CopperString 2.0

Economics

Volume 2 Chapter 16

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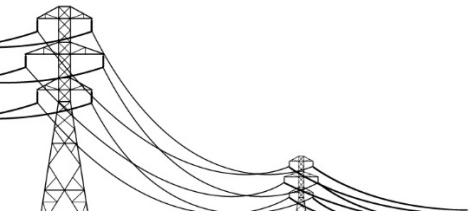


16. Economics

16.1 Introduction

16.1.1 Project overview

The CopperString 2.0 Project (the Project) involves the construction and operation of approximately 1,060 km of extra high voltage overhead electricity transmission line that would extend from Mount Isa to the Powerlink transmission network, via a new connection point near Woodstock, south of Townsville.

The Project involves construction of seven new substations at Woodstock, Hughenden, Dajarra Road (Cloncurry), Mount Isa, Selwyn, Cannington Mine and Phosphate Hill Mine.

The CopperString transmission network is divided into the following eight sections as shown in Figure 16-1:

1. Woodstock Substation
2. Renewable Energy Hub
3. CopperString Core
4. Mount Isa Augmentation
5. Southern Connection
6. Cannington Connection
7. Phosphate Hill Connection
8. Kennedy Connection (option).

The analysis of the micro- and macro-economic impacts potentially associated with the Project was completed by ACIL Allen Consulting. The economic technical assessment report is presented in Volume 3 Appendix AB Economics impact assessment of the environmental impact statement (EIS), with the findings summarised in the sections below in accordance with the terms of reference (TOR). Detailed information regarding relevant legislation and the methodology of the assessment is provided in the technical assessment report.

16.1.2 Objectives

This chapter of the EIS aims to establish the economic context for the Project area, describe the economic environment in which the Project is located and assess the Project's economic contribution and impact to this economic environment. Both positive and negative impacts are identified for the Project in accordance with the Coordinator-General's Economic Impact Assessment Guidelines (April 2017).

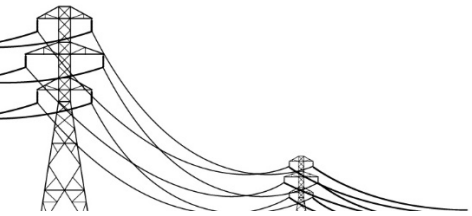
16.1.3 Purpose of chapter

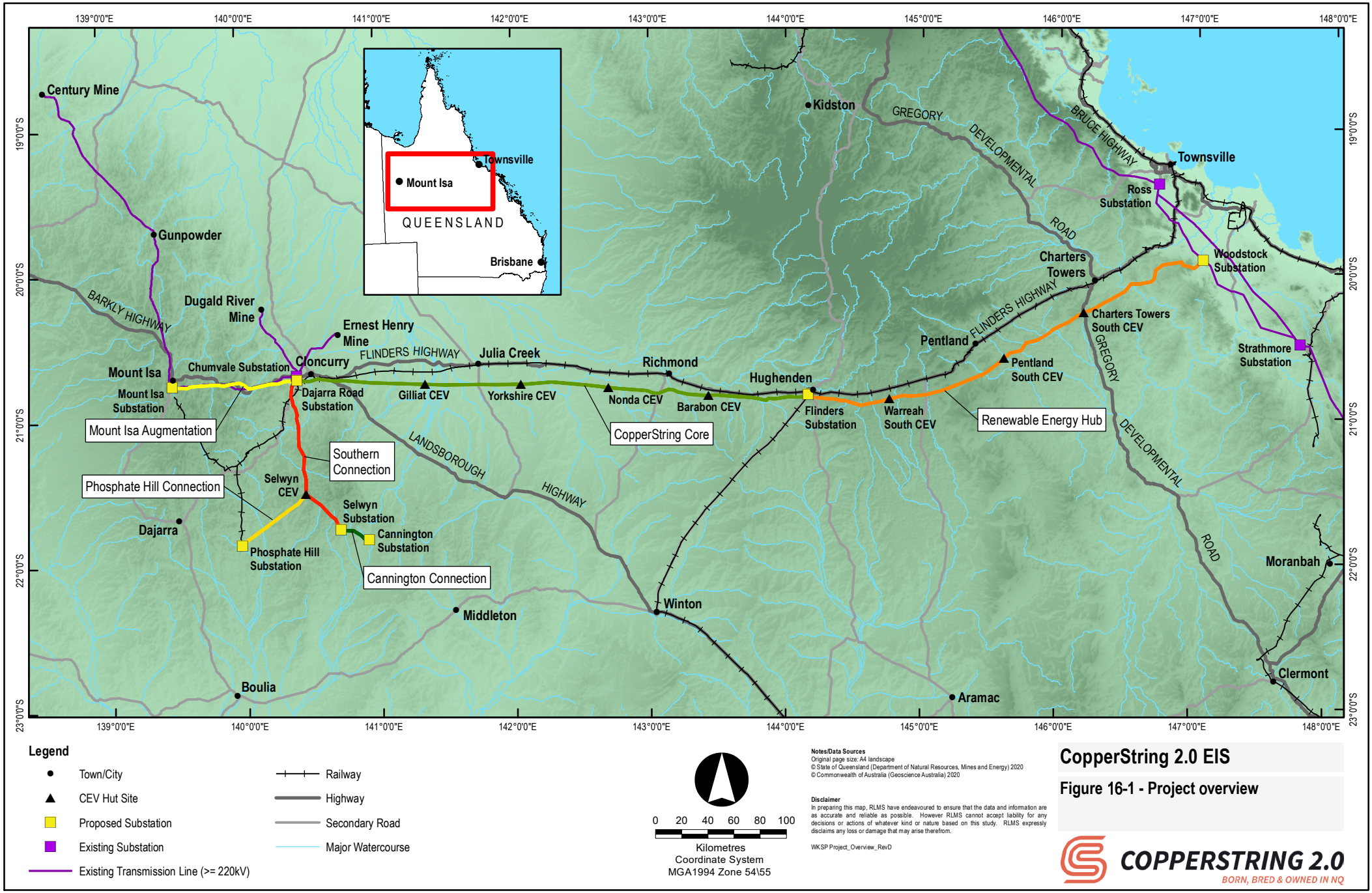
- The purpose of this chapter is to:
- Outline the existing economic environment impacted by the Project.
- Identify economic impacts arising from the Project.
- Identify strategies to avoid or mitigate adverse economic impacts where possible.
- Identify economic opportunities available for capable local businesses and communities.
- Define the potential economic benefit to the region and state.

16.1.4 Defined terms

The following are a list of defined terms utilised throughout this chapter:

- **'Corridor selection'**: The baseline investigation corridor of the transmission line (a nominal 1,060 km long corridor). The corridor selection is 120 m wide from Woodstock to Dajarra Road, and 60 m wide from Dajarra Road to Mount Isa, Dajarra Road to Selwyn, and Selwyn to Phosphate Hill and Cannington. The 4 km long section of the corridor selection from Dajarra Road Substation to Chumvale Substation is 60 m wide and a 3 km long section from Dajarra Road Substation to the Dugald River 220 kV overhead line is 80 m wide.
- **'Study area'**: As defined by individual technical studies in the methodology section or by default the 5 km wide study corridor defined in the Initial Advice Statement and referred to in the EIS ToR.
- **'Project Area'** - The 120 m, 80 m or 60 m wide easement and associated infrastructure (including laydown areas, substations, CEV huts, access tracks, brake and winch sites and construction camps) and works referred to in the EIS ToR (these include off-easement components).

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QUEENSLAND
Townsville
Mount Isa
Brisbane
Century Mine
Gunpowder
Dugald River Mine
Ernest Henry Mine
Mount Isa
Mount Isa Substation
Chumvale Substation
Cloncurry
Dajarra Road Substation
Julia Creek
Richmond
Hughenden
Flinders Substation
Kidston
Townsville
Ross Substation
Woodstock Substation
Charters Towers
Charters Towers South CEV
Pentland
Pentland South CEV
Warreah South CEV
Strathmore Substation
Moranbah
Clermont
Gilliat CEV
Yorkshire CEV
Nonda CEV
Barabon CEV
Selwyn CEV
Selwyn Substation
Cannington Substation
Phosphate Hill Substation
Dajarra
Boulia
Middleton
Winton
Aramac
Mount Isa Augmentation
Phosphate Hill Connection
Southern Connection
Cannington Connection
CopperString Core
Renewable Energy Hub
BARKLY HIGHWAY
FLINDERS HIGHWAY
LANDSBOROUGH HIGHWAY
GREGORY DEVELOPMENTAL ROAD
BRUCE HIGHWAY
Legend
Town/City
CEV Hut Site
Proposed Substation
Existing Substation
Existing Transmission Line (>= 220kV)
Railway
Highway
Secondary Road
Major Watercourse
0 20 40 60 80 100
Kilometres
Coordinate System
MGA1994 Zone 54\55
Notes/Data Sources
Original page size: A4 landscape
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WKSP Project_Overview_RevD
CopperString 2.0 EIS
Figure 16-1 - Project overview
COPPERSTRING 2.0
BORN, BRED & OWNED IN NQ

16.2 Methodology

16.2.1 Study area

The study area for the economic assessment includes the seven local government areas (LGAs) through which the corridor selection traverses. These include:

- Burdekin
- Charters Towers
- Flinders
- Richmond
- McKinlay
- Cloncurry
- Mount Isa.

The assessment also included comparisons of statistics both within the LGA's and with Queensland and Australia.

16.2.2 Economic assessment process

The economic assessment of the Project included the following steps:

- Profile the regions that could be impacted by the Project.
- Summarise the gas market in the Mount Isa region and Queensland as gas-fired power generation is currently the primary source of energy for most mining and industrial projects in the North West Minerals Province (NWMP).
- Provide an analysis of future prospects in the NWMP under a business as usual (BAU) electricity supply scenario and an alternate National Electricity Market (NEM) connected electricity supply scenario and what this means for electricity demand under each scenario over the long term.
- Economic analysis of the Queensland region of the NEM as well as the power system in the Mount Isa region under BAU and NEM connected scenarios.
- Outline projected market outcomes if the Project is to be developed.
- Model the broader economic impacts of the Project for the NWMP and the rest of Queensland using computable general equilibrium modelling.
- Undertake an economic Cost Benefit Analysis for the Project.

16.3 Existing environment

16.3.1 Regional economic profile

The Project impacts seven Local Government Areas (LGAs) as provided on Figure 16-2. The economic characteristics of these regions vary, and elements of the following chapter have been generalised across the group, where appropriate. Significant differences between the regions have been noted, where present. To complete the economic baseline for the Project the regional profile has taken into account research and analysis of anticipated population growth, planned and potential major projects, and other key drivers shaping the future economic growth of the region. The regional profile of the Project has been developed from analysis of all Local Government Areas (LGAs) within the study area.

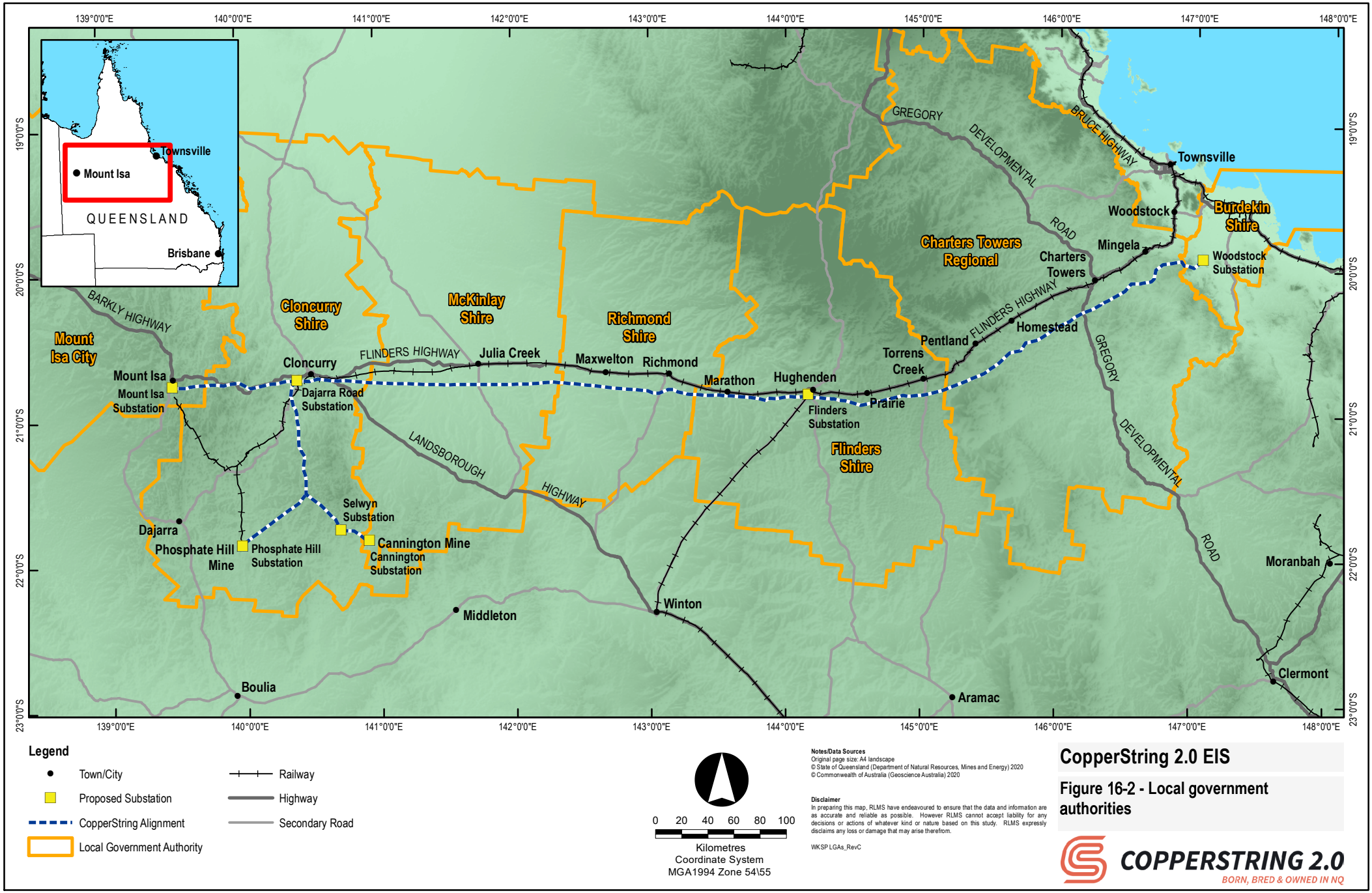
16.3.2 Regional economic context

North West Queensland (NWQ) is not connected to the national transmission network and therefore does not participate in the NEM. NWQ electricity users are currently supplied by either site based local generation or from an isolated grid with central generation in Mount Isa, referred to as the North West Power System (NWPS). Within the NWPS, electricity is supplied by bi-lateral agreements between generators and consumers. The connected generators are Diamantina Power Station and Mica Creek Power station both of which are gas fuelled gas turbine plant. Several mines in the NWQ, such as Phosphate Hill Mine, Osborne Mine and Cannington Mine, currently generate their own site based gas fuelled generation electricity. Electricity generation for isolated mines is mainly diesel fuelled.

The NWMP is the dominant source of base metals in Queensland and an extremely prospective, mineral rich area. After several decades of significant mining activity, the province still holds about 75 percent of Queensland's base metal mineral endowment including copper, lead, silver and zinc as well as major phosphate deposits[1]. The province is also becoming increasingly popular in the exploration for rare earths as global demand grows for the use of these materials in advanced and renewables-based technologies.

Given the opportunities for development and growth in the regions mining sector, concern has been raised about the high cost of electricity supplied from gas fired generation to support the economic mining and processing generally, including lower grade mineralisation. Options which reduce power prices, will increase the competitiveness of Queensland mines compared to their competitors in other jurisdictions.

[1] Department of State Development, Manufacturing, Infrastructure and Planning, *A Strategic Blueprint for Queensland's North West Minerals Province*, https://www.statedevelopment.qld.gov.au/a-strategic-blueprint-for-queensland-s-north-west-minerals-province-nwmp/regional-development/nwmp.html



Legend

- Town/City
- Proposed Substation
- CopperString Alignment
- Local Government Authority
- Railway
- Highway
- Secondary Road

0 20 40 60 80 100

Kilometres

Coordinate System
MGA1994 Zone 54\55

Notes/Data Sources
Original page size: A4 landscape
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WKSP LGAs_RevC

CopperString 2.0 EIS

Figure 16-2 - Local government authorities

COPPERSTRING 2.0
BORN, BRED & OWNED IN NQ

Demand for electricity

The current demand for electricity totals about 396 MW (3,287 GWh). The time of day profile is quite flat as the vast majority (90 percent) is mine load with the remainder made up of the Mount Isa and Cloncurry town (residential and commercial) loads.

Electricity supply is dominated by gas-fired generation coupled with some minor solar and liquid fuel. The majority of energy is supplied by the Diamantina Power Station (DPS), which commenced operations in 2014-15. DPS is owned and operated by APA. DPS has contracts with Glencore, Capricorn Copper and Ergon Retail. AGL supplies the majority of gas to DPS under a gas sales agreement, which expires in 2023. DPS acts as the Generation Co-ordinator for the NWPS. The typical price for large industrial consumers in Mount Isa has risen from around $5/GJ to $10-12/GJ[2]. These higher gas prices have resulted in higher power prices for mining projects in the province.

The projection for long-term contract gas prices in the Mount Isa region is shown in Figure 16-3. Contract gas prices are expected to hover around $10/GJ for the next few years before beginning a climb towards $12/GJ from the early 2030s. In this forecast, supply for Mount Isa is initially sourced mainly from the Surat/Bowen and Cooper basins via the Carpentaria pipeline. This then switches to supply from contracted gas in the Northern Territory via the Northern Gas Pipeline. Around 2030, early supply from the Beetaloo basin begins from unconventional gas plays. The forecast below also assumes the Northern Gas Pipeline capacity of 90 TJ/day is not increased. The tariff applied to gas moving through the Northern Gas Pipeline is set at the current rate of $2.20/GJ (including a $0.70/GJ nitrogen removal cost in addition to the regular $1.50/GJ tariff)[3].

Without any significant developments along the east coast that can ease supply pressure, gas prices are expected to increase over time. Even if more development was successful and extraction costs of gas developed from basins such as the Beetaloo were to be low, the cost of gas for consumers in Mount Isa will also be regularly influenced by movements in international LNG prices and the flow on effect to the domestic market. Long-term contract prices are only likely to fall significantly if a new large source of supply came online which substantially eased the pressure on domestic and LNG gas supply. At present, there is no foreseeable source that could radically address the fundamental problem of tight supply.

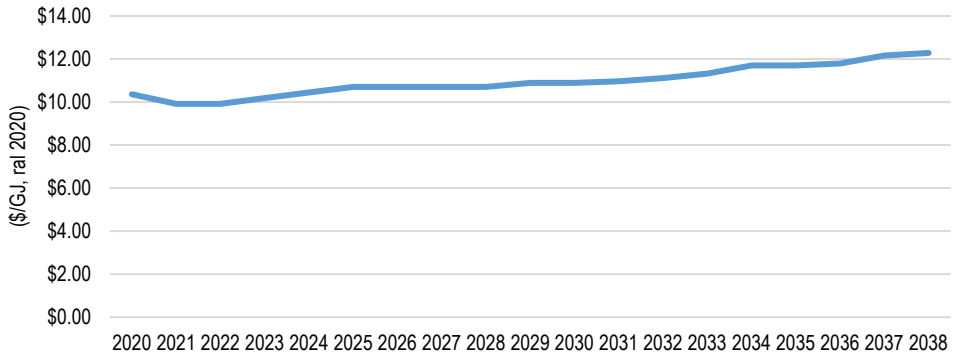


Figure 16-3 Forecast Long Term Contract Mount Isa Gas Price ($/GJ, real 2020)[4]

[2] Oakley Greenwood, Gas Price Trends Review 2017, March 2018
[3] ACCC, Gas Inquiry 2018, Interim Report, January 2020
[4] *ACIL ALLEN GASMARK MODELLING*

16.3.3 Population characteristics

As of June 2018, the combined population of the Study area was 54,015 or 1.1 percent of the population of Queensland.

The largest regions potentially impacted by the Project include Mount Isa which has a population of 18,878 or 35 per cent of the potentially impacted regions and Burdekin which has a population of 17,077 or 32 per cent of the potentially impacted regions.

The estimated population of these all LGAs is shown in Figure 16-4.

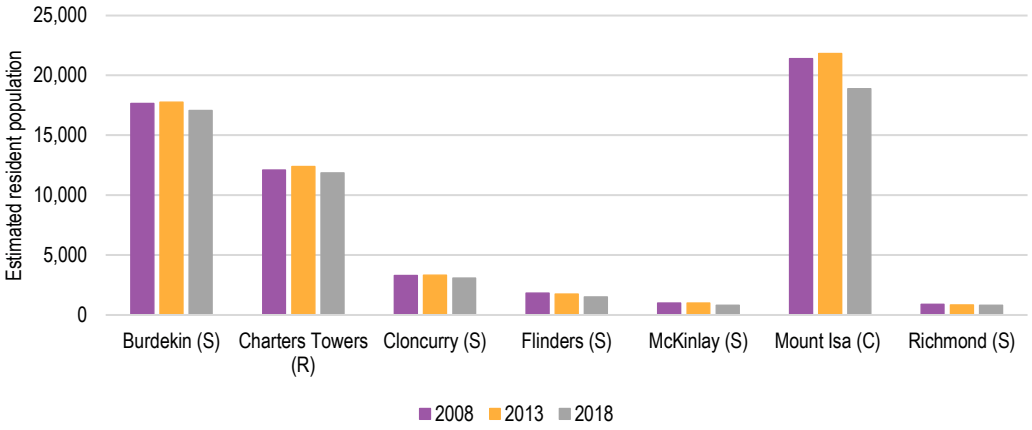


Figure 16-4 Estimated resident population of impacted LGAs[5]

The average annual population growth of the affected LGAs is shown in Table 16-1. The population of these LGAs has, in general, declined over the past 5 years. The largest falls in population growth have been in McKinlay and Flinders, which have each seen an annual population decline of two percent.

Table 16-1 Estimate resident population growth of affected LGAs[6]

Region	Estimated resident population			Average annual growth (%)	
	2008	2013	2018	2008-2018	2013-2018
Study area	58,164	58,879	54,015	-0.7	-1.7
Burdekin (S)	17,653	17,754	17,077	-0.3	-0.8
Charters Towers (R)	12,096	12,391	11,850	-0.2	-0.9
Cloncurry (S)	3,308	3,327	3,091	-0.7	-1.5
Flinders (S)	1,837	1,754	1,499	-2	-3.1
McKinlay (S)	994	992	814	-2	-3.9
Mount Isa (C)	21,381	21,822	18,878	-1.2	-2.9
Richmond (S)	895	839	806	-1	-0.8
Queensland	4,219,505	4,652,824	5,011,216	1.7	1.5

[5] *ABS 3218.0, Regional Population Growth, Australia, various editions*
[6] *ABS 3218.0, Regional Population Growth, Australia, various editions*

Demographic profile

The age profile of the potentially impacted regions closely resembles that of Queensland, though this varies somewhat between LGAs. There are slightly more persons aged 1-14 years, in the potentially impacted regions. Similarly, there are slightly fewer persons aged 15-64 in the potentially impacted regions.

The age profile of the affected LGAs is shown in Table 16-2. Cloncurry and Mount Isa have a smaller share of the population in the 65 years and over age groups, whereas this group make up a higher proportion of the population in Burdekin and Flinders. There is a higher proportion of people aged 24 to 44 years in Cloncurry, McKinlay and Mount Isa than the other LGAs.

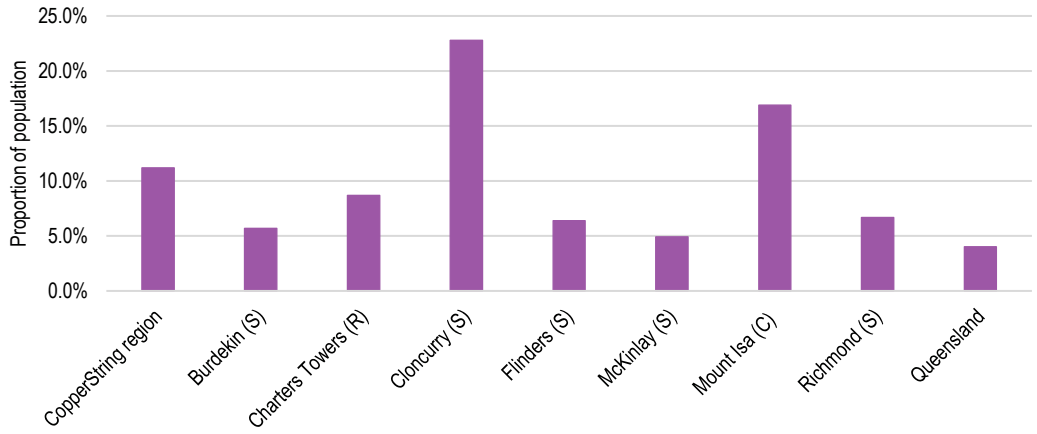
The median resident age in Burdekin and Flinders is higher than the Queensland median of 37.3 years. Conversely, the median resident age of Mount Isa and Cloncurry is below that of Queensland.

Table 16-2 Estimate population by age and LGA, 2018[7]

Region	Proportion of population by age bracket					Median age
	1–14	15-24	24-44	45-64	65+	
Study area	20.9	12.0	26.3	25.4	15.4	37.3
Burdekin (S)	17.2	11.7	21.1	27.8	22.3	45.0
Charters Towers (R)	20.8	12.8	21.7	25.6	19	40.5
Cloncurry (S)	20.6	10.8	32.5	26.6	9.4	35.4
Flinders (S)	18.9	9.0	24.9	27.1	20.1	42.9
McKinlay (S)	21.1	6.1	34.3	26.7	11.8	38.2
Mount Isa (C)	24.5	12.7	32.6	22.7	7.5	31.4
Richmond (S)	23	7.1	27.9	26.7	15.4	36.6
Queensland	19.6	13.1	27.3	24.7	15.4	37.3
Source: ABS 3235.0, Population by Age and Sex, Regions of Australia						

16.3.4 Indigenous residents

Aboriginal and Torres Strait Islander (Indigenous) people make up 4.0 percent of the population of Queensland. In the potentially impacted regions, Indigenous people comprised 8.8 percent of the population. There are higher proportion of indigenous people in the Cloncurry LGA and the Mount Isa LGA. Figure 16-5 shows the indigenous proportion of the population for each LGA.



[7] *ABS 3235.0, Population by Age and Sex, Regions of Australia*

Figure 16-5 Indigenous status by LGA, 2016[8]

16.3.5 Gross Regional Product

In 2018-19, the Queensland economy generated over $357 billion[9].

In 2017-18, the Study area contributed $5.0 billion to the Queensland economy - around 2.4 percent of the State's GDP. Economic growth in the Study area has varied, as shown in Figure 16-6. There has been a 4.8 percent annual average decline in Gross Regional Product (GRP) over the past 2 years - the majority of this decline has been a result of a fall in GRP in the Mount Isa Region.

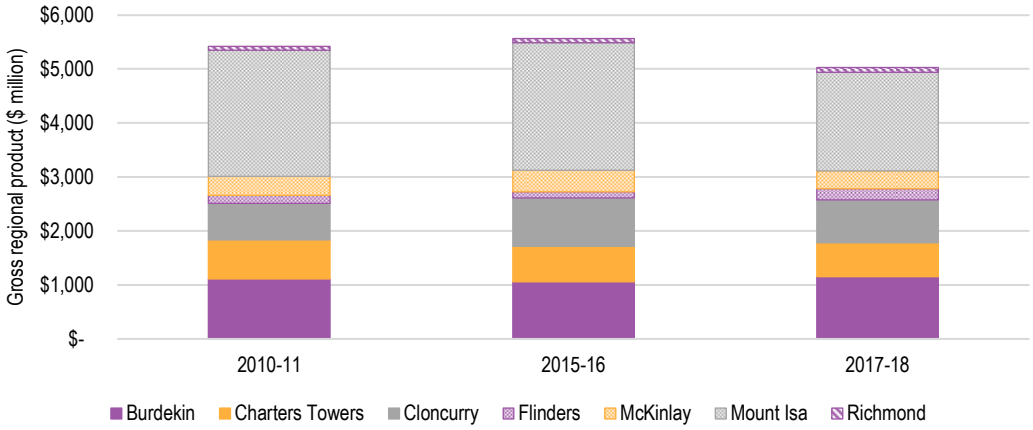


Figure 16-6 Gross Regional Product: Study area ($ Million)[10]

The major industries in these regions in terms of economic value and employment are the agriculture industry (in particular the production of beef cattle) and the mining industry (including copper, silver and gold mining).

16.3.6 Key regional industries

The key regional industries of the Study area are primarily mining and agriculture, forestry and fishing. These two industry groups employ 25 percent of the population in these regions. Figure 16-7 shows the industry employment breakdown for the Study area in comparison to that of Queensland.

[8] *ABS, Census of Population and Housing, 2016, Aboriginal and Torres Strait Islander Peoples Profile - I02*
[9] *Queensland Government, 2019, https://www.treasury.qld.gov.au/queenslands-economy/about-the-queensland-economy/).*
[10] *AUSTRALIAN BUREAU OF STATISTICS CATALOGUE 5220.0*

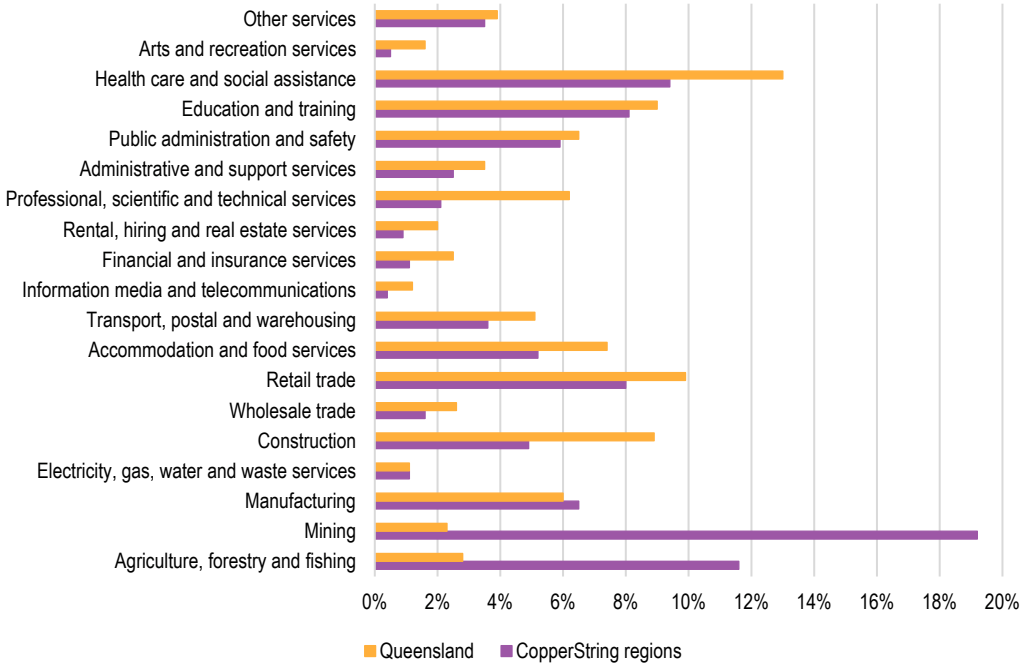
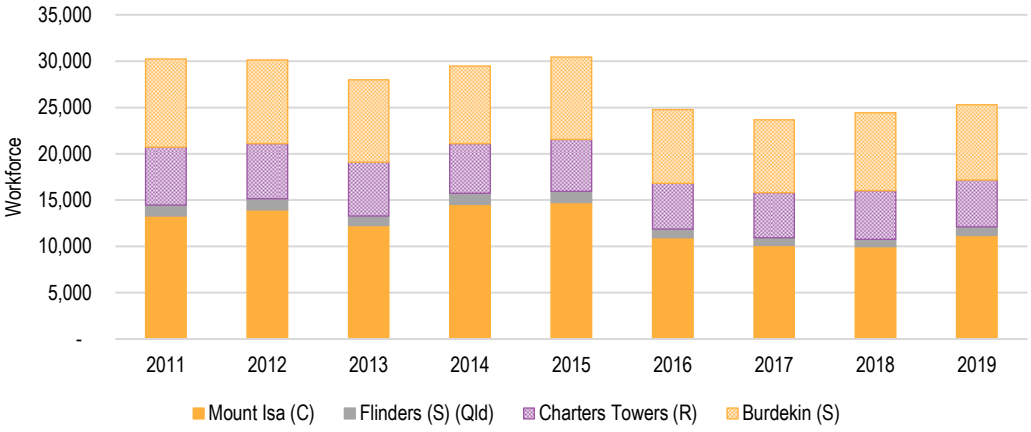


Figure 16-7 Industry of employment: Queensland, Study area (%), 2016[11]

16.3.7 Labour force information

The labour force of the Study area makes up a small portion of Queensland's workforce (1.3 percent). The historical breakdown of this workforce by LGA is illustrated in Figure 16-8. The majority of the labour force within the region is situated in the Mount Isa LGA.



Note: Labour force data not reported for Richmond, McKinlay and Cloncurry.

Figure 16-8 Workforce of Study area (number of persons)[12]

[11] *ABS, Census of Population and Housing, 2016, Working Population Profile - W09 (place of work)*
[12] *Australian Government Department of Jobs and Small Business, Small Area Labour Markets Australia*

Occupation

There is a higher proportion of machinery operators and drivers, labourers, technician and trades workers in the Study area compared to Queensland. Specifically, Mount Isa and Cloncurry LGAs have a high proportion of machinery operators and drivers, and Richmond, McKinlay and Flinders have a high proportion of labourers. Richmond, McKinlay and Flinders LGAs also have a significant portion of their workforce employed as managers. This breakdown is likely due to the employment profile of mine sites.

The distribution of workers across these occupations is presented in Figure 16-9.

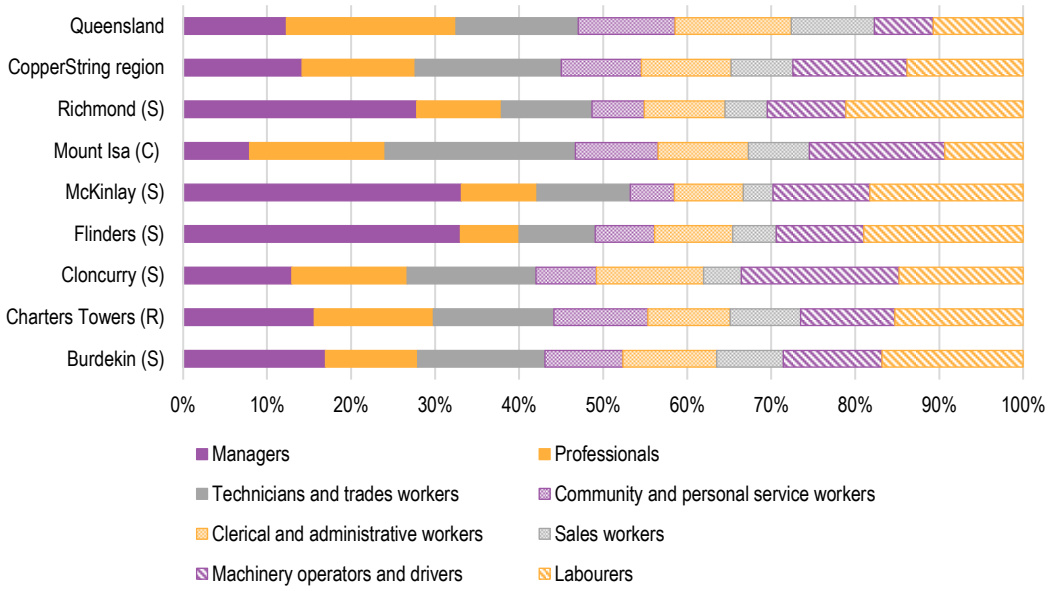


Figure 16-9 Employment by Occupation: Queensland and Study area (%), 2016[13]

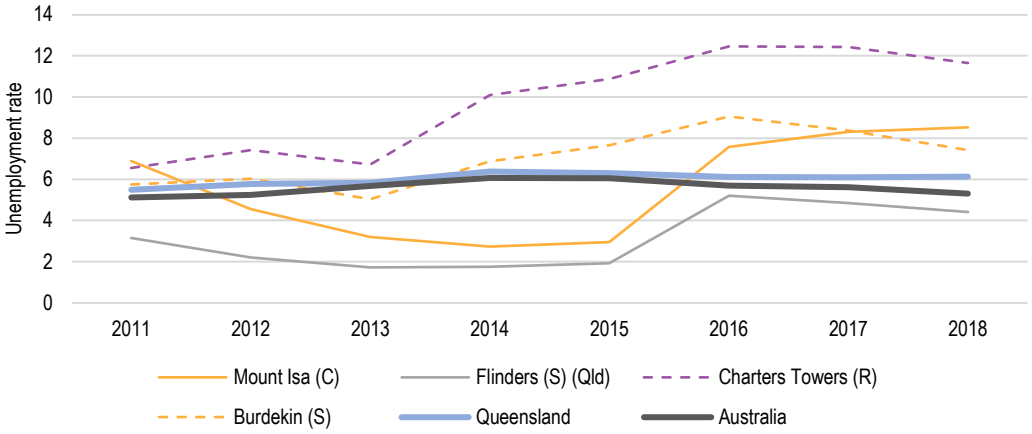
Unemployment

The historical unemployment rate of the Study area compared the state and national rate is presented in Figure 16-10.

In 2018, the rate of unemployment in Flinders LGA was lower than the Queensland average. However, unemployment in the Burdekin and Mount Isa LGAs was higher than the state. Charters Towers LGA also had significantly higher unemployment rate that the state in 2018.

Unemployment in the Study area have generally followed a similar trend with declining or stable unemployment between 2011 to 2014, followed by an increase until 2017.

[13] *ABS, Census of Population and Housing, 2016, General Community Profile - G57*



Note: Labour force data not reported for Richmond, McKinlay and Cloncurry.

Figure 16-10 Unemployment rate: Australia, Queensland, Study area (%)[14]

Indigenous workforce

As of the 2016 Census, Indigenous Australians comprised 6.6 percent of the workforce in the Study area. Unemployment amongst this group is particularly high in the Study area, specifically in Charters Towers, Burdekin, Mount Isa and Richmond. The unemployment rates in these regions is above the state average of Indigenous unemployment. These rates is also significantly higher than the unemployment rate for non-Indigenous workers.

The largest Indigenous workforce is located in Mount Isa. This region accounts for 54 percent of the Indigenous workforce in the Study area.

The Indigenous workforce or Queensland and the Study area is presented in Table 16-3.

Table 16-3 Indigenous Workforce: Queensland, Study area[15]

	Labour force	Number of unemployed	Unemployment rate	Share of total workforce	Share of total number of unemployed
Study area	2,067	461	22%	8.3%	29%
Burdekin (S)	317	85	27%	4%	18%
Charters Towers (R)	296	90	30%	6%	21%
Cloncurry (S)	254	42	17%	17%	61%
Flinders (S)	41	4	10%	6%	15%
McKinlay (S)	18	0	0%	4%	0%
Mount Isa (C)	1,122	236	21%	12%	41%
Richmond (S)	19	4	21%	5%	44%
Queensland	64,965	13,178	20%	2.9%	7.7%

Wages and salaries

The median annual individual income of the Study area is marginally higher than the average for Queensland. However, the weekly median income varies significantly by LGA, with the highest income LGAs being Cloncurry and McKinlay and the lowest being Flinders and Richmond. The total personal income for Queensland and the Study area is shown in Figure 16-11.

[14] *Australian Government Department of Jobs and Small Business, Small Area Labour Markets Australia, 6202.0 - Labour Force, Australia, Nov 2019*

[15] *ABS, Census of Population and Housing, 2016*

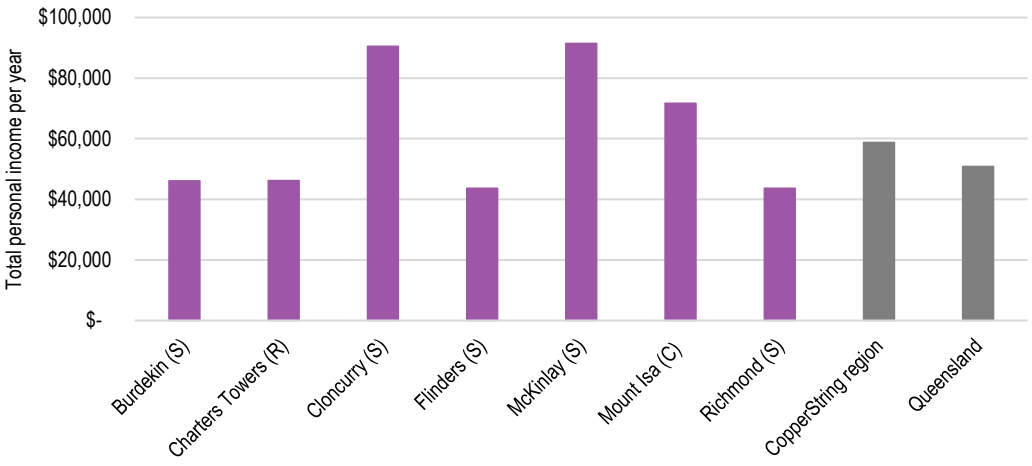


Figure 16-11 Total Personal Income, Queensland, Study area, 2016[16]

A detailed breakdown of personal income in presented in Figure 16-12. There is a much higher share of the population that earn less than $51,999 annually living in Richmond, Flinders, Charters Towers, and Burdekin LGAs compared to Queensland. However, when considering the whole Study area the proportion is lower than the Queensland average due to the high incomes of those in Mount Isa, McKinlay and Cloncurry.

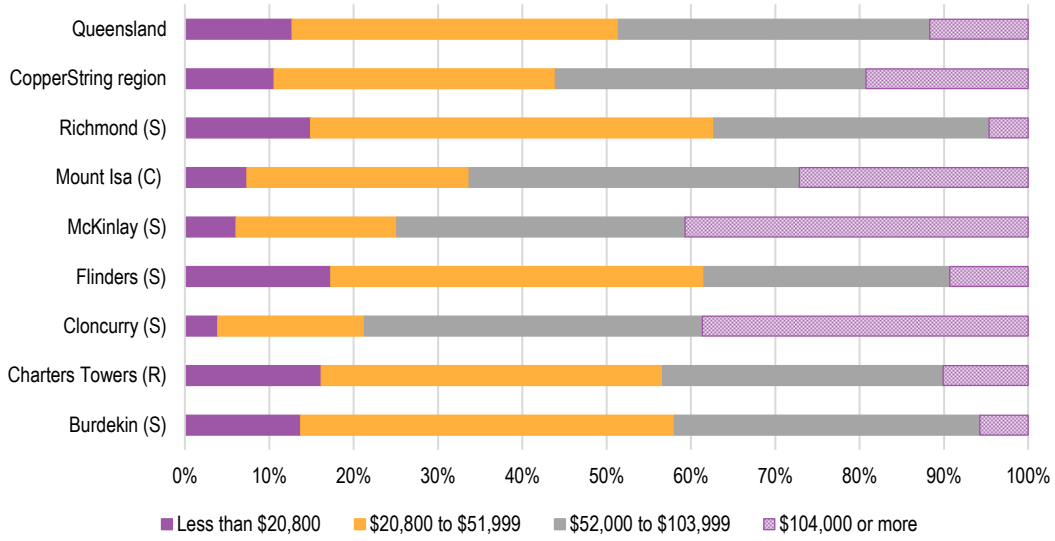


Figure 16-12 Total Personal Income, Queensland and Study area (%), 2016[17]

Skills

Figure 16-13 shows the distribution of the population with non-school qualifications. There is a much higher share of Certificate level qualifications in the Study area compared to the State average. The share of Certificate level qualifications in the area is reflective of the job opportunities in the area.

16 *ABS, Census of Population and Housing, 2016, Working Population Profile - W06 (place of work)* and Queensland Government Statistician's Office, Queensland Treasury, Queensland regional profiles: workforce profile for Townsville and NW QLD region

17 *ABS, Census of Population and Housing, 2016, Working Population Profile - W06 (place of work)*

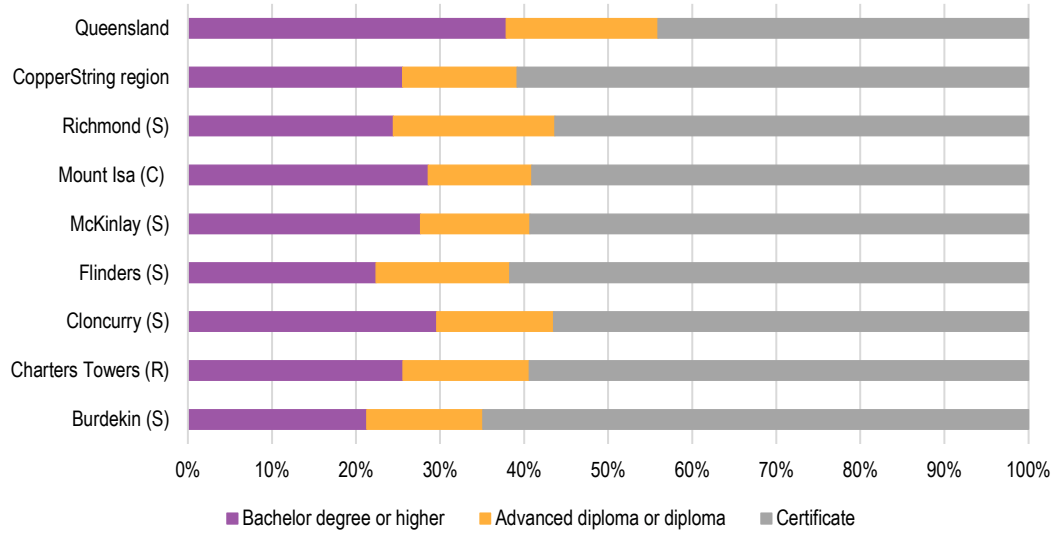


Figure 16-13 Non-School Qualification for Queensland and Study area (%), 2016[18]

16.3.8 Housing and land market

Housing market

Table 16-4 shows 2019 housing building approvals data for the affected LGAs. Many of the regions have a very small number of residential building approvals with four of the LGAs reporting three or less residential building approvals and one or less new houses. The Burdekin LGA had the highest number of building approvals with 30. The average value of residential building approvals was $350,148 for new houses across the Study area, but this value varies greatly between regions.

Rental market

Table 16-5 shows the weekly cost of housing rent for areas of interest to the Project. The median rent varies across regions, but is typically lower than the Queensland average.

[18] *ABS, Census of Population and Housing, 2016, General Community Profile - G40 and G46*

Table 16-4 Housing Building Approvals and Average House Values in Study area, 2019[19]

Heading	Burdekin	Charters Towers	Cloncurry	Flinders	McKinlay	Mount Isa	Richmond	Study area
Residential building approvals								
New houses	19	8	1	0	0	3	0	31
New other residential building	10	2	0	0	0	5	0	17
Total dwelling approvals	30	10	1	0	0	8	0	49
Average value of residential building approval	$330,820	$234,800	$143,500	N/A	N/A	$309,025	N/A	$303,843

Table 16-5 Lodgements and Median Rent for Queensland and Study area, 2019[20]

Heading	Lodgements	Median rent ($ per week)			
		1 bedroom	2 bedroom	3 bedroom	4 bedroom
Burdekin (S)	436	$180	$210	$255	$315
Charters Towers (R)	282	N/A	$205	$255	$330
Cloncurry (S)	147	$185	$250	$300	$365
Flinders (S)	35	N/A	N/A	$200	N/A
McKinlay (S)	5	N/A	N/A	N/A	N/A
Mount Isa (C)	903	$180	$220	$370	$450
Richmond (S)	21	N/A	N/A	$200	N/A
Queensland	178,289	$320	$370	$360	$430

[19] *ABS 8731.0, Building Approvals, Australia*
[20] *QLD regional resident profile 2019*

Land market

Due to the low turnover of rural properties in the region and the wide variety of terrain potentially affected by the Project, it is difficult to obtain an accurate estimate of the current land prices in the region. However, based on rural property sales over 500 ha reported by DNRME, much of the grazing land in the Flinders, Richmond, McKinlay and Cloncurry LGAs is indicated to be valued between $220 and $450 per hectare. More specifically, property values for McKinlay are between $220 and $370 per hectare, Richmond between $220 and $430 per hectare and Flinders between $280 and $470 per hectare[21].

An alternative source of reported land values by Municipality is Rural Bank, which reported an average price per hectare for McKinlay of $289, and $310 for Flinders in 2018.

The precise value of land will depend on the specific characteristics of the property (including water supply and capital improvements).

16.3.9 Regional disadvantage and opportunity

The social and economic indicators for the Study area are poor when compared to other local government areas in Queensland. The proportion of the population in the lowest two quintiles of socio-economic disadvantage for the Study area is 60.8 percent, compared to 40 percent for Queensland.

Figure 16-14 shows the share of the population by the index of relative socio-economic disadvantage quintiles. The disadvantage of the regions differs significantly. The McKinlay LGA has a significantly lower disadvantage than other regions, with none of the population falling into the lowest quintile. Charters Towers, however, has significantly more socio-economic disadvantage, with 96 percent of the population falling in the most disadvantaged three quintiles.

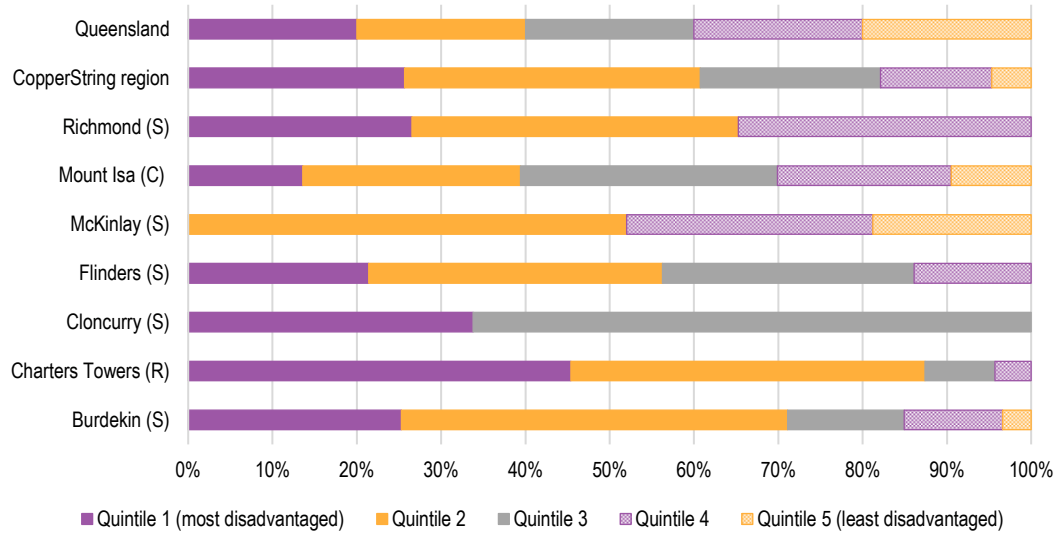


Figure 16-14 Population by Index of Relative Socio-Economic Disadvantage Quintiles, Queensland and Study area, 2016[22]

[21] *Department of Natural Resources, Mines and Energy (2019), Online map of rural property sales. http://qgsp.maps.arcgis.com/apps/webappviewer/index.html?id=dcdd187168d244c78856077487b81390*

[22] *ABS 2033.0.55.001 Census of Population and Housing: Socio-Economic Indexes for Areas (SEIFA), Australia, 2016*

16.4 Economic trends

16.4.1 North West Minerals Province

The NWMP is internationally renowned for being one of the largest, most prospective regions for metals mining. After several decades of significant mining activity, the province still holds about 75 percent of Queensland's base metal mineral endowment including copper, lead and zinc as well as major silver and phosphate deposits[23]. The province is also becoming increasingly popular in the exploration for rare earths as global demand grows for the use of these materials in advanced and renewables-based technologies.

The region also has significant energy resource potential including geothermal and non-traditional (tight shale) resources[24].

The province is also rich in a diverse range of other commodities with recent discoveries of the world's largest molybdenum-rhenium deposit and a high-grade graphite resource.

In addition to the province's well-developed areas, the Queensland Government and industry is currently undertaking further mineral geophysics and geochemistry studies to better understand the highly prospective area east of Mount Isa known as the Eastern Succession (see Figure 16-15). Initial studies have uncovered deposits with promising potential for significant iron-oxide-copper-gold development.

The mineral endowment of the province is likely to continue to be in demand by global manufacturing and construction industries for a range of intermediate uses, including as key inputs into innovative and more traditional applications such as renewable energy, transport infrastructure and other industrial machinery and equipment. However, key challenges will need to be overcome for these resources to be developed in the future as the location of these resources get deeper underground and mineral grades get weaker.

Export history

Over the past 20 years, more than 80 percent of Queensland's base metals exports have come from mines within the province, on average. This has been led by three large mines:

- Glencore's Mount Isa copper/zinc/lead mine complex
- MMG's former Century zinc/lead mine
- South32's (formerly BHP Billiton) zinc/lead Cannington mine.

Exports have been supported by a significant number of smaller to medium sized mines that have targeted common base metals and precious metals including gold and silver.

[23] *Department of State Development, Manufacturing, Infrastructure and Planning, A Strategic Blueprint for Queensland's North West Minerals Province, https://www.statedevelopment.qld.gov.au/a-strategic-blueprint-for-queensland-s-north-west-minerals-province-nwmp/regional-development/nwmp.html*

[24] *DNRM, 2014, Queensland Geology Volume 14, An Assessment of the Geothermal Energy Potential of Northern and Eastern Queensland*

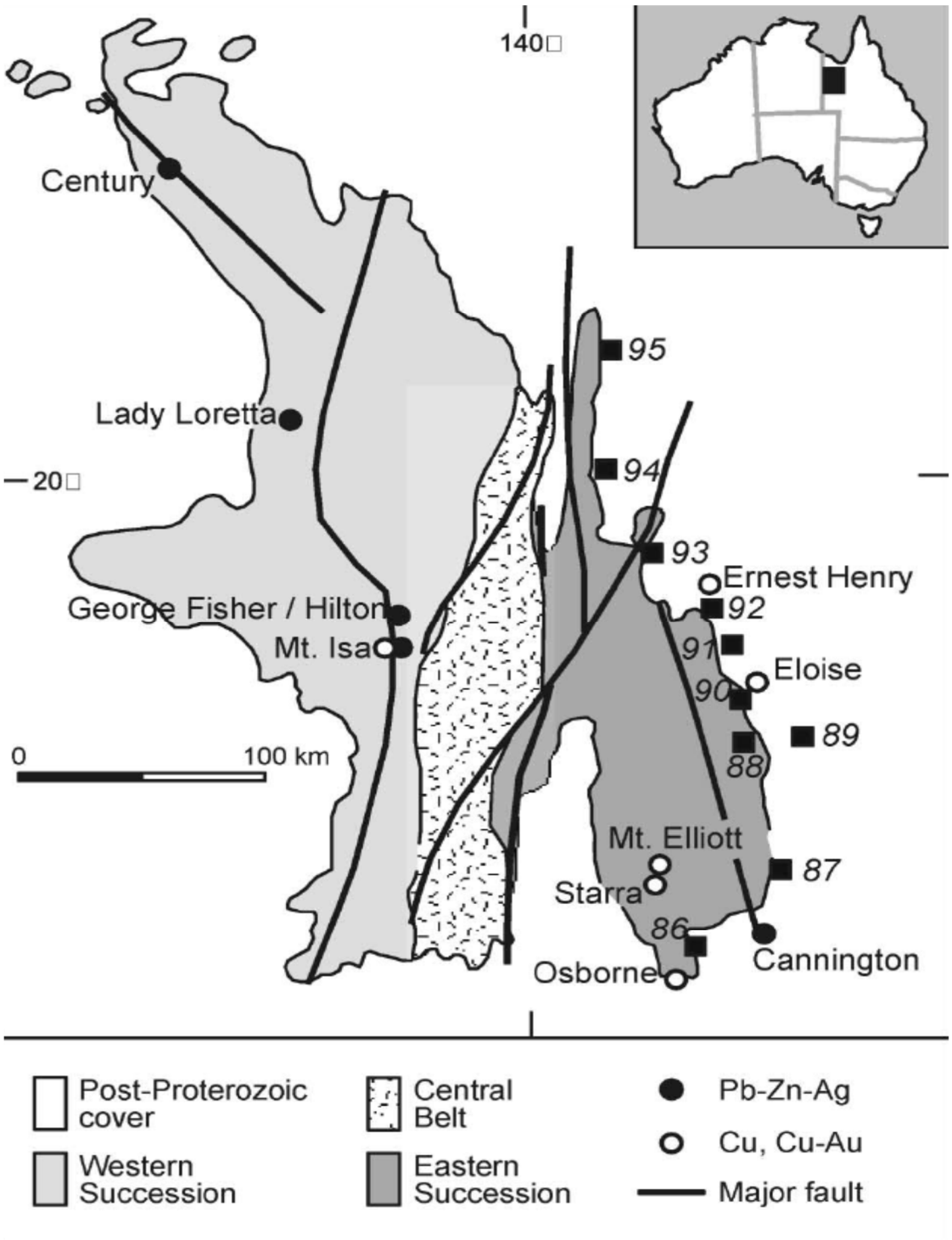


Figure 16-15 Map of the Eastern Succession, North West Minerals Province[25]

Figure 16-16 below shows the value of Queensland's base metal exports over the past decade (2008-09 to 2018-19). Export values did experience marked declines from 2014-15 due to reduced production volumes from mines closing (particularly the Century zinc mine) and weaker commodity prices. However, export values have recovered in the past couple of years, particularly for copper and zinc because of stronger production and improving commodity prices. Copper remains the largest metals revenue earner for Queensland.

25 *W.L. GRIFFIN ET AL (2006) ARCHAEAN AND PROTEROZOIC CRUSTAL EVOLUTION IN THE EASTERN SUCCESSION OF THE MOUNT ISA DISTRICT, AUSTRALIA: U–PB AND HF-ISOTOPE STUDIES OF DETRITAL ZIRCONS*

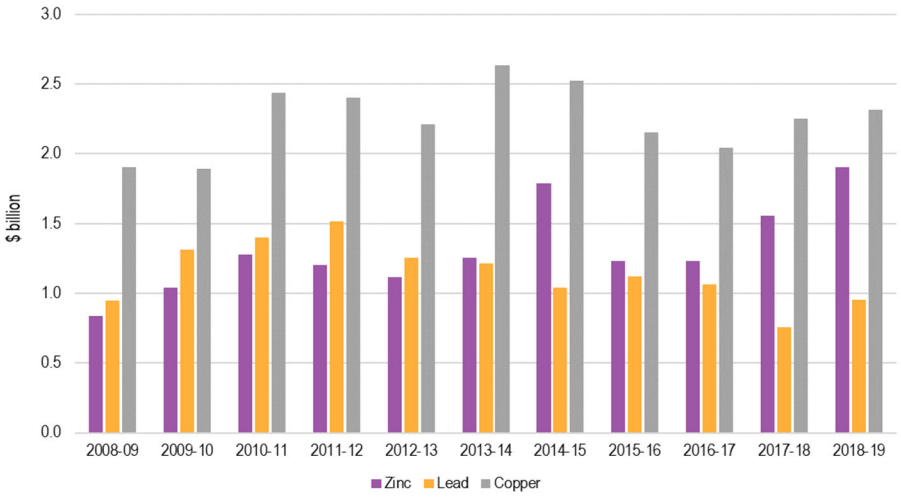


Figure 16-16 Queensland Export of Base Metals: Value ($ Billions)[26]

Developments in the North West Minerals Province

The NWMP has experienced a range of recent developments that will affect the future prospects of the province. These include developments in relation to recent and future mine closures, new mine investments, rising input costs, exploration activity, government policy and market demand.

Market Demand

A fundamental positive for mining investment in the region is the growing demand for metals. Increasing levels of industrialisation in emerging and developing economies, as well as a push towards renewable technology and advanced communication and information technologies, is driving long-term demand for metals mined in the NWMP.

Rising metals prices over the past two decades has been because of this increasing demand. Figure 16-17 shows how commodity prices for certain metals have increased over the years as new sources of demand evolve.

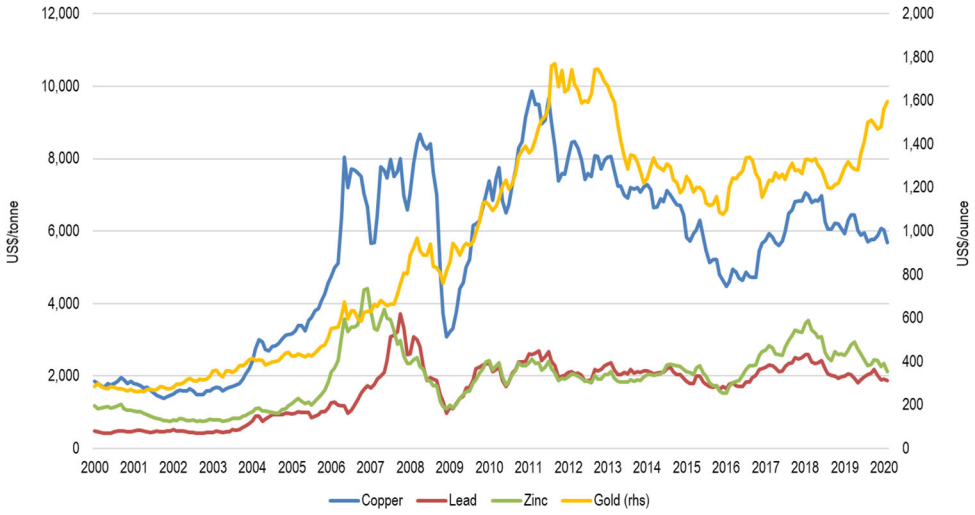


Figure 16-17 Selected Global Metals Prices[27]

[26] *Queensland Government Statistician's Office, February 2020*

[27] *The World BANK, 2019*

Exploration

Exploration activity in the province has recently lifted after experiencing a period of lacklustre exploration in response to weaker commodity prices. Figure 16-18 shows minerals exploration in Queensland for a variety of minerals over the past decade.

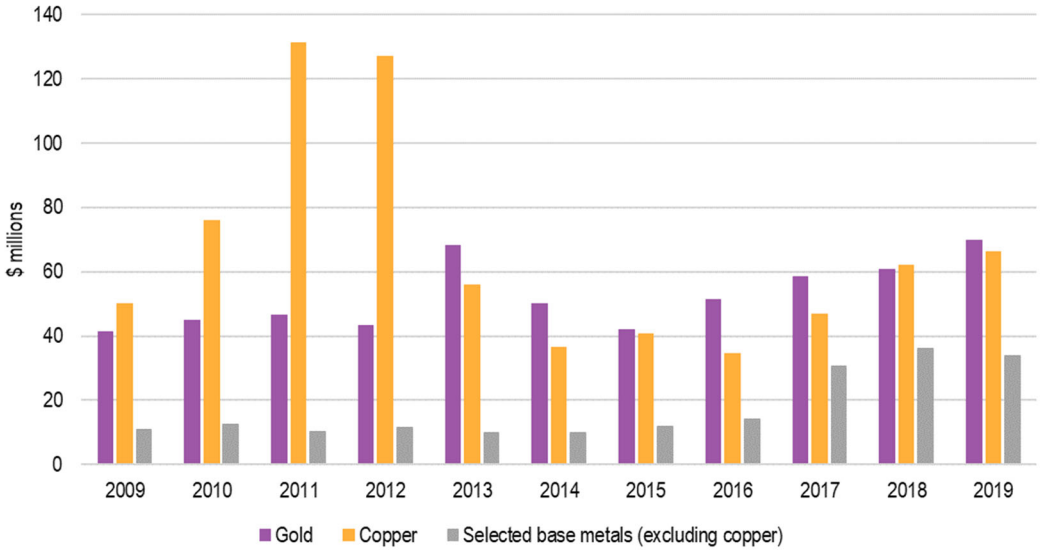


Figure 16-18 Exploration Expenditure for Selected Metals[28]

Copper exploration expenditure has been the hardest hit with expenditure falling from a peak of $130 million in 2011 to half this total in 2019 at $65 million. A noticeable lift has occurred since 2017 for other base metals which includes zinc, lead, cobalt and nickel.

The relationship between exploration expenditure and commodity prices has always been a close relationship in the minerals sector. As the majority of exploration is still carried out by junior miners, this fluctuation in expenditure occurs because of junior miners being heavily reliant on equity funding. As commodity prices are beginning to rise and explorers become more attractive to equity markets, exploration budgets are increasing due to fresh waves of equity funding.

Due to the high prospectivity of the region, close access to markets and available infrastructure, the region will always be in demand for explorers. This is despite exploration becoming more difficult as explorers drill deeper to find the next significant mineralisation deposits. Additionally, these future deposits are more frequently lower grade deposits, which will require higher levels of processing to extract the contained metal. Figure 16-19 shows how copper grades have fallen noticeably over the past few years in several copper producing regions.

This trend of lower grades is leading to less significant deposits than in previous decades and new mines that are smaller in size and in mine life. Pressure on mining costs will also increase for future mines as processing requirements increase and the benefits of scale are not as significant. Therefore, new mines in Queensland will have to find ways to remain competitive against their global competitors (who are also experiencing similar issues) as their prospectivity and cost advantages are eroded over time.

[28] *THE AUSTRALIAN BUREAU OF STATISTICS, December 2019*

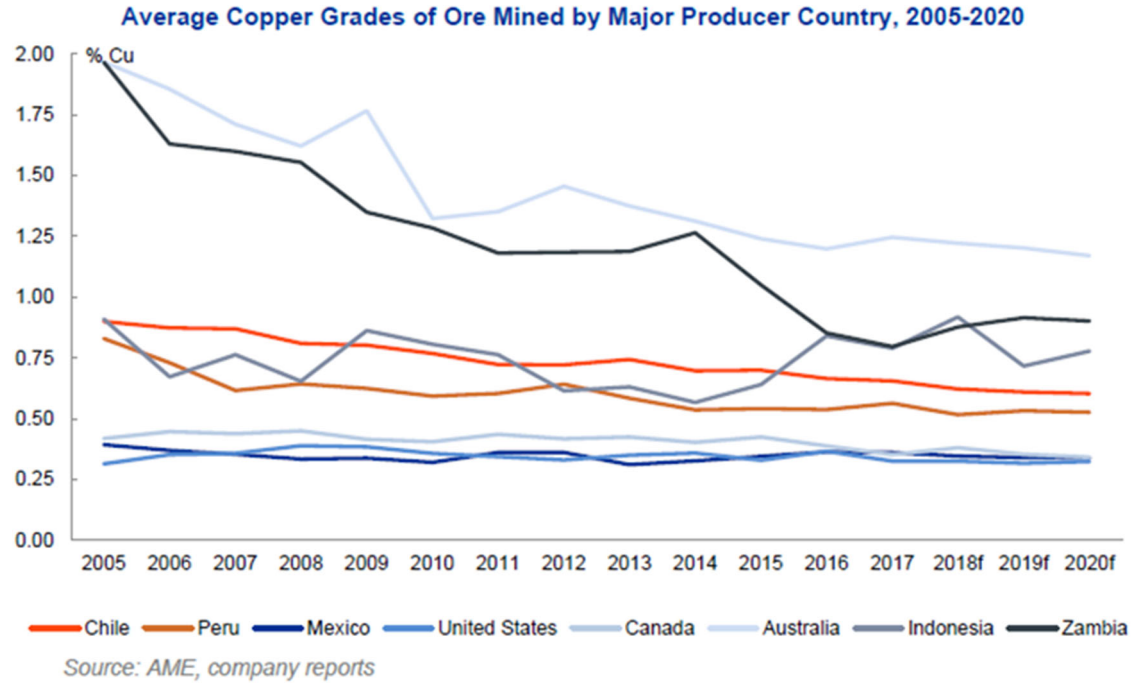


Figure 16-19 Copper Metal Grades[29]

Regulatory environment and Government policy

A positive for development in the province is the continued support of the Queensland Government to encourage investment and mining in the region. Mount Isa is a key town for regional growth and employment. Government policy has been increasingly supportive in recent years as the province faces some challenging times with regards to future mining investment.

The Queensland Government supported the establishment of a North West Minerals Province Taskforce in 2015 to investigate the issues and opportunities affecting the province and advise on a way forward for the region's future. Building on the work of the Taskforce, a strategic blueprint was developed in 2017 that set out a platform through which the Queensland Government would collaborate with other levels of government, business and industry, and communities to support a smooth transition to a stronger and more diversified economy in the longer term.

This strategic blueprint included almost $30.9 million over four years in additional budget measures to support the resources sector. These measures were intended to provide tangible support to promote prosperity of the province for many years to come.

The latest initiative from the Queensland Government announced in November 2019 is targeting greater investment in 'new economy minerals' in Queensland needed for advanced electronics and renewable technologies for the future. To develop a sustainable pipeline of 'new economy minerals' projects into the future, the Queensland Government is investing in exploration activities to improve scientific understanding and supply the valuable geoscience data needed by industry to help locate and define deposits for future production.

The key items of the recently announced $13.8 million package are:

- $4.8 million to re-examine old mine tailings and core samples for new age minerals.
- $9 million to unearth more and better geological information to help industry identify new projects, including $3.5 million in industry grants over five years for new and innovative exploration activities.

[29] *AME GROUP, 2019*

The Queensland Government expects the initiative will encourage new exploration, re-investigate old mines and probe the effectiveness of geological information the Government holds already.

Mine closures and openings

A significant challenge the NWMP has faced over the past few years has been the closure of a number of large producing mines. This is expected to continue over the next 10-15 years as a number of significant mines are forecast to cease. This has been a key development, which has encouraged further support by Government to ensure mining is sustainable in the province over the long term.

The largest of these closures has been the Century zinc mine operated by MMG. Century at its peak produced over a third of Queensland's zinc and lead production. The mine was operational for two decades but ceased due to the exhaustion of reserves at the site. This had significant consequences for zinc and lead production in the state with Queensland exports falling noticeably in 2016 and 2017.

The next looming concern for the province is the future of two further large mines – Glencore's Mount Isa Copper mining complex and South32's Cannington zinc/lead mine. These two operations, particularly Glencore's copper operations in Mount Isa, have supported the province for the past few decades. They produce the overwhelming amount of base metal production in Queensland and support a significant number of businesses and jobs in the region. These two mines have been anticipated to close within the next 10-15 years but in some scenarios (e.g. development of tailings) could keep mining for a longer period. The investment coming online and into the future is not predicted to be at levels that will entirely compensate for the closure of these two mines.

Nevertheless, there are a number of positive developments that could see continued strong development and mining activity in the province if they come to fruition. The first is Glencore deciding to proceed with its 'Super Pit' development. This development would effectively see Glencore maintaining its mining activities in Mount Isa for the next two to three decades at production rates comparable to levels seen over the past decade. However, it would require a substantial investment by Glencore, which the company has ruled out at this stage. Other possible developments could include the processing of tailings deposits, which would also extend mine life significantly.

Other positives that have the potential to minimise the impacts of large existing mines ceasing production is the new mines entering production and the different types of mining occurring. In recent years the province has seen a number of mines come online including MMG's Dugald River zinc mine, Capricorn Copper's copper mine and CuDeco's Rocklands copper mine (although this mine has currently suspended operations).

These mines still demonstrate the on-going potential of the region, albeit at a smaller scale to the giant mines of previous decades. The region is also experiencing a wave of interest in commodities that have not traditionally been mined or explored in the area, including vanadium, graphite and cobalt. If industry can find avenues to mine these commodities commercially at a large scale, this could significantly boost exploration and mining development around Mount Isa.

A promising factor for the province is New Century Resources' project at the former Century zinc mine. Based on the proposed production profile, New Century estimated Century will again be one of the top 10 zinc operations in the world, with steady state production forecasted at 507,000 tonnes per annum of zinc concentrate from the tailings dam only[30]. Although the mine's production rates have not matched this proposed number, significant production is still being

[30] *New Century Resources, Restart Feasibility Study, https://www.newcenturyresources.com/century-mine-project/restart-feasibility-study/*

achieved. This Project represents a very positive development for the mining industry and if this method can be replicated at various sites, the opportunity to 're-mine' older sites could unlock significant additional value for the province and the state. The mining of tailings also has benefits for mine rehabilitation.

Rising power prices

Another key development in the past decade has been rising input costs. Costs for a number of inputs has accelerated. One particular cost has been power.

Existing energy supply in the province is largely dependent on the supply of gas from Ballera over the Carpentaria gas pipeline, both for electricity generation and direct use in minerals processing plants. The Diamantina, Leichardt and Mica Creek power stations in Mount Isa have been the sources of power to the region over recent decades. Some mines operate isolated gas-fired or diesel fired generators. The power station also supplies energy to meet Mount Isa's domestic and commercial requirements and those of Cloncurry and surrounding communities.

As described in Section 16.4.2, the price of gas has increased significantly in recent years. This has driven wholesale prices up in North-West Queensland from levels around $6/GJ in 2013 to current prices now around $10/GJ (see Figure 16-12). Prices for some customers has been even higher at levels around $11/GJ. These higher gas prices are causing electricity prices to rise which is ultimately being passed on to customers, such as mining producers.

Some downward pressure on gas prices in the long term may result from the completion of the Northern Gas Pipeline built by pipeline company Jemena. This pipeline links Mount Isa with supply from the Northern Territory. Gas has commenced flowing through this pipeline into Mount Isa and has the potential in future years to provide the province with larger volumes of gas.

Over the long term, mining activity in the province will potentially be influenced by power prices. Options, which help contain, and even reduce power prices, will increase the competitiveness of Queensland mines compared to their competitors in other jurisdictions.

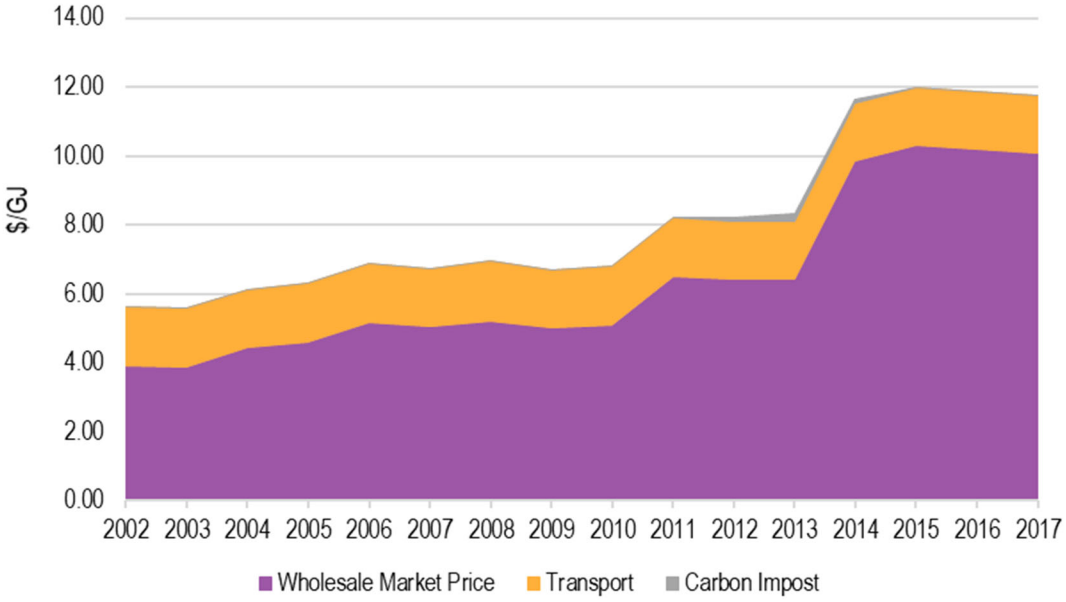


Figure 16-20 North-West Queensland Large Industrial Customer Gas Prices[31]

[31] *Oakley Greenwood, Gas Price trends review report, January 2018*

16.4.2 Gas market

Over the past decade there has been an unprecedented transformation of the Eastern Australian gas market (ECGM), driven by large-scale export liquefied natural gas (LNG) developments and associated upstream coal seam gas (CSG) field production facilities in Queensland. Three separate LNG export projects, with a combined production capacity of more than 25 million tonnes per year of LNG, were commissioned between late 2014 and late 2016. These facilities have a combined gross gas requirement of around 1,500 PJ/a—almost triple the amount of gas currently used in the entire domestic ECGM (see Figure 16-21).

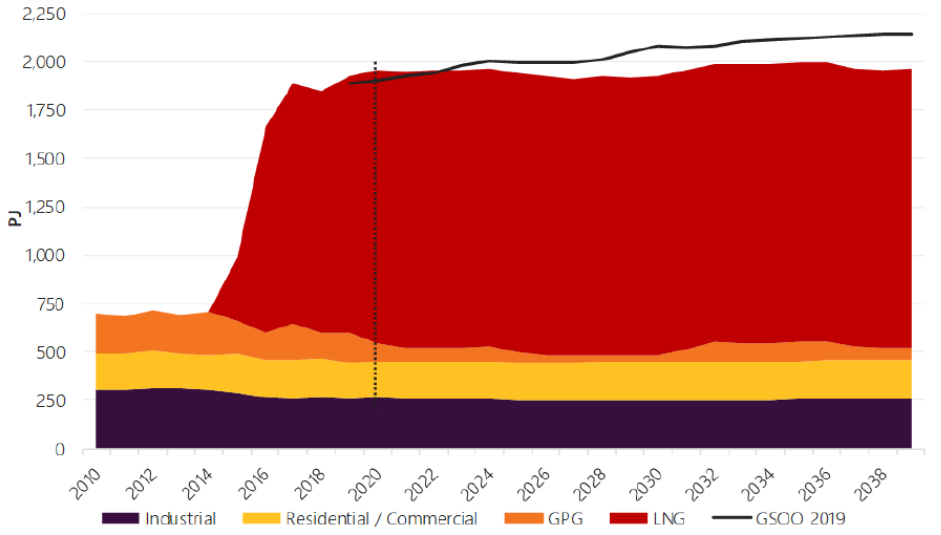


Figure 16-21 East Coast Gas Demand[32]

The impact that these LNG projects have had on the Eastern Australian domestic gas market would be difficult to overstate:

- They have affected the availability of gas to supply power generation, industrial, commercial and residential customers;
- They have pushed up the price of domestic gas and changed the ways in which gas prices are determined; and
- They have affected levels of domestic gas consumption, particularly in the power generation sector.

Although the situation has arguably improved over the last couple of years, there remains significant uncertainty regarding gas supply adequacy in Eastern Australia over the medium to long term. These factors are expected to continue to influence the supply-demand outlook and wholesale gas prices.

The Australian Competition and Consumer Commission (ACCC) and the Australian Energy Market Operator (AEMO) note in their latest reports[33] that the supply outlook in Eastern Australia remains tight, particularly due to lower forecast levels of future production, particularly from the Bass Strait. AEMO note in their 2020 Gas Statement of Opportunities Report that the eastern Australian market could face a supply shortfall by 2024.

Other long-term factors contributing to uncertainty about the adequacy of future gas supply include:

- The volume of gas being exported by Queensland LNG projects

[32] *AEMO, Gas Statement of Opportunities 2020 Report*
[33] *ACCC – January 2020 Gas Inquiry report; AEMO – 2020 Gas Statement of Opportunities Report*

- Low oil prices, which can impact significantly on gas exploration and development for both domestic producers and LNG projects. This has been exacerbated by the collapse in oil prices as a result of reduced global oil demand in the wake of the COVID-19 pandemic.
- Government policy and regulatory restrictions (including moratoria on gas exploration activities), which can affect long term gas supply.

There are two key implications from recent developments in the gas market – the increase in gas prices and impacts on reliability of future long-term supply. Further information can be found in Volume 3 Appendix AB Economics impact assessment.

16.5 Economic impact assessment and mitigation

16.5.1 Project impacts and mitigation

The Project will have significant economic impacts at the national, state and regional level. Direct benefits are expected to be realised through:

- Investment expenditures in the construction phase of the Project – which provides benefits through the flow-on to domestic business activity and employment.
- Ongoing periodic capital expenditures over the life of the transmission line as components need to be replaced.
- Operation and maintenance expenditures during the operation phase.

The other key effects of the Project include:

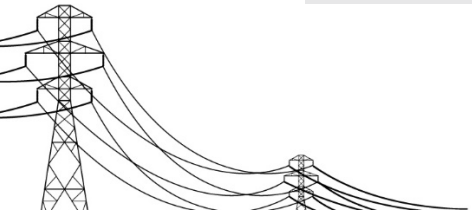
- Increased competition in local electricity markets, and more importantly, increased access to lower cost generation sources, which should lead to lower electricity prices with consequent flow-on economic benefits.
- The provision of significantly more electricity to the region enabling growth in demand by high point source consumers (such as various mining operations).
- The provision of transmission capacity for major new generation projects enabling generators to more economically locate in the region.

These injections and flow-on effects will provide for increased consumption and welfare for Australians in general and Queenslanders in particular.

Both positive and negative impacts have been summarised in Table 16-6 and discussed in the following sections.

Table 16-6 Summary of economic impacts

Impact category	Potential impact
Electricity market impacts	Productivity improvement in the Queensland electricity generation sector.
	Reduction in wholesale electricity prices in North West Queensland.
Industry impacts	Stimulation of additional mineral production in the North West Minerals Province.
	Additional construction activity associated with the Project and increased demand for labour, and goods and services.



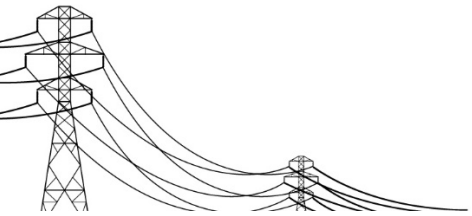
Impact category	Potential impact
Real economic output impacts	Increase of $142.6 billion in North-West Queensland.
	Increase of $139.5 billion in Queensland.
	Increase of $131.8 billion in Australia.
Real income impacts	Increase of $17.4 billion in North-West Queensland.
	Increase of $54.3 billion in Queensland.
	Increase of $78.4 billion in Australia.
Employment impacts (average annual increase/decrease)	Increase of 3,561 FTE jobs in North-West Queensland.
	Increase of 2,695 FTE jobs in Queensland.
	Increase of 640 FTE jobs in Australia.
Property impacts	Potential disruption to cattle breeders and traders during construction phase.

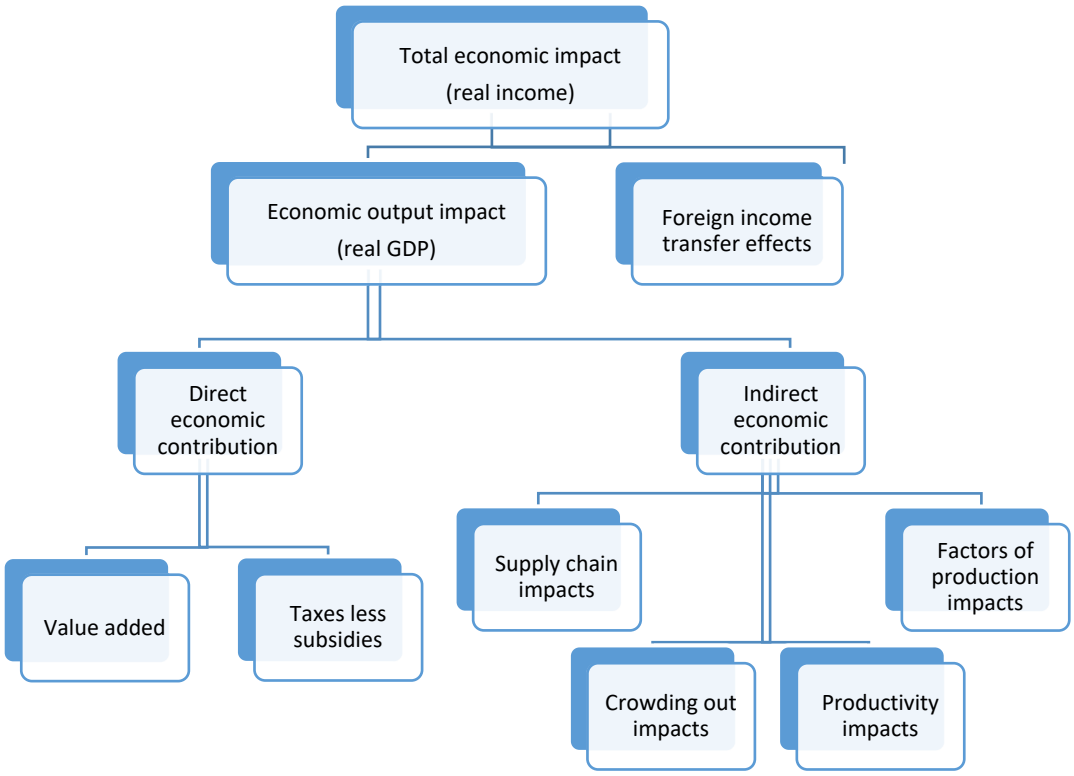
Framework of analysis

The main factors that need to be considered when analysing the macroeconomic impacts of a project or policy include:

- The direct and indirect contribution to the economy as a result of the activities associated with the project or policy.
- Any crowding out implications as resources are potentially diverted away from other productive activities to undertake the project or policy being analysed.
- Any productivity effects generated as a direct result of the policy or project activities – particularly any enduring productivity changes or productivity impacts on other activities not directly associated with the project or policy.
- Any changes to the factors of production in the economy.
- Any implications associated with changes in terms of trade or foreign income transfers.
- The extent of any dynamic element to the size of any of the above effects (for example, associated with different phases of the project).

Figure 16-22 shows these components graphically. Some of these effects may be negligible while others may be significant. An understanding of the effects helps determine the most appropriate tool(s) for the analysis.





Note: In *Tasman Global*, the change in real income is equivalent to the change in equivalent variation – a standard economic measure of the change in consumer welfare resulting from exogenous shocks

Figure 16-22 Estimating the Impact of a Project or Policy

16.5.2 Economic benefits

Real economic output and real income

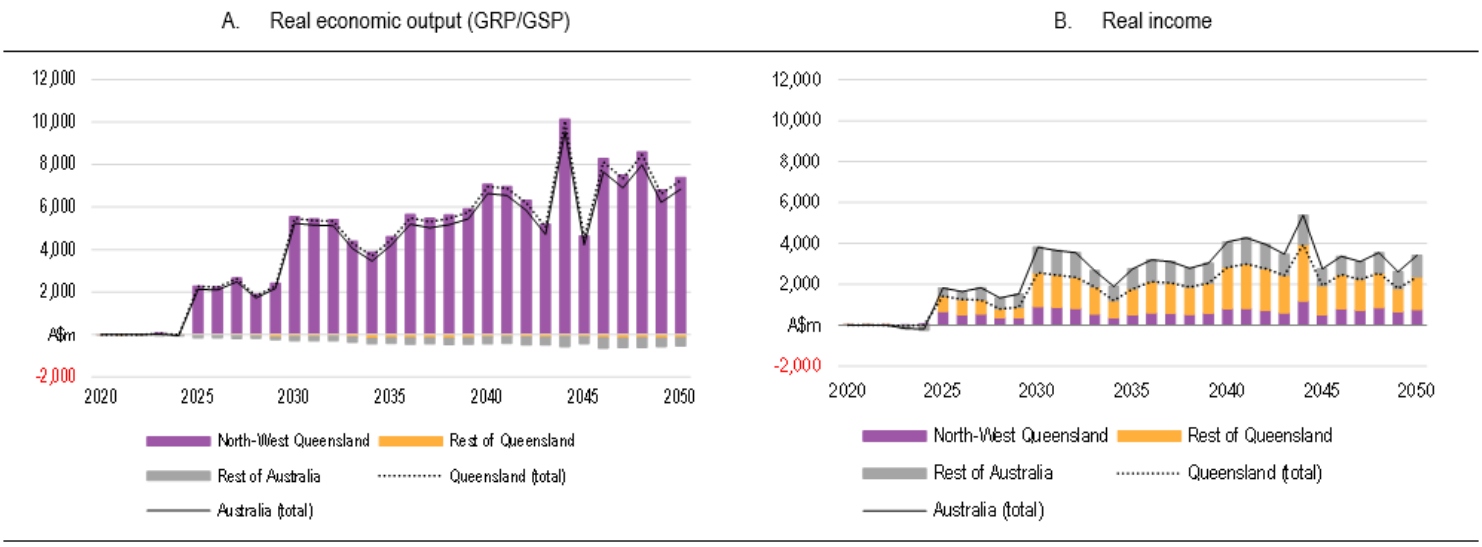
Real economic output is the sum of value added by all producers in the relevant region/state, and any product taxes (minus subsidies) not included in output. When calculated at a national level, this is referred to as GDP, and as GSP/GRP at the state/regional level.

In contrast, the change in real income is:

- the change in real economic output
- plus the change in net foreign income transfers
- plus the change in terms of trade.

While real output is a useful indicator, real income provides a better measure of the welfare impact that changes in these aggregates have on people living in a region.

Figure 16-23 shows the estimated change in both real economic output and real income in each region of Australia due to the construction and operations of the Project. A summary of the projected impacts is presented in Table 16-7, while Table 16-8 presents a decomposition of the macroeconomic impacts.



Note: All years are financial years ending June 30.

Figure 16-23 Change in Australian Real Economic Output and Real Income as a Result of CopperString 2.0, NEM Connected Case Relative to BAU Case (in 2020 terms)

While the macroeconomic effects of the Project in the NEM connected case relative to the BAU Case are driven by many factors, there are five broad elements:

1. The effect of the construction and operation of the Project infrastructure.
2. The underlying productivity improvement in the Queensland generation sector driven by the connection of the two grids resulting in changes in electricity prices.

   i) As per the electricity market analysis in provided in the full economic report (Volume 3 Appendix AB Economics impact assessment), there are a complex range of processes. In general, prices in North-West Queensland are lowered substantially (by over $100/MWh) while the wholesale electricity prices in the Rest of Queensland initially rise in the period 2026–2029 (by about $1.30/MWh), but are then approximately equal thereafter.
3. The movement of electricity generation toward North-West Queensland away from the Rest of Queensland, including the unlocking of additional supply opportunities (such as increasing the connection of the Kennedy energy zone to the NEM).
4. The stimulation of additional mineral production in the North-West driven by the lowering of the electricity prices.
5. The transfer of taxes and returns to capital associated with the increased mineral production in the North-West to other parts of Australia and overseas.

Previous modelling of the Project which did not include the effect of stimulating additional mineral production, projected a national increase in real GDP and real income of around $6.0 billion over the period to 2050, with approximately half of the effect related to the efficiency improvement in the electricity sector, half associated with the higher profitability of miners with less than 5 percent attributable to the effect of building and operating the transmission infrastructure itself.

Unfortunately, in this analysis, the electricity market effects in the NEM connected case relative to the BAU Case are simultaneously intertwined with the additional mineral production so it is not straightforward to decompose the various effects. Saying that, the production and export of approximately $123.5 billion of previously uneconomic mineral resources will be the main driver of the projected macroeconomic effects. In general, the changes in real economic output occur broadly in line with the projected increase in mining production in the NWMP.

The construction and operations of the transmission infrastructure itself, which, at $2 billion, is nominally large, is primarily increasing demand for scarce factors of production, and so has a smaller effect on economic output compared to the size of the investment. However, the additional construction activity associated with the Project has a noticeable effect on the real income of residents in the construction corridor, as there is increased demand for labour and goods and services and this boosts local incomes under the NEM connected case relative to the BAU Case (by a cumulative total of $77 million by 2024).

As shown in Table 16-7, the additional economic activity in the NEM connected case relative to the BAU Case, occurs in North-West Queensland. There is a small projected decrease in real economic output in the Rest of Queensland and the Rest of Australia due to the movement of scarce primary factors (i.e. labour and capital) into the North-West.

Table 16-7 Projected Cumulative Change in Real Economic Output and Real Income in each Region as a Result of CopperString 2.0, NEM Connected Case Relative to BAU Case (in 2020 Terms)

	Total (2020 to 2050)	NPV (3% real discount rate)	NPV (7% real discount rate)	NPV (10% real discount rate)
	2020 $Am	2020 $Am	2020 $Am	2020 $Am
Real economic output				
North-West Queensland	142,587	81,117	41,821	27,051
Rest of Queensland	–3,131	–1,819	–962	–632
Queensland (GSP)	139,455	79,297	40,859	26,418
Rest of Australia	–7,661	–4,342	–2,238	–1,454
Australia (GDP)	131,794	74,955	38,621	24,964
Real income				
North-West Queensland	17,435	10,426	5,779	3,951
Rest of Queensland	36,891	21,317	11,169	7,288
Queensland	54,326	31,743	16,948	11,239
Rest of Australia	24,033	14,096	7,500	4,925
Australia	78,359	45,840	24,449	16,164

Note: NPV = net present value. Source: ACIL Allen Consulting

As shown in Table 16-7, however, the real income generated by the increase in output is not kept within the North-West Queensland region, and is instead repatriated to other Australian and overseas residents through the payment of Queensland and Commonwealth Government taxes and through the payment of dividends to shareholders. For residents in the Rest of Queensland, the increase in real income is positive throughout the projection period from 2025, and more than compensates for any negative effects on real GSP. Similarly, over the whole modelling period, there is a clear, strong aggregate benefit to the real income of Queensland.

For the purposes of this analysis, the economic impact of generation connected at Hughenden in the NEM connected case is included in the North-West Queensland region. Including Hughenden as part of the North-West Queensland region contributes to the transfer of real economic output between North-West Queensland and the Rest of Queensland since the inclusion of CopperString is projected to shift investment in some generation capacity from central and southern Queensland into the Hughenden area. However, the net increase in economic output is shared largely amongst regions.

Table 16-8 Decomposition of Projected Cumulative Total Change in Real GDP and Real Income as a Result of CopperString 2.0, NEM Connected Case Relative to BAU Case (in 2020 Terms)

	North-West Queensland	Rest of Queensland	Queensland (total)	Rest of Australia	Australia (total)
	A$m	A$m	A$m	A$m	A$m
Private consumption	14,291	19,839	34,129	13,377	47,507
Government consumption	0	0	0	0	0
Investment	35,601	–1,301	34,300	–2,507	31,793
Net foreign trade	92,695	–21,669	71,026	–18,532	52,495
Real exports	128,899	–15,621	113,278	–18,024	95,254
Contribution of imports	–36,204	–6,048	–42,252	–508	–42,760
Real economic output	142,587	–3,131	139,455	–7,661	131,794
Terms of trade	–4,326	5,980	1,654	5,894	7,548
Net income transfers	–120,825	34,042	–86,783	25,800	–60,983
Real income	17,435	36,891	54,326	24,033	78,359

Note: Real government consumption is assumed to be unchanged relative to the Reference Case, with any changes in taxation revenue given to private households as a lump sum transfer in each year.
Source: ACIL ALLEN CONSULTING

Real Economic Output

Over the period to 2050, the Project is projected to increase the real economic output of:

- North-West Queensland by a cumulative total of $142.6 billion relative to the Reference Case (with a net present value of $81.0 billion, using a 3 percent real discount rate)
- Queensland as a whole (i.e. real GSP) by a cumulative total of $139.5 billion relative to the Reference Case (with a net present value of $79.3 billion, using a 3 percent real discount rate)
- Australia as a whole (i.e. real GDP) by a cumulative total of $131.8 billion relative to the Reference Case (with a net present value of $75.0 billion, using a 3 percent real discount rate).

To place the projected changes in economic output estimates in perspective, the discounted present value (using a 3 percent discount rate) is equivalent to approximately 21 percent of Queensland's current GSP. This is a significant potential impact that is unlocked by a single project.

Real Income

Real income is a measure of the ability to purchase goods and services, adjusted for inflation. A rise in real income indicates a rise in the capacity for current consumption, but also an increased ability to accumulate wealth in the form of financial and other assets. The change in real income from a development is a measure of the change in welfare of an economy.

The extent to which local residents will benefit from the additional economic output depends on the level of ownership of the capital (including the natural resources) utilised in the business as well as any wealth transfers undertaken by Australian governments as a result of the taxation revenues generated by the Project.

The Queensland Government will receive some additional taxes (such as royalties and payroll taxes) because of the Project, while the Australian Government will receive higher taxes through higher personal income and company tax receipts. Where this additional income will be spent is unknown, but for this study, it was assumed that it would be spent proportionately to the population in each region of Australia.

Over the period 2020 to 2050, the Project is projected to increase the real income of:

- North-West Queensland by a cumulative total of $17.4 billion relative to the Reference (BAU) Case (with a net present value of $10.4 billion, using a 3 percent real discount rate).
- Queensland as a whole by a cumulative total of $54.3 billion relative to the Reference (BAU) Case (with a net present value of $31.7 billion, using a 3 percent real discount rate).
- Australia as a whole by a cumulative total of $78.4 billion relative to the Reference (BAU) Case (with a net present value of $45.8 billion, using a 3 percent real discount rate).

To place these projected changes in income in perspective, the discounted present values (using a 3 percent discount rate) are equivalent to a one-off increase in the average real income of all current residents of Queensland by approximately $6,000 per person (or approximately $16,000 per household).

Employment

As well as generating short-term jobs related to the construction of the Project infrastructure, the Project will also create significant medium term employment in the Queensland economy, monetising the additional resources stimulated under the NEM connected case will generate a significant number of short-term jobs related to the construction phase of the Project. In addition to the direct jobs generated on-site, the construction and installation, and production phases will require significant quantities of Queensland sourced goods and services including mining, engineering and management services, machinery and cement during construction and mining, manufacturing and various business services during operation. Production of these inputs will further increase the demand for labour across the Queensland economy.

A key issue when estimating the impact of a project is determining how the labour market will clear[34]. As discussed in the full economic report (Volume 3 Appendix AB Economics impact assessment), for this analysis, increases in the demand for labour in the North-West Queensland Region can be met by three mechanisms: increasing migration from the Rest of Queensland and Rest of Australia; increasing participation rates and/or average hours worked; and by reducing the unemployment rate. In the model framework, the first two mechanisms are driven by changes in the real wages paid to workers in the North-West Queensland Region

[34] *As with other CGE models, the standard assumption within Tasman Global is that all markets clear (i.e. demand equals supply) at the start and end of each time period, including the labour market. CGE models place explicit limits on the availability of factors and the nature of the constraints can greatly change the magnitude and nature of the results. In contrast, most other tools used to assess economic impacts, including I-O multiplier analysis, do not place constraints on the availability of factors. Consequently, these tools tend to overestimate the impacts of a project or policy.*

while the third is a function of the additional labour demand relative to the BAU Case. Given the moderate unemployment rate assumed throughout the projection period, changes in the real wage rate accounts for the majority of the additional labour supply in the policy scenarios relative to the BAU Case.

It should be noted that this analysis does not assume any change in net foreign migration as a result of the Project between the NEM connected case and the BAU Case.

Employment Creation

As per the projected changes in real economic output, the projected change in employment in North-West Queensland under the NEM connected case relative to the BAU Case, largely follows the change in mineral production (see Figure 16-25). The construction phase of the Project is projected to increase employment in North-West Queensland by 1,849 employee years between 2020–2024, with peak net employment of an additional 950 FTE jobs in 2024. As shown in Figure 16-24, under the NEM connected case, employment in North-West Queensland is projected to remain largely steady at around 12,000 FTE jobs through to 2040, compared to experiencing a gradual decline to approximately 6,400 FTE jobs under the BAU Case.

All else equal, these projections highlight the potential significance of a major project like CopperString in improving the economic viability of the resources present in the NWMP and maintaining the competitiveness of region in the future. This is in line with helping achieve the policy objectives in the Queensland Government's State Planning Policy, the North West Regional Plan 2010 and the North West Queensland Economic Diversification Strategy 2019.

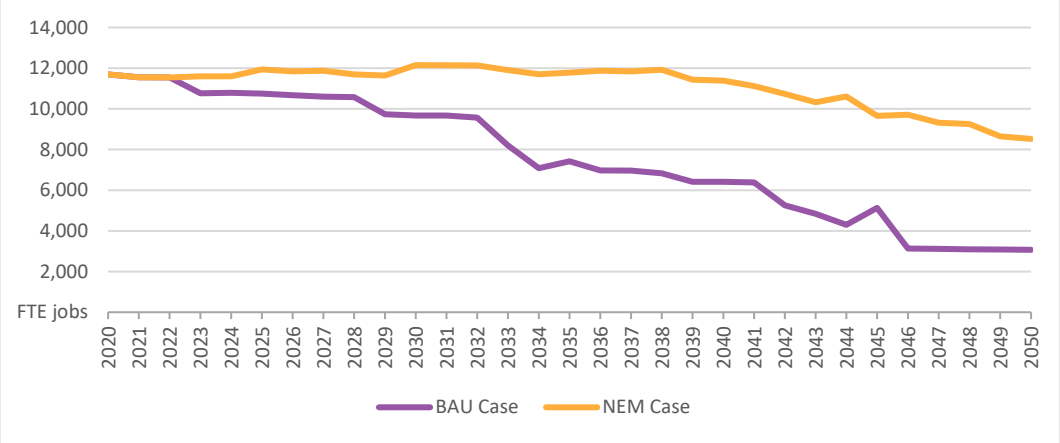


Figure 16-24 Projected Employment in North-West Queensland[35]

A range of different skills will be impacted by the additional economic activity stimulated under the NEM-Connected Case relative to the BAU Case. Figure 16-25 shows the broad classifications and numbers of employees stimulated in North-West Queensland by CopperString over its life. The data reflects the high proportion of technicians and trades workers, skilled machinery operators and drivers as well as professional personnel required to construct a project of this type. Other jobs are stimulated in response to consumer's consumption patterns and their higher incomes, relative to the BAU Case.

[35] *Acil Allen Consulting*

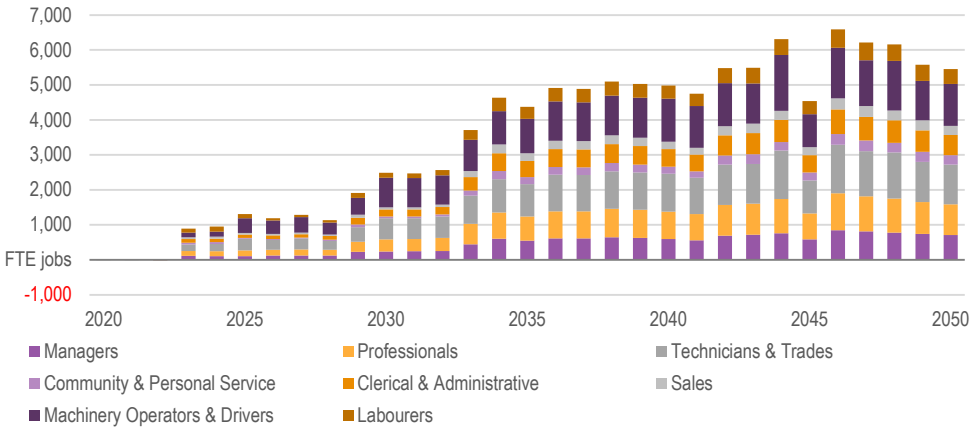


Figure 16-25 Project Additional North-West Queensland Employment by Occupation, NEM Connected Case Relative to BAU Case (Full-time Equivalent Jobs)[36]

Over the modelled life of the Project (to 2050), it is projected that around 19,834 employee years of FTE direct and indirect jobs will be created nationally (annual average of 640 FTE jobs). More specifically, it is projected that the Project will increase employment in:

- North-West Queensland by 110,395 employee years (average annual increase of 3,561 FTE jobs).
- Queensland as a whole by 83,539 employee years (average annual increase of 2,695 FTE jobs).
- Australia as a whole by 19,834 employee years (average annual increase of 640 FTE jobs).

As illustrated in Figure 16-26, the total additional employment from about 2034 is projected to be broadly constant throughout the projection period at approximately 1,000 FTE jobs, but will experience some variation by region year to year.

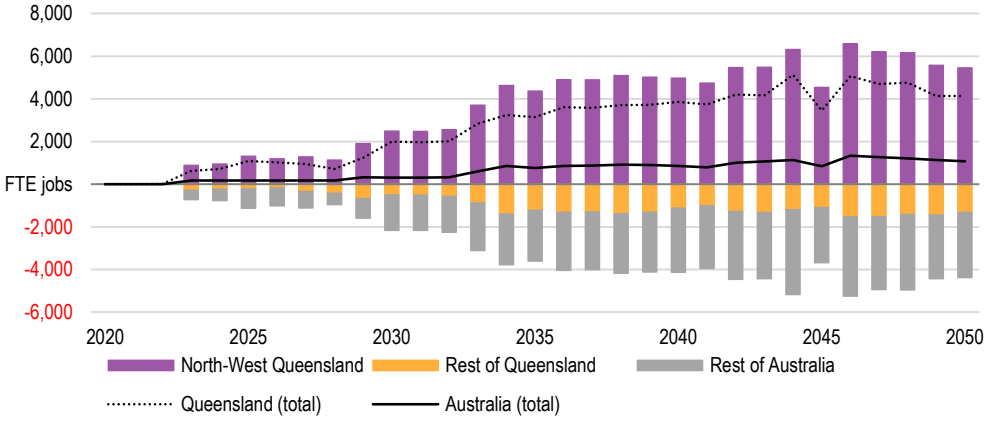


Figure 16-26 Projected Change in Employment by Region, NEM Connected Case Relative to BAU Case (Full-Time Equivalent Jobs)[37]

Figure 16-27 presents the net change in Australian employment by occupation. As shown the main occupations that are projected to be affected are within the Technicians and Trades, and the Machinery Operators and Drivers categories. In net terms other occupations are largely being moved between regions.

[36] *Acil Allen Consulting*
[37] *Acil Allen Consulting*

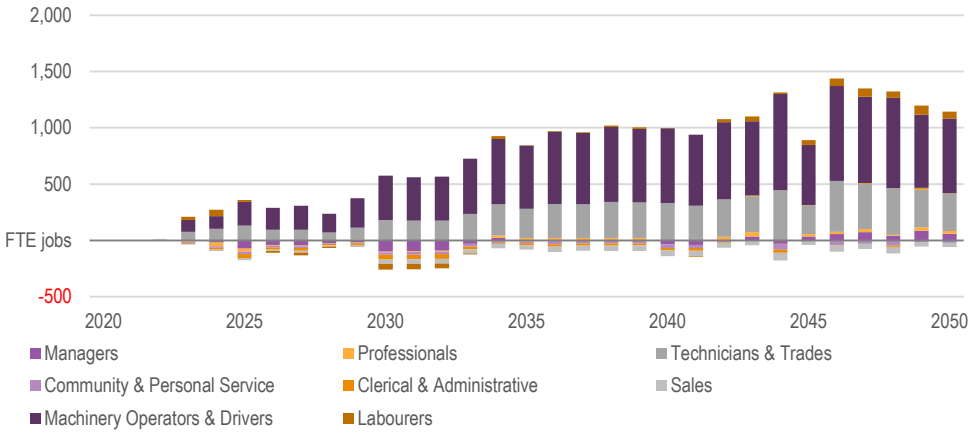


Figure 16-27 Projected Additional Australia Employment by Occupation, NEM Connected Case Relative to BAU Case (Full-Time Equipment Jobs)[38]

Impact on Townsville

Regions like Townsville are also expected to receive noticeable economic impacts from the project. As a significant urban centre and as the primary connection point of the NWMP to the rest of the world, the Townsville economy is likely to be a source of workers and goods and services required for not only the construction and operation of CopperString 2.0, but also for the construction and operation of the additional electricity generation in North-West Queensland as well as the additional mining activity.

The Port of Townsville will be one of the major beneficiaries through the import of various construction materials as well as through the export of bulk minerals, concentrates and metals. Under the NEM-connected case is projected that, on average between 2029–2050, there will be an additional 4.1 million tonnes of dry bulk, concentrates or refined metals produced relative to the BAU case, the majority of which is likely to be exported through the Port of Townsville (refer to Volume 3 Appendix AB Economics impact assessment).

16.5.3 Impact on property management

The main land use on the properties traversed by the corridor selection is beef cattle production. According to satellite images of the region to the north west of Lake Ross there is a small amount of tree crop farming that the Ross Substation and transmission line (on the previously considered option of Ross to Dajarra Road) could cross. However, it appears that with only minor changes to the last stages of this route, impacting on the horticultural enterprises in this area could be avoided.

For the remainder of the route (Woodstock to Dajarra Road) the predominant agricultural land use is beef cattle production. There are several types of cattle production enterprises run in the region:

- breeding,
- trading, and
- combinations of the two.

There are four broad land class types within the corridor selection:

- Mitchell Grass Plains

[38] *Acil Allen Consulting*

- Gulf Plains
- Desert Uplands
- Einasleigh Uplands.

Agricultural land

The impacts of the preparation, construction and maintenance of the corridor selection on the predominant enterprises along the route are described in detail in the full Economic Technical Report (Volume 3 Appendix AB Economics impact assessment).

There are few differences in impacts between the cattle trading and breeding enterprises. However, breeding enterprises that closely control mating may be more sensitive to interruptions and potential mixing of mobs than other types of cattle enterprises.

Once constructed and all reparations have been made, some farmers may view the installation of the power line easement as being beneficial due to:

- the potential for reduced tree competition for moisture with pastures in the easement (depending on the current – if any – competition from trees within the easement).
- rehabilitating construction areas could provide an opportunity to improve the pastures in the affected areas.
- a well maintained access track could be useful infrastructure on the farm providing improved access to some areas for the farmer.

Any such benefits will be case specific.

Mitigation measures

A summary of mitigation measures is provided in Table 16-9.

Table 16-9 Potential Impacts and Mitigation Measures

Potential impact	Mitigation measures	Unmitigated impact	Mitigated impact
Cattle stock control risk due to construction activities.	• Effective landholder communication strategies • Establishing paddock access protocols	Low	Low

Mitigation of stock control risks may be easily achieved by establishing a set of paddock access protocols between each property manager and CopperString personnel prior to commencement of preparations and construction. This is, of course, dependent on the current state of fencing on the property and the agreed installation of suitable access gates.

It is anticipated that the vast majority of impacts to property management through both the construction and operational phases of the Project can be mitigated with the implementation of effective landholder communication strategies.

Other negative short and long-term impacts will be addressed directly with each individual landholder.

Extractive industries

An easement width of 120 m is planned along the Woodstock to Dajarra Road section of the Project, with an easement width of 60 m planned for the western and southern extensions from Dajarra Road. The proposed alignment has avoided mining tenure as part of the initial route

selection. If this conflicts with any planned resource extraction activities, CuString will try to minimise disruption to such activities, where publicly known or notified by relevant stakeholders. Most resource extraction activities can be designed to avoid the necessity of using the proposed easement. For example, lateral or diagonal drilling techniques are a possibility for well-based extraction activities, and in the case of open pit mines, underground systems could achieve satisfactory outcomes. Strategies for local participation

16.5.4 Employment strategies for local residents

The Project will favour employment of local residents. In compliance with government policy, the Project will include a Training Policy and an Indigenous Economic Opportunities Plan to ensure maximise local employment, training and business supply opportunities for Aboriginal and Torres Strait Islander Queenslanders. For example, at least 15 percent of the total man-hours will be undertaken by apprentices and/or trainees and through other workforce training. Head office and administration roles will work Monday to Friday to minimise staff upload costs associated with weekend work and to attract local workers.

The labour force is composed by the following types of workers.

- Civil workers, which will include piling rig offsiders, roads crew, vegetation clearing crew, concreting crew and steel fixers in yard. The skills required for this type of work are generic and local workers will be given preference wherever possible. In general, these workers will be based in regional Queensland.
- Steel Construction workers will include riggers, truck drivers and crane operators. The Project is confident that 80 percent of these workers will be Australian residents on a FIFO basis to Townsville (during Phase 1) or Cloncurry (during Phase 2). The remaining 20 percent will be itinerant workers from Asia (possibly the Philippines) or South America (possibly Colombia).
- Aerial Crew composed of riggers, helicopter pilots and truck drivers. As with the steel construction crew, the Project is confident that 80 percent of these workers will be Australian residents on a FIFO basis to Townsville (during Phase 1) or Cloncurry (during Phase 2). The remaining 20 percent will be itinerant workers from Asia (possibly the Philippines) or South America (possibly Colombia).
- Fibre jointers. This work will most likely be undertaken by a Queensland-based company.

In all instances, the Project will strive to include members of Indigenous communities and people with a disability. Skills assessment and recruitment and training programs will be offered.

16.5.5 Strategies to address government policy

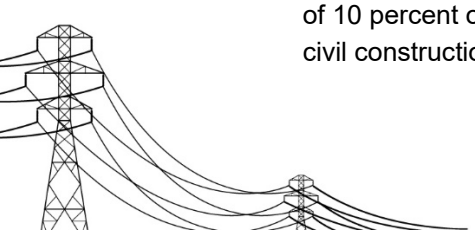
There are two key policy areas which the Project are aiming to achieve:

1. The level of training provided for construction contracts on Queensland Government building and construction contracts, with regard to the Queensland Government Building and Construction Training Policy (Training policy).
2. The use of the locally sourced goods and services, with regard to the Local Industry Policy (DEEDI, 2008).

These are discussed in the following section.

Training and employment

The Queensland Government Building and Construction Training Policy states that a minimum of 10 percent of the total labour of the total labour hours on Queensland Government building or civil construction projects (valued over $250,000 for building or $3,000,000 for civil construction)



be undertaken by Indigenous workers, apprentices, trainees or cadets or used for the upskilling of existing employees. Construction projects with a contract sum of $100 million or greater have a minimum requirement of 15 percent.

The policy requires contractors to provide employment and structured training on State Government building and construction contracts to address skills shortages and create additional employment opportunities in the building and construction industry.

Because the Project is based in a regional area and travel will include off road driving, 4WD training will be a pre-requisite for engineers and site-based staff.

The Project envisages that the admin, camp cleaning/kitchen hand roles will be filled by local people and businesses. Employees will be given training and develop new skills in reception, administration, cost control systems and software packages as required.

All workers will undertake the site and project inductions and these would include training in safety systems, cultural awareness and environmental controls and procedures.

The environmental and safety teams will run toolbox talks regularly at sites (at least every month) where they introduce a training/awareness session such as how to protect the job from scour when rain is forecast.

Within the civil crews, there is a continual development program so that the crew members can progress from CW1 through to CW3.

In addition to the above, the following training programs will take place:

- Approximately 20 workers will be on the Civil Training programme.
- For every five people on each work front site, there would be one first aid officer. Accordingly, approximately 50 workers will undertake a Senior First Aid course.
- Site engineers are mentored by the Project Engineers will be offered various developmental programmes.

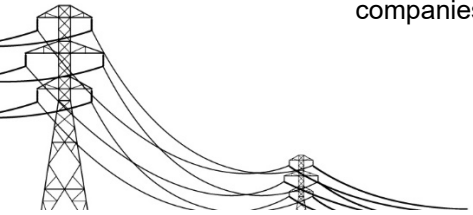
Furthermore, the rigging contractors operate training systems within their crews to continually upskill. It is estimated that it takes four to six months to train new recruit to be able to do all the stringing and steel tasks. It is envisaged that approximately 50-100 new recruits will be hired.

These training programs and the intended hiring of Indigenous people is expected to more than suffice for compliance with the Training Policy and Indigenous Economic Opportunities Plan.

Sourcing local inputs

The *Queensland Charter for Local Content* (Department of State Development, Tourism and Innovation), provides a framework for helping local producers secure business whilst remaining internationally competitive. The policy supports a competitive local industry and provides fair and reasonable opportunity to for the local industry to tender for work on infrastructure and resource-based projects and major procurements in Queensland. The Project will engage the following high-level strategies to operationalise this policy:

- Recognise that involving local industry in projects provides economic benefits to all parties
- Ensure that Queensland and Australian suppliers, contractors and manufacturers are given full, fair and reasonable opportunity to tender and participate in all stages of the Project
- Use Australian standards and codes in the formulation of specifications, tenders and the letting of contracts (except where it is unreasonable to do so)
- Seek to maximise levels of goods and services, including design services, from local companies where they are competitive with respect to cost, quality and timeliness



- Seek to incorporate the *Queensland Charter for Local Content* into contracts entered into with third parties for the supply of goods and services
- encourage private sector project proponents, who are not formally subject to the provisions of the policy, to apply the principles espoused in the policy to their projects on a voluntary basis as 'good corporate citizens'

The provision of effective opportunities for local industry is designed to ensure that investment decisions are not adversely affected.

Other Government policies

In addition to the above policies, by connecting the region to the NEM and significantly lowering local energy prices and improving the economics of resource extraction, the Project will assist the implementation of a number of other Queensland Government policies, including :

1. **The State Planning Policy (SPP):** The SPP outlines the guiding principles and State interests that underpin the delivery of local and regional plans, and development that will advance the social, economic and environmental needs of all Queenslanders. The purpose of the SPP and the state interest policies is to secure a liveable, sustainable and prosperous Queensland. It requires that state interests are integrated in local planning instruments, regional plans and development decisions in order to strengthen the Queensland economy, promote strong communities, protect the environment, wisely manage resources and inform and respond to investment in infrastructure.
2. **Powering Queensland Plan:** The Powering Queensland Plan sets out the State's strategy to guide Queensland through the short term and long-term challenges facing Australia's energy markets to ensure Queenslanders receive affordable and secure supply of electricity. The overall objectives of the plan are to deliver stable energy prices, ensure long-term security of electricity supply, transition to a cleaner energy sector and create new investment and jobs.
3. **North West Regional Plan 2010:** The Plan seeks to manage regional growth and change in the most sustainable way to protect and enhance quality of life in the region. The regional plan identifies the regional framework and desired regional outcomes for the North West region. The regional plan is the pre-eminent plan for the region, and takes precedence over all planning instruments, other than state planning regulatory provisions.
4. **The Strategic Blueprint for Queensland's North West Minerals Province (the blueprint):** The blueprint contains a suite of actions to secure the long-term future of the North West region and its communities. It aims at facilitating the continued development of the resources sector and diversifying the regional economy and creating employment opportunities.

16.6 Sustainable development

Ecologically Sustainable Development (ESD) represents one of the greatest challenges facing Australia's governments, industry, business and community in the coming years. The core objectives of the *National Strategy for Ecologically Sustainable Development 1992* are to enhance individual and community well-being; to provide equity within and between generations; and to protect biological diversity and ecological processes.

Assessment of the impacts of the Project on these objectives indicates that the Project satisfies the criteria presented in the National Strategy on Sustainable Development. The Project will provide a net positive benefit to the local, regional and national economies. The beneficial impact can be determined through the Project's influence as an enabler of development of the NWMP, and renewable energy. The high cost supply of energy in the NWMP or the prohibitive

cost of connection between identified high quality renewable resources and the NEM acts as a constraint on potential development of these resources. CopperString lifts this constraint and enables development of resources to proceed.

Development, particularly of renewable energy, has the greatest potential to address issues such as climate change and the emissions intensity of the NEM, which are key performance indicators of the achievement of the National Strategy on Sustainable Development.

The Project will have a positive benefit on the community and community well-being, both through the employment opportunities during construction and the on going development and operation of mines and processing plants and renewable energy generation.

There is predicted to be a net positive environmental benefit from CopperString, which may be achieved through the minimisation of impacts during the construction period, low to very low operational impacts and the facilitation of otherwise constrained resources and renewable energy projects to connect to the NEM. The combined impact of increased renewable energy generation and significantly reduced gas and diesel fired generation in NWQ is estimated to decrease Queensland $C0_2$ emissions by 7.3 million tonnes in the period to 2050 compared to the BAU case

16.7 Economic modelling

16.7.1 CGE Modelling

This Section provides an overview of the approach used by ACIL Allen to model the broader economic impact of the Project using CGE modelling and presents the projected impacts. Further detail regarding the model is provided in the full Economic Technical Report (Volume 3 Appendix AB Economics impact assessment).

The estimated capital and operating expenses underlying the Project along with the projected electricity market variables were used to inform the computable general equilibrium (CGE) model - *Tasman Global* - Reference Case and policy scenarios. Further detail on the *Tasman Global* model can be found in full Economic Technical Report (Volume 3 Appendix AB Economics impact assessment). The differences between the economic projections of the BAU and NEM connected cases provide a forecast of its total economic impacts. These include the wider economic impacts associated with the construction and ongoing operation of the facilities and supporting services, as well as the impact of changes in the electricity market prices, as relevant.

CGE models produce a wide variety of economic metrics. The metrics reported in this case include:

- Real economic output (as measured by real Gross Regional Product (GRP) and real Gross State Product (GSP) or Gross Territory Product (GTP), the sub-national versions of gross domestic product or GDP) is defined as the sum of value added by all producers who are within the region/state, plus any product taxes (minus subsidies) not included in output. A positive deviation (i.e. increase) of real economic output from the Reference Case implies that the proposed investment will enable the economy to produce more real goods and services potentially available for consumption.
- Real income: The change in CGE models, such as *Tasman Global*, is a measure of the change in economic welfare of the residents of the region, state or country. The change in real income is equal to the change in real economic output plus the change in net foreign income transfers plus the change in terms of trade. In contrast to measures such as real economic output, real income accounts for any impacts of foreign ownership and debt

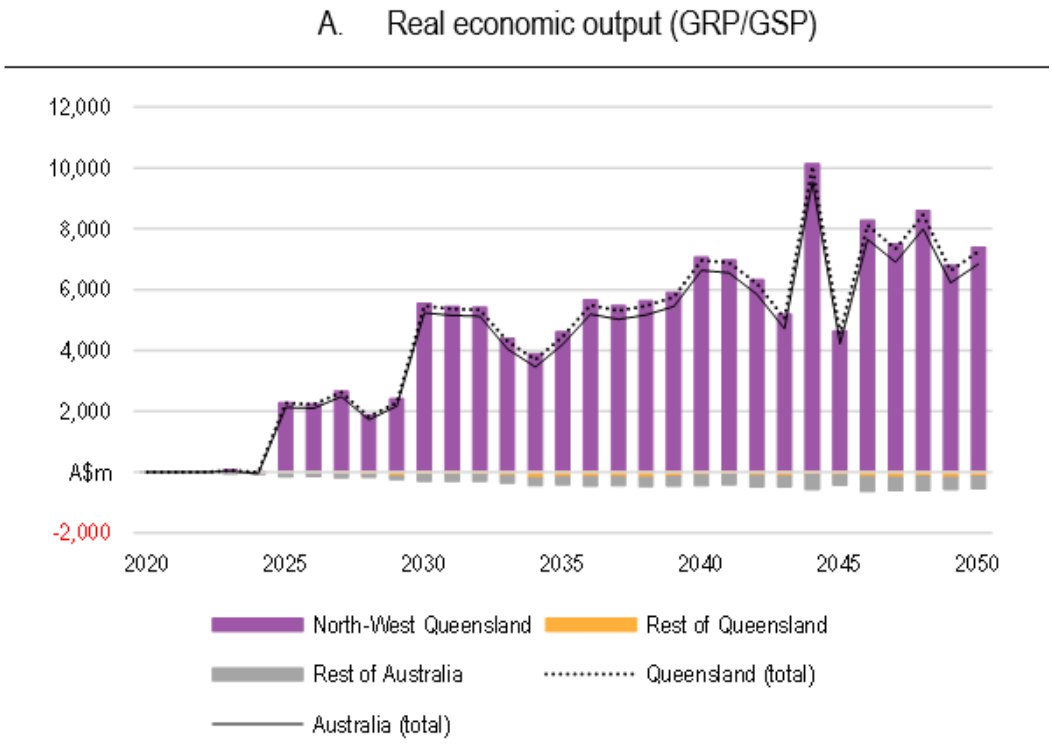
repayments, as well as changes in the purchasing power of residents as a result of a project or policy.

- Employment and real wages impacts of the construction and operations of a major project are produced by *Tasman Global*.

16.7.2 CGE modelling results

Real Economic Output

Figure 16-28[39] shows the estimated change in real economic output in each region of Australia due to the construction and operations of the Project.



Note: All years are financial years ending June 30.

Figure 16-28 Change in Australian Real Economic Output as a Result of CopperString 2.0, NEM Connected Care Relative to BAU Case (in 2020 terms)

Over the period to 2050, the Project is projected to increase the real economic output of:

- North-West Queensland by a cumulative total of $142.6 billion relative to the Reference Case (with a net present value of $81.0 billion, using a 3 percent real discount rate).
- Queensland as a whole (i.e. real GSP) by a cumulative total of $139.5 billion relative to the Reference Case (with a net present value of $79.3 billion, using a 3 percent real discount rate).
- Australia as a whole (i.e. real GDP) by a cumulative total of $131.8 billion relative to the Reference Case (with a net present value of $75.0 billion, using a 3 percent real discount rate).

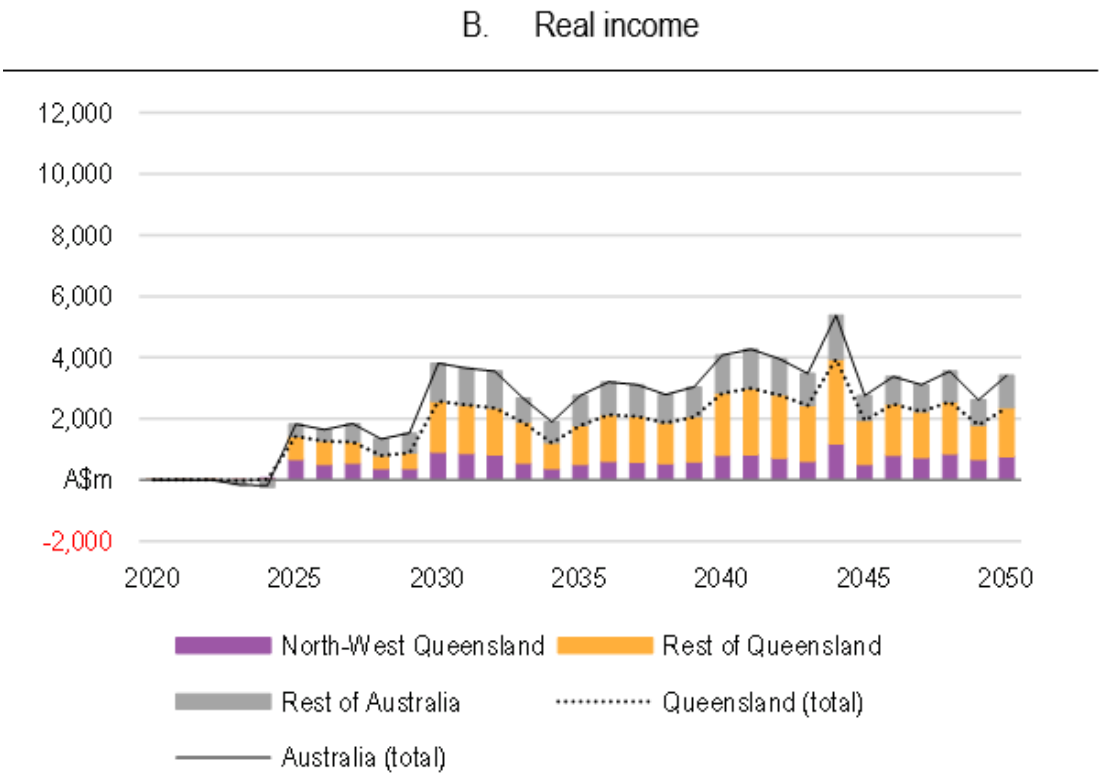
To place the projected changes in economic output estimates in perspective, the discounted present value (using a 3 percent discount rate) is equivalent to approximately 21 percent of

[39] *SOURCE: ACIL ALLEN CONSULTING*

Queensland's current GSP. This is a significant potential impact that is unlocked by a single project.

Real Income

Figure 16-29[40] shows the estimated change in real income in each region of Australia due to the construction and operations of the Project.



Note: All years are financial years ending June 30.

Figure 16-29 Change in Australian Real Economic Income as a Result of CopperString 2.0, NEM Connected Care Relative to BAU Case (in 2020 terms)

Real income is a measure of the ability to purchase goods and services, adjusted for inflation. A rise in real income indicates a rise in the capacity for current consumption, but also an increased ability to accumulate wealth in the form of financial and other assets. The change in real income from a development is a measure of the change in welfare of an economy.

The extent to which local residents will benefit from the additional economic output depends on the level of ownership of the capital (including the natural resources) utilised in the business as well as any wealth transfers undertaken by Australian governments as a result of the taxation revenues generated by the Project.

The Queensland Government will receive some additional taxes (such as royalties and payroll taxes) because of the Project, while the Australian Government will receive higher taxes through higher personal income and company tax receipts. Where this additional income will be spent is unknown, but for this study, it was assumed to be spent proportionately to the population in each region of Australia.

Over the period 2020 to 2050, The Project is projected to increase the real income of:

[40] *SOURCE: ACIL ALLEN CONSULTING*

- North-West Queensland by a cumulative total of $17.4 billion relative to the Reference (BAU) Case (with a net present value of $10.4 billion, using a 3 percent real discount rate).
- Queensland as a whole by a cumulative total of $54.3 billion relative to the Reference (BAU) Case (with a net present value of $31.7 billion, using a 3 percent real discount rate).
- Australia as a whole by a cumulative total of $78.4 billion relative to the Reference (BAU) Case (with a net present value of $45.8 billion, using a 3 percent real discount rate).

To place these projected changes in income in perspective, the discounted present values (using a 3 percent discount rate) are equivalent to a one-off increase in the average real income of all current residents of Queensland by approximately $6,000 per person (or approximately $16,000 per household).

Employment

Over the life of the Project, it is projected that around 19,834 employee years of full time equivalent direct and indirect jobs will be created nationally (annual average of 640 FTE jobs). More specifically, it is projected that the Project will increase employment in:

- North-West Queensland by 110,395 employee years (average annual increase of 3,561 FTE jobs)
- Queensland as a whole by 83,539 employee years (average annual increase of 2,695 FTE jobs)
- Australia as a whole by 19,834 employee years (average annual increase of 640 FTE jobs).

As illustrated in Figure 16-30[41], the total additional Australian employment from about 2034 is projected to be broadly constant throughout the projection period at approximately 1,000 FTE jobs, but will experience some variation by region year to year.

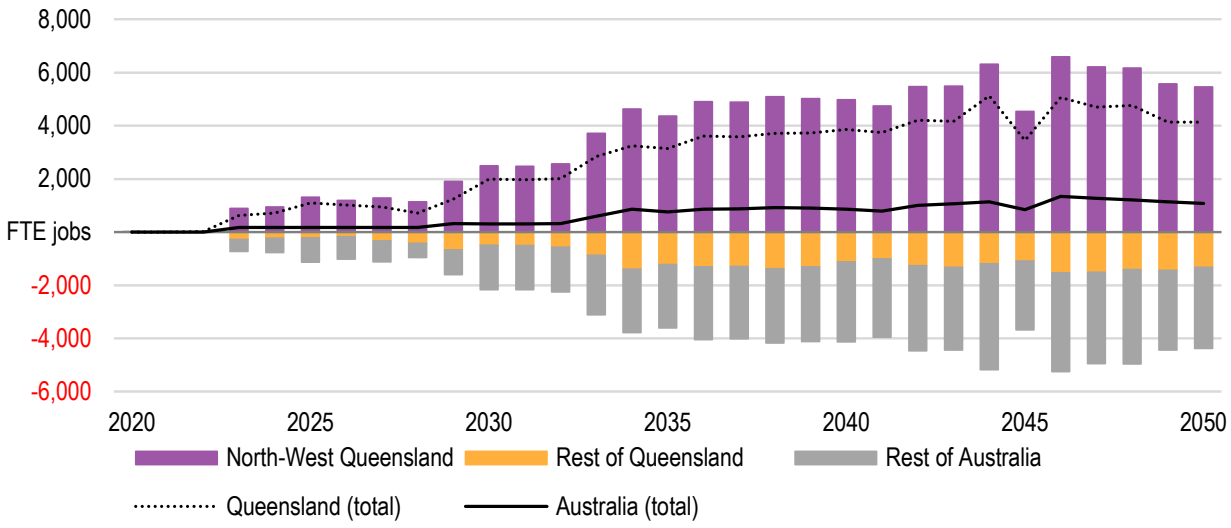


Figure 16-30 Projected Change in Employment by Region, NEM Connected Case Relative to BAU Case (Full Time Equivalent Jobs)

Figure 16-31[42] presents the net change in Australian employment by occupation. The main occupations that are projected to be affected are within the Technicians and Trades, and the Machinery Operators and Drivers categories. In net terms other occupations are largely being moved between regions.

[41] *Source: Acil Allen Consulting*
[42] *Source: Acil Allen Consulting*

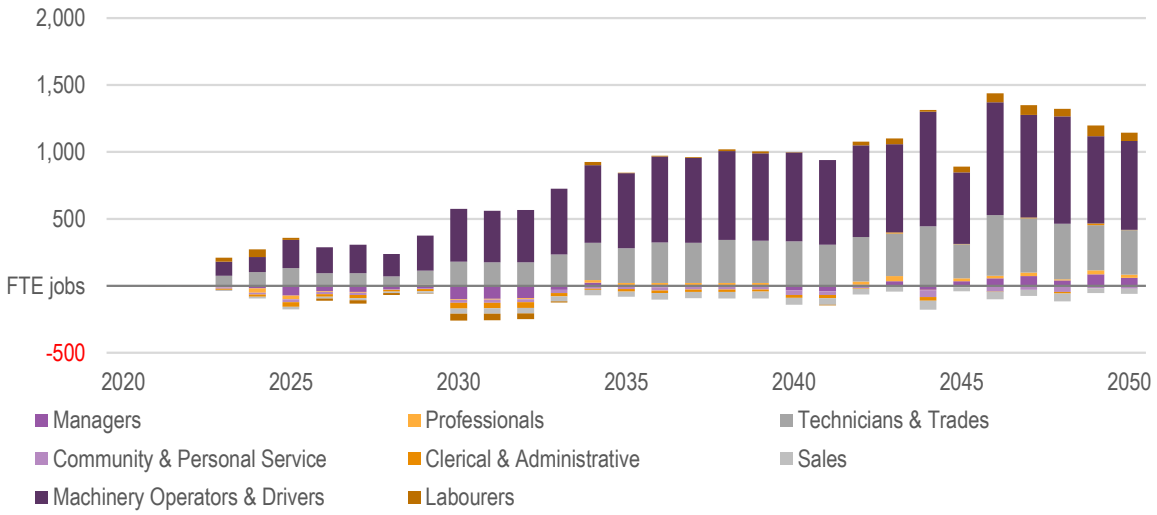


Figure 16-31 Projected Additional Australian Employment by Occupation, NEM Connected Case Relative to BAU Case (Full Time Equivalent Jobs)

16.7.3 Cost benefit analysis

A CBA is an economic approach used to judge the economic merits of a proposed project. The anticipated future flows of costs and benefits of the Project are discounted to arrive at a 'present value' for each annual flow. By adding the present value of the future flows of costs and benefits, a net present value (NPV) is calculated for the Project. The NPV is a dollar estimate of how much would be gained, or lost, by proceeding with the Project. A positive NPV means the Project has economic merit.

The broad approach used for the CBA is provided in Figure 16-32 below. This methodology is consistent with the Queensland Treasury's Guidelines on Project Assessment Framework.

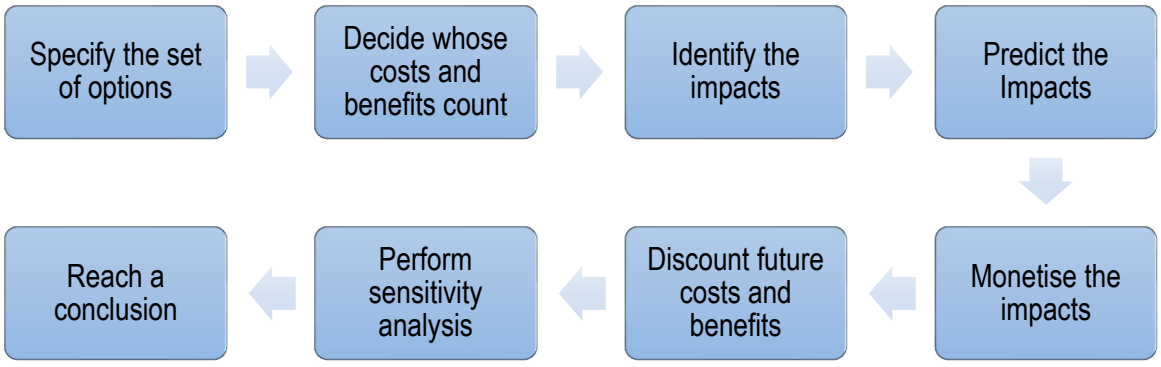


Figure 16-32 Key Steps in the Cost Benefit Analysis Approach

16.7.4 Cost benefit analysis results

A summary of the CBA results is provided as Table 16-10.

Table 16-10 Summary of Cost Benefit Analysis Results

	Undiscounted	NPV 3%	NPV 7%	NPV 10%
	2020 A$m	2020 A$m	2020 A$m	2020 A$m
COST ITEMS				
A. Total project cost (CopperString 2.0)	2,817.2	2,319.2	1,975.5	1,814.5
– Initial capital costs	1,998.0	1,887.6	1,756.3	1,668.2
– Operating costs	674.9	359.6	187.4	127.9
– Ongoing capital expenditure	144.3	72.1	31.9	18.4
B. Additional electricity generation capital costs	829.3	797.2	656.0	547.2
– NWMP generation	–122.2	–109.2	–94.2	–84.6
– NQ Renewable Energy Hub generation	1,862.0	1,619.4	1,356.7	1,195.4
– Existing Queensland NEM generation	–910.5	–713.0	–606.5	–563.6
TOTAL PROJECT COSTS [Equals A+B]	3,646.5	3,116.4	2,631.5	2,361.7
BENEFIT ITEMS				
A. Project revenue (CopperString 2.0)	3,506.8	1,944.4	1,058.3	739.6
– Paid by NWMP customers	2,341.4	1,369.8	784.3	561.1
– Paid by existing Queensland NEM customers	1,165.4	574.6	274.0	178.5
B. Efficiency benefits of electricity generation (total Queensland)	4,648.7	3,261.8	2,160.6	1,646.8
1. Fixed operating cost change	–839.8	–498.9	–266.7	–174.9
– NWMP generation	92.6	58.4	34.6	24.7
– NQ Renewable Energy Hub generation	–1,407.7	–875.9	–508.4	–357.9
– Existing Queensland NEM generation	475.3	318.5	207.1	158.3
2. Fuel and variable operating cost change	5,488.5	3,760.8	2,427.3	1,821.6
– NWMP generation	5,328.2	3,738.0	2,483.5	1,899.5
– NQ Renewable Energy Hub generation	673.8	403.6	216.9	141.8
– Existing Queensland NEM generation	–513.5	–380.8	–273.1	–219.6
C. Reduced emissions (social cost of GHG emissions)	–162.0	–90.9	–48.0	–32.5
– NWMP generation	294.7	206.8	136.9	104.3
– NQ Renewable Energy Hub generation	0	0	0	0
– Existing Queensland NEM generation	–161.8	–129.7	–99.1	–82.0
– Additional mining emissions	–294.9	–168.0	–85.8	–54.8
D. Additional electricity generation (valued at wholesale final prices)	2,758.5	1,612.2	856.4	564.7
– NWMP generation	–1,647.4	–1,109.8	–698.1	–514.0

– NQ Renewable Energy Hub generation	5,537.4	3,377.0	1,908.4	1,318.6
– Existing Queensland NEM generation	–1,131.5	–655.0	–353.9	–239.9
E. Change in NWMP mining EBITDA	27,701.9	16,358.9	8,763.8	5,788.8
TOTAL ELECTRICITY MARKET BENEFITS [Equals A+B+C*+D]	10,752.0	6,727.5	4,027.3	2,918.6
QUEENSLAND ELECTRICITY MARKET BCR	2.95	2.16	1.53	1.24
TOTAL PROJECT BENEFITS [Equals A+B+C+E]	35,695.3	21,474.3	11,934.7	8,142.7
PROJECT BCR	9.79	6.89	4.54	3.45
Note: Total project cost and project revenue are calculated over full 40 year operational life. All other items calculated to 2050 only. SOURCE: ACIL Allen				

Total project costs are $3,646 million, with a net present value (using a 7 percent real discount rate) of $2,632 million, comprising:

- Total project cost of $2,817 million (net present value = $1,976 million)
- Additional electricity generation capital cost of $829 million (net present value = $656 million).

The total project benefits are $35,695 million, with a net present value (using a 7 percent real discount rate) of $11,935 million, comprising:

- Total project revenue of $3,506 million (net present value = $1,058 million)
- Efficiency benefits of electricity generation $4,649 million (net present value = $2,161 million)
- Reduced greenhouse gas emissions benefit of –$162 million (net present value = –$48 million)
- Additional mining EBITDA of $27,702 million (net present value = $8,764 million).

The results show significant net benefits across all discount rates with high benefit cost ratios. In particular, the net benefit of the Project is estimated to be:

- $32.0 billion (undiscounted) with a BCR of 9.79
- $18.4 billion (3% real discount rate) with a BCR of 6.89
- $9.2 billion (7% real discount rate) with a BCR of 4.54
- $5.2 billion (10% real discount rate) with a BCR of 3.45.

The projected increase in mining EBITDA is a significant driver of the total projected net benefits, representing just over 70 percent of the grow benefits generated by the Project. While care has been taken in providing realistic estimates of the potential change in mining activity that could result from the reduction in electricity prices in the NWMP region, there is still a large amount of uncertainty surrounding these estimates. Further sensitivity analysis has been included in the full Economic Technical Report (Volume 3 Appendix AB Economics impact assessment).

16.8 Conclusion

Key findings from the economic assessment and analysis include the following:

- Over the past decade, the availability of gas to supply power generation, industrial, commercial and residential customers has been constrained and is pushing up the energy

prices in the NWMP and impacting the reliability of future long-term supply, impacting the competitiveness of mineral extraction.

- The Project offers a strong alternative option for power supply in the NWMP as it can provide consumers with certainty regarding supply as well as offering lower prices.
- The pipeline of future projects within the NWMP is relatively healthy and NEM access would provide industries within the NWMP a reliable, flexible and globally competitive electricity market which would have a positive impact on resource development and life of mine extensions.
- NEM Market modelling undertaken as part of this assessment indicated:
  - Investment in wind farms is expected to increase within the NQ Energy Hub
  - The Project will not affect investment of capacity in other regions of the NEM.
  - Wholesale electricity prices are projected to decrease in Mt Isa while having a negligible impact on prices within the current Queensland region of the NEM.
- Economic impact modelling over the period to 2050 projected that the Project will increase the real economic output, real incomes and increase employment within North-West Queensland, Queensland as a whole and Australia as a whole.
- Cost benefit analysis results show significant net benefits across all discount rates with high benefit cost ratios. In particular, the net benefit of the Project is estimated to be:
  - $32.0 billion (undiscounted) with a BCR of 9.79
  - $18.4 billion (3% real discount rate) with a BCR of 6.89
  - $9.2 billion (7% real discount rate) with a BCR of 4.54
  - $5.2 billion (10% real discount rate) with a BCR of 3.45.