APPENDIX Q

ECONOMIC ASSESSMENT

Snowy 2.0

Segment Factory

Economic Impact Assessment

Prepared for

EMM

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Contents

Economic terms

Term	Meaning
Input-output table	A table that describes the sale and purchase relationships between producers and consumers within an economy in a particular year.
Input-output coefficients	The ratio of sale or purchase from individual producers and consumers to total sale or purchase.
Business turnover	Gross revenue
Value-added	The difference between the value of a firm's or industry's output (i.e. total revenues received from selling that output) and the cost of the inputs of raw materials, components or services bought in to produce that output.
Household income	Wages paid to employment including imputed wages for the self employed.
Jobs	Full-time and part-time employment
Multiplier effects	The additional economic activity that arises from a project due to the expenditure of the wages of those employed in the project and the expenditure of businesses to enable them to provide inputs to the project.
Scale economies	The cost advantages that enterprises obtain due to their scale of operation (typically measured by amount of output produced), with cost per unit of output decreasing with increasing scale.
Parent input-output table	The input-output table used as the basis for the generation of another input-output table.
Other value added	Stock changes, capital expenditure and government expenditure.
Exports	Sale of goods and services to purchasers outside the region.
Imports	Purchase of goods and services from producers located outside the region.
Flow-ons	See multiplier effects, above.
Production-induced flow-ons	The additional economic activity that arises from a project due to the expenditure of businesses to enable them to provide inputs to the project. It includes subsequent rounds of suppliers to those businesses etc.
Consumption-induced flow-ons	The additional economic activity that arises from a project due to the expenditure of the wages of those employed in the project and employees of those supplying inputs into production. It includes subsequent rounds of wage expenditure for supplying businesses.
Crowding out	Where additional economic activity arising from a project results in some contraction in other economic activity in the region due to competition for labour and capital.
Economic activity	Actions that involve the production, distribution and consumption of goods and services.

Executive summary

Snowy Hydro Limited (Snowy Hydro) proposes to develop Snowy 2.0, a large-scale pumped hydro-electric storage and generation project which would increase hydro-electric capacity within the existing Snowy Mountains Hydro-electric Scheme (Snowy Scheme).

Separate applications are being submitted by Snowy Hydro for different phases of Snowy 2.0, including Exploratory Works for Snowy 2.0 (the Exploratory Works) and Snowy 2.0 Main Works (the Main Works). A separate application has also been submitted for a proposed factory that would manufacture precast concrete segments that would line the tunnels being excavated for Snowy 2.0 (Application Number SSI 10034). This Economic Impact Assessment supports the EIS for the proposed segment factory.

The construction phase of the proposed segment factory would last about five months utilising a workforce of about 30 people, 80% of which are estimated to be sourced from the Snowy Monaro Regional Local Government Area (LGA).

The factory would operate over a period of about 3.5 years utilising a workforce of about 125 people, 80% of which are estimated to be sourced from the Snowy Monaro Regional LGA.

The construction and operation of the factory would provide economic stimulus to the local economy of the Snowy Monaro Regional LGA for approximately 4 years.

The factory construction workforce is estimated at 30 people for 5 months, with 80% (24) sourced locally. To support 30 construction workers in the *non-residential building construction sector* and *construction services sector* of the local economy for a full year, reference to the IO coefficients for the region shows that approximately $16M of capital expenditure would be required in the *non-residential building construction sector*. Forty two per cent (5/12) of this (i.e. $5M) would be needed to support this level of construction workforce for 5 months.

The direct and indirect local economic impact of this level of expenditure in the local economy is estimated at up to:

- $8M in annual direct and indirect output or business turnover;
- $3M in annual direct and indirect value added;
- $1M in annual direct and indirect household income; and
- 46 direct and indirect jobs.

Assuming expenditure patterns similar to that of the *plaster and concrete product manufacturing sector* of the National IO table i.e. the sector in the IO industry classification most reflecting the nature of the segment factory, and adjusting these for local location quotients, the factory operation is estimated to make up to the following contribution to the local economy:

- $147M in annual direct and indirect output or business turnover;
- $46M in annual direct and indirect value-added;
- $21M in annual direct and indirect household income; and
- 252 direct and indirect jobs.

However, the ultimate level of stimulus to the local economy will depend on the extent to which households and businesses can provide the labour and inputs to production required by the factory. Snowy Hydro proposes to work in partnership with local government and the local community to maximise the local economic benefits of the factory and to minimise, as far as possible, any adverse impacts.

1 Introduction

1.1 Snowy 2.0

Snowy Hydro Limited (Snowy Hydro) proposes to develop Snowy 2.0, a large-scale pumped hydro-electric storage and generation project which would increase hydro-electric capacity within the existing Snowy Mountains Hydro-electric Scheme (Snowy Scheme). This would be achieved by establishing a new underground hydro-electric power station that would increase the generation capacity of the Snowy Scheme by almost 50%. Snowy 2.0 would link the existing Tantangara and Talbingo reservoirs within the Snowy Scheme through a series of underground tunnels and hydro-electric power station.

Snowy 2.0 has been declared to be State significant infrastructure (SSI) and critical State significant infrastructure (CSSI) by the NSW Minister for Planning under Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). CSSI is infrastructure that is deemed by the NSW Minister for Planning and Public Spaces to be essential for the State for economic, environmental or social reasons. An application for CSSI must be accompanied by an environmental impact statement (EIS).

Separate applications are being submitted by Snowy Hydro for different phases of Snowy 2.0, including Exploratory Works for Snowy 2.0 (the Exploratory Works) and Snowy 2.0 Main Works (the Main Works).

The first phase of Snowy 2.0, the Exploratory Works (Application Number SSI 9208), includes an exploratory tunnel and portal and other exploratory and construction activities primarily in the Lobs Hole area of the Kosciuszko National Park (KNP). Exploratory Works has been assessed in a separate EIS and is subject to an approval issued by the former NSW Minister for Planning on 7 February 2019. Construction for Exploratory Works has already commenced.

The second phase of Snowy 2.0, the Snowy 2.0 Main Works (Application Number SSI 9687), covers the major construction elements of Snowy 2.0, including permanent infrastructure (such as the underground power station, power waterways, access tunnels, chambers and shafts), temporary construction infrastructure (such as construction adits, construction compounds and accommodation), management and storage of extracted rock material and establishing supporting infrastructure (such as road upgrades and extensions, water and sewage treatment infrastructure, and the provision of construction power). The EIS for Snowy 2.0 Main Works was submitted to the NSW Department of Planning, Industry and Environment (DPIE) in September 2019.

A separate application has also been submitted for a proposed factory that would manufacture precast concrete segments that would line the tunnels being excavated for Snowy 2.0 (Application Number SSI 10034). This Economic Impact Assessment supports the EIS for the proposed segment factory.

On 26 June 2019, Snowy Hydro referred the proposed segment factory (Reference Number 2019/8481) to the Commonwealth Minister for the Environment under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). On 13 August 2019, the proposed segment factory was determined by the Acting Assistant Secretary Assessments and Waste Branch of the Commonwealth Department of the Environment and Energy (DEE), as delegate to the Minister, to be 'not a controlled action' and therefore does not require further assessment or approval under the EPBC Act.

1.2 The proposed segment factory

The tunnels for Snowy 2.0, including the exploratory tunnel for Exploratory Works and underground tunnels linking Tantangara and Talbingo reservoirs for the Main Works, would be excavated, for the most part, using tunnel boring machines (TBMs) and would be lined using precast concrete segments. These segments are proposed to be manufactured at the proposed segment factory to be located on the south-eastern side of Polo Flat (the site), which is an industrial area located to the east of Cooma.

The proposed segment factory would contain a building for the casting and curing of the segments, uncovered storage areas for raw materials and segments, vehicle parking areas and associated offices and workshops.

Main inputs for the segments include aggregate, sand, cement and rebar steel. Primary outputs include the segments which would be transported to the TBM launch sites for Exploratory Works and Main Works within KNP.

The construction phase of the proposed segment factory would last about five months utilising a workforce of about 30 people. Construction would take place six days a week (from Monday to Saturday) and for 10 hours per day.

The factory would operate over a period of about 3.5 years utilising a workforce of about 125 people. It would be operational 24 hours a day, seven days a week.

The proposed segment factory would be constructed and operated by Future Generation Joint Venture (FGJV) which has been contracted by Snowy Hydro to construct Snowy 2.0.

At the completion of the construction of Snowy 2.0, the proposed segment factory would be decommissioned.

Further details of the proposed segment factory are provided in Chapter 2 of this report.

1.3 Location of the site

The site of the proposed segment factory is located on the south-eastern side of Polo Flat, predominantly on the southern part of the land owned by Snowy Hydro. The site is located to the east of Polo Flat Road and to the north of Carlaminda Road.

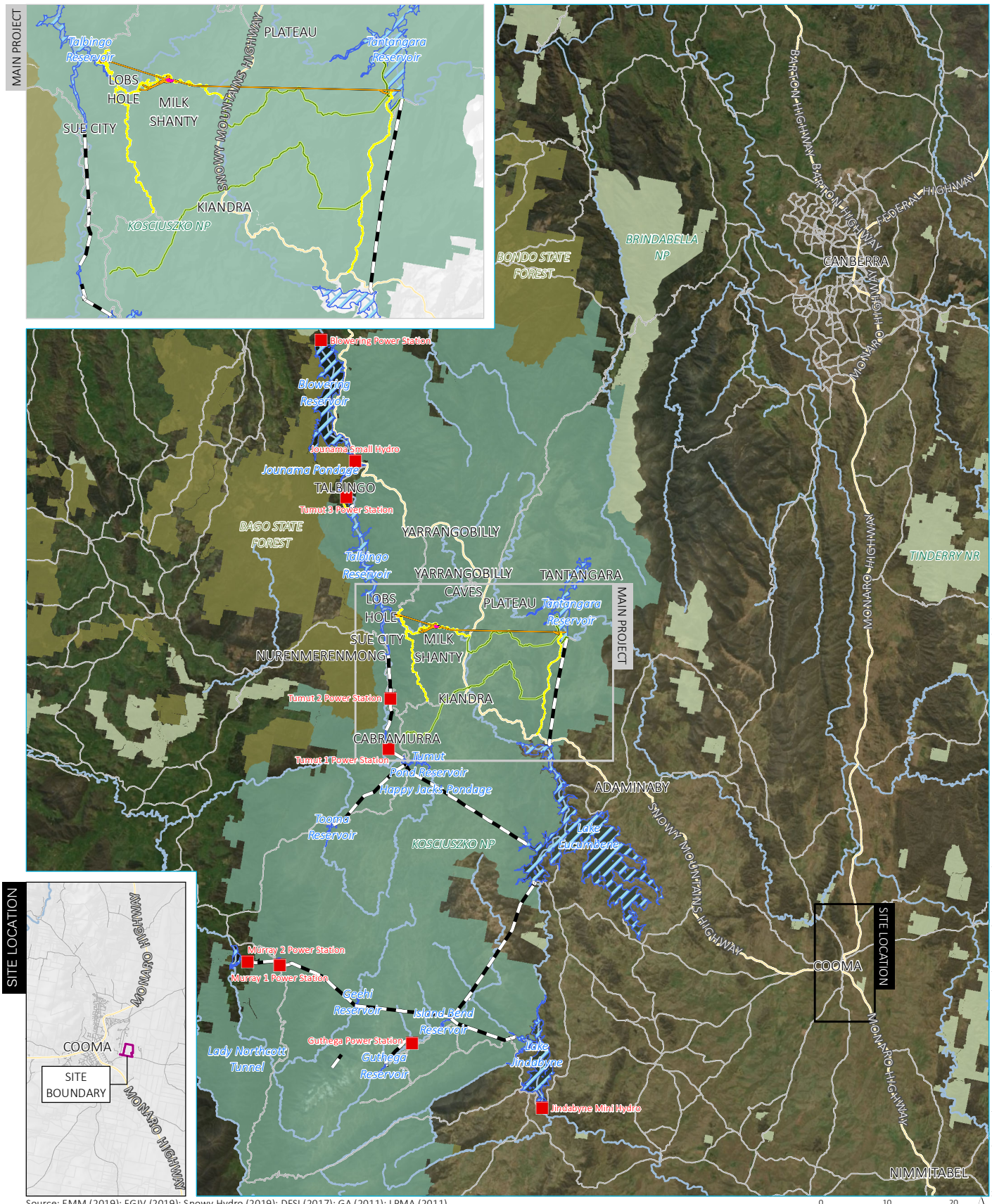
Figure 1.1 shows the location of the site in a regional context and Figure 1.2 shows the site in its local context.

The site contains the following land parcels:

- southern part of Lot 14 in Deposited Plan (DP) 250029 – also known as 9 Polo Flat Road, Polo Flat;
- Lot 3 in DP 238762 – also known as 33 Carlaminda Road, Polo Flat; and
- an unmade road corridor, directly south of the aforementioned lots.

Except for a few buildings located on the southern part of Lot 3 in DP 238762, the site is vacant and dominated by grassland. A third order watercourse flows in a north-westerly direction through the middle of the site.

Lot 14 in DP 250029 is a large parcel of land which contains a private airfield predominantly located in the middle and northern part of the land. This airfield was originally established in 1921 and further developed in the late 1950s and 1960s to service the Snowy Scheme. It became the base for the Snowy Mountains Hydro-electric Authority's (the predecessor to Snowy Hydro) flying unit and aircraft. The land was sold by Snowy Hydro in 1998 where it continued use as a private airfield. Snowy Hydro purchased the land again in early 2019.



Source: EMM (2019); FGJV (2019); Snowy Hydro (2019); DFSI (2017); GA (2011); LPMA (2011)

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KEY

- Site boundary

Snowy 2.0 project elements
- Utilities
- Tunnels, portals, intakes
- Power station
- Permanent roads and surface infrastructure

Existing Snowy Scheme
- Existing power station
- Existing pipeline tunnel
- Scheme storage

- Main road
- Local road or track
- Watercourse
- Kosciuszko National Park
- NPWS reserve
- State forest

Location of the project area

Economic Assessment
Figure 1.1

snowy 2.0

EMM creating opportunities

Source: EMM (2019); FGJV (2019); Snowy Hydro (2019); DFSI (2017); GA (2011); LPMA (2011)

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KEY

- Site boundary
- Rail line
- Main road
- Local road or track
- Watercourse
- Cadastral boundary
- NPWS reserve

Location of site in local context

Economic Assessment
Figure 1.2

snowy 2.0

EMM creating opportunities

The site is surrounded by industrial development to the west and predominantly rural land to the south and east. To the north of the site is the remainder of Lot 14 in DP 250029 which contains the private airfield, and other industrial development. Snowy Hydro's private airfield contains a main north-south aligned runway, hangers and offices. It also contains an above ground fuel tank for the refuelling of planes and helicopters.

Lot 3 in DP 238762 contains a communications tower which ceased use (ie transmission) in August 2019.

There is an isolated industrial operation containing a residence located about 150 metres (m) to the south-east of the site, and an abattoir located about 350 m to the east.

The nearest residence is a rural residence located about 450 m to the south-south-east of the site. The nearest residences within Cooma are located about 1 km to the west of the site.

1.4 Proponent

Snowy Hydro is the proponent for the proposed segment factory. Snowy Hydro is an integrated energy business – generating energy, providing price risk management products for wholesale customers and delivering energy to homes and businesses. Snowy Hydro is the fourth largest energy retailer in the NEM and is Australia's leading provider of peak, renewable energy.

As previously stated, the proposed segment factory would be constructed and operated by FGJV which has been contracted by Snowy Hydro to construct Snowy 2.0.

1.5 Purpose of this report

This Economic Impact Assessment supports the EIS for the proposed segment factory. It documents the economic activity that the factory could potentially provide to the local economy of Snowy Monaro Regional LGA.

The specific objectives of this assessment are to:

- provide a project description;
- describe the existing local economy;
- identify the potential economic activity impacts on the local economy of factory construction, operation and cessation;
- identify mitigation measures to maximise the benefits for the local economy while minimising adverse impacts.

1.6 Assessment guidelines and requirements

This Economic Impact Assessment has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs), issued by the DPIE on 31 July 2019.

The SEARs must be addressed in the EIS. Table 1.1 lists the matters relevant to this assessment and where they are addressed in this report.

Table1.1 Relevant matters raised in SEARs and information request

Requirement	Section addressed
An assessment of the economic impacts of the project on the locality	Section 4

2 Project description

2.1 Introduction

It is proposed to construct and operate a factory on the site to supply precast concrete segments that would line the tunnels for Snowy 2.0.

The construction phase of the proposed segment factory would last about five months utilising a workforce of about 30 people. The operational phase would last about 3.5 years utilising a workforce of about 125 people.

The proposed segment factory would be decommissioned at the completion of operations.

2.2 Construction

2.2.1 Main activities

The following main activities would be undertaken for the construction of the proposed segment factory:

- demolition and removal of buildings and decommissioned telecommunications tower on the southern part of site;
- clearing, removal of topsoil and vegetation (topsoil excavated would be stockpiled on site for later use if deemed suitable);
- undertaking earthworks to establish level surfaces;
- establishment of primary access road;
- installation of site services (power, water and communications);
- establishment of site surfaces (ie concrete, asphalt and cement soil); and
- construction of site facilities and buildings, including precast building, concrete batching plant (CBP), workshops, offices, parking areas, storage areas and associated facilities.

2.2.2 Earthworks

Excavation will be carried out at the site to provide level surfaces, establish the access road and create the required trenches for drainage.

Where possible excavated material would be reused on site for filling and compaction (including benching areas of the site where required). Where there is a deficit of excavated material, additional material would be sourced from local quarries.

2.2.3 Traffic movements

Construction vehicle movements will comprise construction worker's light vehicles and heavy vehicles transporting equipment, building and construction materials, waste, and fill material if required.

2.2.4 Construction timeframe and hours

The construction phase of the proposed segment factory would last about five months (estimated to commence in March 2020 subject to obtaining the required approvals). Construction would be undertaken from Monday to Saturday for 10 hours per day. Access to the site would generally start at 6 am for pre-starts and toolbox talks, and construction would commence at 7 am.

2.2.5 Workforce

A workforce of about 30 people would be required to construct the proposed segment factory.

2.3 Operations

2.3.1 General

The segments would be produced by casting concrete (made in the CBP) in reusable steel moulds which would then be cured in a chamber. Following curing, the segments would be temporarily stored onsite before being transported to the TBM launch sites within KNP.

The casting and curing would be undertaken in the precast building. Storage of the segments would predominantly be undertaken in uncovered storage areas.

Main inputs for the segments include aggregate, sand, water, cement and steel rebar.

Approximately 130,500 segments would be manufactured over the operational period.

2.3.2 Site layout

The layout of the proposed segment factory is shown in Figure 2.1. Details of the site layout are provided below.

i General layout

The CBP and precast building (which contains a casting room and curing chamber) would be located at the southern end of the site. Open storage areas would be located predominantly to the north of the building on the northern part of the site.

Site offices and workshops would be located in the south-western corner of the site.

ii Ingress and egress

Vehicle ingress and egress to the site would be provided on a new access road which would connect to Polo Flat Road. The access road would be constructed on an existing informal service road located in the unmade road corridor immediately north of Carlaminda Road.

iii Raw materials storage

Cement silos, and aggregate and sand storage areas for the CBP would be located adjacent to the CBP. Storage would be sized to hold approximately three days production.

Other raw materials include steel rebar and concrete admixtures which would be stored in, or adjacent to, the precast building.

Source: EMM (2019); FGJV (2019); Snowy Hydro (2019); DFSI (2017); ESRI (2019); GA (2011); LPMA (2011)

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KEY

- Site boundary
- Indicative site layout
- Local road or track
- Cadastral boundary
- Precast yard, concrete plant, aggregates area, precast warehouse, segment storage
- Bus stop and parking
- Offices, guard house and first aid
- Mechanical and plant workshop with parking
- Trailer parking
- Storage area
- Emergency storage area
- Detention basin
- Drainage

Proposed layout

Economic Assessment
Figure 2.1

snowy 2.0

EMM creating opportunities

iv Parking

Two large parking areas are proposed in the south-western corner of the site, and to the north of the precast building. Parking in the south western area would be used for light vehicles, trucks and buses. Parking to the north of the precast building would be used for trucks.

v Drainage

A diversion drain would be constructed around the eastern perimeter of the site to divert water from the third order watercourse. The drain diversion would be constructed to match the general width and depth of the existing watercourse.

A detention basin would be provided to the north of the site to collect surface flows. Overflows from the detention basin would be directed into the diversion drain.

2.3.3 Utility connections

The proposed segment factory would be connected to utility mains, including communications, electricity, water, wastewater and gas.

2.3.4 Segment inputs

As previously stated, main inputs for the precast concrete segments include aggregate, sand, cement and steel rebar. These main inputs would likely be sourced from locations in proximity to site and/or from quarries near Canberra.

In addition to these main inputs, several accessories are also required to produce the segments, such as reinforcement cages, steel fibres, gaskets and inserts. These inputs would likely be sourced from Canberra.

2.3.5 Segment transport

Following casting, curing and storage, the segments would be transported to the TBM launch sites within KNP.

2.3.6 Traffic movements

Operational vehicle movements will comprise light vehicles (worker's vehicles and service vehicles) and heavy vehicles required for the transportation of the main inputs for the segments and for the transportation of the segments from the site to the TBM launch sites within KNP.

2.3.7 Staff and manpower

A workforce of about 125 people would be required to operate the proposed precast segment factory. Most of this workforce would be sourced locally from the Snowy mountains Regional LGA and surrounding localities.

2.3.8 Hours of operation

It is proposed to operate the proposed segment factory 24 hours a day, seven days a week. It is estimated that the factory would operate for a period of about 3.5 years.

2.4 Decommissioning

As previously stated, the proposed segment factory would be decommissioned at the completion of construction of Snowy 2.0 which would include removal of all plant and equipment. Snowy Hydro would retain the main structures such as the precast building, workshops and offices and seek to use these for an alternative industrial use.

It is envisaged that Snowy Hydro would submit a separate application for approval for an alternative use of the site prior to the decommissioning phase of the project.

3 Local economy

3.1 Introduction

The Snowy 2.0 segment factory will be located in Cooma, within the Snowy Monaro Regional LGA.

3.2 Characterisation of the region

Snowy Monaro Regional LGA comprises an area of 15,158 square kilometres and occupies the higher slopes of the eastern side of the Great Dividing Range between the Australian Capital Territory and Queenbeyan-Palerang LGA to the north, the state boundary with Victoria to the south and Eurobodalla LGA and Bega Valley LGA to the east. Towns[1] in the Snowy Monaro Regional LGA include :

- Cooma (6,681);
- Jindabyne (2,629);
- Bombala (1,387);
- Berridale (1,197);
- Adaminaby (301); and
- Nimmitabel (2320) (ABS Census 2016a).

An indication of the health of an economy can be gained from population changes. This theory of regional economic growth suggests that places that are able to attract population immigration create increased demand for goods and services and thus more jobs. This growth leads to increasing local multiplier effects, scale economies and an increase in the rate of innovation and capital availability (Sorensen, 1990). Conversely, population losses can contribute to a 'vicious cycle' of decline whereby reduced populations results in closure of services, which in turn makes it difficult to attract new populations (Sorensen, 1990).

Trends in regional economies of NSW as a result of globalisation and associated structural adjustment include:

- loss of significant industries such as abattoirs and timber mills from many rural areas;
- increased mechanisation of agriculture and aggregation of properties, resulting in loss of employment opportunities in this industry;
- growth of regional centres, at the expense of smaller towns;
- preference of Australians for coastal living, particularly for retirement; and
- preference of many of today's fastest growing industries for locating in large cities (Collits, 2000).

The result is that there has been declining population in many rural LGAs that are located in non-coastal areas in NSW. There has also been a decline in the population of smaller towns even in regions where the population has been growing.

Against this backdrop, it is evident that the population of the Snowy Monaro Regional LGA has grown slightly, at a rate of 3.9% since 2006, less than that for NSW as a whole (14.2% between 2006 and 2016).

[1] Populations are in brackets.

Table 3.1 Population growth

Region	2006	2011	2016	Growth Rate 2006 - 2011	Growth Rate 2011 - 2016	Growth Rate 2006 - 2016
Snowy Monaro Regional	19,452	19,689	20,216	1.2%	2.7%	3.9%
New South Wales	**6,549,177**	**6,917,658**	**7,480,228**	**5.6%**	**8.1%**	**14.2%**

Source: ABS (2016b).

The NSW Department of Planning, Industry and Environment's (DPIE) population forecasts for the Snowy Monaro Regional LGA is given in Table 3.2. This suggests small population growth in the Snowy Monaro Regional LGA.

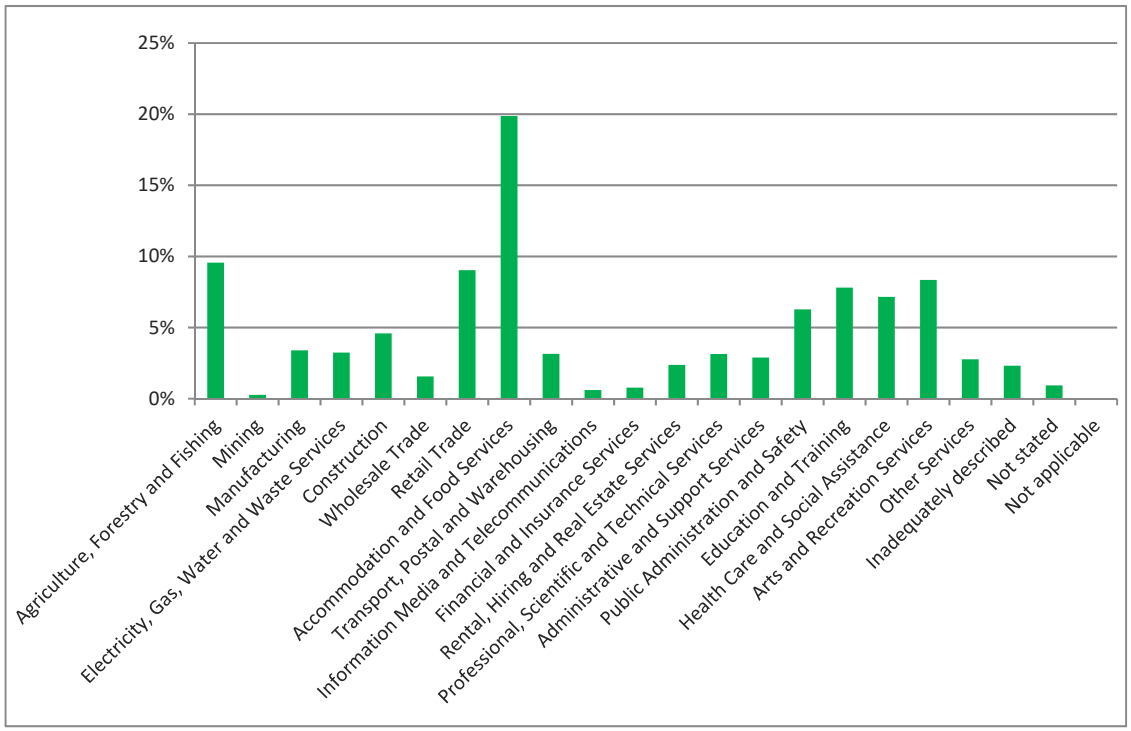
Table 3.2 Population growth rate projections

Region	2016 to 2021	2021 to 2026	2026 to 2031	2031 to 2036
Snowy Monaro Regional	1.7%	1.2%	0.7%	0.2%
New South Wales	**7.1%**	**6.6%**	**6.1%**	**5.7%**

Source: NSW Planning, Indusry and Environment (2019).

A broad indication of the nature of the economy can be gained by examining place of work employment by industry data - refer to Figure 3.1.

Figure 3.1 Place of work employment by industry



Source: ABS (2016c).

This indicates the significance of the accommodation and food services sector and retail trade sector (reflecting the importance of tourism), as well as the agriculture, forestry and fishing sector (sheep and beef cattle farming). Location quotients[2] indicate a regional specialisation in the agriculture, forestry and fishing sector; accommodation and food services sector; electricity/gas/water and waste services sector; and arts and recreation services sector.

Journey to Work data shows that 83.2% of the 9,713[3] people who work in the Snowy Monaro Regional LGA also reside in the Snowy Monaro Regional LGA. The remaining 16.8% work in the LGA but live outside it, with No Fixed Address (NSW)(154), Bega Valley LGA (133) and the ACT (120) being the largest sources of workers. There is little provision of labour from Snowy Valleys LGA (20).

Conversely, 82.4% of the 9,801[4] employed residents in the Snowy Monaro Regional LGA work in the region, with 12.4% working outside the region. The main locations for work outside the region are ACT (728), No Fixed Address (NSW) (492) and Queanbeyan-Palerang Region LGA (114).

A more detailed examination of the economy of the local region can be gained from preparation of an input-output (IO) table for the economy.

A 2016 IO table of the local economy was developed using the Generation of Input-Output Tables (GRIT) procedure (Attachment 1) using the latest 2016-17 IO table of the National economy (ABS 5209.0.55.001 Australian National Accounts: Input-Output Tables - 2016-17) as the parent table and a 2016 Census employment by industry data for NSW and the region. The 114 sector IO table of the local economy was aggregated to 50 sectors and 8 sectors for the purpose of describing the economy.

A highly aggregated 2016 IO table for the local economy is provided in Table 3.2. The rows of this table indicate how the gross regional output of an industry is allocated as sales to other industries, to households, to exports and other final demands (OFD) (which includes stock changes, capital expenditure and government expenditure). For example, the agriculture/forestry/fishing sector in the region sells $45M worth of output to the agriculture, forestry and fishing sector of the local economy, $32M worth of output to the manufacturing sector of the local economy etc. It also sells $2M of output directly to households and exports $190 worth of output from the region.

The corresponding column shows the sources of inputs to produce that gross regional output. These include purchases of intermediate inputs from other industries, the use of labour (household income), the returns to capital or other value-added (OVA) (which includes gross operating surplus and net indirect taxes and subsidies) and goods and services imported from outside the region. The number of people employed in each industry is also indicated in the final row. For the agriculture/forestry/fishing sector to produce $333M worth of output, it purchases $45M of inputs from the agriculture/forestry/fishing sector of the local economy; $2M of inputs from the manufacturing sector of the local economy etc. It also imports $96M of inputs from outside the region, generates $106M in other value added, employs 944 people and pays $42M in wages and salaries.

Output for the local economy is estimated at $5.0B. Value-added for the local economy is estimated at $1.3BM, comprising $567M to households as wages and salaries and $713M in OVA.

The total employment in the local economy was 9,761 jobs.

[2] Location quotients are a way of quantifying how "concentrated" an industry is in a region compared to a larger geographic area, in this case NSW. They are calculated by comparing the industry's share of regional employment with its share of NSW employment. A LQ of one indicates that the concentration of an industry's employment in a region is the same as for the state. A LQ of greater than one indicates the region has a greater concentration of employment in an industry compared to NSW and hence the likelihood of this sector in a region being able to provide the goods and services demanded by a project are greater than where the concentration is less than one. LQs greater than 1.2 reflect specialisation of that industry in the local area.

[3] This is slightly different to the place of work employment figure referred to in the impact assessment as it is based on profile.id.com, rather than 2016 census data.

[4] This is also based on profile.id.com, rather than the 2016 census, and hence there may be slight differences.

Table 3.2 Aggregated transactions table: local economy 2016 ($M)

	Ag, forestry, fishing	Mining	Manuf.	Utilities	Building	Trade/ Accom	Bus. Srvcs	Public/ Pers. Srvcs	**TOTAL**	Household Expenditure	OFD	Exports	**Total**
Ag, forestry, fishing	45	0	32	0	0	4	1	1	**83**	2	58	190	**333**
Mining	0	0	1	0	1	0	0	0	**3**	0	3	7	**13**
Manuf.	2	0	4	1	7	14	1	3	**31**	14	6	80	**131**
Utilities	5	0	2	93	1	8	8	7	**124**	14	215	44	**398**
Building	6	0	2	6	36	7	9	7	**73**	1	129	1	**204**
Trade/Accom	9	0	3	4	5	11	10	11	**54**	115	27	227	**423**
Bus.Srvcs	19	1	10	26	13	50	77	47	**243**	145	75	114	**577**
Public/Pers Srvcs	2	0	1	3	2	3	11	22	**43**	72	332	41	**488**
TOTAL	**89**	**3**	**55**	**132**	**66**	**96**	**117**	**97**	**654**	**362**	**846**	**704**	**2,566**
Household Income	42	2	20	31	36	127	120	189	**567**	-	-	-	**567**
OVA	106	3	15	79	28	101	205	81	**618**	50	44	1	**713**
Imports	96	5	40	156	74	99	135	122	**727**	286	90	19	**1,122**
TOTAL	**333**	**13**	**131**	**398**	**204**	**423**	**577**	**488**	**2,566**	**698**	**980**	**724**	**4,967**
Employment (no.)	944	21	341	329	469	3,086	1,304	3,268	**9,761**				

The economic structure of the local economy can be compared with that for NSW through a comparison of results from the respective IO models (Figures 3.2 and 3.3). This reveals that the agriculture/forest/fishing, and trade/accommodation sectors in the local economy are of greater relative importance than they are to the NSW economy, while the mining sectors, manufacturing sectors and business services sectors are of less relative importance than they are to the NSW economy.

Figure 3.2 Summary of aggregated sectors: local economy (2016)

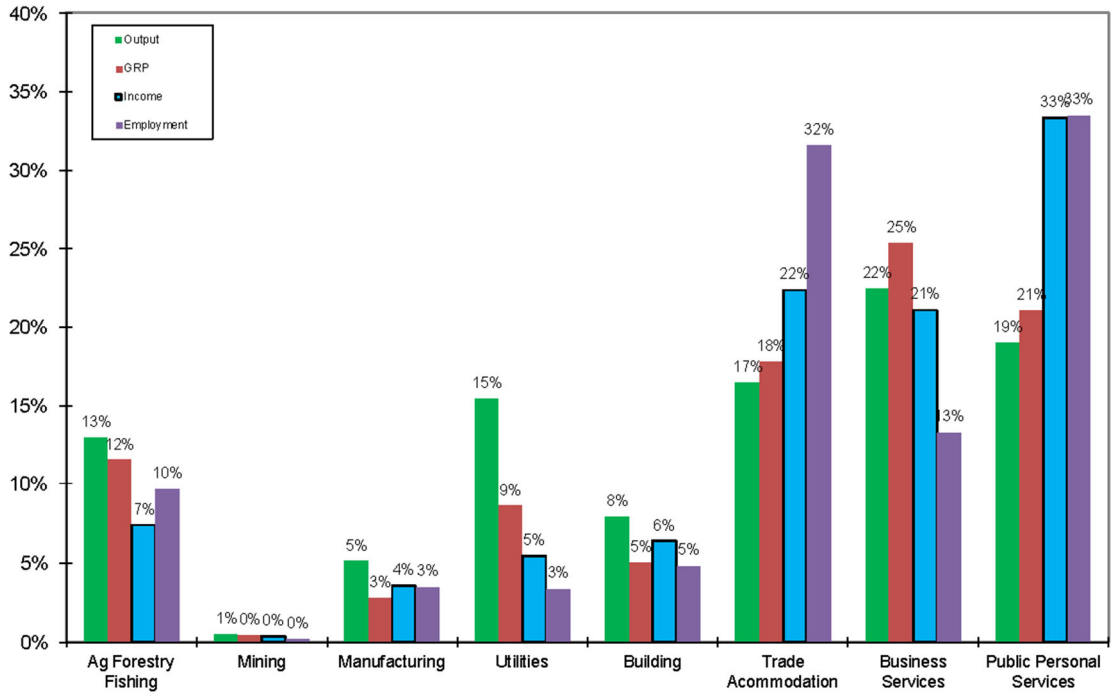
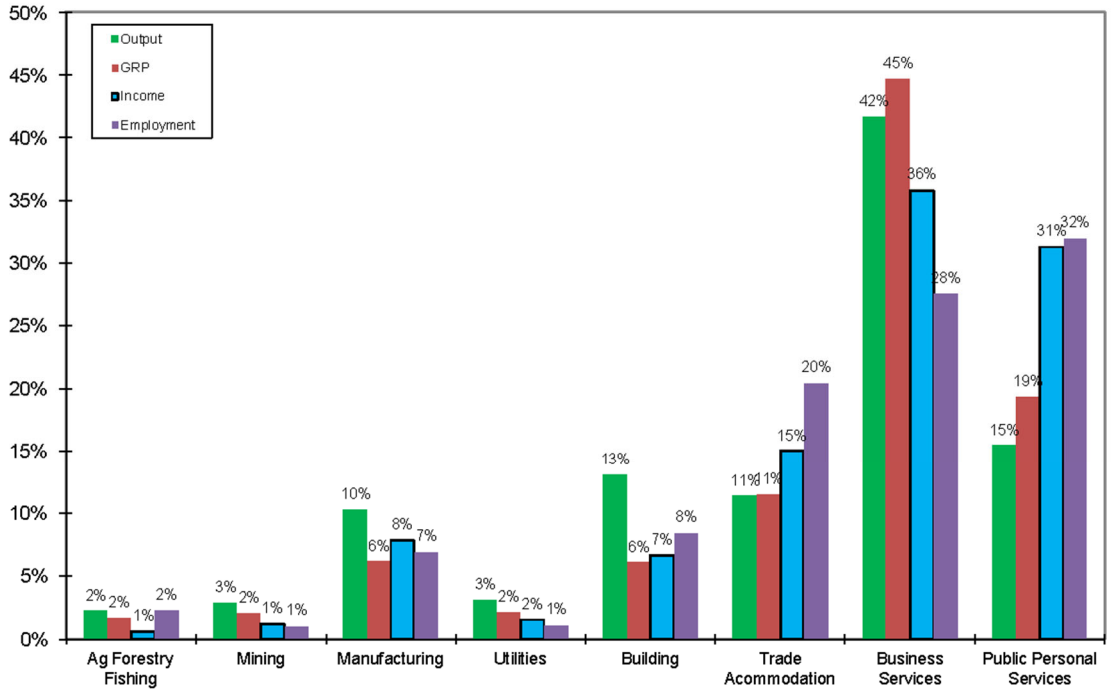


Figure 3.3 Summary of aggregated sectors: NSW economy (2016)



Figures 3.4 to 3.6 provide a more expansive sectoral distribution of gross regional output, employment, household income, value-added, exports and imports, and can be used to provide some more detail in the description of the economic structure of the local economy. From Figure 3.4, it is evident that in terms of gross regional output, utilities, sheep/grains/beef/dairy cattle, accommodation/restaurants and wood manufacturing are the most significant sectors. In terms of value-added, accommodation/restaurants, sheep/grains/beef/dairy cattle and utilities are the most significant sectors (Figure 3.4). The accommodation/restaurants, retail trade, sheep/grains/beef/dairy cattle, education and sport/recreation/gambling sectors are the most significant sector in terms of local employment (Figure 3.5) while the accommodation/restaurants, public administration and education sectors are the most significant sectors in terms of income (Figure 3.5). Major importing sectors include utilities and sheep/grains/beef/dairy cattle, while major exporting sectors include accommodation/restaurants and sheep/grains/beef/dairy cattle (Figure 3.6).

Figure 3.4 Sectoral distribution of gross regional output and value added ($M)

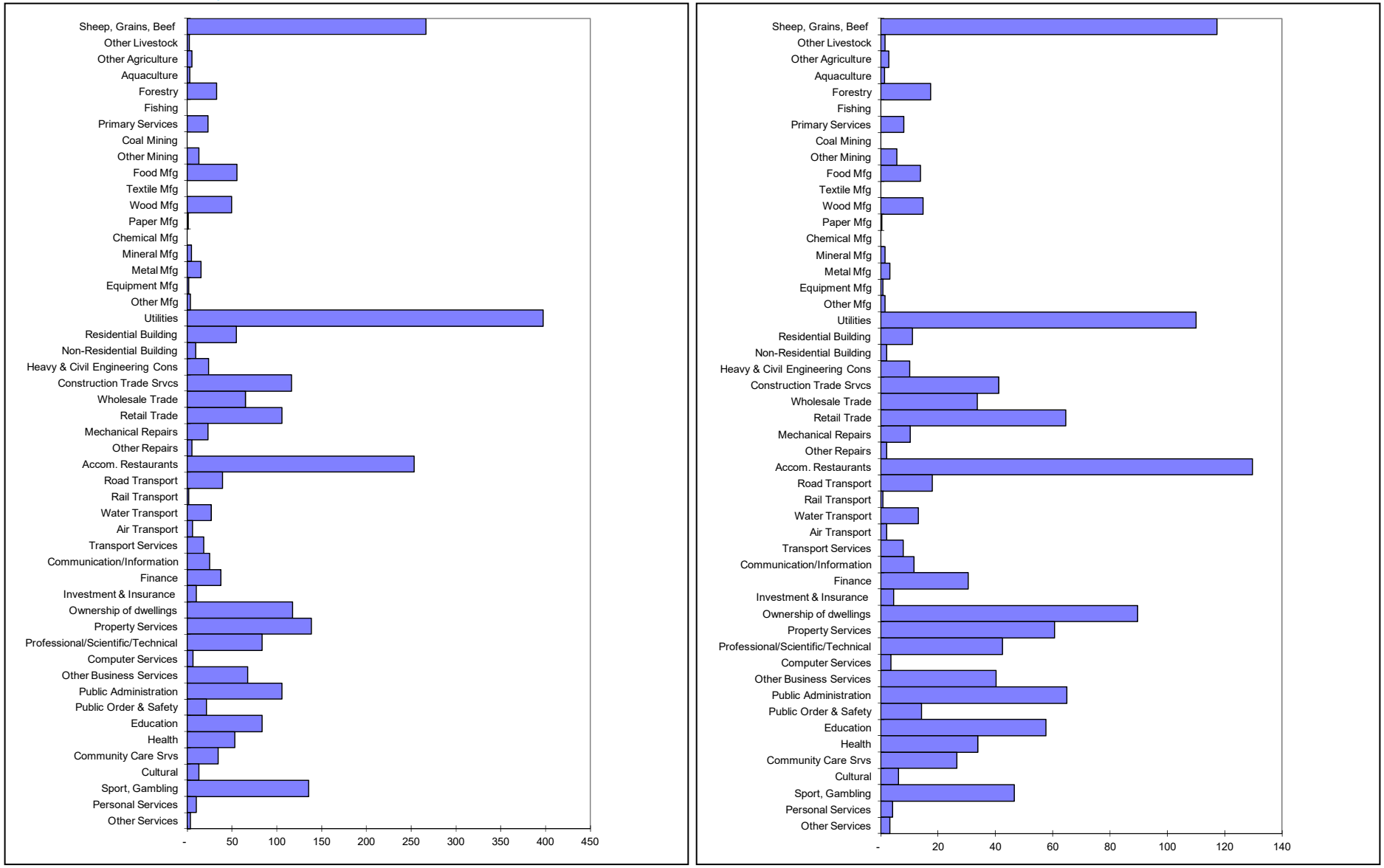
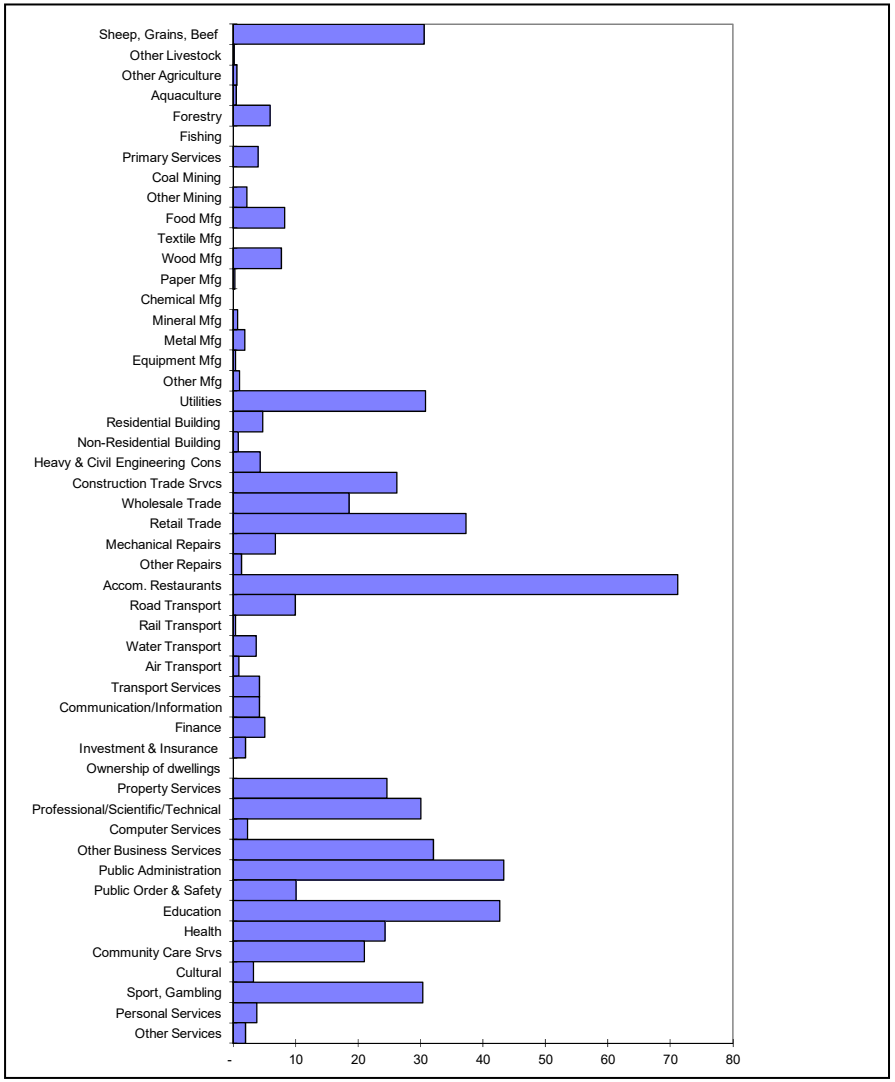


Figure 3.5 - Sectoral distribution of income ($M) and employment (No.)

Income



Employment

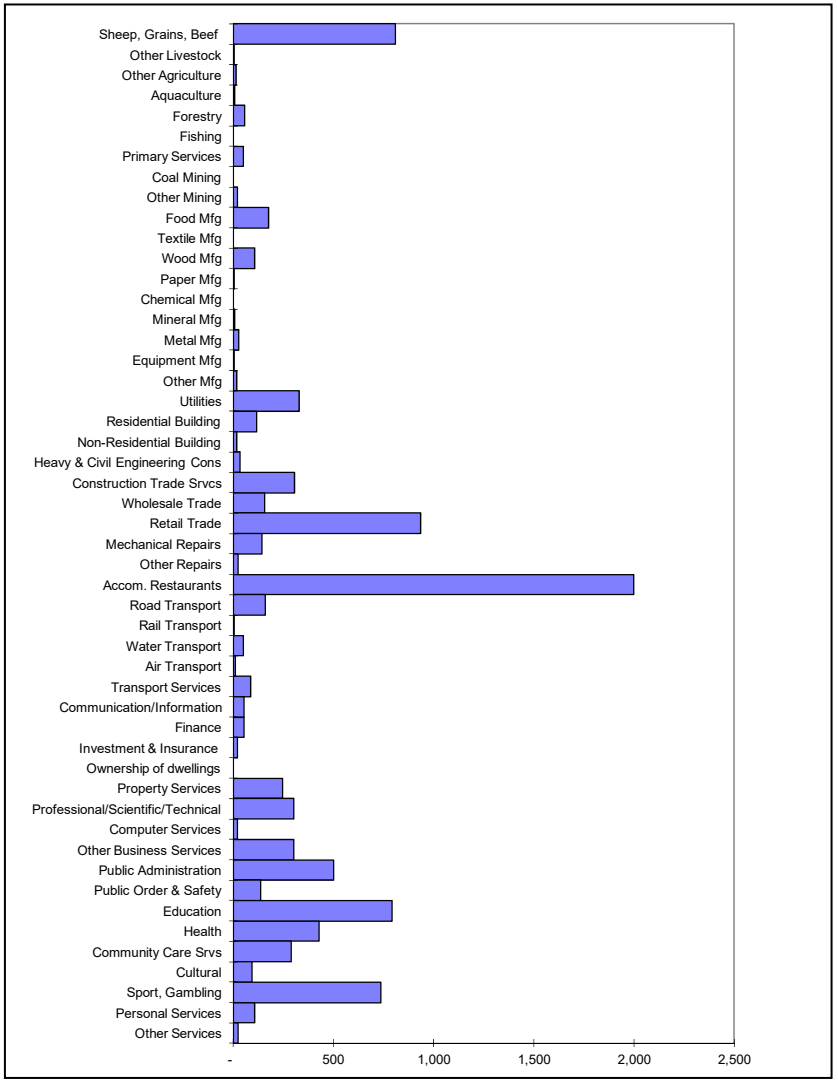
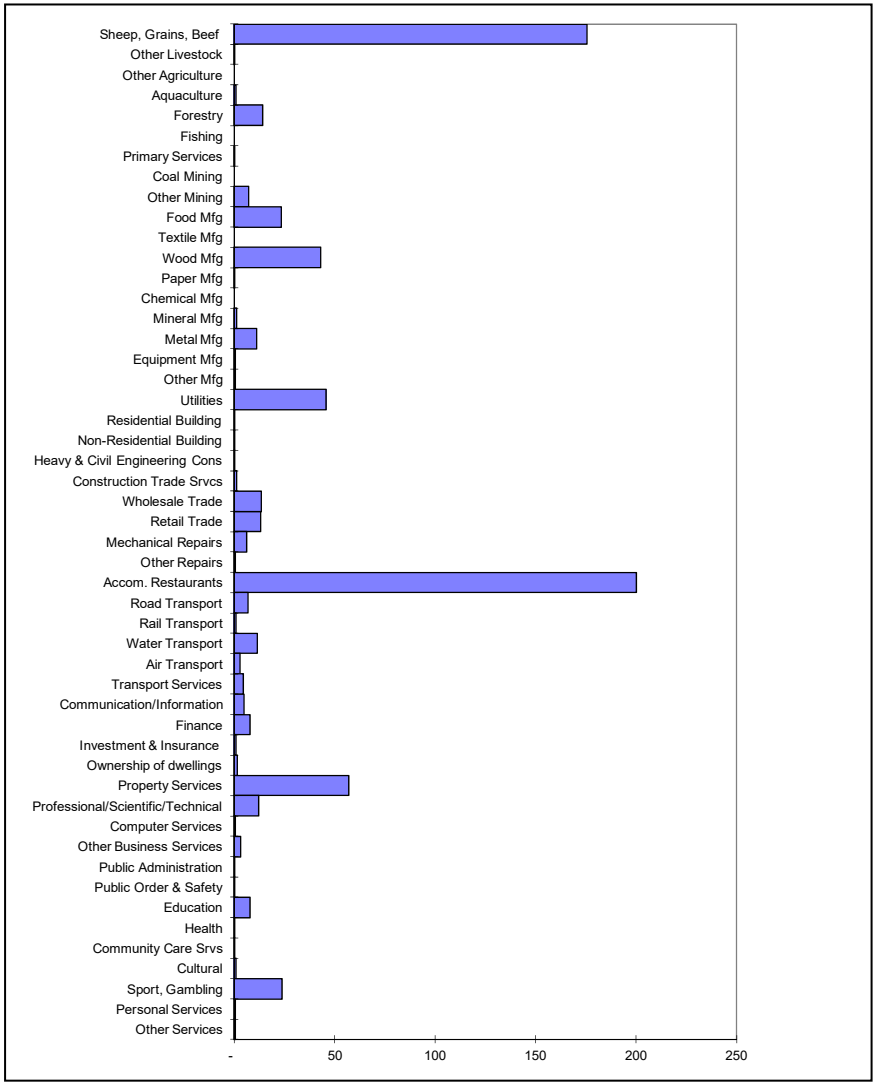


Figure 3.6 Sectoral distribution of exports and imports ($M)

Exports



Imports

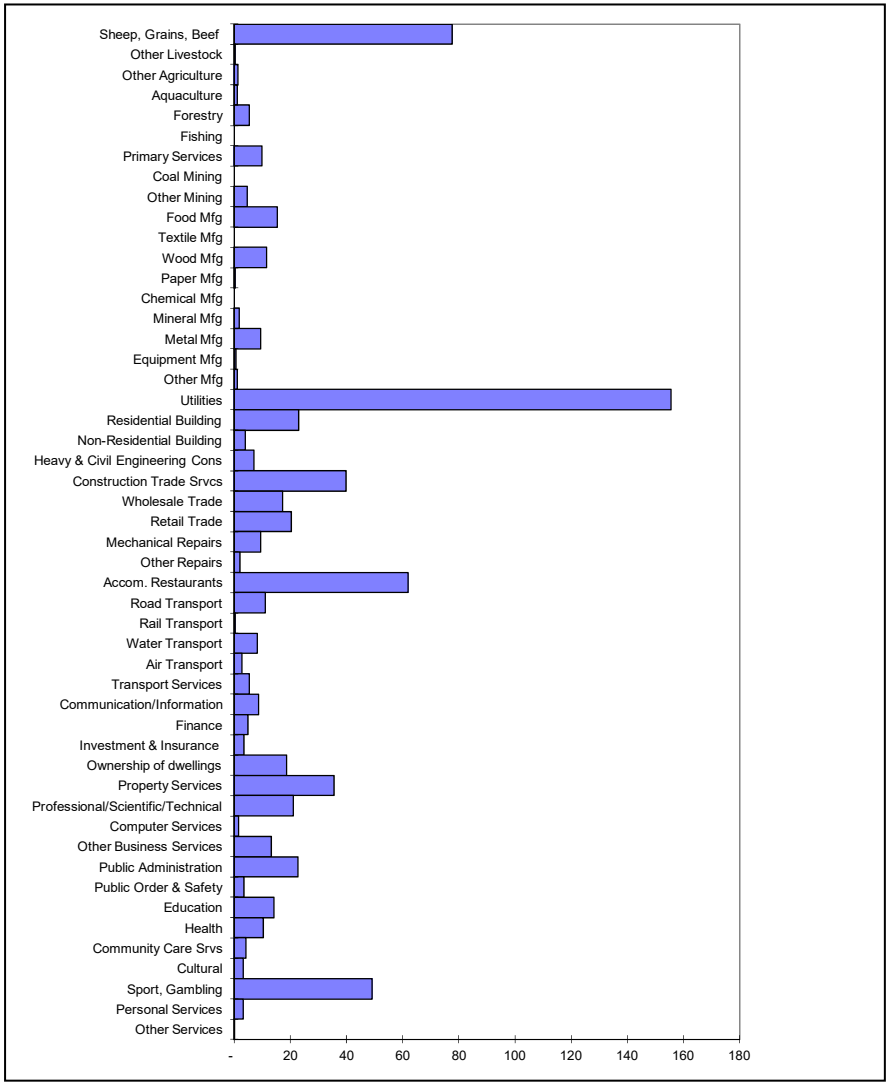
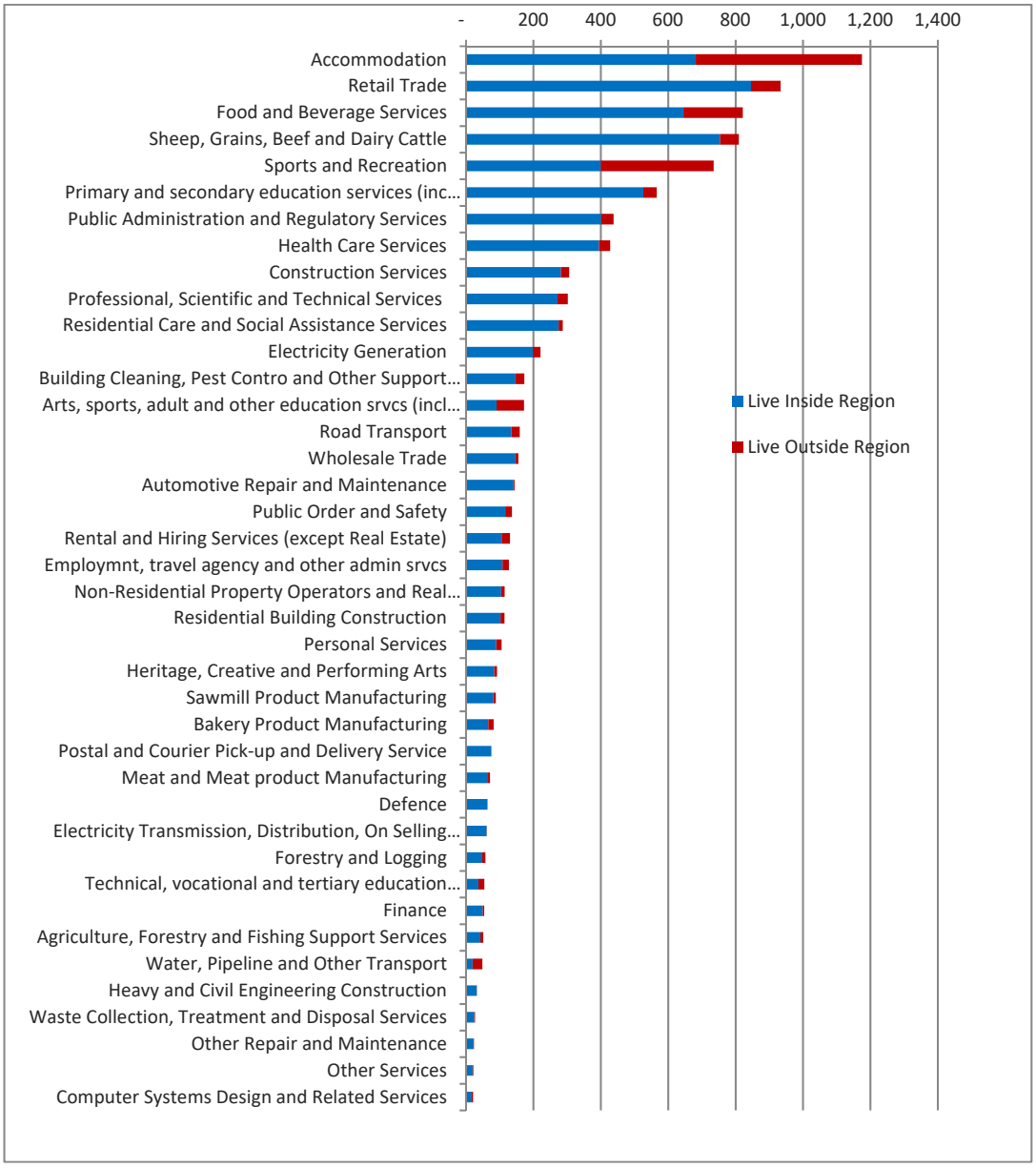


Figure 3.7 shows the top 40 individual IO industry sectors by employment number for the region. The five most significant employment providers in the region are accommodation; retail trade; food and beverage services; sheep/grains/beef/dairy cattle; and sports and recreation. In the top 40 individual industry sectors by employment, 18% of the workforce resides outside the region. The sectors with the highest proportion of labour sourced from outside the region are water/pipeline and other transport (59%); arts/sport/adult/other educational services (47%); sports and recreation (46%); and accommodation (42%).

Figure 3.7 Main employment sectors in the region (job numbers)



Source: Generated from ABS 2016 (d).

4 Local impacts

The revenue, expenditure and employment associated with the construction and operation phases of the factory would stimulate economic activity for the local economy, as described in this section.

4.1 Construction phase

4.1.1 Introduction

Direct economic activity associated with the factory construction is estimated to mainly occur within three sectors of the economy:

- the *non-residential building construction sector* which includes businesses involved in construction of non-residential buildings, including industrial buildings;
- the *construction services sector* which includes businesses involved in site preparation services, plumbing, electrical, and other trades; and
- the *specialised and other machinery and equipment manufacturing sector* which includes the manufacturing industrial machinery and equipment.

Given the largely specialist nature of capital equipment and the relatively small size of the local economy, for this analysis it is assumed that all such purchases are made outside the local economy.

4.1.2 Impact on local economy

Construction costs are estimated at $55M (FGJV, 2019). The average annual factory direct construction workforce is estimated at 30 people for 5 months, with 80% (24) sourced locally i.e. the Snowy Monaro Regional LGA (FGJV, 2019).

To support 30 construction workers in the *non-residential building construction sector* and *construction services sector* for a full year, reference to the IO coefficients for the region shows that approximately $16M of capital expenditure would be required in the *non-residential building construction sector*[5]. Forty two per cent (5/12) of this (i.e. $5M) would be needed to support this level of construction workforce for 5 months.

The direct and indirect local economic impact of this level of expenditure in the local economy is reported in Table 4.1.

[5] The *construction services sector* is closely linked to the *non-residential building construction sector* and expenditure in the *non-residential building construction sector* generates employment in the *construction services sector*.

Table 4.1 Economic impacts of the construction workforce on the local economy

	Direct	Production induced	Consumption induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($M)	5	3	1	3	8
Type 11A Ratio	1.00	0.50	0.12	0.62	1.62
VALUE ADDED ($M)	2	1	0	1	3
Type 11A Ratio	1.00	0.36	0.22	0.58	1.58
INCOME ($M)	1	0	0	0	1
Type 11A Ratio	1.00	0.37	0.16	0.53	1.53
EMPL. (No.)	30	10	6	16	46
Type 11A Ratio	1.00	0.33	0.20	0.54	1.54

Note: Totals may have minor discrepancies due to rounding.

In estimating the total local impacts, it is important to separate the flow-on effects that are associated with firms buying goods and services from each other (production-induced effects) and the flow-on effects that are associated with employing people who subsequently buy goods and services as households (consumption-induced effects). This is because these two effects operate in different ways and have different spatial impacts.

Production-induced effects occur in a near-proportional way within a region, whereas the consumption-induced flow-on effects only occur in a proportional way if workers and their families are located in the region or migrate into the region. Where workers commute from outside the region some of the consumption-induced flow-on effects leak from the region. For the purpose of this analysis it was assumed that 80% of the construction workforce (24) are sourced from the region and that the remainder who relocate to the region or commute from outside the region do not expend any significant amount of their income in the region. On this basis the total local economic impact during the five months of construction is estimated at up to:

- $8M in annual direct and indirect output or business turnover;
- $3M in annual direct and indirect value added;
- $1M in annual direct and indirect household income; and
- 46 direct and indirect jobs.

Where workers are already located in the region i.e. unemployed or employed, some of the consumption-induced flow-ons in the region may already be occurring through expenditure of their current wage or unemployment benefits. The impacts represent the gross economic footprint of the factory rather than the incremental effects.

4.1.3 Multipliers

Multipliers are summary measures used for predicting the total impact on all industries in an economy from changes in the demand for the output of any one industry (ABS, 1995). There are many types of multipliers that can be generated from IO analysis (refer to Attachment 2). Type 11A ratio multipliers summarise the total impact on all industries in an economy in relation to the initial own sector effect e.g. total income effect from an initial income effect and total employment effect from an initial employment effect, etc.

The Type 11A ratio multipliers for the construction phase of the factory range from 1.53 for income up to 1.62 for output.

4.1.4 Main sectors affected

The IO analysis indicates that construction is most likely to directly impact the *non-residential building construction sector* and *construction services sector*. Flow-on impacts from the construction of the factory are likely to affect a number of different sectors of the local economy. The sectors most impacted by output, value-added, income and employment production-induced flow-ons are the professional/scientific/technical services sector, wholesale trade, retail trade and road transport sectors. The sectors most impacted by output, value-added, income and employment consumption-induced flow-ons are the retail trade, food and beverage services and wholesale trade, primary and secondary education and health care services.

4.2 Operation phase

4.2.1 Introduction

The segment factory will operate for approximately 3.5 years. For the analysis of the factory, a segment factor sector was developed and inserted into the local IO table[6] reflecting average annual turnover of $115M and employment of 125 people (FGJV, 2019). For this new sector:

- the estimated gross annual turnover of the factory, i.e. $115M, was allocated to the output row;
- direct employment in the factory i.e. 125 people, was allocated to the employment row.
- the estimated wages were based on the average wages in the *plaster and concrete product manufacturing sector* of the National IO table i.e. the sector most reflecting the nature of the segment factory;
- the estimated wage bill of employees residing in the region (100), was allocated to the household wages row with the remainder allocated to a secondary household wages row that does not get incorporated into flow-on effects;
- OVA was estimated as a proportion of annual turnover from the ratios in the National IO table for the *plaster and concrete product manufacturing sector*;
- non-wage expenditure was initially allocated across the relevant intermediate sectors in the local economy and imports based on ratios in the National IO table for the *plaster and concrete product manufacturing sector*;
- non-wage local expenditure in the region was then adjusted between the region and imports based on local location quotients for each sector providing inputs to the *plaster and concrete product manufacturing sector*[7].

4.2.2 Impacts

The total and disaggregated annual impacts of the average operation of the factory on the local economy in terms of output, value-added, income and employment (in 2019 dollars) are shown in Table 4.2.

[6] Inflated to 2019

[7] Some regional location quotients were manually adjusted downwards based on industry mix within IO sectors and the likely demands of the Project, as well as likelihood that a particular input would be provided locally. For example, major inputs to production such as concrete, iron and steel manufacturing, structural metal product manufacturing, repairs and maintenance were assumed to be imported due to quantities required and their specialised nature.

Table 4.2 Annual local economic impacts of the factory

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT	Adjusted Total for Non Local Hires
OUTPUT ($M)	115	21	14	35	150	147
Type 11A Ratio	1.00	0.18	0.12	0.30	1.30	1.28
VALUE ADDED ($M)	29	10	8	18	47	46
Type 11A Ratio	1.00	0.35	0.28	0.63	1.63	1.58
INCOME ($M)	14	5	3	8	21	21
Type 11A Ratio	1.00	0.36	0.20	0.55	1.55	1.51
EMPL. (No.)	125	81	58	139	264	252
Type 11A Ratio	1.00	0.65	0.46	1.11	2.11	2.02

Note: Totals may have minor discrepancies due to rounding.

Again local economic impacts are separated out between production-induced effects and consumption-induced effects. Production-induced effects occur in a near-proportional way within a region. Where workers commute from outside the region (assumed to be 20%) some of the consumption-induced flow-on effects (20%) leak from the region. Where workers are already located in the region i.e. unemployed or employed, some of the consumption-induced flow-ons in the region may already be occurring through expenditure of their current wage or unemployment benefits. The impacts represent the gross economic footprint of the factory rather than the incremental effects.

The factory is estimated to make up to the following contribution to the local economy (Table 4.2):

- $147M in annual direct and indirect output or business turnover;
- $46M in annual direct and indirect value-added;
- $21M in annual direct and indirect household income; and
- 252 direct and indirect jobs.

To the extent that businesses are able to supply more inputs to production than assumed in the above analysis the impacts will be larger. However, to the extent that businesses are able to supply less inputs to product than assumed in the above analysis the impacts will be smaller.

4.2.3 Multipliers

Type 11A ratio multipliers for the factory range from 1.28 for output up to 2.02 for employment.

Capital intensive industries tend to have a high level of linkages with other sectors in an economy thus contributing substantial flow-on employment while at the same time only having a lower level of direct employment (relative to output levels). This tends to lead to relatively high ratio multipliers for employment. A lower ratio multiplier for income (compared to employment) also generally occurs as a result of comparatively higher wage levels in the factory sector compared to incomes in the sectors that would experience flow-on effects from the factory.

Capital intensive projects also typically have a relatively low ratio multiplier for value-added, reflecting the relatively high direct value-added for the factory compared to that in flow-on sectors. The low output ratio multiplier largely reflects the high direct output value of the factory compared to the sectors that experience flow-on effects from the factory.

4.2.4 Main sectors affected

Based on the above assumptions, flow-on economic activity from the factory is likely to occur in a number of different sectors of the local economy. The sectors most impacted by output, value-added and income flow-on economic activity are likely to be the:

- Non Metallic Mineral Mining;
- Road Transport;
- Retail Trade Sector;
- Employment, Travel Agency and Other Administrative Services;
- Food and Beverage Services Sector;
- Electricity Transmission, Distribution, On Selling and Electricity Market Operation;
- Construction Services;
- Building Cleaning, Pest Control and Other Support Services;
- Non-Residential Property Operators and Real Estate Services;
- Professional, Scientific and Technical Services Sector;
- Public Order and Safety.

Examination of the estimated direct and flow-on employment impacts gives an indication of the sectors in which employment opportunities would be generated by the factory operation (Table 4.3).

Table 4.3 Sectoral distribution of total local employment impacts of the factory

Sector	Average Direct Effects	Production Induced	Consumption Induced	Total
Primary	0	1	1	1
Mining	0	2	0	2
Manufacturing	125	3	2	130
Utilities	0	3	1	4
Wholesale/Retail	0	14	14	28
Accommodation, cafes, restaurants	0	8	9	17
Building/Construction	0	3	1	3
Transport	0	14	1	15
Services	0	34	18	52
Total	**125**	**81**	**46**	**252**

Note: Totals may have minor discrepancies due to rounding.

Table 4.3 indicates that direct, production-induced and consumption-induced employment impacts of the factory on the local economy are likely to have different distributions across sectors. Production-induced flow-on employment would occur mainly in the services, transport and wholesale/retail, sectors, while consumption induced flow-on employment would be mainly in the services, wholesale/retail trade and accommodation/cafes/restaurants sectors (Table 4.3).

Businesses that can provide the inputs to the production process required by the factory and/or the products and services required by employees would directly benefit from the factory by way of an increase in economic activity. However, because of the inter-linkages between sectors, many indirect businesses would also benefit.

4.3 Potential contraction in other sectors

Economic impacts for local economies modelled using IO analysis represent only the gross or positive economic activity footprint associated with the factory. Where employed and unemployed labour resources in the region are limited and the mobility of in-migrating or commuting labour from outside the region is restricted, there may be competition for local labour resources as a result of the individual project that drives up local wages. In these situations, there may be some 'crowding out' of economic activity in other sectors of the local economy.

'Crowding out' would be most prevalent if the local economy was at full employment and it was a closed economy with no potential to use labour and other resources that currently reside outside the region. However, the local economy is not at full employment and is an open economy with access to external labour resources. There is already considerably movement of labour to the region and from the region. Consequently, 'crowding out' of economic activity in other sectors as a result of the factory would not be expected to be significant.

However, even where there is some 'crowding out' of other economic activities this does not indicate losses of jobs but the shifting of labour resources to higher valued economic activities. This reflects the operation of the market system where scarce resources are reallocated to where they are most highly valued and where society would benefit the most from them. This reallocation of resources is therefore considered a positive outcome for the economy, not a negative.

4.4 Segment plant cessation

As outlined in Section 4.2 and 4.3, the factory would provide direct and indirect economic activity in the local economy for approximately 5 months of construction and 3.5 years of operation. Conversely, the cessation of the project in the future would result in a contraction in local economic activity.

The magnitude of the local economic impacts of cessation of the factory would depend on a number of interrelated factors at the time, including:

- the movements of workers and their families;
- alternative development opportunities; and
- economic structure and trends in the local economy at the time.

Ignoring all other influences, the impact of factory cessation on the local economy would depend on whether the workers and their families affected would leave the area. If it is assumed that some or all of the workers remain in the region and gain alternative employment, then the impacts of factory cessation would not be as severe compared to a greater number leaving the region or becoming unemployed. This is because the consumption-induced flow-ons of the decline would be reduced through the continued consumption expenditure of those who stay (Economic and Planning Impact Consultants, 1989). Under this assumption, the local economic impacts of factory cessation would approximate the direct and production-induced effects in Table 4.3. However, if displaced workers and their families leave the region then impacts would be greater and begin to approximate the total effects in Table 4.3.

The decision by workers, on cessation of the factory, to move or stay would be affected by a number of factors including the prospects of gaining employment in the local economy compared to other regions, the likely loss or gain from homeowners selling, and the extent of "attachment" to the local area (Economic and Planning Impact Consultants, 1989).

Ultimately, the significance of the economic impacts of cessation of the factory would depend on the economic structure and trends in the local economy at the time. For example, if the factory cessation takes place in a declining economy, the impacts might be significant. Alternatively, if factory cessation takes place in a growing diversified economy where there are other development opportunities, the ultimate cessation of the factory may have little impact.

Nevertheless, given the uncertainty about the future prospects in the local economy, it is not possible to predict the likely circumstances within which factory cessation would occur.

5 Mitigation and management

The factory will provide economic stimulus to the economy of the Snowy Monaro Regional LGA. The level of stimulus will depend on the extent to which households and businesses can provide the labour and inputs to production required by the factory. Snowy Hydro and its contractor, Future Generation Joint Venture (FGJV), propose to liaise with local government and the local community to maximise the local economic benefits of the factory and to minimise any adverse impacts, as far as possible. In this respect, a number of specific economic impact mitigation measures are proposed, including:

Local employment

- The provision of employment opportunities for the local labour force, where they have the required skills and experience.

Potential business impacts

- Collaboration with Councils, economic development organisations, local chambers of commerce and State Government to:
  - Inform local businesses of the goods and services required by the factory, service provision opportunities and compliance requirements of businesses to secure contracts.
  - Encourage and advise local business on how to meet the requirements of the factory for supply contracts.
  - Develop relevant networks to assist qualified local businesses to tender for provision of goods and services to support the factory, where possible.

Potential accommodation impacts

- Minimise impacts on short term accommodation by providing (subject to approval) in-commuting workforce accommodation in the proposed temporary accommodation facility at Pacific Hills in Cooma, while on shift.

6 Conclusion

The construction phase of the proposed segment factory would last about five months utilising a workforce of about 30 people, 80% of which are estimated to be sourced from the Snowy Monaro Regional Local Government Area (LGA).

The factory would operate over a period of about 3.5 years utilising a workforce of about 125 people, 80% of which are estimated to be sourced from the Snowy Monaro Regional LGA.

The construction and operation of the factory would provide economic stimulus to the local economy of the Snowy Monaro Regional LGA for approximately 4 years.

The direct and indirect local economic impact of construction in the local economy is estimated at up to:

- $8M in annual direct and indirect output or business turnover;
- $3M in annual direct and indirect value added;
- $1M in annual direct and indirect household income; and
- 46 direct and indirect jobs.

The direct and indirect local economic impact of factory operation in the local economy is estimated at up to:

- $147M in annual direct and indirect output or business turnover;
- $46M in annual direct and indirect value-added;
- $21M in annual direct and indirect household income; and
- 252 direct and indirect jobs.

However, the ultimate level of stimulus to the local economy will depend on the extent to which households and businesses can provide the labour and inputs to production required by the factory. Snowy Hydro proposes to work in partnership with local government and the local community to maximise the local economic benefits of the factory and to minimise, as far as possible, any adverse impacts.

7 References

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Attachment 1 – The GRIT system for generating input-output tables

The Generation of Regional Input-Output Tables (GRIT) system was designed to:

- combine the benefits of survey based tables (accuracy and understanding of the economic structure) with those of non-survey tables (speed and low cost);
- enable the tables to be compiled from other recently compiled tables;
- allow tables to be constructed for any region for which certain minimum amounts of data were available;
- develop regional tables from national tables using available region-specific data;
- produce tables consistent with the national tables in terms of sector classification and accounting conventions;
- proceed in a number of clearly defined stages; and
- provide for the possibility of ready updates of the tables.

The resultant GRIT procedure has a number of well-defined steps. Of particular significance are those that involve the analyst incorporating region-specific data and information specific to the objectives of the study. The analyst has to be satisfied about the accuracy of the information used for the important sectors; in this case the other mining sector. The method allows the analyst to allocate available research resources to improving the data for those sectors of the economy that are most important for the study.

An important characteristic of GRIT-produced tables relates to their accuracy. In the past, survey-based tables involved gathering data for every cell in the table, thereby building up a table with considerable accuracy. A fundamental principle of the GRIT method is that not all cells in the table are equally important. Some are not important because they are of very small value and, therefore, have no possibility of having a significant effect on the estimates of multipliers and economic impacts. Others are not important because of the lack of linkages that relate to the particular sectors that are being studied. Therefore, the GRIT procedure involves determining those sectors and, in some cases, cells that are of particular significance for the analysis. These represent the main targets for the allocation of research resources in data gathering. For the remainder of the table, the aim is for it to be 'holistically' accurate (Jensen, 1980). This means a generally accurate representation of the economy is provided by the table, but does not guarantee the accuracy of any particular cell. A summary of the steps involved in the GRIT process is shown in Table A1 (Powell and Chalmers, 1995).

Table A1 The GRIT method

Phase	Step	Action
PHASE I		ADJUSTMENTS TO NATIONAL TABLE
	1	Selection of national input-output table (114-sector table with direct allocation of all imports, in basic values).
	2	Adjustment of national table for updating.
	3	Adjustment for international trade.
PHASE II		ADJUSTMENTS FOR REGIONAL IMPORTS
		(*Steps 4-14 apply to each region for which input-output tables are required*)
	4	Calculation of 'non-existent' sectors.
	5	Calculation of remaining imports.
PHASE III		DEFINITION OF REGIONAL SECTORS
	6	Insertion of disaggregated superior data.
	7	Aggregation of sectors.
	8	Insertion of aggregated superior data.
PHASE IV		DERIVATION OF PROTOTYPE TRANSACTIONS TABLES
	9	Derivation of transactions values.
	10	Adjustments to complete the prototype tables.
	11	Derivation of inverses and multipliers for prototype tables.
PHASE V		DERIVATION OF FINAL TRANSACTIONS TABLES
	12	Final superior data insertions and other adjustments.
	13	Derivation of final transactions tables.
	14	Derivation of inverses and multipliers for final tables.

Source: Bayne and West (1988).

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Attachment 2 – Underlying assumptions and interpretations of input-output analysis and multipliers

1. "The *basic assumptions* in IO analysis include the following:

   - there is a fixed input structure in each industry, described by fixed technological coefficients (evidence from comparisons between IO tables for the same country over time have indicated that material input requirements tend to be stable and change but slowly; however, requirements for primary factors of production, that is labour and capital, are probably less constant);
   - all products of an industry are identical or are made in fixed proportions to each other;
   - each industry exhibits constant returns to scale in production;
   - unlimited labour and capital are available at fixed prices; that is, any change in the demand for productive factors will not induce any change in their cost (in reality, constraints such as limited skilled labour or investment funds lead to competition for resources among industries, which in turn raises the prices of these scarce factors of production and of industry output generally in the face of strong demand); and
   - there are no other constraints, such as the balance of payments or the actions of government, on the response of each industry to a stimulus.

2. The multipliers therefore describe *average effects, not marginal effects*, and thus do not take account of economies of scale, unused capacity or technological change. Generally, average effects are expected to be higher than the marginal effects.

3. The IO tables underlying multiplier analysis only take account of one form of *interdependence,* namely the sales and purchase links between industries. Other interdependence such as collective competition for factors of production, changes in commodity prices which induce producers and consumers to alter the mix of their purchases and other constraints which operate on the economy as a whole are not generally taken into account.

4. The combination of the assumptions used and the excluded interdependence means that IO multipliers are higher than would realistically be the case. In other words, they tend to *overstate* the potential impact of final demand stimulus. The overstatement is potentially more serious when large changes in demand and production are considered.

5. The multipliers also do not account for some important pre-existing conditions. This is especially true of Type II multipliers, in which employment generated and income earned induce further increases in demand. The implicit assumption is that those taken into employment were previously unemployed and were previously consuming nothing. In reality, however, not all 'new' employment would be drawn from the ranks of the unemployed; and to the extent that it was, those previously unemployed would presumably have

consumed out of income support measures and personal savings. Employment, output and income responses are therefore overstated by the multipliers for these additional reasons.[8]

6. The most *appropriate interpretation* of multipliers is that they provide a relative measure (to be compared with other industries) of the interdependence between one industry and the rest of the economy which arises solely from purchases and sales of industry output based on estimates of transactions occurring over a (recent) historical period. Progressive departure from these conditions would progressively reduce the precision of multipliers as predictive device" (ABS 1995, p.24).

Multipliers indicate the total impact of changes in demand for the output of any one industry on all industries in an economy (ABS, 1995). Conventional output, employment, value-added and income multipliers show the output, employment, value-added and income responses to an initial output stimulus (Jensen and West, 1986).

Components of the conventional output multiplier are as follows:

Initial effect - which is the initial output stimulus, usually a $1 change in output from a particular industry (Powell and Chalmers, 1995; ABS, 1995).

First round effects - the amount of output from all intermediate sectors of the economy required to produce the initial $1 change in output from the particular industry (Powell and Chalmers, 1995; ABS, 1995).

Industrial support effects - the subsequent or induced extra output from intermediate sectors arising from the first round effects (Powell and Chalmers, 1995; ABS, 1995).

Production induced effects - the sum of the first round effects and industrial support effects (i.e. the total amount of output from all industries in the economy required to produce the initial $1 change in output) (Powell and Chalmers, 1995; ABS, 1995).

Consumption induced effects - the spending by households of the extra income they derive from the production of the extra $1 of output and production induced effects. This spending in turn generates further production by industries (Powell and Chalmers, 1995; ABS, 1995).

The *simple multiplier* is the initial effect plus the production induced effects.

The *total multiplier* is the sum of the initial effect plus the production-induced effect and consumption-induced effect.

Conventional employment, value-added and income multipliers have similar components to the output multiplier, however, through conversion using the respective coefficients show the employment, value-added and income responses to an initial output stimulus (Jensen and West, 1986).

For employment, value-added and income, it is also possible to derive relationships between the initial or own sector effect and flow-on effects. For example, the flow-on income effects from an initial income effect or the flow-on employment effects from an initial employment effect, etc. These own sector relationships are referred to as ratio multipliers, although they are not technically multipliers because there is no direct line of causation between the elements of the multiplier. For instance, it is not the initial change in income that leads to income flow-on effects, both are the result of an output stimulus (Jensen and West, 1986).

A description of the different ratio multipliers is given below.

Type 1A Ratio Multiplier = $\frac{\text{Initial + First Round Effects}}{}$

[8] This qualifier is not applicable when the multiplier is used to identify the gross economic footprint of a project. With respect to estimation of the net economic footprint of project, the overestimation of Type 11 multipliers is reduced by job chain effects and increases in labour force participation as a result of a project.

$$\text{Type 1B Ratio Multiplier} = \frac{\text{Initial + Production Induced Effects}}{\text{Initial Effects}}$$

$$\text{Type 11A Ratio Multiplier} = \frac{\text{Initial + Production Induced + Consumption Induced Effects}}{\text{Initial Effects}}$$

$$\text{Type 11B Ratio Multiplier} = \frac{\text{Flow-on Effects}}{\text{Initial Effects}}$$

Source: Centre for Farm Planning and Land Management (1989).

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