tighter lending criteria has made it more difficult to receive loan approval, as well as reducing the amount that can be borrowed. Additionally, in response to rising offshore borrowing costs, out-of-cycle rate rises have started to hit. The stamp duty concession induced recovery in first home buyer loans also looks to be flatlining. These factors underpin downward pressure on house dwellings in the short-term. Total dwelling commencements are forecasted to drop by 8% in 2018/19 and another 9% in 2019/20 to a trough of 99,235 dwellings. It is forecasted that national new house commencements will average 110,668 annually between 2019-2023.

Nevertheless, a continued high rate of net overseas migration and a monetary policy stance conducive to housing demand is expected to ramp up housing construction in the mid- to long-term. It is forecast for the 2024-2028 period that national new house dwellings will average 114,312 annually, a 3% increase from 2019-2023.

The upcoming Federal election (most likely in May 2019) adds risk to the forecast profile, with Labor persisting with reform to limit negative gearing to new dwellings and cut the capital gains tax concession from 50% to 25%. In our view this policy would have significant implications for investor property demand which would reverberate through to the demand for new dwellings.

Chart 3.1: Number of Private House Dwellings Commenced – Australia



Building sector - Multi-residential dwellings and non-dwelling buildings

Multi-residential dwellings

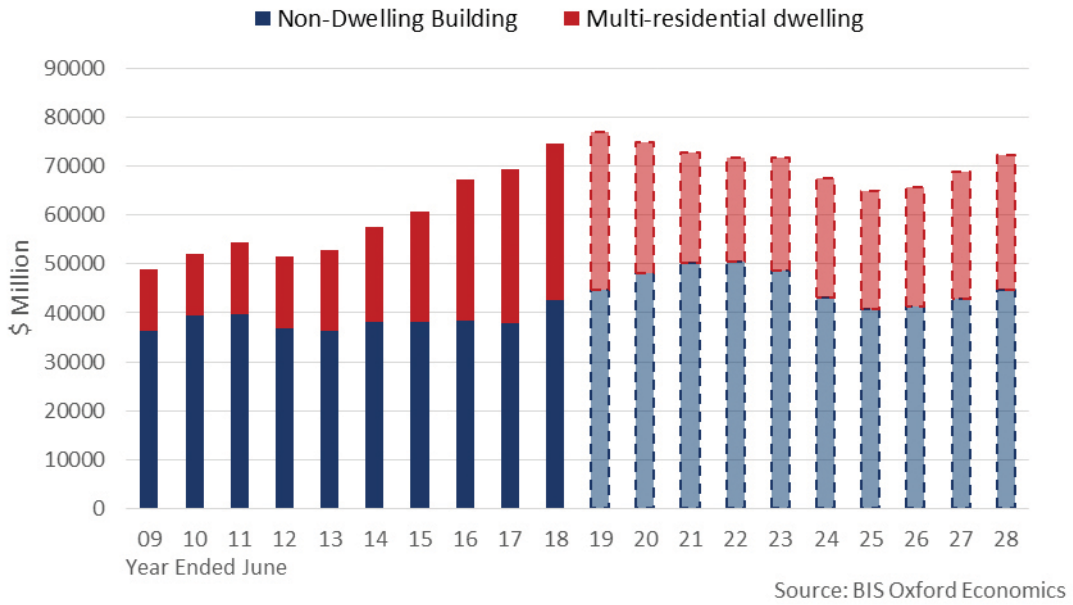
The value of work done for multi-residential dwellings in 2017/18 is measured at $31.4 billion (constant 2015/16 prices), representing 46% of total dwelling commencements in 2017/18. This historically high level of commencements is underpinned by changing investment preferences and costs which have pushed investors and residents towards apartment dwellings. However, it is anticipated that spending on multi-residential dwellings will ease back by 33% by 2021/22 to $20.9 billion. This is driven by a scaling back of investor demand as rising costs for investors, stricter lending standards and the oversupply in some inner-city markets (i.e. Brisbane and Melbourne) dampen investor appetite. Additionally, increased taxes and charges, combined with toughening capital control in China are likely to drive a significant drop in foreign investor demand for new units.

Nevertheless, as per house commencements, the continuation of elevated overseas migration inflows, a solid economic outlook and an expansionary monetary policy stance will in the long run strengthen housing demand and thus dwelling commencements. From 2023 to 2028, we expect the value of work done in multi-residential dwelling commencements to grow by 29%.

Non-residential building

National non-residential building continued to expand in 2017/18 to $41.6 billion (constant 2015/16 prices), a 12% growth from 2016/17. The considerable upturn in non-residential building has been largely led by improving private sector investments, particularly in office buildings surging by 34% to $7.1 billion and accommodation (+33%) to $3.4 billion. New South Wales and Victoria has and should continue to lead the charge, although growth is expected to radiate out to the other states over the coming years.

Chart 3.2: Multi-Residential Dwelling and Non-Dwelling Building – Australia
Value of Work Done, 2015/16 Prices



Backed by a healthy pipeline of public and private sector major projects, as well as low borrowing costs and strong population growth, it is forecast that non-residential building will remain at an elevated level over the next four years to 2021/22. This will be largely driven by social and institutional buildings, with particular strong growth in health (averaging +23% per year). Commercial and industrial building is forecast to grow by an average of 3% each year, underpinned by sustained activity in transport building (averaging +13% per year) as station components of various major commuter rail projects are undertaken.

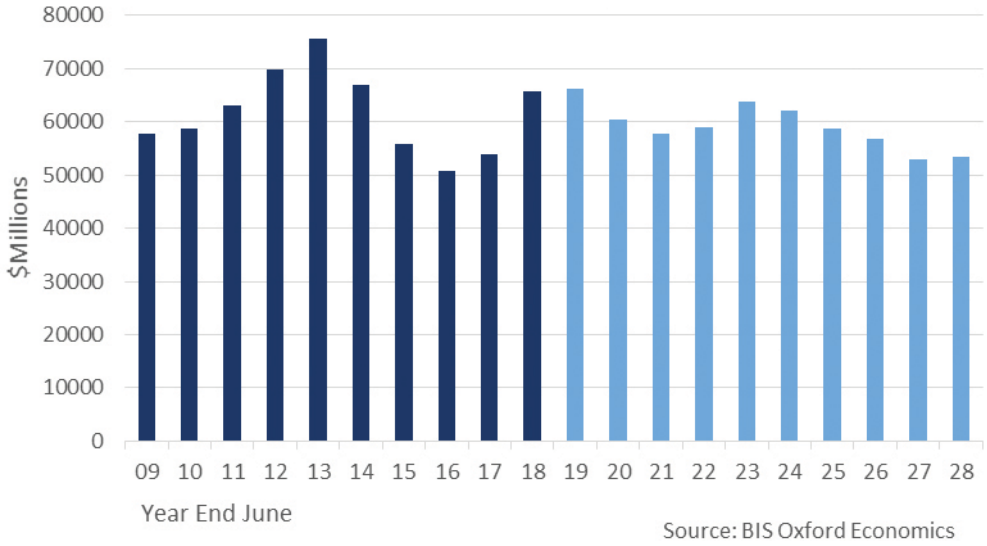
From 2023, slowing economic conditions, higher borrowing costs and easing stock pressure in several non-residential markets that helped drive the upturn (e.g. Sydney offices, hotels) are anticipated to begin driving investment lower. Total non-residential commencements over the 2023-28 period are forecast to ease back by 10% (from 2019-2022 period) to $42.2 billion per annum.

3.1.3 Engineering sector - Utilities and transport engineering construction

Utilities engineering construction includes the construction or water, sewerage, electricity and telecommunications assets, which collectively amounted to $28 billion in work done during 2017/18 (constant 2015/16 prices). This is up around 20% from 2016/17, driven mainly by electricity (particularly renewable generation) activity. The outlook for utilities construction is negative overall, as the NBN and 5G implementation reaches a peak and declines. Additionally, renewables work is expected to peak and fall after 2018/19. Falling electricity and telecoms work between 2018/19 and 2022/23 – currently estimated to amount to a loss of $8.5 billion in work done – will be a drag on the overall engineering sector.

Transport engineering construction includes the construction of roads, bridges, railways and harbours, which collectively amounted to an estimated $30 billion in work done during 2017/18. This is up 24% from 2016/17 but is still well below the peak reached in 2012/13. The outlook for growth in transport construction remains very strong given a large pipeline of publicly funded transport projects.

Chart 3.3: Utilities and Transport Engineering Construction – Australia
Value of Work Done, 2015/16 Prices



3.1.4 Mining and heavy industry sector

Mining and heavy industry (M&HI) construction

M&HI has steered the engineering construction trends of the nation over the last decade, making up 51% of total engineering construction at its $69.3 billion peak in 2013/14. This peak was underpinned by over $200 billion of investment across seven LNG projects, as well as a boom in bulk commodities such as iron ore and coal. This once in a generation LNG investment cycle is coming to an end and has been the single biggest driver of the downturn in total engineering construction activity since its peak in 2012/13. After 3 consecutive years of declines averaging 22% annually, total work done slumped to $33 billion in 2016/17 (constant 2015/16 prices). M&HI construction experienced a surge in 2017/18 to $39 billion (+20% annually), largely due to a transitory fillip in oil and gas (O&G) activity. Excluding O&G construction, M&HI work done for 2017/18 stood at $10.9 billion (+17%). M&HI construction is expected to fall back again in 2018/19 to a projected activity of $27 billion per annum between 2018/19 and 2027/28.

Mining exploration

Mining exploration has experienced a heavy decline since a peak in 2012/13. High commodity prices over the period to 2012 drove up exploration and investment into new mines and additional supply began to come online – both in Australia and overseas. This boom in production undercut prices, which in turn resulted in declines in exploration expenditure from the peak in 2012/13.

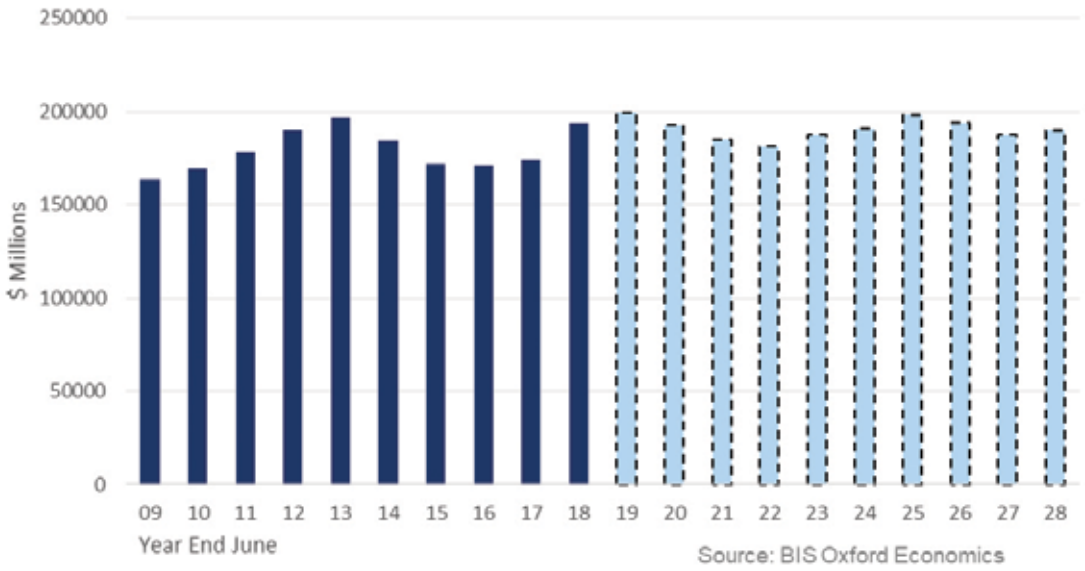
From the $7.7 billion peak in 2012/13, total exploration expenditure contracted by nearly two-thirds to $2.9 billion in 2017/18. This is the lowest annual level of exploration in 13 years and is comparable to late-90's levels. We forecast total expenditure to rise back above $3.3 billion in FY19 as activity is beginning to respond to improvements in commodity prices, particularly in the oil and gas sector. We forecast national mining exploration investment over the 2019-2023 period to be around $3.6 billion per annum, followed a slight increase to $3.8 billion per annum in the 2024-2028 period.

Chart 3.4: Mining & Heavy Industry Construction and Mining Exploration Investment – Australia
Constant 2015/16 prices

3.1.5 Total construction

Overall, total construction in Australia is forecast to increase in FY2019 (+3.1%) before declining for three consecutive years to FY2022 (average -2% p.a.) due to weakened activity in engineering construction and non-residential building. This is followed by a recovery from FY2023 to a peak of $194.1 billion in FY2025 (+5.7%) before declining to $190.4 billion in FY2028.

Chart 3.5: Total Construction by Category – Australia
Value of Work Done, 2015/16 Prices



3.2 Estimate of existing surveying and geospatial workforce

Table 3.2 presents BIS Oxford Economics' estimate of the size of the skilled surveying and surveying-related workforce in Australia in 2017/18. The aggregate figures for surveyors, spatial scientists, technicians and other professions are sourced from 2016 ABS Census data and scaled to 2017/18 according to changes in the labour market.[7] The numbers were then disaggregated into various occupation groups based on the results of our industry survey.

We estimate that surveyors comprise of 53% of the total skilled workforce nationwide, with spatial scientists and all technicians making up 16% and 8% respectively. The cadastral sector is estimated to account for 50% of all surveying activity, followed by the building sector (18%), engineering (17%), mining (9%) and other sectors (6%).

Compared to the workforce in the previous update (2013/14), we estimate that the total number of skilled surveying and geospatial workforce has shrunken by 13%. This corresponds to the overall decline in construction activity between FY2014 and early FY2018. Given its relatively stronger growth, the cadastral sector seems to have absorbed a greater proportion of surveying work from other sectors during this period.

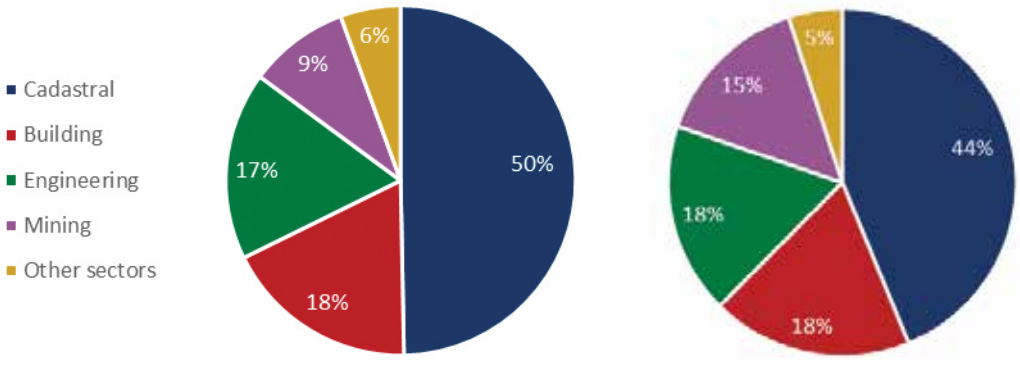
Table 3.2: Estimated Size of Total Skilled Workforce in Australia

Occupation Groups	2013/14	2017/18		
Surveying sectors				
Cadastral	3,856	4,099	▲	243
Building	1,645	1,487	▼	(158)
Engineering	1,570	1,434	▼	(136)
Mining	1,300	768	▼	(532)
Other sectors	441	460	▲	19
Total surveyors	**8,812**	**8,248**	▼	**(564)**
Registered Surveyors	*2,598*	*2,567*	▼	(31)
Total spatial scientists	**3,576**	**2,529**	▼	**(1047)**
Surveying technicians	1,103	1,070	▼	(33)
Spatial technicians	300	207	▼	(93)
Total technicians	**1,403**	**1,277**	▼	**(126)**
Total skilled surveying & geospatial workforce	**13,791**	**12,054**	▼	**(1737)**
Planners	369	1,098	▲	729
Engineers	527	1,316	▲	789
Environmental Scientists	147	421	▲	274
Other staff (include Architects)	161	583	▲	422
Total other professionals	**1,204**	**3,418**	▲	2214
Total Skilled Workforce	14,995	15,472	▲	**477**

Source: BIS Oxford Economics, ABS, CRSBANZ

7 Data provided from the ABS' Labour Force, *Australia, Detailed, Quarterly.*

Chart *3.6*: Comparison of Surveying Sectoral Activity between FY18 (left) and FY14 (right) - AUS



3.3 Forecast of skilled labour demand

National demand for skilled labour in the surveying and geospatial profession is forecast to drop slightly by 1% to 17,708 persons in FY2019. This reflects the mixed growth across all sectors, with the growth in building, engineering and mining sectors counteracted by the contracted activity in cadastral activity. The decline in overall labour demand is expected to continue in the next 4 years to FY2022, as building, engineering and mining activity weakens. The average labour demand over the next five years (FY2019-23) is estimated to be 16,584 persons.

We expect a slight recovery in 2022/23 pushing labour demand up by 3% to 16,414 persons. However, the projected weakening in building, engineering and mining activity during FY2024-28 will see annual labour demand maintain at a lower average of 15,399 persons per annum during the period, 7% lower than the previous five-year average.

Another contributing factor to the decline in labour demand is the cumulative effect of labour productivity growth (assumed at 1.5% per year). Productivity growth begins to have a visible effect towards the end of the forecast cycle, effectively reducing labour demand by 2,420 persons by 2027/28.

Chart 3.7: Forecast of Total Demand for Skilled Labour – Australia (1.5% labour productivity)

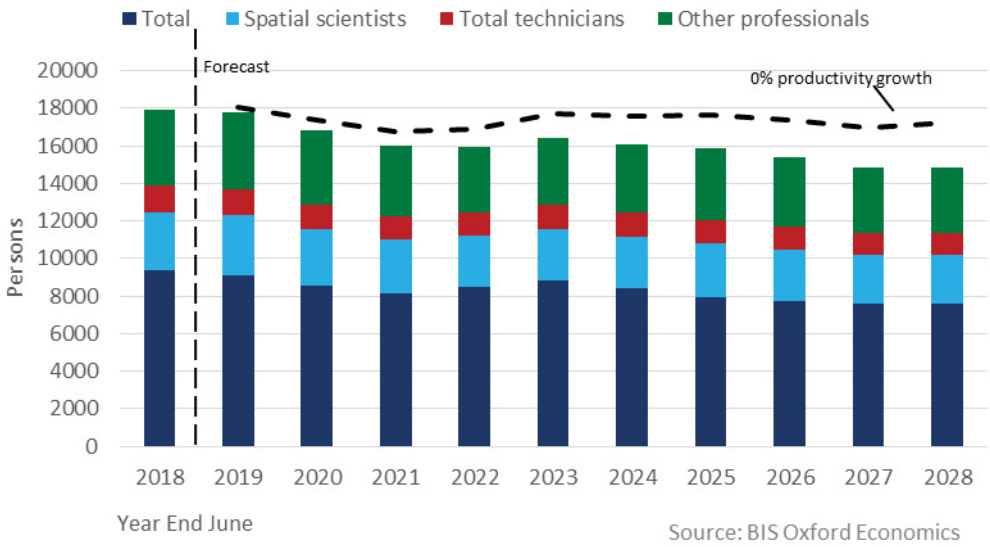


Chart 3.8: Forecast of Demand for Surveyors by Sector – Australia (1.5% Productivity Growth)

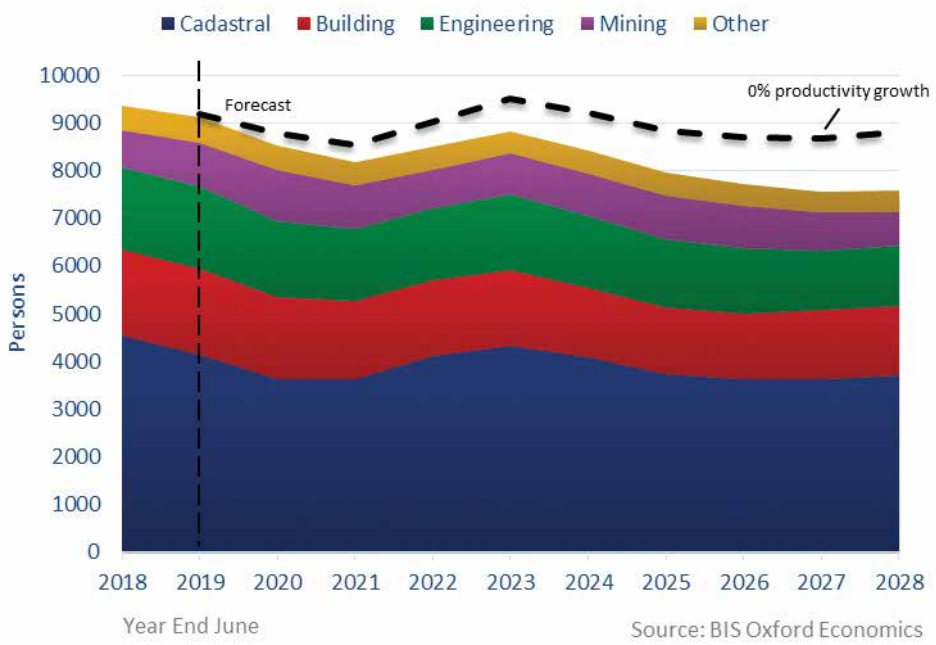
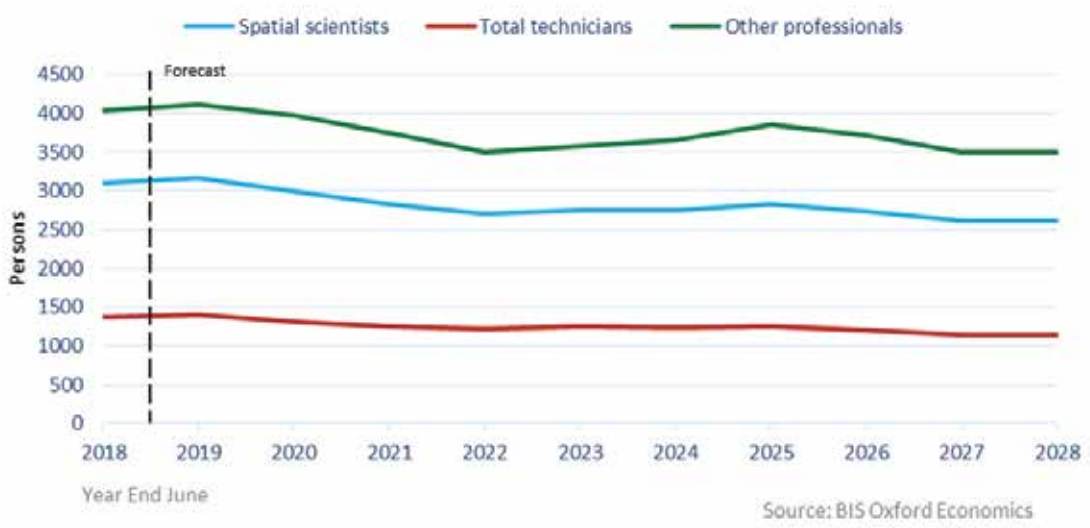


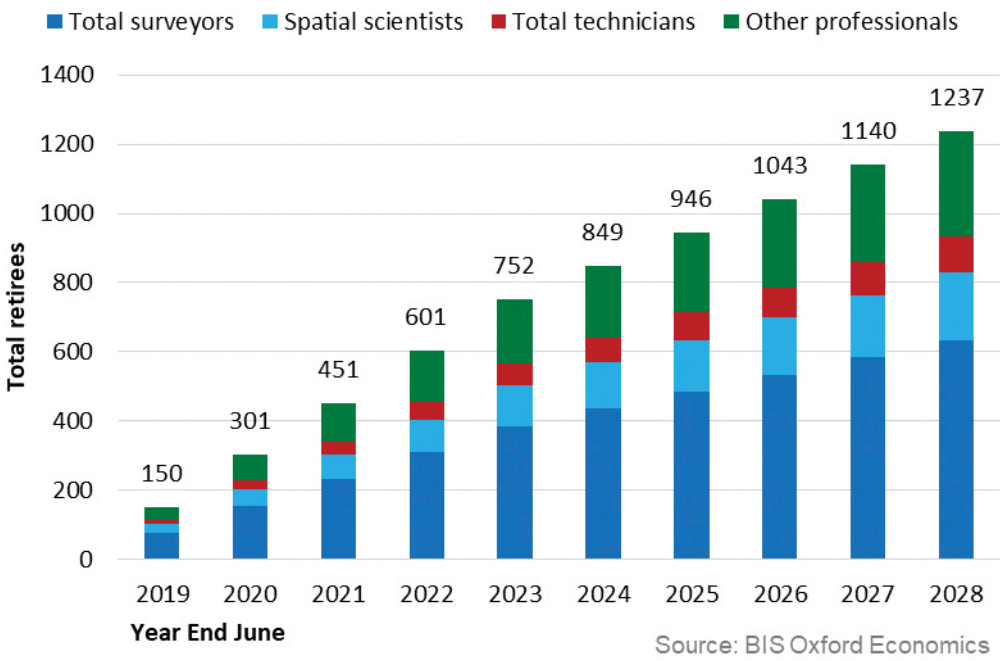
Chart 3.9: Forecast of Demand for Spatial Scientists, Technicians and Other Professionals – Australia (1.5% Productivity Growth)



3.4 Forecast of workforce attrition

Given the estimated age profile of the existing workforce, we estimate that a total of 1,237 persons (8% of current workforce) will retire from the surveying and geospatial workforce over the next 10 years in Australia. Of the retiring personnel, 828 are surveyors and spatial scientists, 104 are technicians and 304 are other professionals.

Chart 3.10: Forecast of Cumulative Workforce Attrition – Australia



3.5 Forecast of workforce gap

Workforce gap is defined as the difference between labour demand and the existing workforce. A positive workforce gap indicates a shortage of skilled labour and vice versa. In FY2018, the size of the national workforce gap is estimated at 2,400 personnel, with surveyors accounting for nearly half of the shortage (1,097 persons) followed by other professionals (623 persons), spatial scientists (579 persons) and technicians (101 persons). This gap is expected to slightly widen by in FY2019 (+2.5%), before declining by three consecutive years to FY2022, in line with construction activity. Whilst construction activity is projected to elevate at higher levels of activity after FY2023, the effects of productivity growth will see labour demand and thus workforce gap to gradually lower in the FY2024-28 period.

Chart 3.11: Forecast of Workforce Gap for Registered Surveyors – Australia (1.5% Productivity Growth)

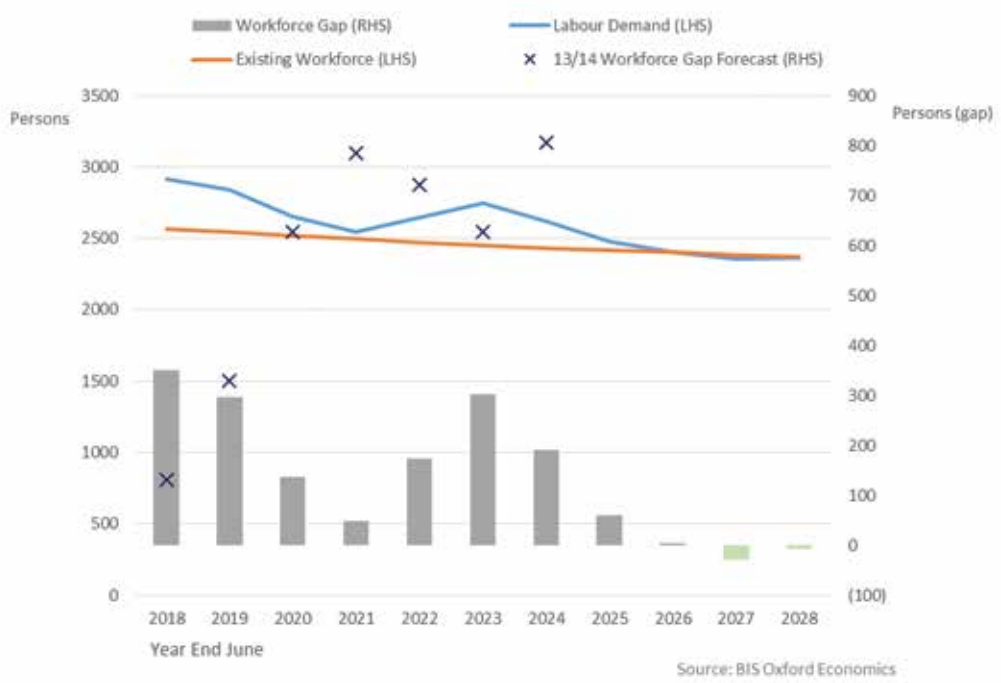


Chart 3.12: Forecast of Workforce Gap for Total Surveyors – Australia (1.5% Productivity Growth)

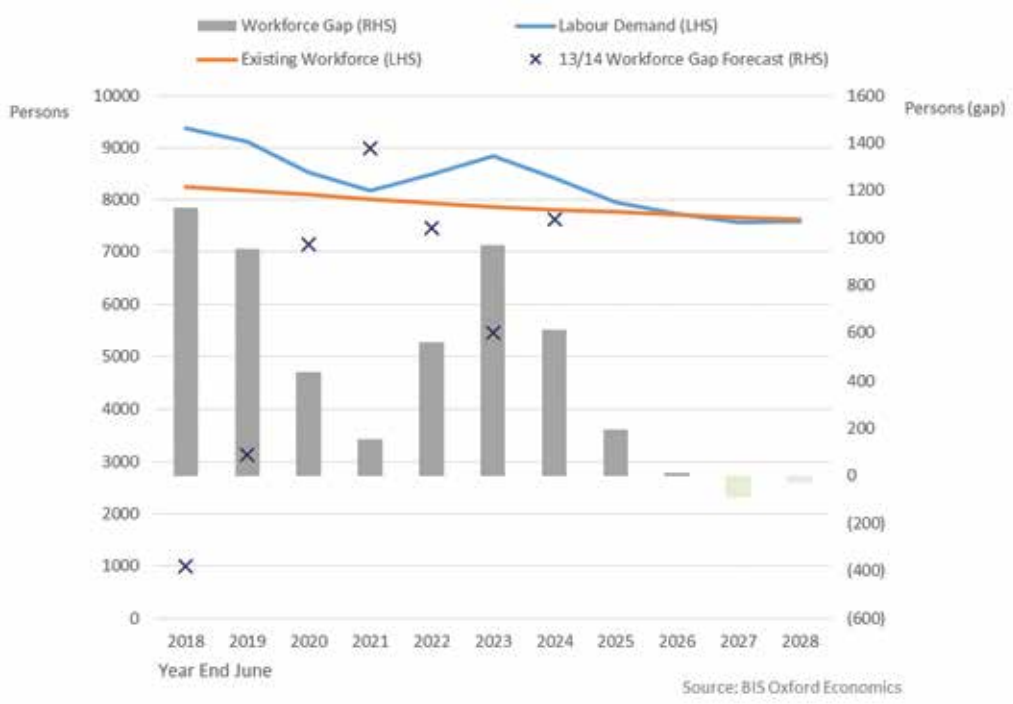


Chart 3.13: Forecast of Workforce Gap for Spatial Scientists – Australia (1.5% Productivity Growth)

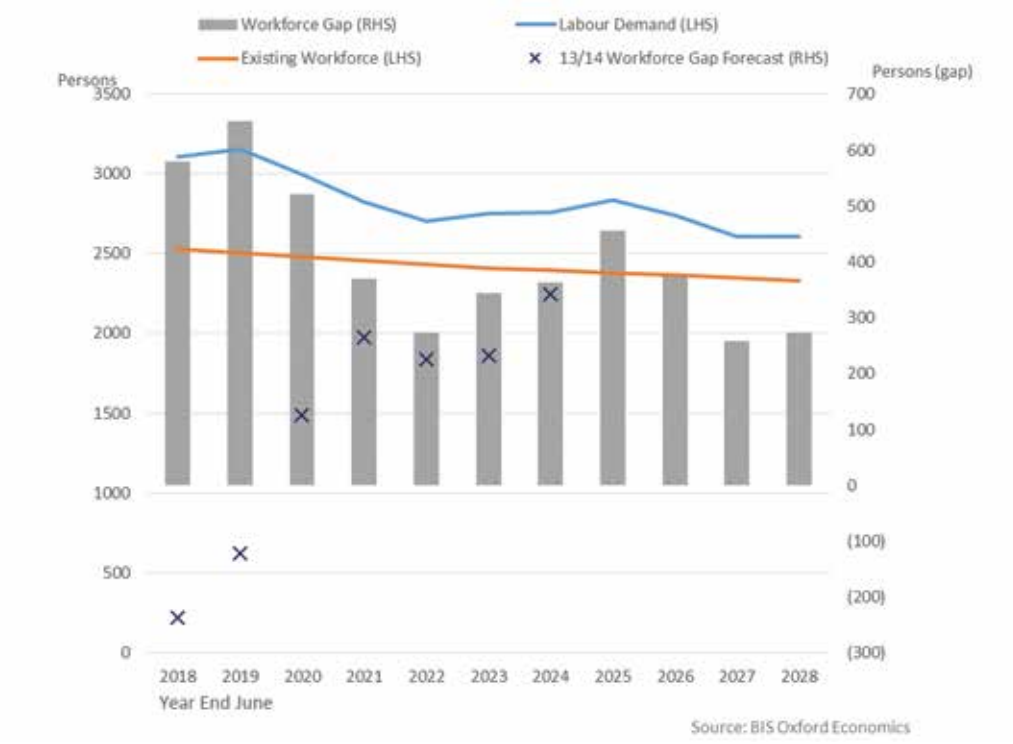


Chart 3.14: Forecast of Workforce Gap for Total Technicians – Australia (1.5% Productivity Growth)

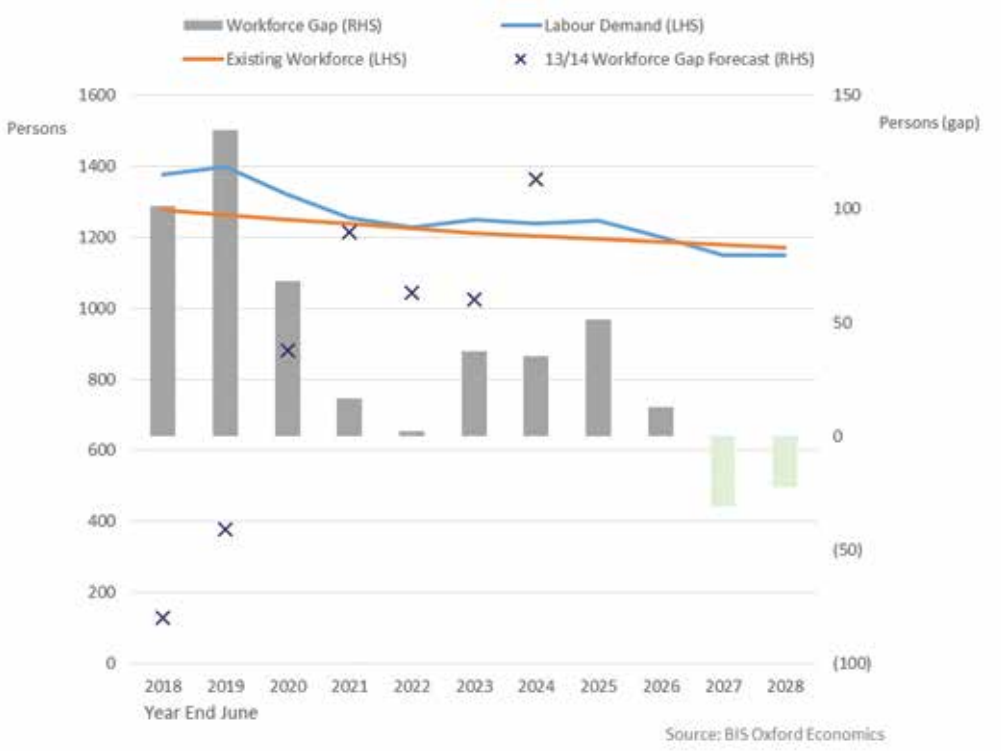


Chart 3.15 Forecast of Workforce Gap for Total Skilled Workforce – Australia (1.5% Productivity Growth)

3.6 New supply of surveyors, spatial scientists and technicians

The workforce gap will need to be met by the supply of new skilled surveying and geospatial professionals to avoid a capability shortfall in the workforce. Our model of new skilled labour supply is based on the projected number of new graduates from local training authorities which is split into two groups:

1. **Higher Education:** students completing an undergraduate geomatics engineering degree are assumed to join the surveying and geospatial workforce as surveyors or spatial scientists.
2. **Vocational Education and Training (VET):** students completing a Diploma (or the equivalent) in geomatics engineering are assumed to join the workforce as surveying or spatial science technicians.

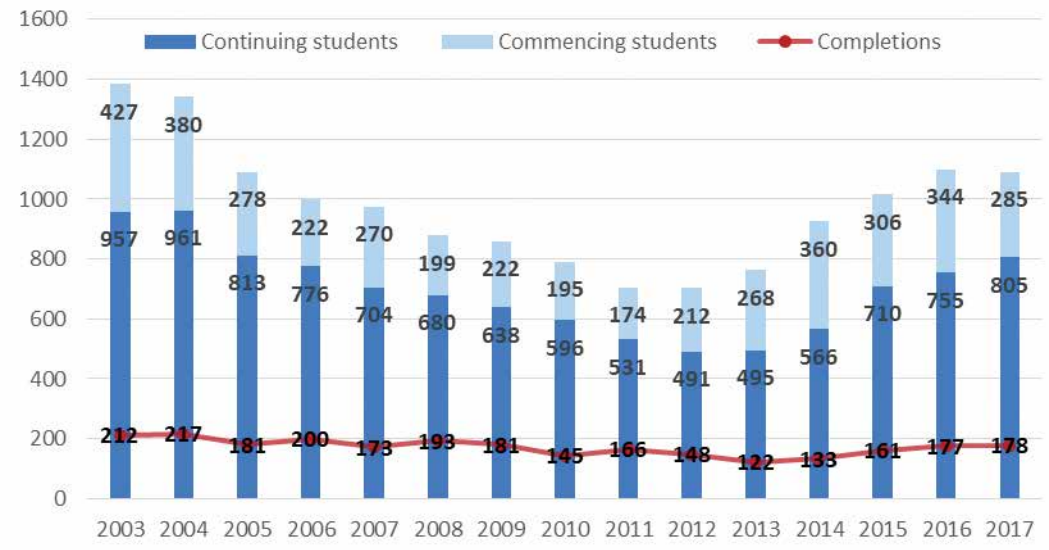
3.6.1 Higher education - undergraduate geomatics engineering degrees

According to the Department of Education and Training's (DET) higher education statistics, there are currently 9 universities providing undergraduate geomatics engineering degrees in Australia:

1. University of Newcastle (NSW)
2. University of New South Wales (NSW)
3. RMIT University (VIC)
4. University of Melbourne (VIC)[8]
5. University of Southern Queensland (QLD)
6. University of South Australia (SA)
7. Curtin University (WA)
8. University of Tasmania (TAS)
9. Flinders University (SA)

Chart 3.16 shows the number of enrolment and completion in undergraduate geomatics engineering degrees in Australian universities. Total undergraduate enrolment numbers have declined significantly since 2003 from 1,384 to 703 in 2012, a 49% reduction. This seems to be driven by the significant reduction in new enrolments which halved from 427 to 212 new students in the same period. However, national undergraduate enrolment began to recover in 2013, with new commencing students rising from a trough of 174 students in 2011 to 344 students in 2016 (+98%).

Chart 3.16: Number of Student Enrolment and Completion in Undergraduate Geomatics Engineering degrees

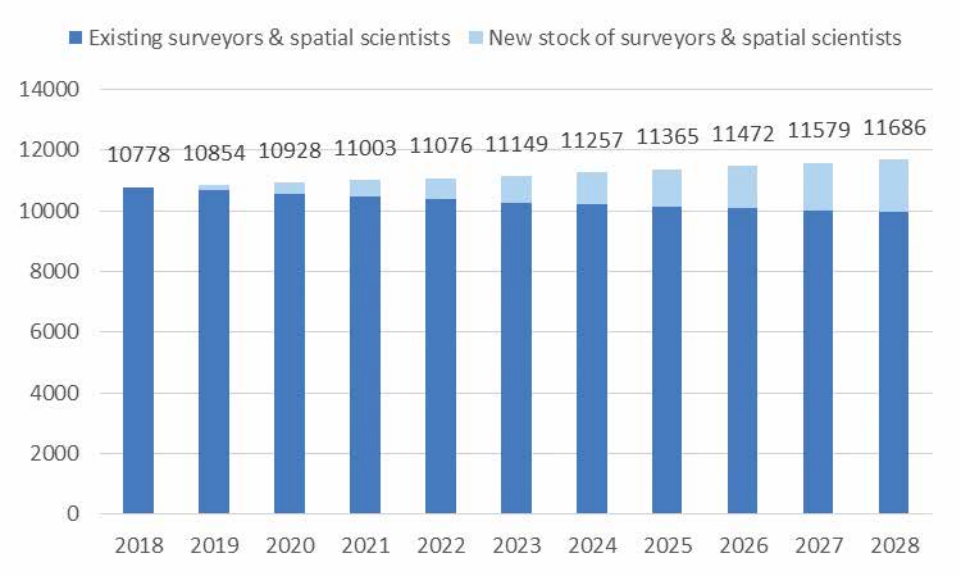


8 We note that in 2008 The Department of Geomatics at The University of Melbourne began implementing radical changes to its degree structure by replacing its Bachelor of Geomatic Engineering with a more general 3-year Bachelor of Environments or Bachelor of Science which is then followed by a 2-year Masters of Engineering (Geomatics) program for students who completed a major in Geomatics (or with an approved degree from another institution). Unfortunately, this change seems to have resulted in enrolment and completion numbers not being fully captured by DET statistics post-2008.

The completion of undergraduate geomatics engineering degrees have remained relatively stable between 2003-2017. The number of undergraduate completions in 2013-17 averaged at 152 completions per annum, which is slightly lower than the five-year average of 194 completions in the 2003-07 period. Nevertheless, student completions have been on the rise since 2013, growing at an average of 9% each year.

Consequently, we project an average of 174 new graduates joining the workforce as surveyors or spatial scientists each year for the coming decade, resulting in the number of surveyors and spatial scientists to grow by 8% by FY2028. This is a slight upward revision from our previous forecast of around 133 new surveyors and spatial scientists each year in our 2013/14 update.

Chart 3.17: Forecast of Existing and New Stock of Surveyors & Spatial Scientists



Other trends in higher education enrolment – gender enrolment

The number of female students in undergraduate geomatics engineering degrees have significantly declined in Australia, from 208 in 2003 to less than 20 students in 2013. Female enrolments have since picked up, albeit still at a historically low level at around 60 students in 2017 (see Chart 3.17 and 3.18). In 2013-17, female students make up 4% of all students in undergraduate geomatics engineering degrees, a proportion significantly lower from 2003.

Chart 3.18: Trend of Gender Enrolment in Undergraduate Geomatics Engineering Degrees

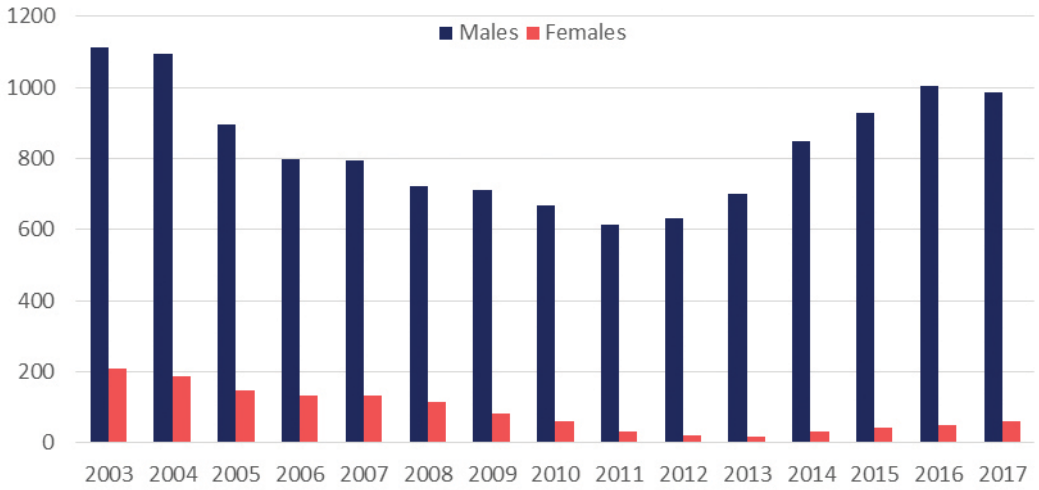
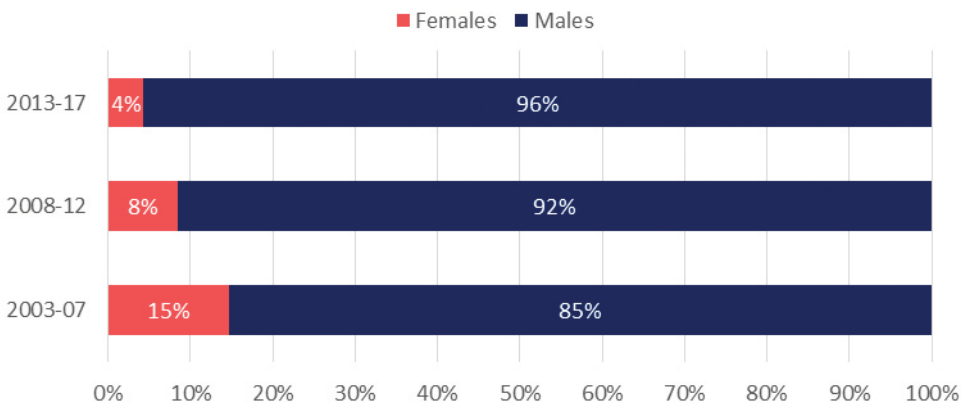


Chart 3.19: Gender Ratio of Undergraduate Geomatics Engineering Students



Other trends in higher education enrolment - student attendance

Around 15% of undergraduate students have historically opted for part-time study load between 2005 and 2013 (see Chart 3.19). Historically, a greater proportion of commencing students tend to take on full-time study load than non-commencing students, with 95% of commencing students opting for full-time study compared to 82% of non-commencing students during 2005-13. However, the proportions seem to be converging since 2013, with the proportion of commencing students opting for part-time study jumping up from an average of 4% in 2008-12 to 20% 2013-17, nearing the proportion of non-commencing students studying part-time (24%). One possible interpretation of this rising trend of new students taking up part-time studies is that there may be an increasing number of surveying technicians and/or VET graduates deciding to upskill their qualifications through higher education, whilst working at some capacity in their current jobs.

Chart 3.20: Trend of Student Attendance in Undergraduate Geomatics Engineering Degrees

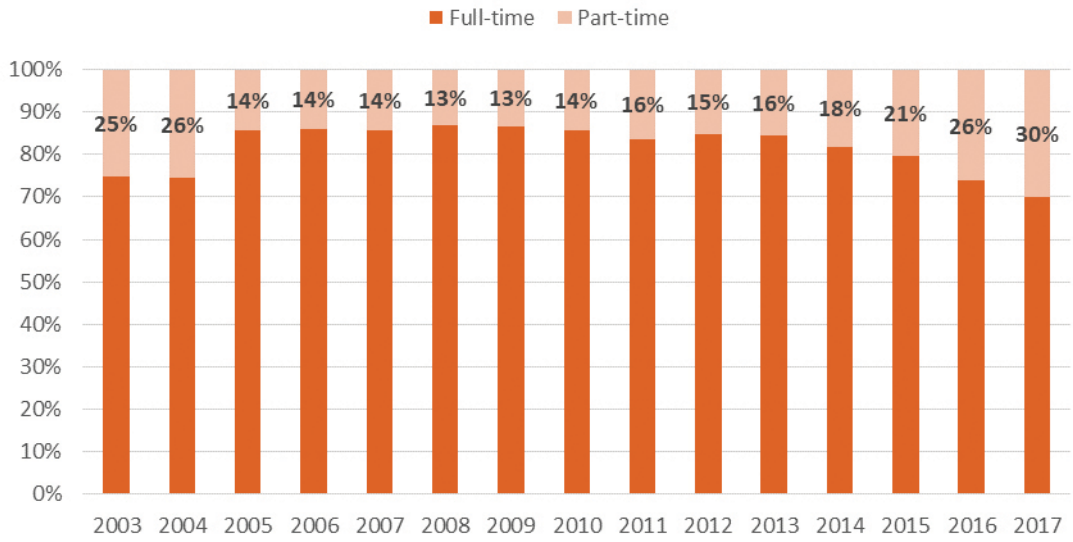
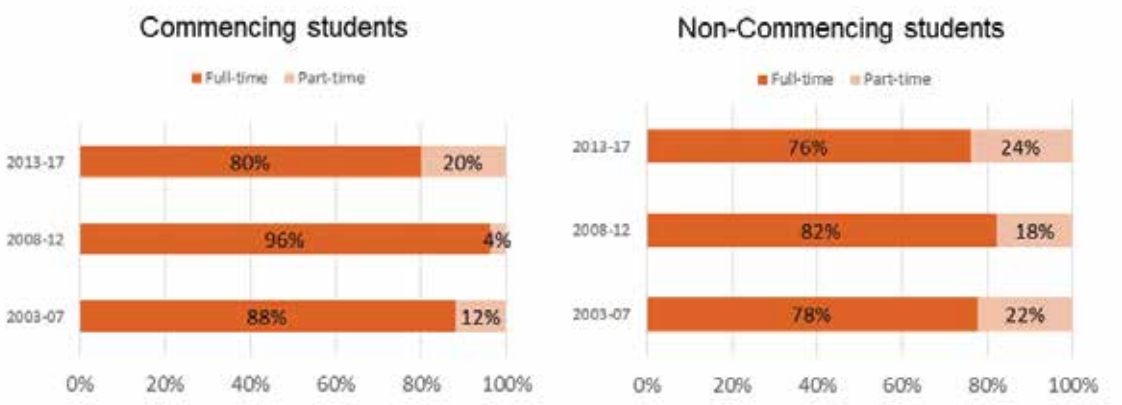


Chart 3.21: Trend of Undergraduate Student Attendance: Commencing vs. Non-Commencing



3.6.2 Vocational Education and Training (VET)

Chart 3.17 shows the number of student enrolment and completion in VET geomatics engineering courses (Diploma or above). After reaching a trough in 2005, VET enrolment numbers went up by 46% to 747 in 2008. Enrolments then generally declined until 2012 where it roughly returned to the same level in 2005. However, enrolments have been growing consistently since 2013 at an average rate of 3.5% p.a. There were 586 enrolments recorded in 2017

Student completion has been slowly growing over time. The 2003-07 period recorded an average completion of 78 per year. This figure more than doubled in 2008-12, with an average completion of 188 students per year. This growth continued in 2013-17 at an average of 261 student completions each year.

We forecast an average of 175 additional technicians joining the workforce each year for the coming decade which means the number of technicians will more than double by 2028 (see Chart 3.18). This is a significant upward revision from our previous report (of 65 technicians each year) which of course leads to a significant revision to our forecast of potential capability shortfall for surveying and spatial science technicians.[9]

9 In engaging with key stakeholders during our research, however, we observed anecdotal evidence of surveying technicians choosing to upskill their qualifications within 10 years of obtaining their technician qualifications. This is currently not explicitly captured in the model and hence there may be potential double-counting in our estimation of labour supply as a significant number of technicians progress to become qualified surveyors.

Chart 3.22: Number of Student Enrolment and Completion in VET Geomatics Engineering Courses (Diploma or above)

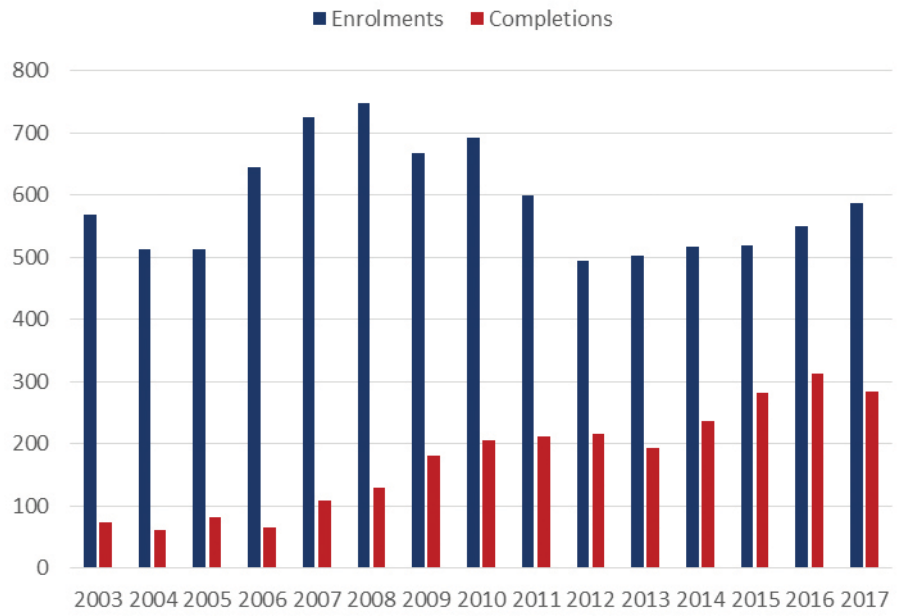
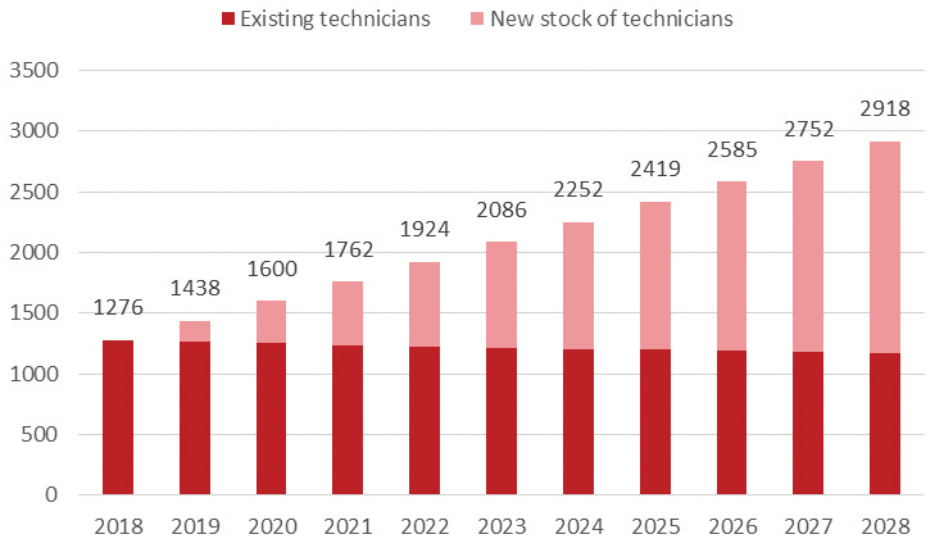


Chart 3.23: Forecast of Existing and New Stock of Technicians



3.7 Forecast of capability shortfall

Given our projections of the workforce gap and graduate supply, we forecast that *Australia will experience a capability shortfall of surveyors and spatial scientists within the first half of the forecast period (to 2022/23)*, with an average shortfall of 505 surveyors and spatial scientists each year. Starting with an estimated shortfall of 1,676 persons in 2017/18, we expect it to decrease to 2020/21 in accordance with projected declining industry activity and thus labour demand. This shortage will however rise again in 2021/22 to the size of 433 persons in 2022/23. In the second half of the forecast period (2023/24-2027/28), we estimate that the new stock of surveyors will meet and exceed the existing workforce gap, leading to an average surplus of 912 surveyors per year.

As for surveying and spatial science technicians, we expect the small workforce gap to be quickly overtaken by new entrants of VET graduates in the workforce. We measure a surplus of 35 technicians in 2018/19 which will continue to widen at an average pace of 193 persons per year to the end of the forecast horizon in 2027/28. The forecast results are shown in detail in Table 3.3.

Chart 3.24: National Workforce Capability Position

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Surveyors & spatial scientists	Deficit					Surplus				
	1428	605	(6)	129	438	(75)	(571)	(1004)	(1398)	(1491)
Surveying & spatial science technicians	Surplus					Surplus				
	(40)	(281)	(507)	(696)	(836)	(1013)	(1171)	(1384)	(1602)	(1769)

Source: BIS Oxford Economics

Table 3.3: Labour Demand Forecast and Workforce Gap – Australia (Baseline Scenario based on 1.5% labour productivity growth)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
	Estimates	Forecasts									
Labour Demand											
All Surveyors	**9375**	**9125**	**8531**	**8171**	**8498**	**8834**	**8425**	**7960**	**7728**	**7575**	**7589**
Cadastral	4554	4144	3628	3622	4102	4333	4079	3737	3619	3638	3694
Building	1784	1790	1731	1658	1611	1578	1463	1394	1389	1431	1481
Engineering	1739	1745	1582	1495	1500	1584	1516	1432	1357	1253	1242
Mining	770	912	1081	914	820	863	889	909	891	804	723
Other sectors	529	534	509	483	465	476	477	489	472	449	449
Registered/Licensed Surveyors (a)	*2917*	*2840*	*2655*	*2543*	*2645*	*2749*	*2622*	*2477*	*2405*	*2357*	*2362*
Spatial Scientists	3108	3156	3002	2826	2707	2752	2757	2834	2740	2606	2606
Total Technicians	1378	1398	1319	1255	1228	1250	1240	1248	1201	1149	1150
Total Surveying & Geospatial Workforce	**13860**	**13680**	**12853**	**12252**	**12432**	**12837**	**12422**	**12042**	**11669**	**11330**	**11345**
Other Professionals	4041	4109	3976	3740	3499	3573	3647	3849	3720	3496	3495
Total skilled labour demand	**17901**	**17789**	**16829**	**15992**	**15931**	**16410**	**16068**	**15891**	**15389**	**14826**	**14840**
Existing Workforce (b)											
All Surveyors	**8249**	**8172**	**8095**	**8018**	**7941**	**7864**	**7814**	**7765**	**7715**	**7666**	**7616**
Cadastral	4099	4060	4021	3982	3943	3904	3879	3854	3829	3804	3779
Building	1487	1473	1459	1445	1431	1417	1409	1400	1391	1382	1373
Engineering	1434	1421	1408	1395	1382	1369	1361	1353	1344	1336	1328
Mining	768	761	754	748	741	734	729	725	721	716	712
Other sectors	460	456	452	447	443	439	436	433	430	428	425
Registered/Licensed Surveyors	*2567*	*2543*	*2519*	*2495*	*2471*	*2447*	*2432*	*2416*	*2401*	*2386*	*2370*
Spatial Scientists	2529	2505	2481	2457	2433	2410	2394	2379	2364	2348	2333
Total Technicians	1276	1264	1251	1238	1226	1213	1205	1197	1188	1180	1172
Total Surveying & Geospatial Workforce	**12054**	**11940**	**11827**	**11713**	**11600**	**11486**	**11414**	**11341**	**11268**	**11195**	**11122**
Other Professionals	3418	3381	3345	3308	3271	3234	3210	3186	3163	3139	3115
Total skilled labour	**15472**	**15322**	**15171**	**15021**	**14871**	**14721**	**14624**	**14527**	**14430**	**14333**	**14237**
Workforce Gap (c)											
All Surveyors	**1126**	**953**	**436**	**153**	**557**	**970**	**610**	**195**	**13**	**(91)**	**(27)**
Cadastral	454	83	(393)	(361)	158	428	200	(118)	(211)	(166)	(85)
Building	297	317	272	212	180	161	55	(6)	(2)	49	108
Engineering	304	324	174	100	118	215	155	79	13	(83)	(86)
Mining	1	151	327	166	79	129	159	184	171	87	11
Other sectors	69	78	57	36	22	38	41	56	42	22	24
Registered/Licensed Surveyors	*350*	*297*	*136*	*48*	*173*	*302*	*190*	*61*	*4*	*(28)*	*(8)*
Spatial Scientists	579	651	521	368	273	343	363	455	376	258	272
Total Technicians	101	135	68	17	2	37	35	51	13	(31)	(22)
Total Surveying & Geospatial Workforce	**1806**	**1739**	**1026**	**538**	**832**	**1350**	**1008**	**701**	**402**	**136**	**223**
Other Professionals	623	727	632	433	228	339	436	663	557	357	380
Total skilled labour	2429	2467	1657	971	1060	1689	1444	1364	959	493	603
New stock of surveyors & spatial scientists (c)		177	352	527	701	875	1048	1221	1393	1565	1737
New stock of technicians (d)		175	349	524	699	873	1048	1222	1397	1572	1746
Surveyors & spatial scientists capability shortfall (e)	1705	1428	605	(6)	129	438	(75)	(571)	(1004)	(1398)	(1491)
Technicians capability shortfall (e)	101	(40)	(281)	(507)	(696)	(836)	(1013)	(1171)	(1384)	(1602)	(1769)

Source: BISOE, ABS, CRSBANZ

(a) Registered surveyors are included in the total number of surveyors.

(b) Existing workforce is generated by diminishing the size of the current skilled workforce due to retirement.

(c) Workforce gap is calculated as labour demand less existing workforce.

(d) New stock of surveyors and technicians are shown as annual increments.

(e) Capability shortfall is derived by subtracting new supply from workforce gap. Positive number implies a shortage of labour; bracketed numbers imply an excess of supply.

Chapter Four

Forecasts of Labour Demand and Workforce Gap for New South Wales

4. FORECASTS OF LABOUR DEMAND AND WORKFORCE GAP FOR NEW SOUTH WALES

4.1 Economic and industry outlook

4.1.1 General economic environment

The New South Wales economy is still growing at a solid pace but has slowed compared with the stellar growth of over 5% seen a couple years ago. As growth in other states improves, New South Wales is no longer an outperformer compared with the national average. In FY2018, New South Wales' domestic demand, as measured by State Final Demand (SFD), grew by 3.5%, exactly in line with the growth in national domestic demand.

Spending in the state is being driven by strong business investment and a healthy consumer sector, while growth in dwelling investment has slowed sharply over the past year from its double-digit increases of the previous three years. However, New South Wales' economic growth, measured by Gross State Product (GSP), is estimated to have slipped below national GDP growth (at 2.1% versus 2.8% nationally), due to weak net international exports detracting from growth. Nevertheless, we expect exports to strengthen from FY2020 as rural exports recover from the current drought and mineral and coal exports are set to increase as new capacity comes onstream. Additionally, the weak Australian dollar (expected to remain within a US70-78 cent band) will continue to help manufacturing and services exports.

Employment has bounced back from the soft FY2017 to record growth of 3.4% for the year to September 2018, which is markedly ahead of overall national jobs growth. The state unemployment rate continues to track well below the national average and was a low 4.4% in September 2018 compared to the national rate of 5.0%.

Over the next three years we expect economic growth (GSP) in New South Wales to continue to lag the national economy, growing at an average of 2.1% per annum on average. This is a result of a divergent pattern in some of the state's key drivers as summarised in the following sections. As for state demand, we expect New South Wales' SFD to moderate over the next 2 years to 1.6% and 1.3% in FY2019 and FY2020 respectively, before picking up from FY2021 and averaging 3.4% over the 3 years to FY2023.

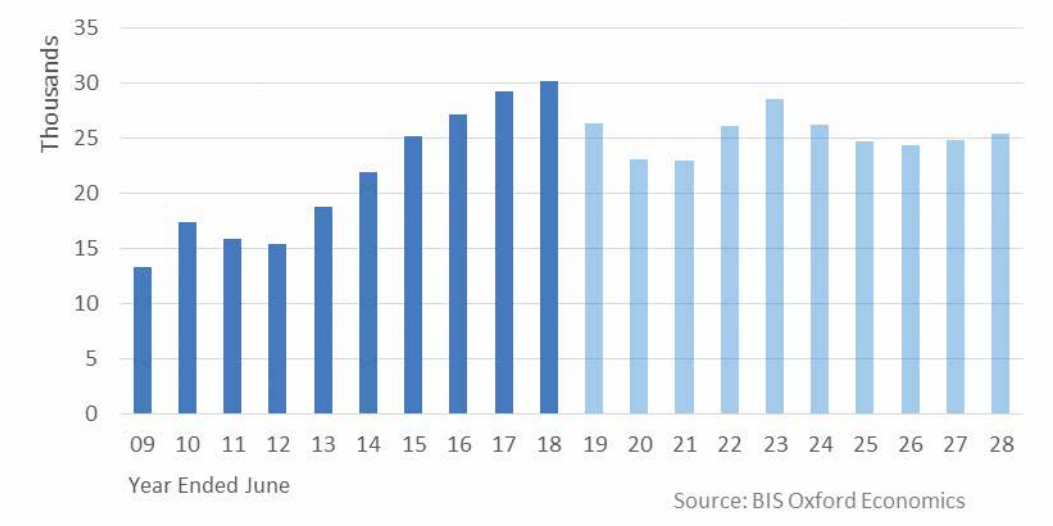
During the FY2024-28 period, New South Wales' economic growth (GSP) is projected to average 2.3% p.a., lower than the previous five-year average of 3.9%. The state's domestic demand growth is likewise projected to fall from 3.5% p.a. in FY2019-23 to 2.3% p.a. in FY2024-28.

4.1.2 Cadastral sector - Private house commencements

Dwelling building has been a key driver of economic growth in New South Wales, but tighter lending restrictions are reining in demand, prices and development feasibility. After reaching a record high of 30,203 new house commencements in FY2018 (+3.3% from FY2017), new house building is expected to decline over the next three years to fall by an average of 8% p.a. to a trough of 23,000 commencements in FY2021.

However, we expect activity will still hold well above the historical average as steady population growth and a resilient economy put a floor under dwelling building activity. In our baseline forecast, soft house price growth is expected to re-emerge and solid economic growth will spur a pick-up in dwelling commencements back to 28,640 houses in FY2023. Beyond this, affordability constraints will see activity in New South Wales hover below the five years of the residential upturn between 2014–2018 with an annual average over the 2024–2028 period of 25,130 houses. Despite a weaker profile to the preceding decade (2014-2023), this is still a strong level of activity by historical standards.

Chart 4.1: Number of Private House Dwellings Commenced – NSW



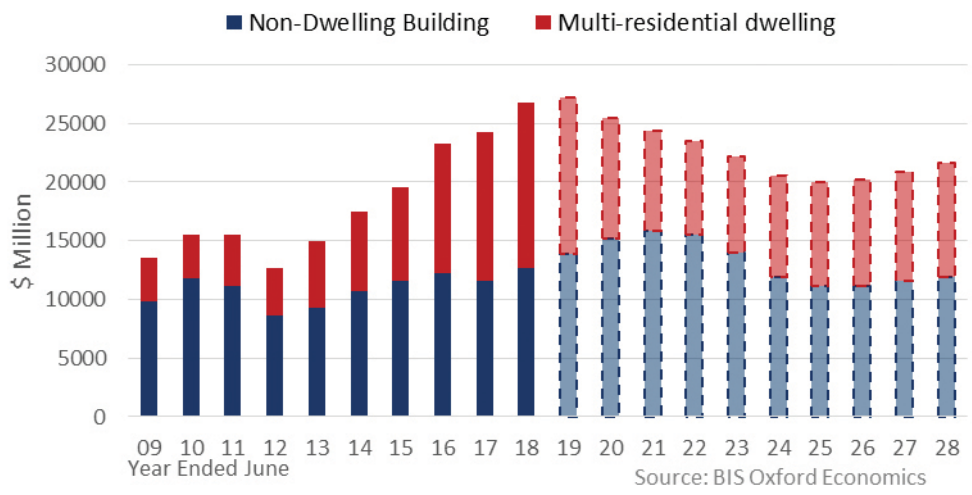
4.1.3 Building sector - Multi-residential dwellings and non-dwelling buildings

Multi-residential dwellings

Since reaching a record high in FY2017, multi-residential dwellings in New South Wales is projected to fall in the coming years. Total multi-residential dwelling commencements in New South Wales is measured to have fallen by 10% in FY2018 as the retreat in apartments continue. Dominated by an investor-heavy Sydney market, high density apartments have been the most affected.

In terms of the value of work done, in multi-residential dwelling commencements is projected to halve from $14.2 billion in FY2018 to $7.9 billion in FY2020. Activity is then estimated to track upward from FY2023 as favourable market conditions begin to materialise. The average value of work done in the FY2024-2028 period is forecasted at a slightly higher level of $9.1 billion, though not overtaking the level reached between FY2014-2018.

Chart 4.2: Multi-residential dwelling and Non-dwelling Building – NSW
Value of Work Done, 2015/16 Prices



Non-dwelling buildings

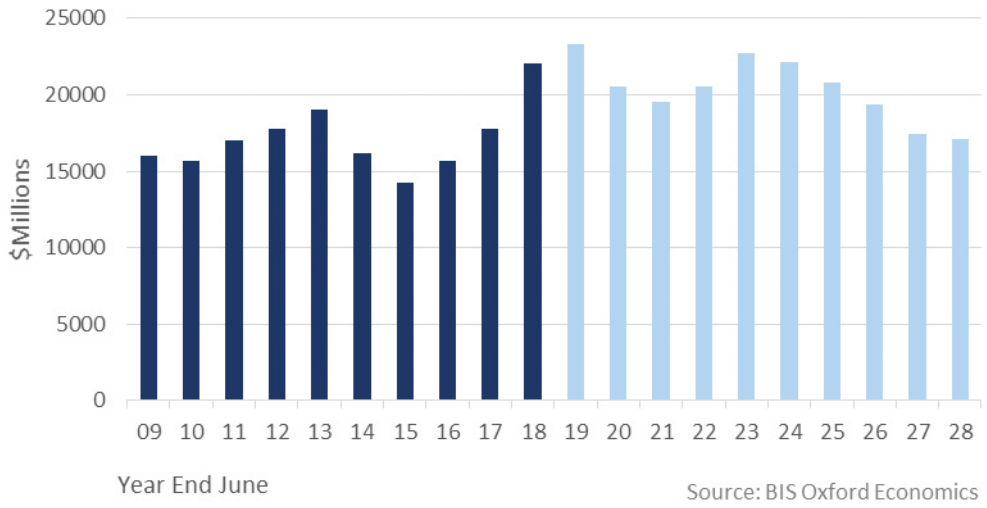
A dual private and public sector investment boom has driven non-residential building to record levels in New South Wales. In FY2018, non-residential building activity in New South Wales grew by 10% to $12.7 billion. Sydney's booming services sector is helping push the business case for investment in new buildings, especially in offices (+19%) where eight developments valued at or over $100 million began construction. The $800 million Castle Towers Expansion and the $800 million New Grafton Prison should give a major boost to retail and other social & institutional building.

Growth is forecast to continue to FY2021, rising by an average of 8% p.a. to $15.8 billion. Activity should begin to normalise in FY2022 and FY2023 with most sub-sectors expected to decline, though remaining at a historically elevated level above $12 billion. Non-dwelling building activity is estimated to average $11.5 billion p.a. over the FY2024-28 period, slightly

4.1.4 Engineering sector - Utilities and transport engineering construction

Engineering construction across the utilities and transport sectors reached to a record level of $22 billion in FY2018 (+23.9% from FY2017). This growth is set to continue in FY2019 (+5.9%) given the strong growth in private infrastructure (including electricity and telecommunications) and public investment in transport infrastructure projects (e.g. North-West and Metro rail projects, WestConnex, Sydney Light Rail and Pacific Highway roadworks). However, utilities and transport engineering construction are projected to decline over FY2020-21 as major private and public projects (including the NBN) are completed. Activity is set to decline by 12% in FY2020 and 4.9% in FY2021 to $19.4 billion. We estimate that utilities and transport construction will average around $19 billion over the FY2024-28 period which is 9.2% lower than the previous five-year average of $21.3 billion in FY2019-23.

Chart 4.3: Utilities and Transport Engineering Construction – NSW
Value of Work Done, 2015/16 Prices

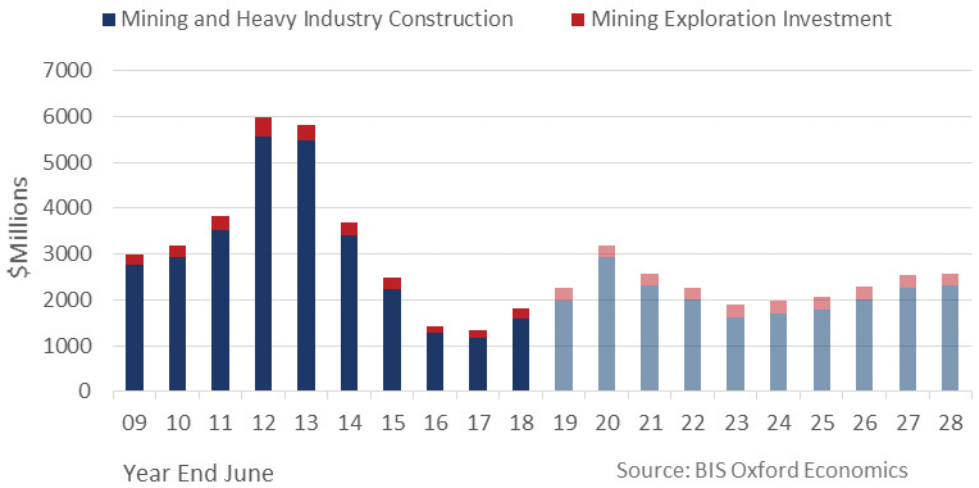


4.1.5 Mining and heavy industry sector

In New South Wales, mining and heavy industry construction tends to be dominated by coal-related projects but is also influenced by other minerals projects across base metals and mineral sands, as well as other heavy industry.

In FY2018, M&HI activity jumped 36% to $1.7bn – the first increase since 2011/12 – driven by rising coal and other minerals-related projects. Further strong growth is expected in the next few years, driven by a catch up in coal-related sustaining capital works, as well as new projects in coal and other minerals getting underway including Whitehaven's $650m Vickery coal mine, Mach Energy's $756m open cut coal mine and Mt Pleasant and the $640m Dubbo Zirconia project by Alkane exploration, amongst a range of smaller projects. The completion of these projects, in conjunction with weakening commodity prices, is likely to see M&HI activity in New South Wales ease back in the early 2020s, before another cyclical upswing takes hold.

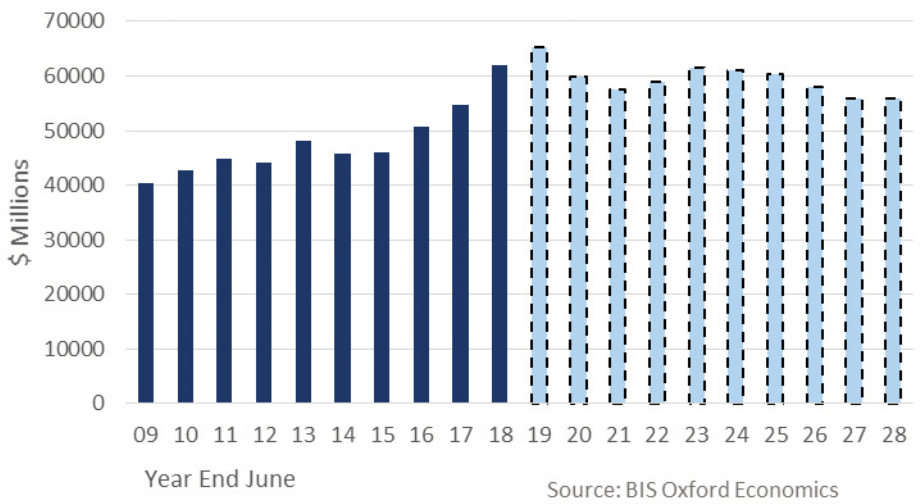
Chart 4.4: Mining & Heavy Industry Construction and Mining Exploration Investment – NSW Constant 2015/16 Prices



4.1.6 Total construction

Overall, construction activity in New South Wales is forecast to fall from a peak of $65.2 billion in FY2019 to $57.4 billion FY2021, largely driven by the projected decline in residential and non-residential building, as well as utilities and transport engineering construction. This is then followed by strong levels of recovery in residential building and utilities and transport construction, pushing total construction back to $61.5 billion by FY2023, resulting in a five-year average of $60.6 billion p.a. Total construction in FY2024-28 is projected to decline by an average of 3.9% p.a. as major projects in engineering construction are completed in the second half of the forecast horizon.

Chart 4.5: Total Construction by Category – NSW Value of Work Done, 2015/16 Prices



4.2 Estimate of the existing surveying and geospatial workforce

Size and breakdown of state workforce

Since our previous update in FY2014, the size of the surveying and geospatial workforce in New South Wales is estimated to be 4,437 persons (+9%). This is mainly driven by the growth in the number of surveyors, jumping up by 19% to 3,302 persons in FY2018. Spatial scientists and technicians, on the other hand, have experienced a decline by 19% and 3% respectively.

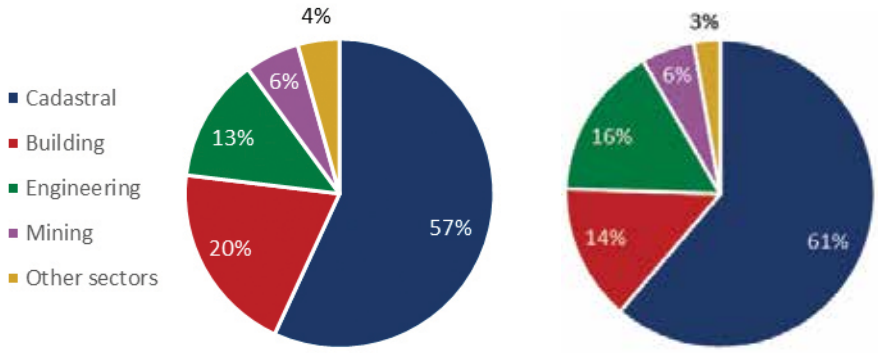
We estimate the cadastral sector to represent the largest proportion of surveying work, comprising 57% of surveying activity. This is followed by building (20%), engineering (13%), mining (6%) and other sectors (4%).

Table 4.1: Estimated Size of Total Skilled Workforce in New South Wales

Occupation Groups	2013/14	2017/18		
Surveying sectors				
Cadastral	1,696	1,879	▲	183
Building	396	661	▲	265
Engineering	446	429	▼	(17)
Mining	154	189	▲	35
Other sectors	77	144	▲	67
Total surveyors	**2,769**	**3,302**	▲	**533**
Registered Surveyors	*927*	*924*	▼	(3)
Total spatial scientists	**844**	**687**	▼	**(157)**
Surveying technicians	368	385	▲	17
Spatial technicians	92	63	▼	(29)
Total technicians	**460**	**448**	▼	**(12)**
Total skilled surveying & geospatial workforce	**4,073**	**4,437**	▲	**364**
Planners	120	331	▲	211
Engineers	155	284	▲	129
Environmental Scientists	35	73	▲	38
Other staff (include Architects)	31	94	▲	63
Total other professionals	**341**	**782**	▲	441
Total Skilled Workforce	4,414	5,219	▲	**805**

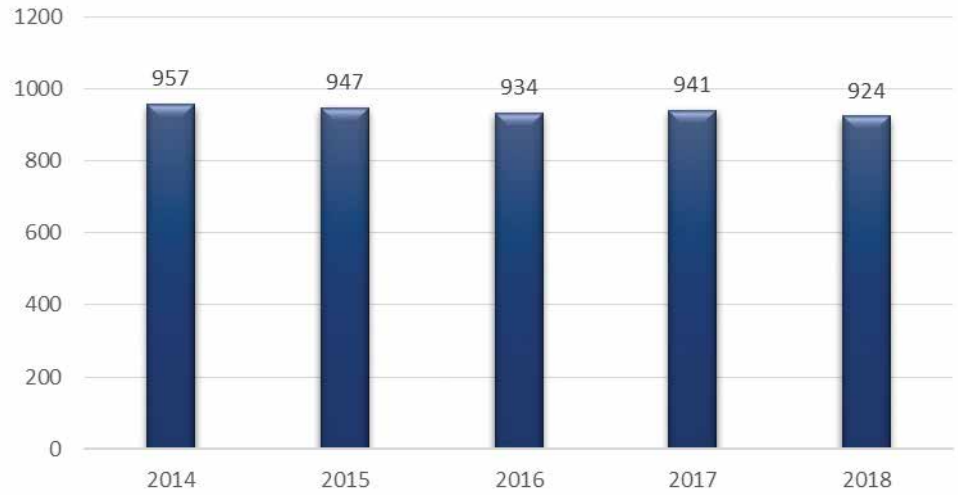
Source: BIS Oxford Economics, ABS, CRSBANZ

Chart *4.6*: *Comparison of Surveying Sectoral Activity between FY18 (left) and FY14 (right) - NSW*



Source: BIS oxford Economics

Chart *4.7*: *Number of Registered Surveyors - NSW*



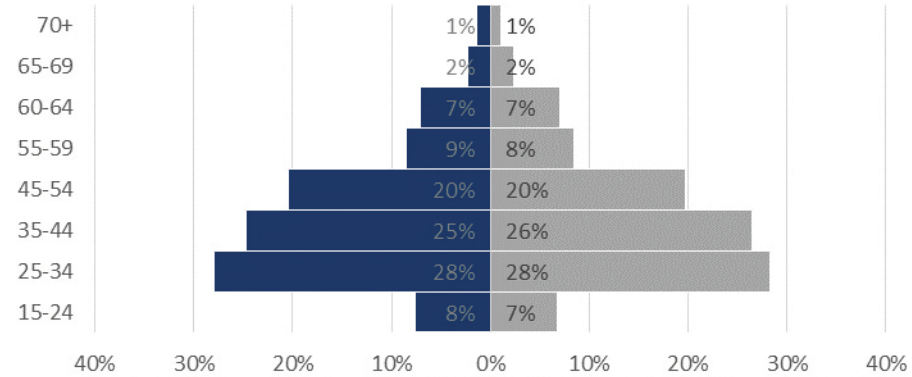
Source: Board of Surveying and Spatial Information of NSW

Age profile and income of state workforce

Chart 4.7 shows the age profile of the surveying workforce in New South Wales in comparison to national figures. 39.8% of the workforce in New South Wales is aged over 45 years old, compared to the national figure of 38.6%.

Chart 4.8 shows the comparison of average earnings of full-time surveyor or spatial scientist per week by age group between New South Wales and Australia. The average weekly income for a surveyor or spatial scientist in New South Wales is estimated at $1,786 compared to national average of $1,795.

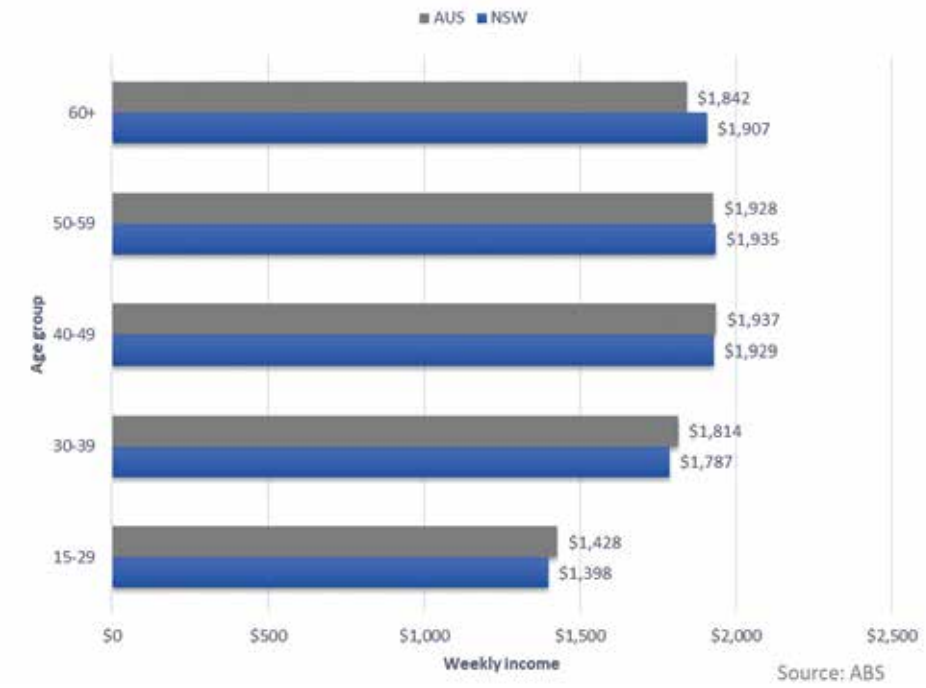
Chart 4.8: Age Distribution of Workforce – NSW vs AUS



	15-24	25-34	35-44	45-54	55-59	60-64	65-69	70+
NSW	8%	28%	25%	20%	9%	7%	2%	1%
AUS	7%	28%	26%	20%	8%	7%	2%	1%

Source: ABS

Chart 4.9: Full-time Weekly Earnings by Age – NSW vs AUS



Source: ABS

4.3 Forecasts of skilled labour demand

The demand for total skilled labour in New South Wales is projected to increase by 18% to 6,142 persons in FY2019, in line with national demand. However, skilled labour demand is then expected to decline to 5,281 persons in FY2021 due to weakened construction activity as previously discussed. However, a projected recovery in residential building and utilities and transport construction during FY2022-23 is set to increase demand for skilled labour, specifically within the cadastral and engineering sectors. After reaching a peak of 5,623 persons, demand is projected to decline, in line with total construction as well as improving labour productivity.

Chart 4.10: Forecast of Total Demand for Skilled Labour – NSW (1.5% productivity growth)

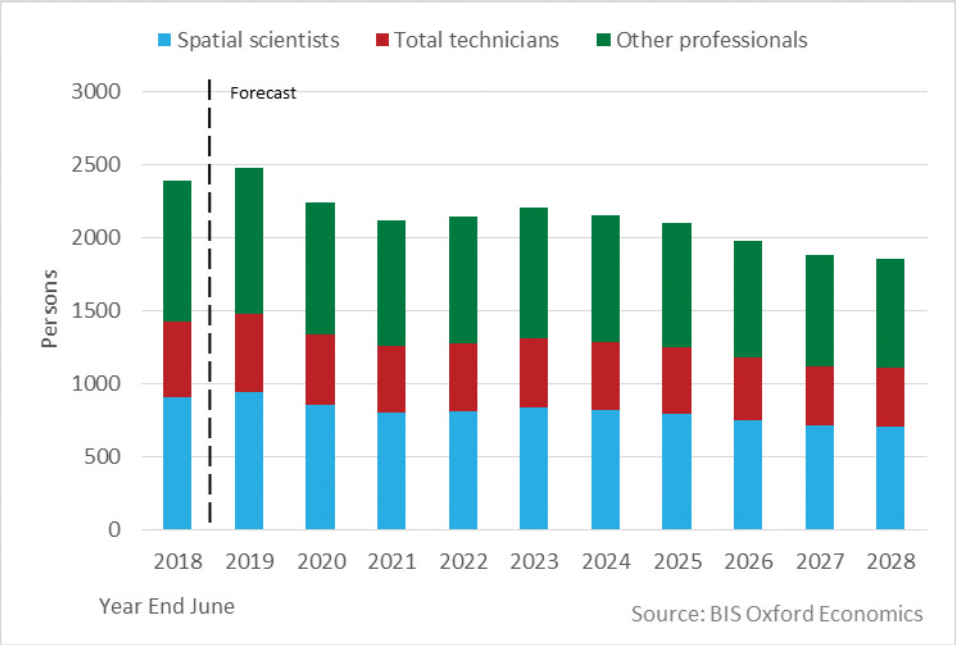


Chart 4.11: Forecast of Demand for Surveyors by Sector – NSW (1.5% productivity growth)

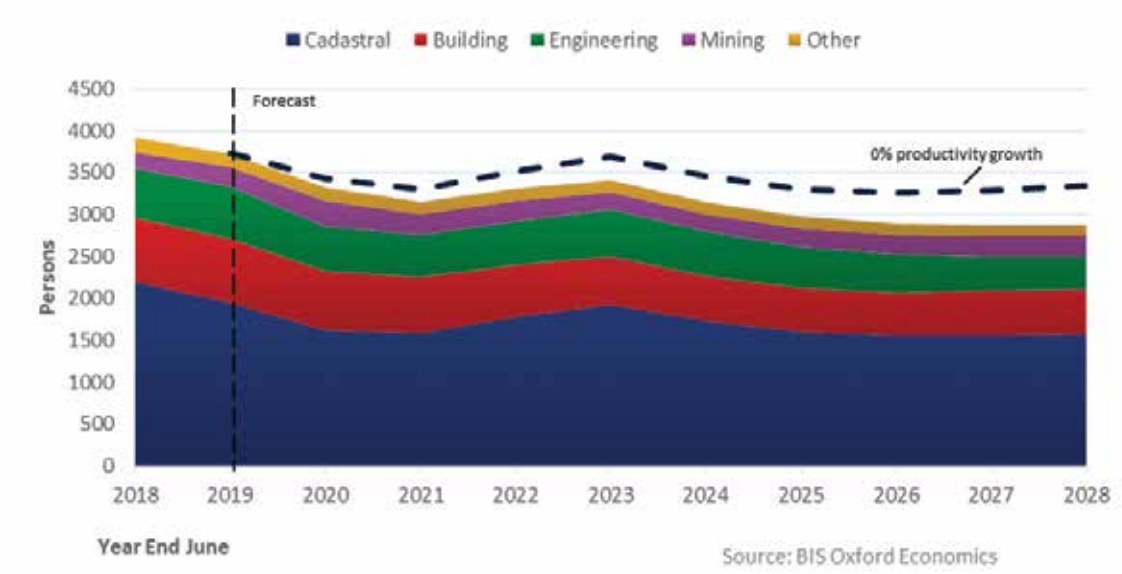
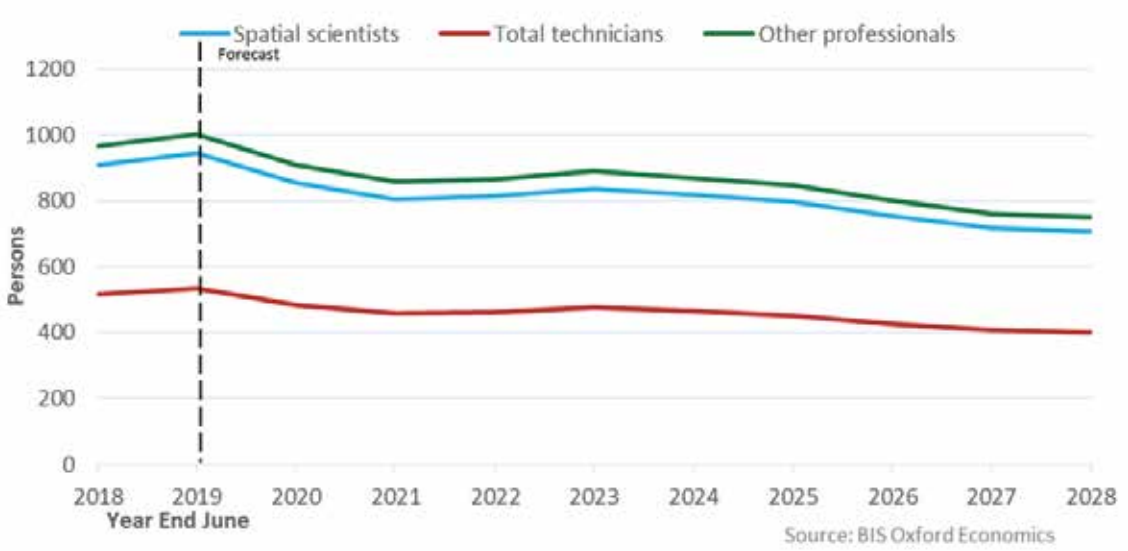


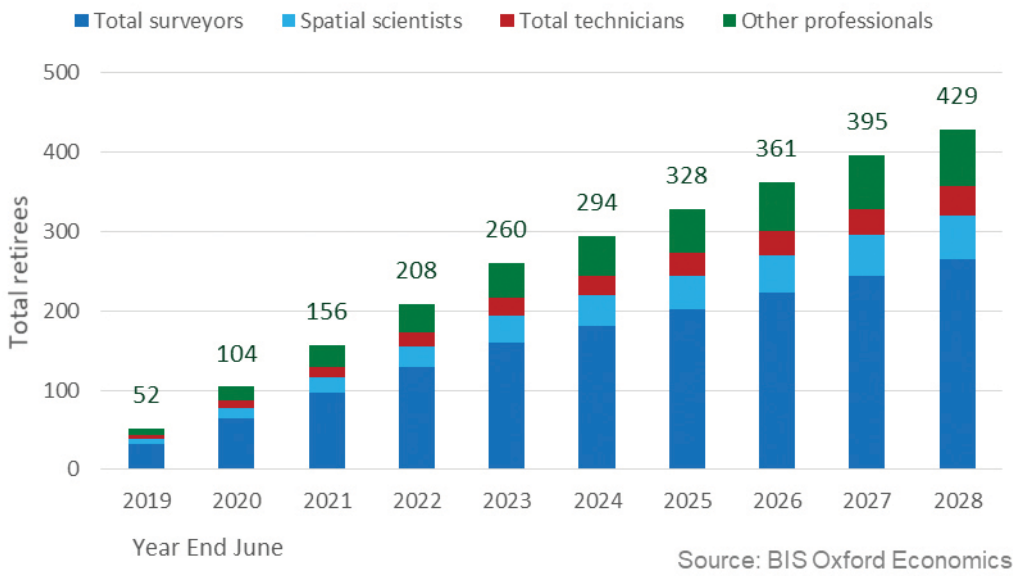
Chart 4.12: Forecast of Demand for Spatial Scientists, Technicians and Other Professionals – NSW (1.5% productivity growth)



4.4 Forecast of workforce attrition

We estimate that 8.2% (429 persons) of existing workforce in New South Wales will retire over the next 10 years, given the current age profile of the state's workforce. This includes 265 surveyors, 55 spatial scientists, 36 technicians and 72 other professionals.

Chart 4.13: Forecast of Cumulative Workforce Attrition – NSW



4.5 Forecast of workforce gap

In FY2018, the size of the workforce gap in New South Wales is estimated at 1,073 personnel, with surveyors accounting for 55% of the shortage, followed by spatial scientists (21%), other professionals (17%) and technicians (6%). The overall workforce gap is expected to narrow over the next 3 years to 220 persons in FY2021 as labour demand continues to decrease, followed by a transitory increase to FY2023 as construction activity recovers. The projected workforce gap in the second half of the forecast period (FY2024-28) is set to decrease by an average of 87 persons per annum, leading to a small surplus of 47 workers by FY2028.

Chart 4.14: Forecast of Workforce Gap for Registered Surveyors – NSW (1.5% Productivity Growth)

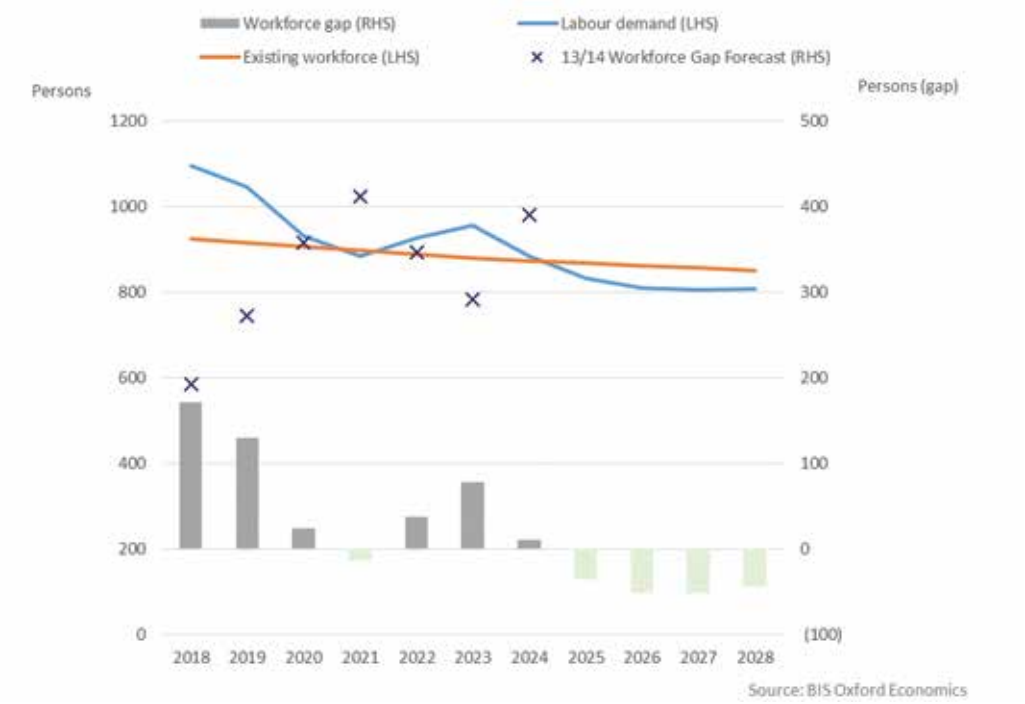


Chart 4.15: Forecast of Workforce Gap for Total Surveyors – NSW (1.5% Productivity Growth)

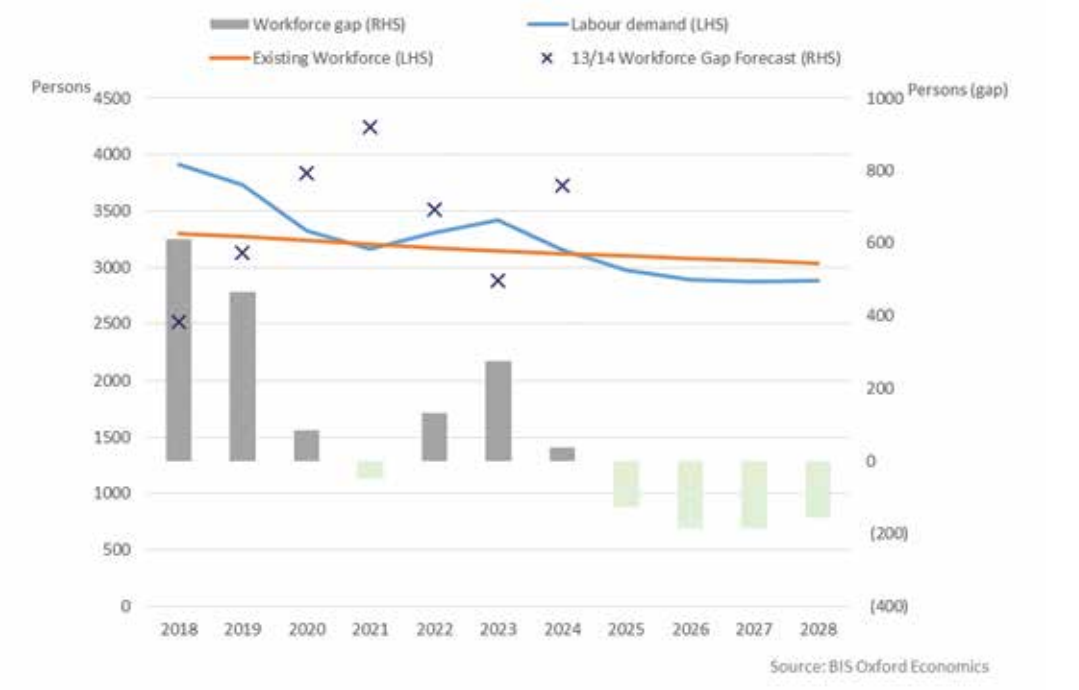


Chart 4.16: Forecast of Workforce Gap for Spatial Scientists – NSW(1.5% Productivity Growth)

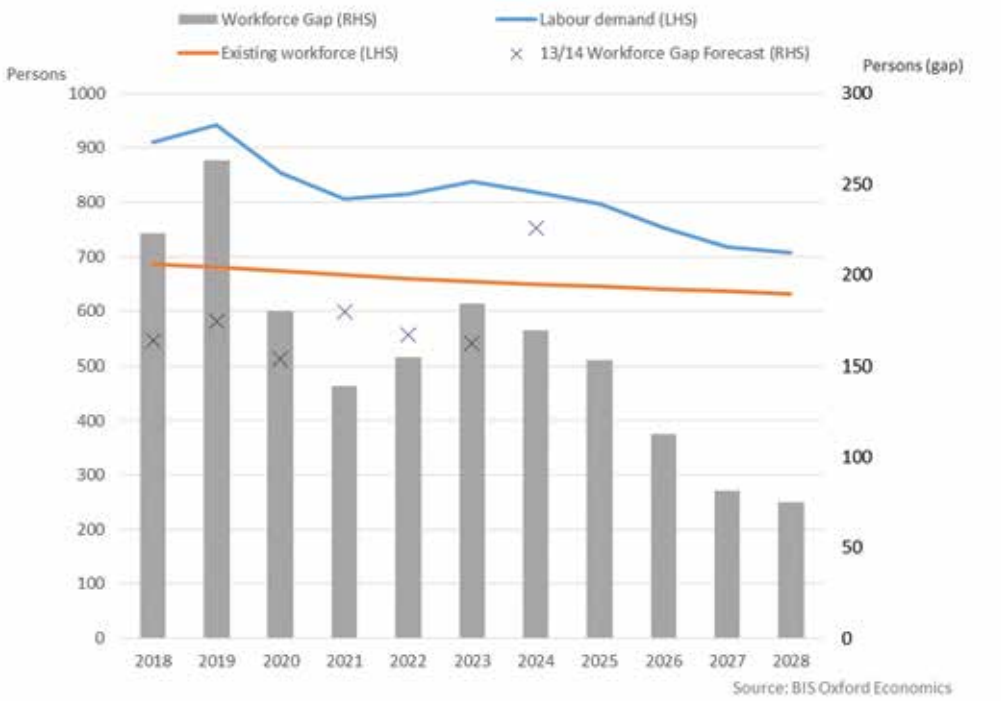
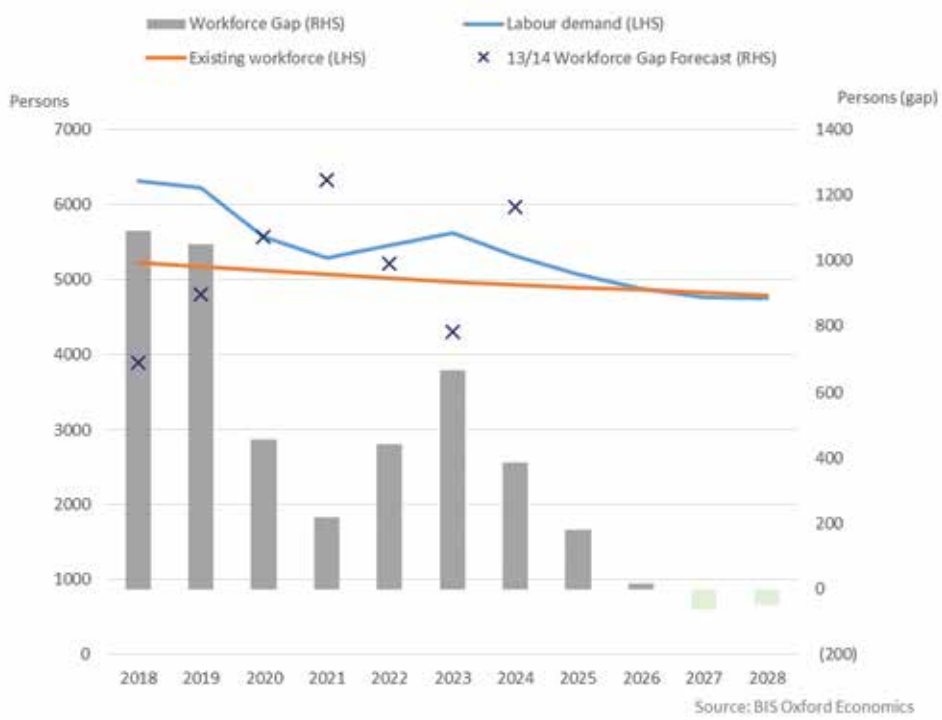


Chart 4.17: Forecast of Workforce Gap for Total Technicians – NSW
(1.5% Productivity Growth)

Chart 4.18: Forecast of Workforce Gap for Total Skilled Workforce – NSW (1.5% Productivity Growth)



Overall, we project New South Wales' current stock of surveyors and spatial scientists to be insufficient to meet construction activity over the next 5 years. This gap is expected to slowly transition into a small surplus towards the end of the next decade as major projects are completed. We forecast a relatively small shortage of technicians in the next 10 years. However, given the strong supply of new VET graduates, we expect this shortage to be met by incoming new technicians.

Table 4.2: Workforce Gap Outcome – NSW

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
			Shortage					*Surplus*		
Surveyors & spatial scientists	727	266	92	289	460	206	27	(73)	(104)	(81)
			Shortage					*Shortage*		
Surveying & spatial science technicians	92	45	23	32	50	42	33	10	(7)	(10)

Source: BIS Oxford Economics

Table 4.3: Labour Demand Forecast and Workforce Gap – New South Wales (Baseline Scenario based on 1.5% labour productivity growth)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
	Estimates	Forecasts									
Labour Demand											
All Surveyors	**3912**	**3733**	**3323**	**3158**	**3307**	**3417**	**3156**	**2972**	**2892**	**2872**	**2880**
Cadastral	2203	1955	1623	1590	1775	1920	1732	1608	1562	1572	1582
Building	765	767	706	664	630	586	536	514	510	520	532
Engineering	592	618	535	501	519	565	543	503	461	408	395
Mining	188	224	305	258	236	194	199	204	223	244	244
Other sectors	164	170	154	145	147	151	147	144	136	129	127
Registered/Licensed Surveyors (a)	*1095*	*1045*	*930*	*884*	*926*	*956*	*883*	*832*	*809*	*804*	*806*
Spatial Scientists	910	943	853	806	815	838	818	798	753	717	707
Total Technicians	516	535	484	457	462	475	464	453	427	407	401
Total Surveying & Geospatial Workforce	**5338**	**5211**	**4661**	**4421**	**4584**	**4730**	**4439**	**4223**	**4072**	**3996**	**3988**
Other Professionals	967	1003	907	857	866	891	870	848	801	763	751
Total skilled labour demand	**6306**	**6214**	**5568**	**5278**	**5450**	**5621**	**5309**	**5071**	**4873**	**4759**	**4739**
Existing Workforce (b)											
All Surveyors	**3301**	**3269**	**3237**	**3205**	**3173**	**3141**	**3120**	**3099**	**3078**	**3057**	**3036**
Cadastral	1879	1860	1842	1824	1806	1787	1775	1764	1752	1740	1728
Building	661	654	648	641	635	628	624	620	616	612	608
Engineering	429	424	420	416	412	408	405	402	400	397	394
Mining	189	187	185	184	182	180	179	177	176	175	174
Other sectors	144	143	141	140	139	137	136	135	135	134	133
Registered/Licensed Surveyors	*924*	*915*	*906*	*897*	*888*	*879*	*873*	*867*	*862*	*856*	*850*
Spatial Scientists	687	680	674	667	660	654	649	645	640	636	632
Total Technicians	448	443	439	434	430	426	423	420	417	414	411
Total Surveying & Geospatial Workforce	**4436**	**4393**	**4349**	**4306**	**4263**	**4220**	**4192**	**4164**	**4136**	**4107**	**4079**
Other Professionals	781	773	764	755	746	737	732	726	720	715	709
Total skilled labour	**5217**	**5165**	**5113**	**5061**	**5009**	**4957**	**4923**	**4889**	**4856**	**4822**	**4788**
Workforce Gap (c)											
All Surveyors	**611**	**464**	**86**	**(47)**	**134**	**276**	**37**	**(126)**	**(186)**	**(185)**	**(156)**
Cadastral	324	94	(219)	(234)	(30)	133	(44)	(155)	(190)	(168)	(146)
Building	105	112	58	23	(4)	(42)	(88)	(106)	(105)	(92)	(75)
Engineering	163	193	115	85	107	158	138	100	61	11	1
Mining	(1)	37	120	74	54	14	20	26	47	69	71
Other sectors	20	27	12	5	8	14	11	8	1	(4)	(5)
Registered/Licensed Surveyors	*171*	*130*	*24*	*(13)*	*38*	*77*	*10*	*(35)*	*(52)*	*(52)*	*(44)*
Spatial Scientists	223	263	180	139	154	184	169	153	113	81	75
Total Technicians	69	92	45	23	32	50	42	33	10	(7)	(10)
Total Surveying & Geospatial Workforce	**903**	**819**	**312**	**115**	**321**	**510**	**247**	**59**	**(63)**	**(111)**	**(91)**
Other Professionals	186	230	144	102	120	153	139	122	81	48	42
Total skilled labour	1089	1049	455	217	441	664	386	182	17	(63)	(49)

(a) Registered surveyors are included in the total number of surveyors.

Source: BISOE, ABS, CRSBANZ

(b) Existing workforce is generated by diminishing the size of the current skilled workforce due to retirement.

(c) Workforce gap is calculated as labour demand less existing workforce. Positive number implies shortage of labour; bracketed number implies excess of supply.

Chapter Five

Forecasts of Labour Demand and Workforce Gap for Victoria

5. FORECASTS OF LABOUR DEMAND AND WORKFORCE GAP FOR VICTORIA

5.1 Economic and industry outlook

General economic environment

The Victorian economy continues to perform at a stellar pace. State Final Demand (SFD) expanded by 5.0% in FY2018 compared to 3.5% growth in national domestic demand. This was the fourth consecutive year of outperformance for the state. Gross State Product (GSP) growth is estimated to be somewhat weaker in FY2018 at 3.4%, but still beat Australian GDP growth of 2.8%. Employment growth has been volatile month by month, oscillating from positive to negative for the past year. In annual terms, employment grew by 2.6% to September 2018, above the 2.3% result for Australia. Even so, Victoria's unemployment rate is comfortably below the national average, at 4.5% versus 5.0% at September 2018.

The sources of the robust growth have been broad-based, but a key factor has been relatively strong population growth in the state, averaging almost 2.4% over the past five years – which was 0.8% above the national average. Combined with healthy employment growth, this underpinned very strong household spending averaging 3.7% over the past 3 years, easily the fastest of all the states and well above the national average of 2.8% over the same period. Higher population increases have also driven solid growth in dwelling investment. Robust government spending (both recurrent and capital) has been a key growth driver, funded by asset sales, booming real estate stamp duties, healthy payroll tax receipts and Commonwealth road funding. Export volumes have shown good increases, while business investment rebounded strongly in FY2018 (+9.2%), after only modest growth in the previous two years.

However, we are forecasting Victoria's economic growth to slow sharply over the next two years, with GSP and SFD growth averaging around 2.9% and 3.1 respectively over FY2019 and FY2020. This is largely due to the weakening of some of the recent drivers from their elevated growth levels. Population growth, for instance, is now slowing and is projected to gradually ease to 1.7% by FY2021. This combined with slower employment growth and continued weak wage increases means that growth in household spending will likely to be much slower. Additionally, public investment will peak over this year, before declining in FY2020 and FY2021 as several major projects wind down to completion, including the NBN, although we expect public investment to remain at high levels in the early 2020s. Meanwhile, government recurrent expenditure is also expected to ease, as the rapid pace of spending growth of the past three years is not sustainable.

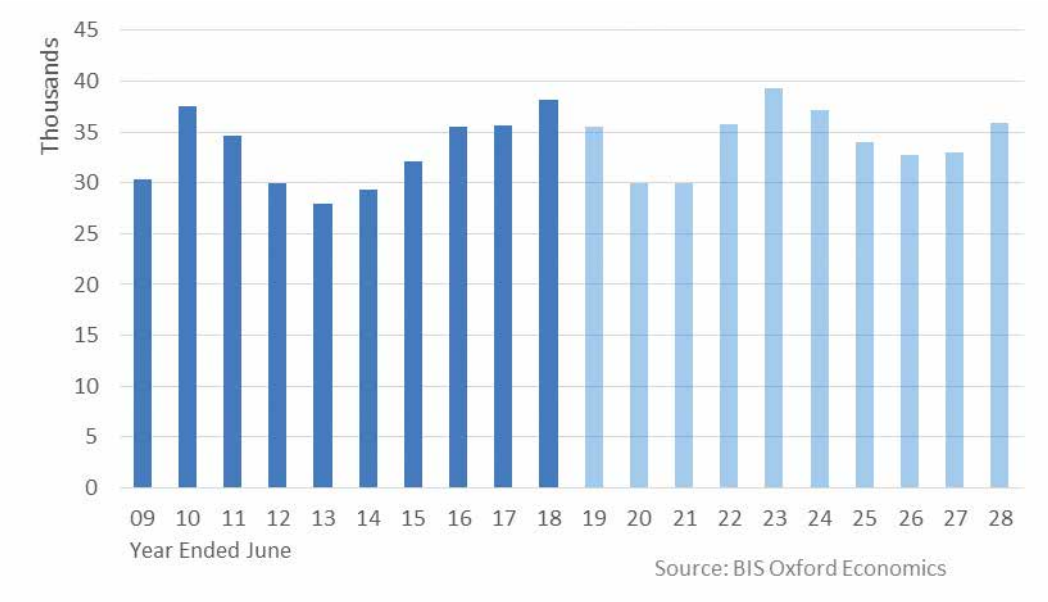
Nevertheless, we expect the Victorian economy to strengthen again from early next decade as both dwelling and public investment pick up from their troughs and business investment strengthens. SFD is projected to average around 3.5% in the early 2020s (FY2021-23), while GSP growth will average around 4.2% per annum. The pick-up in investment will drive a rebound in employment over these years, which will lead to strengthening in household spending. Faster jobs growth will also push down the state unemployment rate, although we expect it to sit above the national average from FY2021.

We are expecting slower growth during the FY2024-28 period, with GSP growth projected at an average of 1.9% p.a. and SFD at an average of 2.2% p.a. Projected rapid rises in interest rates over 2022-2023 will impact housing investment and consumer demand, while business investment is expected to weaken as the long uptrend in non-dwelling building comes to an end, led by a decline in office construction. A gradual pickup in growth is then expected to ensue from FY2025, as public investment, consumer spending and housing recover and strengthen.

5.1.1 Cadastral sector - Private house commencements

Due to solid owner-occupier demand, house commencements continue to creep upwards in FY2018 at 38,136 houses. The projected slowdown in Victoria's GSP, as previously mentioned, will coincide with house commencements edging back by 7.0% in FY2019 and 15.4% in FY2020 to 30,010 houses. Activity will track upwards from FY2022 onwards as the state's undersupply swells, placing upward pressure on housing demand. By FY2023 activity will reach 39,360 new house dwellings. As a result, over the 2019–2023 period we are forecasting a solid average result of 34,114 new house commencements annually. While respectable, it is well below the average recorded in the last five years. Net migration is expected to moderate over this period, with better prospects and affordability drawing migrants to other states. Over the longer term, we are forecasting a modest pick-up to an average of 34,562 houses over the FY2024-28 period.

Chart 5.1: Number of Private House Dwellings Commenced – VIC



5.1.2 Building sector - Multi-residential dwellings and non-dwelling buildings

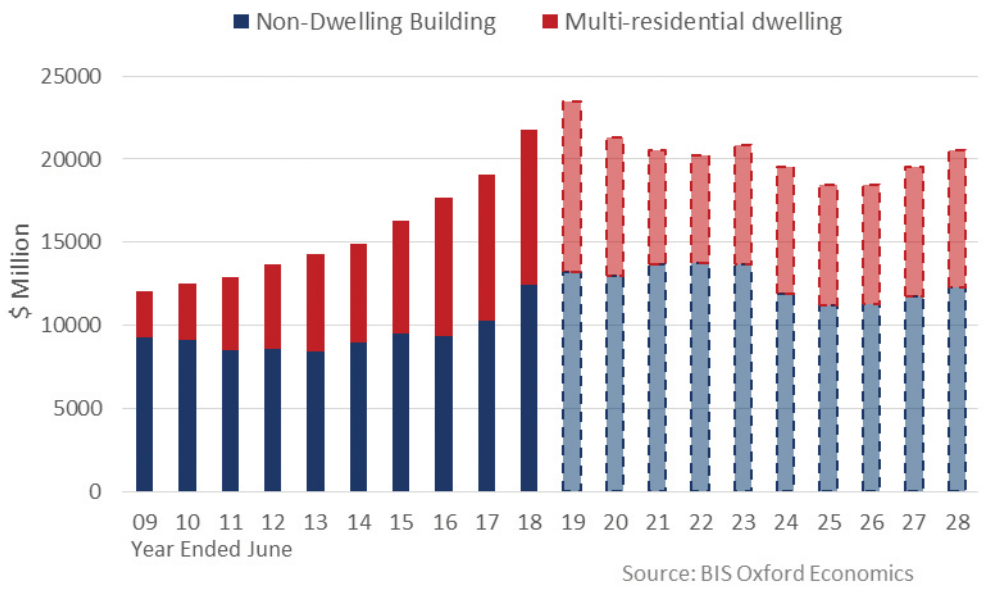
Multi-residential dwellings

Similar to private houses, solid owner-occupier demand has led to a surge in apartment approvals. Multi-residential dwelling investment is forecast to record another year of moderate growth in FY19, due to considerable work still 'in the pipeline'. However, increasing taxes and stricter lending practices will hit investor demand, placing a downward pressure on multi-residential dwellings, particularly high-density buildings, in FY20202 and FY2021. Consequently, we forecast that the value of work done in multi-residential dwellings will fall by 37% from $10.3 billion in FY2019 to $6.5 billion in FY2022. The second half of the forecast period (FY2024-28), will see a slow recovery in multi-residential building activity, growing at an average of 1.8% p.a. to $8.3 billion in FY2028.

Non-dwelling buildings

Non-residential building has seen a considerable ramp up in Victoria over the past two years, reaching an estimated record of $12 billion in FY2018. This growth is projected to continue in the following five years, although at a slower pace as the pipeline of major projects contracts. Activity is forecast to ease from the current high, with the value of work done over the FY2019-23 period is forecast to average $13.5 billion p.a., followed by a lower level of $11.7 billion p.a. in the following five-year period to FY2028.

Chart 5.2: Multi-residential dwelling and non-dwelling building – VIC
Value of Work Done, 2015/16 Prices

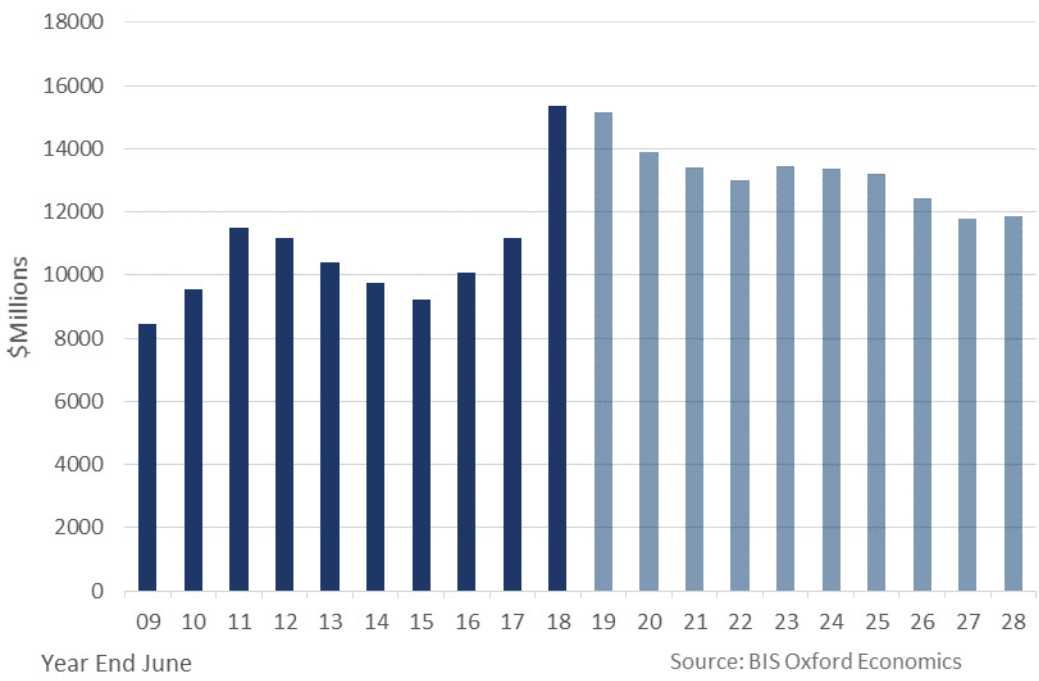


5.1.3 Engineering sector - Utilities and transport engineering construction

Victoria's engineering construction has remained relatively steady over the past decade when compared to the "resource boom" states, with spikes in work done typically timed around major transport initiatives such as Citylink (late 1990s), Eastlink (mid-2000s) and Peninsula Link (early 2010s) Since surging above $9 billion in FY2010, utilities and transport engineering construction work done has ranged between $9.2 billion and $11.5 billion between FY2011 and FY2017. The level of activity within this relatively narrow range is underpinned by a steady stream of projects in roads, water, sewerage, electricity and telecoms.

In FY2018, utilities and transport construction work done reached $15.4 billion (37.6% increase from the previous year), driven by growth in telecoms, roads and electricity segments. In the its 2018/19 Budget, the State Government has restated its commitment to road and transport infrastructure with the inclusion of almost $4.3 billion for better roads and $1.9 billion to continue an unprecedented overhaul of the state's public transport network. Publicly funded programs will provide a floor to Victoria's utilities and transport engineering activity in the medium term, helping to bring average activity to $13.8 billion p.a. in the five years to FY2023, up from $11.1 billion in the preceding five years. Activity is expected to lower to an average of $12.5 billion p.a. in FY2024-28 as major projects are completed.

Chart 5.3: Utilities and Transport Engineering Construction – VIC
Value of Work Done, 2015/16 Prices



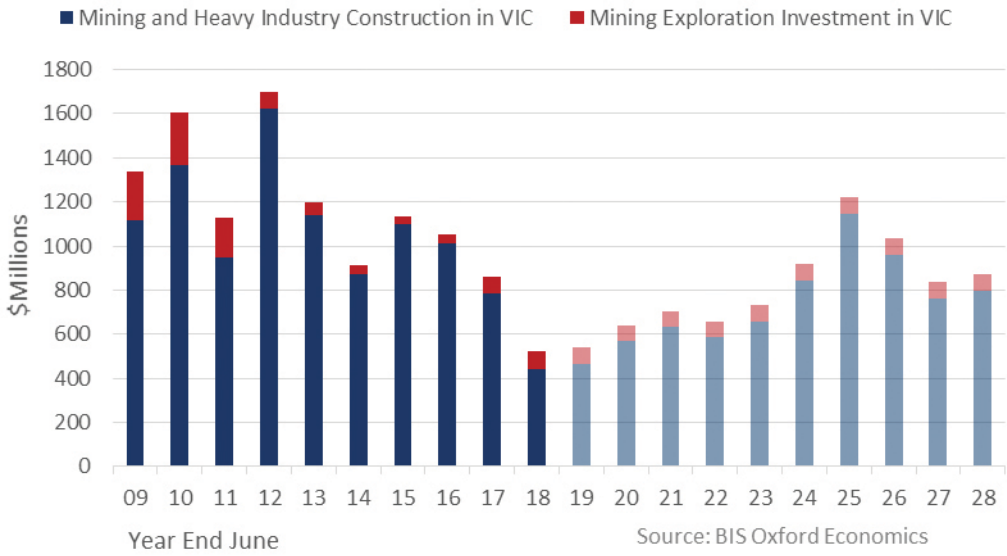
5.1.4 Mining and heavy industry sector

In Victoria, mining and heavy industry construction tends to be dominated by offshore oil and gas-related projects but is also influenced by other minerals projects across base metals and mineral sands. The closure of brown coal fired electricity generators in Victoria has seen a substantial reduction in coal-related mining construction in the state.

In FY2018, M&HI activity in Victoria slumped 44% to $441m – the lowest level of activity since FY2002. The winding down and/or completion of major oil and gas projects such as the $1 billion Longford gas conditioning plant in FY2017 and the $522 million Sole offshore gas field (completed in FY2019) drove much of the fall. Activity is expected to pick up gradually over the next few years led by further gas projects – such as the $400m West Barracouta development by BHP and ExxonMobil and the $560 million Manta gas field – as well as smaller copper and magnesium projects. The period between 2022/23 and 2027/28 is expected to be much stronger, with some very large projects including the $2.2 billion Kipper gas field and $518 million Donald mineral sands projects both likely to get underway.

Overall, M&HI activity in Victoria is forecast to rise from $540 million in FY2019 to $1.2 billion in FY2025, before declining to $871 million in FY2028.

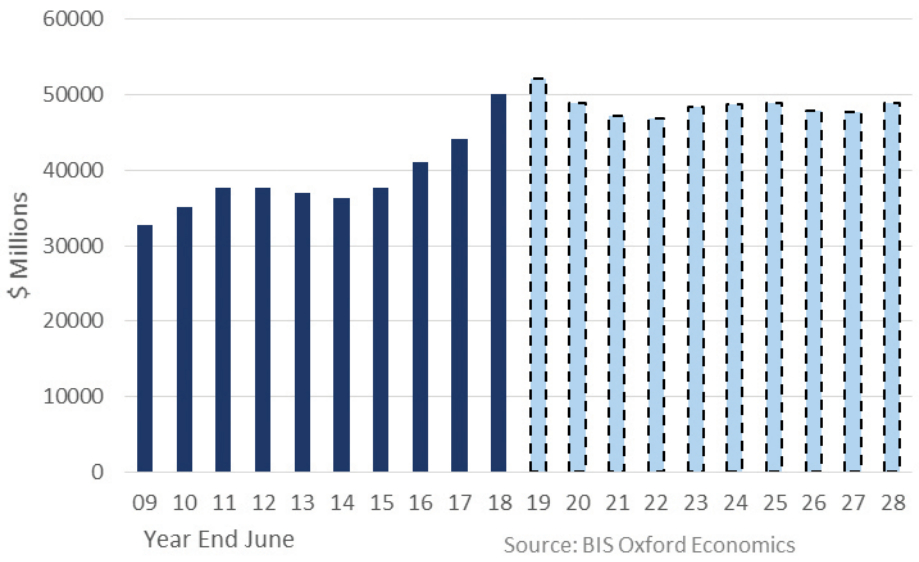
Chart 5.4: Mining & Heavy Industry Construction and Mining Exploration Investment – VIC Constant 2015/16 Prices



5.1.5 Total construction

Overall, construction activity in Victoria is forecast to increase to a peak of $52.2 billion in FY2019 before declining to $46.8 billion in FY2022, largely driven by the projected decline in building and utilities and transport construction. This is then followed by a rebound across all sectors in FY2023, raising total construction by 3.2%, resulting in a five-year average of $48.7 billion. Total construction in FY2024-28 is projected to average around the same level of $48.4 billion (-0.48%).

Chart 5.5: Total Construction by Category – VIC
Value of Work Done, 2015/16 Prices



5.2 Estimate of the existing surveying and geospatial workforce

Size and breakdown of state workforce

In FY2018, the size of the surveying and geospatial workforce in Victoria is estimated to be 2,006 persons, 14% smaller than the size of the workforce in FY2014. Surveyors have shrunken by 13% to 1,279 persons, accounting for 44% of the surveying and geospatial workforce. Spatial scientists have also experienced a decline to 425 persons (-35%) in the same period. On the other hand, there has been a slight increase in the number of technicians from 215 to 302 persons.

In terms of the composition of surveying work, there seems to be a significant shift towards cadastral activity, which saw an increase in its proportion of total surveying activity from 38% in FY2014 to 51% in FY2018.This is followed by engineering (21%), building (19%), other (6%) and mining sector (3%).

Table 5.1: Estimated Size of Total Skilled Workforce in Victoria

Occupation Groups	2013/14	2017/18		
Surveying sectors				
Cadastral	558	656	▲	98
Building	393	238	▼	(155)
Engineering	338	273	▼	(65)
Mining	54	38	▼	(16)
Other sectors	125	74	▼	(51)
Total surveyors	**1,468**	**1,279**	▼	**(189)**
Registered Surveyors	*417*	*523*	▲	106
Total spatial scientists	**658**	**425**	▼	**(233)**
Surveying technicians	172	258	▲	86
Spatial technicians	43	44	▲	1
Total technicians	**215**	**302**	▲	**87**
Total skilled surveying & geospatial workforce	**2,341**	**2,006**	▼	**(335)**
Planners	72	171	▲	99
Engineers	116	510	▲	394
Environmental Scientists	26	83	▲	57
Other staff (include Architects)	55	146	▲	91
Total other professionals	**269**	**910**	▲	641
Total Skilled Workforce	2,610	2,916	▲	**306**

Source: BIS Oxford Economics, ABS, CRSBANZ

Chart 5.6: Comparison of Surveying Sectoral Activity between FY18 (left) and FY14 (right) - VIC

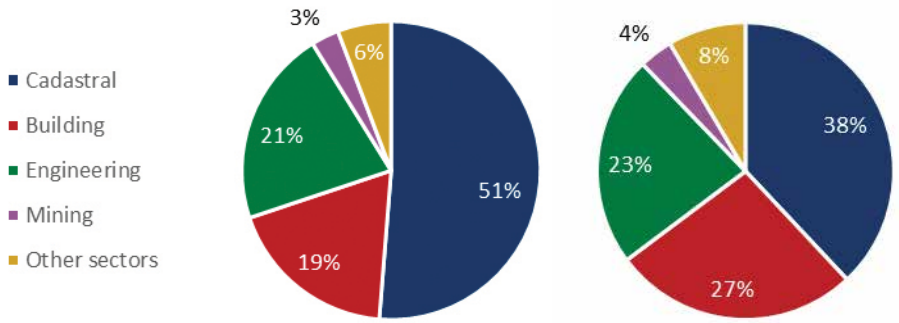
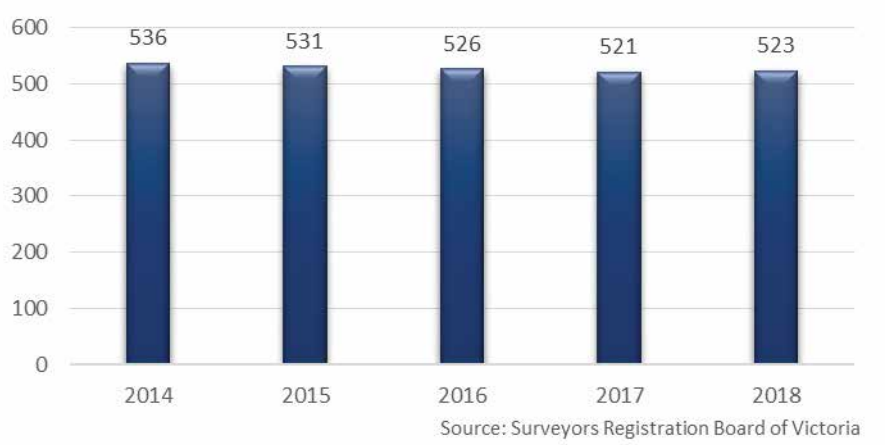


Chart *5.7: Number of Registered Surveyors - VIC*

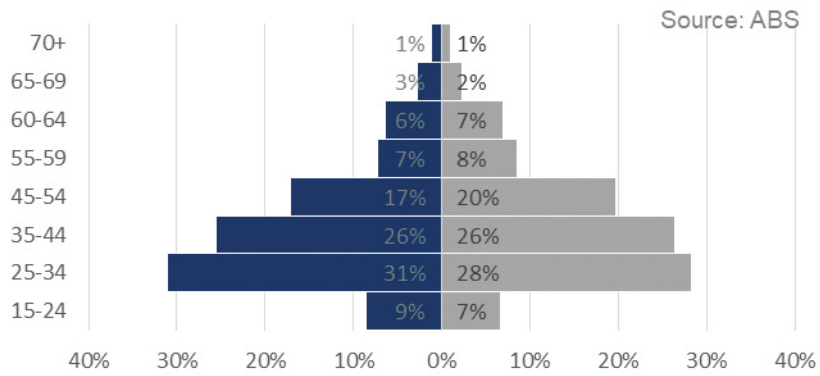


Age profile and income of state workforce

Chart 5.7 shows the age profile of the surveying workforce in Victoria in comparison to national figures. 34% of the workforce in Victoria is aged over 45 years old, which is lower than the national figure of 38.6%.

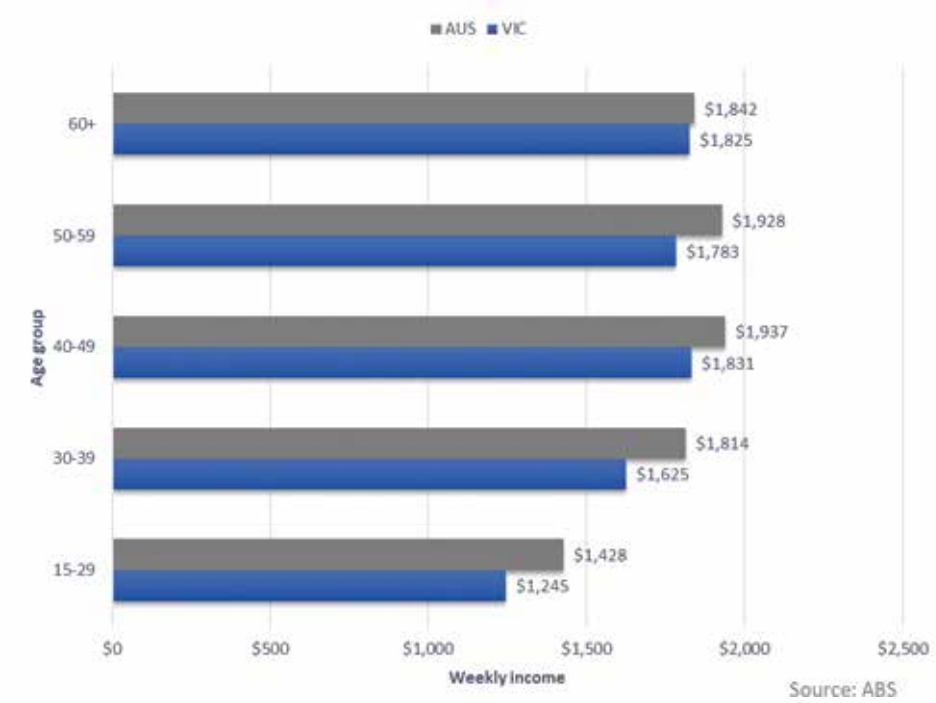
Chart 5.8 shows the comparison of average earnings of full-time surveyor or spatial scientist per week by age group between Victoria and Australia. The average weekly income for a surveyor or spatial scientist in Victoria is estimated at $1,634 compared to the national average of $1,795

Chart 5.8: Age Distribution of Workforce – VIC vs AUS



	15-24	25-34	35-44	45-54	55-59	60-64	65-69	70+
■ VIC	9%	31%	26%	17%	7%	6%	3%	1%
■ AUS	7%	28%	26%	20%	8%	7%	2%	1%

Chart 5.9: Full-time Weekly Earning by Age – VIC vs AUS



5.3 Forecasts of skilled labour demand

The demand for total skilled labour in Victoria is projected to decrease in the next three years by 13.8% to 3,211 persons in FY2021 due to weakened activity across most construction sectors. A projected recovery in construction activity will increase total labour demand to 3,335 persons in FY2023. We then expect a general decline in labour demand, in line with weakening total construction activity as well as improving labour productivity.

Chart 5.10: Forecast of Total Demand for Skilled Labour – VIC (1.5% productivity growth)

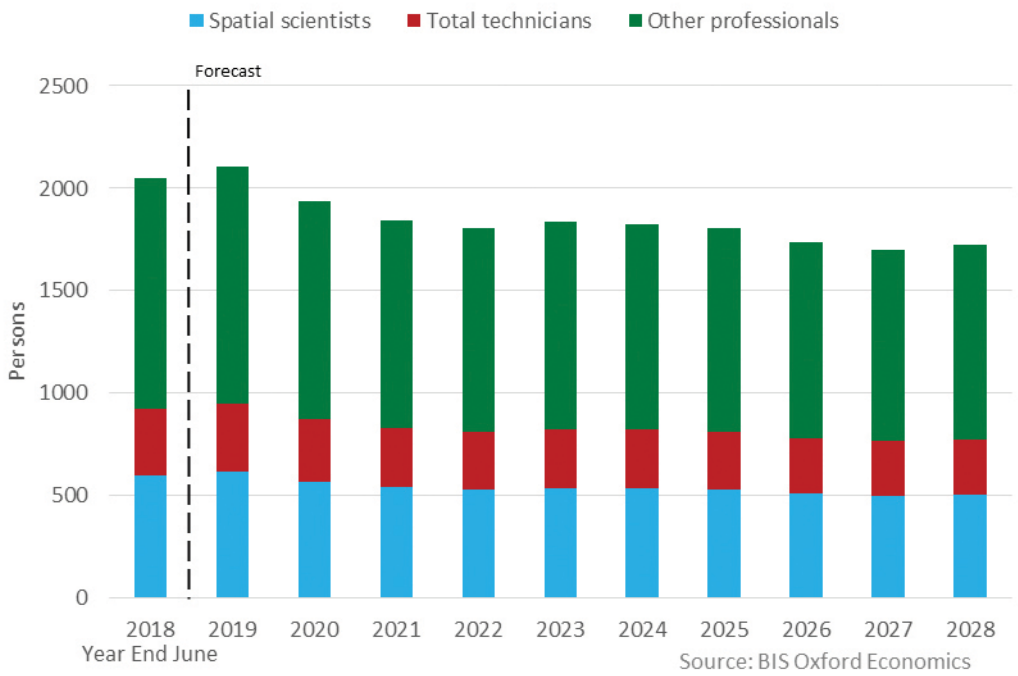
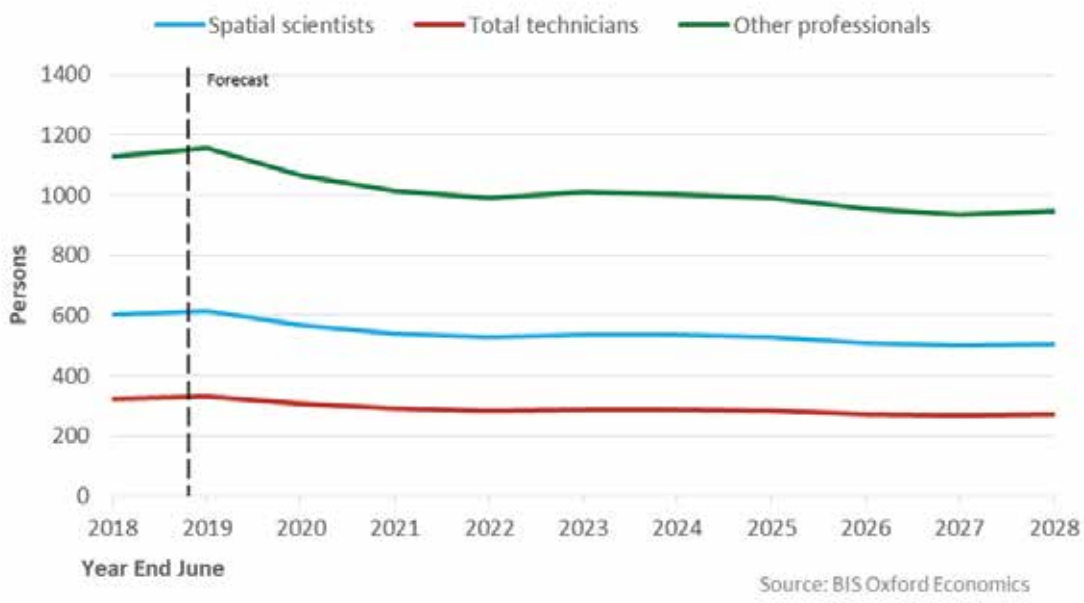


Chart 5.11: Forecast of Demand for Surveyors by Sector – VIC (1.5% productivity growth)

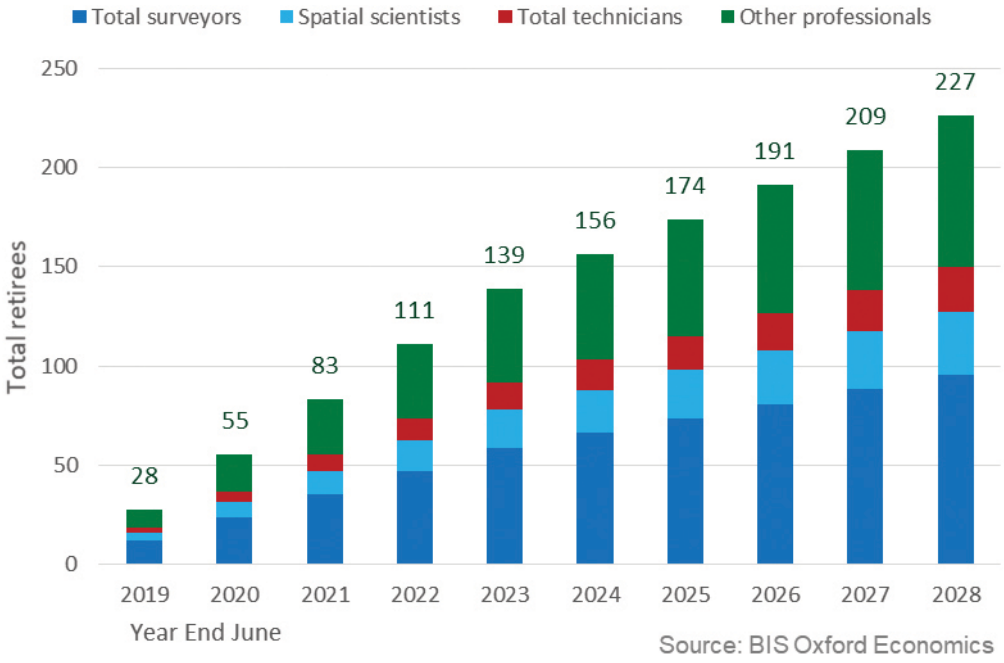
Chart 5.12: Forecast of Demand for Spatial Scientists, Technicians and Other Professionals – VIC (1.5% productivity growth)



5.4 Forecast of workforce attrition

We estimate that 7.8% (227 people) of existing workforce in Victoria will retire in the next 10 years, given the current age profile of the workforce. This includes 96 surveyors, 32 spatial scientists, 23 technicians and 77 other professionals.

Chart 5.13: Forecast of Cumulative Workforce Attrition – VIC



5.5 Forecast workforce gap

In FY2018, the size of the workforce gap in Victoria is estimated at 808 personnel, with surveyors accounting for 48% of the shortage, followed by other professionals (26%), then spatial scientists (21%), and technicians (2.5%). After a minor increase in FY2019, the workforce gap is expected to decrease significantly by 40% to 496 persons in FY2020. This is primarily led by decreases in the workforce gap for surveyors, particularly, who will experience a transition from shortage to surplus in FY2020.

Chart 5.14: Forecast of Workforce Gap for Registered Surveyors – VIC (1.5% Poductivity Growth)

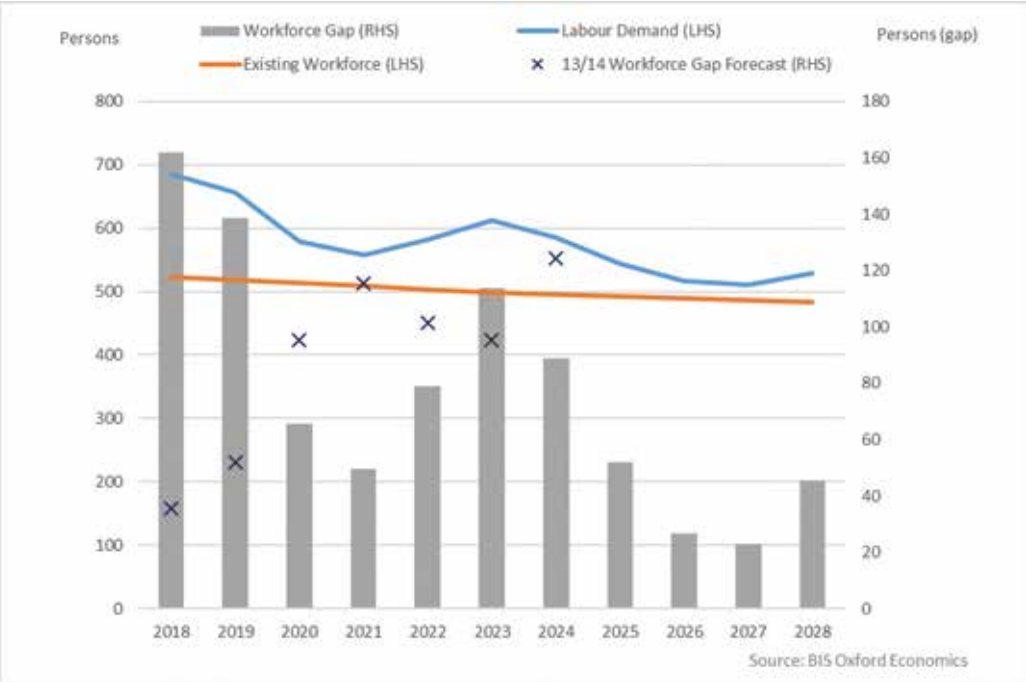


Chart 5.15: Forecast of Workforce Gap for Total Surveyors – VIC (1.5% Productivity Growth)

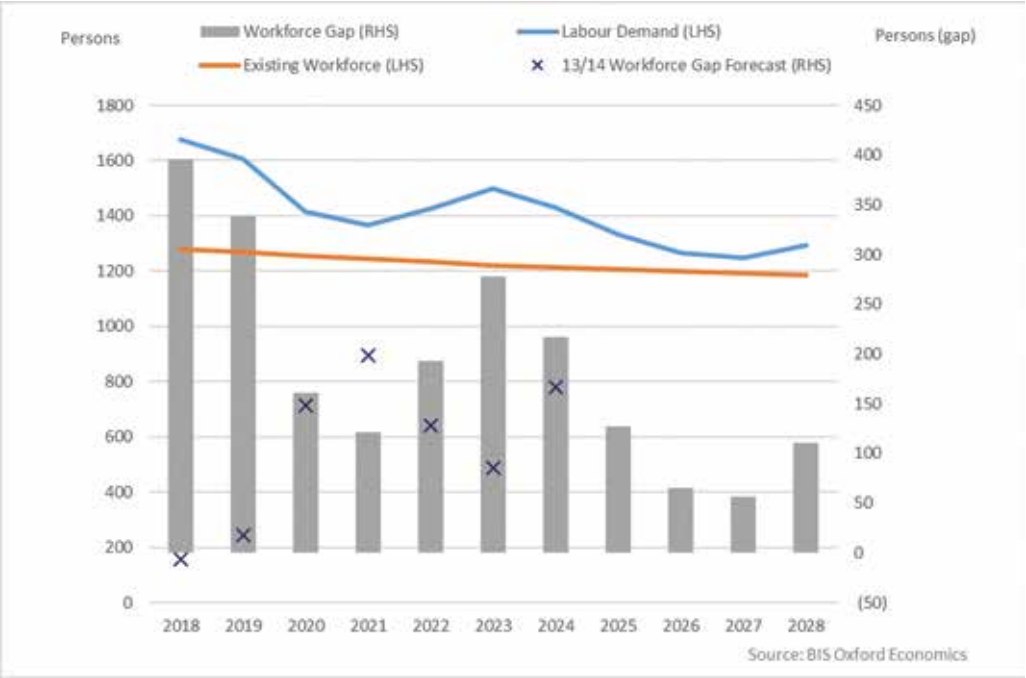


Chart 5.16: Forecast of Workforce Gap for Spatial Scientists – VIC (1.5% Productivity Growth)

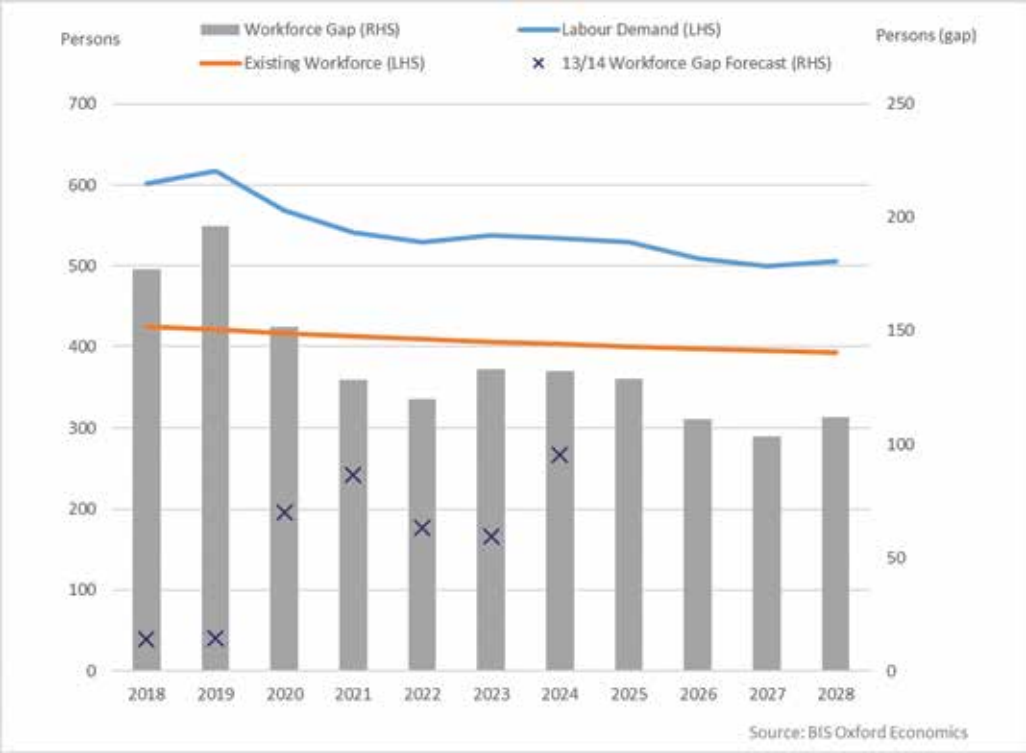
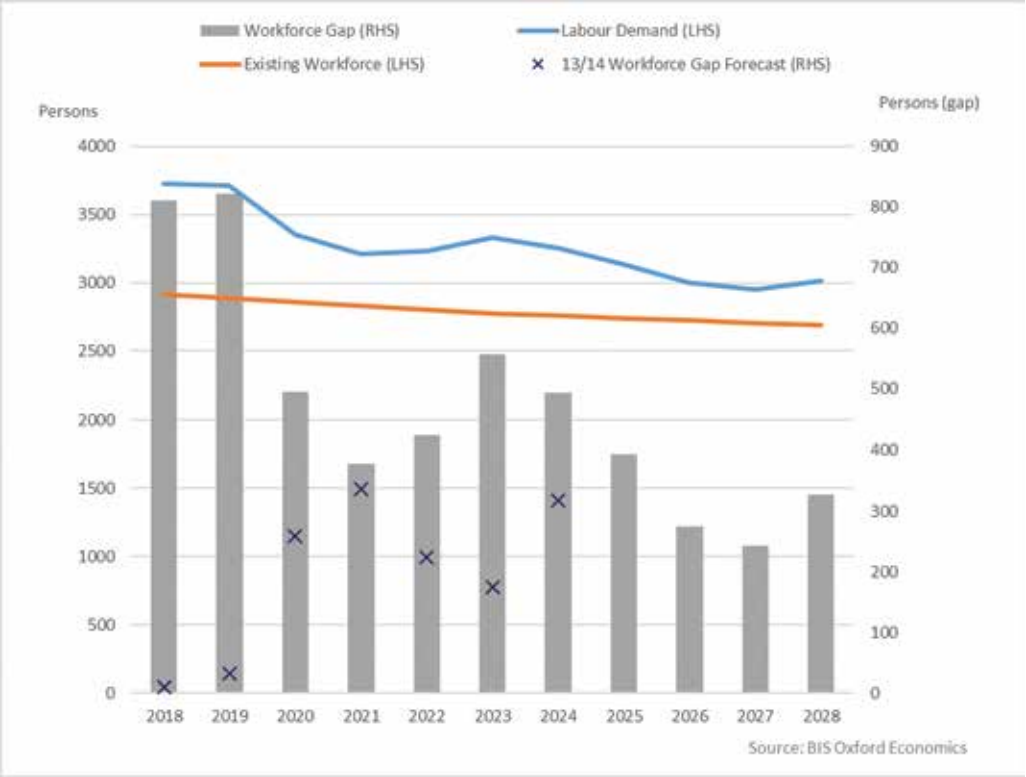


Chart 5.17: Forecast of Workforce Gap for Total Technicians – VIC (1.5% Productivity Growth)

Chart 5.18: Forecast of Workforce Gap for Total Skilled Workforce – VIC (1.5% Productivity Growth)



Overall, we project Victoria's current stock of surveyors and spatial scientists to be insufficient to meet construction activity over the next 10 years to FY2028. This shortage is particularly serious in the first half of the forecast period. On the other hand, we forecast an initial small shortage of technicians in the two years to FY2020 which then transitions to a small surplus for the rest of the forecast horizon.

Table 5.2: Workforce Gap Outcome – VIC

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
			Shortage					*Shortage*		
Surveyors & spatial scientists	535	312	249	313	411	349	255	176	160	223
			Shortage					*Surplus*		
Surveying & spatial science technicians	32	9	(4)	(7)	0	0	(1)	(10)	(13)	(8)

Source: BIS Oxford Economics

Table 5.3: Labour Demand Forecast and Workforce Gap – Victoria (Baseline Scenario based on 1.5% labour productivity growth)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
	Estimates	Forecasts									
Labour Demand											
All Surveyors	**1675**	**1606**	**1417**	**1365**	**1425**	**1499**	**1430**	**1333**	**1264**	**1247**	**1295**
Cadastral	748	675	568	559	657	712	662	597	566	563	601
Building	352	374	334	318	308	313	288	268	265	275	285
Engineering	427	415	375	357	340	347	339	331	307	286	284
Mining	40	32	38	34	25	31	44	41	35	34	34
Other sectors	108	111	102	97	95	97	96	95	91	90	91
Registered/Licensed Surveyors (a)	*685*	*657*	*579*	*558*	*583*	*613*	*585*	*545*	*517*	*510*	*529*
Spatial Scientists	602	617	569	541	529	538	535	529	509	499	505
Total Technicians	323	331	305	291	284	289	287	284	273	268	271
Total Surveying & Geospatial Workforce	**2600**	**2555**	**2291**	**2197**	**2239**	**2326**	**2252**	**2146**	**2046**	**2015**	**2071**
Other Professionals	1128	1156	1065	1014	991	1008	1002	991	954	935	946
Total skilled labour demand	**3728**	**3710**	**3356**	**3210**	**3230**	**3334**	**3253**	**3137**	**3000**	**2950**	**3017**
Existing Workforce (b)											
All Surveyors	**1279**	**1268**	**1256**	**1244**	**1232**	**1221**	**1213**	**1206**	**1199**	**1191**	**1184**
Cadastral	656	650	644	638	632	626	622	618	615	611	607
Building	238	236	234	231	229	227	226	224	223	222	220
Engineering	273	270	268	265	263	260	258	257	255	254	252
Mining	38	38	38	37	37	37	36	36	36	36	36
Other sectors	74	74	73	72	72	71	71	70	70	69	69
Registered/Licensed Surveyors	*523*	*518*	*513*	*509*	*504*	*499*	*496*	*493*	*490*	*487*	*484*
Spatial Scientists	425	421	417	413	409	405	403	400	398	395	393
Total Technicians	302	300	297	294	291	289	287	285	283	282	280
Total Surveying & Geospatial Workforce	**2006**	**1988**	**1970**	**1951**	**1933**	**1915**	**1903**	**1891**	**1880**	**1868**	**1857**
Other Professionals	910	901	891	882	873	863	857	851	845	839	833
Total skilled labour	**2916**	**2889**	**2861**	**2833**	**2805**	**2778**	**2760**	**2743**	**2725**	**2707**	**2690**
Workforce Gap (c)											
All Surveyors	**396**	**339**	**161**	**121**	**193**	**278**	**217**	**127**	**65**	**56**	**111**
Cadastral	92	25	(76)	(79)	25	86	40	(22)	(48)	(48)	(6)
Building	114	138	100	86	79	86	63	44	42	54	65
Engineering	155	145	107	92	78	87	81	74	51	32	32
Mining	2	(6)	0	(3)	(12)	(6)	8	5	(1)	(2)	(2)
Other sectors	34	37	29	25	23	26	25	25	22	20	22
Registered/Licensed Surveyors	*162*	*139*	*66*	*49*	*79*	*114*	*89*	*52*	*27*	*23*	*45*
Spatial Scientists	177	196	152	128	120	133	132	129	111	104	112
Total Technicians	21	32	9	(4)	(7)	0	0	(1)	(10)	(13)	(8)
Total Surveying & Geospatial Workforce	**594**	**567**	**321**	**245**	**306**	**411**	**349**	**254**	**166**	**146**	**214**
Other Professionals	217	255	174	132	119	145	144	140	108	96	113
Total skilled labour	811	822	495	377	425	556	493	394	275	242	328

(a) Registered surveyors are included in the total number of surveyors.

Source: BISOE, ABS, CRSBANZ

(b) Existing workforce is generated by diminishing the size of the current skilled workforce due to retirement.

(c) Workforce gap is calculated as labour demand less existing workforce. Positive number implies shortage of labour; bracketed number implies excess of supply.

Chapter Six

Forecasts of Labour Demand and Workforce Gap for Queensland

6. FORECASTS OF LABOUR DEMAND AND WORKFORCE GAP FOR QUEENSLAND

6.1 Economic and industry outlook

6.1.1 General economic environment

While traditionally one of the stronger state performers in Australia, Queensland has been impacted in recent years by weak investment growth. Despite being one of Australia's key 'resources' states – and one of the largest exporters of coal and gas – the state's economy is in fact highly diversified and increasingly linked into global trade networks through tourism, agriculture and education industries.

Queensland's GSP accelerated to 3.6% in FY2018, the fastest rate of growth in 6 years. The recovery has been underpinned by trade-exposed sectors (particularly tourism-related activity) and modest growth in consumer spending. GSP is forecast to remain above the national average through to FY2021. Queensland's State Final Demand (SFD) also accelerated to 4.7% in FY2018. SFD growth in FY2018 has been driven by strong increases in private non-dwelling construction (+16%) and investment in plant and equipment (+7.6%) as well as government consumption expenditure (+5.6%). Unlike private investment, however, public investment fell in FY2018, presenting a drag on economic growth in the state.

Employment growth accelerated to 3.5% in FY2018, with 85,000 jobs added over the year. Despite this, the unemployment rate remains around 6%, above the Australian average of 5.5% Looking ahead, the pace of jobs growth is expected to ease, as output catches up with employment, and the unemployment is expected to remain around 6%.

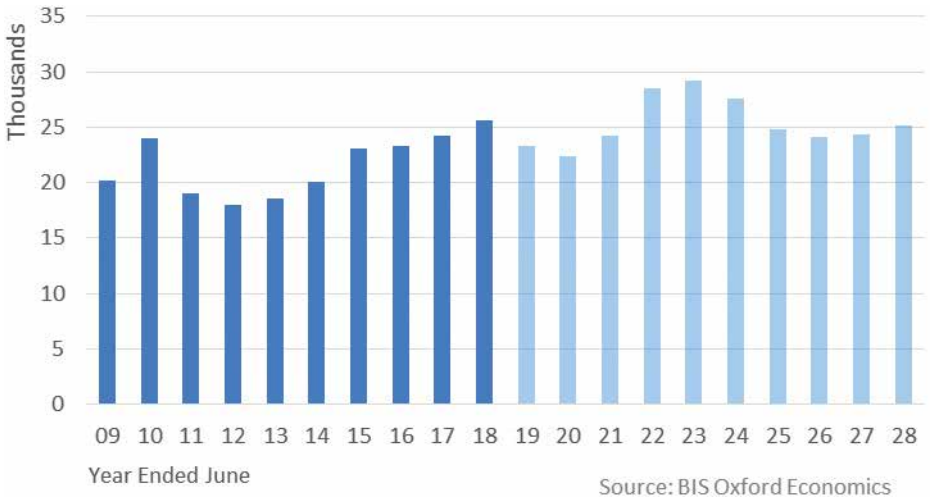
After strong export growth over the 4 years to FY2017, export growth stalled in FY2018. However, with the AUD expected to remain in a US70-78 cents band, the competitive AUD will boost the tradeable sectors of agriculture, tourism (including parts of Retail Trade), manufacturing and mining, with export growth expected to recover over the medium term.

Overall, Queensland economic growth (as measured by GSP) is expected to average around 3.2% p.a. in the FY2019-2023 period, followed by a lower average growth of 2.4% p.a. in the following five-year period to FY2028.

6.1.2 Cadastral sector - Private house commencements

Private house commencements are estimated to have grown by 6% in FY2018 to 25,620 houses. Even though population growth in certain regional areas such as the Gold Coast and Sunshine Coast will support the state's housing commencements, we project that house dwellings will decline over the next two years to FY2020 as the state's oversupply in dwelling is corrected in the market, falling to 28,530 new houses in FY2020. Once a balanced market, house commencements is expected to climb back up to 29,220 in FY2023, above the current level. Over the long term, house commencement activity is forecast to fall to an average of 25,220 new houses p.a. during the FY2024-28 period.

Chart 6.1: Number of Private House Dwellings Commenced – QLD



6.1.3 Building sector - Multi-residential dwellings and non-dwelling buildings

Multi-residential dwellings

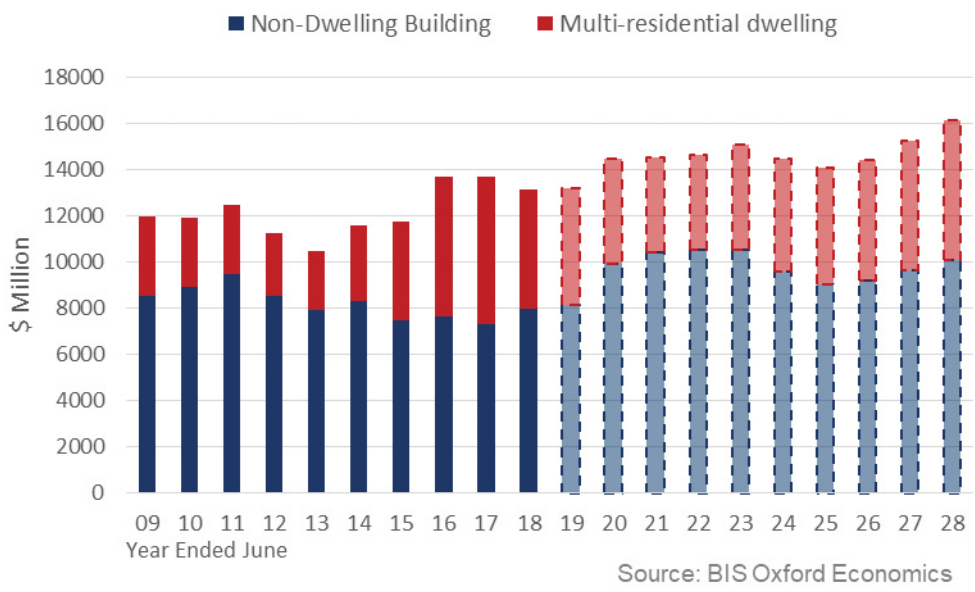
The mechanisms which supported the apartment sector are now weakening after several years of strong growth. The surge of apartments coming onto the market has not been matched by demand, resulting in an oversupply of attached dwellings particularly in Brisbane's CBD. Additionally, the flow of investors from Sydney and Melbourne looking for a market with better growth prospects has now diminished. Consequently, the value of work done in multi-residential building has diminished by 19% in FY2018 to $5.2 billion. We project the activity to further decline in the three years, resulting in an average work done value of $4.5 billion p.a. in the FY2019-23 period. However, as the housing market corrects itself from oversupply and as population growth continues, we project the long-term activity of multi-residential building to be around $5.6 billion p.a. for the following five-year period to FY2028.

Non-dwelling buildings

Positive economic conditions through 2003–2008, followed by public sector investment over 2009–2010 drove a strong upturn in non-residential building in Queensland, with total commencements more than doubling to over $8 billion in that period. Nonetheless, with public support for education and hospitals waning, non-dwelling building fell back in FY2012 (-9.6%) and FY2013 (-7.4%). After a jump in FY2014 with the $950 million Sunshine Coast University Hospital and a series of major office projects in the Brisbane CBD commencing, activity dived 10.2% to $7.5 billion in FY2015. From this low base, non-residential activity has recovered over more recent years. In FY2018 Queensland saw its non-residential building activity to edge up to $7.9 billion.

In line with improving economic conditions in the Sunshine State, as well as a sizable project pipelines, it is projected that non-residential commencements in Queensland will rebase to a materially high level over the next five years (an average of $9.9 billion p.a. over FY2019-23). Annual activity over the FY2024-28 period are forecast to average $9.5 p.a., given the sustained population growth in Queensland.

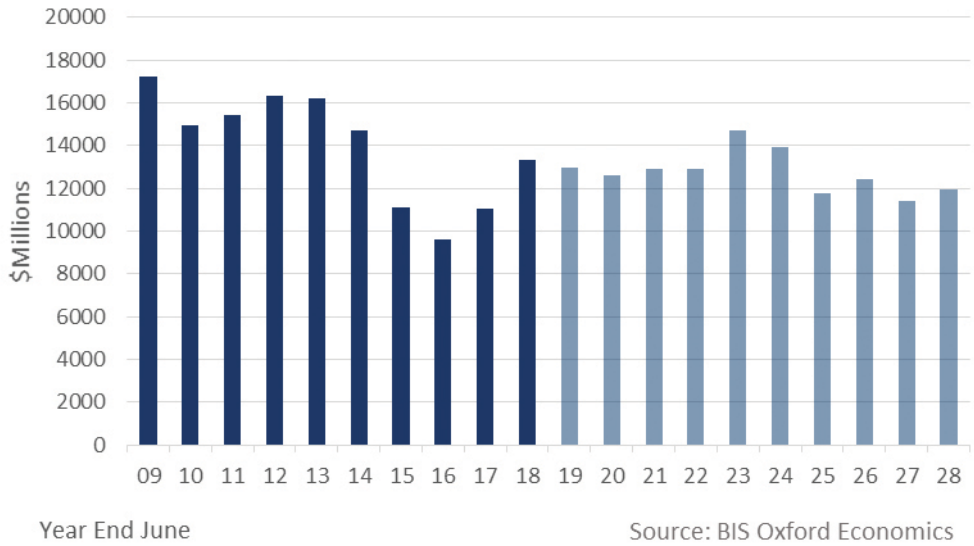
Chart 6.2: Multi-residential dwelling and non-dwelling building – QLD
Value of Work Done, 2015/16 Prices



6.1.4 Engineering sector - Utilities and transport engineering construction

While utilities and transport engineering construction activity fell dramatically from FY2014 (with declines across most sectors as private and public investment contracted post resources boom), it has settled at relatively high levels in recent years. Looking forward we expect activity to moderate around current levels. A modest uptick in transport related construction (led notably by the Cross River Rail project) is expected to offset declining utilities construction after FY2019. Activity is set to average around $13.2 billion p.a. over the five years to FY2023, followed by an average of $12.3 billion p.a. over the following five years to FY2028.

Chart 6.3: Utilities and Transport Engineering Construction – QLD
Value of Work Done, 2015/16 Prices



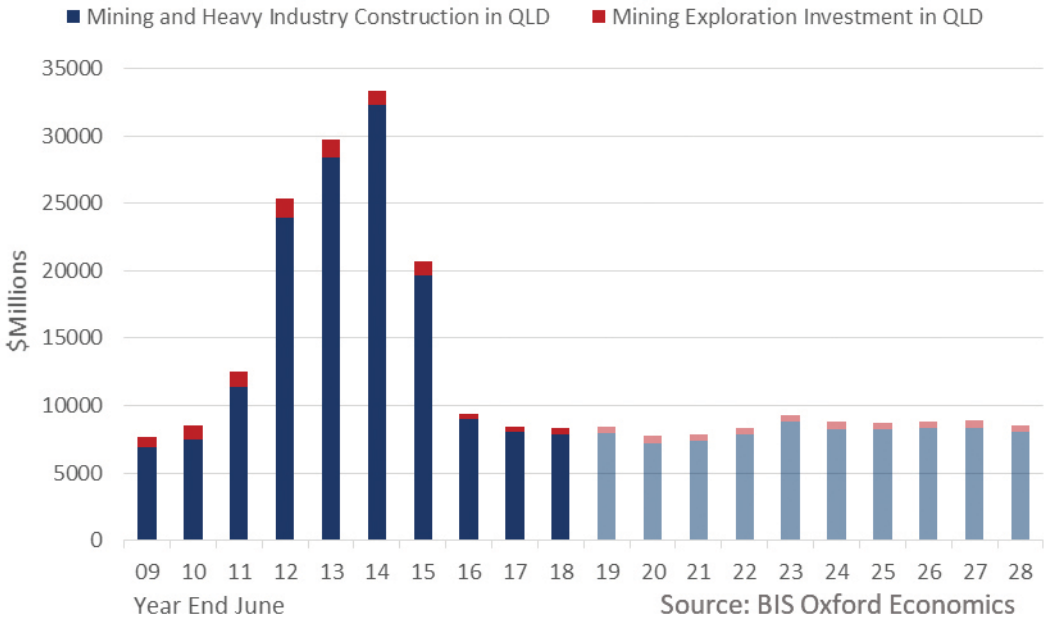
6.1.5 Mining and heavy industry sector

In Queensland, mining and heavy industry construction was traditionally dominated by coal-related projects but has seen an extraordinary boom-bust cycle in LNG gas field and processing (train) construction over the past decade, which will require substantial ongoing upstream development works. The state also sees a significant volume of cyclical BAA (Bauxite Alumina and Aluminium) construction, given bauxite reserves and the location of key alumina refining and aluminium smelting facilities, as well as base metals-related construction activity across gold, copper, silver, lead and zinc.

In FY2018, M&HI activity in Queensland eased 3% to $7.8 billion, continuing a long decline since FY2014 with the end of the LNG resources investment boom. The decline in FY2018 masks a considerable upswing in coal-related activity after many years of underinvestment, and a very strong contribution from the BAA sub-segment driven by the $2.5 billion Amrun bauxite project. Looking ahead, the completion of Amrun is expected to offset rising activity elsewhere, with annual work done expected to stay in the $7-8 billion range. Higher levels of activity are expected in the second half of the coming decade given Queensland's need to reinvest in gas supplies to feed in large LNG production trains, as well as higher coking coal (to support global steel production) and other minerals activity.

Overall, M&HI activity will remain at a relatively flat level of around $8.3 billion p.a. to FY2023, followed by an elevated activity of around $8.8 billion p.a. from FY2024 to FY2028.

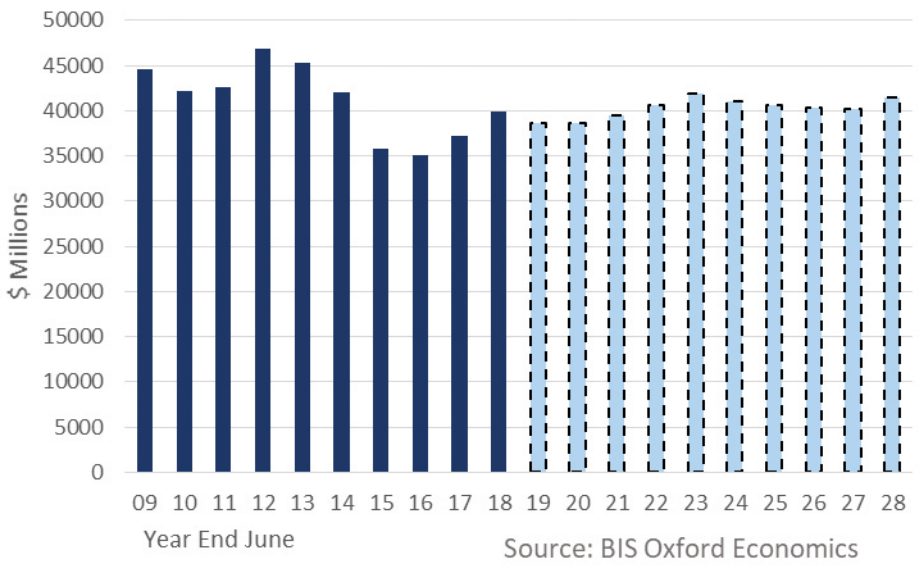
Chart 6.4: Mining & Heavy Industry Construction and Mining Exploration Investment – QLD Constant 2015/16 Prices



6.1.6 Total construction

Overall, construction activity in Queensland is forecast to fall in the next two years to $38.6 billion in FY2020 (-3% from FY2018) as activity in utilities and transport construction and M&HI weaken during the period. However, positive growth across all sectors in FY2021-23 will see total construction rise to $41.9 billion by the end of the period (+9% from FY2020). We project total construction in Queensland to stabilise around $40.7 billion in FY2024-28.

Chart 6.5: Total Construction by Category – QLD
Value of Work Done, 2015/16 Prices



6.2 Estimate of the existing surveying and geospatial workforce

Size and Breakdown of state workforce

In FY2018, the size of the surveying and geospatial workforce in Queensland is estimated to be 2,094 persons, a 38% decrease from FY2014. Whilst remaining the largest component of the entire skilled workforce, the number of surveyors dropped by 34% to 1,400 persons. The number of spatial scientists and technicians have also been in decline, dropping by 53% and 22% respectively. We estimate the cadastral sector to represent the largest proportion of surveying work, comprising 45% of surveying activity. This is followed by building (17%), engineering (15%), mining (14%) and other sectors (9%).

Table 6.1: Estimated Size of Total Skilled Workforce in Queensland

Occupation Groups	2013/14	2017/18		
Surveying sectors				
Cadastral	693	627	▼	(66)
Building	453	242	▼	(211)
Engineering	324	209	▼	(115)
Mining	541	200	▼	(341)
Other sectors	117	122	▲	5
Total surveyors	**2,128**	**1,400**	▼	**(728)**
Registered Surveyors	*562*	*500*	▼	(62)
Total spatial scientists	**865**	**409**	▼	**(456)**
Surveying technicians	291	235	▼	(56)
Spatial technicians	73	50	▼	(23)
Total technicians	**364**	**285**	▼	**(79)**
Total skilled surveying & geospatial workforce	**3,357**	**2,094**	▼	**(1263)**
Planners	89	280	▲	191
Engineers	141	205	▲	64
Environmental Scientists	36	54	▲	18
Other staff (include Architects)	30	111	▲	81
Total other professionals	**296**	**650**	▲	354
Total Skilled Workforce	3,653	2,744	▼	**(909)**

Source: BIS Oxford Economics, ABS, CRSBANZ

Chart 6.6: Comparing Surveying Sectoral Activity between FY18 (left) and FY14 (right)

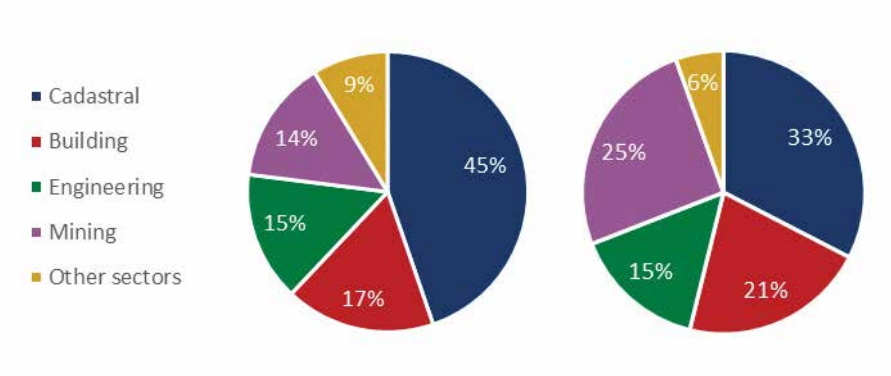
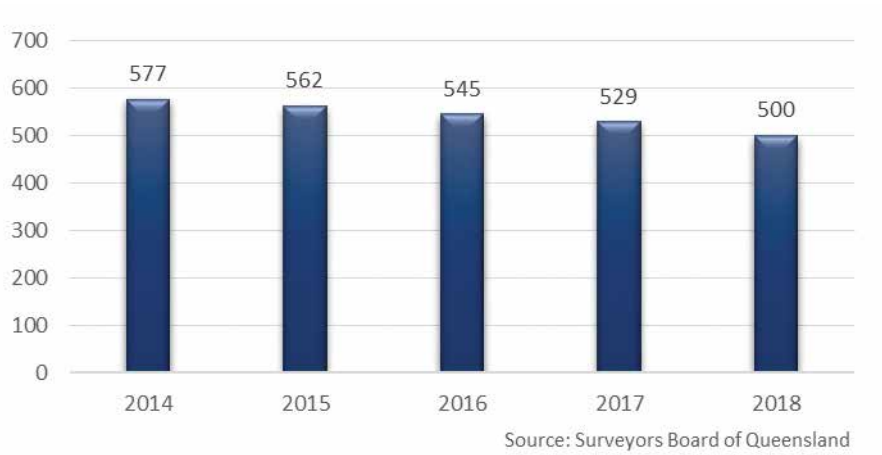


Chart 6.7: Number of Registered Surveyors - QLD

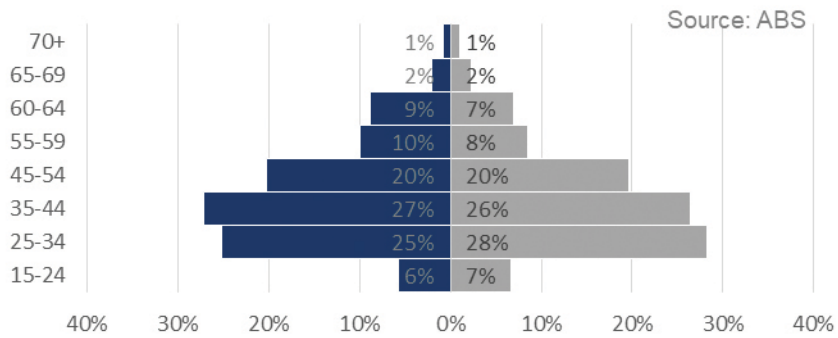


Age profile and income of state workforce

Chart 6.8 shows the age profile of the surveying workforce in Queensland in comparison to national figures. 41.9% % of the workforce in Queensland is aged over 45 years old, compared to the national figure of 38.6%.

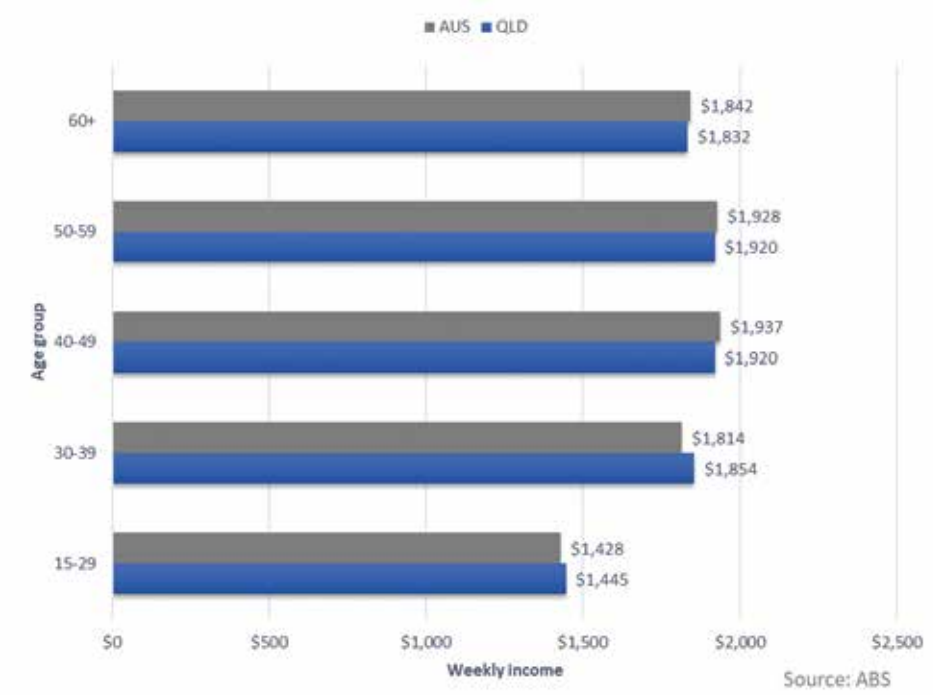
Chart 6.9 shows the comparison of average earnings of full-time surveyor or spatial scientist per week by age group between Queensland and Australia. The average weekly income for a surveyor or spatial scientist in Queensland is estimated at $1,816 compared to national average of $1,795.

Chart 6.8: Age Distribution of Workforce – QLD



	15-24	25-34	35-44	45-54	55-59	60-64	65-69	70+
QLD	6%	25%	27%	20%	10%	9%	2%	1%
AUS	7%	28%	26%	20%	8%	7%	2%	1%

Chart 6.9: Full-time Weekly Earnings by Age – QLD vs AUS



6.3 Forecasts of skilled labour demand

From 3,301 persons in FY2018, weakening construction activity will translate into lower demand for skilled labour in the next two years, leading to a total demand of 3,025 persons by FY2020. A projected recovery across all construction sectors in FY2021-23 will see labour demand pick back up to 3,308 persons in FY2023. A decrease in construction activity will then ensue after FY2024, resulting in total labour demand to decrease by around 3% per annum to FY2028.

Chart 6.10: Forecast of Total Demand for Skilled Labour – QLD (1.5% productivity growth)

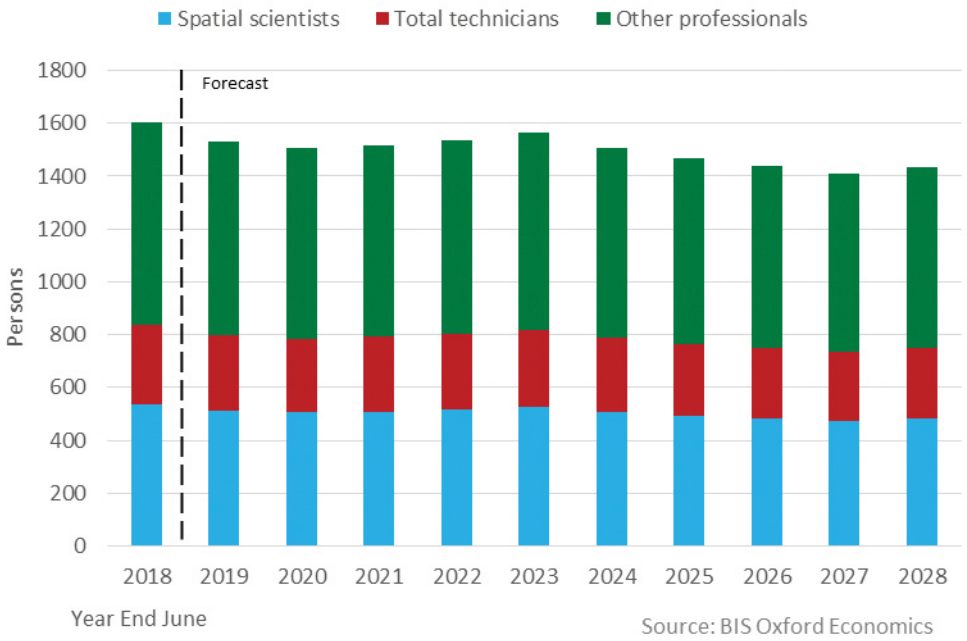


Chart 6.11: Forecast of Demand for Surveyors by Sector – QLD (1.5% productivity growth)

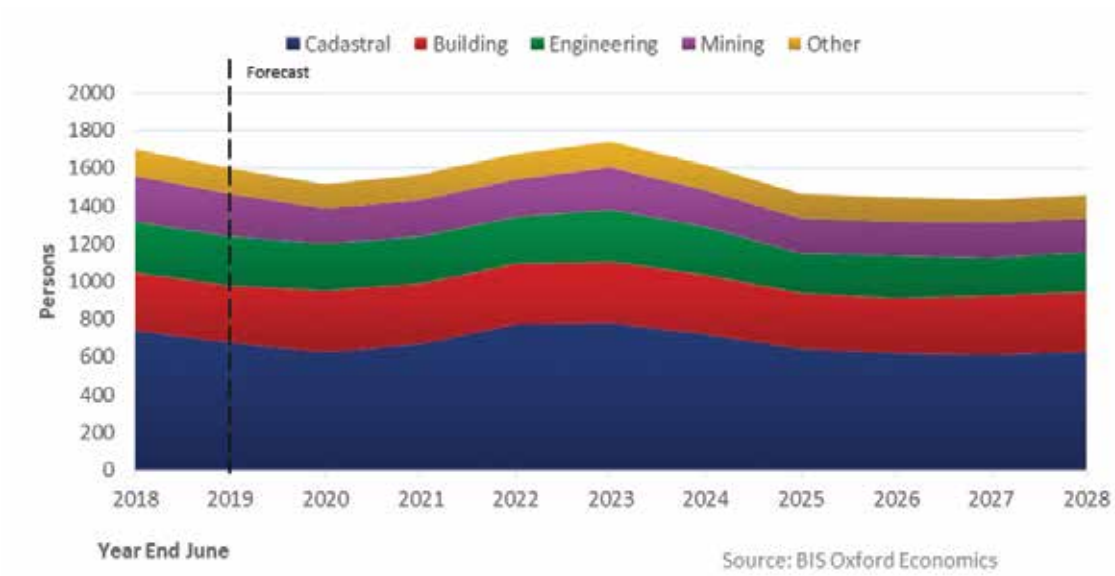
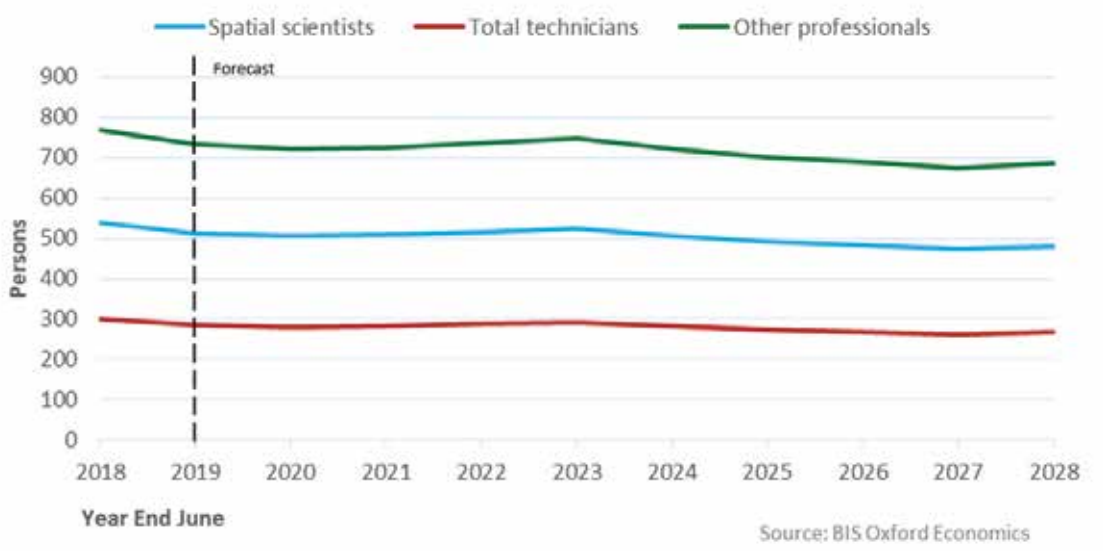


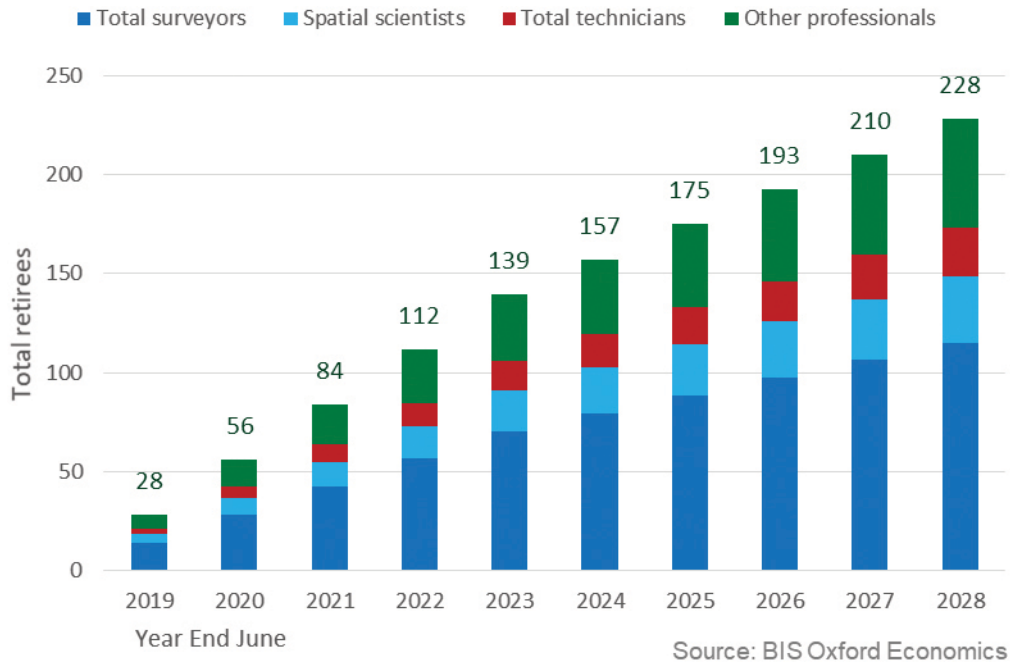
Chart 6.12: Forecast of Demand for Spatial Scientists, Technicians and Other Professionals – QLD (1.5% productivity growth)



6.4 Forecast of workforce attrition

We estimate that 8.3% of existing workforce in Queensland will retire in the next 10 years, given the current age profile of the workforce. This includes 115 surveyors, 34 spatial scientists, 24 technicians and 55 other professionals.

Chart 6.13: Forecast of Cumulative Workforce Attrition – QLD



6.5 Forecast workforce gap

In FY2018, the size of the workforce gap in Queensland is estimated at 557 personnel, with surveyors accounting for 53% of the shortage, followed by spatial scientists (23%), other professionals (21%) and technicians (3%). This gap is set to narrow over the next two years as labour demand decreases, resulting in a shortage of 338 persons in FY2020. Following the rise in labour demand and workforce retirement, the shortage is projected to widen again to 414 persons by FY2023. After this peak, lowered demand for labour as a result of weakened construction activity will see the workforce gap trend downward, resulting in an average shortage of 386 persons p.a. during the FY2024-28 period.

Chart 6.14: Forecast of Workforce Gap for Registered Surveyors – QLD (1.5% Productivity Growth)

Chart 6.15: Forecast of Workforce Gap for Total Surveyors – QLD (1.5% Productivity Growth)

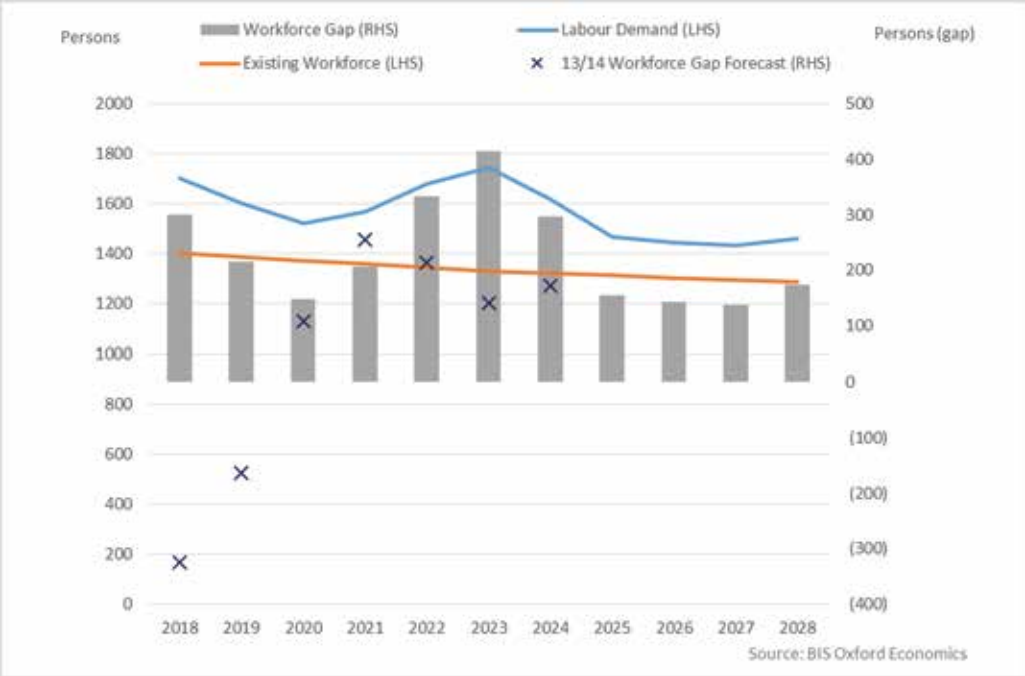


Chart 6.16: Forecast of Workforce Gap for Spatial Scientists – QLD (1.5% Productivity Growth)

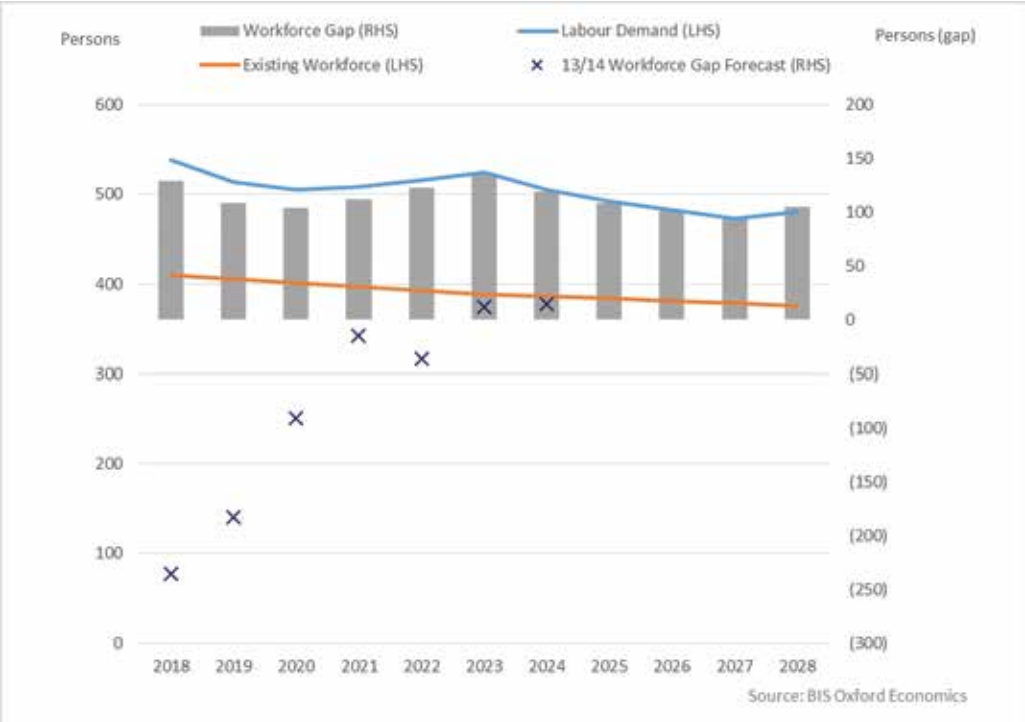


Chart 6.17: Forecast of Workforce Gap for Total Technicians – QLD (1.5% Productivity Growth)

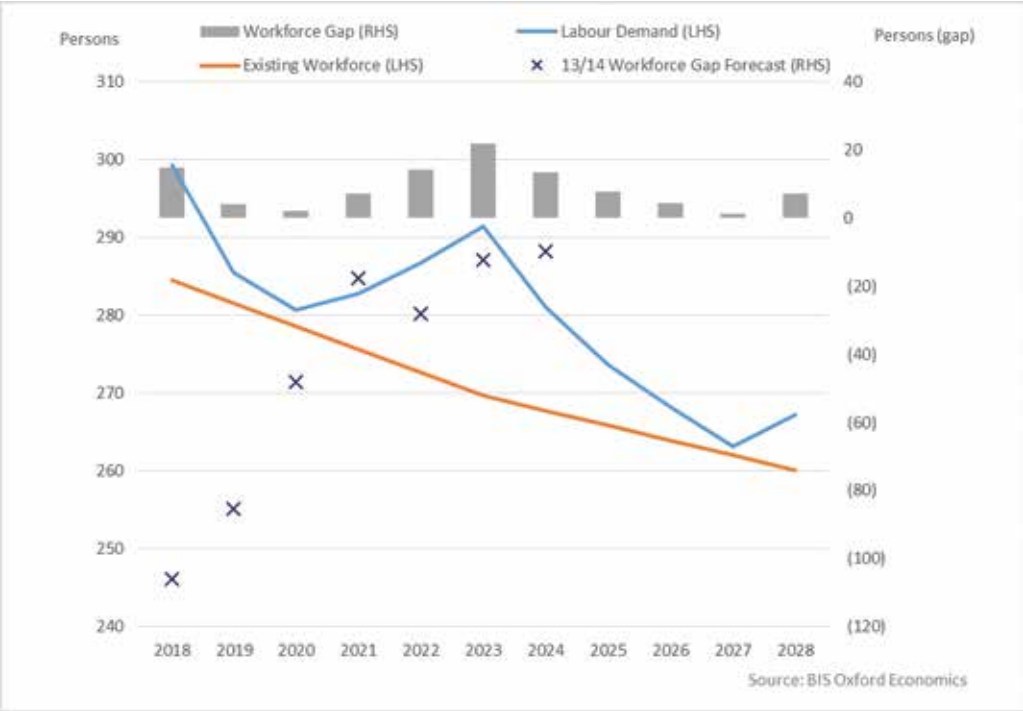
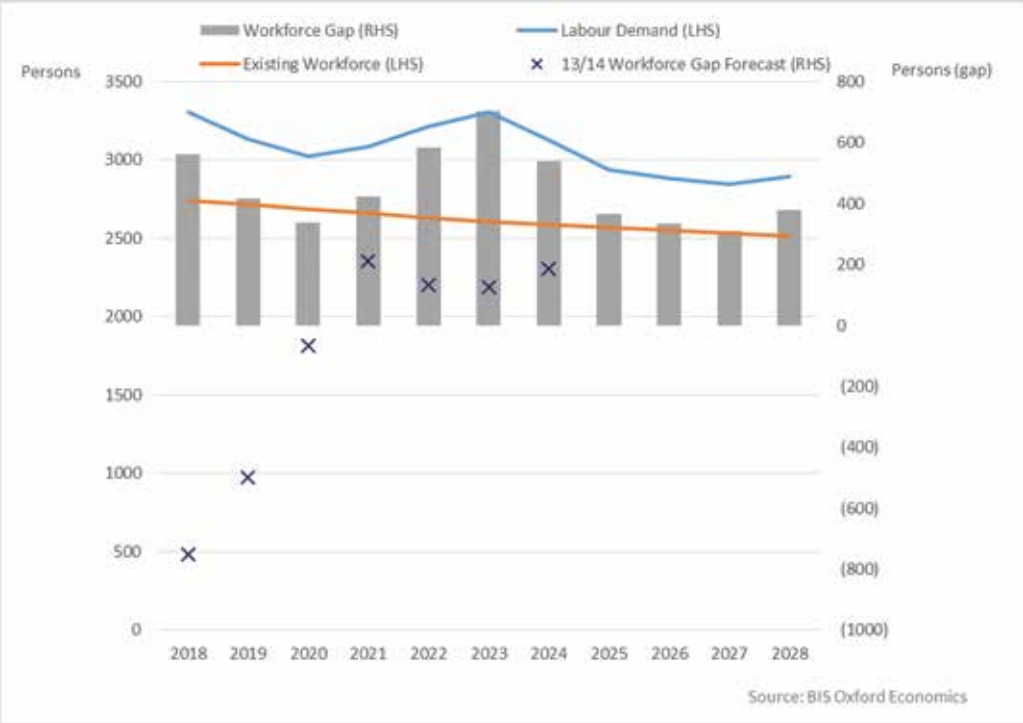


Chart 6.18: Forecast of Workforce Gap for Total Skilled Workforce – QLD (1.5% Productivity Growth)



Similar to New South Wales and Victoria, we project Queensland's current stock of surveyors and spatial scientists to be insufficient to meet construction activity over the next 10 years to FY2028. This shortage is particularly serious during FY2022-24. We also forecast a relatively small shortage of technicians within the same period. However, given the strong supply of new VET graduates, we expect this shortage to be met by incoming new technicians.

Table 6.2: Workforce Gap Outcome – QLD

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
			Shortage					*Shortage*		
Surveyors & spatial scientists	323	251	319	456	549	417	264	243	232	279
			Shortage					*Shortage*		
Surveying & spatial science technicians	4	2	7	14	22	13	8	4	1	7

Source: BIS Oxford Economics

Table 6.3: Labour Demand Forecast and Workforce Gap – Queensland (Baseline Scenario based on 1.5% labour productivity growth)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
	Estimates	Forecasts									
Labour Demand											
All Surveyors	**1700**	**1601**	**1519**	**1566**	**1678**	**1743**	**1618**	**1467**	**1445**	**1432**	**1459**
Cadastral	743	676	624	667	773	780	724	642	615	613	623
Building	307	303	328	324	322	327	309	296	298	311	324
Engineering	270	259	248	250	247	277	258	214	223	202	208
Mining	240	229	188	192	202	224	196	187	183	183	179
Other sectors	140	134	131	132	134	136	132	128	126	123	125
Registered/Licensed Surveyors (a)	*607*	*572*	*542*	*559*	*599*	*622*	*578*	*524*	*516*	*511*	*521*
Spatial Scientists	538	513	505	509	516	524	506	492	482	473	481
Total Technicians	299	285	281	283	287	291	281	274	268	263	267
Total Surveying & Geospatial Workforce	**2538**	**2400**	**2305**	**2357**	**2480**	**2559**	**2405**	**2233**	**2196**	**2168**	**2207**
Other Professionals	768	732	720	725	736	748	721	702	688	675	686
Total skilled labour demand	**3305**	**3133**	**3025**	**3082**	**3216**	**3307**	**3126**	**2935**	**2884**	**2843**	**2893**
Existing Workforce (b)											
All Surveyors	**1400**	**1386**	**1372**	**1358**	**1344**	**1330**	**1321**	**1312**	**1303**	**1294**	**1285**
Cadastral	627	620	614	608	601	595	591	587	583	579	575
Building	242	240	237	235	233	230	229	227	226	224	222
Engineering	209	207	205	203	201	199	197	196	195	193	192
Mining	200	198	196	194	192	190	189	187	186	185	183
Other sectors	122	121	120	119	117	116	115	115	114	113	112
Registered/Licensed Surveyors	*500*	*495*	*490*	*485*	*480*	*475*	*472*	*468*	*465*	*462*	*459*
Spatial Scientists	409	405	401	397	393	389	386	384	381	378	376
Total Technicians	285	282	279	276	273	270	268	266	264	262	260
Total Surveying & Geospatial Workforce	**2094**	**2073**	**2052**	**2031**	**2010**	**1988**	**1975**	**1961**	**1948**	**1934**	**1921**
Other Professionals	649	643	636	629	622	616	611	607	603	599	594
Total skilled labour	**2744**	**2716**	**2688**	**2660**	**2632**	**2604**	**2586**	**2569**	**2551**	**2533**	**2515**
Workforce Gap (c)											
All Surveyors	**300**	**215**	**147**	**207**	**333**	**413**	**297**	**155**	**142**	**137**	**174**
Cadastral	116	56	10	59	171	184	133	55	32	34	48
Building	65	64	91	89	90	97	80	68	73	87	102
Engineering	61	52	43	47	46	78	60	18	29	9	16
Mining	40	31	(8)	(2)	10	34	7	(0)	(3)	(2)	(4)
Other sectors	18	12	11	14	17	20	16	13	12	10	13
Registered/Licensed Surveyors	*107*	*77*	*53*	*74*	*119*	*148*	*106*	*55*	*51*	*49*	*62*
Spatial Scientists	129	108	104	112	123	135	119	109	102	95	105
Total Technicians	15	4	2	7	14	22	13	8	4	1	7
Total Surveying & Geospatial Workforce	**443**	**327**	**253**	**326**	**470**	**571**	**430**	**272**	**248**	**234**	**286**
Other Professionals	118	90	84	96	113	132	109	95	85	76	91
Total skilled labour	562	417	337	423	584	703	539	366	333	310	378

(a) Registered surveyors are included in the total number of surveyors.

Source: BISOE, ABS, CRSBANZ

(b) Existing workforce is generated by diminishing the size of the current skilled workforce due to retirement.

(c) Workforce gap is calculated as labour demand less existing workforce. Positive number implies shortage of labour; bracketed number implies excess of supply.

Chapter Seven

Forecasts of Labour Demand and Workforce Gap for South Australia

7. FORECASTS OF LABOUR DEMAND AND WORKFORCE GAP FOR SOUTH AUSTRALIA

7.1 Economic and industry outlook

7.1.1 General economic environment

The South Australian economy has finally gained traction over the past 2 years to FY2018, thanks to surging investment. This follows six years of anaemic growth, when State Final Demand (SFD) increased by an average 1.1% p.a. and Gross State Product (GSP) only 0.9% p.a. This was largely due to the lack of growth drivers, coupled with relatively small population growth and many South Australians moving interstate in search of job opportunities.

However, there are signs of improvement, as evidenced by the increased growth in SFD and GSP in FY2018 (6.2% and 2.0% respectively). The pick-up in overall investment has been the key to the improvement in the state's economy. Total investment increased by 7.7% in FY2018 (compare to 4.9% FY2017), led initially by dwelling and public investment, and then joined by surging business investment over the year. This has underpinned the recovery in employment, with the state's unemployment rate down from 7.3% in FY2016 to 5.3% in November 2018.

A further increase in overall investment is predicted for FY2019, with moderate rises in forecast for dwelling, business investment and public investment. New public investment has increased a cumulative of 31% over the past 3 years, and after another small rise in FY2019. However, it is then expected to enter a steep two-year decline, as several major projects are completed. The $415m Osborne Shipyard upgrade (the building component of the $535m facility for the build of the Future Frigates, which commenced in the March quarter 2018) and the $180m Queen Elizabeth Hospital expansion (commencing in 2019) will be the biggest public projects. Additionally, another round of road, rail and utilities infrastructure projects are projected to drive solid increases in public investment from FY2022 to FY2025.

In the early years of the next decade, a solid pick-up in residential, non-mining business and public investment will see a rise in employment growth and tightening in the state's labour market. Indeed, the state's unemployment rate is forecast to fall from around 5.3% in November 2018 to under 5% in FY2023, near the projected national average of 4.8% at that time. The tightening in the state's labour market will, in turn push up wages in the state.

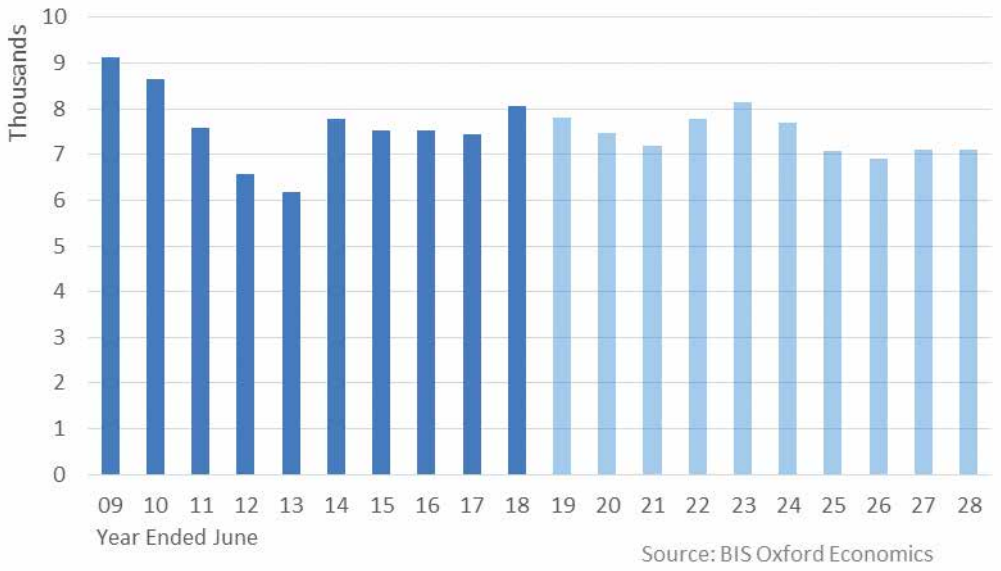
The state government finances are constrained by ongoing deficits and debt, and a scarcity of public assets to provide revenue (or to sell) after most of the states' electricity and ports assets were privatised over the past two decades. State government revenue growth will also be limited, with stamp duty revenue set to fall and payroll tax growth expected to weaken from next year in line with slower employment growth. This is likely to lead to slower growth in government spending.

Overall, SFD growth is forecast to average 2.4% growth over the five years to FY2025 (compared to an average of 2.2% for the past 5 years), while GSP is forecast to average 2.4% over the five years to FY2025 (compared to an average of 1.5% for the past 5 years and 2.3% for the past three decades).

7.1.2 Cadastral sector - Private house commencements

Due to the slow-moving nature of South Australia's market, total private house commencements have managed to hold relatively flat above 7,400 houses since 2014. In FY2018, house commencements are estimated at 8,060 houses, 8.3% higher than the previous year. This is projected to fall back at a gradual rate (around 3.6% p.a.) to 7,200 houses in the next three years to FY2021, before experiencing a small upswing in FY2022 and FY2023 back to current levels. Consequently, the five-year average of house commencements during FY2019-23 is projected to be 0.14% higher than the previous five-year average, slightly lower than the previous five-year period average growth of 0.63%. House commencements is forecast to soften further in FY2024-28, with an average of 7,180 new commencements p.a. which is 6.6% lower than the previous five-year average.

Chart 7.1: Number of Private House Dwellings Commenced – SA



7.1.3 Building sector - Multi-residential dwellings and non-dwelling buildings

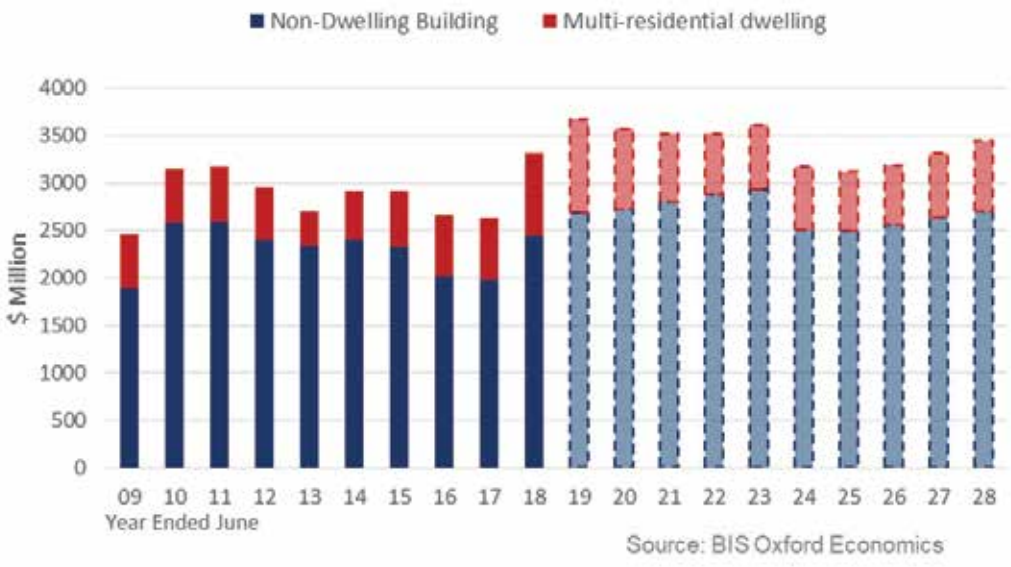
Multi-residential dwellings

The value of work done in multi-residential dwellings is estimated to have expanded 34% to $879 million in FY2018, a record high level. Strong attached dwelling volumes in the past, especially in medium density are supporting this result. Nevertheless, building activity for multi-residential dwellings is expected to decline as demand weakens and dwelling oversupply reaches a height (of almost 4,000 dwellings) in FY2019. The value of work done in multi-residential building is forecast to fall over the next four years to $647 million in FY2022 (-6.8% p.a. on average) before experiencing a small recoup in FY2023 as South Australia is expected to move back into a small dwelling undersupply. We project activity to soften further in the FY2024-28 period at an average of $671 million p.a. (10.4% lower than the previous five-year average).

Non-dwelling buildings

Non-residential building in South Australia has seen solid trend growth over recent years, lifting activity to a high level historically. With a sizable pipeline of major projects, activity grew by 23% in FY2018 to $2.4 billion. A moderately weaker but still healthy result is projected for FY2019, with the $180 million Queen Elizabeth Hospital –New Clinical Building the largest project scheduled. A further gradual weakening is projected for FY2020, before major projects like the $400 million New Women's and Children's Hospital and a $150 million museum project at the Old Royal Adelaide Hospital Site provide a boost into FY2021. As a result, annual value of work done for non-dwelling buildings is forecast to average to rise to $2.7 billion in the five years to FY2023. This is to be followed by an average of $2.6 billion over the FY2024-28 period.

Chart 7.2: Multi-residential dwelling and non-dwelling building – SA
Value of Work Done, 2015/16 Prices

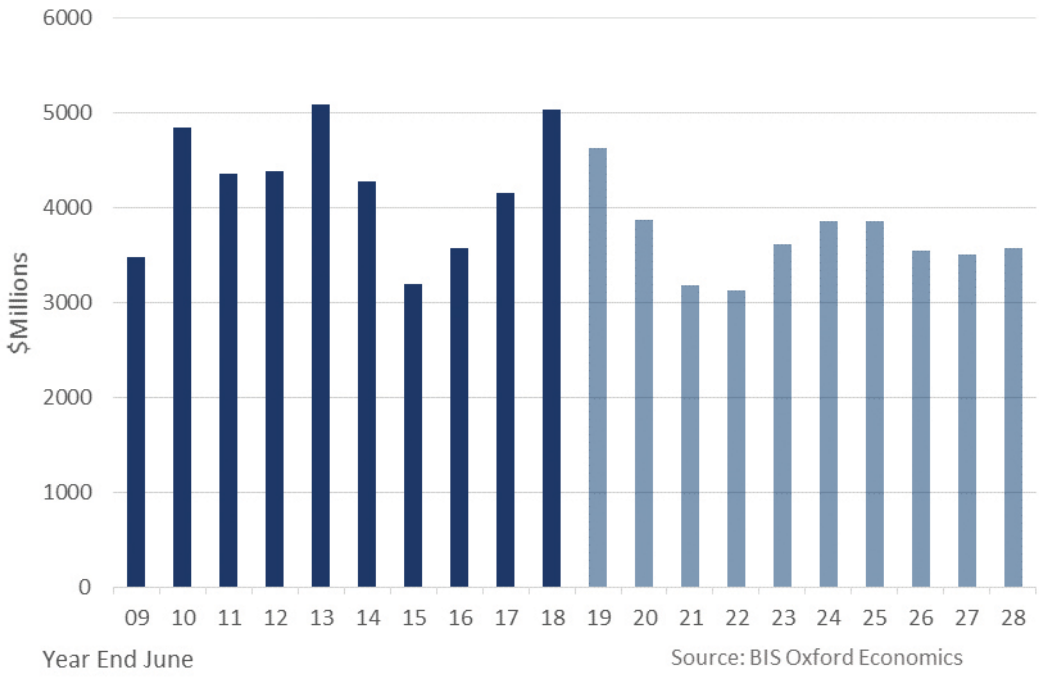


7.1.4 Engineering sector - Utilities and transport engineering construction

The value of utilities and transport engineering construction work done in South Australia experienced rapid growth in the five years to FY2013, peaking at $5.9bn in that year. However, from FY2014 engineering construction activity started to decline as the resource investment bust took its toll on private and public (notably rail) investment. In FY2016-18, utilities and transport engineering construction activity lifted in several categories that had experienced weakness in the two years prior, particularly roads (North South corridor works), railways (Adelaide to Tarcoola upgrade), harbours, water, electricity and telecoms (primarily, the NBN).

Roads, rail, electricity and telecoms work are set to experience falling activity through the next four years before regaining strength towards FY2023. In the interim, cycling work done in roads (further stages along the North South Corridor), recreation, electricity, water and sewerage will provide a floor to engineering activity. Work done is forecast to average $3.5 billion in the five years to FY2023 and followed by an average $3.2 billion in the following five years to FY2028.

Chart 7.3: Utilities and Transport Engineering Construction – SA
Value of Work Done, 2015/16 Prices



7.1.5 Mining and heavy industry sector

In South Australia, mining and heavy industry construction is led by other minerals projects, particularly copper and gold (dominated by the massive Olympic Dam mine, which also produces large quantities of uranium) and a small volume of iron ore in the Middleback Ranges to support steel production at Whyalla. The state also sees significant ongoing onshore gas development through the rich Cooper Basin.

In FY2018, M&HI activity in South Australia rose 33% to over $1.2 billion, not far off its resource boom peak of $1.4 billion in FY2014. Leading the increase is Oz Mineral's $825m Carrapeetena copper project (due for completion in 2019/20) as well as sustaining capital works at BHP Billiton's Olympic Dam mine. M&HI activity in South Australia is expected to move lower over the next few years as existing projects are completed, although will be sustained at reasonably high levels due to new projects getting underway including Rex Mineral's $480m Hillside Copper project and rising levels of onshore oil and gas works to feed growing east coast demand. Activity is expected to jump to a higher plane during the 2020s as a major expansion of the Olympic Dam site gets underway.

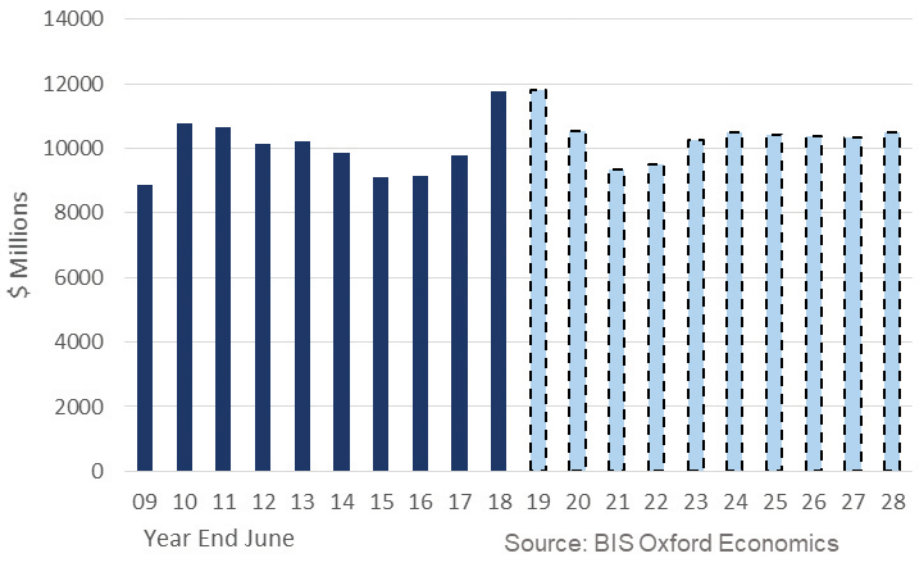
Overall, M&HI activity in South Australia is projected to trend upward to $1.8 billion in FY2026, followed by a decline to $1.2 billion by FY2028.

Chart 7.4: Mining & Heavy Industry Construction and Mining Exploration Investment – SA Constant 2015/16 Prices

7.1.6 Total construction

Overall, construction activity in South Australia is forecast to rise by 0.4% in FY2019 as growth in multi-residential and non-residential building outweighs the decline in engineering construction. However, the continual decline in engineering construction will see total construction decline in FY2020 and FY2021 by 10.8% and 11.3% respectively. This is then followed by a three-year recovery as activity across all sectors improves. We project total construction activity to average $10.4 billion in the second half of the forecast horizon (FY2024-28), compared to the average of $10.3 billion in the first half.

Chart 7.5: Total Construction by Category – SA
Value of Work Done, 2015/16 Prices



7.2 Estimate of the existing surveying and geospatial workforce

Size and breakdown of state workforce

In FY2018, the size of the surveying and geospatial workforce in South Australia is estimated to be 702 persons (-11% from FY2014). The number of surveyors decreased from FY2014 to 397 persons in FY2018 (-17%). Technicians suffered the greatest decline, dropping by more than half during the period to 41 persons. Spatial scientists, on the other hand, is estimated to have grown by 24% to 264 persons. Similar to other states, we estimate the cadastral sector to take up most of surveying work (48%), followed by engineering (19%), building (13%), mining (11%) and other sectors (9%).

Table 7.1: Estimated Size of Total Skilled Workforce in South Australia

Occupation Groups	2013/14	2017/18		
Surveying sectors				
Cadastral	210	189	▼	(21)
Building	78	52	▼	(26)
Engineering	100	75	▼	(25)
Mining	72	44	▼	(28)
Other sectors	17	37	▲	20
Total surveyors	**477**	**397**	▼	**(80)**
Registered Surveyors	*152*	*135*	▼	(17)
Total spatial scientists	**213**	**264**	▲	**51**
Surveying technicians	58	26	▼	(32)
Spatial technicians	38	15	▼	(23)
Total technicians	**96**	**41**	▼	**(55)**
Total skilled surveying & geospatial workforce	**786**	**702**	▼	**(84)**
Planners	17	100	▲	83
Engineers	5	35	▲	30
Environmental Scientists	19	27	▲	8
Other staff (include Architects)	23	30	▲	7
Total other professionals	**64**	**192**	▲	128
Total Skilled Workforce	850	894	▲	**44**

Source: BIS Oxford Economics, ABS, CRSBANZ

Chart 7.6: Comparing Surveying Sectoral Activity between FY18 (left) and FY14 (right)

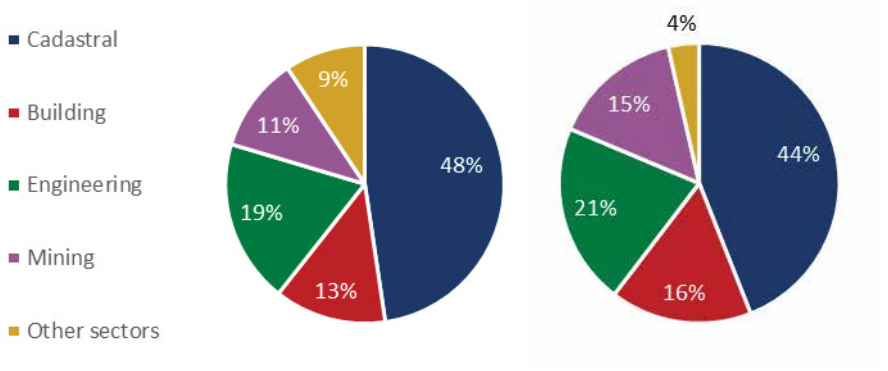
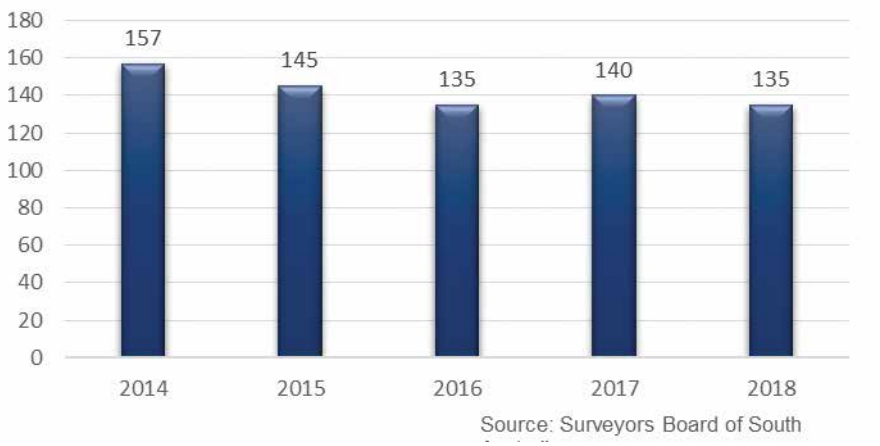


Chart 7.7: Number of Registered Surveyors - SA



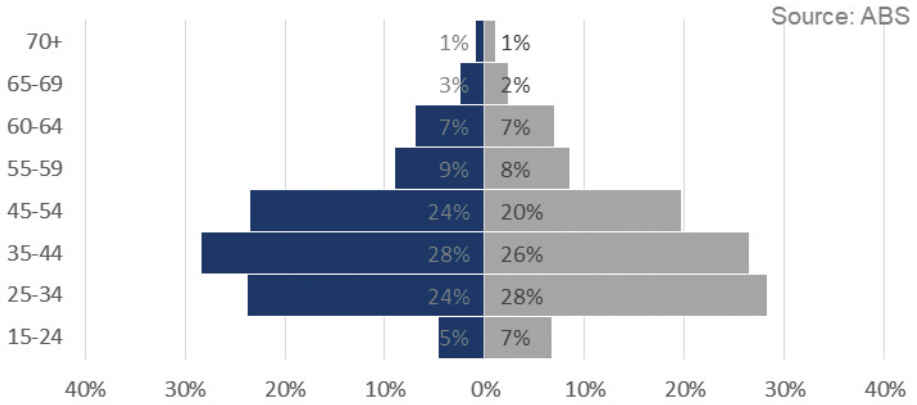
Source: Surveyors Board of South Australia

Age profile and income of state workforce

Chart 7.8 shows the age profile of the surveying workforce in South Australia in comparison to national figures. 43.1% of the workforce in South Australia is aged over 45 years old, compared to the national figure of 38.6%.

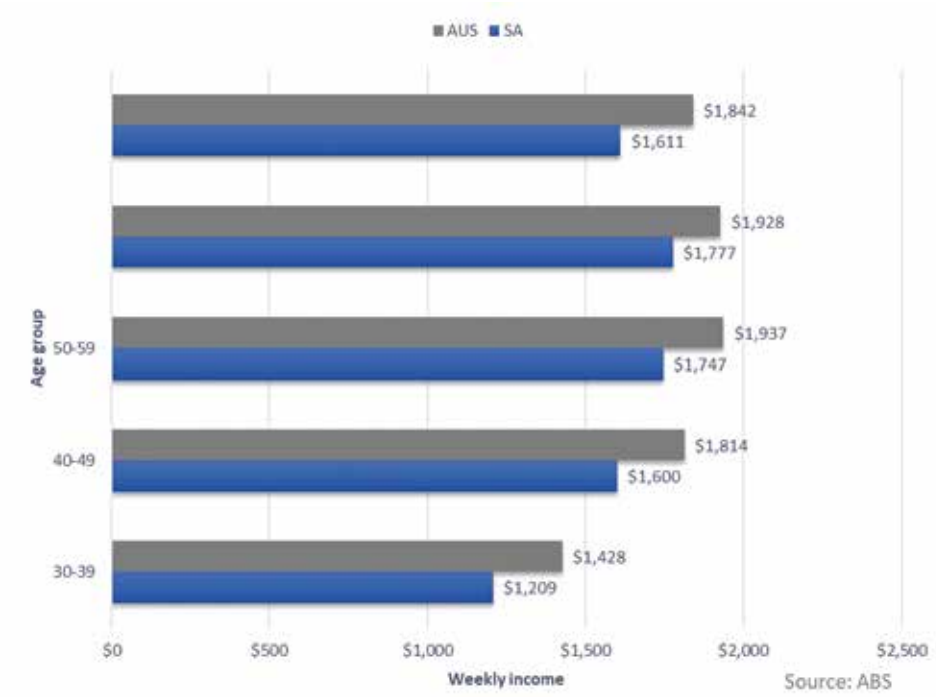
Chart 7.9 shows the comparison of average earnings of full-time surveyor or spatial scientist per week by age group between South Australia and Australia. The average weekly income for a surveyor or spatial scientist in South Australia is estimated at $1623 compared to national average of $1,795.

Chart 7.8: Age Distribution of Workforce – SA



	15-24	25-34	35-44	45-54	55-59	60-64	65-69	70+
■ SA	5%	24%	28%	24%	9%	7%	3%	1%
■ AUS	7%	28%	26%	20%	8%	7%	2%	1%

Chart 7.9: Full-time Weekly Earnings by Age – SA vs AUS



7.3 Forecasts of skilled labour demand

The projected downturn in utilities and transport engineering, as well as private house commencements, will lead to a decrease in total labour demand in South Australia from 1,109 persons in FY2018 to 855 persons in FY2021. Labour demand is then projected to rise in accordance with the projected growth in construction activity during FY2022-23. Subsequently, as residential building, non-residential building and utilities and transport engineering construction settle at lower average levels in FY2024-28, total labour demand in South Australia will gradually decrease to 835 persons by FY2028.

Chart 7.10: Forecast of Total Demand for Skilled Labour – SA (1.5% productivity growth)

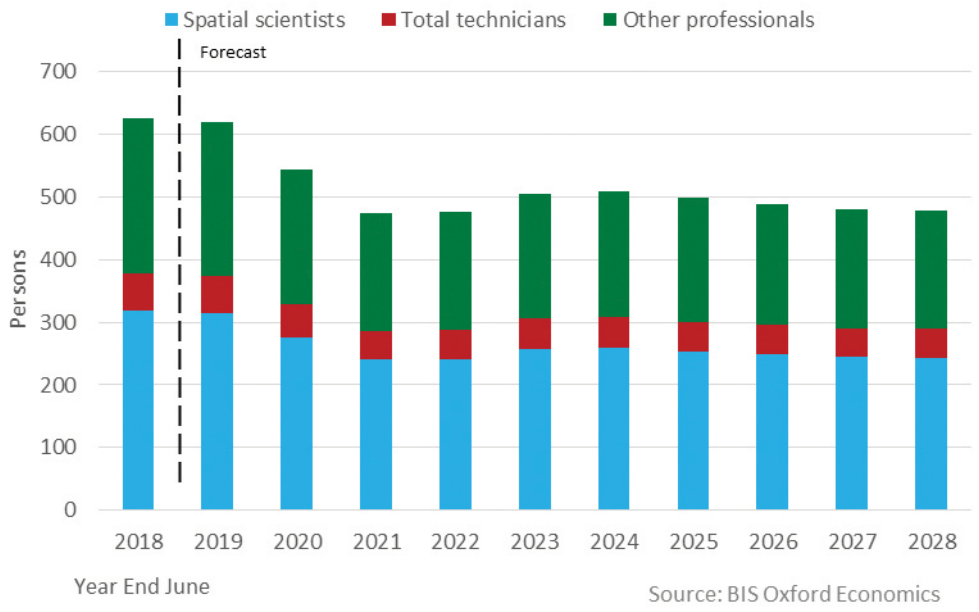


Chart 7.11: Forecast of Demand for Surveyors by Sector – SA (1.5% productivity growth)

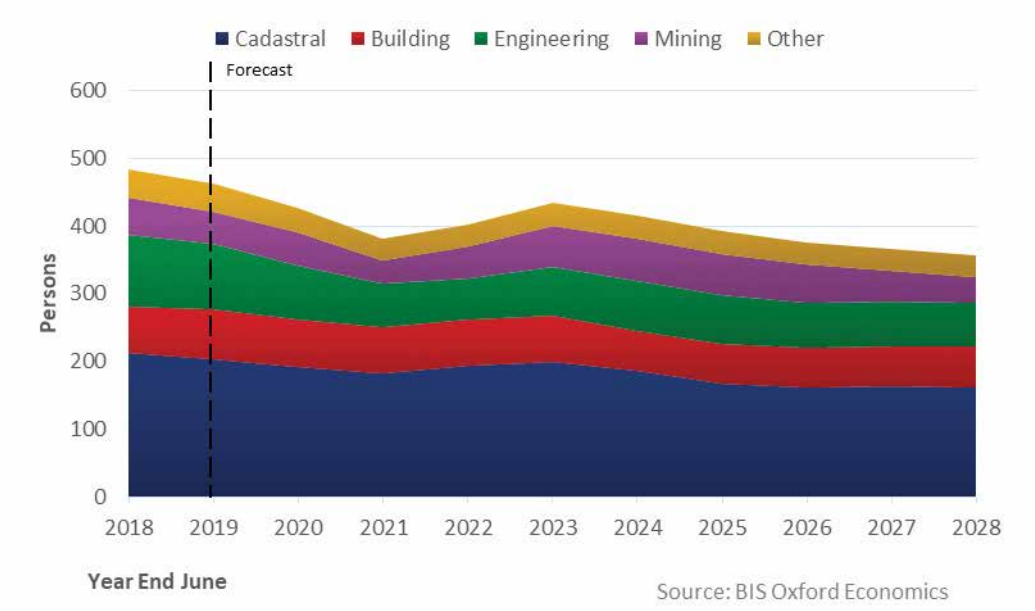
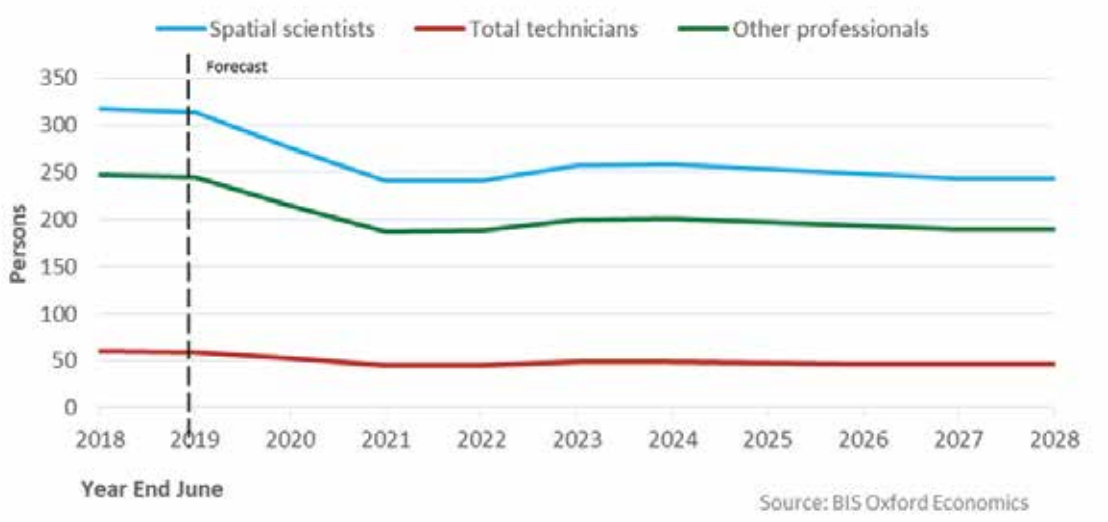


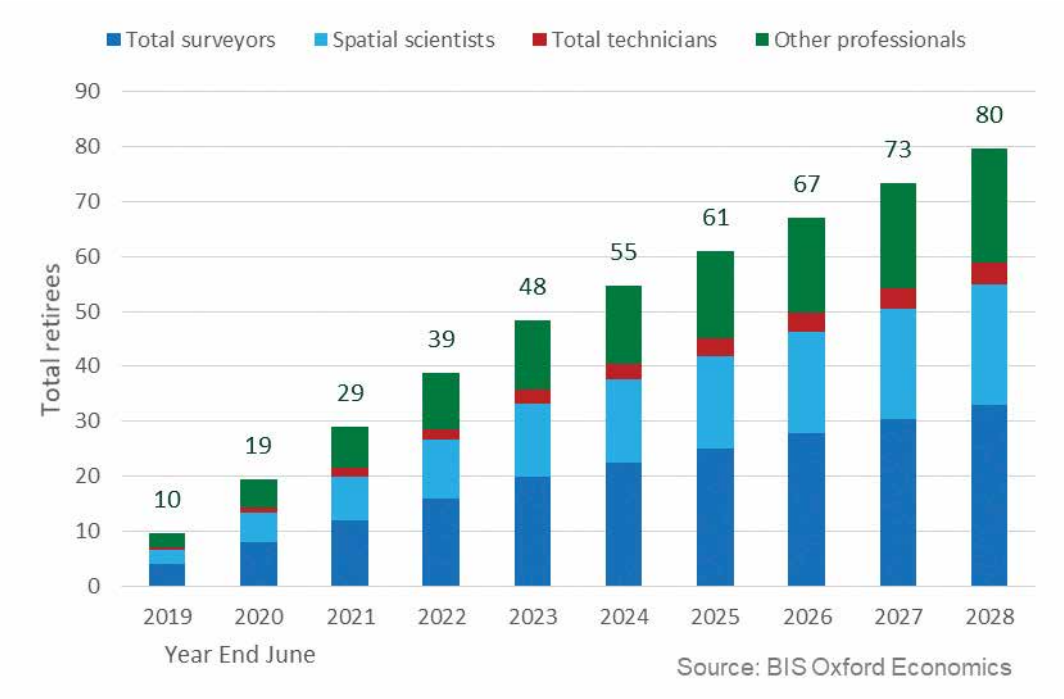
Chart 7.12: Forecast of Demand for Spatial Scientists, Technicians and Other Professionals – SA (1.5% productivity growth)



7.4 Forecast of workforce attrition

We estimate that 8.9% (80 people) of the existing workforce in South Australia will retire in the next 10 years, given the current age profile of the workforce. This includes 33 surveyors, 22 spatial scientists, 4 technicians and 21 other professionals.

Chart 7.13: Forecast of Cumulative Workforce Attrition – SA



7.5 Forecast workforce gap

In FY2018, the size of the total workforce gap in South Australia is estimated at 216 personnel, with surveyors accounting for 40% of the shortage, followed by spatial scientists (25%), other professionals (26%) and technicians (8.7%). Labour demand over the next 10 years is not expected to exceed current level in FY2018. The existing workforce will meet demand toward FY2021 as construction activity declines, after which labour demand will rebound and widen the workforce gap in the following two years to FY2023. Demand is set to decrease steadily after FY2023 which will eventually reduce the workforce gap to the size of 21 persons.

Chart 7.14: Forecast of Workforce Gap for Registered Surveyors – SA (1.5% Productivity Growth)

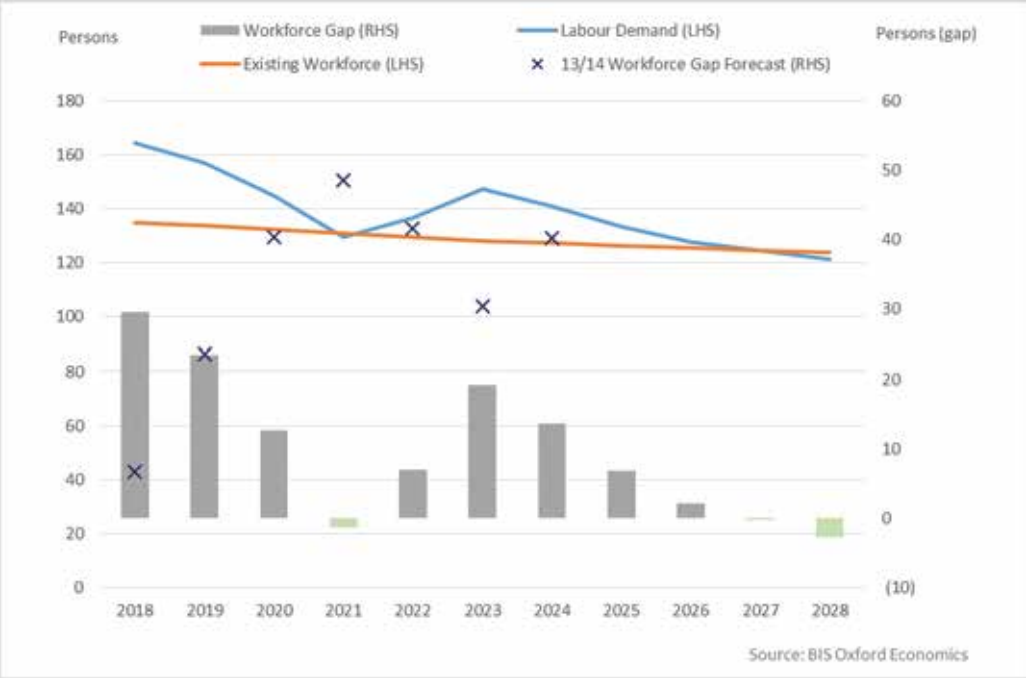


Chart 7.15: Forecast of Workforce Gap for Total Surveyors – SA (1.5% Productivity Growth)

Chart 7.16: Forecast of Workforce Gap for Spatial Scientists – SA (1.5% Productivity Growth)

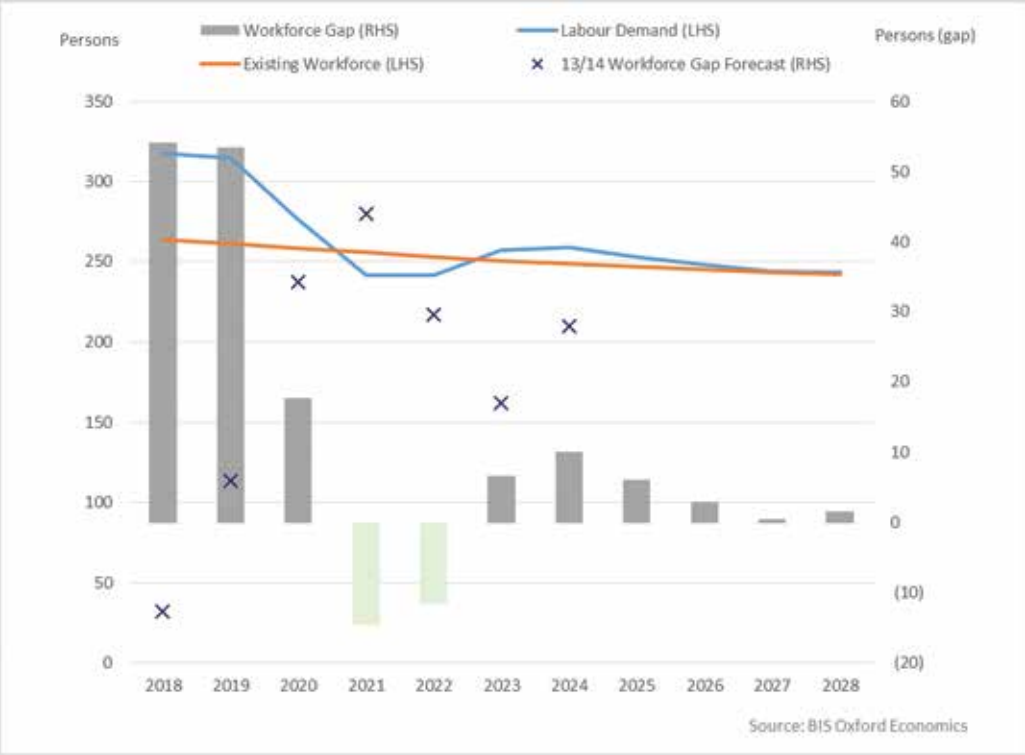


Chart 7.17: Forecast of Workforce Gap for Total Technicians – SA (1.5% Productivity Growth)

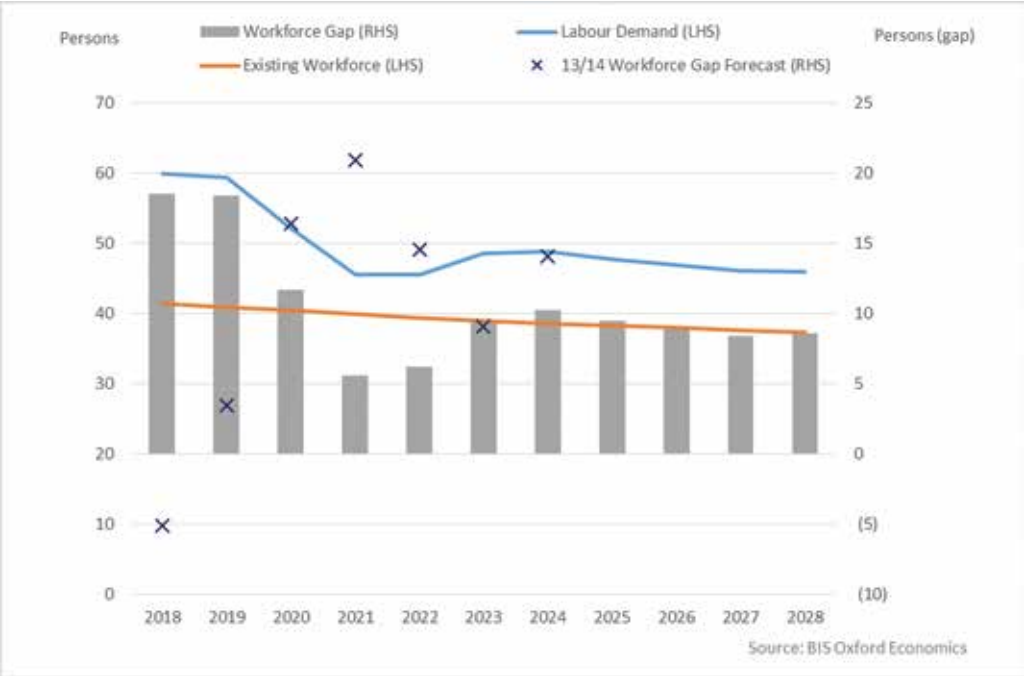
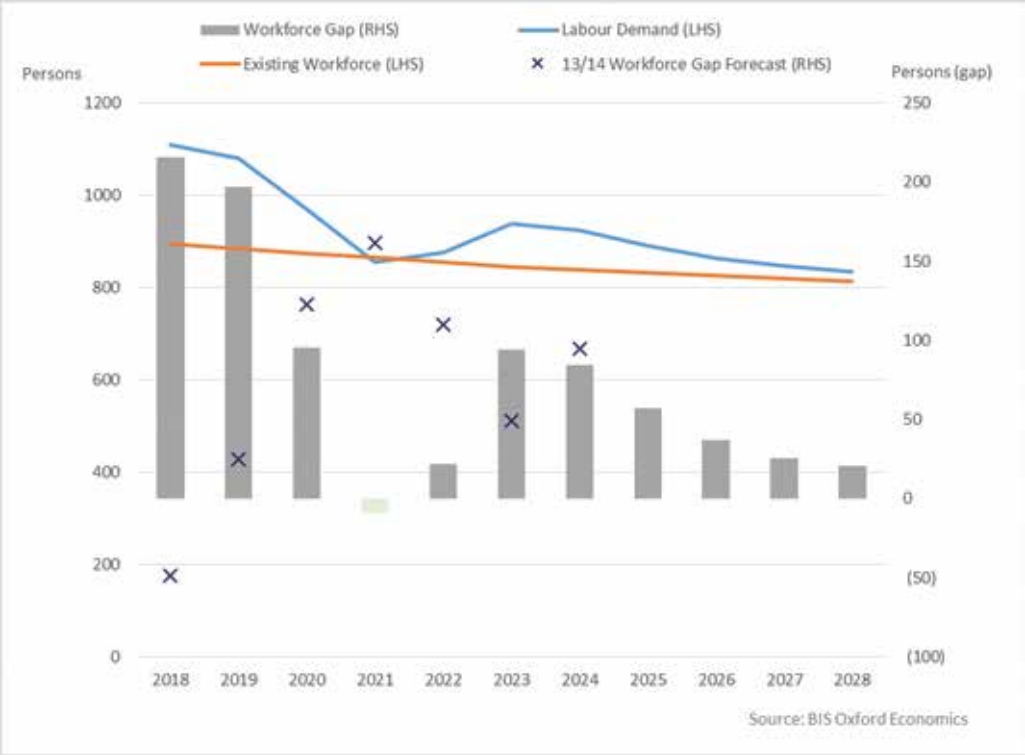


Chart 7.18: Forecast of Workforce Gap for Total Skilled Workforce – SA (1.5% Productivity Growth)



Overall, we project South Australia's current stock of surveyors and spatial scientists to be insufficient to meet construction activity throughout most of the forecast period to FY2028. This shortage is particularly acute within the next two years to FY2020 as well as the FY2023-24 period. We also forecast a relatively small shortage of technicians within the same period. However, given the strong supply of new VET graduates, we expect this shortage to be met by incoming new technicians.

Table 7.2: Workforce Gap Outcome – SA

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
			Shortage					*Shortage*		
Surveyors & spatial scientists	122	55	(19)	9	63	50	26	9	(0)	(6)
			Shortage					*Shortage*		
Surveying & spatial science technicians	18	12	6	6	10	10	9	9	8	9

Source: BIS Oxford Economics

Table 7.3: Labour Demand Forecast and Workforce Gap – South Australia (Baseline Scenario based on 1.5% labour productivity growth)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
	Estimates	Forecasts									
Labour Demand											
All Surveyors	**484**	**462**	**426**	**381**	**402**	**434**	**415**	**392**	**375**	**366**	**356**
Cadastral	212	203	191	181	193	199	185	167	161	163	161
Building	68	75	71	69	68	69	60	58	58	60	61
Engineering	106	96	79	64	62	71	74	73	66	65	65
Mining	56	47	48	35	47	61	61	60	57	47	37
Other sectors	42	41	36	32	32	34	34	33	33	32	32
Registered/Licensed Surveyors (a)	*165*	*157*	*145*	*130*	*137*	*147*	*141*	*133*	*128*	*124*	*121*
Spatial Scientists	318	315	276	241	242	257	259	253	248	244	243
Total Technicians	60	59	52	45	46	48	49	48	47	46	46
Total Surveying & Geospatial Workforce	**862**	**836**	**755**	**668**	**689**	**739**	**722**	**693**	**671**	**656**	**646**
Other Professionals	247	245	215	188	188	200	201	197	193	190	189
Total skilled labour demand	**1109**	**1081**	**970**	**855**	**877**	**939**	**924**	**890**	**864**	**846**	**835**
Existing Workforce (b)											
All Surveyors	**397**	**393**	**389**	**385**	**381**	**377**	**374**	**372**	**369**	**367**	**364**
Cadastral	189	187	185	184	182	180	178	177	176	175	174
Building	52	51	51	50	49	49	49	48	48	48	47
Engineering	75	75	74	73	72	72	71	71	70	70	69
Mining	44	43	43	42	42	42	41	41	41	40	40
Other sectors	37	37	36	36	36	35	35	35	35	34	34
Registered/Licensed Surveyors	*135*	*134*	*132*	*131*	*130*	*128*	*127*	*126*	*126*	*125*	*124*
Spatial Scientists	264	261	258	256	253	250	249	247	245	244	242
Total Technicians	41	41	40	40	39	39	39	38	38	38	37
Total Surveying & Geospatial Workforce	**702**	**695**	**688**	**681**	**674**	**666**	**662**	**657**	**653**	**648**	**643**
Other Professionals	191	189	186	184	181	179	177	176	174	172	171
Total skilled labour	**894**	**884**	**874**	**865**	**855**	**845**	**839**	**833**	**827**	**820**	**814**
Workforce Gap (c)											
All Surveyors	**87**	**69**	**37**	**(4)**	**21**	**56**	**40**	**20**	**6**	**(1)**	**(8)**
Cadastral	23	15	6	(2)	11	19	6	(10)	(15)	(12)	(12)
Building	17	24	21	19	19	20	11	10	10	12	14
Engineering	31	22	6	(9)	(10)	(1)	3	3	(4)	(5)	(4)
Mining	12	4	5	(8)	5	20	20	19	16	6	(3)
Other sectors	5	4	(0)	(4)	(4)	(2)	(1)	(2)	(2)	(2)	(2)
Registered/Licensed Surveyors	*30*	*23*	*13*	*(1)*	*7*	*19*	*14*	*7*	*2*	*(0)*	*(3)*
Spatial Scientists	54	53	18	(15)	(12)	7	10	6	3	0	2
Total Technicians	19	18	12	6	6	10	10	9	9	8	9
Total Surveying & Geospatial Workforce	**160**	**141**	**67**	**(13)**	**15**	**73**	**60**	**36**	**18**	**8**	**2**
Other Professionals	56	56	29	4	7	21	24	21	19	17	19
Total skilled labour	215	197	95	(9)	22	94	85	57	37	26	21

(a) Registered surveyors are included in the total number of surveyors.

Source: BISOE, ABS, CRSBANZ

(b) Existing workforce is generated by diminishing the size of the current skilled workforce due to retirement.

(c) Workforce gap is calculated as labour demand less existing workforce. Positive number implies shortage of labour; bracketed number implies excess of supply.

Chapter Eight

Forecasts of Labour Demand and Workforce Gap for Western Australia

8. FORECASTS OF LABOUR DEMAND AND WORKFORCE GAP FOR WESTERN AUSTRALIA

8.1 Economic and industry outlook

8.1.1 General economic environment

The Western Australian economy has borne most of the national decline in mining investment, which followed an unprecedented investment boom in iron ore and later LNG. The investment downturn spilled over to a range of support sectors such as business and rental services. Western Australia's Gross State Product (GSP) contracted by 2.4% in FY 2017 and domestic demand (SFD) contracted by 9.7% and 15.1% in FY2016 and FY2017 respectively.

However, Western Australia is past the worst. While there are still some constraints to growth – weaker consumer spending and retail turnover, and an oversupply of dwellings and commercial space established during the boom years – economic growth has finally returned. In FY2018, Western Australia recorded a 1.7% growth in its GSP and a 1.1% growth in its domestic demand. The pace of the mining investment decline has now slowed dramatically. Excluding oil and gas, resources investment and spending is starting to rise again led by large sustaining capital projects in iron ore and new investments in a range of metals and minerals including gold, mineral sands, rare earths and lithium. The ramp up in LNG production is supporting growth in total economic output, which is measured to have bounced back to 1.8% growth in FY2018 and forecasted to accelerate and exceed 3% in both FY2019 and FY2020.

After declining through much of FY2016 and FY2017, employment is also recovering, with the state adding 28,000 jobs in FY2018. The unemployment rate averaged 6.0% in FY2018, 0.2% lower than the average of FY2017. Following 2% employment growth in FY2018, growth is expected to soften a little in FY2019, but reaccelerate in FY2020, boosted by accommodation and tourism, health care, and the arts and recreation sectors. Overall, Western Australia's GSP growth is projected average 4.4% p.a. during the FY2019-23 period, followed by a slower growth of 2.4% p.a.

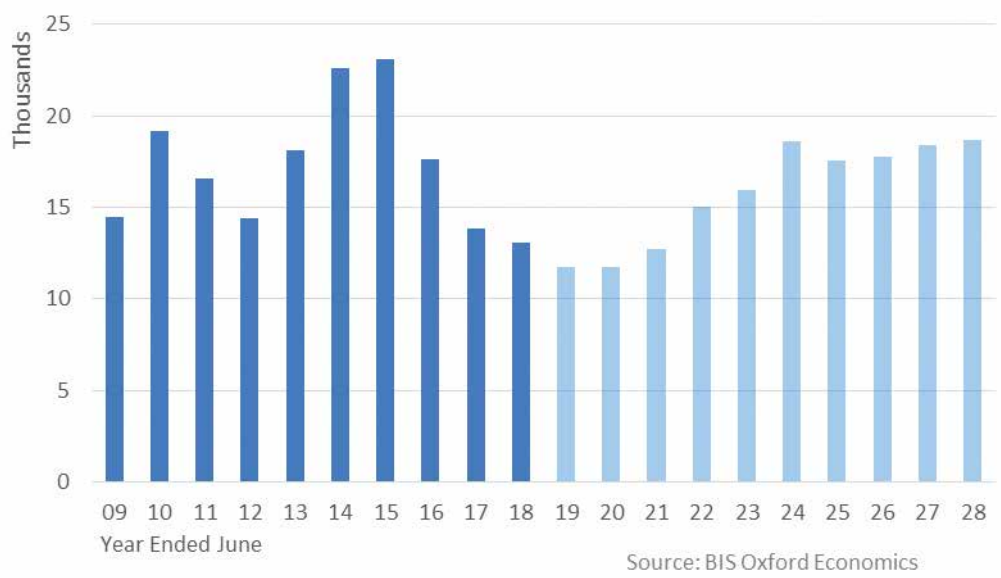
In FY2018, 77% of Western Australian GSP and 79% of Western Australian employment was concentrated in Perth. We expect that employment and GSP growth in Perth will continue to outpace growth in the rest of Western Australia, due to services supporting resources and agriculture, which is expected to concentrate in Perth.

In summary, the Western Australian economy is strengthening again, after a substantial collapse in demand, incomes and employment during the resources bust. However, growth is still relatively feeble and the Western Australian economy remains a long way short of the levels of demand it saw during the resources boom. The positive news is that investment is starting to turn, which will drive growth in employment and incomes. Mining investment is picking up following four successive years of decline, while public investment in transport and utilities is also on the increase. While a sustained recovery in housing investment and parts of non-residential building is still some way off, population and employment growth are starting to recover, which will start to absorb the oversupply of stock. This is the necessary first stage of recovery before a stronger investment cycle takes place in the 2020s.

8.1.2 Cadastral sector - Private house commencements

Softness in the Western Australian residential market is set to continue over the short term, with both owner-occupier and investor demand showing no clear signs of improvement. Glimmers of hope from improving population inflows and falling vacancy rates, especially in regional Western Australia are promising but it will be a while before the excess housing stock is soaked up and commencements begin to ramp up again from their low base. An estimated soft FY2018 result of 13,066 private house commencements looks to be followed by the bottoming out of the cycle in FY2019 at 11,710 new houses. Nevertheless, it is forecast that activity will steadily improve from FY2020 onwards. Population growth will increase from the present level, gradually creeping back above the national rate. As the stock deficiency diminished, underlying pressure will build once again and house price growth will return. Relative affordability will become a key asset for Western Australia in attracting demand to the state. This will be enough to underpin a slow prolonged upturn. This will see the annual average for the five years to FY2023 come in at 13,428 new houses, well below the average for the past five years of 18,037. Over the FY2024-28 period, we expect activity to recover to 18,204 new house commencements per annum (+35.6% from the previous five-year average). This sizable lift reflects the boom and bust nature of Western Australia.

Chart 8.1: Number of Private House Dwellings Commenced – WA



8.1.3 Building sector - Multi-residential dwellings and non-dwelling buildings

Multi-residential dwellings

Like private house commencements, softness in Western Australia's residential market has resulted in weaker building activity for multi-residential dwellings, with the value of work done decreasing by around 13% to $1.4 billion in FY2018. Activity is projected to decline to $1.2 billion in FY2019 (-14%), before experiencing a recovery from FY2020 onwards. Multi-residential building activity is forecast to slowly reach $1.3 billion by FY2023 (8% increase from FY2019). Over the FY2024-28 period, we expect activity to average around $1.5 billion p.a. (+26% from the previous five-year average).

Non-dwelling buildings

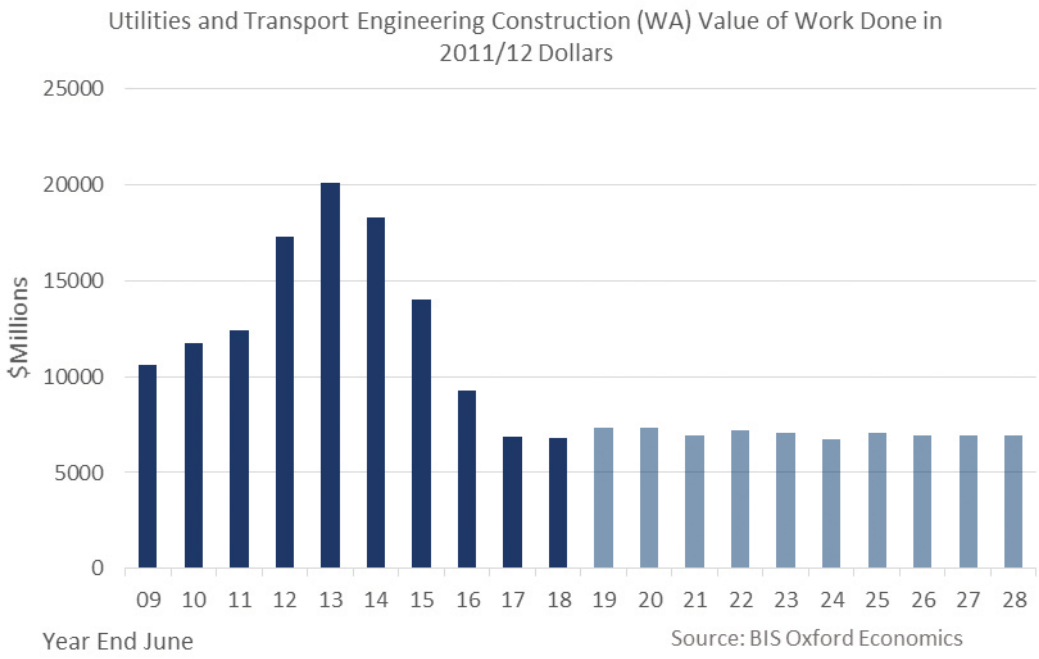
From this high base of $6.1 billion in FY2012, non-residential building has steadily trended down with the fading of the resource boom, falling to $4.6 billion in FY2017. Activity stabilised in FY2018 (+2%), with a few major shopping centre expansions underway such as the $350 million Karrinyup Shopping Centre. Retail and education investment are anticipated to hold at a high level for the coming years, pushing non-dwelling building activity from a trough of $4.0 billion in FY2019 to an average of $4.7 billion p.a. over the five-year period to FY2023. Annual value of work done for non-residential building is projected to slowly rise in the second half of the forecast horizon (FY2024-28) to $5.1 billion.

Chart 8.2: Multi-residential dwelling and non-dwelling building – WA
Value of Work Done, 2015/16 Prices

8.1.4 Engineering sector - Utilities and transport engineering construction

Utilities and transport engineering construction has been declining in Western Australia since FY2014. Activity measured $6.8 billion in FY2018, a third of what it was in FY2014. Nevertheless, Commonwealth Government funding for infrastructure projects will help provide a floor to engineering work. Major projects underpinning our publicly funded engineering construction forecasts over the short to medium term include the rollout of the NBN and a number of road projects including NorthLinkWA and the Forrestfield Airport Rail Link. Work done in utilities and transport construction is forecast to average $7.2 billion in FY2019-23 (-35% from previous five-year average), followed by an average $6.9 billion in FY2024-28 (-4%).

Chart 8.3: Utilities and Transport Engineering Construction – WA
Value of Work Done, 2015/16 Prices



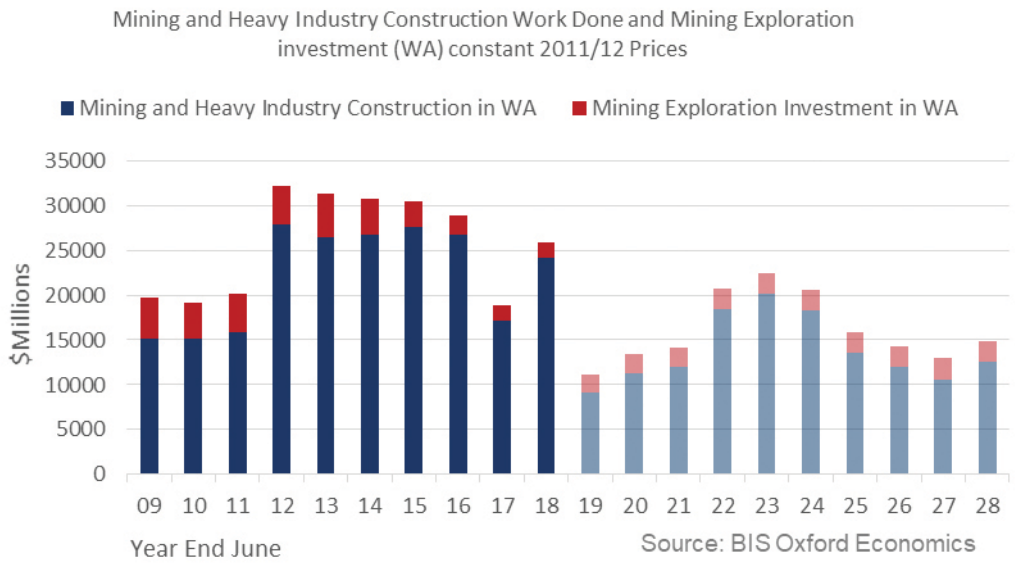
8.1.5 Mining and heavy industry sector

Western Australia is traditionally Australia largest state for mining and heavy industry work. Over the past decade, activity has averaged $25 billion per annum, driven by a super cycle in LNG and iron ore development. However, we note that construction activity in Western Australia has been heavily overstated by the way the ABS reports offshored LNG modules as construction activity. WA also sees a large volume of other minerals projects across copper, gold, mineral sands, silver-lead-zinc and, increasingly, lithium.

FY2018, M&HI activity in Western Australia surged to 47% to $25 billion, but much of this was driven by the classification of the Prelude offshore LNG platform (fabricated offshore, arrived in the September quarter of 2017) as construction activity. Even so, excluding oil and gas construction, M&HI activity in WA still rose in FY2018 on the back of rising other minerals (lithium, gold and iron ore), BAA (Bauxite Alumina and Aluminium) and OHI (Other Heavy Industries) work. Over the next few years, M&HI activity is expected to rise further as major iron ore sustaining capital projects (by the three majors – BHP Billiton, Rio Tinto and FMG) all get underway simultaneously. For FY2019, the M&HI appears to be a sharp reduction, but this is simply the 'correction' from the Prelude addition the previous year. Underlying work is on the rise. Further iron ore projects, as well as a strong round of base metals development, is expected to combine with LNG expansions and new gas field developments to produce another very strong phase of MHIC activity in the second half of the next 10 years.

Overall, M&HI activity in Western Australia is forecast to rise steadily to $2.2 billion in FY2023, before contracting during the FY2024-28 period by around 13% p.a.

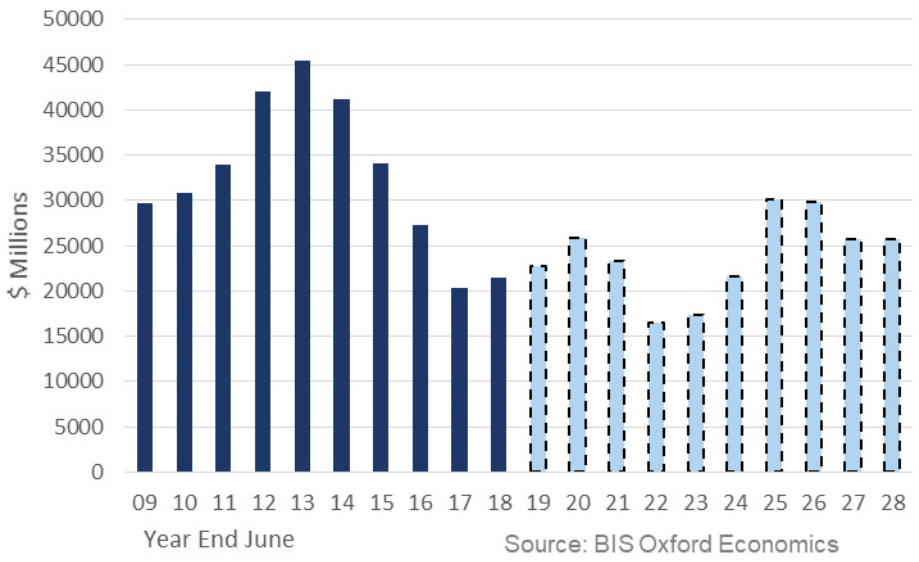
Chart 8.4: Mining & Heavy Industry Construction and Mining Exploration Investment – WA Constant 2015/16 Prices



8.1.6 Total construction

Overall, construction activity in Western Australia is projected to increase in the next 2 years to FY2020 by 20%, driven by strong growths in M&HI and utilities and transport engineering construction. However, this is set to reverse in FY2021 and FY2022, with total construction declining by 36% to $16.5 billion. We project that total construction will average $21.2 billion in FY2019-23 (-27% from previous five-year average) and $26.7 billion in FY 2024-28 (+26%).

Chart 8.5: Total Construction by Category – WA
Value of Work Done, 2015/16 Prices



8.2 Estimate of the existing surveying and geospatial workforce

Size and breakdown of state workforce

In FY2018, the size of the surveying and geospatial workforce in Western Australia is estimated to be 2,088 persons (-15% from FY2014). The number of surveyors decreased from FY2014 to 1,546 persons in FY2018 (-17%). The number of spatial scientists and technicians have both declined by 36% to 424 and 118 persons respectively. We estimate the cadastral sector to represent the largest proportion of surveying work, comprising 32% of surveying activity in Western Australia. This is followed by mining (19%), engineering (27%), building (14%) and other sectors (5%).

Table 8.1: Estimated Size of Total Skilled Workforce in Western Australia

Occupation Groups	2013/14	2017/18	
Surveying sectors			
Cadastral	439	499	▲ 60
Building	309	268	▼ (41)
Engineering	326	419	▲ 93
Mining	457	289	▼ (168)
Other sectors	88	71	▼ (17)
Total surveyors	**1,619**	**1,546**	▼ **(73)**
Registered Surveyors	*244*	*227*	▼ (17)
Total spatial scientists	**663**	**424**	▼ **(239)**
Surveying technicians	147	98	▼ (49)
Spatial technicians	37	20	▼ (17)
Total technicians	**184**	**118**	▼ **(66)**
Total skilled surveying & geospatial workforce	**2,466**	**2,088**	▼ **(378)**
Planners	55	181	▲ 126
Engineers	86	236	▲ 150
Environmental Scientists	23	161	▲ 138
Other staff (include Architects)	17	169	▲ 152
Total other professionals	**181**	**747**	▲ 566
Total Skilled Workforce	2,647	2,835	▲ **188**

Source: BIS Oxford Economics, ABS, CRSBANZ

Chart 8.6: Comparing Surveying Sectoral Activity between FY18 (left) and FY14 (right)

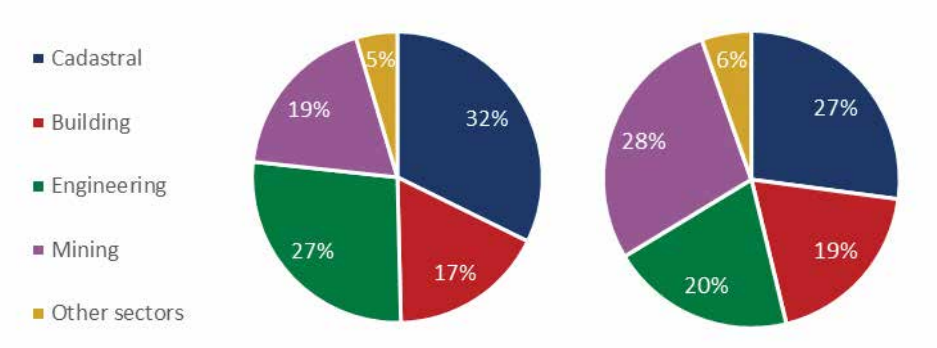
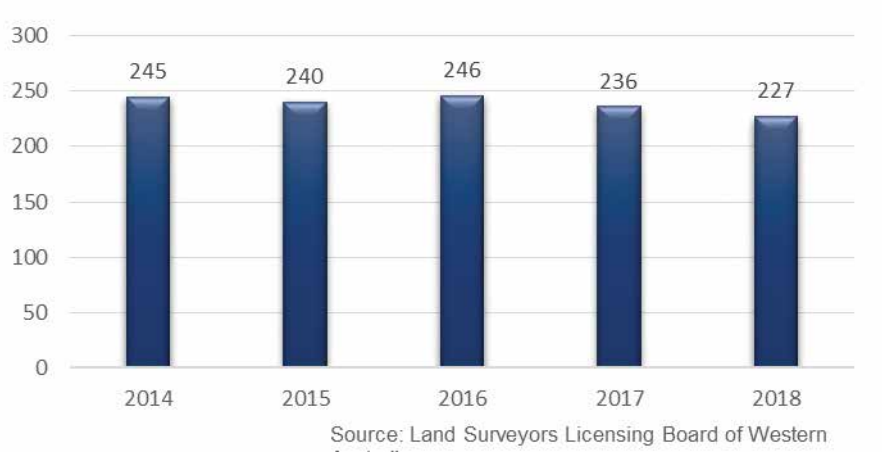


Chart 8.7: Number of Registered Surveyors - WA



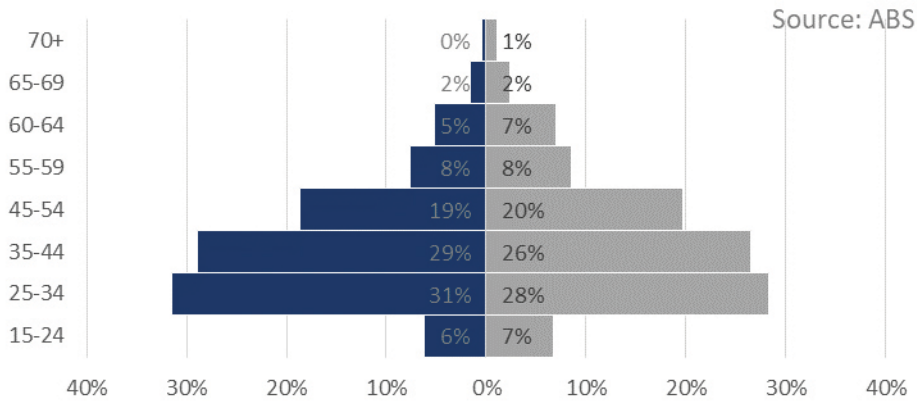
Source: Land Surveyors Licensing Board of Western Australia

Age profile and income of state workforce

Chart 8.8 the age profile of the surveying workforce in Western Australia in comparison to national figures. 33.5% of the workforce in Western Australia is aged over 45 years old, compared to the national figure of 38.6%.

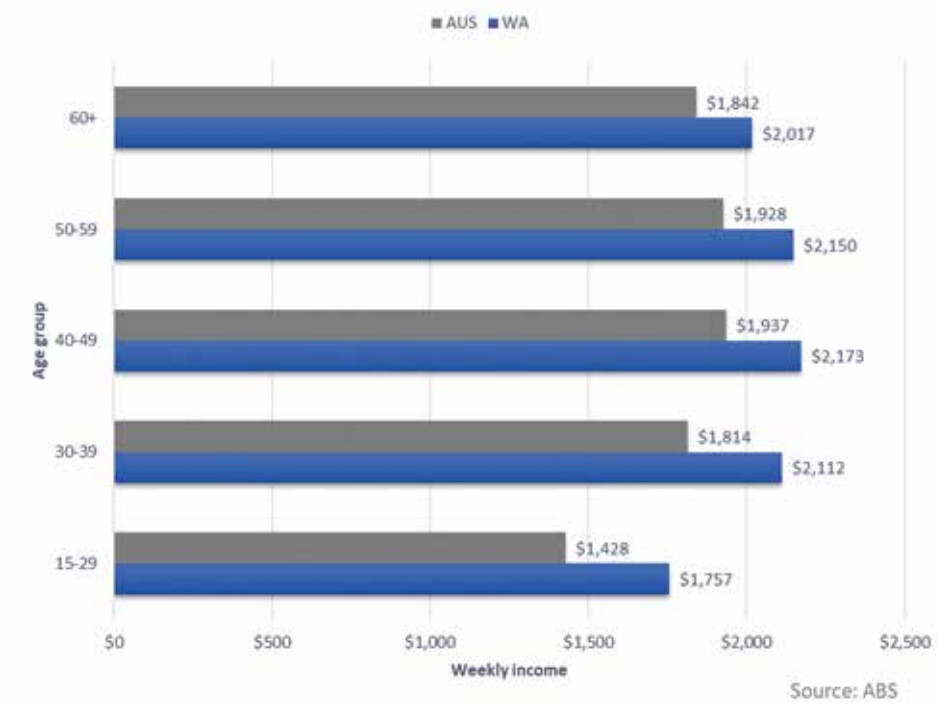
Chart 8.9 shows the comparison of average earnings of full-time surveyor or spatial scientist per week by age group between Western Australia and Australia. The average weekly income for a surveyor or spatial scientist in Western Australia is estimated at $2054.22 compared to national average of $1,795.

Chart 8.8: Age Distribution of Workforce – WA vs AUS



	15-24	25-34	35-44	45-54	55-59	60-64	65-69	70+
■ WA	6%	31%	29%	19%	8%	5%	2%	0%
■ AUS	7%	28%	26%	20%	8%	7%	2%	1%

Chart 8.9: Age Distribution of Workforce – WA vs AUS



8.3 Forecasts of skilled labour demand

Total labour demand in Western Australia is projected to rise from 2,510 persons in FY2018 to 2,953 in FY2020, as total construction is underpinned by strong growth in M&HI and utilities and transport engineering construction. Labour demand is then expected to decline as construction activity weakens to FY2022 before picking back up to roughly the same level in FY2025. As construction activity weakens and the effect of productivity growth accumulates, total labour demand is projected to drop to 2,578 persons by FY2028 (-16% from FY2025).

Chart 8.10: Forecast of Total Demand for Skilled Labour – WA (1.5% productivity growth)

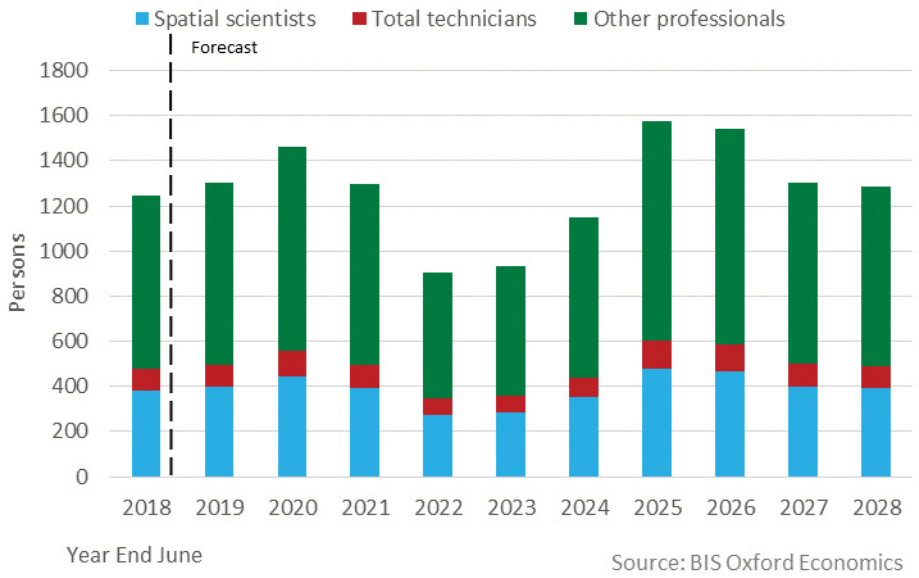


Chart 8.11: Forecast of Demand for Surveyors by Sector – WA (1.5% productivity growth)

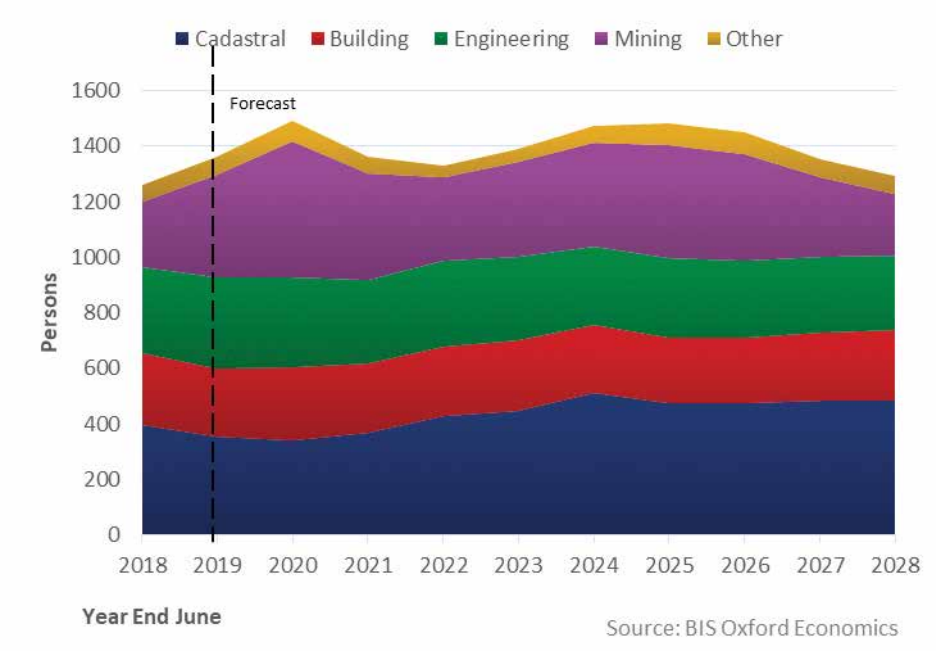
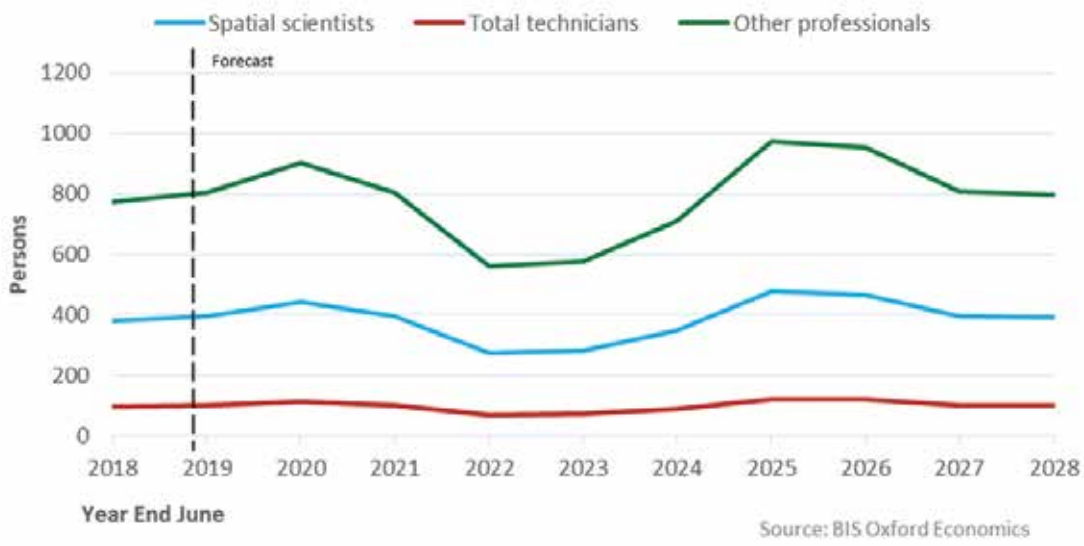


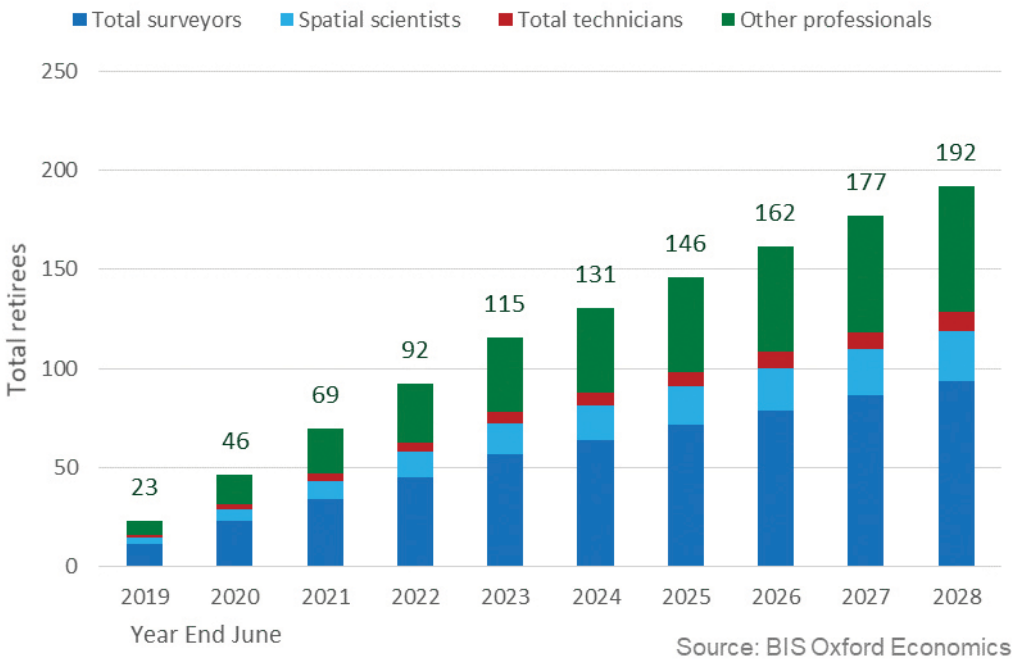
Chart 8.12: Forecast of Demand for Spatial Scientists, Technicians and Other Professionals – WA (1.5% productivity growth)



8.4 Forecast of workforce attrition

We estimate that 6.8% of the existing workforce in Western Australia will retire in the next 10 years, given the current age profile of the workforce. This includes 93 surveyors, 26 spatial scientists, 9 technicians and 64 other professionals.

Chart 8.13: Forecast of Cumulative Workforce Attrition – WA



8.5 Forecast workforce gap

Unlike many other states, Western Australia is estimated to face a surplus of labour in the surveying and geospatial workforce. The size of this surplus is estimated at 325 personnel. Surveyors involved in the cadastral and engineering construction sectors were the largest contributors to the surplus, with both groups experiencing a surplus of 109 and 105 respectively. However, a steady increase in the demand for skilled labour will create a workforce gap by FY2020 (estimated size of 164 persons). After a significant decrease in labour demand, the workforce gap will close once again after FY2021. We project another labour shortage around FY2025-26 due to growth in M&HI and engineering construction sectors.

Chart 8.14: Forecast of Workforce Gap for Registered – WA (1.5% Productivity Growth)

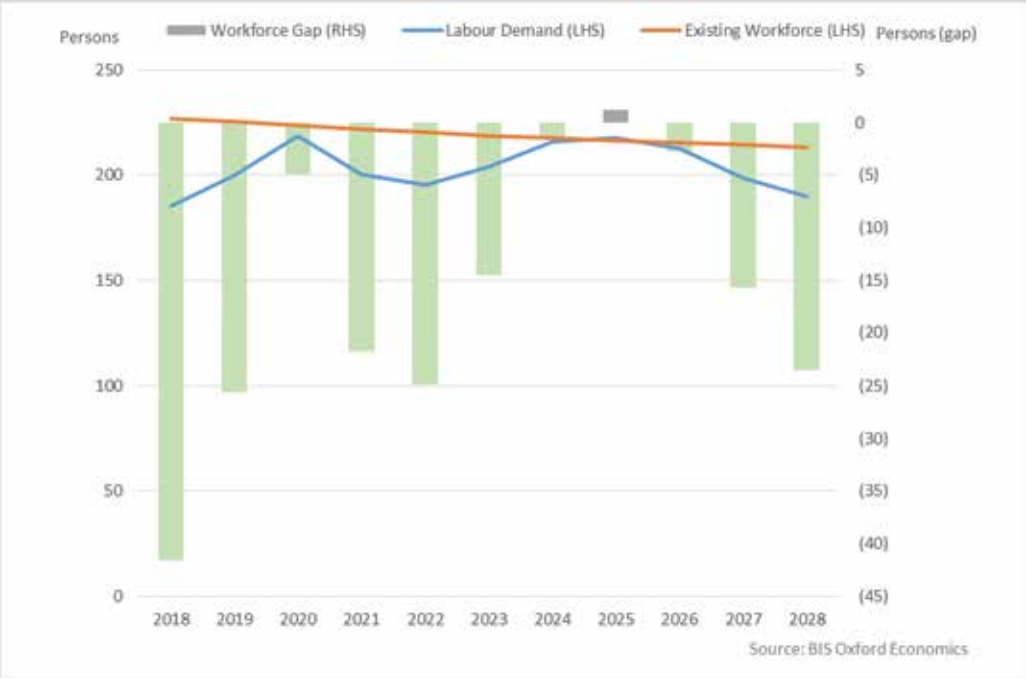


Chart 8.15: Forecast of Workforce Gap for Total Surveyors – WA (1.5% Productivity Growth)

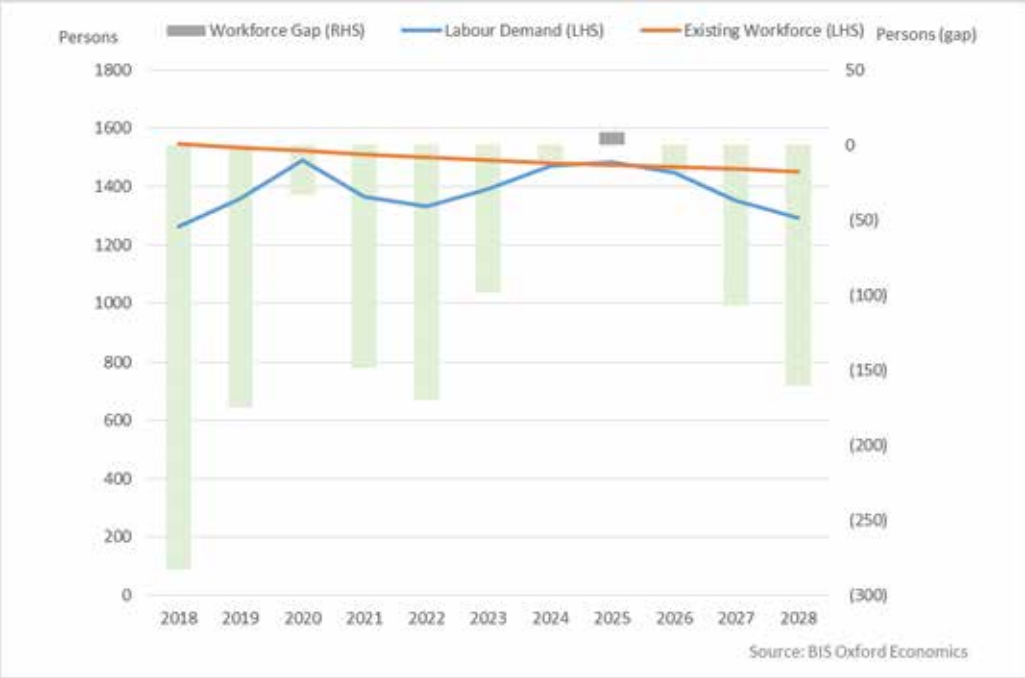


Chart 8.16: Forecast of Workforce Gap for Spatial Scientists – WA (1.5% Productivity Growth)

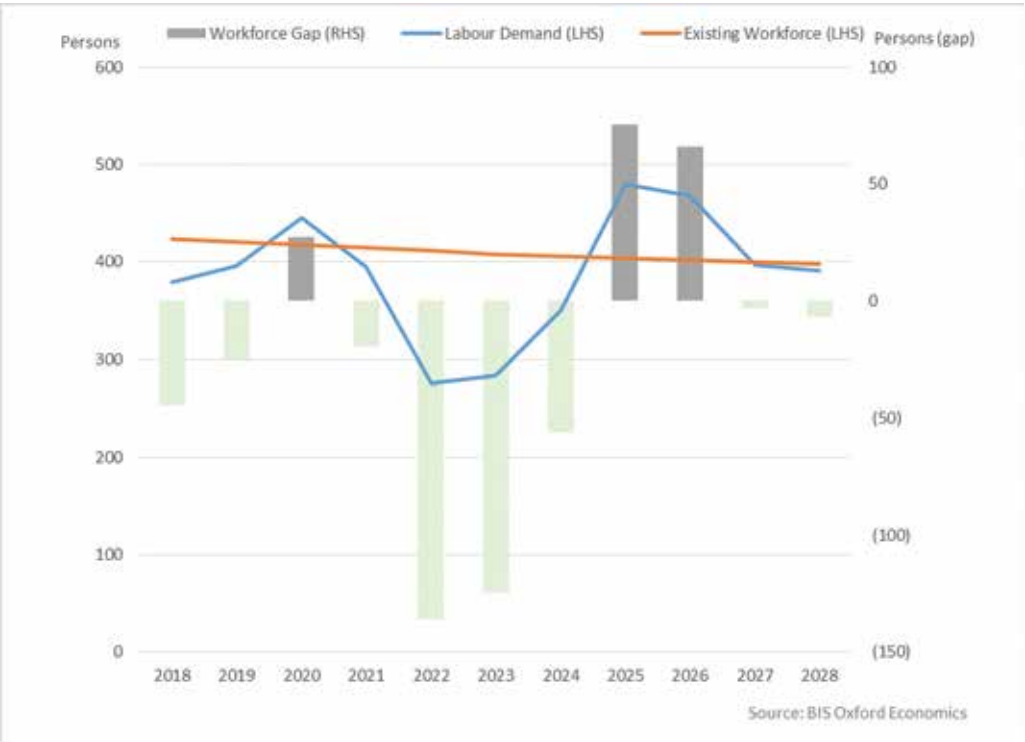
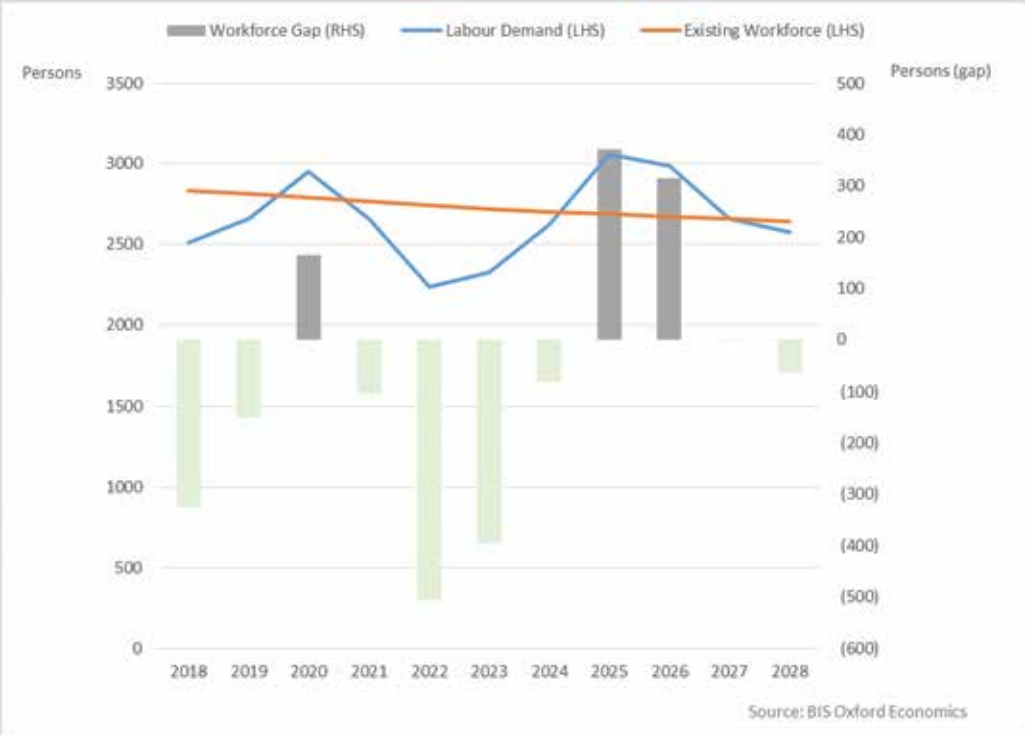


Chart 8.17: Forecast of Workforce Gap for Total Technicians – WA (1.5% Productivity Growth)

Chart 8.18: Forecast of Workforce Gap for Total Skilled Workforce – WA (1.5% Productivity Growth)



Overall, we project Western Australia's current stock of surveyors and spatial scientists to be able to meet construction activity throughout most of the forecast period to FY2028, with a temporary shortage during FY2025-26 due to strong mining and engineering activity. We also forecast a surplus of technicians during the same period (see Table 8.2).

Table 8.2: Workforce Gap Outcome – WA

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Surveyors & spatial scientists			*Surplus*					*Surplus*		
	(199)	(6)	(168)	(305)	(223)	(66)	83	47	(110)	(167)
Surveying & spatial science technicians			*Surplus*					*Surplus*		
	(16)	(2)	(14)	(43)	(40)	(22)	12	10	(8)	(9)

Source: BIS Oxford Economics

Table 8.3: Labour Demand Forecast and Workforce Gap – Western Australia (Baseline Scenario based on 1.5% labour productivity growth)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
	Estimates	Forecasts									
Labour Demand											
All Surveyors	**1263**	**1360**	**1490**	**1364**	**1331**	**1391**	**1471**	**1483**	**1448**	**1353**	**1292**
Cadastral	394	355	342	366	426	445	511	475	474	484	483
Building	263	243	262	250	253	257	245	234	234	243	254
Engineering	310	328	324	301	307	298	280	289	279	273	271
Mining	235	370	491	382	301	345	378	407	385	289	221
Other sectors	61	64	72	64	44	46	57	77	76	64	63
Registered/Licensed Surveyors (a)	*185*	*200*	*219*	*200*	*196*	*204*	*216*	*218*	*213*	*199*	*190*
Spatial Scientists	379	396	445	395	275	284	350	479	468	397	391
Total Technicians	97	101	114	101	70	72	89	122	120	101	100
Total Surveying & Geospatial Workforce	**1739**	**1857**	**2048**	**1859**	**1677**	**1746**	**1911**	**2084**	**2036**	**1851**	**1783**
Other Professionals	771	804	905	803	560	577	712	975	952	807	795
Total skilled labour demand	**2510**	**2661**	**2953**	**2662**	**2237**	**2323**	**2623**	**3059**	**2988**	**2658**	**2578**
Existing Workforce (b)											
All Surveyors	**1546**	**1534**	**1523**	**1512**	**1501**	**1489**	**1482**	**1474**	**1467**	**1460**	**1452**
Cadastral	499	495	491	488	484	480	478	476	473	471	468
Building	268	266	264	262	260	258	257	256	255	253	252
Engineering	419	416	413	410	407	404	402	400	398	396	394
Mining	289	287	285	283	281	278	277	276	274	273	271
Other sectors	71	71	70	70	69	69	68	68	68	67	67
Registered/Licensed Surveyors	*227*	*225*	*224*	*222*	*220*	*219*	*218*	*217*	*215*	*214*	*213*
Spatial Scientists	424	420	417	414	411	408	406	404	402	400	398
Total Technicians	118	117	116	115	113	112	112	111	110	109	109
Total Surveying & Geospatial Workforce	**2087**	**2072**	**2056**	**2041**	**2025**	**2010**	**2000**	**1989**	**1979**	**1969**	**1959**
Other Professionals	748	740	732	725	717	710	705	699	694	689	684
Total skilled labour	**2835**	**2812**	**2789**	**2766**	**2743**	**2720**	**2704**	**2689**	**2673**	**2658**	**2643**
Workforce Gap (c)											
All Surveyors	**(283)**	**(174)**	**(33)**	**(148)**	**(169)**	**(99)**	**(10)**	**8**	**(19)**	**(107)**	**(160)**
Cadastral	(105)	(140)	(149)	(121)	(58)	(36)	33	(0)	1	13	15
Building	(5)	(24)	(3)	(13)	(7)	(1)	(12)	(22)	(20)	(11)	2
Engineering	(109)	(88)	(89)	(108)	(100)	(106)	(122)	(111)	(118)	(122)	(123)
Mining	(54)	84	206	100	20	67	101	132	111	16	(51)
Other sectors	(10)	(7)	2	(6)	(25)	(23)	(12)	10	8	(3)	(4)
Registered/Licensed Surveyors	*(42)*	*(26)*	*(5)*	*(22)*	*(25)*	*(15)*	*(2)*	*1*	*(3)*	*(16)*	*(24)*
Spatial Scientists	(44)	(25)	27	(19)	(136)	(125)	(56)	75	66	(3)	(7)
Total Technicians	(21)	(16)	(2)	(14)	(43)	(40)	(22)	12	10	(8)	(9)
Total Surveying & Geospatial Workforce	**(349)**	**(215)**	**(8)**	**(181)**	**(348)**	**(263)**	**(89)**	**95**	**57**	**(118)**	**(176)**
Other Professionals	24	64	172	78	(158)	(133)	7	275	258	118	111
Total skilled labour	(325)	(151)	164	(103)	(506)	(396)	(81)	370	314	(1)	(65)

(a) Registered surveyors are included in the total number of surveyors.

Source: BISOE, ABS, CRSBANZ

(b) Existing workforce is generated by diminishing the size of the current skilled workforce due to retirement.

(c) Workforce gap is calculated as labour demand less existing workforce. Positive number implies shortage of labour; bracketed number implies excess of supply.

Chapter Nine

Forecasts of Labour Demand and Workforce Gap for Tasmania

9. FORECASTS OF LABOUR DEMAND AND WORKFORCE GAP FOR TASMANIA

9.1 Economic and industry outlook

9.1.1 General economic environment

Tasmania is enjoying its best economic performance since the GFC. State Final Demand (SFD) increased by 3.9% in FY2018, outperforming the 3.5% pace of growth in Australian domestic demand. Gross State Product (GSP) growth was only around 1.1% over FY2016 and FY2017, but we estimate GSP increased by 2.8% in FY2018. Booming business investment and household spending, plus a moderate increase in dwelling investment, drove the strong result. Employment increased 2.9% in FY2018, but has since stalled, and in September 2018 was -0.4% less than the September 2017 level. Even so, the state's unemployment rate has fallen slightly over the last year as the participate rate eased. As at September 2018, Tasmania had a 5.8% unemployment rate compared with 5.0% for Australia.

Although we expect a moderation in Tasmania's SFD over the next year to 3% in FY2019, it should be remembered that this is a relatively good result for Tasmania, and still higher than the 2.3% forecast for Australian domestic demand. Household spending, which makes up the bulk of SFD, will ease back from the unsustainably strong 3% increase in FY2018, and average around 2% growth in FYs 2019 to 2021, due to weak wages and slower population and employment growth.

Strong growth in private dwelling building will be a key driver over the next two years, after a significant correction over the FY2016-2017 period. In this area, Tasmania is out of step with most other states and territories, where the downturn has just or will shortly commence. Non-dwelling building should resume its upswing this financial year after a steep decline in FY2018, with a cumulative increase of over 60% predicted over the next 2 financial years, and another solid rise in FY2021. Private engineering construction is expected to decline sharply over the next year after the strong growth of the past 2 years, but then should bounce back over FY2020, driven by high levels of electricity-related investment (mainly wind farms), renewed private telecommunications construction and increases in mining investment. Machinery and equipment investment jumped by over 40% in FY2018 (after five years of decline), and although growth will come back, it is set to be sustained for the next few years.

Public investment is expected to be the weak link and is set for a three-year decline as several major projects finish. Meanwhile, export growth—including tourism and food—is benefitting from the runway extension at Hobart Airport. This has allowed the first direct international flights to areas of South-East Asia and provide benefits for producers of high-perishable goods, with air freight providing direct access. A sustained competitive AUD should also help exports as Tasmania's key trade-oriented industries of agriculture, aquaculture, tourism and manufacturing start to reap the benefits of greater competitiveness, attracting greater foreign and domestic demand.

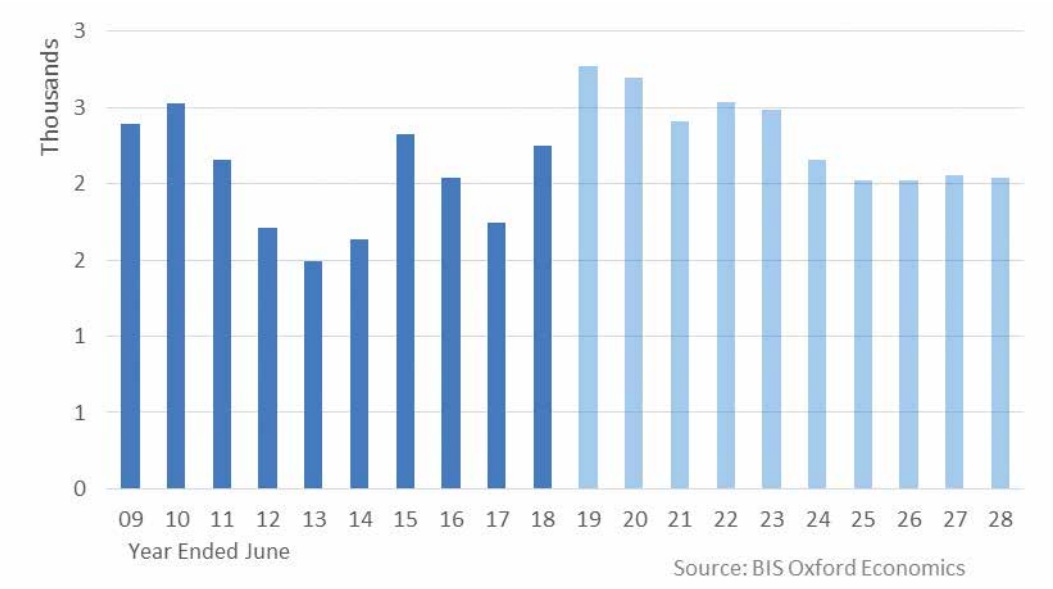
Overall, we forecast around 2.1% average annual growth in SFD over the three years to June 2020. GSP should receive a boost from net exports and record somewhat stronger growth, averaging around 2.5%.

9.1.2 Cadastral sector - Private house commencements

After a period of weak economic conditions coupled with slow population growth, Tasmania has shown solid improvement over recent years. Aided also by a fall in interest rates, house building activity saw a noticeable boost, climbing to over 2,300 house commencements in FY2015. Missing the beginning of the national residential building upturn, Tasmania's building surge was short lived, reflecting the persistence of an excess supply of dwellings, especially outside of Hobart.

Tasmania's house commencements have rebounded since FY2017 with strong approvals in houses supporting a rosier outlook for the state. Commencement activity for houses is estimated to increase in FY2018 by 29.1% to 2,253 new houses. Whilst this growth is anticipated to continue in FY2019 to 2,770 new houses (+22.9%), the weight of oncoming stock will see this gradually decline over the forecast period. From FY2020, activity will soften to 2,490 house commencements in FY2023, leading to an average of 2,582 new houses p.a. in the first half of the forecast period. In the second half of the forecast period (FY2024-28), house commencements will continue to weaken to an average of 2,060 new houses p.a. (-20.2% from the previous five-year average).

Chart 9.1: Number of Private House Dwellings Commenced – TAS



9.1.3 Building sector - Multi-residential dwellings and non-dwelling buildings

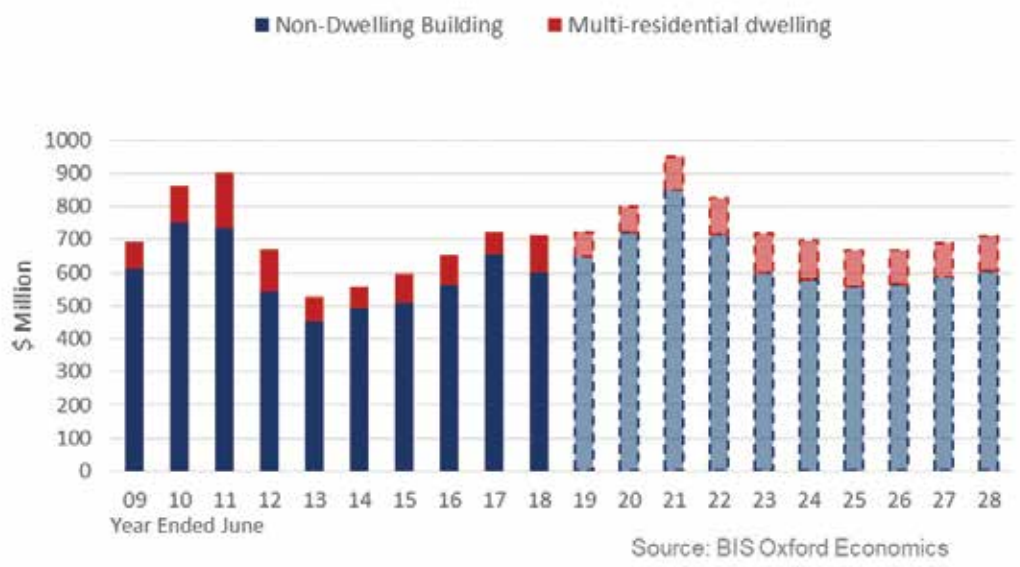
Multi-residential dwellings

As with private houses, multi-residential building activity rebounded in FY2018 to $116 million (+69% from previous year), given the strong approvals in medium density dwellings. However, activity is projected to dampen in FY2019 before recovering to the current levels by FY2023. Looking further ahead, Tasmania is projected to broadly see a softening market for multi-residential dwellings, with activity anticipated to fall from a peak of $119 million in FY2024 to $106 million in FY2028.

Non-dwelling buildings

The Tasmanian economy is taking off, especially for Hobart, helping facilitate an elevated forecast profile for non-residential building. Total activity trended upwards over the four years to $655 million in FY2017. With a void of major projects starting, activity is estimated to ease back in FY2018 (-8%). From a low base, non-dwelling building activity in Tasmania is projected to rise consistently to FY2022, with a series of major projects including the $150 million MONA Hotel Project and the $220 million New North Tasmania Prison being undertaken. Annual work done over the FY2019-23 period is forecast to average $696 million p.a., 23% higher than the previous five-year average. This is followed by a lower average of $586 million p.a. (-16%).

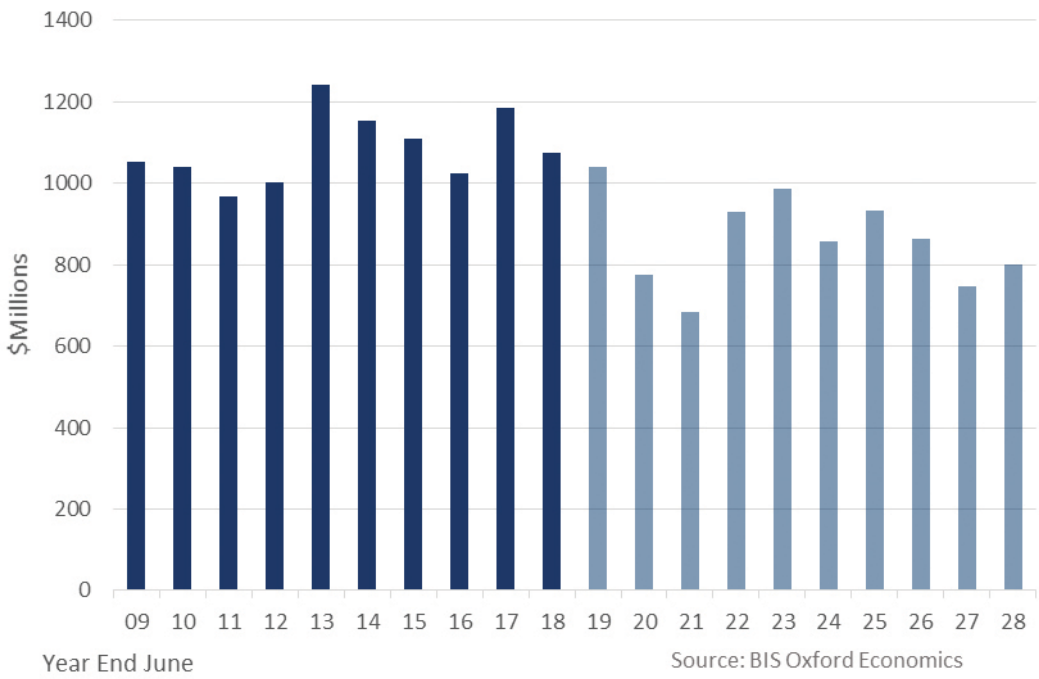
Chart 9.2: Multi-residential dwelling and non-dwelling building – TAS
Value of Work Done, 2015/16 Prices



9.1.4 Engineering sector - Utilities and transport engineering construction

At around $1-1.2 billion in work done annually, Tasmania's utilities and transport engineering construction market is relatively small, with work done and commencements considerably impacted by the size and timing of a handful of projects. Total work done reached a record $1.2 billion in FY2013, before falling back over the subsequent three years to $1.0 billion in FY2016. Activity has edged higher again over FY2017, supported mainly by roads and rail projects. Tasmania was one of the first states to see NBN investment, and hence is also the first state to see the near completion of NBN works: unlike all other states and territories, telecoms work halved in FY2018 on our estimates, and this was a key driver of the estimated 9.3% decline in utilities and transport engineering construction work, despite rising work volume in roads, water and recreation. In our view, this is just the start of a substantial correction in engineering construction activity in the state, with the completion of the NBN, on top of moderating roads (Midland Highway), rail (Freight Rail Revitalisation) and water (Irrigation – Tranche 2) projects, driving annual activity down by one-third to $685m over the next three years to FY2021. Activity beyond FY21 will be supported by the construction of the new Bridgewater Bridge and the second BassLink Interconnector. Overall, work done in utilities and transport construction is forecast to average $883 million in FY2019-23 (-20% from previous five-year average), followed by an average $841 million in FY2024-28 (-5%).

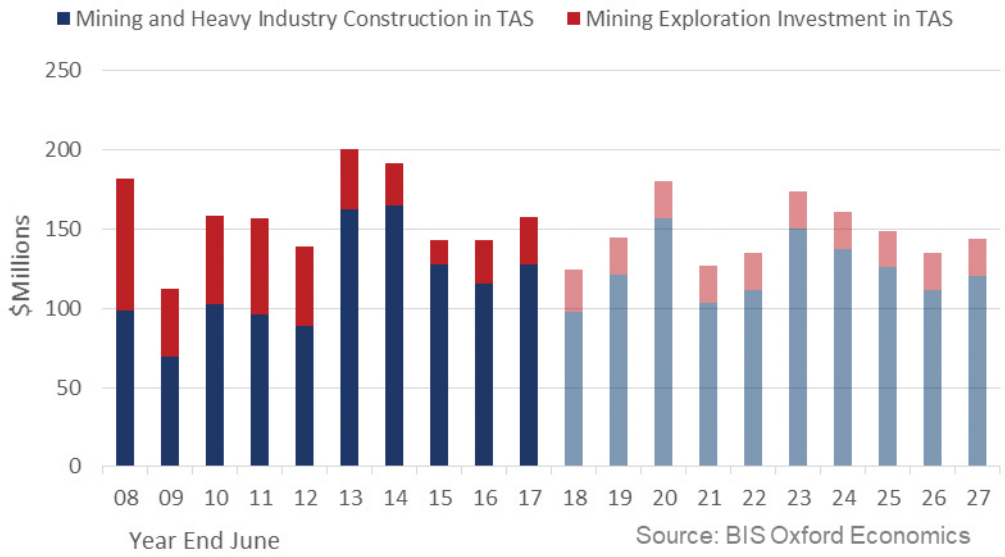
Chart 9.3: Utilities and Transport Engineering Construction – TAS
Value of Work Done, 2015/16 Prices



9.1.5 Mining and heavy industry sector

Tasmania has a very small and volatile M&HI sector, focused in other minerals construction, particularly the development of tin, gold and silver-lead-zinc deposits. In FY2018, M&HI activity in Tasmania rose 10% to $158 million, sustaining a five-year period of stronger M&HI activity since FY2013. The restart of the Rension tin mine ($205m) was a key contributor to recent levels of activity, with other tin, tungsten, magnetite and scheelite projects expected to hold activity at an average of $142 million per annum through the next five years to FY2023, and then rising to nearly $152 million per annum over the five years to FY2028.

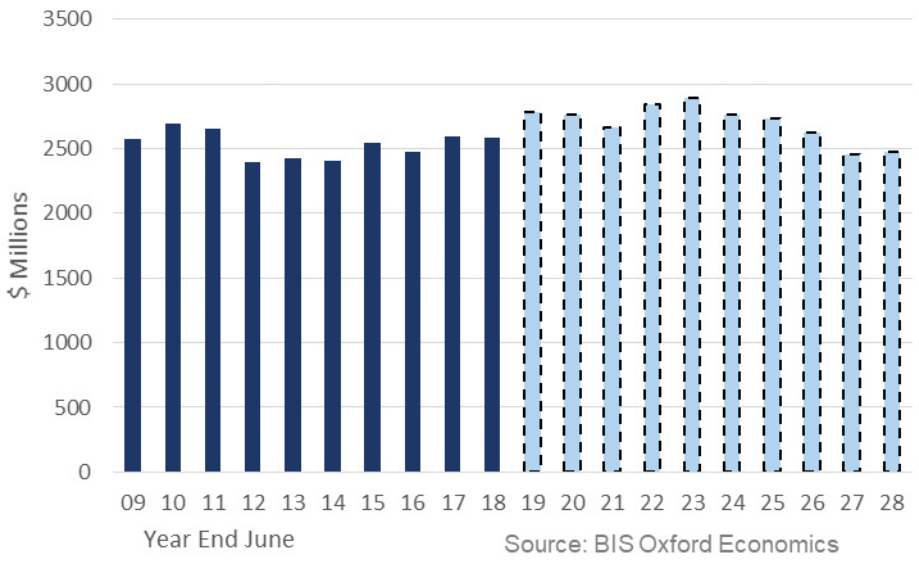
Chart 9.4: Mining & Heavy Industry Construction and Mining Exploration Investment – TAS Constant 2015/16 Prices



9.1.6 Total construction

Overall, construction activity in Tasmania is projected to increase in FY2019 by 8% given the growth in residential and non-residential building. However, the projected decline in utilities and transport engineering construction is set to decrease total construction activity by 4% in FY2020-21. This is followed by the sudden boost in public infrastructure investment which will push total construction up by 8% by FY2023. We project total construction activity to average $2.6 billion in FY2024-28, 6.5% lower than the previous five-year average.

Chart 9.5: Total Construction by Category – TAS
Value of Work Done, 2015/16 Prices



9.2 Estimate of the existing surveying and geospatial workforce

Size and breakdown of state workforce

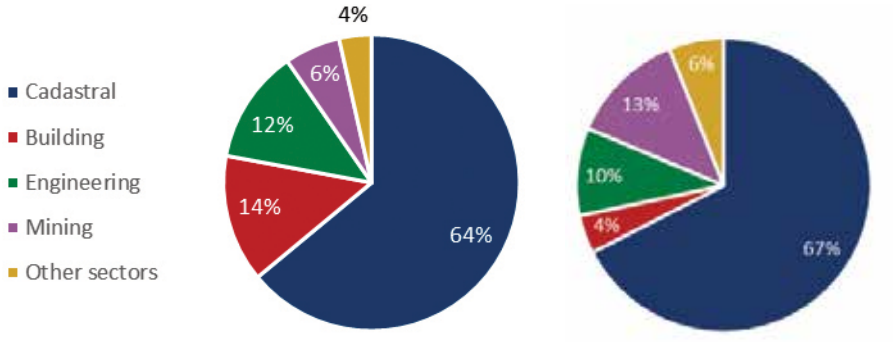
Since our previous update in FY2014, the size of the surveying and geospatial workforce in Tasmania is estimated to have shrunken by 37% to 195 persons. The pool of surveyors decreased to 117 persons in FY2018 (-30%). Spatial scientists are estimated to have halved to 51 persons and the number of technicians falling by 29% to 27 persons. The cadastral sector is estimated to take up most of the surveying work, comprising 64% of surveying activity in Tasmania. This is followed by building (14%), engineering (12%), mining (6%) and other sectors (4%).

Table 9.1: Estimated Size of Total Skilled Workforce in Tasmania

Occupation Groups	2013/14	2017/18		
Surveying sectors				
Cadastral	112	75	▼	(37)
Building	7	16	▲	9
Engineering	16	15	▼	(1)
Mining	21	7	▼	(14)
Other sectors	10	4	▼	(6)
Total surveyors	**166**	**117**	▼	**(49)**
Registered Surveyors	*98*	*86*	▼	(12)
Total spatial scientists	**108**	**51**	▼	**(57)**
Surveying technicians	30	21	▼	(9)
Spatial technicians	8	6	▼	(2)
Total technicians	**38**	**27**	▼	**(11)**
Total skilled surveying & geospatial workforce	**312**	**195**	▼	**(117)**
Planners	7	20	▲	13
Engineers	10	23	▲	13
Environmental Scientists	3	16	▲	13
Other staff (include Architects)	2	17	▲	15
Total other professionals	**22**	**76**	▲	54
Total Skilled Workforce	334	271	▼	**(63)**

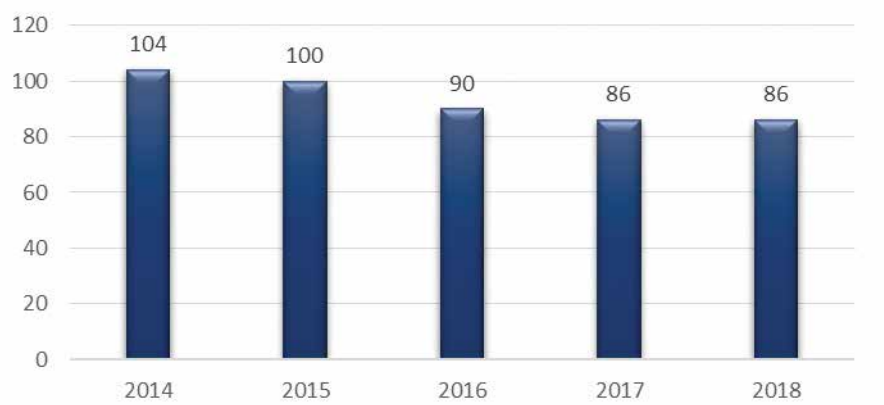
Source: BIS Oxford Economics, ABS, CRSBANZ

Chart 9.6: Comparing Surveying Sectoral Activity between FY18 (left) and FY14 (right)



Source: BIS Oxford Economics

Chart 9.7: Number of Registered Surveyors - TAS



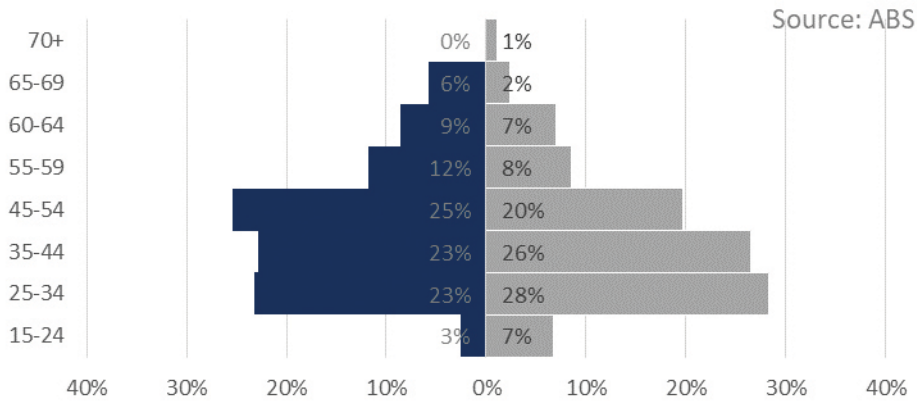
Source: Department of Primary Industries, Parks, Water and Environment

Age profile and income of state workforce

Chart 9.8 shows the age profile of the surveying workforce in Tasmania in comparison to national figures. 51.8% of the workforce in Tasmania is aged over 45 years old, compared to the national figure of 38.6%.

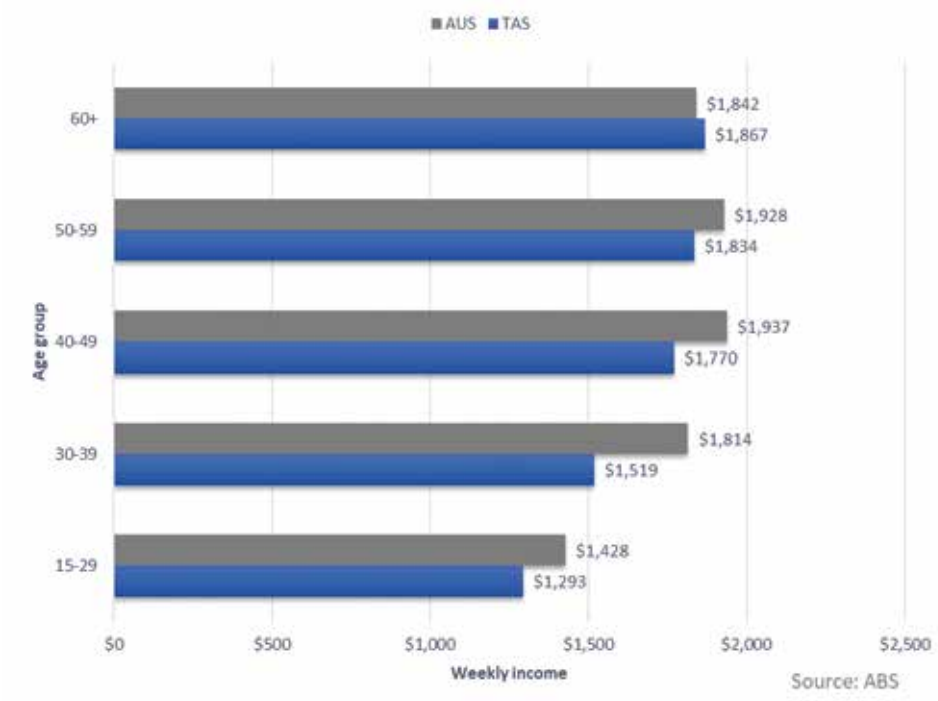
Chart 9.9 shows the comparison of average earnings of full-time surveyor or spatial scientist per week by age group between Tasmania and Australia. The average weekly income for a surveyor or spatial scientist in Tasmania is estimated at $1,668 compared to national average of $1,795.

Chart 9.8: Age Distribution of Workforce – TAS vs AUS



	15-24	25-34	35-44	45-54	55-59	60-64	65-69	70+
TAS	3%	23%	23%	25%	12%	9%	6%	0%
AUS	7%	28%	26%	20%	8%	7%	2%	1%

Chart 9.9: Full-time Weekly Earnings by Age – TAS vs AUS



9.3 Forecasts of skilled labour demand

After rising above 350 persons in FY2019, total labour demand is expected to gradually decrease over the next decade to 262 persons in FY2028. We project a small upturn in FY2022 as the temporary growth in utilities and transport engineering construction and private house commencements outweighs the decline in other sectors.

Chart 9.10: Forecast of Total Demand for Skilled Labour – TAS (1.5% productivity growth)

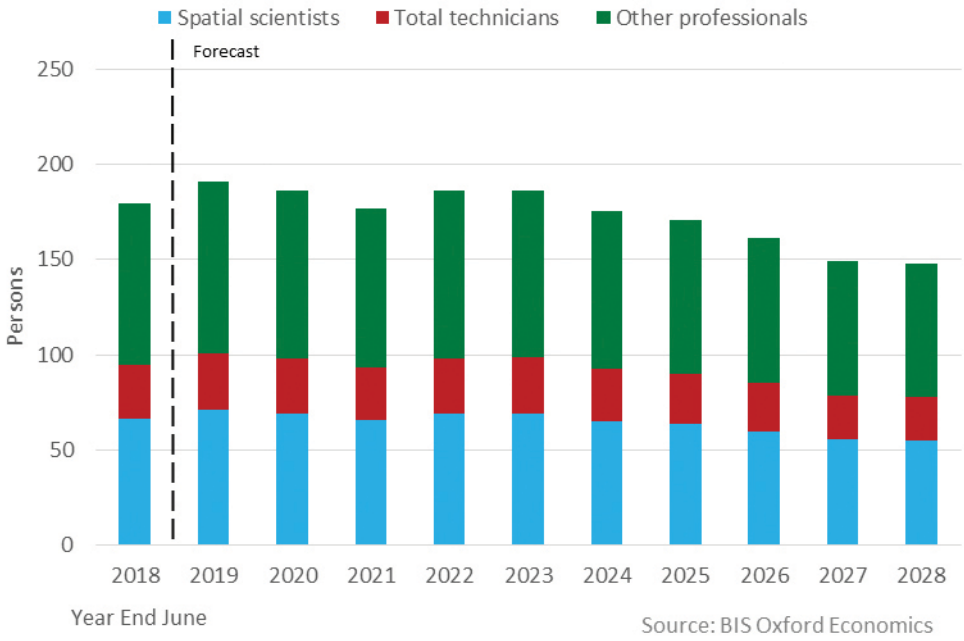


Chart 9.11: Forecast of Demand for Surveyors by Sector – TAS (1.5% productivity growth)

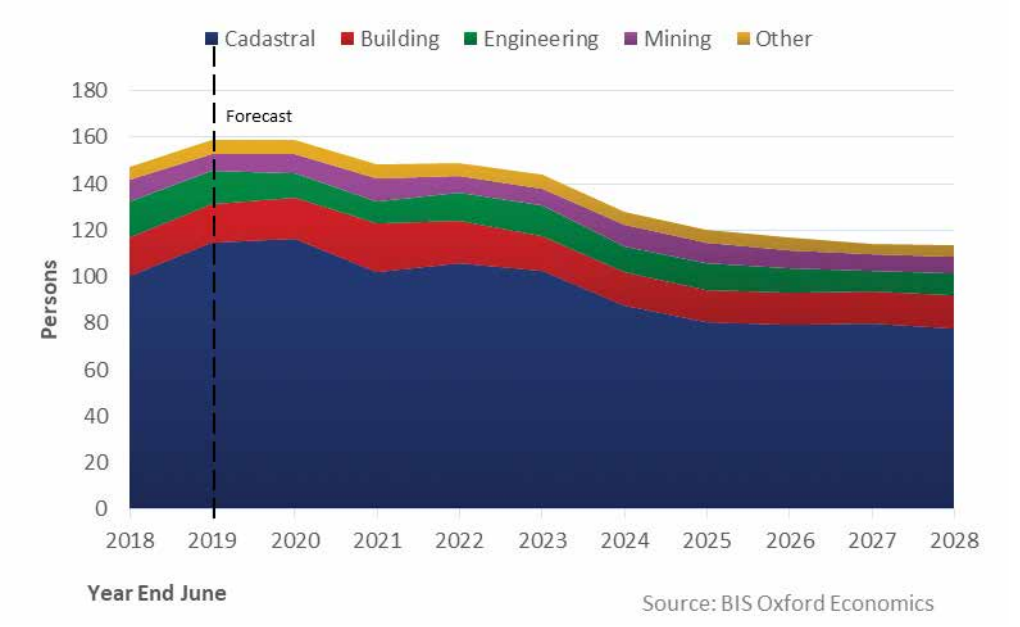
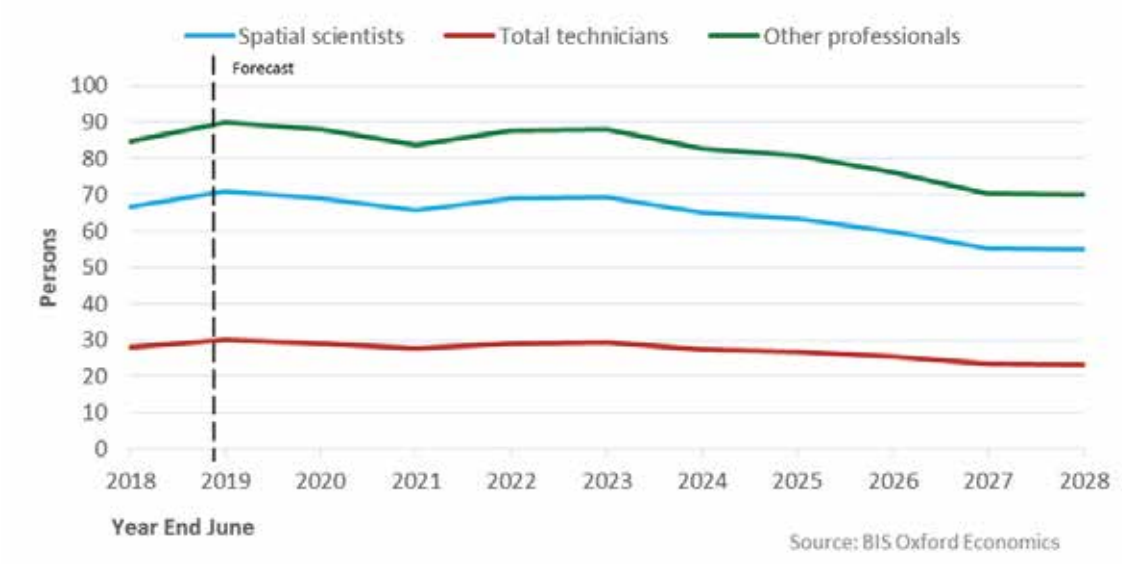


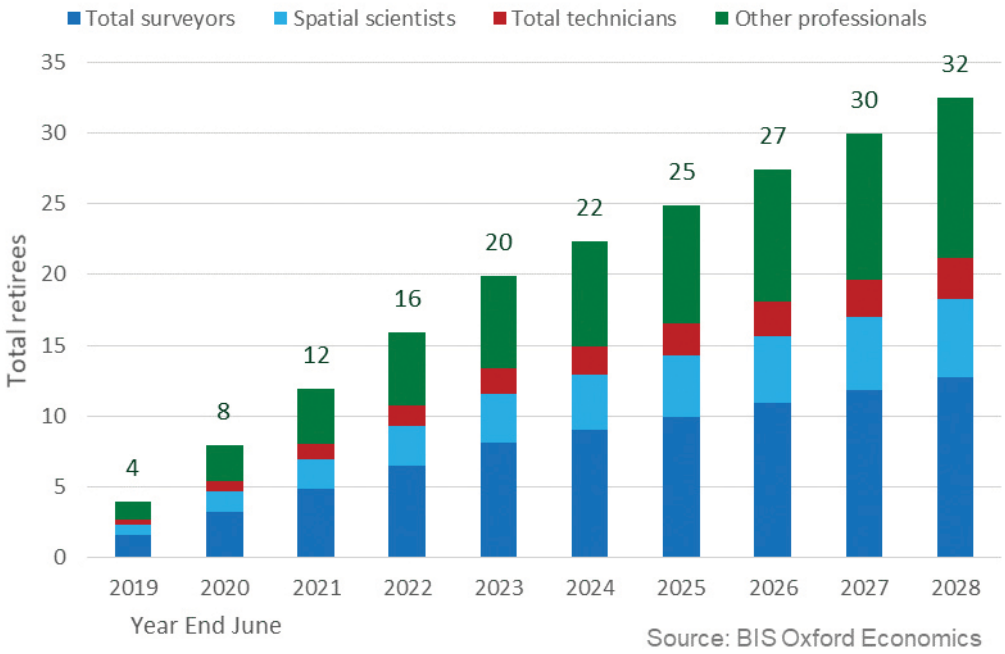
Chart 9.12: Forecast of Demand for Spatial Scientists, Technicians and Other Professionals – TAS (1.5% productivity growth)



9.4 Forecast of workforce attrition

We estimate that 12% of the existing workforce in Tasmania will retire in the next 10 years, given the current age profile of the workforce. This includes 13 surveyors, 6 spatial scientists, 3 technicians and 11 other professionals.

Chart 9.13: Forecast of Cumulative Workforce Attrition – TAS



9.5 Forecast workforce gap

In FY2018, the size of the workforce gap in Tasmania is estimated at 57 personnel, with surveyors accounting for 52% of the shortage, followed by spatial scientists (28%), other professionals (15%) and technicians (5%). This shortage is set to increase to 90 persons in FY2019 but then, as with labour demand, is expected to fall to a small shortage of 24 persons.

Chart 9.14: Forecast of Workforce Gap for Registered Surveyors – TAS (1.5% Productivity Growth)

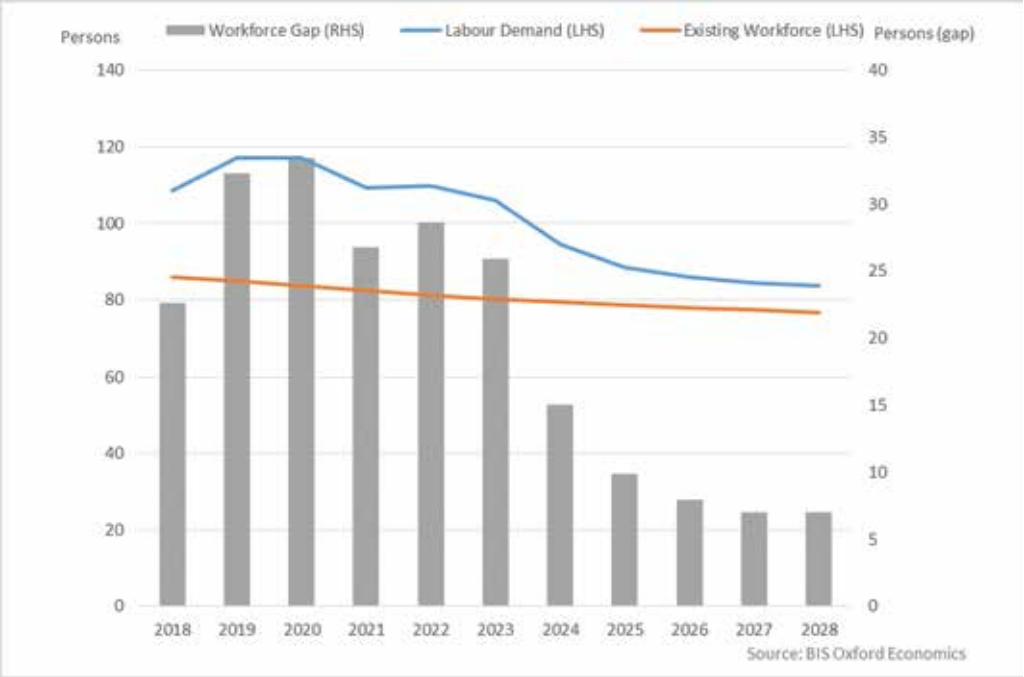


Chart 9.15: Forecast of Workforce Gap for Total Surveyors – TAS (1.5% Productivity Growth)

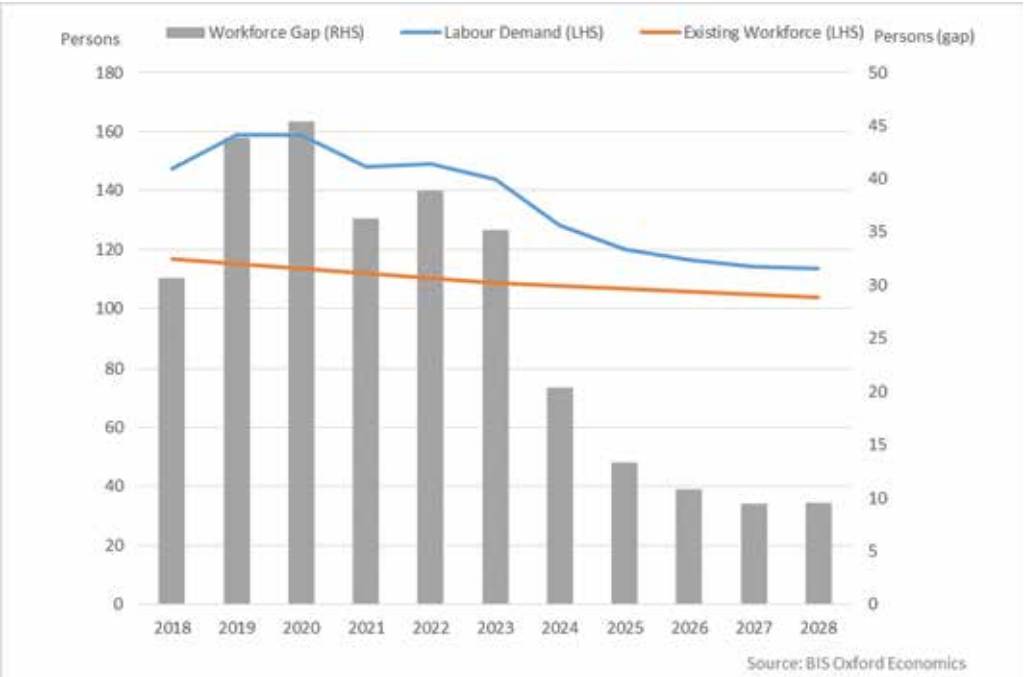


Chart 9.16: Forecast of Workforce Gap for Spatial Scientists – TAS
(1.5% Productivity Growth)

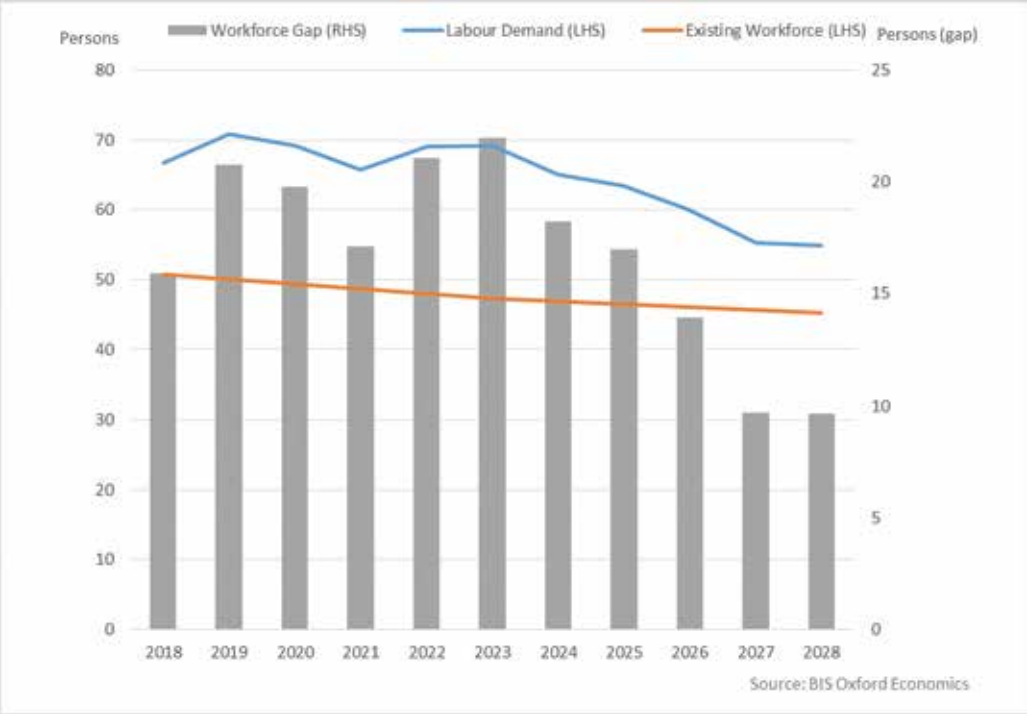
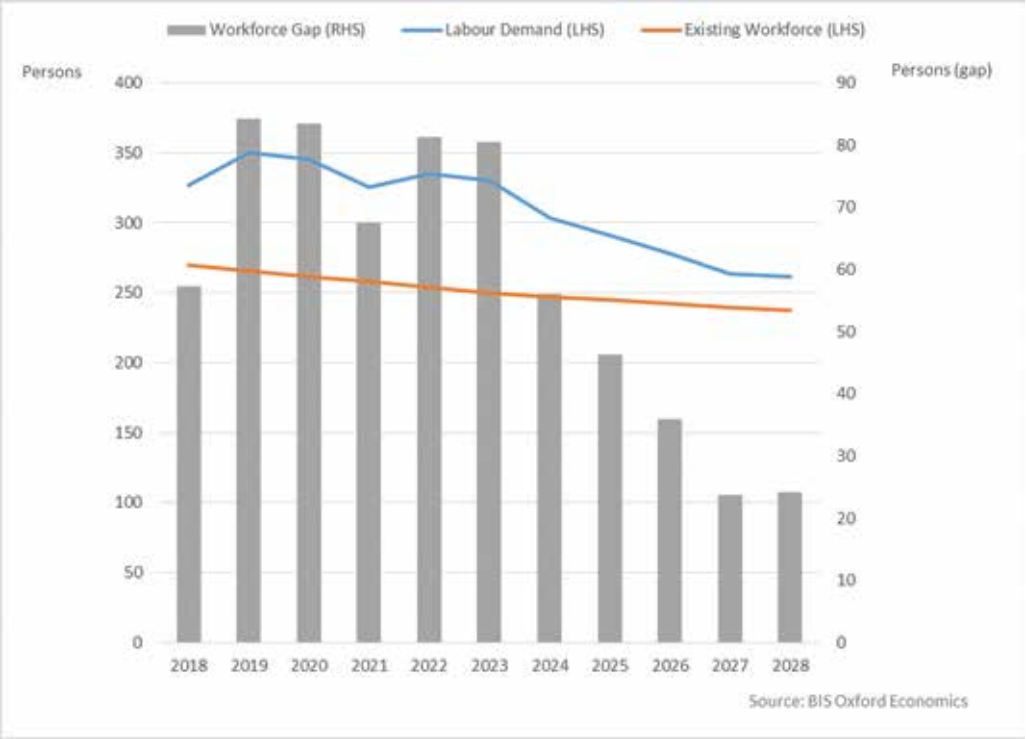


Chart 9.17: Forecast of Workforce Gap for Total Technicians – TAS
(1.5% Productivity Growth)

Chart 9.18: Forecast of Workforce Gap for Total Skilled Workforce – TAS (1.5% Productivity Growth)



Overall, we project Tasmania's current stock of surveyors and spatial scientists to be insufficient to meet construction activity throughout the forecast period to FY2028. This shortage is particularly acute within the first half of the forecast period (to FY2023). We also forecast a minor shortage of technicians within the same period. However, given the strong supply of new VET graduates, we expect this shortage to be met by incoming new technicians.

Table 9.2: Workforce Gap Outcome – TAS

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
			Shortage					*Shortage*		
Surveyors & spatial scientists	65	65	53	60	57	39	30	25	19	19
			Shortage					*Shortage*		
Surveying & spatial science technicians	4	4	3	4	5	3	3	1	(0)	(0)

Source: BIS Oxford Economics

Table 9.3: Labour Demand Forecast and Workforce Gap – Tasmania (Baseline Scenario based on 1.5% labour productivity growth)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
	Estimates	Forecasts									
Labour Demand											
All Surveyors	**147**	**159**	**159**	**148**	**149**	**144**	**128**	**120**	**117**	**114**	**113**
Cadastral	101	115	116	102	106	102	87	81	79	80	78
Building	17	16	18	21	18	15	15	14	14	14	14
Engineering	15	14	10	9	12	13	11	12	11	9	10
Mining	10	7	8	10	7	7	10	9	8	7	7
Other sectors	6	6	6	6	6	6	6	5	5	5	5
Registered/Licensed Surveyors (a)	*109*	*117*	*117*	*109*	*110*	*106*	*94*	*89*	*86*	*84*	*84*
Spatial Scientists	67	71	69	66	69	69	65	63	60	55	55
Total Technicians	28	30	29	28	29	29	28	27	25	23	23
Total Surveying & Geospatial Workforce	**242**	**260**	**257**	**242**	**247**	**242**	**221**	**210**	**202**	**193**	**192**
Other Professionals	85	90	88	84	88	88	83	81	76	70	70
Total skilled labour demand	**327**	**350**	**345**	**325**	**335**	**330**	**303**	**291**	**278**	**263**	**261**
Existing Workforce (b)											
All Surveyors	**117**	**115**	**113**	**112**	**110**	**109**	**108**	**107**	**106**	**105**	**104**
Cadastral	75	74	73	72	71	69	69	68	68	67	66
Building	16	16	16	16	15	15	15	15	15	15	14
Engineering	15	14	14	14	14	14	13	13	13	13	13
Mining	7	7	7	7	7	7	7	7	6	6	6
Other sectors	4	4	4	4	4	4	4	4	4	4	4
Registered/Licensed Surveyors	*86*	*85*	*84*	*82*	*81*	*80*	*79*	*79*	*78*	*77*	*77*
Spatial Scientists	51	50	49	49	48	47	47	46	46	46	45
Total Technicians	26	26	26	25	25	25	24	24	24	24	23
Total Surveying & Geospatial Workforce	**194**	**191**	**188**	**186**	**183**	**180**	**179**	**177**	**176**	**174**	**173**
Other Professionals	76	75	73	72	71	69	68	68	67	66	65
Total skilled labour	**270**	**266**	**262**	**258**	**254**	**250**	**247**	**245**	**242**	**240**	**237**
Workforce Gap (c)											
All Surveyors	**31**	**44**	**45**	**36**	**39**	**35**	**20**	**13**	**11**	**10**	**10**
Cadastral	26	41	44	31	35	33	19	12	12	13	11
Building	0	0	2	5	3	0	(0)	(1)	(1)	(1)	(0)
Engineering	0	(0)	(4)	(5)	(2)	(1)	(2)	(2)	(2)	(4)	(3)
Mining	2	0	2	4	0	1	3	2	1	1	1
Other sectors	2	2	2	2	2	2	2	2	1	1	1
Registered/Licensed Surveyors	*23*	*32*	*33*	*27*	*29*	*26*	*15*	*10*	*8*	*7*	*7*
Spatial Scientists	16	21	20	17	21	22	18	17	14	10	10
Total Technicians	2	4	4	3	4	5	3	3	1	(0)	(0)
Total Surveying & Geospatial Workforce	**48**	**69**	**69**	**56**	**64**	**62**	**42**	**33**	**26**	**19**	**19**
Other Professionals	9	16	15	12	17	19	14	13	10	5	5
Total skilled labour	57	84	83	68	81	81	56	46	36	24	24

(a) Registered surveyors are included in the total number of surveyors.

Source: BISOE, ABS, CRSBANZ

(b) Existing workforce is generated by diminishing the size of the current skilled workforce due to retirement.

(c) Workforce gap is calculated as labour demand less existing workforce. Positive number implies shortage of labour; bracketed number implies excess of supply.

Chapter Ten

Forecasts of Labour Demand and Workforce Gap for Northern Territory

10. FORECASTS OF LABOUR DEMAND AND WORKFORCE GAP FOR NORTHERN TERRITORY

10.1 Economic and industry outlook

10.1.1 General economic environment

The Northern Territory economy is highly cyclical, with wild swings in the growth rates of State Final Demand (SFD) driven by large variations in work done on large investment projects. Recent history is no exception, with growth in SFD tracking the colossal $37 billion Ichthys LNG project. SFD fell by 3.8% and 6.2% in FY2015 and FY2016 respectively, then jumped 7.6% in FY2017, before falling 2.8% in FY2018. Employment creation has been similarly erratic, declining 0.2% in FY2015, increasing 1.5% and 3.0% in FY2016 and FY2017, and then falling 1.1% in FY2018. There has continued to be volatility over the past year, with a weakening in the monthly employment figures since May 2018, which followed a steady improvement over the previous eight months. Employment growth through the year to September eased to 1.2%, compared to a 2.3% increase Australia-wide. The Territory's unemployment rate was 4.1% in September, a marked improvement on the 4.5% in late 2017.

Gross State Product (GSP) has shown a less volatile profile than SFD and employment in recent years, rising 3.8% in FY2017 after around 1.9% growth in the previous 2 years. As the Ichthys project wound down over the second half of 2018, translating to significant falls in engineering construction activity, GSP growth will suffer another slowdown in FY2019. There is no strong compensating growth from other sectors of the domestic state economy to replace this project, with the next largest project - the $800 million Northern Gas Link (connecting Northern Territory to the east coast gas network) – now recently completed.

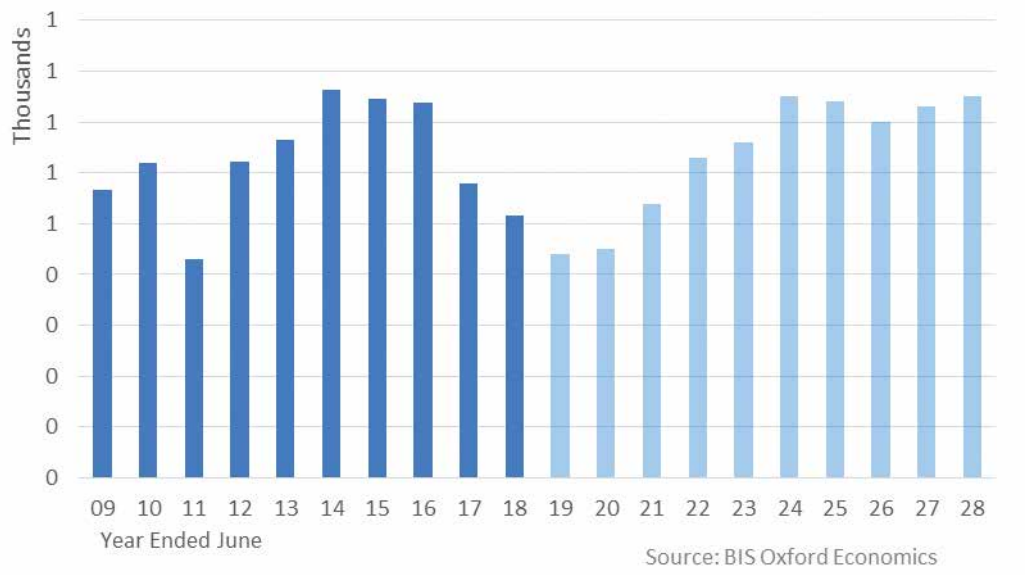
Overall, while SFD in the Northern Territory contracts again over the next year, GSP will get a (strong initially but diminishing) boost as LNG and oil production from Ichthys comes on stream from late 2018, and as the lower AUD boosts tourism and food exports. However, given the severity of the decline in SFD, we believe these positives will not be sufficient in keeping GSP growth positive over the next year. SFD is expected to return to positive, albeit weak, growth in FY2020, which, with the LNG and tourism-boosted exports, will see GSP lift in FY2020. An expected upturn in dwelling investment from FY2021 and a rebound in public investment, combined with further improvement in non-residential building, is forecast to lead to a pick-up in employment and an acceleration in population growth from early next decade (interstate inflows are expected to turn positive). In turn, this is expected to drive stronger household spending and an overall strengthening in SFD from FY2021. Mining investment is also expected to provide support to the Northern Territory economy in the early 2020's, although the increases will be of a much smaller base following the completion of the Ichthys LNG plant.

10.1.2 Cadastral sector - Private house commencements

Weak underlying demand pulled down by slow population growth and the afterglow of high volumes of engineering and mining investment in the Northern Territory have caused a sizable dwelling stock surplus to emerge, estimated to have developed to approximately 1,700 dwellings by June 2018. House commencements are estimated to have fallen for a fifth straight year in FY2018 to 515 houses.

With FY2019 expected to represent the bottom of the trough in building activity, new dwelling demand will pick up from this record low base as employment and population growth improve. By FY2023, house commencements are expected to reach 660, a 50% increase from FY2019. This growth is forecast to continue as economic and population growth trends upward in the second half of the forecast horizon, with an average of 734 new houses p.a. in over the FY2024-28 period (34% higher than the previous five-year average).

Chart 10.1: Number of Private House Dwellings Commenced – NT



10.1.3 Building sector - Multi-residential dwellings and non-dwelling buildings

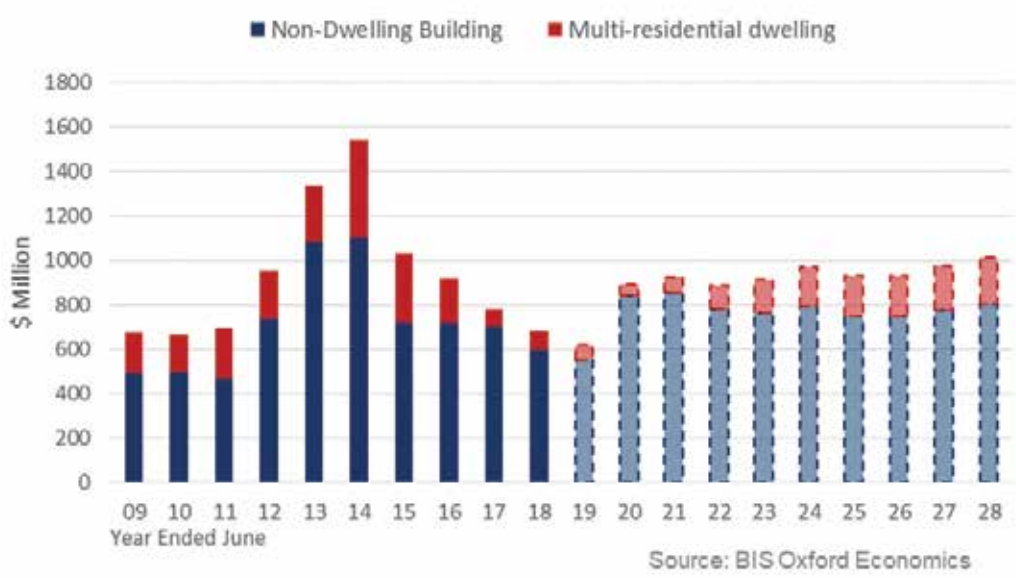
Multi-residential dwellings

Due to the sizable oversupply of dwelling stock, multi-residential building has been in significant decline over the past few years, with work done falling from $438 million in FY2014 to $84 million in FY2017. This drastic fall is also reflective of the withdrawal of investors from the apartment market due to four years of price falls. The rental vacancy rate in Darwin has risen over the downturn to a high 8.9% but has fallen to 5.9% in March 2018, suggesting stock is gradually being soaked up. Softness is projected to persist over the next three years to FY2021 (averaging around $64 million p.a.). Activity is then forecast to pick up from FY2022, growing at an average of 14% to $214 million in FY2028.

Non-dwelling buildings

Reflective of the small size and narrow industry base of the Northern Territory, non-residential building starts have tended to vary significantly from year to year. Since the peak of $1.1 billion in FY2014, non-residential building in Northern Territory has been declining consecutively to $601 million in FY2018. However, we expect activity to bounce back in the next couple years as improving economic conditions and an allowance for further defence work (e.g. Tindal Joint Strike Fighter Project Facilities and Larrakeyah Barracks Project) supports an elevated non-residential building activity into the next decade. Annual work done over the FY2019-23 period is forecast to average $748 million p.a., followed by a higher average of $750 million p.a. in the following five-year period.

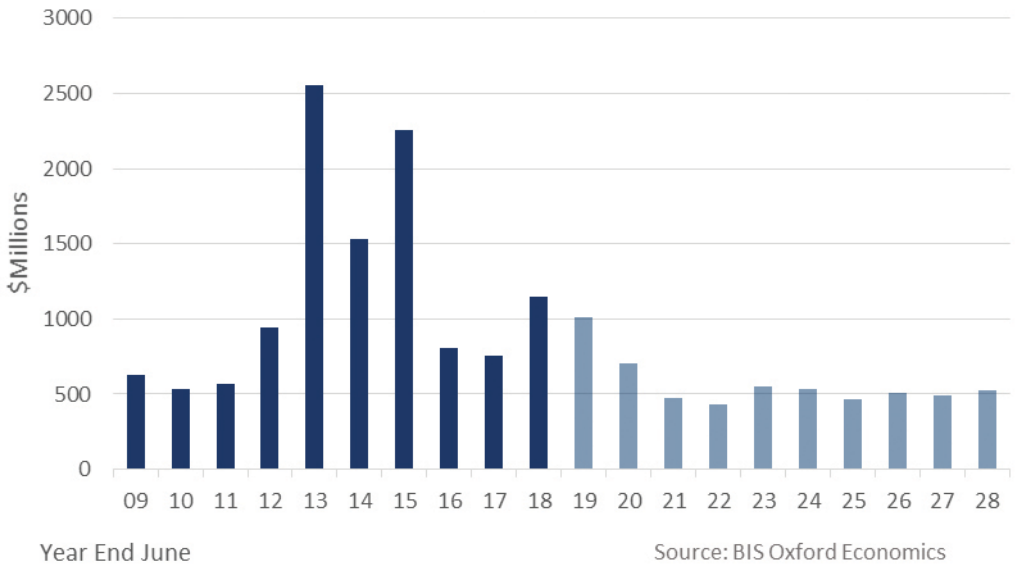
Chart 10.2: Multi-residential dwelling and non-dwelling building – NT Value of Work Done, 2015/16 Prices



10.1.4 Engineering sector - Utilities and transport engineering construction

Engineering construction is typically volatile in the Northern Territory, driven primarily by large natural resource projects and associated infrastructure. Work done in utilities and transport construction has ranged from $756 million to $2.3 billion between FY2014 and FY2018. It is forecast that utilities and transport construction activity will dampen over the next decade, eventually halving from $1.0 billion in FY2019 to $521 million in FY2028.

Chart 10.3: Utilities and Transport Engineering Construction – NT
Value of Work Done, 2015/16 Prices



10.1.5 Mining and heavy industry sector

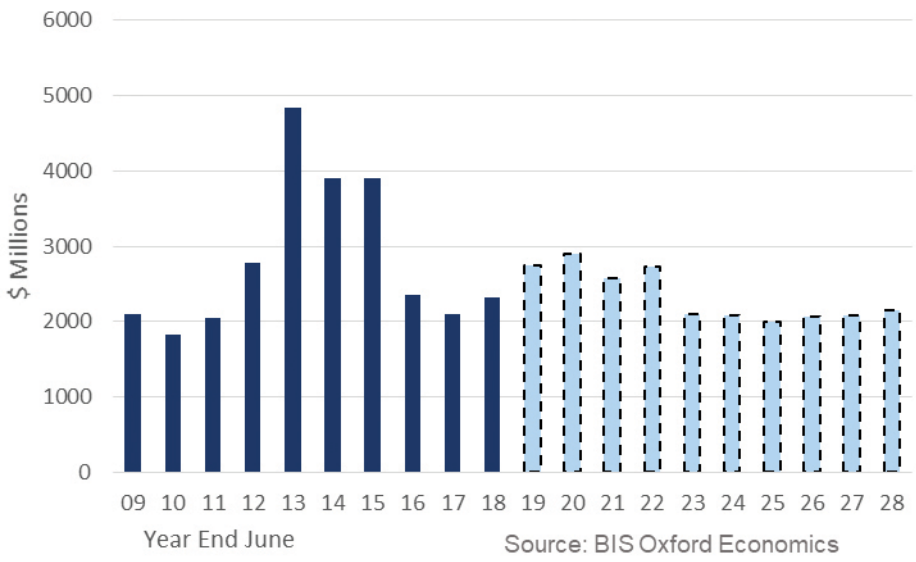
Northern Territory M&HI activity has simply boomed over the past five years, dominated by the $24 billion Ichthys LNG development, including on shore processing facilities near Darwin. Over the last five years, M&HI activity has averaged $5.5 billion per annum, but this is expected to fall to an average of $1.7 billion p.a. over the five years to FY2023, with much of this activity driven by other minerals projects – such as Mt Todd gold ($900m), Mt Peake Vanadium Phase 1 ($850m), Nolans Rare Earths (RE) mine ($980m), the Chandler Salt mine ($464m) and Ammaroo Phosphate Stage 1 ($368m) – in the wake of the completion of the construction of Ichthys. While oil and gas activity will be lower than during the boom, it is likely to level out at reasonably high levels historically through ongoing sustaining capital works. The completion of a range of large other minerals projects by the first half of the 2020s sees a lower average level of activity expected in the FY2024-28 period.

Chart 10.4: Mining & Heavy Industry Construction and Mining Exploration Investment – NT Constant 2015/16 Prices

10.1.6 Total construction

Overall, construction activity in Northern Territory is projected to increase over FY2019 and FY2020 by 18.6% and 5.3% respectively, due to growth in M&HI activity and residential and non-residential building. Total construction is then expected to drop in FY2021 before picking back up in FY2022. From FY2023 to FY2028 onwards we project total construction to stabilise between $2-2.2 billion each year.

Chart 10.5: Total Construction by Category – NT
Value of Work Done, 2015/16 Prices



10.2 Estimate of the existing surveying and geospatial workforce

Size and breakdown of state workforce

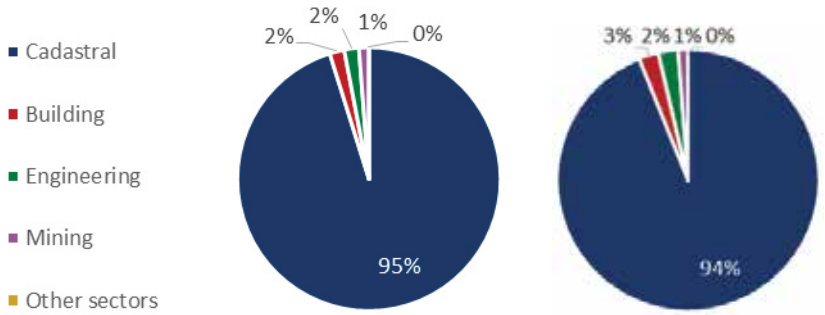
Since our previous update in FY2014, the size of the surveying and geospatial workforce in Northern Territory is estimated to have shrunken by 13% to 164 persons. We estimate that there were 77 surveyors, 66 spatial scientists and 21 technicians in FY2018. Virtually all the surveying work is done in the cadastral industry, taking up 95% of surveying activity.

Table 10.1: Estimated Size of Total Skilled Workforce in Northern Territory

Occupation Groups	2013/14	2017/18		
Surveying sectors				
Cadastral	77	74	▼	(3)
Building	2	1	▼	(1)
Engineering	2	1	▼	(1)
Mining	1	1		
Other sectors	-	-		
Total surveyors	**82**	**77**	▼	**(5)**
Registered Surveyors	*112*	*92*	▼	(20)
Total spatial scientists	**83**	**66**	▼	**(17)**
Surveying technicians	19	17	▼	(2)
Spatial technicians	5	4	▼	(1)
Total technicians	**24**	**21**	▼	**(3)**
Total skilled surveying & geospatial workforce	**189**	**164**	▼	**(25)**
Planners	4	6	▲	2
Engineers	7	11	▲	4
Environmental Scientists	3	5	▲	2
Other staff (include Architects)	2	3	▲	1
Total other professionals	**16**	**25**	▲	9
Total Skilled Workforce	205	189	▼	**(16)**

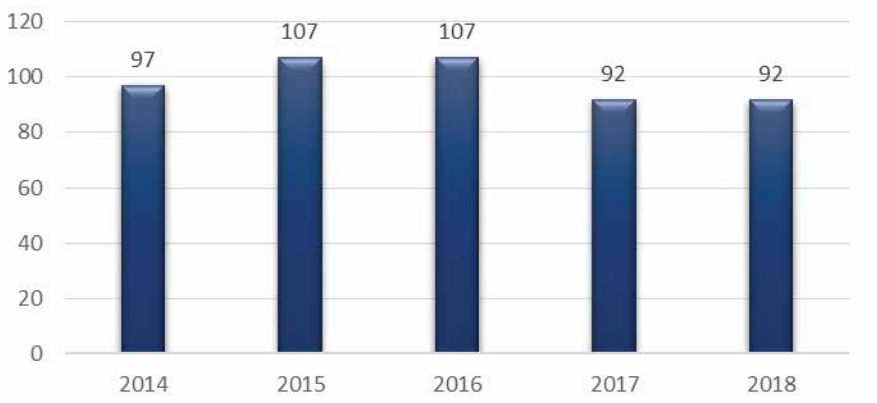
Source: BIS Oxford Economics, ABS, CRSBANZ

Chart 10.6: Comparing Surveying Sectoral Activity between FY18 (left) and FY14 (right)



Source: BIS Oxford Economics

Chart 10.7: Number of Registered Surveyors - NT



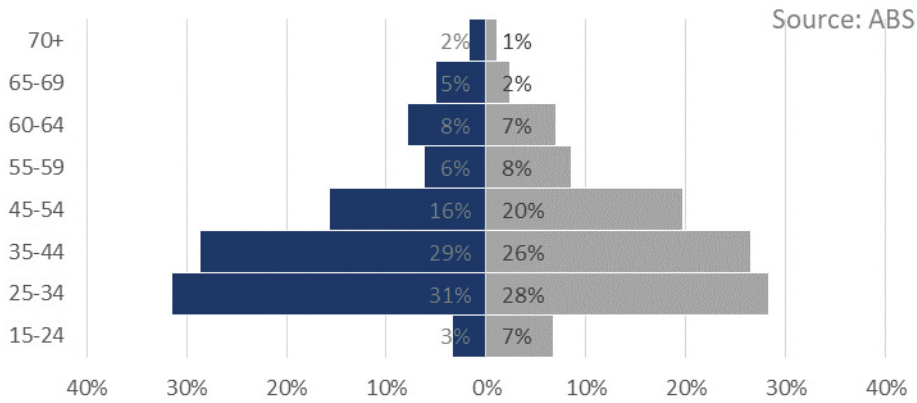
Source: Surveyors Board of the Northern Territory of Australia

Age profile and income of state workforce

Chart 10.8 shows the age profile of the surveying workforce in The Northern Territory in comparison to national figures. 36.5% of the workforce in Northern Territory is aged over 45 years old, compared to the national figure of 38.6%.

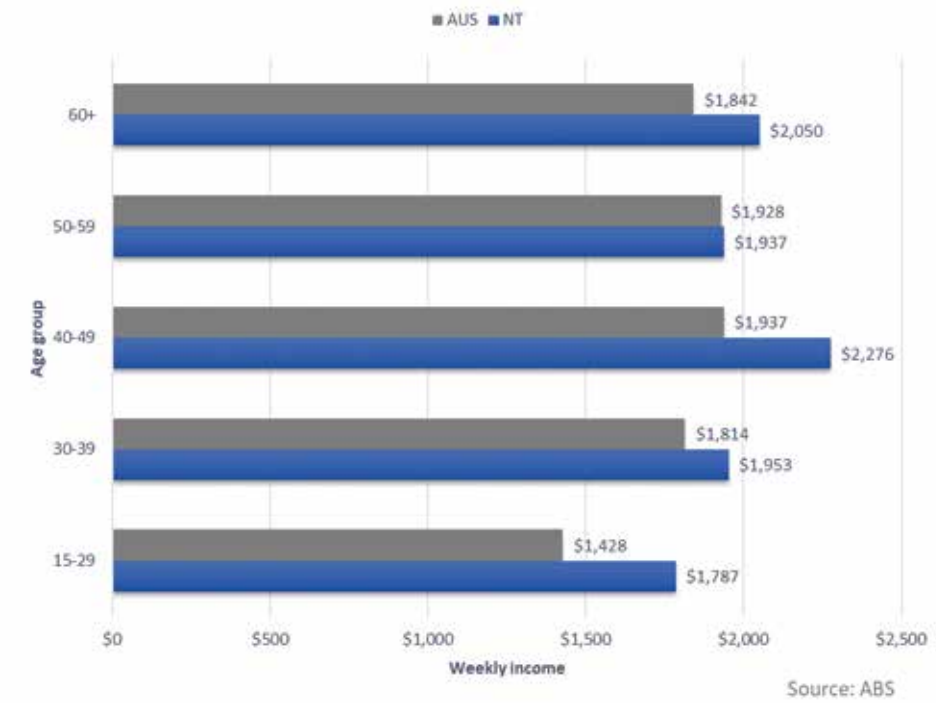
Chart 10.9 shows the comparison of average earnings of full-time surveyor or spatial scientist per week by age group between Northern Territory and Australia. The average weekly income for a surveyor or spatial scientist in The Northern Territory is estimated at $1,982 compared to national average of $1,795.

Chart 10.8: Age Distribution of Workforce – NT vs AUS



	15-24	25-34	35-44	45-54	55-59	60-64	65-69	70+
■ NT	3%	31%	29%	16%	6%	8%	5%	2%
■ AUS	7%	28%	26%	20%	8%	7%	2%	1%

Chart 10.9: Full-time Weekly Earnings by Age – NT vs AUS



10.3 Forecasts of skilled labour demand

Total labour demand in Northern Territory is projected to rise from 171 persons in FY2018 to 186 persons in FY2020, in accordance with the growth in M&HI activity and residential and non-residential building. From a peak of 193 persons in FY2022, labour demand is expected to fall at an average level of 165 persons between FY2023 and FY2028.

Chart 10.10: Forecast of Total Demand for Skilled Labour – NT (1.5% productivity growth)

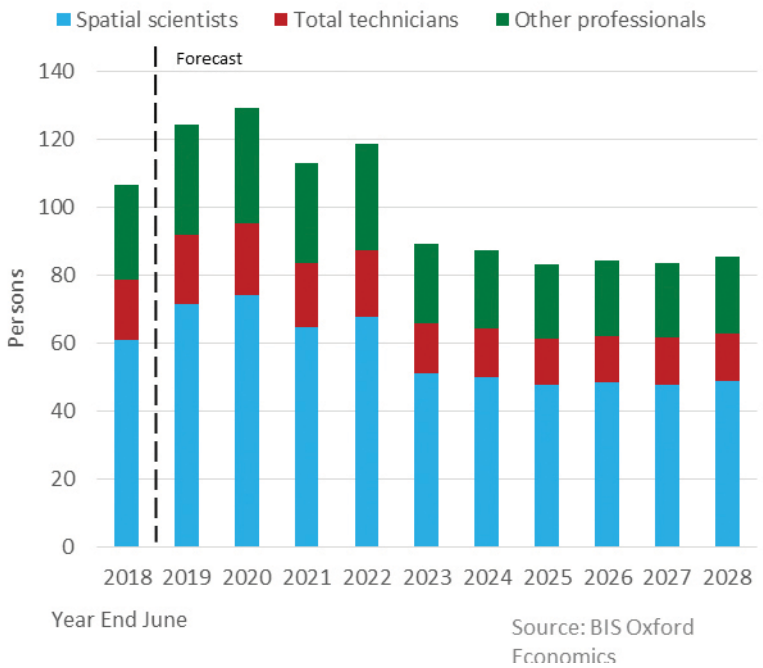


Chart 10.11: Forecast of Demand for Surveyors by Sector – NT (1.5% productivity growth)

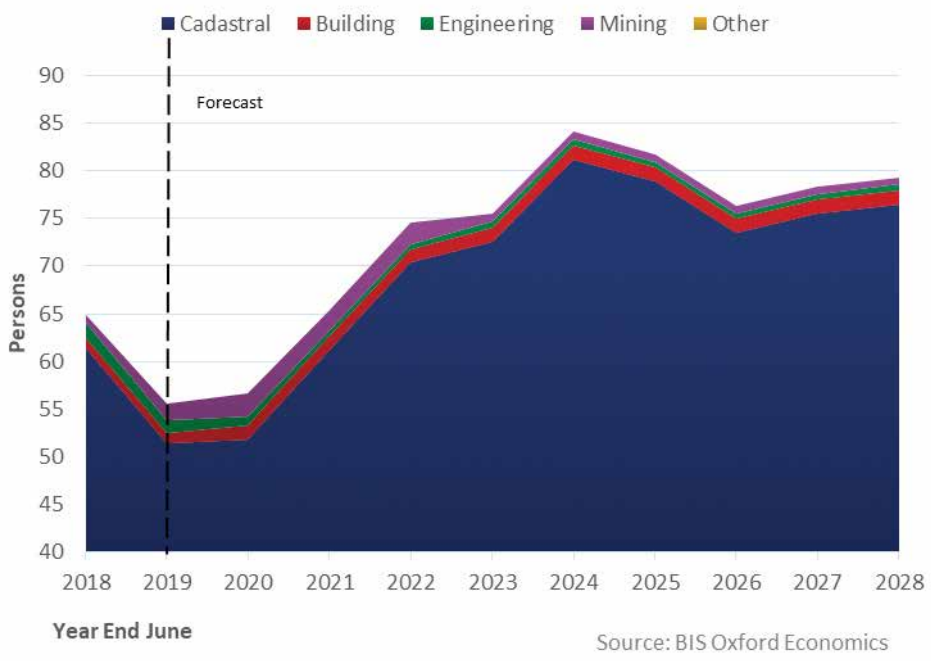
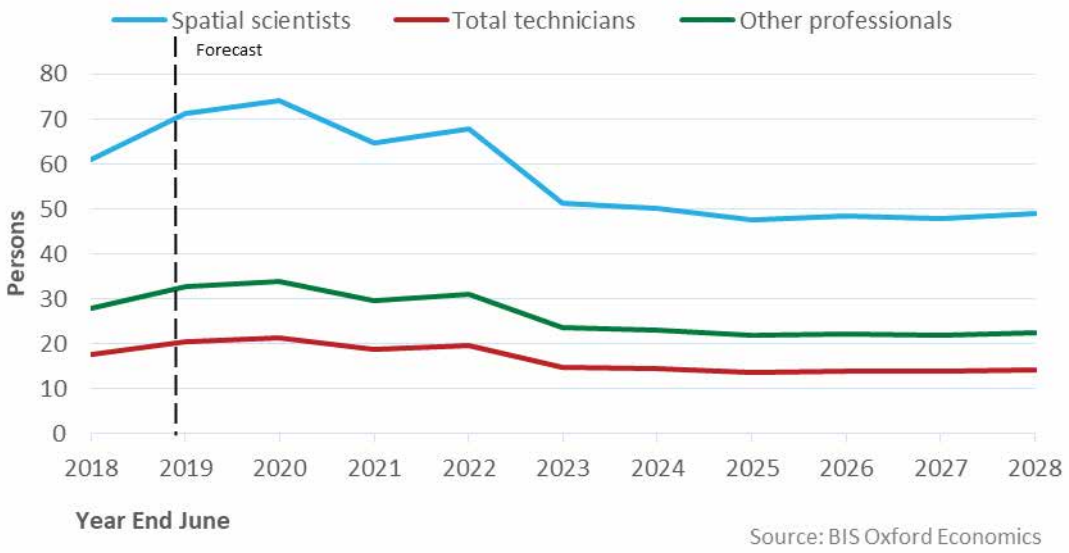


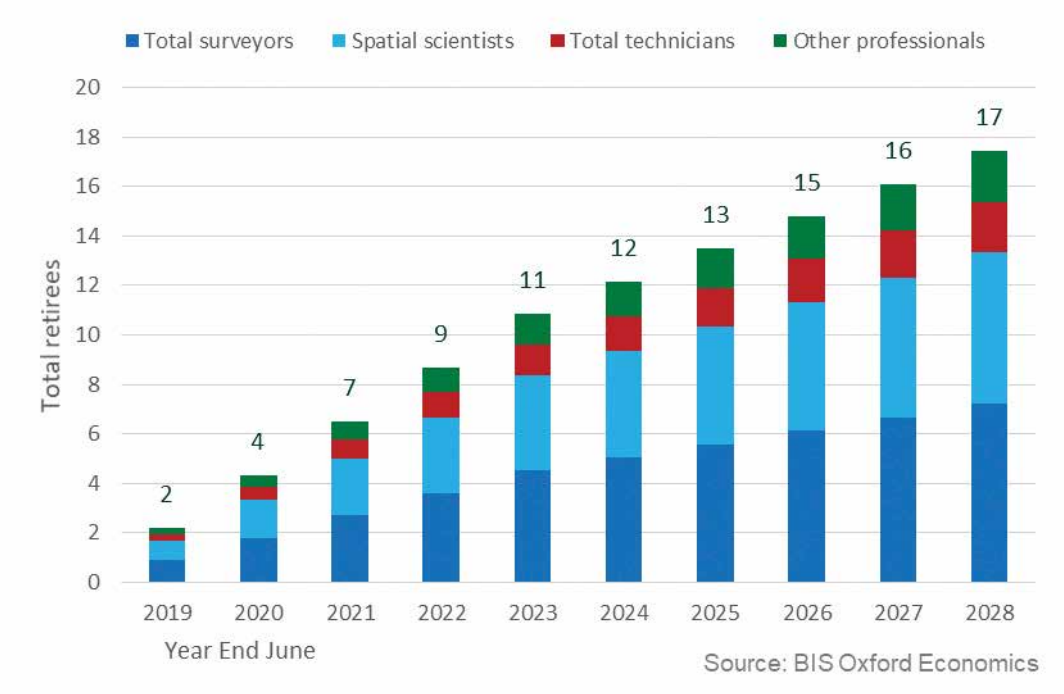
Chart 10.12: Forecast of Demand for Spatial Scientists, Technicians and Other Professionals – NT (1.5% productivity growth)



10.4 Forecast of workforce attrition

We estimate that 9.2% of existing the workforce in the Northern Territory will retire in the next 10 years, given the current age profile of the workforce. This includes 7 surveyors, 6 spatial scientists, 2 technicians and 2 other professionals.

Chart 10.13: Forecast of Cumulative Workforce Attrition – NT



10.5 Forecast workforce gap

Unlike other states except Western Australia, Northern Territory is estimated to face a small surplus of 18 personnel in FY2018, mostly made up of surveyors. The overall surplus is expected to mostly continue in the following decade, except in FY2020 and FY2022 as existing workforce will not be able to meet the increased construction activity during those years. However, we project a small shortage of surveyors from FY2022 onwards, as well as a shortage of spatial scientists between FY2019 and FY2022 as existing workers retire.

Chart 10.14: Forecast of Workforce Gap for Registered Surveyors – NT (1.5% Productivity Growth)

Chart 10.15: Forecast of Workforce Gap for Total Surveyors – NT (1.5% Productivity Growth)

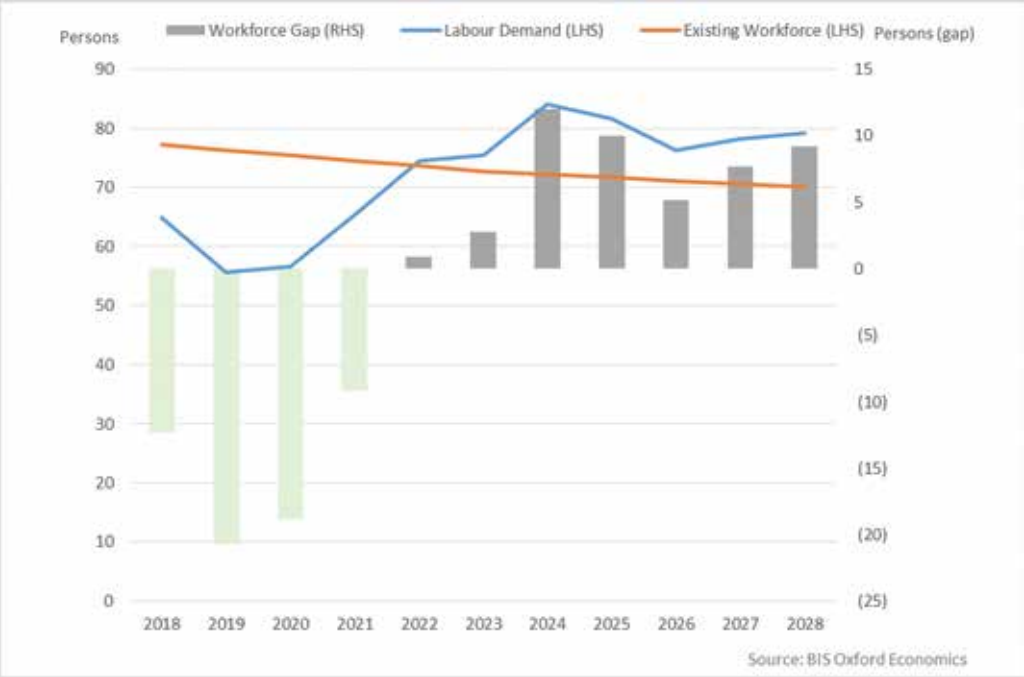


Chart 10.16: Forecast of Workforce Gap for Spatial Scientists – NT (1.5% Productivity Growth)

Chart 10.17: Forecast of Workforce Gap for Total Technicians – NT (1.5% Productivity Growth)

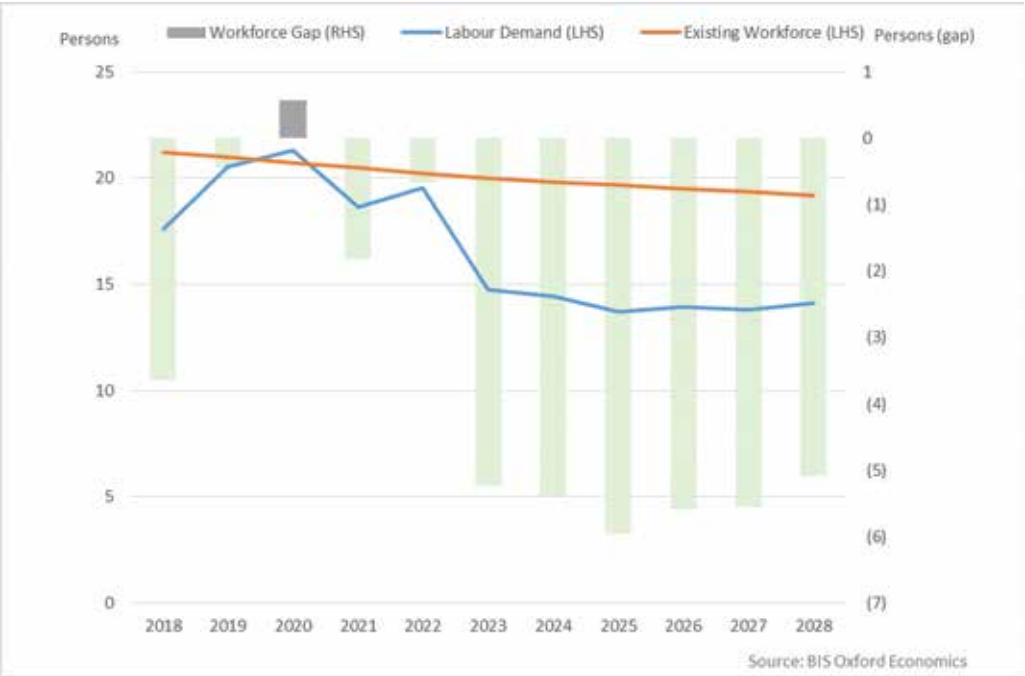
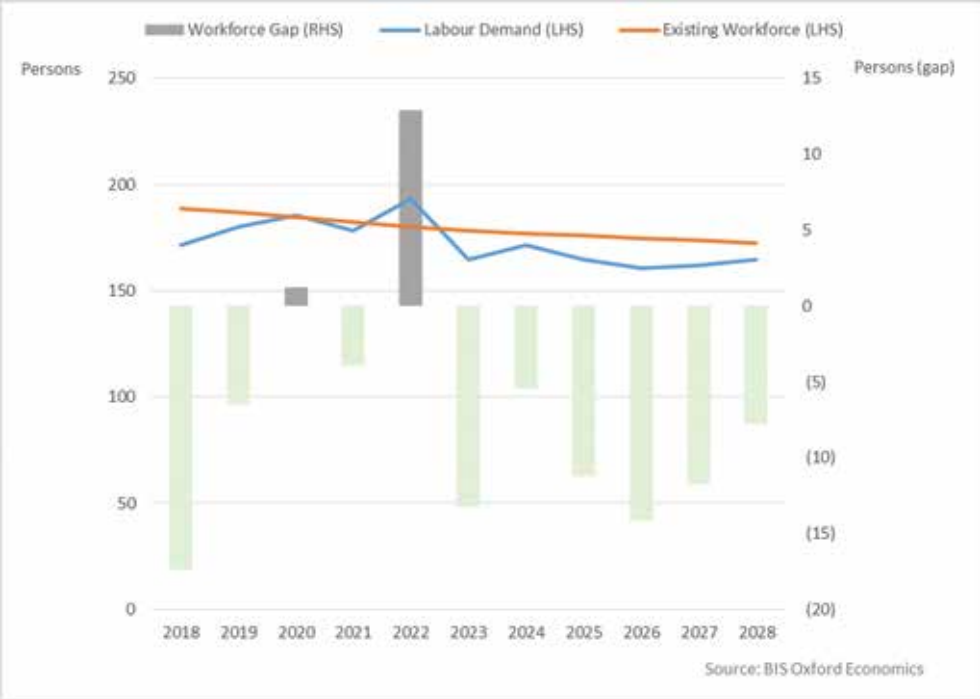


Chart 10.18: Forecast of Workforce Gap for Total Skilled Workforce – NT (1.5% Productivity Growth)



Overall, we project Northern Territory's current stock of surveyors and spatial scientists to be able to meet construction activity throughout most of the forecast period to FY2028. Similarly, we also forecast a relatively small surplus of technicians within the same period.

Table 10.2: Workforce Gap Outcome – NT

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Surveyors & spatial scientists			*Surplus*					*Surplus*		
	(14)	(9)	(8)	6	(8)	1	(3)	(7)	(4)	(1)
Surveying & spatial science technicians			*Surplus*					*Surplus*		
	(0)	1	(2)	(1)	(5)	(5)	(6)	(6)	(6)	(5)

Source: BIS Oxford Economics

Table 10.3: Labour Demand Forecast and Workforce Gap – Northern Territory (Baseline Scenario based on 1.5% labour productivity growth)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
	Estimates	Forecasts									
Labour Demand											
All Surveyors	**65**	**56**	**57**	**65**	**75**	**75**	**84**	**82**	**76**	**78**	**79**
Cadastral	61	51	52	61	70	73	81	79	74	76	76
Building	1	1	1	1	1	1	1	1	1	1	1
Engineering	2	1	1	1	1	1	1	1	1	1	1
Mining	1	2	2	2	2	1	1	1	1	1	1
Other sectors	0	0	0	0	0	0	0	0	0	0	0
Registered/Licensed Surveyors (a)	*45*	*39*	*40*	*46*	*52*	*53*	*59*	*57*	*53*	*55*	*55*
Spatial Scientists	61	71	74	65	68	51	50	48	48	48	49
Total Technicians	18	21	21	19	20	15	14	14	14	14	14
Total Surveying & Geospatial Workforce	**144**	**148**	**152**	**149**	**162**	**141**	**149**	**143**	**139**	**140**	**142**
Other Professionals	28	33	34	30	31	23	23	22	22	22	22
Total skilled labour demand	**172**	**180**	**186**	**178**	**193**	**165**	**172**	**165**	**161**	**162**	**165**
Existing Workforce (b)											
All Surveyors	**77**	**76**	**75**	**75**	**74**	**73**	**72**	**72**	**71**	**71**	**70**
Cadastral	74	73	72	71	70	69	69	68	68	67	67
Building	1	1	1	1	1	1	1	1	1	1	1
Engineering	1	1	1	1	1	1	1	1	1	1	1
Mining	1	1	1	1	1	1	1	1	1	1	1
Other sectors	0	0	0	0	0	0	0	0	0	0	0
Registered/Licensed Surveyors	*54*	*53*	*53*	*52*	*52*	*51*	*51*	*50*	*50*	*49*	*49*
Spatial Scientists	66	65	64	63	63	62	61	61	60	60	60
Total Technicians	21	21	21	20	20	20	20	20	19	19	19
Total Surveying & Geospatial Workforce	**164**	**162**	**160**	**158**	**156**	**155**	**153**	**152**	**151**	**150**	**149**
Other Professionals	25	24	24	24	24	24	24	24	24	24	24
Total skilled labour	**189**	**187**	**185**	**182**	**180**	**178**	**177**	**176**	**175**	**174**	**172**
Workforce Gap (c)											
All Surveyors	**(12)**	**(21)**	**(19)**	**(9)**	**1**	**3**	**12**	**10**	**5**	**8**	**9**
Cadastral	(12)	(21)	(20)	(10)	0	3	13	11	6	8	10
Building	(0)	(0)	0	0	0	0	0	0	0	0	0
Engineering	0	0	(0)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Mining	(0)	1	1	1	1	(0)	(0)	(0)	(0)	(0)	(0)
Other sectors	0	0	0	0	0	0	0	0	0	0	0
Registered/Licensed Surveyors	*(9)*	*(14)*	*(13)*	*(6)*	*1*	*2*	*8*	*7*	*4*	*5*	*6*
Spatial Scientists	(5)	6	10	1	5	(11)	(11)	(13)	(12)	(12)	(11)
Total Technicians	(4)	(0)	1	(2)	(1)	(5)	(5)	(6)	(6)	(6)	(5)
Total Surveying & Geospatial Workforce	**(21)**	**(15)**	**(8)**	**(10)**	**6**	**(13)**	**(5)**	**(9)**	**(13)**	**(10)**	**(6)**
Other Professionals	3	8	10	6	7	(0)	(1)	(2)	(2)	(2)	(1)
Total skilled labour	(17)	(7)	1	(4)	13	(13)	(5)	(11)	(14)	(12)	(8)

(a) Registered surveyors are included in the total number of surveyors.

Source: BISOE, ABS, CRSBANZ

(b) Existing workforce is generated by diminishing the size of the current skilled workforce due to retirement.

(c) Workforce gap is calculated as labour demand less existing workforce. Positive number implies shortage of labour; bracketed number implies excess of supply.

Chapter Eleven

Forecasts of Labour Demand and Workforce Gap for Australian Capital Territory

11. FORECASTS OF LABOUR DEMAND AND WORKFORCE GAP FOR AUSTRALIAN CAPITAL TERRITORY

11.1 Economic and industry outlook

11.1.1 General economic environment

The Australian Capital Territory economy staged a healthy recovery over FY2016 and FY2017 and sustained robust growth in FY2018. The key driver of growth has been the reversal of the Commonwealth Government's earlier austerity drive. By both measures of economic growth, State Final Demand (SFD) and Gross State Product (GSP), the ACT outperformed against the national average in FY2018 – by 4.0% versus 3.5% in the former case and 3.6% versus 2.8% in the latter. Employment growth was robust in calendar 2017, at 4.8%. However, employment levels have fallen in recent months, dragging down growth over the year to September 2018 to just 0.5%. Despite the recent slowing, the ACT unemployment rate remains the lowest of all the states and territories, at 3.4% in November 2018. This compares with 5.1% Australia-wide.

Government expenditure dominates the economy of the ACT, unlike the other states (except the Northern Territory). In FY2017, government recurrent spending and public investment constituted around two-thirds of SFD – compared to the more usual figure of around 22% for other states. Indeed, the sustained weakness of government consumption expenditure over the 5 years to FY17 inclusive constrained SFD over those 5 years. However, the strong bounce back in government consumption expenditure last year (+3.8%) lifted SFD to 4% in FY2018.

A key driver has been strong growth in household spending (averaging 3.5% over the past 3 years, compared to the national average of 2.8%), which has been underpinned by the acceleration in employment growth, picking up from 1.5% in FY2016 to 2.7% in FY2017 and then averaging 3% over the past year. Population growth, although expected to ease to 1.7% by FY2021, will continue to provide a boost to aggregate consumer spending.

New public investment lifted strongly (by 21%) in FY2017 and a further 4% in FY2018, due to a strong increase in public non-dwelling building led by high schools and university building activity, the $110 million University of Canberra Hospital and the $100 million ACT Supreme Court redevelopment. Public engineering construction has also lifted due to the NBN roll-out, water and sewerage projects and $700 million Canberra Light Rail project (stage 1). However, with these projects finishing and road construction falling, public engineering construction will plummet over the next 2 years.

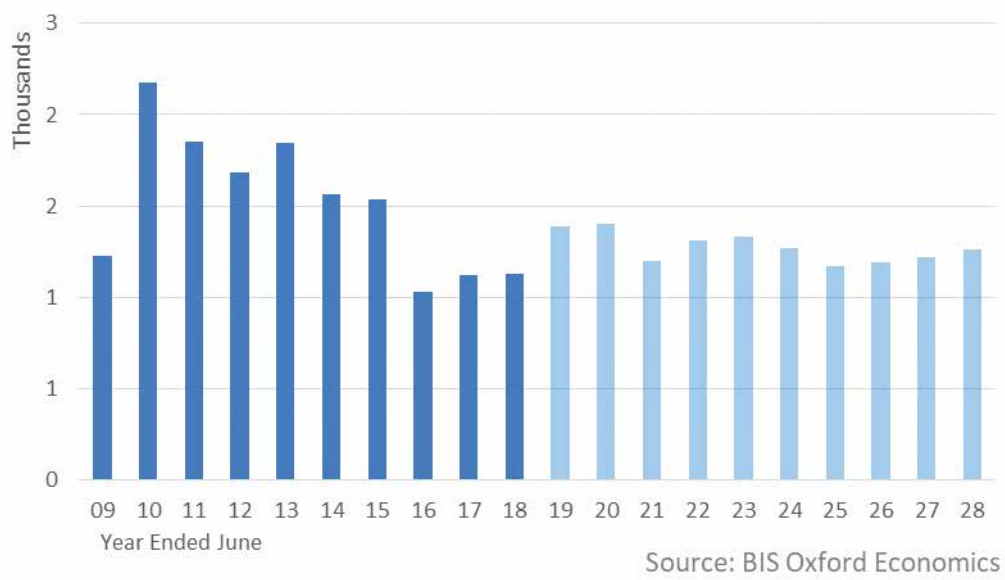
Meanwhile, business investment is currently growing strongly, increasing by 10% in FY2018, due to non-dwelling building and equipment expenditure rising strongly. However, only modest increases in business investment are expected over the next 3 years.

Overall, both SFD and GSP are expected to ease over the next three years. SFD is forecast to average 2.5% p.a., while GSP is forecast to average 2.3% p.a.

11.1.2 Cadastral sector - Private house commencements

After four years of negative growth, new dwelling starts in the Australian Capital Territory rebounded 8.4% to 1,117 new houses in FY2017. Strong population growth and an expanding economy are estimated to have sparked demand, as evidenced by the small rise in house commencements to 1,260 in FY2018. Over the next five years to FY2023, house commencements are forecast to average around 1,325 houses p.a., a 4% rise from FY2014-18. However, in response to a developing oversupply, it is forecast that house building activity will retreat in the FY2024-28 period, easing back to an average of 1,222 new houses p.a. which is comparable to the FY2014-18 activity.

Chart 11.1: Number of Private House Dwellings Commenced – ACT



11.1.3 Building sector - Multi-residential dwellings and non-dwelling buildings

Multi-residential dwellings

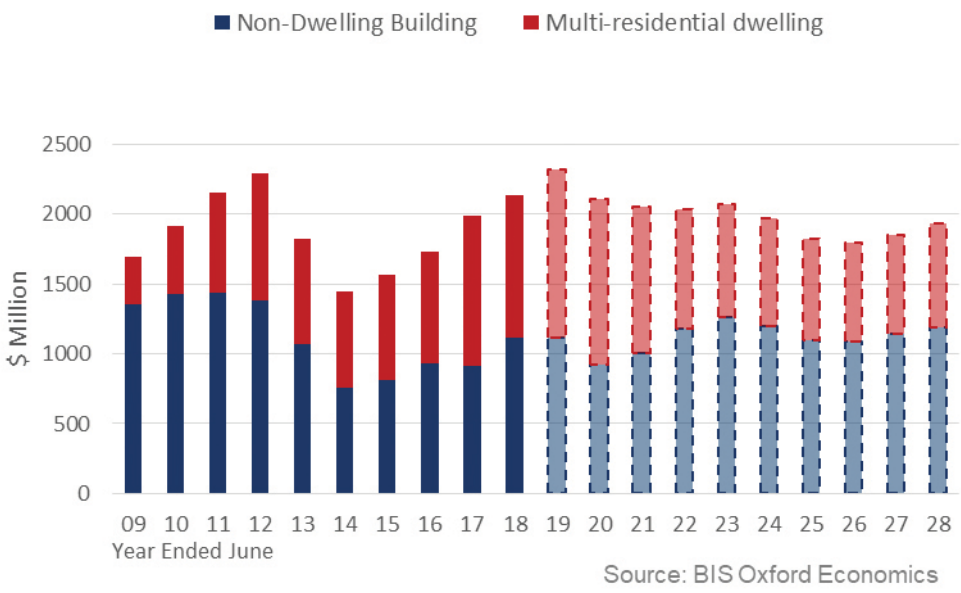
After three years of growth, the level of work done in multi-residential dwellings has fallen modestly by 4% to $1.0 billion in FY2018. Activity is projected to grow to $1.3 billion in FY2019 but begins to slow down in FY2020 due to a developing oversupply. As multi-residential comes off a record unsustainable base, activity is forecast to retreat sharply from FY2021 to $771 million in FY2026. This is then followed by a modest recovery in FY2027 (+2%) and FY2028 (+5%).

Non-dwelling buildings

As the base of the Federal Government, non-residential building in Canberra is heavily reliant on the operations of the public sector. Driven by major projects in the office, education and transport sectors, non-residential starts held at a very high level in the Australian Capital Territory from FY2006 to FY2013, at over $1 billion per annum. Activity has since fallen back considerably, to an average work done of $832 million p.a. between FY2014 and FY2016.

However, the Canberra economy continues to perform well and a sharp rebound to $1.1 billion was estimated in FY2018 as a series of new education and office developments was undertaken, including the $180 million ANU –Union Court Development. As the pipeline of major projects shrinks, non-dwelling building activity is forecast to dip back temporarily in FY2019 (-1%) and FY2020 (-17%). Annual work done over the FY2019-23 is forecast to average $1.09 billion p.a., followed by a similar level of activity in FY2024-28 (average $1.14 p.a.).

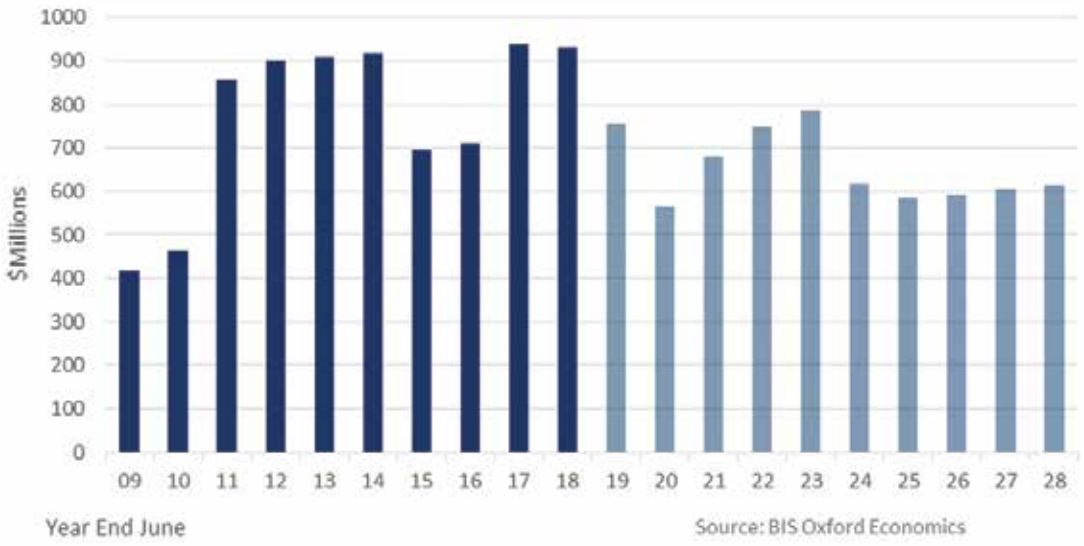
Chart 11.2: Multi-residential dwelling and non-dwelling building – ACT
Value of Work Done, 2015/16 Prices



11.1.4 Engineering sector - Utilities and transport engineering construction

The ACT is a small territory with a small population, so the public sector drives the majority of engineering construction. This means that there are a few large projects that determine the movement of construction investment and completion of these projects strongly weighs on overall work done in the ACT. Over the last 4 years, ACT utilities and transport engineering construction activity has risen over 33.8% to an estimated $932 million, mainly on the back of rail (Capital Metro Stage 1) and, to a lesser extent, telecoms (mainly the rollout of the NBN). Looking ahead, the completion of the first stage of Capital Metro, coupled with the winding down of NBN work, is forecast to see ACT engineering construction slip to just $566m by FY2020. However, the second stage of Capital Metro (Parliamentary Triangle) as well as Monaro Highway upgrades are expected to drive a turnaround from FY2021. Work done in utilities and transport construction is forecast to average $708 million in FY2019-23 (-16% from previous five-year average), followed by an average $603 million FY2024-28 (-15%).

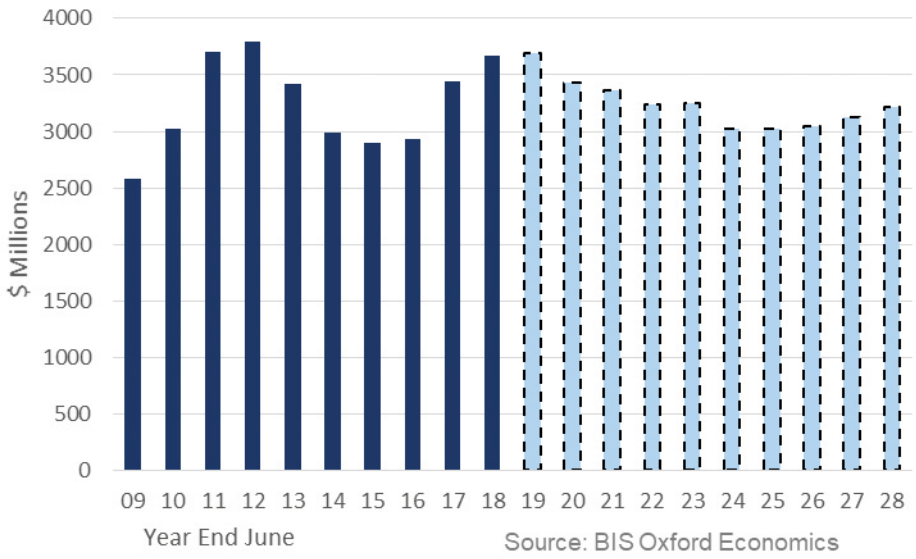
Chart 11.3: Utilities and Transport Engineering Construction – ACT
Value of Work Done, 2015/16 Prices



11.1.5 Total construction

Overall, construction activity in the Australian Capital Territory to increase by 0.5% to $3.7 billion in FY2019, given the continual growth in residential and non-residential building activity. It is then projected to gradually decline to $3.0 billion by FY2026 as major projects are completed. We estimate total construction in FY2024-28 to average $3.1 billion, compared to FY2019-23 average of $3.4 billion.

Chart 11.4: Total Construction by Category – ACT
Value of Work Done, 2015/16 Prices



11.2 Estimate of the existing surveying and geospatial workforce

Size and breakdown of state workforce

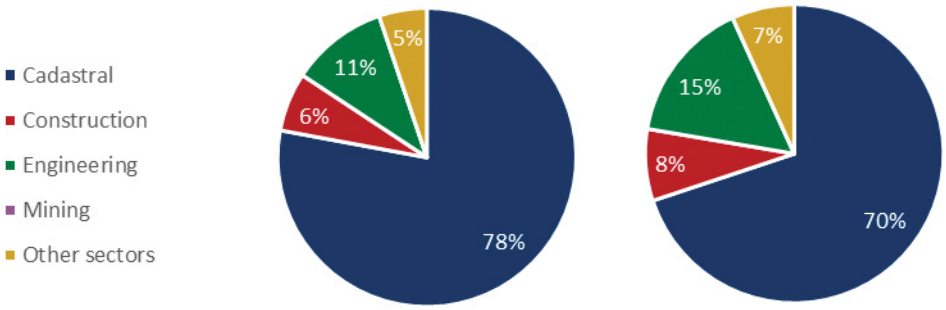
Since our previous update in FY2014, the size of the surveying and geospatial workforce in the Australian Capital Territory is estimated to have risen by 36% to 370 persons. Of which we estimate 131 are surveyors, 204 are spatial scientists and 35 are technicians. The cadastral sector is estimated to take up most of the surveying work, comprising 78% of surveying activity in the state. This is followed by engineering (11%), building (6%), and other sectors (5%).

Table 11.1: Estimated Size of Total Skilled Workforce in Australian Capital Territory

Occupation Groups	2013/14	2017/18		
Surveying sectors				
Cadastral	72	102	▲	30
Building	8	8		
Engineering	16	14	▼	(2)
Mining	-	-		
Other sectors	7	7		
Total surveyors	**103**	**131**	▲	**28**
Registered Surveyors	*86*	*80*	▼	(6)
Total spatial scientists	**143**	**204**	▲	**61**
Surveying technicians	20	30	▲	10
Spatial technicians	5	5		
Total technicians	**25**	**35**	▲	**10**
Total skilled surveying & geospatial workforce	**271**	**370**	▲	**99**
Planners	5	8	▲	3
Engineers	7	12	▲	5
Environmental Scientists	2	4	▲	2
Other staff (include Architects)	1	15	▲	14
Total other professionals	**15**	**39**	▲	24
Total Skilled Workforce	286	409	▲	**123**

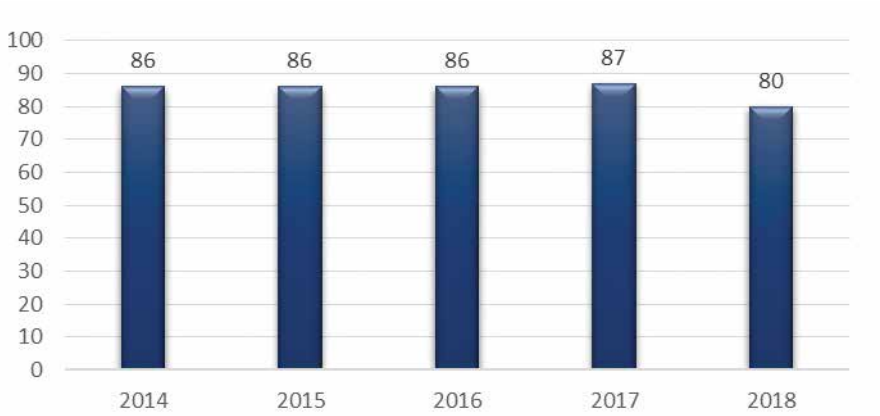
Source: BIS Oxford Economics, ABS, CRSBANZ

Chart 11.5: Comparing Surveying Sectoral Activity between FY18 (left) and FY14 (right)



Source: BIS Oxford Economics

Chart 11.6: Number of Registered Surveyors - ACT



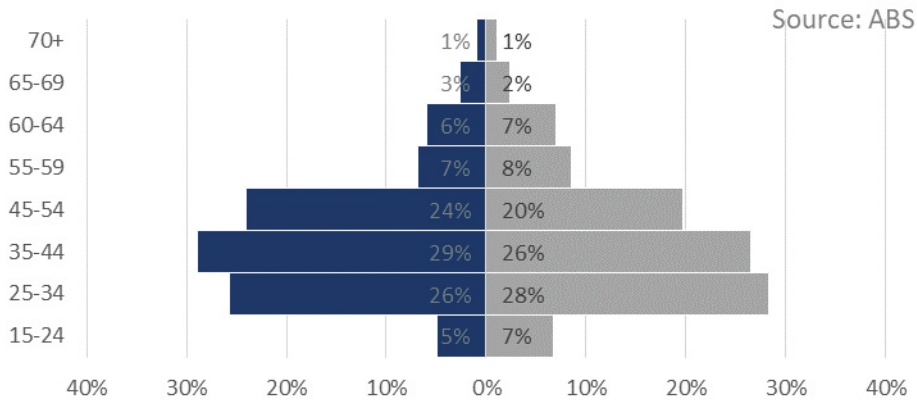
Source: ACT Planning & Land Authority

Age profile and income of state workforce

Chart 11.7 shows the age profile of the surveying workforce in the Australian Capital Territory in comparison to national figures. 40.5% of the workforce in Australian Capital Territory is aged over 45 years old, compared to the national figure of 38.6%.

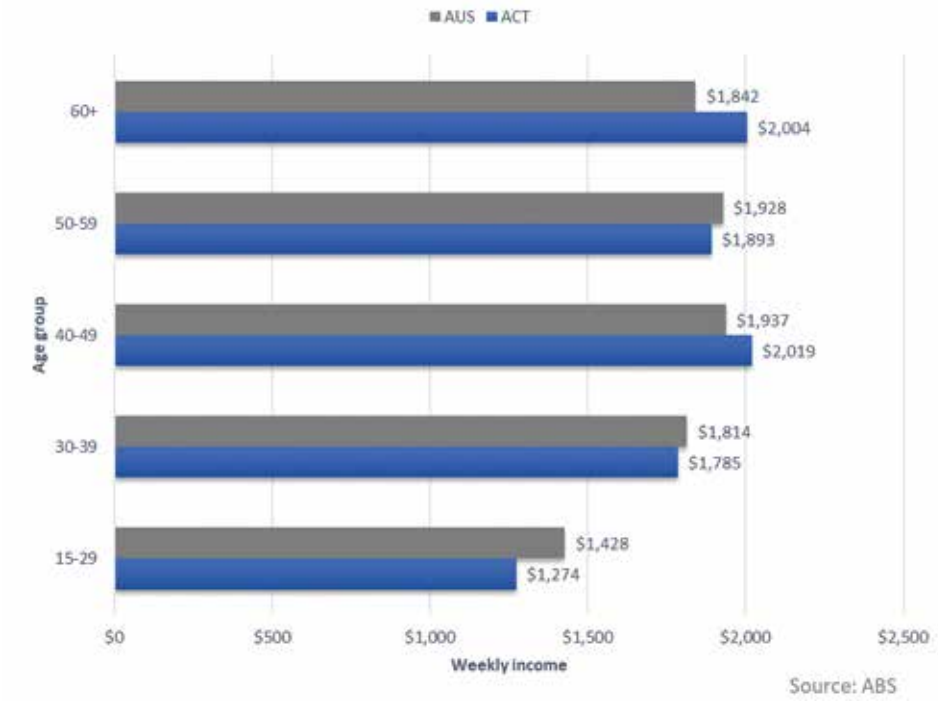
Chart 11.8 shows the comparison of average earnings of full-time surveyor or spatial scientist per week by age group between Australian Capital Territory and Australia. The average weekly income for a surveyor or spatial scientist in Australian Capital Territory is estimated at $1,818 compared to national average of $1,795.

Chart 11.7: Age Distribution of Workforce – ACT



	15-24	25-34	35-44	45-54	55-59	60-64	65-69	70+
■ ACT	5%	26%	29%	24%	7%	6%	3%	1%
■ AUS	7%	28%	26%	20%	8%	7%	2%	1%

Chart 11.8: Full-time Weekly Earnings by Age – ACT vs AUS



11.3 Forecasts of skilled labour demand

After an initial increase in FY2019, total labour demand in ACT is projected to decline over the next seven years to FY2025, in line with weakening construction activity. Even though construction activity is projected to pick up after FY2026, the increased skills need is expected to be met by rising productivity growth, hence stabilising overall labour demand around 345 persons in FY2026-28.

Chart 11.9: Forecast of Total Demand for Skilled Labour – ACT (1.5% productivity growth)

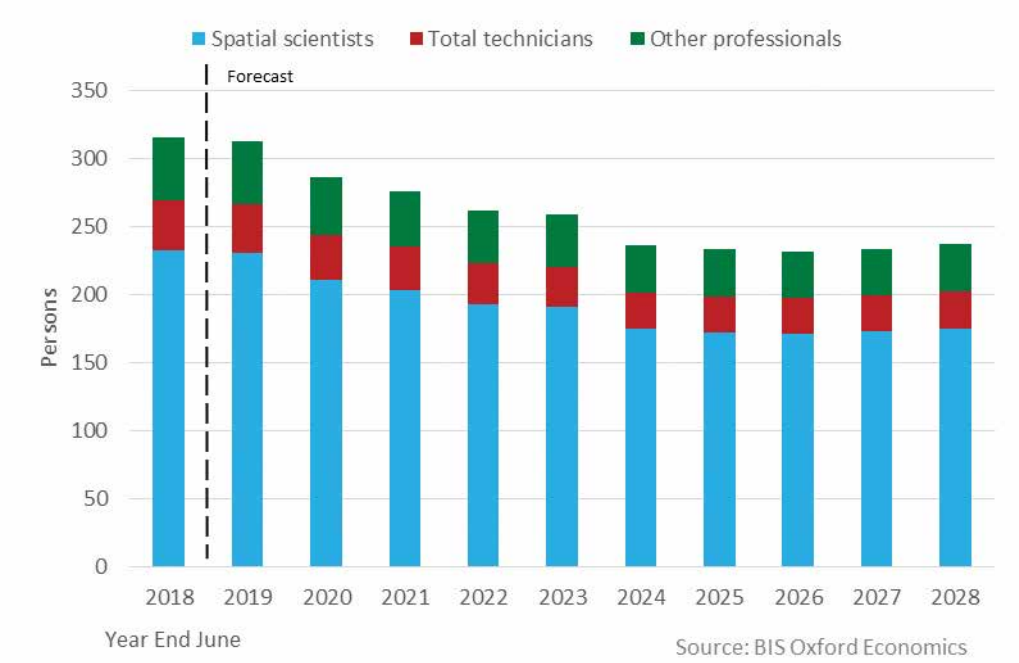


Chart 11.10: Forecast of Demand for Surveyors by Sector – ACT (1.5% productivity growth)

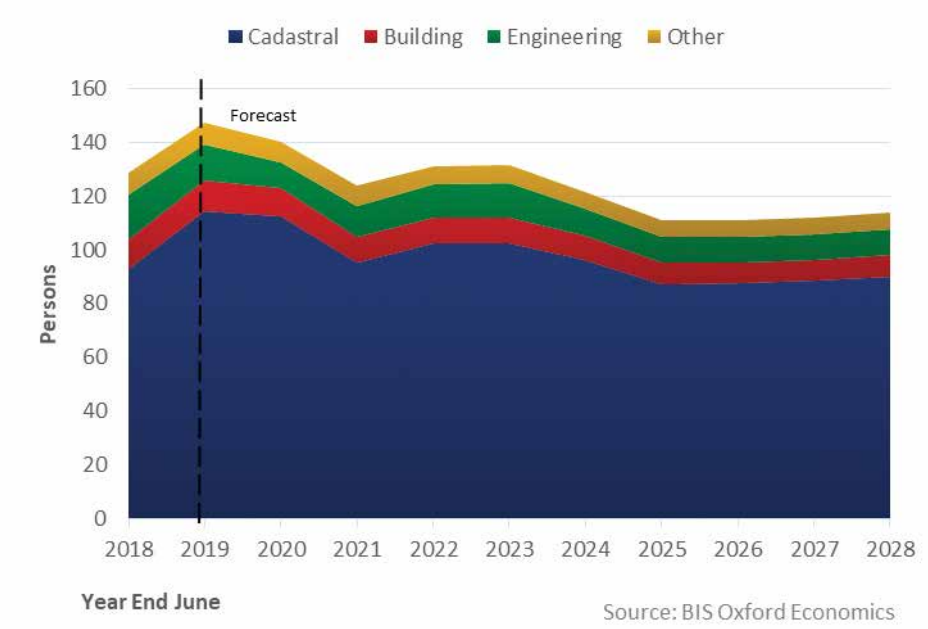
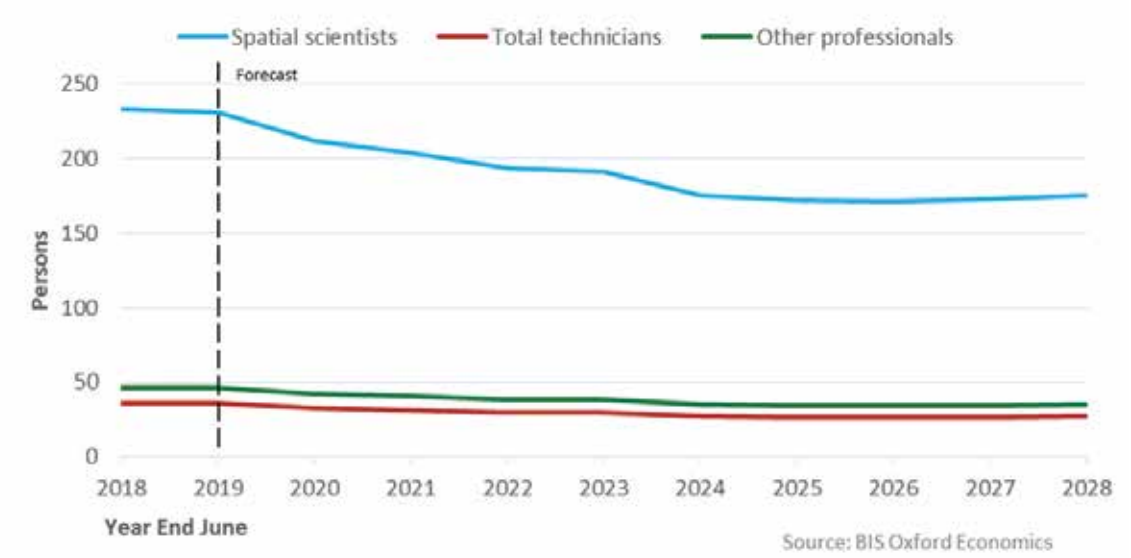


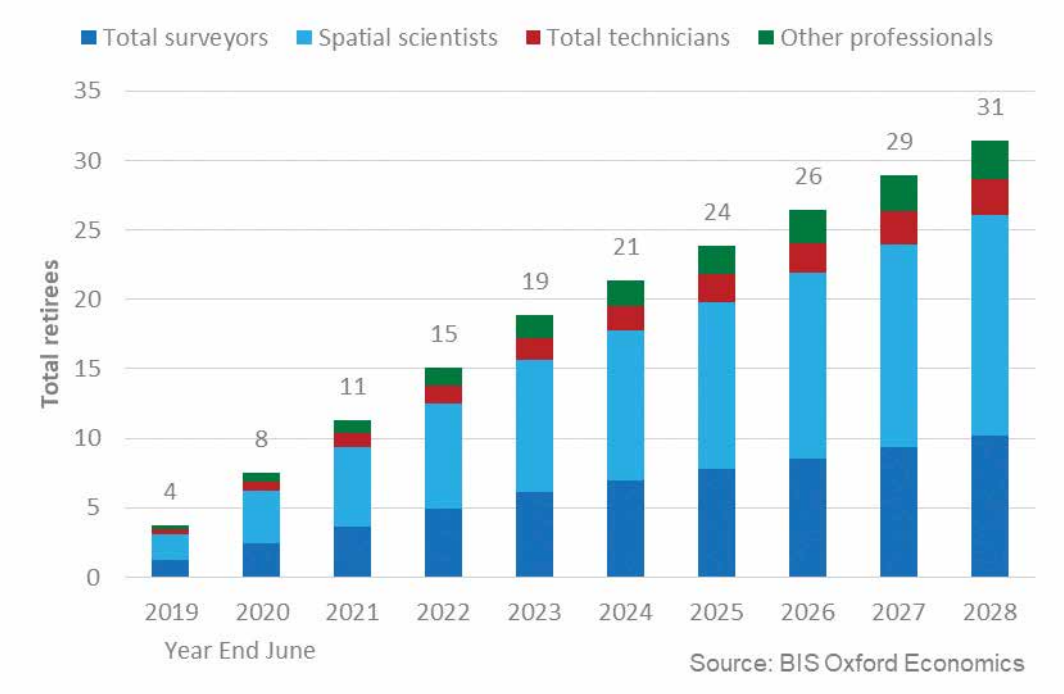
Chart 11.11: Forecast of Demand for Spatial Scientists, Technicians and Other Professionals – ACT (1.5% productivity growth)



11.4 Forecast of workforce attrition

We estimate that 7.7% of the existing workforce in the Australian Capital Territory will retire in the next 10 years, given the current age profile of the workforce. This includes 10 surveyors, 16 spatial scientists, 3 technicians and 3 other professionals.

Chart 11.12: Forecast of Cumulative Workforce Attrition – ACT



11.5 Forecast workforce gap

The size of the workforce gap in the Australian Capital Territory is estimated at 37 personnel in FY2018. The primary contributor to this shortage was spatial scientists who make up 78% of the workforce gap, followed by other professionals who made up the remaining gap. The shortage is projected to decline over the years, eventually reaching a sustained surplus after FY2024.

Chart 11.13: Forecast of Workforce Gap for Registered Surveyors – ACT
(1.5% Productivity Growth)

Chart 11.14: Forecast of Workforce Gap for Total Surveyors – ACT
(1.5% Productivity Growth)

Chart 11.15: Forecast of Workforce Gap for Spatial Scientists – ACT (1.5% Productivity Growth)

Chart 11.16: Forecast of Workforce Gap for Total Technicians – ACT (1.5% Productivity Growth)

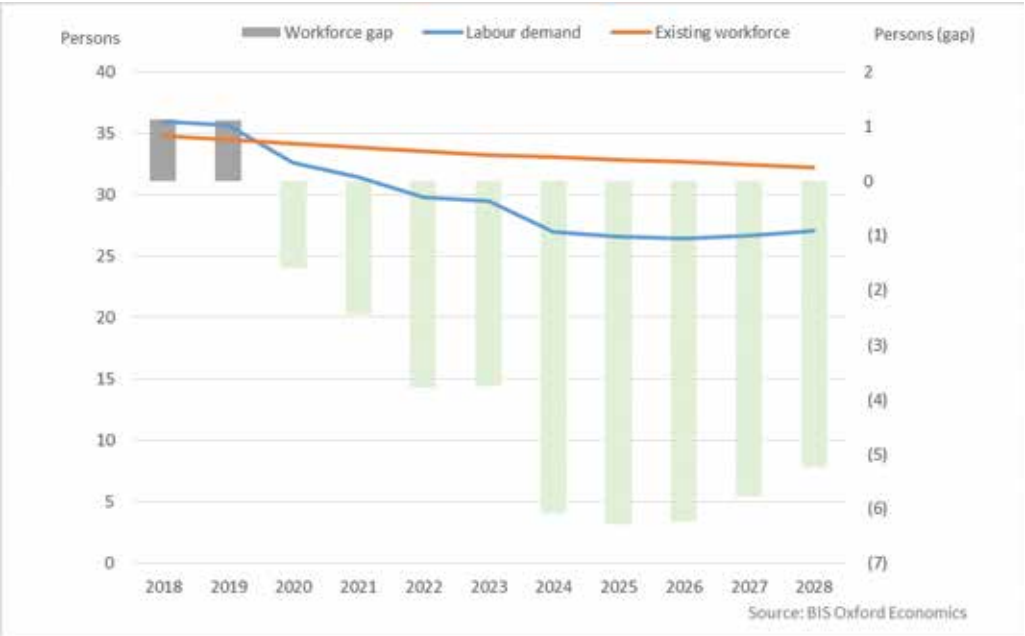
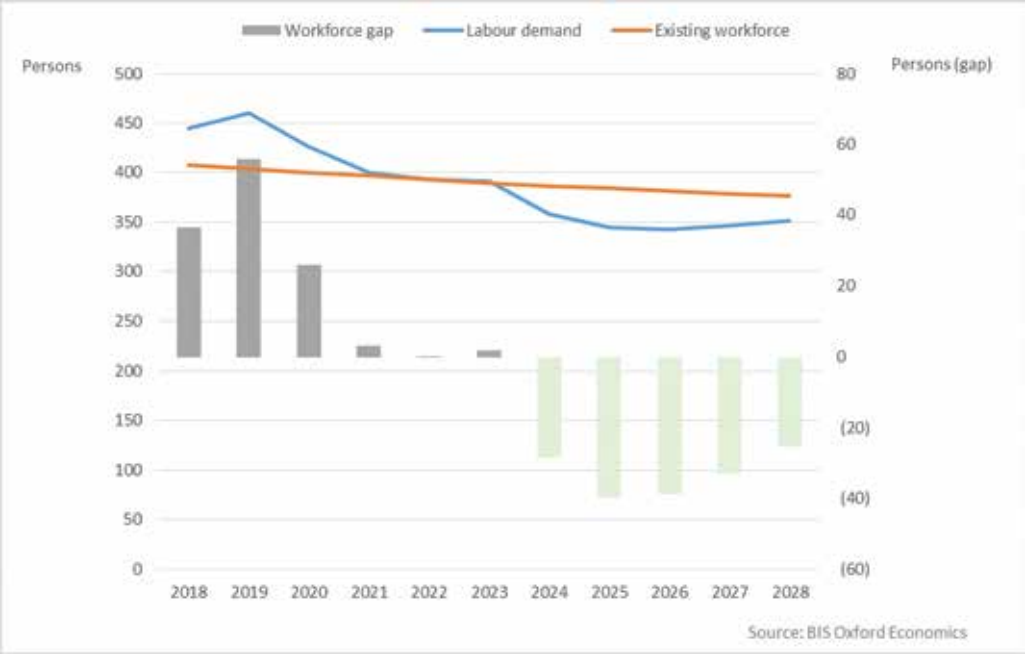


Chart 11.17: Forecast of Workforce Gap for Total Skilled Workforce – ACT
(1.5% Productivity Growth)



Overall, we project the current stock of surveyors and spatial scientists in the Australian Capital Territory to be insufficient to meet construction activity during the first half of the forecast period to FY2023. This gap will transition to a surplus, however, during the second half of the forecast period as construction activity subsides. Furthermore, we forecast a small surplus of technicians throughout the forecast period.

Table 11.2: Workforce Gap Outcome – ACT

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
			Shortage					*Surplus*		
Surveyors & spatial scientists	46	23	2	2	4	(21)	(32)	(31)	(26)	(20)
			Surplus					*Surplus*		
Surveying & spatial science technicians	1	(2)	(2)	(4)	(4)	(6)	(6)	(6)	(6)	(5)

Source: BIS Oxford Economics

Table 11.3: Labour Demand Forecast and Workforce Gap – Australia Capital Territory (Baseline Scenario based on 1.5% labour productivity growth)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
	Estimates	Forecasts									
Labour Demand											
All Surveyors	**129**	**147**	**140**	**124**	**131**	**132**	**121**	**111**	**111**	**112**	**114**
Cadastral	93	114	113	95	102	102	96	87	87	88	90
Building	11	11	10	10	10	9	9	8	8	8	8
Engineering	17	13	10	12	13	13	10	9	9	10	9
Mining	0	0	0	0	0	0	0	0	0	0	0
Other sectors	8	8	8	7	7	7	6	6	6	6	6
Registered/Licensed Surveyors (a)	*79*	*90*	*86*	*76*	*80*	*80*	*74*	*68*	*68*	*68*	*69*
Spatial Scientists	233	231	211	204	193	191	175	172	171	173	175
Total Technicians	36	36	33	31	30	30	27	27	26	27	27
Total Surveying & Geospatial Workforce	**398**	**414**	**384**	**359**	**354**	**352**	**323**	**310**	**308**	**311**	**316**
Other Professionals	47	46	42	41	39	38	35	34	34	35	35
Total skilled labour demand	**444**	**460**	**426**	**400**	**393**	**391**	**358**	**344**	**343**	**346**	**351**
Existing Workforce (b)											
All Surveyors	**131**	**130**	**129**	**127**	**126**	**125**	**124**	**123**	**123**	**122**	**121**
Cadastral	102	101	100	99	98	97	97	96	95	95	94
Building	8	8	8	8	8	8	8	8	8	8	8
Engineering	14	14	14	13	13	13	13	13	13	13	13
Mining	0	0	0	0	0	0	0	0	0	0	0
Other sectors	7	7	7	7	7	6	6	6	6	6	6
Registered/Licensed Surveyors	*80*	*79*	*79*	*78*	*77*	*76*	*76*	*75*	*75*	*74*	*74*
Spatial Scientists	204	202	200	198	196	194	193	192	191	189	188
Total Technicians	35	35	34	34	34	33	33	33	33	32	32
Total Surveying & Geospatial Workforce	**370**	**366**	**363**	**360**	**356**	**353**	**350**	**348**	**346**	**344**	**341**
Other Professionals	38	38	37	37	37	36	36	36	36	35	35
Total skilled labour	**408**	**404**	**400**	**397**	**393**	**389**	**386**	**384**	**381**	**379**	**376**
Workforce Gap (c)											
All Surveyors	**(2)**	**17**	**12**	**(4)**	**5**	**7**	**(3)**	**(12)**	**(12)**	**(10)**	**(7)**
Cadastral	(9)	13	12	(4)	4	5	(1)	(9)	(8)	(7)	(4)
Building	2	3	2	2	1	2	1	0	0	0	1
Engineering	3	(0)	(4)	(2)	(1)	(0)	(3)	(4)	(3)	(3)	(3)
Mining	0	0	0	0	0	0	0	0	0	0	0
Other sectors	2	2	1	1	0	0	(0)	(0)	(0)	(0)	(0)
Registered/Licensed Surveyors	*(1)*	*11*	*7*	*(2)*	*3*	*4*	*(2)*	*(8)*	*(7)*	*(6)*	*(4)*
Spatial Scientists	29	29	11	5	(3)	(3)	(18)	(20)	(20)	(17)	(13)
Total Technicians	1	1	(2)	(2)	(4)	(4)	(6)	(6)	(6)	(6)	(5)
Total Surveying & Geospatial Workforce	**28**	**47**	**21**	**(1)**	**(2)**	**(0)**	**(27)**	**(38)**	**(37)**	**(32)**	**(25)**
Other Professionals	9	9	5	4	2	2	(1)	(1)	(1)	(1)	(0)
Total skilled labour	36	56	26	3	0	2	(28)	(40)	(39)	(33)	(25)

(a) Registered surveyors are included in the total number of surveyors.

Source: BISOE, ABS, CRSBANZ

(b) Existing workforce is generated by diminishing the size of the current skilled workforce due to retirement.

(c) Workforce gap is calculated as labour demand less existing workforce. Positive number implies shortage of labour; bracketed number implies excess of supply.

Chapter Twelve

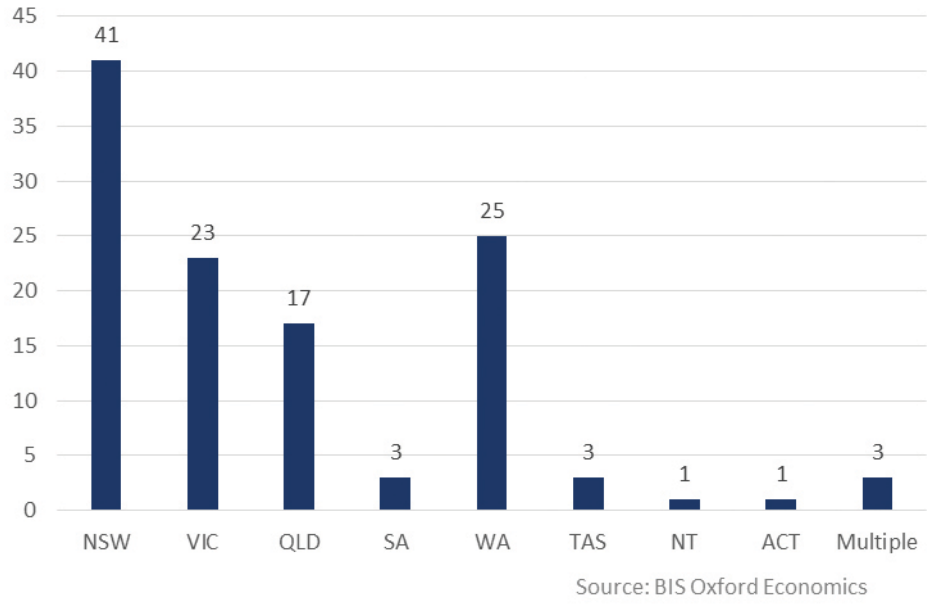
Key Survey Results

12. KEY SURVEY RESULTS

12.1 Survey responses

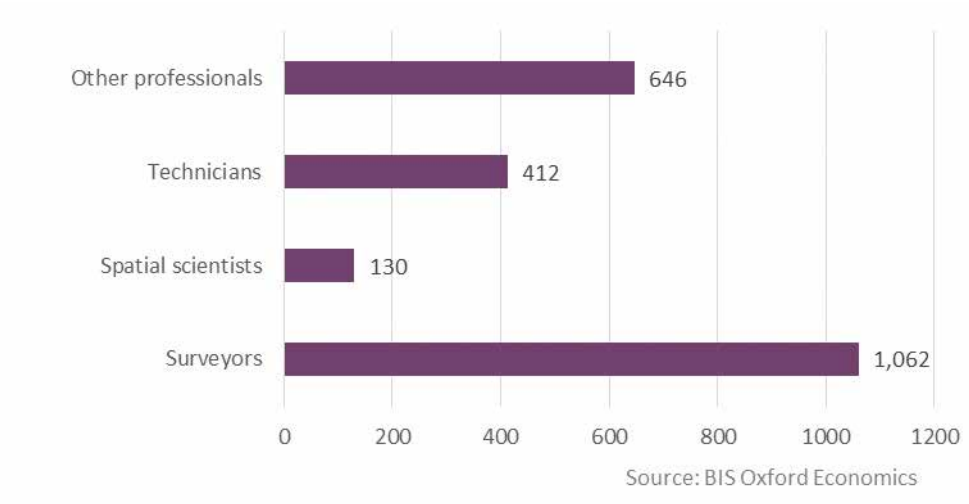
In the latest industry survey, BIS Oxford Economics received a total of 117 survey responses across Australia. Of these responses, 35% were received from New South Wales, 21% from Western Australia, 20% from Victoria, 15% from Queensland and 9% from other states and/or from companies operating in multiple states.

Chart 12.1: Tally of survey responses by State



On aggregate, these survey results represent 2,249 employed persons, including 1,062 surveyors, 130 spatial scientists, 412 technicians and 646 other professionals (comprising of planners, environmental scientists, engineers and other staff). We estimate 13.3% of the surveying and geospatial profession was represented in the survey.

Chart 12.2: Total Current Workforce by occupation

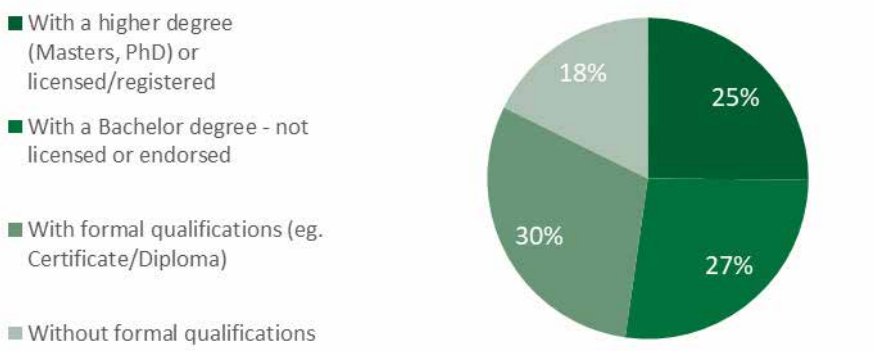


12.2 Key results

Qualifications

Of all the surveyors and spatial scientists represented in our survey, 48% have not graduated with a bachelor's degree or higher. Of the remaining 52% who have obtained a degree, nearly half are currently not licenced, and the other half are qualified with either a licence or a higher degree (Masters, PhD).

Chart 12.3: Qualifications of Surveying and Geospatial Workforce

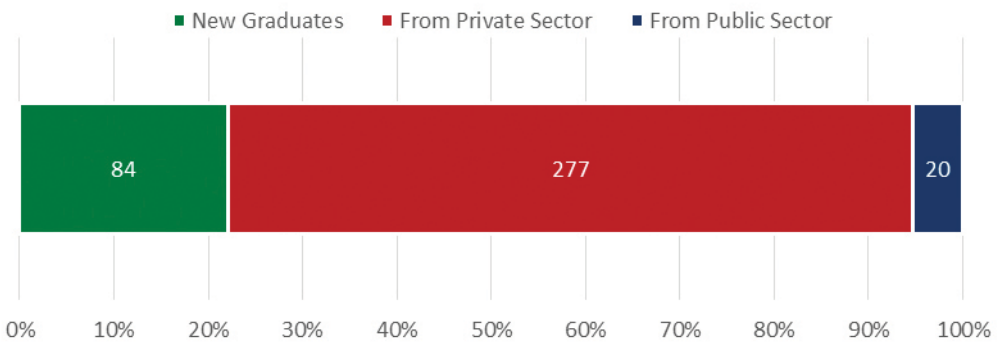


Source: BIS Oxford Economics

New hires

Our respondents indicated a total of 381 new hires in the past 12 months. Of all new hires, 73% were from other firms in the private sector, 5% from the public sector and 22% from new graduates joining the workforce.

Chart 12.4: Breakdown of Hiring Sources for Surveying Firms

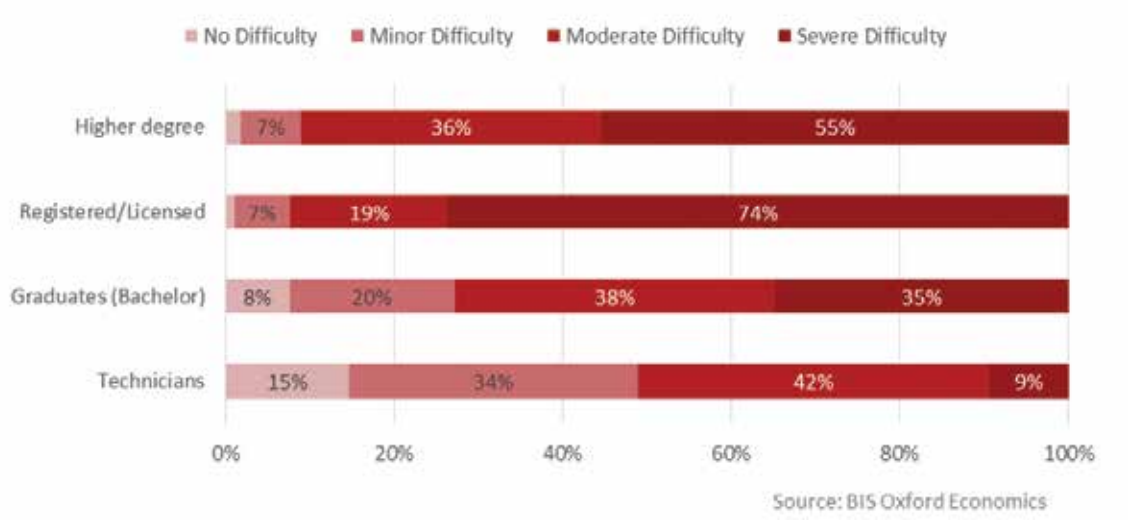


Source: BIS Oxford Economics

Hiring difficulty for surveyors

Chart 12.5 shows the degree of hiring difficulty for surveyors across several skills level. Firms seem to be experiencing the least hiring difficulty with surveying technicians, corresponding to our analysis and forecast above. There are great difficulties for hiring surveyors, however, particularly for registered/licensed surveyors, with 74% of respondents indicating 'Severe Difficulty'.

Chart 12.5: Hiring Difficulty for Surveyors by Skills Level



Chapter Thirteen

Limitations and Future Research

13. LIMITATIONS AND FUTURE RESEARCH

A key limitation of the quantitative model used in this report is that it measures requirements in terms of labour or 'personnel', not necessarily skills and experience. This is important in an industry such as surveying, given that it can take 10 years through training and experience to become a surveyor. The model used here quantifies a capability deficit or surplus in terms of the number of persons required across the occupation groups considered. However, this does not consider the range of skills or experience held by persons, not only between occupations, but within an occupation group. Retirees will always have much more skills and experience than the new personnel that replace them. This is particularly true when supply is focused on new graduates, but the impact may be lessened by the hiring of personnel via immigration, where existing skills and experience may be higher.

As mentioned in earlier studies, an "equivalent persons" index may be developed. This aim of the index would be to convert the "number of persons" measure to a measure of skills and capability. This index will require accurate measures of experience earned (e.g. number of years employed in the surveying and geospatial industry for each person, not just age) and some agreement on an appropriate scale that compares people with different measures of experience. The scale will explicitly reflect the pace at which people develop once hired and reach "high" levels of capability, and the point at which they reach a maximum contribution. We feel this is a valid area for further enquiry and development in future studies but note that it would affect the comparability of results between studies.

A second limitation of the model is its assumptions regarding the timing of surveying demand. The model as specified quantifies the annual capability shortfall or surplus that is forecast to exist in the surveying and geospatial industry for each year to 2021/22 and is based on BIS Oxford Economics' projections of construction activity in that year. However, for many surveying occupations, the demand for labour will necessarily precede the period where actual construction takes place (for example, the necessary design, measurement, calculations, plan and document presentations occurs well before the construction phase). In the case of engineering skills, particularly, we believe that hiring should take place around 4-6 years before anticipated increases in skills demand to allow time for appropriate professional development that will meet workforce requirements. Together, this means that, ideally, labour hiring should take place several years before any anticipated peaks in the measured capability shortfall (which is based on construction work done). Even so, we suspect that the quantified capability shortfall or surplus provides a reasonable estimate of the true labour requirement, on average, across the forecast period.

A third limitation is the way retirement is modelled. We have made significant improvements to the retirement modelling in this report, based upon latest available data. This has had the impact of reducing the number of retirements from the existing workforce compared to previous studies, which we consider to be a more realistic outcome. However, there is still considerable scope to improve the estimation and forecasting of retirement across the surveying population. Here, we could improve accuracy in the retirement model by undertaking closer study (through a survey) of retirement behaviour specifically amongst surveying and geospatial professionals. The results of this survey could provide a more realistic attrition rate over time.

The model is also limited in terms of its accounting for career progression. So far, the model assumes workers to remain within their skill level throughout the 10-year forecast horizon. However, from engaging with key stakeholders it was apparent that it is quite often for technicians to obtain higher level of qualifications and progress to working as a qualified surveyor, and likewise from a candidate surveyor to a registered surveyor. Capturing the multiple stages of career progression in the model may improve the realism of our forecasted results. Adding this dimension can better inform workforce planning.

Finally, we believe that there needs to be a more consistent terminology adopted for the surveying profession across the states and territories and embedded within the data that is then collected by the ABS and education sector. For this report, we have retained the terminology we have used in previous reports (for consistency purposes) for describing different types of surveying work as well as qualifications but acknowledge that it may cause confusion for some readers. We express our hope that future updates of the workforce capability position for the surveying industry will be agreed on a single terminology that describes the surveying profession and the roles within it.

Bibliography

BIBLIOGRAPHY

ABS (Australian Bureau of Statistics):

- 2006, Census of Population and Housing, Canberra
- 2011, Census of Population and Housing, Canberra
- 2011, Census of Population and Housing, Customised Data Report - Employed Persons Aged 15 and Over by selected 6-digit Occupation and Industry Division by State/Territory of usual residence, Canberra
- 2009 Information Paper: ANZSCO: *Australian Standard Classification of Occupations*, First Edition Revision 1, Cat. No. 1221.0, Canberra
- 2013, Australian and New Zealand Standard Classification of Occupations, Cat. No. 1220.0, Canberra
- 2016, Census of Population and Housing, Canberra
- 2016, Census of Population and Housing, Customised Data Report - Employed Persons Aged 15 and Over by selected 6-digit Occupation and Industry Division by State/Territory of usual residence, Canberra
- 2017, Deaths, Australia, Cat. No. 3302.0, Canberra
- 2018, *Labour Force, Australia, Quarterly*, Cat. No. 6291.0.55.003, Canberra

BIS Oxford Economics:

- 2013, Skills Gap Study for Surveyors and Geospatial Professionals 2012–2022, Sydney, Australia
- 2015, Skills Gap Study for Surveyors and Geospatial Professionals 2014–2024, Sydney, Australia
- 2017, Australia and New Zealand Roads Capability Analysis 2017-2027, Sydney, Australia
- 2018, Mining in Australia, Sydney, Australia.
- 2018, Building in Australia, Sydney, Australia
- 2018, Long Term Forecasts, Sydney, Australia
- 2018, Australasian Railway Association Skills Capability Study, Sydney, Australia
- 2019, Engineering Construction in Australia, Sydney, Australia

Consulting Surveyors National (2012), Submission to the Standing Committee on Education, Employment and Workplace Relations inquiry into the Shortage of Engineering and related Employment Skills, Canberra.

Department of Home Affairs (2018), Visa Statistics, Subclass 457 quarterly pivot tables.

Department of Education and Training (2018), Higher Education Statistics, Customised Data Report.

Engineers Australia (2017), The Engineering Profession: A Statistical Overview, Thirteenth Edition, February 2017.

Foundation for Young Australians & AlphaBeta (2016), New Work Mindset: 7 new job clusters to help young people navigate the new work order, <https://www.fya.org.au/wp-content/uploads/2016/11/The-New-Work-Mindset.pdf>.

National Centre for Vocational Education Research (2018), VOCSTATS, <https://www.ncver.edu.au/research-and-statistics/vocstats>.

BIS Oxford Economics would like to thank Consulting Surveyors National and the Land Surveyors Boards in each State and Territory, supported by the Council of Reciprocal Surveyors Board of Australia and New Zealand (CRSBANZ) for organising the provision of statistics regarding the number of registered surveyors in each state that were used in this report.

Consulting Surveyors National

www.acsnational.com.au