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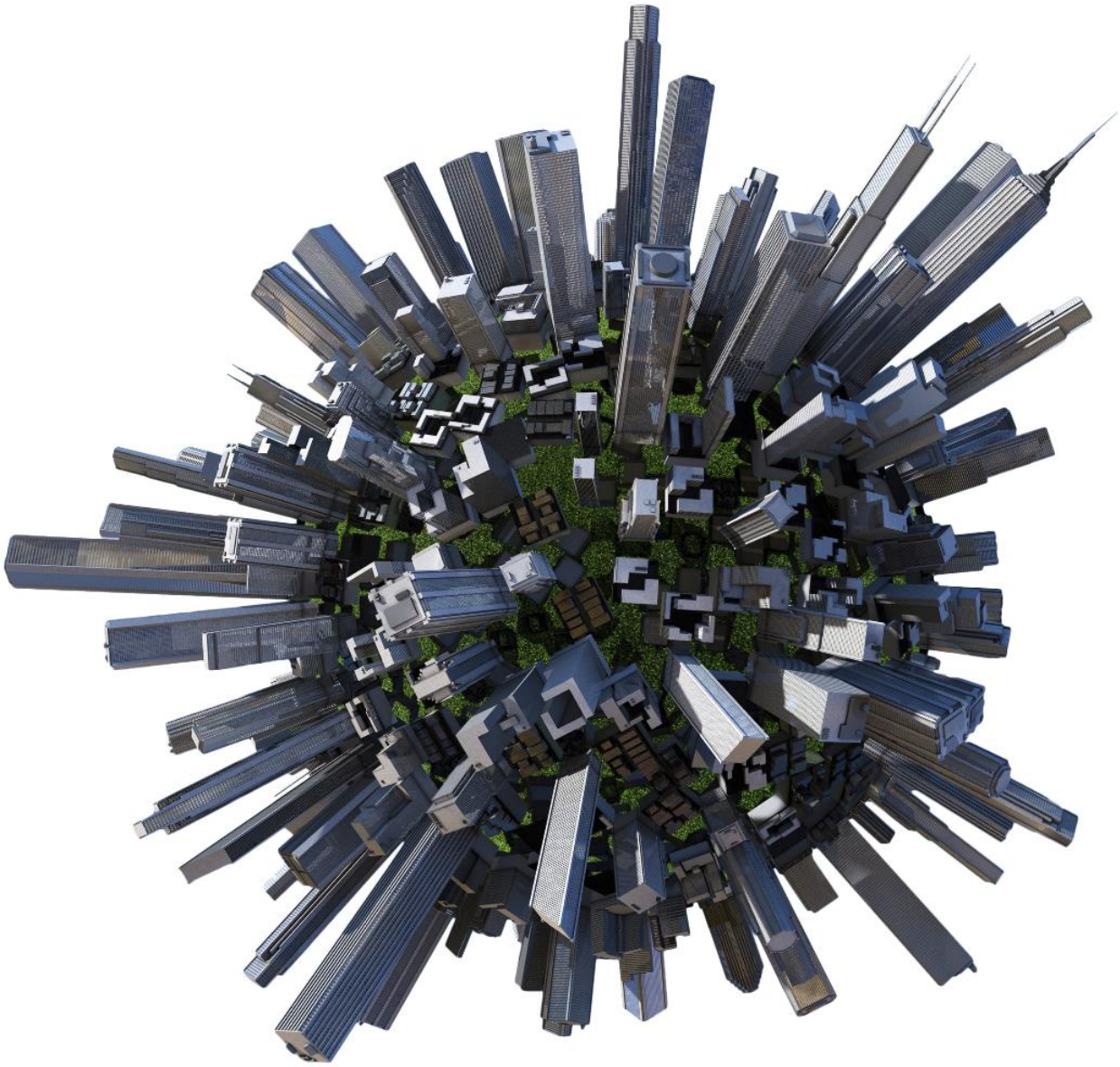


Northern Correctional Facility

Economic Impact Assessment

June 2023

Deloitte Access Economics

Contents

Glossary

Short name	Full name
AYDC	Ashley Youth Detention Centre
CGE	Computable General Equilibrium
DOJ	Department of Justice
EIA	Economic Impact Assessment
FTE	Full-Time Equivalent
GRP	Gross Regional Product
GSP	Gross State Product
LGA	Local Government Area
NCF	Northern Correctional Facility

Executive summary

Background

The Tasmanian Government is committed to building a new Northern Correctional Facility (NCF). The NCF will be a 270-bed adult correctional facility to be located on the current Ashley Youth Detention Centre (AYDC) site, between Deloraine and Westbury in the state's north. As part of this process, the AYDC is to be relocated.

The Tasmanian Department of Justice (DOJ) has engaged Deloitte Access Economics to provide an Economic Impact Assessment (EIA) of the development of the proposed NCF, which incorporates the economic impact of the relocation of the AYDC. Deloitte Access Economics has used its in-house Computable General Equilibrium (CGE) model to undertake this assessment.

The baseline economic trajectory accounts for the relocation of AYDC and its impact on the public administration sector in Meander Valley. The economic shocks to the CGE model included the capital investment for the NCF and the increased expenditure on public administration for operating the NCF over the modelling horizon to 2040. These construction and operational timeframes have been provided by DOJ.

Results

The results of the modelling indicate that the additional investment and activity associated with the NCF will increase Gross Regional Product in Meander Valley by $289 million. There is expected to be $89 million of crowding out[1] in the rest of the Tasmanian economy, meaning that the net impact across Tasmania is $200 million in additional Gross State Product over the modelled period. In addition, the project will result in an additional 273 Full-Time Equivalent (FTE) jobs in Meander Valley by 2040. There is expected to be a reduction of 229 FTEs due to crowding out and migration in the rest of Tasmania, leading to a net gain of 44 FTEs across the state over the modelled period.

Table i: Change in GSP, GRP and employment, Tasmania

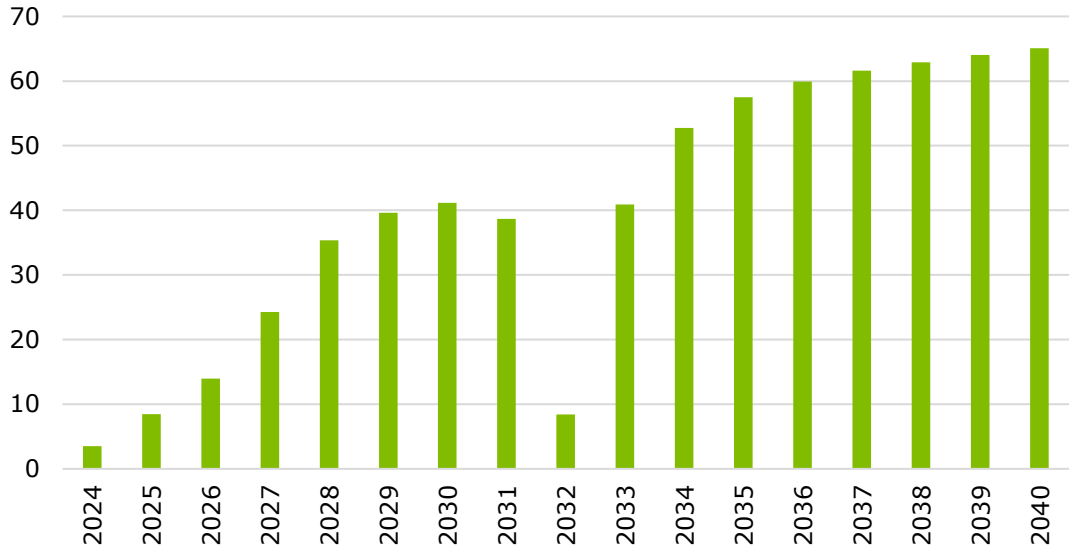
Gross State/Regional Product ($m)	**Average per year**	**To 2040**
Meander Valley	35.7	289
Tasmania	24.0	200
Employment (FTEs)	**Average per year**	**In 2040**
Meander Valley	152.5	273
Tasmania	24.0	44

Source: Deloitte Access Economics

Note: Gross State Product impacts are reported in terms of average additional GSP per year and the cumulative net present value by 2040. Employment impacts are reported in terms of additional FTE per year on average and in 2040.

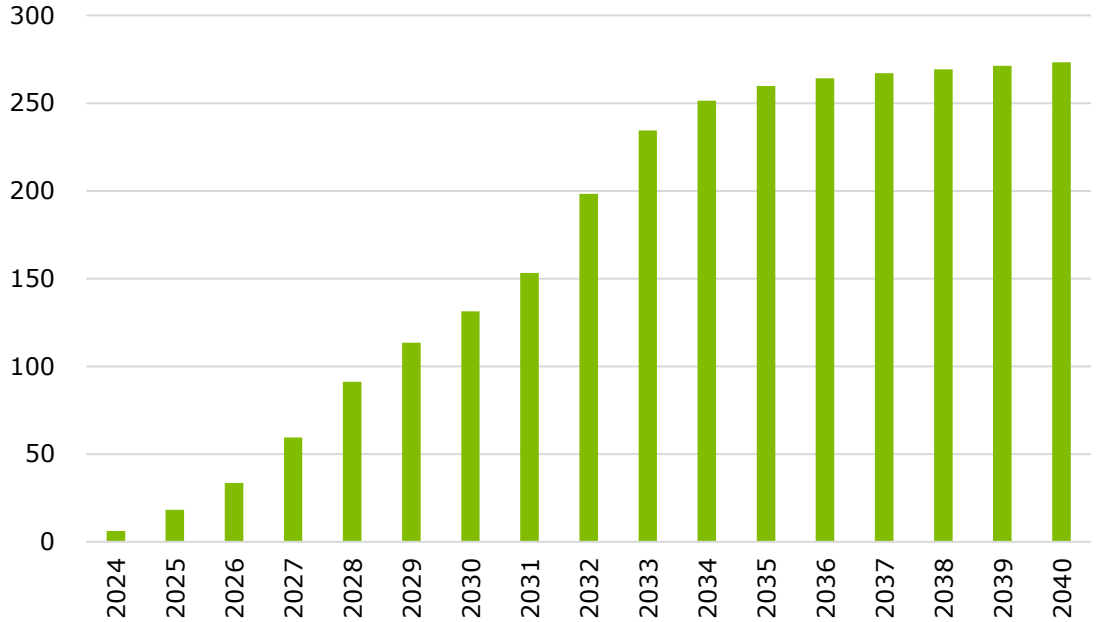
[1] A critical parameter of the EIA is the concept of crowding out. Crowding out accounts for economic limitations in availability of resources such as the supply of labour which is the major input for the NCF once operational. Whilst there will be hundreds of new employment positions at the NCF, this will draw existing employees from across the state resulting in employment reductions in other regions. This shift may be relocation of employees from the existing Risdon Prison or career moves from other industries. Accounting for the constraint of scarce resources available to the Tasmanian economy has become more important as the post-COVID economy continues to experience supply and demand challenges, especially in the availability of labour.

Figure i: Additional value added[2] to 2040, Meander Valley ($m)



Source: Deloitte Access Economics

Figure ii: Additional employment to 2040, Meander Valley (FTEs)



Source: Deloitte Access Economics

[2] Value added refers to the level of economic activity within a particular region. It is measured as the returns to labour (in the form of wages and salaries) and capital (profits).

1 Background and scope

1.1 Background

The Tasmanian Government is committed to building a new Northern Correctional Facility (NCF). The NCF will be a 270-bed adult correctional facility located on the current Ashley Youth Detention Centre (AYDC) site, between Deloraine and Westbury in the state's north. The facility aims to provide better rehabilitation and reintegration outcomes for offenders and their families. The NCF will predominantly accommodate sentenced offenders who are progressing through their sentences and starting to prepare for reintegration into the community. Tasmania's major correctional facilities are currently located in the south of the State, despite over half of the offender population originating from the north or north-west. As per the Government's announcement in September 2021, it is expected that the AYDC will close by September 2024.

1.2 Scope of report

The Tasmanian Department of Justice (DOJ) has engaged Deloitte Access Economics to provide an Economic Impact Assessment (EIA) of the closure of the AYDC and the development of the proposed Northern Correctional Facility (NCF).

The purpose of this EIA is to model the economic impact of the NCF project on Gross State Product (GSP), Gross Regional Product (GRP) in the affected region, employment, and industry impacts.

1.3 Report structure

This report is structured as follows:

- Chapter 2 provides an overview of the NCF project and the characteristics of the affected region
- Chapter 3 details the methodology and approach used for the modelling
- Chapter 4 presents the results of the economic impact modelling
- Chapter 5 provides a consideration and review of previous economic modelling undertaken for the NCF.

2 Project details

2.1 The project

The project involves the decommissioning of the AYDC (which consists of a school and the youth detention centre), and the conversion of the site to the adult NCF. The proposed site is at 4260 Meander Valley Road, Deloraine, PID 6275320, Title Reference 12/6765. This site is in the Meander Valley Local Government Area (LGA) between Deloraine and Westbury.

The AYDC currently employs 7.6 Full-Time Equivalents (FTEs) at the school, and 66.8 at the AYDC. It has an annual operating budget of $1.2 million for the school and $10.3 million for the AYDC. The AYDC is due to close by September 2024. Due to the relocation, the AYDC employees and the associated expenditure may leave the region.

The NCF has a construction and development budget of $270 million. Development is expected to take place from when AYDC closes in 2024, until the opening date in 2028-29. When the new facility opens, it will employ 367.1 FTE staff and have an annual operating budget of $97.7 million. The facility is also intended to replace the Launceston Reception Prison, which has 40 FTE staff and an operating budget of $5 million.

To reflect the uncertainty of the project, a low scenario, where the facility employs 250 FTEs and has an annual operating budget of $66.5 million has also been considered in addition to the core scenario. Every other parameter is constant across the scenarios.

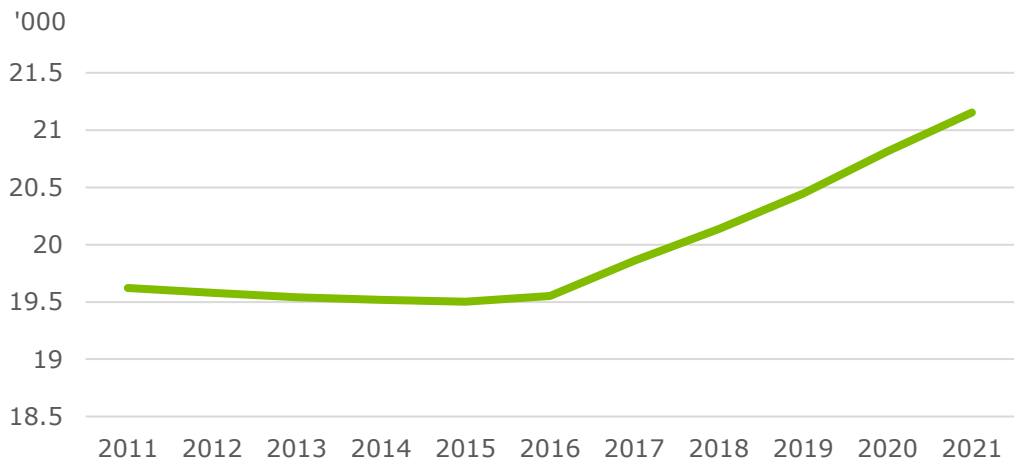
2.2 Characteristics of the region

An overview of the economic and demographic characteristics of the Meander Valley LGA is given below. This information will help inform an understanding of the potential impacts of the NCF project on the region.

2.2.1 Population and demographics

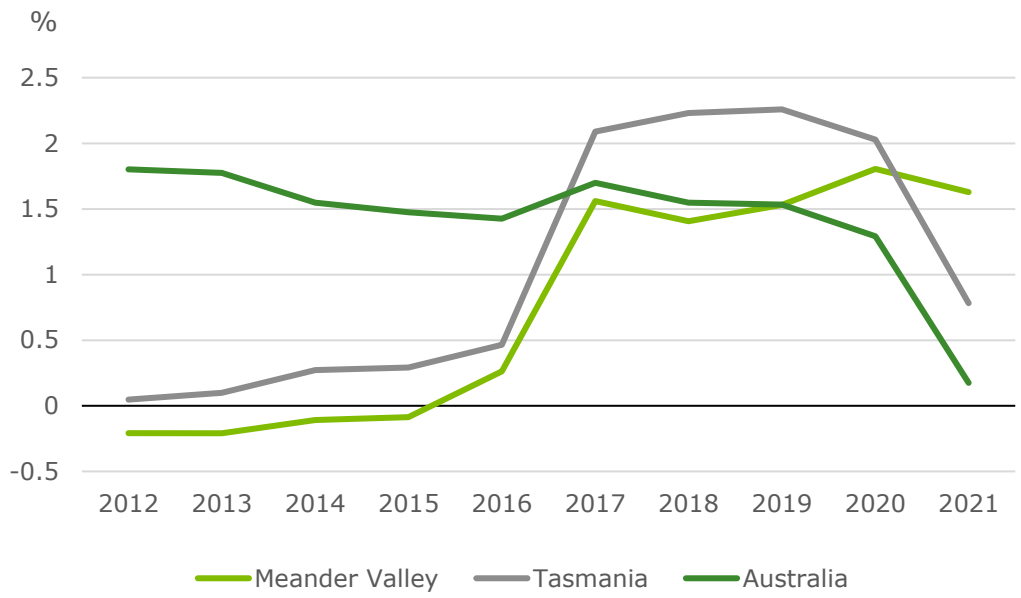
The Estimated Residential Population of Meander Valley Council as of June 2021 was 21,153 (Figure 2.1), approximately 3.9 per cent of Tasmania's total population at the time (541,500). In the last five years Meander Valley's population has grown at a rate of around 1.5 per cent. The region's population growth has been maintained in 2021, while growth in the rest of Tasmania and Australia slowed (Figure 2.2).

Figure 2.1: Estimated Resident Population, Meander Valley, Year ending June



Source: Australian Bureau of Statistics, Regional Population Growth, Australia.

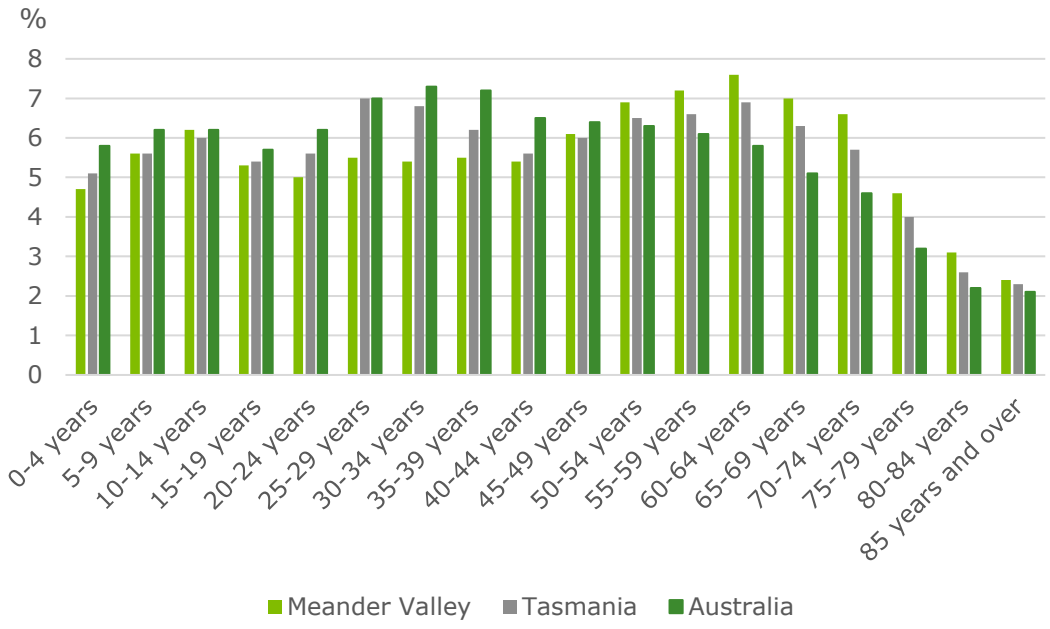
Figure 2.2: Annual estimated Resident Population growth, Meander Valley, Tasmania, Australia



Source: Australian Bureau of Statistics, Regional Population Growth, Australia.

Meander Valley has an older population relative to both the rest of the state and country. 51.5 per cent of the population is over 44 years of age, compared with Tasmania (46.9 per cent) and Australia (41.8 per cent) (Figure 2.3). Accordingly, Meander Valley has a smaller share of population in the young working age group (20-44 years) relative to the rest of Tasmania and Australia. This has implications for the ability of the local workforce to meet demand for labour in the future.

Figure 2.3: Population share by age bracket, Meander Valley, Tasmania, and Australia, 2021

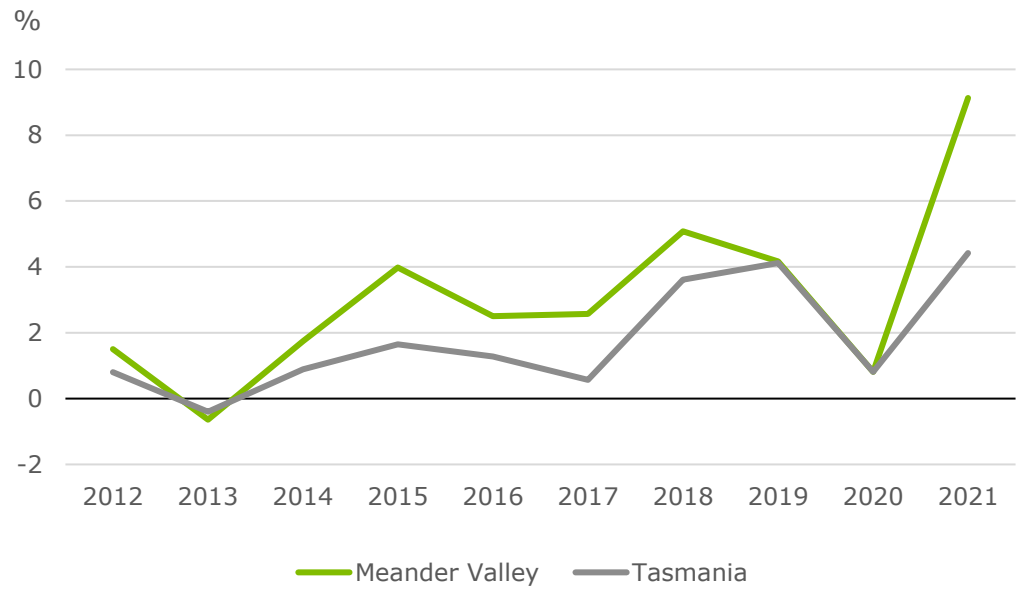


Source: Australian Bureau of Statistics, 2021 Census.

2.2.2 Economy

In 2020-21, Meander Valley's Gross Regional Product (GRP) was $1.1 billion, 3.2 per cent of the state's total. Meander Valley's economy has grown at a faster rate than the rest of the state since 2013, with a compound annual growth rate of 3.2 per cent since 2012, compared with 1.9 per cent in Tasmania. Both economies experienced a drop in growth during the initial impacts of COVID-19 but since then the Meander Valley economy has rebounded (Figure 2.4).

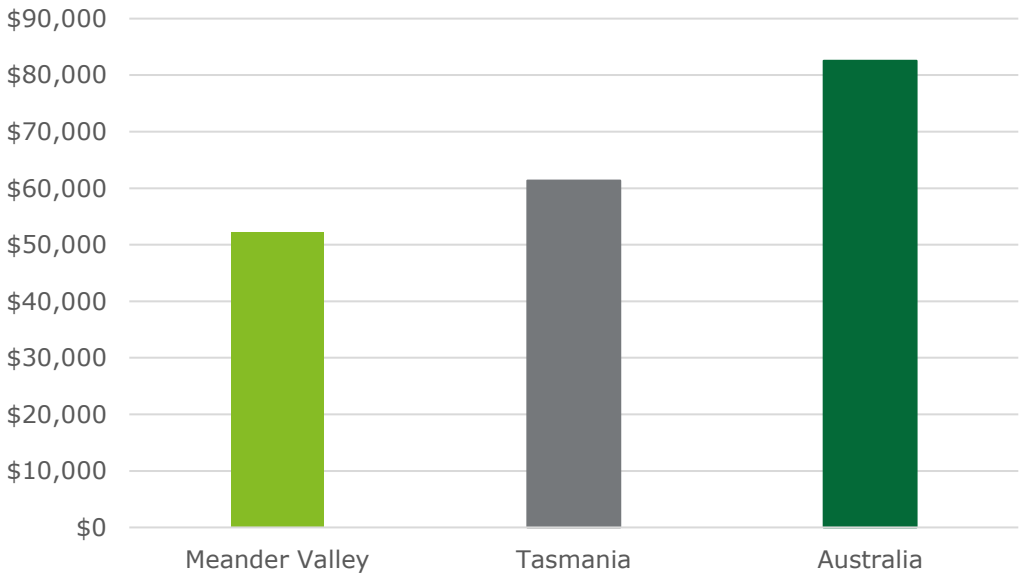
Figure 2.4: GRP and GSP growth, Meander Valley and Tasmania



Source: National Institute of Economic and Industry Research.

The GRP per capita for Meander Valley is $52,238, which is several thousand lower than both Tasmanian GSP per capita of $61,354 and Australian Gross Domestic Product per capita of $82,545 (Figure 2.5).

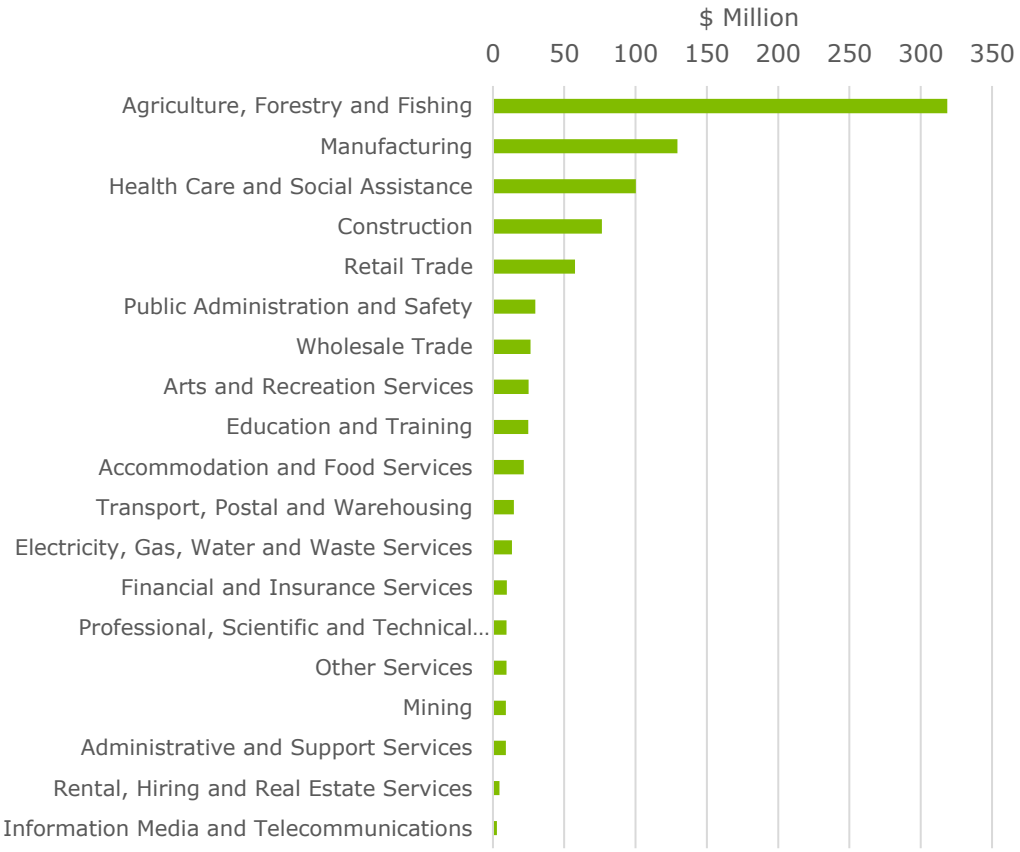
Figure 2.5: Gross Product per capita, Meander Valley, Tasmania, and Australia, 2021



Source: Australian Bureau of Statistics, National Institute of Economic and Industry Research.

In Meander Valley the largest industry in terms of value added is agriculture, forestry and fishing which generated $319 million in 2020/21. Other significant industries include manufacturing, construction, and health care and social assistance. Together, these four industries account for 70 per cent of Meander Valley's GVA (Figure 2.6).

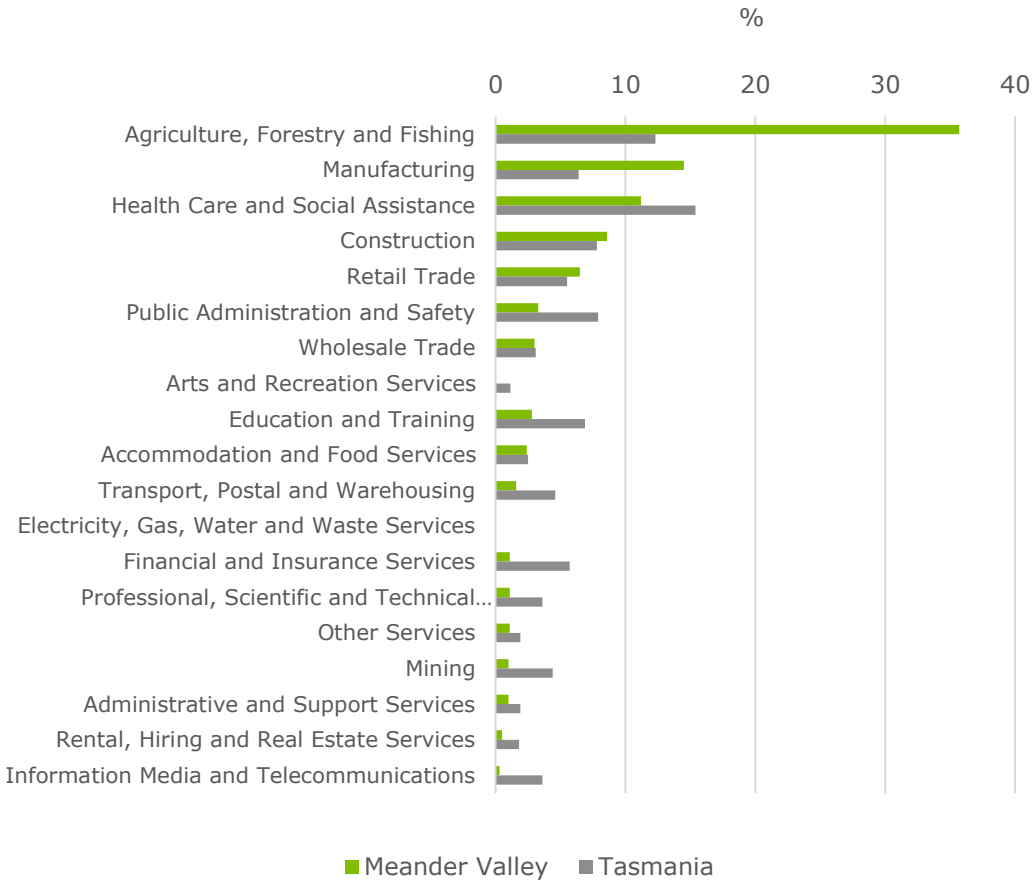
Figure 2.6: Gross Value Added by industry, Meander Valley 2020/21



Source: National Institute of Economic and Industry Research.

The agriculture, forestry, and fishing sector in Meander Valley is large relative to the state average. The industry accounts for over 35 per cent of the region's GRP, compared to 12.3 per cent in Tasmania. The region's manufacturing sector is also large relative to the rest of the state, but Meander Valley is relatively smaller in the finance and IT sectors (Figure 2.7).

Figure 2.7: Industry GVA share of total, Meander Valley Council and Tasmania, 2020/21

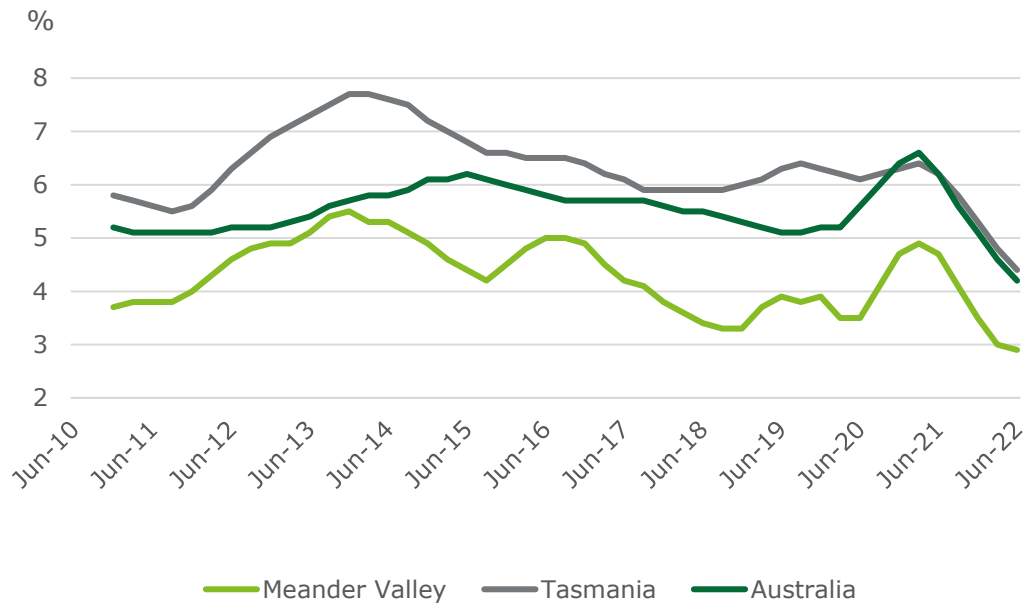


Source: National Institute of Economic and Industry Research.

2.2.3 Labour market

The Meander Valley's labour market is tighter on average than both Tasmania and Australia, reflected by a lower unemployment rate. Meander Valley's unemployment rate has remained around 1-2 percentage points below the state average since 2010 (Figure 2.8). The gap was greatest during 2018 and 2019 but has closed to less than a percentage point since the beginning of 2021. Most recently (June 2022), Meander Valley's unemployment rate was 2.9 per cent while Tasmania and Australia were 4.4 per cent and 4.2 per cent respectively.

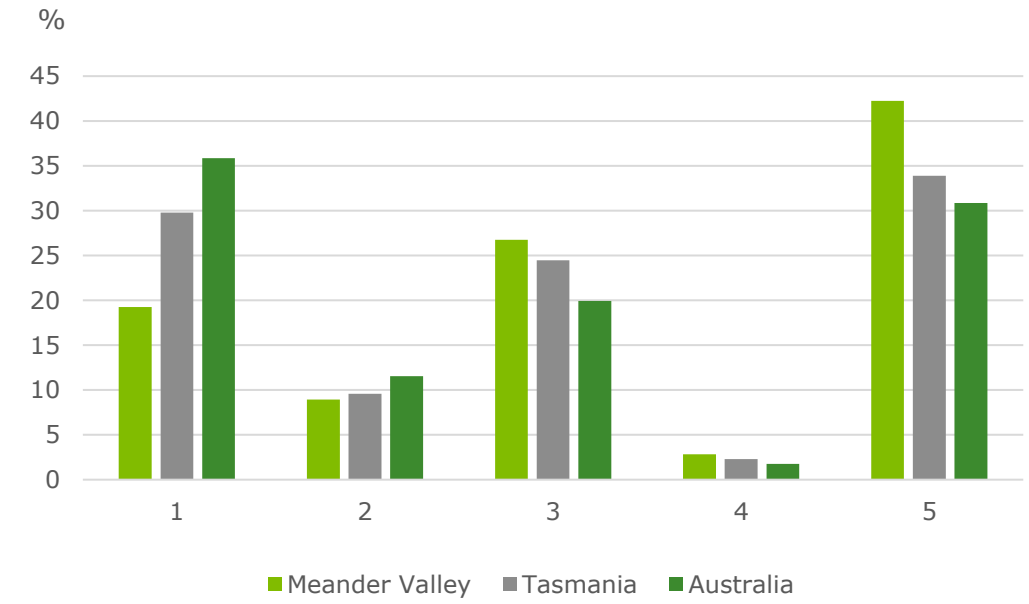
Figure 2.8: Unemployment rate, Meander Valley, Tasmania, and Australia



Source: Australian Bureau of Statistics, Labour Force Survey. Department of Employment, Small Area Labour Markets.

The ANZSCO skill level of jobs in Meander Valley is generally lower than the state and national averages (Figure 2.9). 19 per cent of jobs in Meander Valley are level 1 (highest skilled: Bachelor's degree or above prerequisite), compared with 29 per cent across Tasmania and 35 per cent in Australia. The share of low-skilled jobs (Level 5: Certificate 1 or no formal training) is higher in Meander Valley – 42.2 per cent, compared to 33.9 per cent in Tasmania and 30.8 per cent nationally. Meander Valley also has a higher share of medium-skilled jobs (level 3: Certificate IV & III).

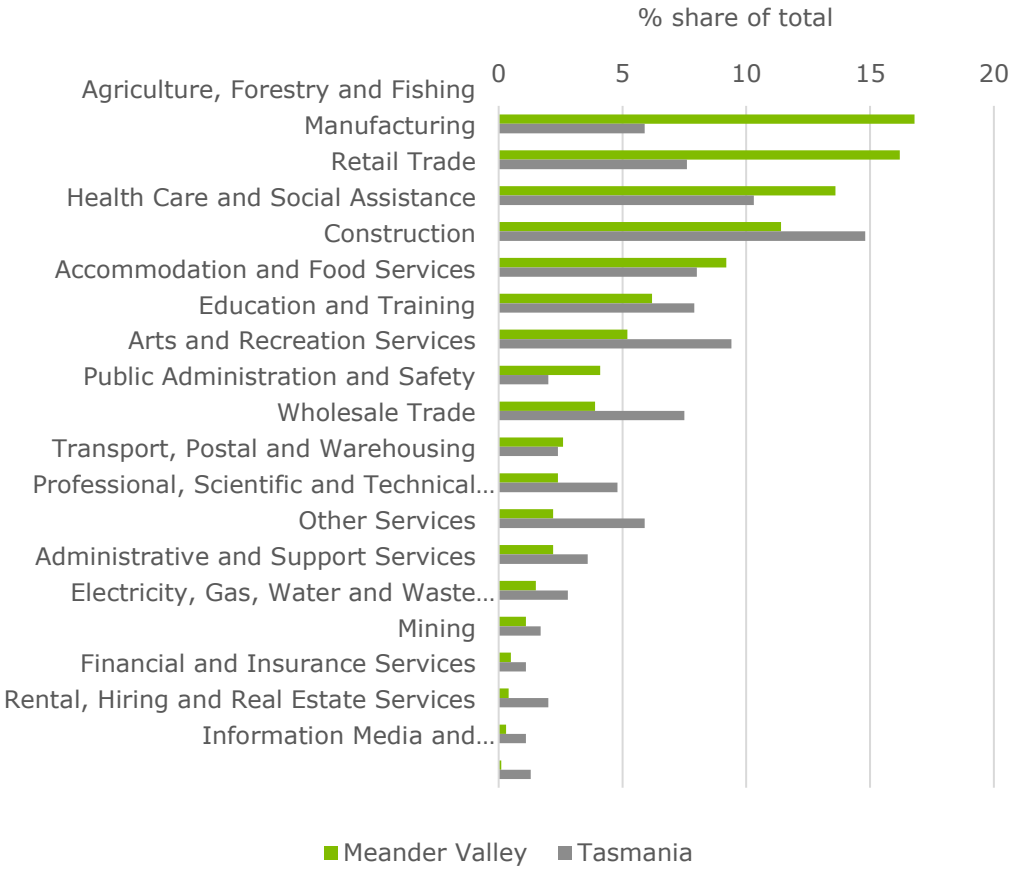
Figure 2.9: Proportion of jobs by ANZSCO skill level, Meander Valley, Tasmania, and Australia, 2021



Source: Australian Bureau of Statistics, Labour Force Survey.

Reflecting the relative gross value added of the various industries, Meander Valley has a high share of employment in the agriculture, forestry and fishing and manufacturing industries relative to the state average (Figure 2.10). Meander Valley has a relatively small workforce in the fields of education and training, professional, scientific, and technical services, representing low comparative advantage in these areas.

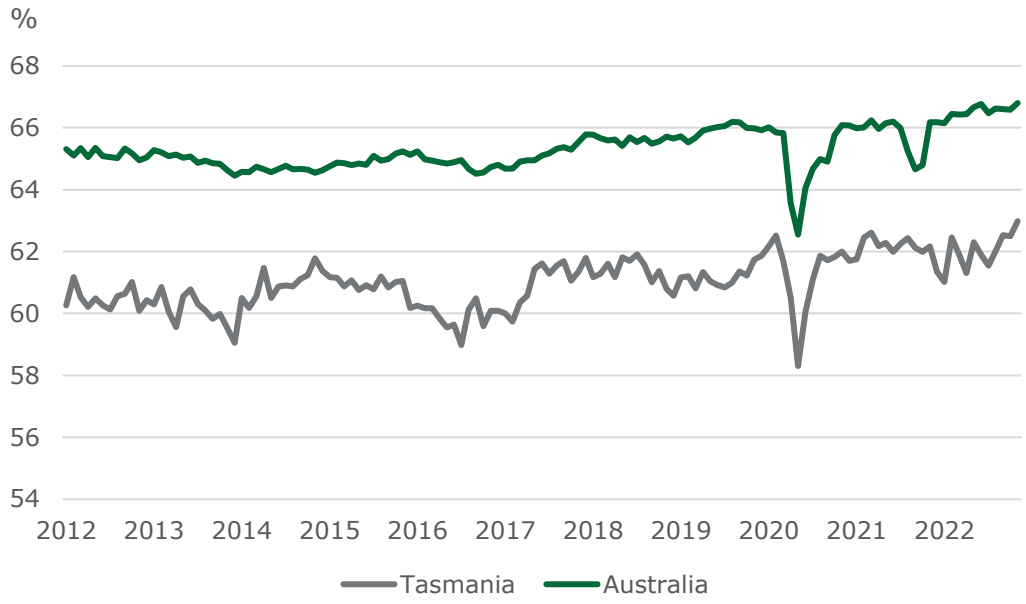
Figure 2.10: Industry employment shares of total, Meander Valley, and Tasmania



Source: National Institute of Economic and Industry Research.

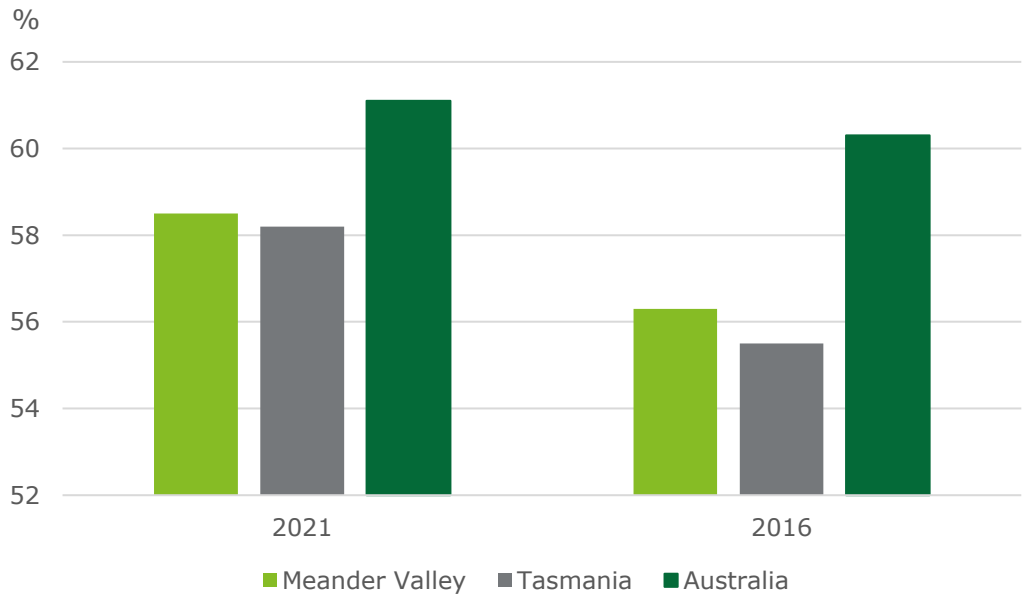
Tasmania has a lower participation rate and employment to population rate than the national average (Figure 2.11 and Figure 2.13). This indicates a high level of underutilised labour. Monthly labour force data is not available for Meander Valley, but the 2021 and 2016 Census data showed that the participation rate was close to the Tasmanian average (Figure 2.12), which is below the national average.

Figure 2.11: Participation rate, Tasmania, and Australia



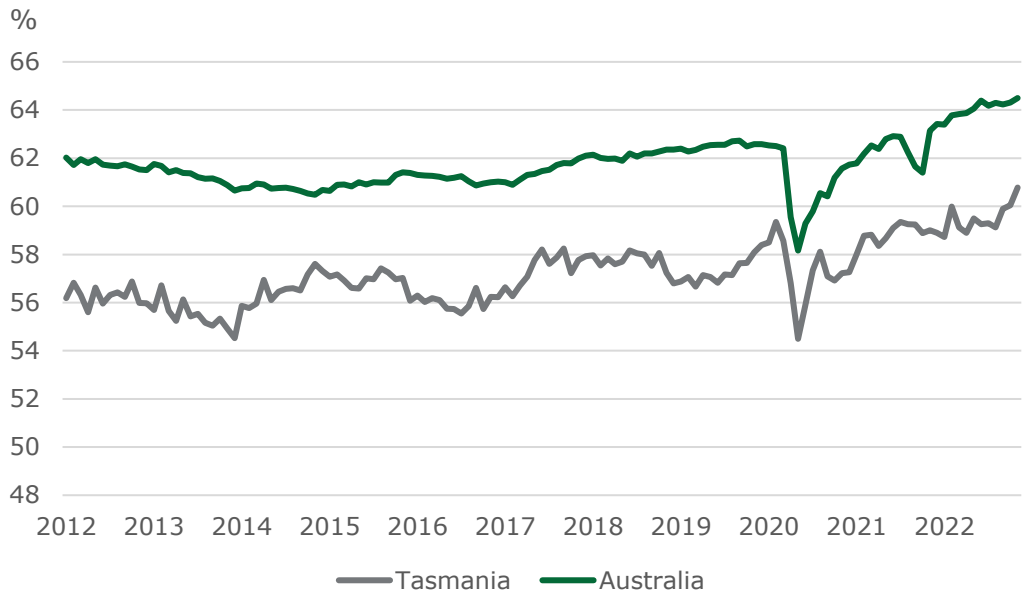
Source: Australian Bureau of Statistics, Labour Force.

Figure 2.12: Participation rate, Meander Valley, Tasmania, and Australia



Source: Australian Bureau of Statistics, 2021 and 2016 Census.

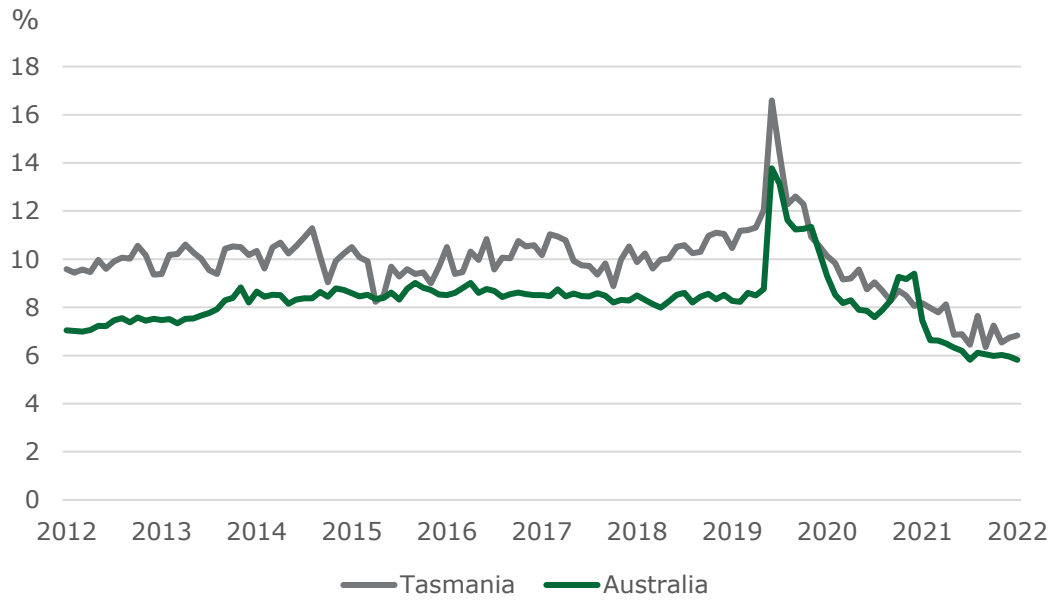
Figure 2.13: Employment to population ratio, Tasmania, and Australia



Source: Australian Bureau of Statistics, Labour Force.

The Tasmanian labour market has historically exhibited a slightly higher underemployment rate than the national average. This indicates that there are workers in Tasmania who would work more hours if they could. However, since the spike in underemployment during COVID-19, the gap to the national average has shrunk (Figure 2.14).

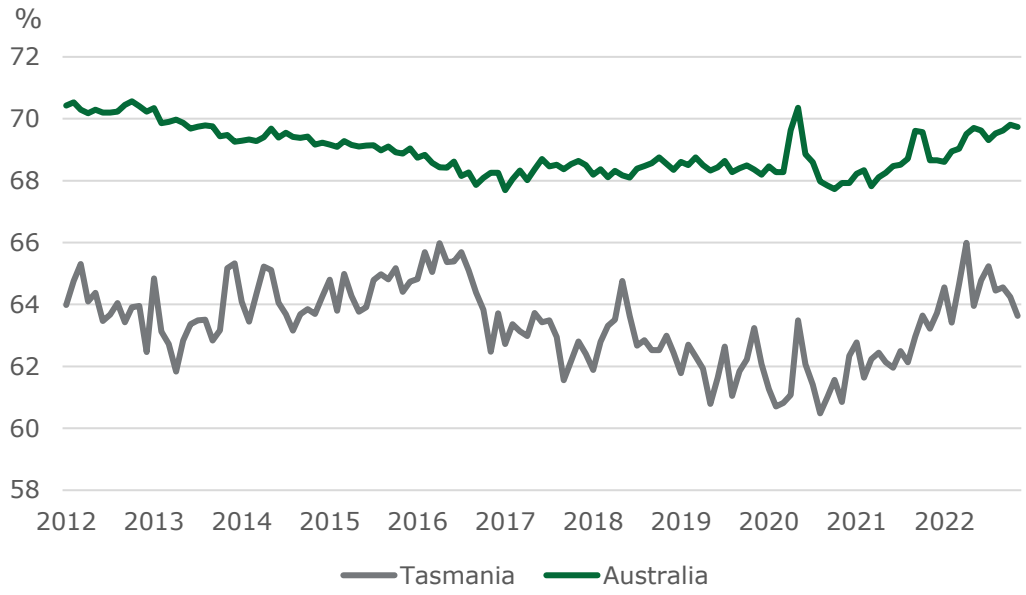
Figure 2.14: Underemployment rate, Tasmania, and Australia.



Source: Australian Bureau of Statistics, Labour Force.

Tasmania's low share of full-time workers (Figure 2.15) can help to explain why the state has a higher underemployment rate compared with the national average. Tasmania has always had a full-time share of employment several percentage points lower than the national average. This reflects a high number of casual or part-time jobs in the state.

Figure 2.15: Full-time share of employment, Tasmania, and Australia



Source: Australian Bureau of Statistics, Labour Force.

2.2.4 Education & Training

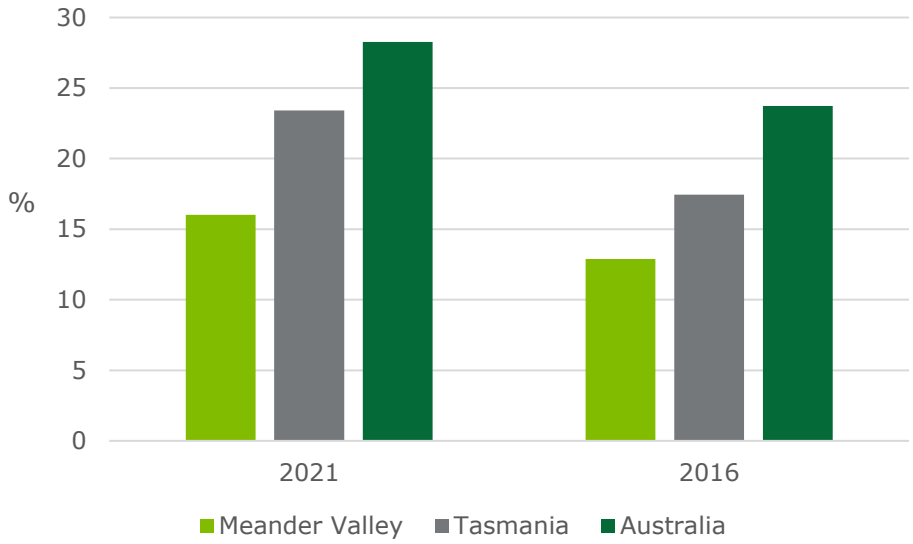
Educational attendance rates in Meander Valley are consistent with the state average at pre-school, primary and secondary stages. However, attendance is lower at university and TAFE/vocational institutions (Figure 2.16) – only 4 per cent of Meander Valley residents are attending either university or a TAFE/vocational institution compared with 6.2 per cent of Tasmanian residents. This has implications for the ability of the local population to address skill shortages in tertiary areas if they arise in the future.

Figure 2.16: Educational institution attendance rates, Meander Valley, and Tasmania

Source: Australian Bureau of Statistics, 2021 Census.

The share of tertiary-educated Meander Valley residents has risen from 12.9 per cent to 16 per cent in the past five years. While similar increases occurred both state-wide and nationally, Meander Valley's tertiary education rate is still well below the state average of 23.4 per cent and the national average of 28.3 per cent (Figure 2.17).

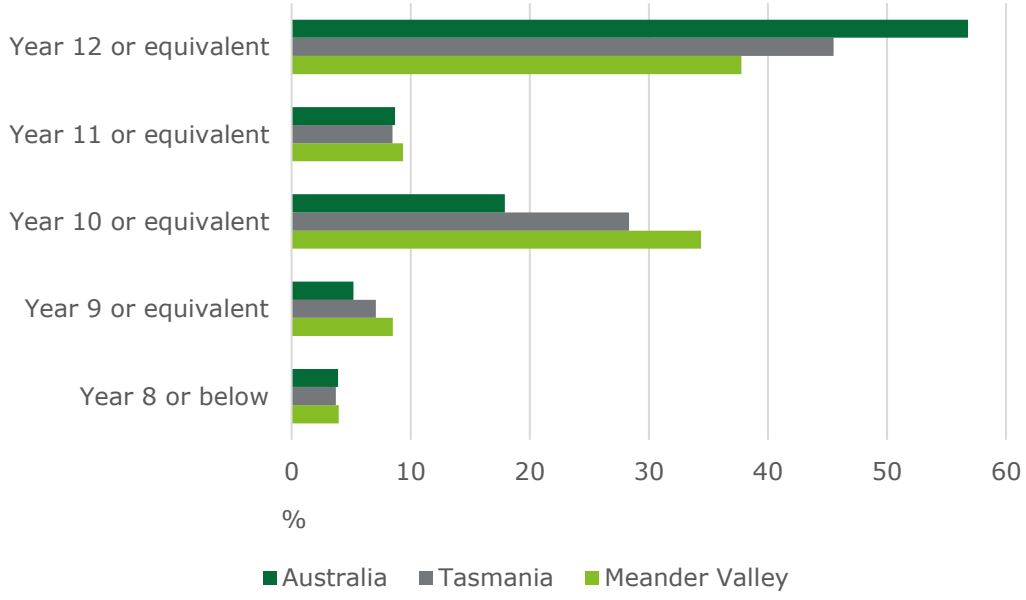
Figure 2.17: Proportion of persons aged 20+ with a bachelor's degree or above, Meander Valley, Tasmania, and Australia



Source: Australian Bureau of Statistics, 2021 & 2016 Census.

Meander Valley residents have a higher secondary school completion rate than both the state and national averages up to year 11 or equivalent, although Meander Valley's year 12 completion rate of 37.8 per cent is below the state average of 45.5 per cent and the national average of 56.8 per cent (Figure 2.18).

Figure 2.18: Highest level of secondary school completed, Meander Valley and Tasmania, 2021

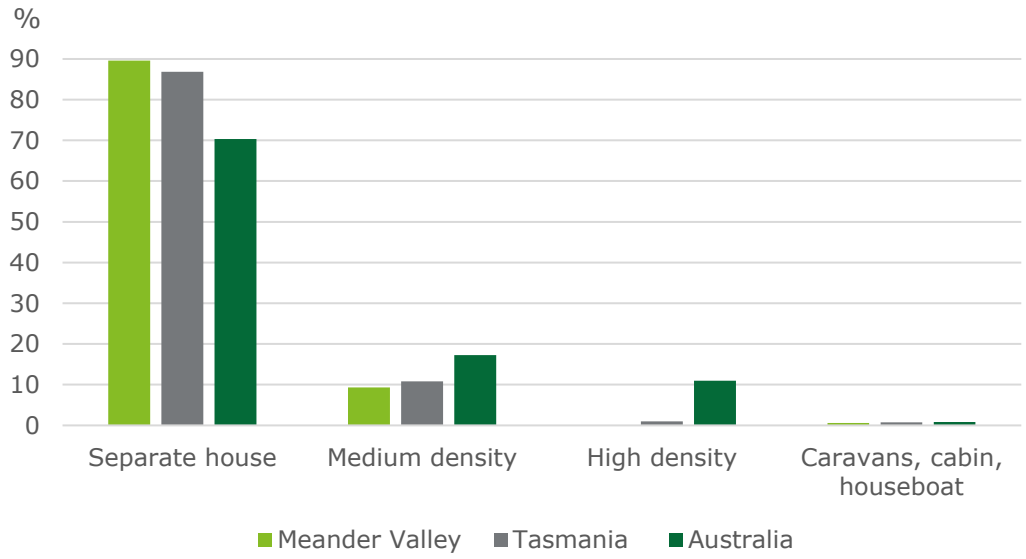


Source: Australian Bureau of Statistics, 2021 Census.

2.2.5 Housing & Accommodation

The majority of Meander Valley's housing market is characterised by separate houses, consistent with the state average and above the national average (Figure 2.19). Medium density dwelling structures make up the next highest category in both Meander Valley (9.3 per cent) and Tasmania (10.8 per cent). This is indicative of housing tenure type, with a larger proportion of homeowners and purchasers dwelling in separate houses. 73.7 per cent of Meander Valley residents either own a dwelling outright or own with a mortgage, while 20 per cent are renting (Figure 2.20).

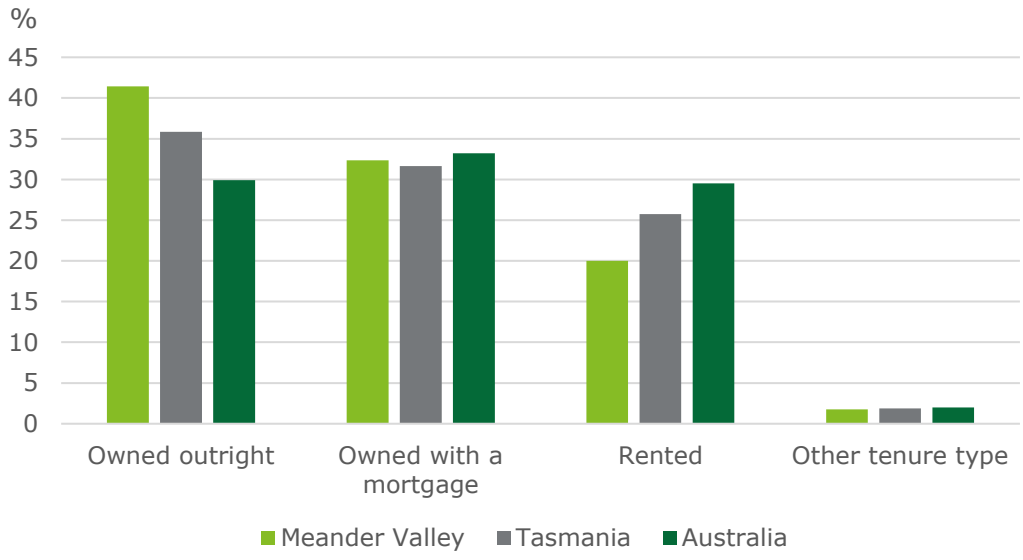
Figure 2.19: Dwelling structure, Meander Valley, and Tasmania



Source: Australian Bureau of Statistics, 2021 Census.

A smaller share of Meander Valley residents rent their property relative to both the state and national average (Figure 2.19).

Figure 2.20: Tenure type, occupied private dwellings, Meander Valley, and Tasmania, 2021



Source: Australian Bureau of Statistics, 2021 Census.

3 Methodology

3.1 Computable General Equilibrium (CGE) modelling

A change (or shock) in any part of the economy has impacts that reverberate throughout the rest of the economy. For example, the shock scenario would generate economic activity throughout Tasmania, because of increased capital investment and expanded production, as well as related increases in consumer spending through higher levels of employment and disposable income.

This study seeks to model these impacts using the Deloitte Access Economics Regional General Equilibrium Model (DAE-RGEM). DAE-RGEM is a large scale, dynamic, multi-region, multi-commodity CGE model of the world economy with bottom-up modelling of Australian regions. DAE-RGEM encompasses all economic activity in an economy – including production, consumption, employment, taxes, and trade – and the inter-linkages between them. For this project, the model has been customised for the Tasmanian economy, adopting its unique economic characteristics.

A set of inputs that stylize these alternative scenarios have been developed, so that the economic impact of the scenarios can be estimated. The database underlying the model has been calibrated to reflect the current economic climate, and the future economic trajectory for Tasmania and Australia between 2022 and 2040, in terms of economic growth and employment. Further detail as to the modelling framework used is provided in Appendix A.

The data used in this analysis was provided by DOJ, the Australian Bureau of Statistics, the Global Trade Analysis Project and Deloitte Access Economics.

3.2 Modelled regions

The regions modelled in this analysis include the Tasmanian economy and the Meander Valley (the region where the NCF is to be located, outlined below).

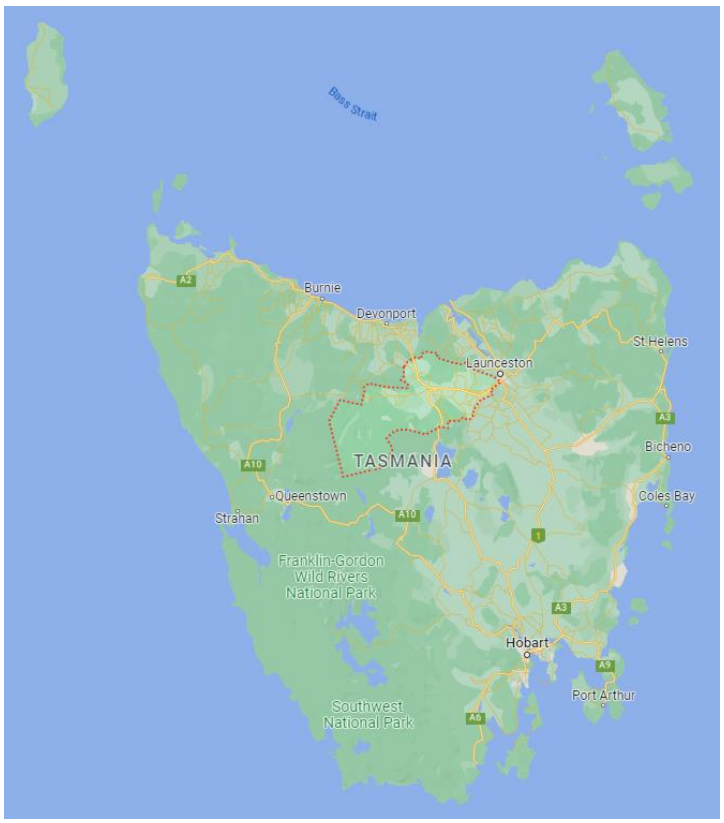


Image: Google Maps

4 Results

4.1 Summary

The results of the modelling indicate that the additional investment and activity associated with the NCF is expected to have a positive impact on the Tasmanian economy, increasing Gross State Product (GTP) and employment (in FTE terms) over the period between 2024 and 2040. The results are given as a net present value (NPV) to account for time preferences. The results are presented as incremental impacts to the baseline – a scenario where the NCF is not developed. Aggregate results are presented for the core scenario (367.1 operational FTEs) and low (250 operational FTEs) scenario.

Table 4-1: Average deviation in GSP and employment, Tasmania[3]

	Average per annum	Average (low scenario)	2040	2040 (low scenario)
Gross State Product ($m)	24.0	24.5	200.4	207.4
Employment (FTEs)	24.9	24.2	44	40.9

Source: Deloitte Access Economics

Note: Gross State Product impacts are reported in terms of average additional GSP per year and the cumulative net present value by 2040. Employment impacts are reported in terms of additional FTE per year on average and in 2040.

4.2 Regional Breakdown

To isolate the impact of the Project on the local area, the Meander Valley economy is separated from the rest of Tasmania for the purposes of modelling. The Meander Valley LGA is set to receive the majority of economic benefits from Northern Correctional Facility. Meander Valley is estimated to gain an additional $289m in value add, in real NPV terms between 2024 and 2040 (discounted at 7 per cent). While the rest of Tasmania is estimated to lose $89m in economic activity due to crowding out[4] (Figure 4.1), meaning the state gains a total of $200m overall (Table 4-1). All sectors within Meander Valley will gain additional value add by 2040.[5] Economic contribution grows steadily as construction ramps up, then falls briefly during the period between completion and full operations, after which point activity continues to grow (Figure 4.2).

The number of jobs in Meander Valley is expected to increase, with an additional 273 FTEs in 2040 (Table 4-4). 229 FTEs are crowded out of the rest of Tasmania as a result, meaning the net job gain is 44 FTEs (Figure 4.3).

[3] The low direct employment scenario results in a lower total employment gain, but a higher gain in gross product. This is because of higher implied labour productivity – fewer jobs are required for the NCF, meaning labour is not crowded out as much as the core scenario.

[4] A critical parameter of the EIA is the concept of crowding out. Crowding out accounts for economic limitations in availability of resources such as the supply of labour which is the major input for the NCF once operational. Whilst there will be hundreds of new employment positions at the NCF, this will draw existing employees from across the state resulting in employment reductions in other regions. This shift may be relocation of employees from the existing Risdon Prison or career moves from other industries. Accounting for the constraint of scarce resources available to the Tasmanian economy has become more important as the post-COVID economy continues to experience supply and demand challenges, especially in the availability of labour.

[5] Except for public administration, which is marginally smaller.

Table 4-2: Average deviation in GSP and employment, Meander Valley

	Average per annum	Average per annum (low)	2040	2040 (low)
Gross Regional Product ($m)	35.7	35.1	289.3	288.2
Gross Regional Product deviation (%)	2.5	2.5	4.1	3.8
Employment (FTEs)	152.5	140.0	273.3	248.5

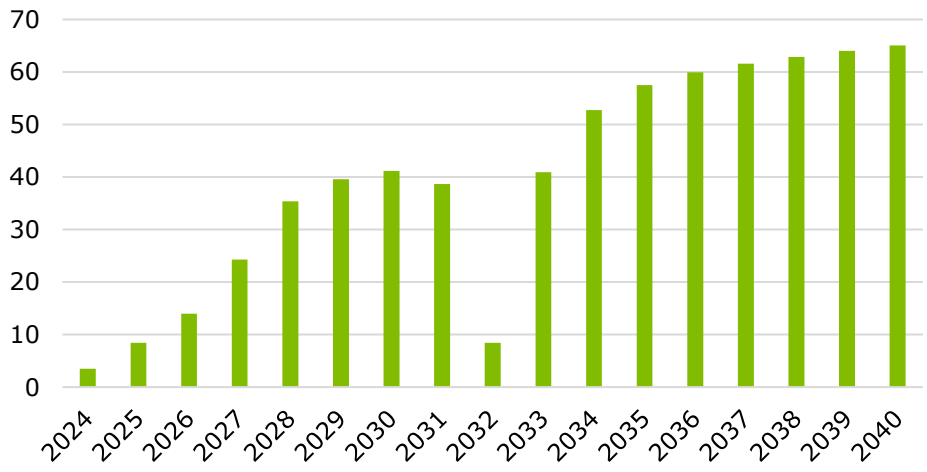
Source: Deloitte Access Economics

Note: Gross State Product impacts are reported in terms of average additional GSP per year and the cumulative net present value by 2040. Employment impacts are reported in terms of additional FTE per year on average and in 2040.

Figure 4.1 Region breakdown of additional value add to 2040 (NPV)

Source: Deloitte Access Economics

Figure 4.2 Additional value add to 2040, Meander Valley ($m)

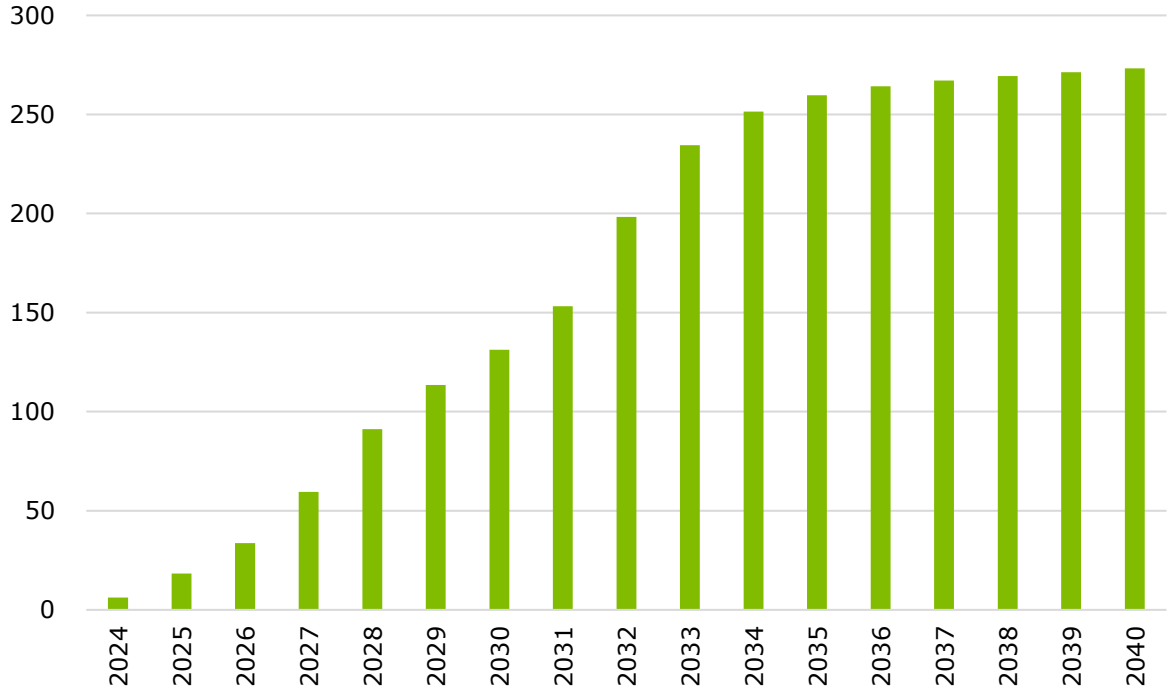


Source: Deloitte Access Economics

Figure 4.3: Region breakdown of additional FTEs in 2040

Source: Deloitte Access Economics

Figure 4.4 Additional Employment to 2040, Meander Valley (FTEs)



Source: Deloitte Access Economics

4.3 Sector Breakdown

The economic impact of the Project is also broken down by sector. By 2040 each sector within Meander Valley is estimated to have an increase in value added because of NCF's construction and operations. Impacts are primarily concentrated in the construction sector, with further major flow-on impacts appearing in heavy manufacturing, public administration and business services. Construction is estimated to gain a total of $64m in value add from now to 2040, the largest of all industries (Table 4-3). The heavy manufacturing sector is expected to be $55m larger than under the baseline. Other sectors are expected to experience more moderate growth (Figure 4.5).

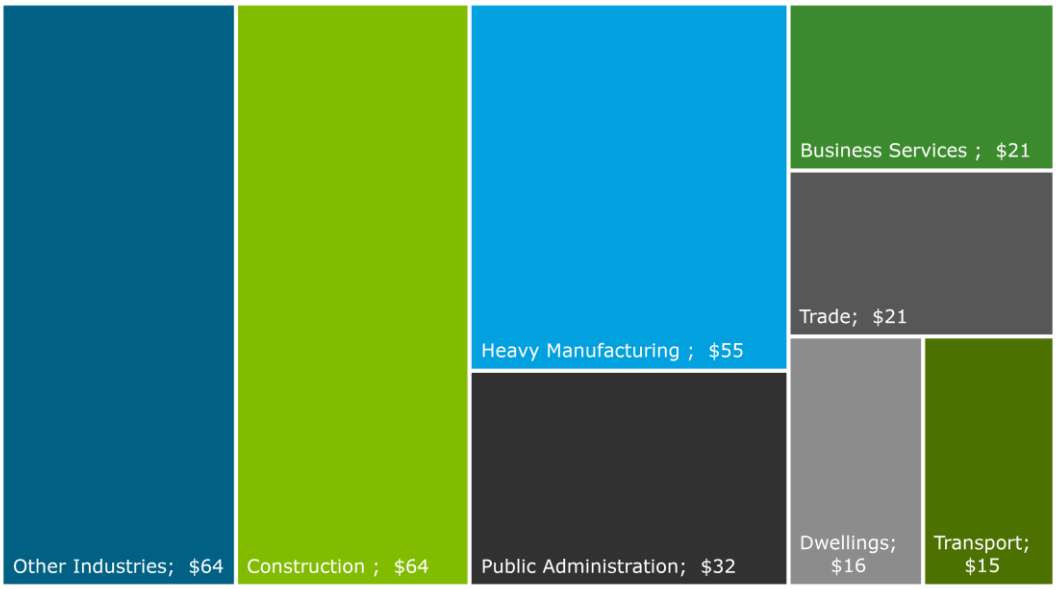
The majority of additional employment is estimated to flow into Public Administration and construction with 48 and 34 FTEs respectively. Trade and Heavy Manufacturing are also forecasted to gain significant increases in employment (Figure 4.6).

Table 4-3 Breakdown of additional value add to 2040 (NPV), Select industries, Meander Valley

Industry	Additional Value Add ($m)
Construction	64
Heavy Manufacturing	55
Public Administration	32
Business Services	21
Trade	21
Dwellings	16
Transportation	15
Other Industries	64

Source: Deloitte Access Economics

Figure 4.5 Sector breakdown of additional value add to 2040 ($m NPV), Meander Valley



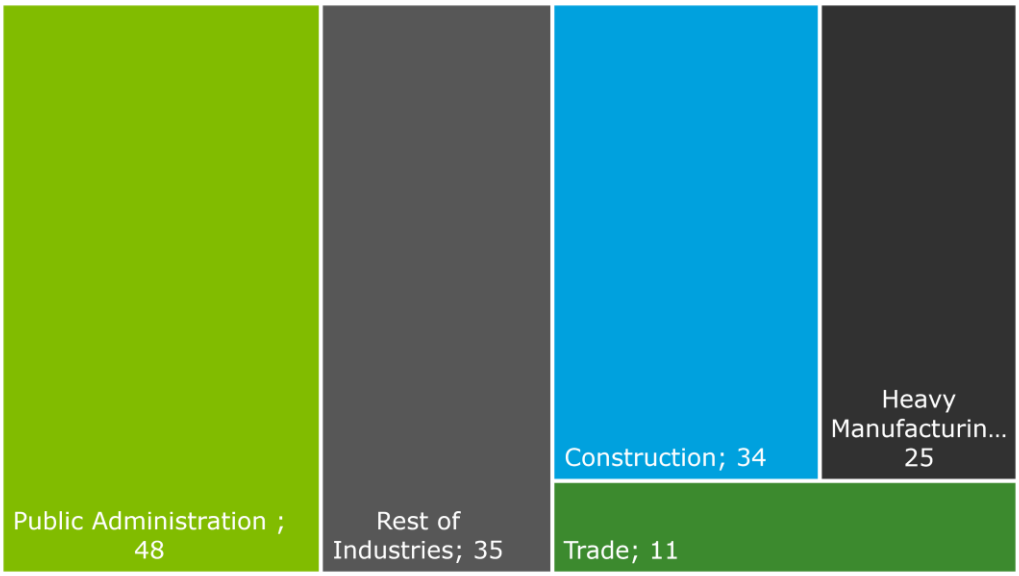
Source: Deloitte Access Economics

Table 4-4 Sector breakdown of additional FTEs in 2040, Meander Valley

Industry	Additional FTEs
Public Administration	48
Rest of Industries	35
Construction	34
Heavy Manufacturing	25
Trade	11

Source: Deloitte Access Economics

Figure 4.6 Sector breakdown of additional FTEs in 2040, Meander Valley



Source: Deloitte Access Economics

5 Consideration and review of previous economic modelling

5.1 Background

In August 2021, SGS Economics and Planning (SGS) presented a high-level socioeconomic analysis of the proposed NCF, including economic impact assessment and a high-level cost-benefit analysis (CBA).

This section includes consideration and review of the SGS report, the data sets utilised for that report and discussion of the results of the above analysis with reference to any relevant findings of that study.

5.2 Analysis

SGS's database on the economic structure of Meander Valley Council was derived from the 2016 ABS census, while Deloitte Access Economics was able to draw on the 2021 census for our work. The expenditure data used by SGS was also different to that provided to Deloitte Access Economics. This was mostly due to only early-stage information being available to SGS. SGS models the economic impact using a Northern Tasmania region (comprised of several LGAs surrounding the site) compared to the Deloitte Access Economics analysis which specifically modelled the Meander Valley region.

The SGS report included a cost-benefit analysis (CBA) report that models whether the project directly is of a net-benefit to the community. CBAs help to quantify the social benefits together with the costs of the project. It does not consider the impact on the wider economy, nor the use of scarce resources. To analyse the wider-economic impact SGS uses an input-output model.

The SGS report also included modelling on the broader economic impact of the proposed NCF. SGS's wider economic impact modelling utilises a different economic analysis framework to Deloitte Access Economics. SGS's input-output model used to analysis the economic impact differs from Deloitte Access Economics' in-house DAE-RGEM CGE model. DAE-RGEM uses a dynamic framework over time that is constrained by the scarce resources available to an economy. Whilst the underlying data of CGE models draw on input-output databases, CGE uses accepted economic theory and establishes that an economy has limited scarce resources to use as inputs. CGE modelling acknowledges that investment in the NCF requires the use of resources including investments and labour from different economies and sectors, resulting in crowding out effects, spill-overs and linkages between sectors. The CGE simulation models these relationships and forecasts the differences between a business-as-usual case without NCF and one with NCF.

In contrast, SGS's modelling used a static multiplier that has been applied to the project's expenditure each year over the time horizon. The multiplier was derived from a region-specific econometric model. The tool gives a more conservative analysis of a region's economic impact as resource constraints are not considered nor how economic structures can change. The lack of crowding out in the SGS model is one of the reasons why the total SGS impact estimate is larger than in this report. Whilst this tool is limited in its bespoke abilities, if used appropriately, it can still provide useful insights.

5.3 Results

Whilst the results might differ, both analyses provide important information based on widely recognised economic analysis tools. Due to differing approaches and data, the results differ

between these reports and are not directly comparable. A comparison of the key results from each report is shown in Table 5-1.

Table 5-1: Comparison of SGS and Deloitte results, modelled region

	Average (Deloitte)	Average (SGS)	2040 (Deloitte)	2040 (SGS)
Gross State Product ($m)	35.7	33.9	200.4	436.1
Employment (FTEs)	24.9	41	273.3	372

Appendix A: DAE-RGEM

Introduction

A change in any one part of the economy will have impacts that reverberate throughout the entire economy. For example, the building of a new mine will involve increased economic activity in the mining industry, but it will also have a range of impacts in other parts of the economy:

- There will be affects up and down **the supply chain**. As a sector expands it will draw in an increased volume of intermediate inputs from related sectors resulting in an increased demand for their output and an expansion in production. If the expansion in the sector is demand driven (especially foreign demand) then the price of its output will increase putting pressure on those who use it as an intermediate input meaning their production may contract.
- The expansion in the sector directly affected, and those which supply it, will result in an increased competition in **factor markets** (like those for labour and capital). Factors will move between industries in response to changes in demand and the price (wage) they can earn. This will result in the 'crowding out' of some activity in competing sectors as they lose workers and capital.
- At an aggregate level (across the whole economy) there may be an increase in demand for labour such that it induces increased labour supply (the encouraged worker effect) or an inflow of capital as relative rates of return shift. This **induced factor supply** enables an expansion of the economy, meaning more income and consumption which can stimulate sectors oriented toward this.
- If the expanding sector is export-oriented, then the expansion of its production which resulted in increased export income and could be associated with a positive shift in the terms of trade. However, this positive effect—in conjunction with an inflow of investment—would increase demand for local currency, causing **real exchange rate** appreciation with consequences for other exporting industries.

Computable General Equilibrium (CGE) models are the best-practice method available for examining the impacts of a change in one part of the economy on the broader economy as they can capture the multitude of impacts highlighted above. Not only can CGE models account for these effects but the results from the models can be used to build a narrative which stakeholders respect – because it is based on accepted economic theory and the latest data – and one which is easily understood.

DAE-RGEM

The Deloitte Access Economics regional general equilibrium model (DAE-RGEM) belongs to the class of models known as recursive dynamic regional CGE models.[6] Other examples of models in this class are the Global Trade and Analysis Project Dynamic (GDyn) model, the Victoria University Regional Model (VURM) and The Enormous Regional Model (TERM).

Like GDyn, DAE-RGEM is a global model, able to simulate the impact of changes in any of the 140 countries in the GTAP database (including Australia) onto each of the 140 countries. The ability to incorporate the flow-on impacts of changes that may occur in rest of the world is a key feature of global models that is not available in single-country models, such as the VURM Model or TERM.

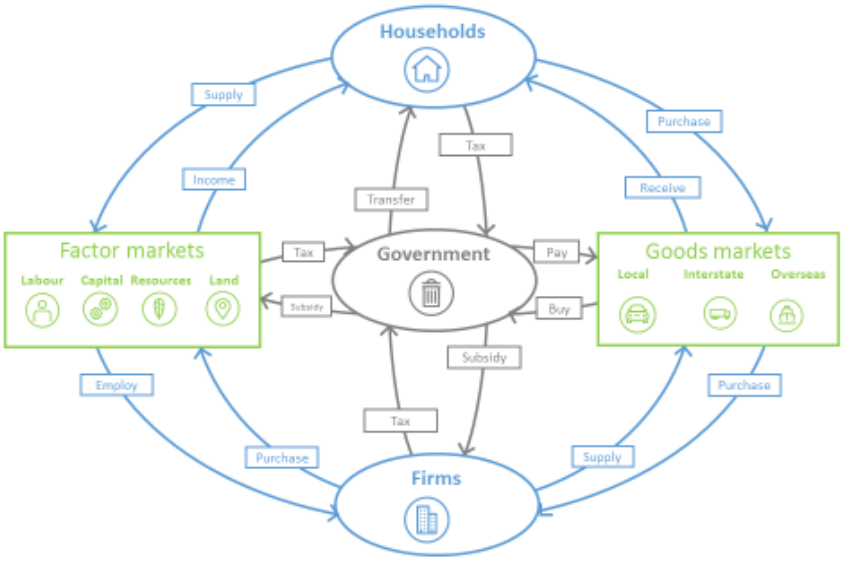
However, like those models, DAE-RGEM is a bottom-up model of regional Australia. So DAE-RGEM is able to project the impacts on different States and sub-State regions of Australia of changes occurring in any region of Australia or in rest of the world within a single, robust, integrated economic framework.

[6] In North America the term Applied General Equilibrium (AGE) is also used.

This model projects changes in macroeconomic aggregates such as GDP, employment, export volumes, investment and private consumption. At the sectoral level, detailed results such as output, exports, imports by commodity and employment by industry are also produced.

The following diagram gives a stylised representation of DAE-RGEM, specifically a system of interconnected markets with appropriate specifications of demand, supply and the market clearing conditions determine the equilibrium prices and quantity produced, consumed and traded.

Figure A.1: A stylised representation of DAE-RGEM



The model rests on the following key assumptions:

- All markets are competitive and all agents are price takers.
- All markets clear, regardless of the size of the shock, within the year.
- It takes one year to build the capital stock from investment and investors take future prices to be the same as present ones as they cannot see the future perfectly
- Supply of land and skills are exogenous. In the business-as-usual case, supply of natural resource adjusts to keep its price unchanged; productivity of land adjusts to keep the land rental constant at the base year level.
- All factors sluggishly move across sectors. Land moves within agricultural sectors; natural resource is specific to the resource using sector. Labour and capital move imperfectly across sectors in response to the differences in factor returns. Inter-sectoral factor movement is controlled by overall return maximizing behaviour subject to a CET function. By raising the size of the elasticity of transformation to a large number we can mimic the perfect mobility of a factor across sectors and by setting the number close to zero we can make the factor sector specific. This formulation allows the model to acknowledge the sector specificity of part of the capital stock used by each sector and the sector specific skills acquired by labour while remaining in the industry for a long time. Any movement of such labour to another sector will mean a reduction in the efficiency of labour as a part of the skills embodied will not be used in the new industry of employment.

DAE-RGEM is based on a substantial body of accepted microeconomic theory. Key features of the model are:

- The model contains a 'regional household' that receives all income from factor ownerships (labour, capital, land and natural resources), tax revenues and net income from foreign asset holdings. In other words, the regional household receives the gross national income (GNI) as its income.

- The regional household allocates its income across private consumption, government consumption and savings so as to maximise a Cobb-Douglas utility function. This optimisation process determines national savings, private and government consumption expenditure levels.
- Given the budget levels, household demand for a source-generic composite goods are determined by minimising a CDE (Constant Differences of Elasticities) expenditure function. For most regions, households can source consumption goods only from domestic and foreign sources. In the Australian regions, however, households can also source goods from interstate. In all cases, the choice of sources of each commodity is determined by minimising the cost using a CRESH (Constant Ratios of Elasticities Substitution, Homothetic) utility function defined over the sources of the commodity (using the Armington assumption).
- Government demand for source-generic composite goods, and goods from different sources (domestic, imported and interstate), is determined by maximising utility via Cobb-Douglas utility functions in two stages.
- All savings generated in each region are used to purchase bonds from the global market whose price movements reflect movements in the price of creating capital across all regions.
- Financial investments across the world follow higher rates of return with some allowance for country specific risk differences, captured by the differences in rates of return in the base year data. A conceptual global financial market (or a global bank) facilitates the sale of the bond and finance investments in all countries/regions. The global saving-investment market is cleared by a flexible interest rate.
- Once aggregate investment level is determined in each region, the demand for the capital good is met by a dedicated regional capital goods sector that constructs capital goods by combining intermediate inputs in fixed proportions, and minimises costs by choosing between domestic, imported and interstate sources for these intermediate inputs subject to a CRESH aggregation function.
- Producers supply goods by combining aggregate intermediate inputs and primary factors in fixed proportions (the Leontief assumption). Source-generic composite intermediate inputs are also combined in fixed proportions (or with a very small elasticity of substitution under a CES function), whereas individual primary factors are chosen to minimise the total primary factor input costs subject to a CES (production) aggregating function.

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