Appendix 15

Economic Impact Assessment

prepared by

Synergies Economic Consulting

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Economic Impact Assessment of the Copi Mine Project

Revised Final Report to RZ Resources

March 2024

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Executive Summary

The Copi mine project involves the development of a rare earths and mineral sand mine at a site approximately 35 km from the Silver City Highway, 75 km northwest of Wentworth in the Murray Basin region of southwestern New South Wales (NSW). The project involves the mining of a range of strategically significant rare earths and minerals, which are transported for separation at a Mineral Separation Plant (MSP) at Pinkenba in Queensland, prior to being exported via the Port of Brisbane. A proportion of the products produced may be transported directly to port for export.

Synergies has been engaged to undertake the following in relation to the project:

1) Assess the economic feasibility of the Copi mine project by undertaking a cost-benefit analysis (CBA)

2) Evaluate the net benefits of the Copi mine project to the NSW community

3) Evaluate the employment, non-labour project expenditure, and environmental and social effects of the Copi mine project in the locality

4) Estimate the flow-on economic impacts attributable to the Copi mine project

5) Assess the impacts of the Copi mine project on the regional labour market.

Cost-benefit analysis

CBA is the primary tool used to assess the economic feasibility of projects. It involves identifying, assessing, and quantifying the economic benefits and costs attributable to a project. The figure below provides an overview of the key steps to undertaking the CBA of the Copi mine project.

Cost-benefit analysis approach
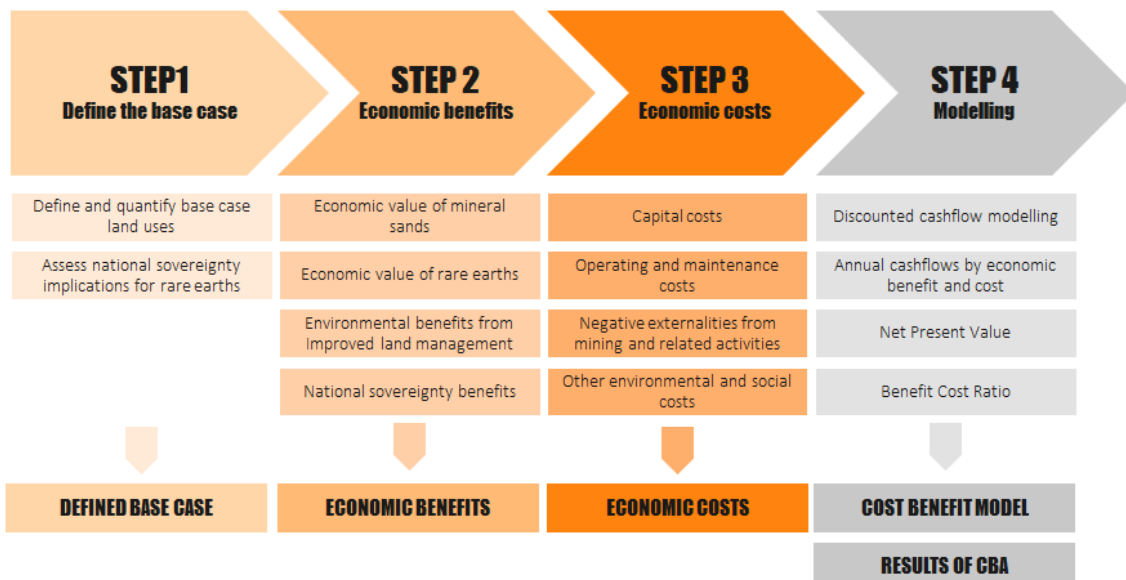
Economic benefits and costs are assessed relative to a base case, being the 'business as usual' scenario in the absence of the project. The key characteristics of the base case against which the economic impacts of the Copi mine project are to be assessed are as follows:

- use of the land on which the project is located is valued at approximately $670,817 (in present value (PV) terms), based on its highest use value (being sheep grazing);

- the groundwater resources within the project area are hypersaline and hence carry no material economic value;

- the mine site has been heavily degraded by past land use practices and the remaining vegetation and species carry no material economic value; and

- there is a significant and increasing strategic risk associated with Australia's continued reliance on imports for its supply of rare earths and minerals.

The table below summarises the quantified economic benefits and costs under the project case relative to the base case.

Summary of economic benefits and costs ($million Present Value terms, 5 per cent real)

Metric	Estimate ($m, Present Value)
Economic benefits	
Value of minerals and rare earths production	$4,417
Total economic benefits	**$4,417**
Economic costs	
Foregone value of alternative land uses (grazing)	($0.7)
Capital and sustaining costs	($889)
Operating and maintenance costs	
0000 General	($3)
1000 Geology	($7)
2000 Mining	($870)
3000 Processing	($479)
4000 Mine Site Infrastructure	($103)
5000 Off-Site Infrastructure	($5)
6000 Logistics	($571)
7000 ESG (Land rehabilitation costs)	($71)
9000 Project Deliver	($20)
10000 Overheads	($193)
Subtotal	($2,322)
Greenhouse gas emissions and other externalities	

Metric	Estimate ($m, Present Value)
Road and rail externalities	($50)
Copi mine and MSP operations	($99)
Subtotal	($149)
Groundwater licensing costs	($3)
Total economic costs	($3,364)
Net Present Value	**$1,052**
Benefit Cost Ratio	**1.31**

Note: Totals may not add due to rounding.
Source: Synergies modelling.

As shown in the table above, the Copi mine project returns a positive NPV and a BCR of 1.31. The results of sensitivity testing demonstrate that while the CBA results are sensitive to changes to price projections, the Copi mine project still returns a positive NPV and BCR above one at all sensitives tested.

Net benefits to NSW

The net benefits of the Copi mine project to the NSW community have been assessed in accordance with the *NSW Government Guidelines for the economic assessment of mining and coal seam gas proposals*. The Copi mine project is expected to deliver a net economic benefit to the NSW community of approximately $332 million in PV terms (real social discount rate of 5 per cent). The table below provides a detailed breakdown of the results of this analysis. Parameter variations used for sensitivity tests revealed positive benefits for the NSW community across all scenarios.

Breakdown of net benefit results by item

Item	Incremental ($m, NPV)	NSW community share (%)	Net benefit to NSW ($m, NPV)	Net cost to NSW ($m, NPV)
Net producer surplus	$434	32%	$139	-
Corporate income tax	$594	32%	$194	-
Royalties	$143	100%	$143	-
Benefits to existing landholders	-	-	-	-
Benefits to workers	-	-	-	-
Benefits to suppliers	-	-	-	-
Net environmental, social and transport costs				
Road and rail externalities	($50)	100%	-	($50)
Copi mine operations	($99)	100%	-	($99)
Net public infrastructure costs	-	-	-	-
Total			**$481**	**$149**

Note: Totals may not add due to rounding.
Source: Synergies' analysis.

Local effects analysis

This section evaluates the impacts of the Copi mine project in its locality, in accordance with the *NSW Government Guidelines for the economic assessment of mining and coal seam gas proposals*. The key components of the local effects analysis (LEA) include:

* effects relating to local employment

* effects related to non-labour project expenditure

* environmental and social impacts on the local community.

The table below provides a summary of LEA results for the Copi mine project during both the construction and operational phases. It is important to note that, unlike the CBA, the results of the LEA are not additive.

Estimated local effects – construction and operational results for Copi project

Metric	Unit	Construction phase		Operational phase	
		Project direct: Total	Project direct: Local	Project direct: Total	Project direct: Local
Direct employment	FTE	480	250	240	120
FTE equivalent of increase in income	FTE	169	84	14	7
Other non-labour expenditure					
2024	$million	$43.07	$13.84	-	-
2025	$million	$263.34	$84.61		
2026	$million	$234.45	$75.33		
2027	$million	$103.50	$33.25	$115.23	$29.64
2028	$million	-	-	$313.94	$80.75
2029	$million	-	-	$372.40	$95.79
2030	$million	-	-	$379.57	$97.63
2031+	$million	-	-	$353.36	$90.89
Road and rail externalities	$million	-	-	($50)	($3)
Greenhouse gas emissions	$million	-	-	($99)	($84)

Source: Synergies modelling.

Economic impact assessment

A broader analysis has also been undertaken to complement the CBA and LEA assessments for NSW. This has involved Economic Impact Analysis (EIA) modelling using the input-output modelling approach. While both the CBA and LEA assessments focuses on primary impacts (i.e. first round impacts) in terms of welfare changes,

including changes in producer and consumer surplus, EIA modelling focuses on flow-on impacts (second-round, third-round, etc.) on parties who are subsequently affected by the primary costs and benefits being imposed either directly or via externalities.

The economic impacts for the Copi mine project have been estimated using a non-linear input-output (NLIO) model. At the heart of the model is a static representation of an economy called an input-output (I-O) table, which reflects the interdependencies between 19 industry sectors (based on 1-digit ANZSICs, or Australian and New Zealand Standard Industrial Classification divisions). Because the separation of minerals for the Copi project occurs at the Pinkenba MSP, which is adjacent to the Port of Brisbane, economic impacts are assessed in relation to the following geographical classifications:

- State of NSW

- Wentworth local government area (LGA)

- Greater Brisbane.

The economic impact assessment is undertaken for two different stimulus amounts:

- capital expenditure – initial capital expenditure associated with the construction of the Copi mine and associated infrastructure to be incurred from Year 1 (FY2024) through to Year 4 (FY2027); and

- operational impacts – based on the value of production of minerals and rare earths over the 19-year operating life of the Copi mine project.

The operational impacts of the projects are assessed over two-time horizons:

- 2028-2031 (impacts estimated on an annual basis)

- 2032-2045 (impacts estimated for average annual mining revenues over the noted period).

The reason for the two different time horizons is that there is potential for material shifts in the way economies, industries, and markets operate when estimating economic impacts over this long timeframe. That is, the structure of economies, and the linkages between the mining sector and other sectors of the economy, may be significantly different over the 2032 to 2045 period than implied in the current NLIO model.

While the NLIO model, and thereby economic and employment multipliers developed based on the current structure of the regional and state economies, can be applied to

production and expenditure estimates over this timeframe, the results generated by the model will need to be interpreted with caution and taken to be indicative impacts.[1]

Impacts on the NSW economy

The table below shows the overall contributions[2] to the NSW economy during both the construction and operational phases of the Copi project.

NSW – economic impact results for Copi mine project

Metric	Unit	Construction Phase[a]	Operational Phase
Total output	$million	$1,857	$12,161
Gross State Product	$million	$718	$4,564
Labour income	$million	$351	$1,746
Employment supported	FTEs (peak year)	1,465	1,133

a Includes up-front capital expenditure and sustaining capital expenditure to be incurred throughout the operational period of the project.
Source: Synergies.

Impacts on the Wentworth economy

The table below shows the overall contributions[3] to the Wentworth economy during both the construction and operational phases of the Copi mine project.

Wentworth LGA – economic impact results for Copi mine project

Metric	Unit	Construction Phase[a]	Operational Phase
Total output	$million	$1,280	$10,691
Gross Regional Product	$million	$339	$1,561
Labour income	$million	$308	$848
Employment supported	FTEs (peak year)	754	580

a Includes up-front capital expenditure as well as the sustaining capital expenditure to be incurred throughout the operational period of the project.
Source: Synergies.

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[1]   Developing a future series of I-O tables requires extensive data and information on the relationships between industries, products and decision-makers within an economy, which are typically obtained through surveys or direct data requests.

[2]   The overall economic impact is the sum of direct, indirect, and induced impacts (refer to section 8.3.4).

[3]   Ibid.

Impacts on the Greater Brisbane economy

The table below shows the overall contributions[4] to the Greater Brisbane economy during both the construction and operational phases of the Copi mine project.[5]

Greater Brisbane – economic impact results for Copi mine project

Metric	Unit	Construction Phase[a]	Operational Phase
Total output	$million	$122	$1,544
Gross Regional Product	$million	$34	$620
Labour income	$million	$19	$171
Employment supported	FTEs (peak year)	90	114

a Includes up-front capital expenditure as well as the sustaining capital expenditure to be incurred throughout the operational period of the project.
Source: Synergies.

Labour market impacts

The key conclusions from the assessment of the feasible potential labour supply within the regional labour market against the labour requirements of the Copi mine project are as follows:

- the extent to which labour requirements will be able to be met from within the regional economy will be largely contingent upon the labour market impacts from the planned closure of the Snapper and Gingko mineral sands mines;

- the key constraint is likely to be in relation to Professionals, given the number of workers required by the project (32 FTEs and 52 FTEs in the construction and operational phases respectively) and the relatively low proportion of the labour force that possesses these skills and qualifications within the regional economy, particularly outside of the Health and Social Assistance industry;

- while the regional economy contains a high proportion of Technicians and Trade Workers relative to the NSW economy, the significant number of FTEs required (128 FTEs and 38 FTEs respectively) and the concentrated industrial structure in the regional economy indicates that it is likely that at least a portion of these workers will need to be sourced from outside of the regional labour market; and

- labour force data for the regional labour market indicates that project requirements in relation to Managers, Clerical and Administrative Workers, Machinery

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4   Ibid.

5   Construction period impacts based on construction costs allocated to the MSP, while operational impacts are based on an allocation of revenue derived from the production of rare earths and minerals using the proportion of operational expenditure attributable to the Pinkenba MSP.

Operators and Drivers, and Labourers should be able to be satisfied by sourcing labour from within the regional labour market, particularly having regard for the scope to attract workers from the Agriculture, Forestry, and Fishing sector, which is the largest industry in the regional economy in terms of employment.

In terms of the overall impact of the Copi mine project on the regional labour market, the project is estimated to generate significant direct, indirect, and induced employment in both the construction and operational phase. The employment supported by the project will span a diverse range of industries within the regional economy, including mining, construction, retail trade, and accommodation and food services.

Total employment in the Wentworth-Buronga region is currently estimated at 2,960, with the employment attributable to the Copi mine project during the construction and operating phase representing an increase of 25 per cent and 10 per cent respectively. The region is currently experiencing a period of low unemployment and constrained labour supply (unemployment rate of 3.2 per cent with 142 unemployed persons).

Under the scenario in which the closure of the Snapper and Gingko mines occur as scheduled and workers are not reallocated to other projects, it is likely that all labour requirements will be met from within the broader region.

Alternatively, in the absence of labour to be made available as a result of these projects, there will likely be a need for either an increase in the population, and hence labour force of the region, or labour will need to be imported from outside of the region.

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Figures and Tables

Glossary

Glossary of key terms

Cost-benefit analysis | An analysis tool for appraising the economic merits of a policy or infrastructure project. It helps decision makers understand the combined benefits and costs to all members of society to improve social welfare.

Direct impacts | Impacts directly attributable to the project, in particular investments associated with developing and operating the coal mine, and revenues generated by the sale of coal.

Economic impact analysis | An analysis tool for appraising the impacts of a policy or infrastructure project on the economy of a project area. The impacts do not typically play a role in cost-benefit analysis, but rather focus on economic activity, such as changes in business sales (output), gross product, labour income and employment.

Employment | A measure of the total number of full-time equivalent jobs generated or facilitated by the project.

Gross product | A measure of the net value of economic activity generated or facilitated by the project (differs from 'output' because only the final value added of the production is considered). When assessed at the state level, the measure becomes gross state product. At the regional level, the measure is referred to as gross regional product.

Indirect impacts | Impacts generated by production activities upstream of the project by industries that supply into the sector directly supplying the final product or service. This includes machinery, equipment and other supporting products and services.

Induced impacts | Impacts of activities generated by the spending of additional income directly or indirectly related to the activity for which impacts are being assessed. This includes the spending of wages on accommodation, food services and other sectors of the economy.

Input-output (I-O) model	An input–output model is a quantitative economic model that represents the interdependencies between different sectors of an economy, showing how output from one industrial sector may become an input to another industrial sector.
Labour income	A measure of the share of gross product (and gross output) which is directly paid to individuals in the form of wages.
Nonlinear I-O model	A form of input–output model that adjusts the relationships between sectors to better account for resource constraints and purchase leakages.
Output	A measure of the gross value of economic activity generated or facilitated by the project.

Glossary of key acronyms and abbreviations

ABS	Australian Bureau of Statistics
AUD	Australian dollar
BCR	Benefit-Cost Ratio
CBA	Cost-benefit analysis
CPI	Consumer Price Index
CO2-e	Carbon dioxide equivalent
EIA	Economic impact analysis
EUR	European Union euro
FTE	Full-time equivalent
ha	Hectares
km	Kilometres
NLIO	Non-linear input-output
NPV	Net Present Value
USD	United States dollar

1 Introduction

Synergies Economic Consulting (Synergies) has been engaged by RZ Resources to undertake the economic impact assessment components required as part of the Environmental Impact Statement (EIS) for the proposed Copi mine project in south-west New South Wales (NSW).

The project, which is located approximately 75km to the northwest of Wentworth, involves the development of a mineral sands and rare earths mine and associated infrastructure, with materials to be transported to a mineral separation and processing plant at Pinkenba in Queensland before being exported via the Port of Brisbane. Alternatively, a proportion of the materials may be transported directly to port for export. The project has significant strategic value given the increasing importance of these minerals and rare earths in a range of strategic applications and the need for Australia to reduce its reliance on imports and develop its own rare mineral and rare earths resources.

This report contains a detailed assessment of the economic impacts attributable to the project, including a cost-benefit analysis (CBA) to assess the economic feasibility of the project and an economic impact analysis (EIA) to assess the beneficial contributions of the project, both during construction and operation, on the local, regional, and state economies. This is supplemented with an evaluation of the net benefits of the Copi mine project to the NSW community, in addition to the evaluation of employment and non-labour project expenditures in the locality.

The CBA and EIA[6] have been undertaken in accordance with best practice principles and is consistent with the NSW Treasury framework, while the evaluation of net benefits and local effects have been undertaken in accordance with the *NSW Government Guidelines for the economic assessment of mining and coal seam gas proposals*.

Additionally, the report includes a detailed analysis of the impacts of the project on the regional labour market and the implications for the extent to which labour will likely be sourced from within the local and regional economies and the expected impact of the project on the regional labour market.

The structure of the report is as follows:

- section 2 provides a detailed overview of the project

- section 3 sets out the approach to undertaking the cost-benefit analysis

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[6] Synergies' in-house non-linear input-output (NLIO) model has been applied to assess the impacts on local, regional, and state economies.

- section 4 defines the base case against which economic impacts have been assessed

- section 5 contains the assessment of economic benefits

- section 6 contains the assessment of economic costs

- section 7 details the results of the CBA, including the sensitivity analysis

- section 8 contains the evaluation of net benefits of the Copi mine project to the NSW community

- section 9 includes a detailed socioeconomic profile of the regional economy

- section 10 contains the evaluation of impacts of the Copi mine project in its locality

- section 11 details the approach to undertaking the economic impact assessment

- section 12 contains the results of the economic impact assessment

- section 13 contains an analysis of the impacts of the project on the local and regional labour market.

Appendix A contains technical details associated with the derivation of regional input-output tables.

2   Project overview

This section provides a detailed overview of the project, including its location, a detailed description of the mining process and logistics chain, and an overview of the applications for the minerals and rare earths to be produced by the project.

2.1   Location

The Copi mine project is located approximately 35 km from the Silver City Highway, 75 km northwest of Wentworth in the Murray Basin region of southwestern NSW.

The project involves the development of a rare earths and sand minerals mine, encompassing the Copi North (EL8312) and Sunshine (EL8385) tenements. The extraction area is approximately 17 km long and up to approximately 3.3 km wide, as shown in Figure 1.

Figure 1   Location of Copi North and Sunshine mining tenements
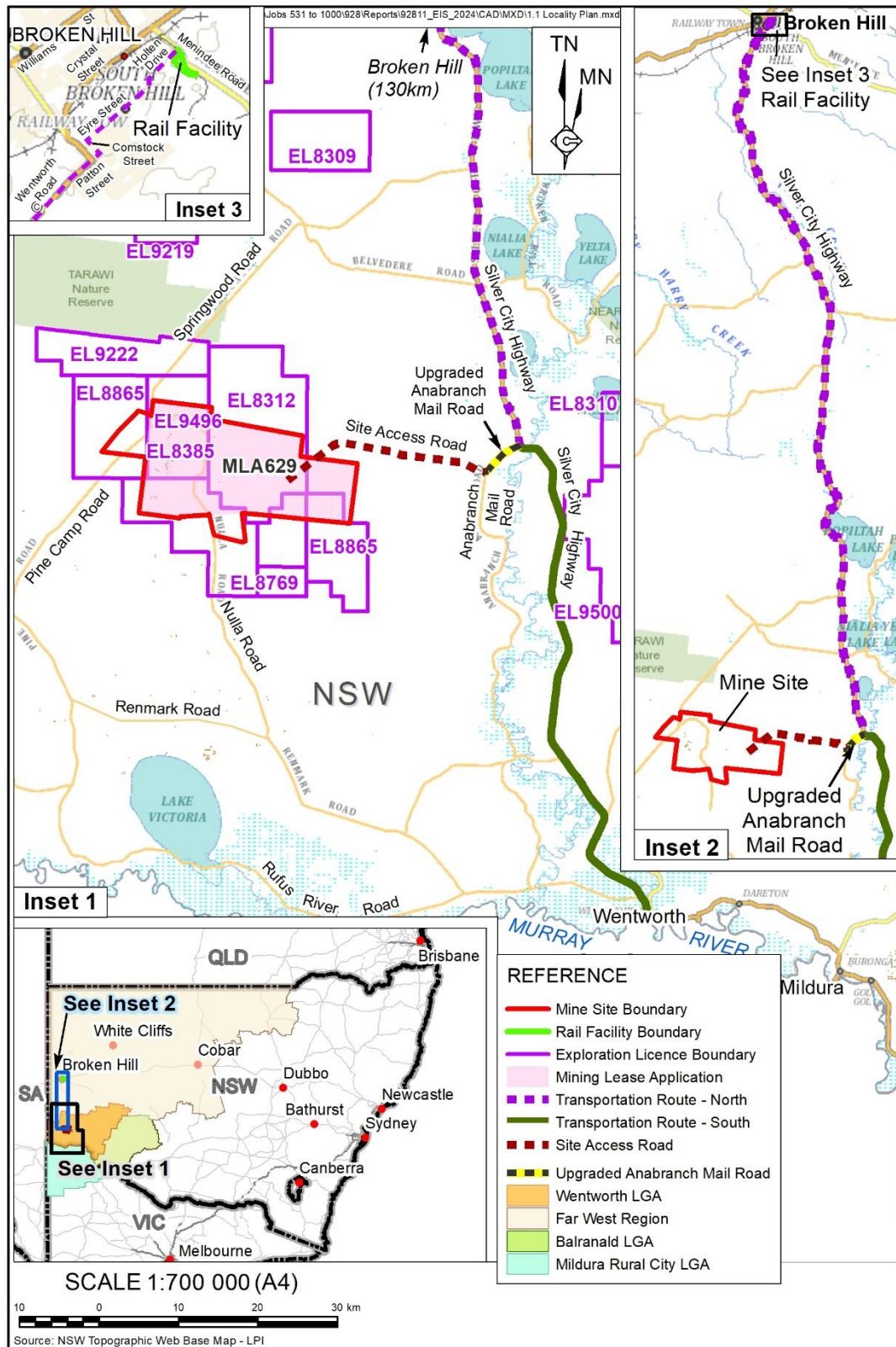
Source: RW Corkery & Co Pty Limited.

2.2 Mining process and logistics chain

The project supply chain commences with the mining of mineral sands and rare earths at the Copi mine and concludes with the export of specific minerals and rare earths via the Port of Brisbane. The figure below provides an overview of the supply chain.

Figure 2   Pit-to-port mining process
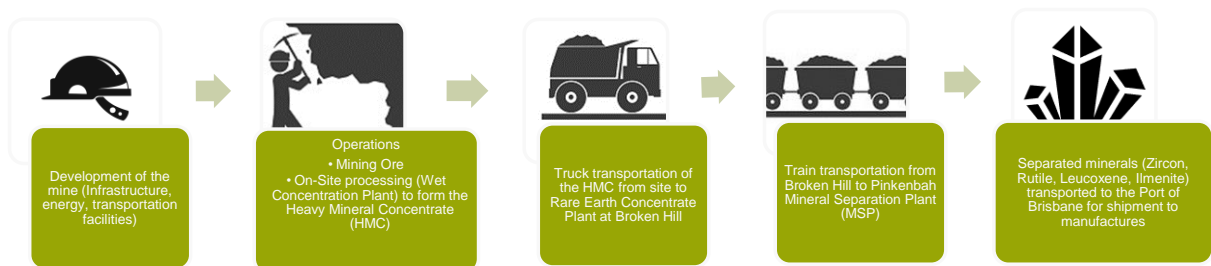
Source: Synergies, based on project information provided by RZ Resources.

The wet dredge mining technique will be employed to mine the mineral sands and rare earths. This process involves the following key streps:

- mining commences with a starter pond at the southwestern extent of the deposit, to be extracted using a conventional free dig, load and haul mining techniques;

- interburden would be extracted using floating dredges and initially transferred to the Off Path Storage Facility;

- ore is then to be extracted using a floating dredge and transferred to a Wet Concentration Plant at the Copi mine site for processing;

- the material is then processed using wet screening and gravity separation to separate the Heavy Mineral Concentrate[7] (HMC) from the excess material or tailings;

- the HMC is transported via road to the Rare Earth Concentrate Plant at Broken Hill for washing, drying, and separation;

- separated product is then transferred to rail for transport to the Mineral Separation Plant (MSP) at Pinkenba in Queensland;

- the minerals and rare earths are separated at the MSP, using a process that involves conventional techniques such as electrostatic separation, gravity, and magnetic fractionation;

- the commodities are transported to the Port of Brisbane for storage and shipment; and

- the mined area is then rehabilitated to the standard required for the land to be suitable for the highest value non-mining uses.[8]

The wet dredge mining technique requires access to water, which is to be sourced from production bores within the Loxton-Parilla Sands, located within the Western Murray Porous Rock Aquifer under the Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources 2020 under the *Water Management Act (NSW) (2000)*.

Given the project location is on an undeveloped site, significant investment is required in supporting infrastructure to provide the site with access to key services such as water, electricity, and transport. This investment has been included in the capital cost estimate for the project (see section 6.1).

2.3   Minerals and rare earths

The table below details the minerals and rare earths to be produced by the Copi mine project and a sample of the key uses for each.

Table 1   Overview of key uses for minerals and rare earths to be produced by the Copi mine

Mineral/Rare earth	Uses
Rutile	• Chemicals, paints, pigments

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[7]   The mineral concentrate is further processed at the Copi mine site using a concentrate upgrade plant to produce a range of products. For the purposes of this document, all mineral products are referred to as Heavy Mineral Concentrate (HMC).

[8]   Sand and Mineral Facts Sheet (2022) Government of Victoria, https://earthresources.vic.gov.au/__data/assets/pdf_file/0004/461758/Mineral-Sands-Fact-sheet-March-2022.pdf

Mineral/Rare earth	Uses
	• Critical input to titanium production, porcelain, and glass manufacture • Critical ingredient in Hiti, which is used as a whitening agent in a range of high-value products • Key products include solar panels, fibre optics, LCD panels, LED lights
Zircon and Zircon Concentrate	• High-value uses for piping, cladding, and lining in the metals industry (due to high heat and erosion resistance) • Key products include solar panels, fibre optics, LCD panels, LED lights
HiTi	• Mixture of Rutile and Leucoxene • Titanium, batteries • Whitening agent in a range of high-value products
Chloride Ilmenite Sulphate Ilmenite	• Chemicals, paints, pigments • Building block for titanium dioxide, used in titanium metal and welding flux, also as a whitening agent
Monazite concentrate	• By-product of mineral and rare earth mining • Automotive catalyst, glass, polishing powders.

Note: Monazite concentrate contains a collection of rare earths with many uses.
Source: Outlook for Selected Critical Minerals in Australia 2021.

The figure below presents the breakdown of total production during Copi mine's life of 19 years.

Figure 3 Breakdown of total production during life of Copi mine (19 years)
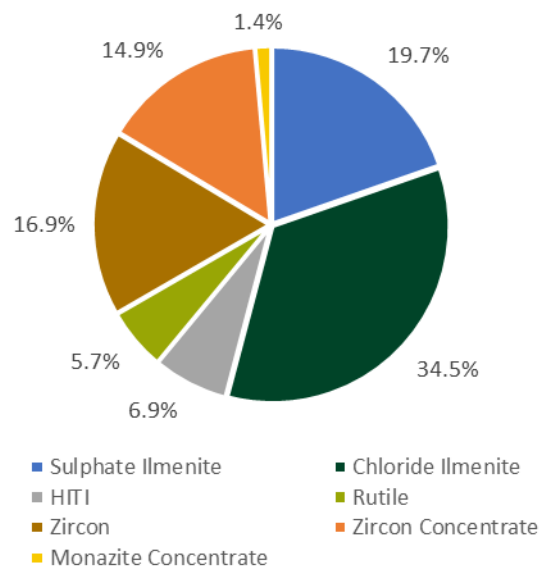
Note: Total production over the life of the Copi mine is around 6.69 million tonnes.
Source: Production data provided by RZ Resources.

As shown in the figure above, Sulphate and Chloride Ilmenite accounts for 54.2 per cent of life of mine (LOM) production from the Copi project, with Monazite accounting for only 1.4 per cent of LOM production.

These minerals and rare earths are critical inputs for a range of high-value products, including electric vehicles, renewable energy technologies, medical equipment, and

military equipment. Demand for the manufacture of these products is set to continue to grow in the coming decades, placing further importance on the supply of these minerals and rare earths.

For example, the Australian Government has committed to constructing electric vehicle charging stations every 150km, which will require significant quantities of several of the minerals listed in Table 1. Emerging medical technologies, a sector in which Australia is a recognised world leader, are also becoming increasingly reliant upon these minerals and rare earths. Overseas, India is projected to significantly increase its production in industries requiring significant quantities of titanium, which will place further pressure on demand for minerals such as ilmenite and rutile.[9]

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[9]   Austrade (2021) Unlocking Australia-India critical minerals partnership potential.

3 Approach to the cost-benefit analysis

This section details our approach to undertaking the CBA of the Copi mine project and the key assumptions adopted. It is important to note that while the CBA considers Copi project activities relating to mining, road and rail transportation, processing at Pinkenba in Queensland, and exports of minerals from the Port of Brisbane, the project's EIS application pertains to mining and road transportation only.

3.1 Approach

CBA is the primary tool used to assess the economic feasibility of projects. It involves identifying, assessing, and quantifying the economic benefits and costs attributable to a project. Economic benefits and costs are assessed relative to a base case, being the 'business as usual' scenario in the absence of the project. The figure below provides an overview of the key steps to undertaking the CBA of the Copi mine project.

Figure 4   Cost-benefit analysis approach
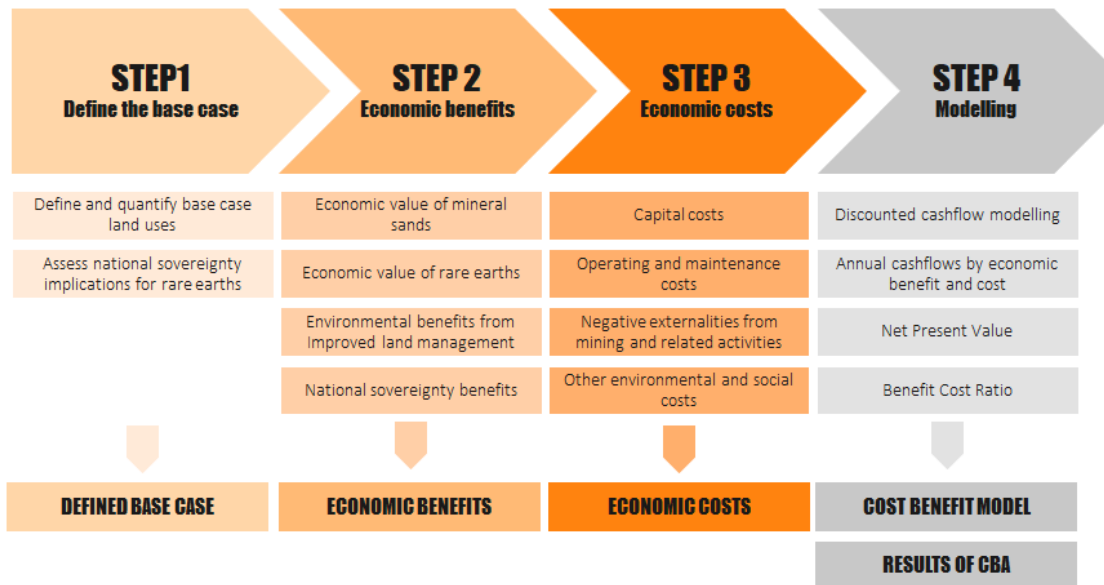
Source: Synergies.

3.2 Key assumptions

The key assumptions underpinning the CBA are as follows:

- discounted cashflow modelling in real terms based on Australian dollar (AUD) 2023

- all capital costs to be incurred in financial years 2024 to 2027

- 19 years of mining, commencing from financial year 2027 and ending in 2045

- 20-year evaluation period (financial years 2025-45)

- real social discount rate of 5 per cent (sensitivity analysis at 3 and 7 per cent).

4 Base case

The assessment and quantification of the economic benefits and costs attributable to the Copi mine project firstly requires the definition of a base case (also referred to as 'business as usual') against which the incremental impacts attributable to the project can be assessed. The base case has been defined having regard to the following:

- alternative uses for the land and water resources to be consumed by the project

- the outlook for the sourcing of rare earths and minerals.

4.1 Land and resource use

Definition of the base case requires a long-term outlook for the utilisation of land and resources to be consumed under the project case. The agricultural assessment for the Copi project revealed that approximately 87 per cent of the area of agricultural holdings within the Wentworth-Balranald Region are used for grazing. While four per cent of the area of agricultural holdings is used for cropping,[10] the agricultural assessment noted that no land within the mine site is suitable for cropping.[11]

The agricultural assessment for the Copi project identified that approximately of 3,728 hectares of Class 6 land suitable for agricultural use would be disturbed by the Project.[12] The assessment determined that that land would be expected to expected to return an annual gross margin of approximately $50,962 or approximately $13 per hectare. This results in a total (undiscounted) estimate of $1,121,171 over the evaluation period, which is equal to $$670,817 in PV terms (5 per cent real).

The project will also impact on the groundwater resources at the project site, as the wet dredge mining method involves mixing the sand with water to form a dredge to prepare for separation. Groundwater resources in the region are hypersaline and are currently significantly underutilised. As such, no value has been ascribed to the loss of value under the base case from the consumption of groundwater resources by the project.

While the area to be affected by the development of the mine has been heavily degraded by past land use practices, there are both threatened communities and species present. The project is also expected to disturb numerous Aboriginal heritage sites. Having noted this, these impacts are not expected to be significant, as well as the impacts on historic

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[10] The remainder of the balance of the area of agricultural holdings is used for rangeland grazing (82%) or improved pasture (1%).

[11] Crop production is not feasible due to the low quality of the land and lack of access to water resources of sufficient quality and reliability.

[12] The remaining disturbance area comprising Class 7 and Class 8 land was assumed to be non-productive.

heritage, air quality, noise, visual amenity and surface water. Traffic and transport will be impacted by the project; however, the Anabranch Mail Road will be upgraded to mitigate traffic flows and thereby delays.

In summary, the only quantified value under the base case is the use of land for agricultural activity. Given 3,782 hectares of Class 6 land are to be affected under the project case, this translates to an annual use value of $50,962. This value has been applied from year 1 (i.e. FY2024) to the final year of land rehabilitation (i.e. FY 2045), which results in a PV estimate of $ $670,817 (real social discount rate of 5 per cent).

4.2　Interactions with other projects

The Snapper and Ginkgo Mineral Sands Mines, operated by Tronox Mining Australia Limited (formally Cristal Mining) are located approximately 70km to the east-northeast of the Mine Site. The development consents for those operations permit mining until 10 July 2026 and 31 December 2025, respectively. Processed ore is transported from those mines via the Silver City Highway, with the operations sharing an approximately 150km section of the highway. Tronox currently operate up to approximately 26 laden AB-Quad Road Trains per day. This compares with the proposed Project-related maximum of 12 laden movements per day. The operations also use a separate Rail Facility than that proposed to be used for the Project.

Given the distance between the operations, and the fact that the Snapper and Ginko Mines are expected to close around the same time as the Project commences, no quantifiable economic interactions between the existing and proposed operations have been considered.

In addition, the Euston Mineral Sands Project, proposed by Iluka Resources Ltd, located approximately 25km east of Mildura and 50km east of Wentworth has recently been declared to be a State Significant Development, with SEARs issued on 23 February 2023. Potential exists for construction and operations for the two projects to overlap. The Euston Project is located approximately 25km to the east of Mildura, whereas the Copi Mine Site is located approximately 75km to the northwest of Wentworth. The two projects are located approximately 150km apart. As a result, there would be limited opportunity for direct cumulative impacts, however, potential exists for indirect impacts, particularly in relation to competition for workers and services.

The Copi Project would generate 480 full-time construction jobs, 200 mining jobs, and 40 rehabilitation jobs. The Euston Project would generate approximately 250 to 300 jobs

during construction and 150 to 250 jobs during operations.[13] As a result, the projects cumulatively would require up to approximately 750 people during construction up to 450 people during operations. This would be offset by a likely reduction in approximately 200 positions when the Snapper and Gingko Mines close in 2025 and 2026.

4.3 Outlook for the sourcing of rare earths and minerals

As noted above, the minerals and rare earths to be produced by the Copi mine project are critical inputs to a range of high-value products across the energy, health, defence, and aviation sectors. Hence, the supply outlook for these minerals and rare earths is of strategic importance and relevant to the assessment of the base case for the CBA. This differs from CBAs conducted on resource projects in the coal and iron ore sectors, where the commodities produced are of limited strategic value and are produced and traded in significant quantities throughout the world economy.

4.3.1 Structure of the rare earths and minerals sector

Figure 5 shows the breakdown of the current rare earth and minerals sector in terms of global production.

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[13] Scoping Report - Euston Mineral Sands Project (January 2023) - https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=PDA-49591461%2120230119T024434.317%20GMT

Figure 5 Rare Earths Reserves by country in Mega Tonnes
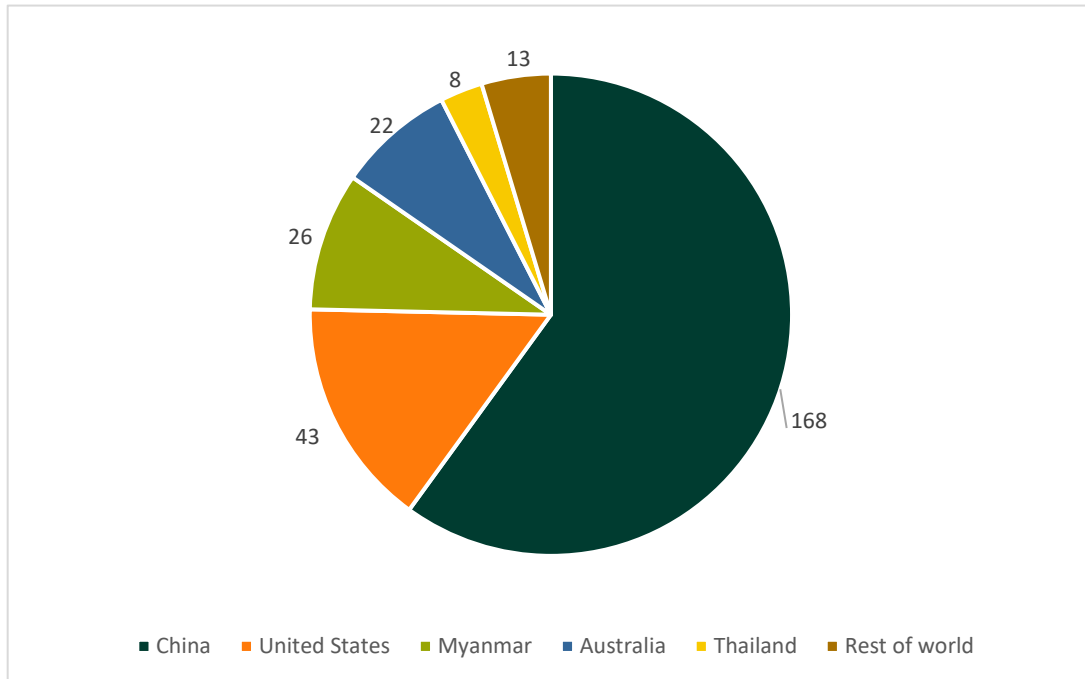
Source: U.S Geological Survey (2022).[14]

As shown in the figure above, rare earth reserves are highly concentrated, with 84 per cent accounted for by China and the United States.[15] The production and refining of rare earths is similarly concentrated, with China's market shares increasing to almost 70 per cent and 80 per cent respectively. It is also estimated that China accounts for around 90 per cent of global production of downstream rare earth products and technologies.[16]

4.3.2 Strategic implications

As discussed above, rare earths and minerals are critical inputs for a range of high-value products, several of which are currently undergoing periods of significant growth in demand.

Without the development of additional rare earth and mineral deposits in Australia, the base case outlook involves a continued, and likely increased, reliance on international

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[14] U.S Geological Survey. (2020) RARE EARTHS. https://pubs.usgs.gov/periodicals/mcs2022/mcs2022-rare-earths.pdf

[15] When Myanmar's production is included in China's total (See: Daly, T. 'China rare earths extend surge on worries over Myanmar supply, inspection threat'. Reuters; March 26 2021; DOA: October 11 2022).

[16] Mitchell, J. 'China's stranglehold of the rare earths supply chain will last another decade.' Mining Technology; April 26 2022; DOA: October 11 2022.

imports for supply of rare earths and minerals, noting Australia's demand for these rare earths and minerals is expected to exhibit significant growth in the coming decades. With demand soaring, and no clear and available sources of rare earths for production, Australian technology industries could be left behind in the global race for innovation.

4.4   Summary of the base case

In summary, the key characteristics of the base case against which the economic impacts of the Copi mine project are to be assessed are as follows:

- use of the land on which the project is located is valued at approximately $670,817 in PV terms (5 per cent real), based on the highest use value of the land (being grazing);

- the groundwater resources within the project area are hypersaline and hence carry no material economic value;

- the mine site has been heavily degraded by past land use practices, and the remaining vegetation and species carry no material economic value; and

- there is a significant and increasing strategic risk associated with Australia's continued reliance on imports for its supply of rare earths and minerals.

5 Economic benefits

There are two economic benefits to be assessed under the project case:

- the value of the rare earths and minerals to be produced by the Copi mine project; and

- addressing the strategic risk associated with Australia's reliance on imports for supply of rare earths and minerals.

5.1 Value of rare earths and minerals

The economic value of the rare earths and minerals to be produced by the project is calculated based on:

1) The projected production of rare earths and minerals as provided by RZ Resources.

2) The price projections for each rare earth and mineral to be produced by the project.

5.1.1 Rare earth and mineral production profile

Figure 6 shows the profile of production of minerals and rare earths from the Copi mine over the operating period.

Figure 6   Annual production of mineral sands and rare earths from the Copi mine
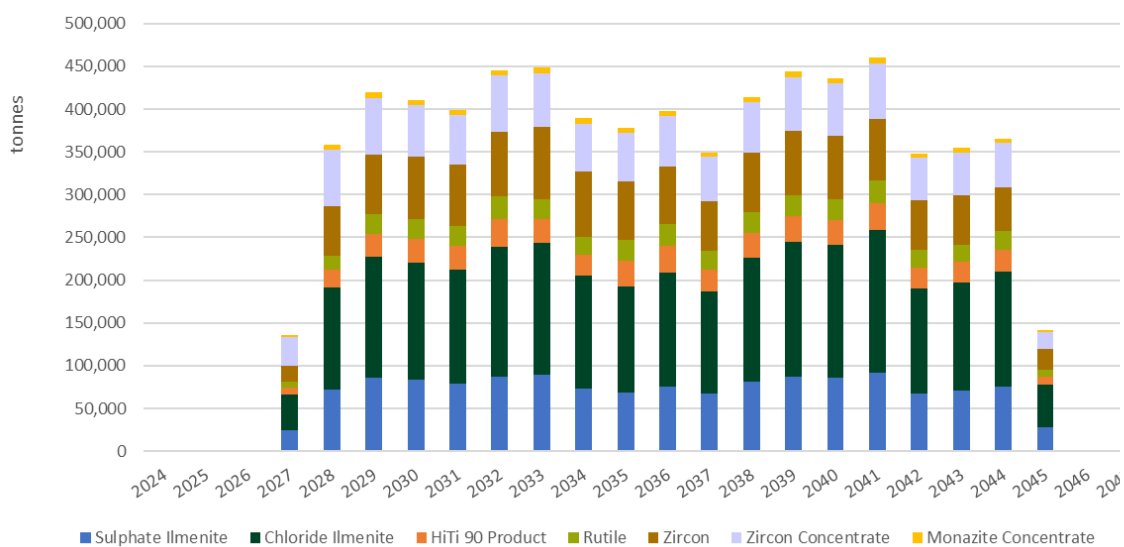
Source: Production plan provided by RZ Resources.

As shown in the figure above, production is expected to reach peak production of 460,000 tonnes in year 2041. While the scale of production varies from year-to-year, the relative distribution shares of rare earths and minerals seem to be constant, with chloride ilmenite being the dominant category.

5.1.2 Price projections

Price projections were applied to the above production profiles to estimate the economic value of the mineral sands and rare earths. The price projections for chloride ilmenite, rutile and zircon are based on adjusted[17] forecasts produced by TZ Minerals International (TZMI), an independent global company specialising in information provision in relation to mineral sands markets. The price projections for HiTi and monazite concentrate were provided by RZ Resources in nominal terms and were converted to real 2023 values using the average of derived deflators for chloride ilmenite, rutile, and zircon (due to data limitations). The price projections for zircon concentrate were initially calibrated based on data provided by RZ Resources and subsequently adjusted to real 2023 values.[18] The price projections for each mineral product are displayed in Figure 7.

Figure 7 Annual price forecasts by mineral
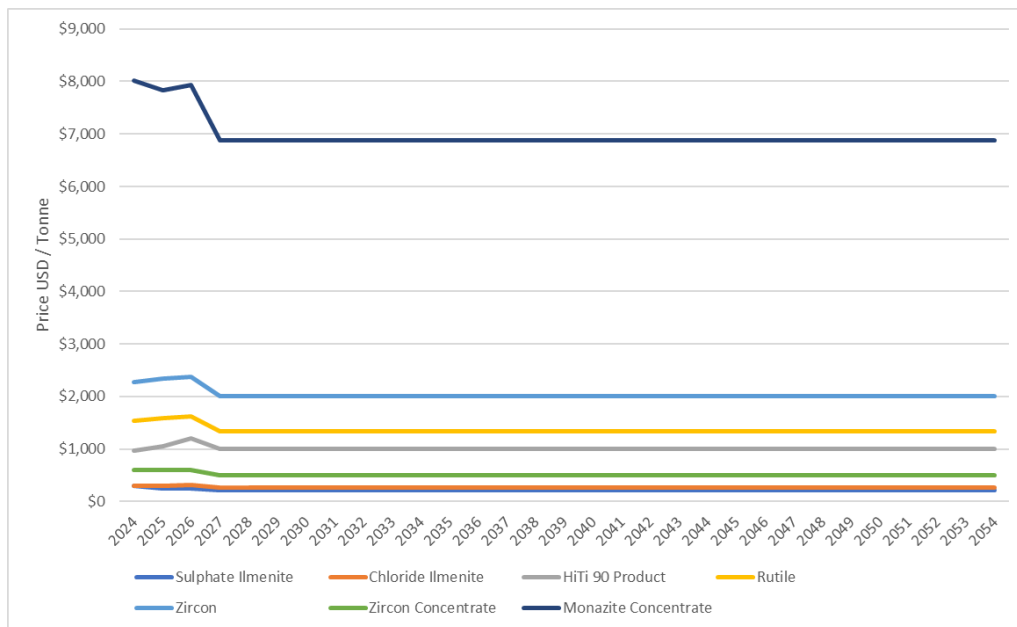
Source: TZMI; RZ Resources; Synergies analysis.

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17 Prices were converted from real 2021 to real 2023 values by rebasing respective deflators for noted minerals.

18 By rebasing deflators (from real 2021 to real 2023) corresponding to zircon concentrate.

TZMI provided the following observations in relation to these price projections:

- price projections are based on long-term fundamentals of supply and demand, noting that in the short term, prices can vary substantially based on short-term shifts in inventory (and other market shocks); and

- prices are expected to decline in the short term, before remaining constant in real terms from 2027.[19]

A fixed exchange rate provided by RZ Resources was applied to convert forecast prices from United States dollar (USD) to AUD (i.e. 1 USD = 1.4286 AUD).

5.1.3 Economic value of rare earths and minerals

Figure 8 shows the annual economic benefit derived from the mining, processing, and sale of all mineral and rare earth to be produced by the Copi mine project, based on the production profiles and price projections detailed above.

Figure 8 Economic benefit of saleable rare earths and minerals derived from Copi mine project
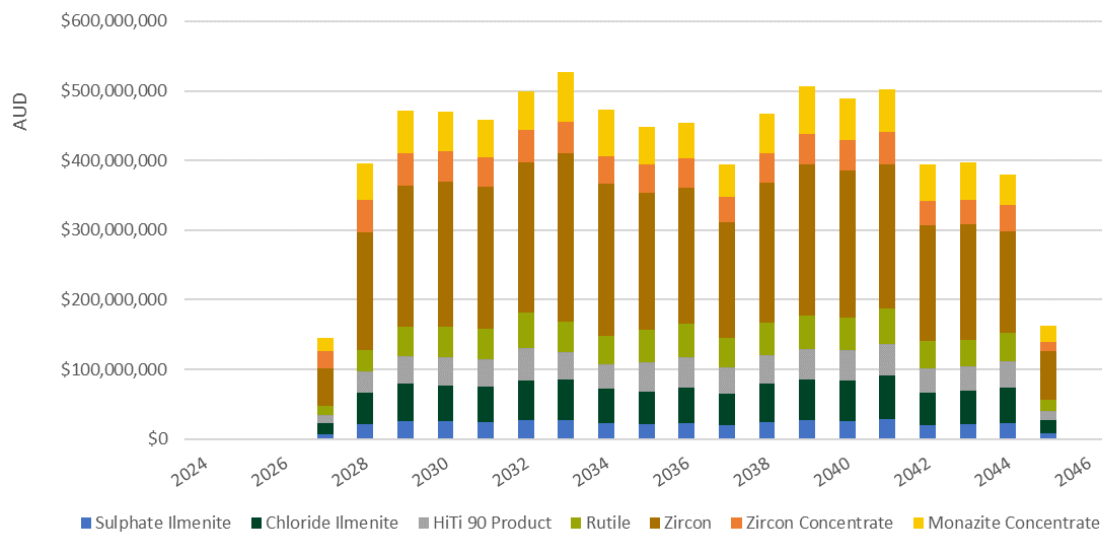
Source: Synergies modelling.

As shown in the figure above, Zircon accounts for the largest proportion of the total economic value of rare earths and minerals to be produced by the project, despite accounting for a relatively moderate proportion of total production.

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19   TZMI (2023).

The total value of rare earths and minerals produced by the Copi mine project over the evaluation period is estimated at $8.04 billion, with a Present Value estimate of $4.42 billion at a real social discount rate of 5 per cent.

5.2 Strategic value of enhanced self-sufficiency

As described in section 4.2, there is a significant and increasing strategic risk associated with Australia's continued reliance on imports as its primary supply source for rare earths and minerals that are critical inputs for a variety of high-value applications. Under the base case, Australia's reliance on imports will continue, and likely grow, over the medium to long term as demands for these rare earths and minerals grows. This is despite Australia containing significant undeveloped reserves of rare earths and minerals.

The strategic value of projects that seek to develop these reserves has been recognised by the Australian Government through its 2022 Critical Minerals Strategy, which aims to make Australia a critical mineral powerhouse by 2030.[20] This will not be possible without the development of projects such as the Copi mine project, which will significantly enhance Australia's production capacity of rare earths and minerals, in addition to developing downstream mineral separation and processing facilities necessary for final manufacture of high value products.

While the economic benefit to be derived from the mining and processing of rare earths and minerals have been quantified based on their export value (as the highest value use of the products), the project also provides the strategic benefit of significantly improving Australia's self-sufficiency in relation to the supply of several critical minerals. Under the scenario in which Australia's supply of imported rare earths and minerals does become disrupted (the risk of which is likely to increase over the evaluation period), projects such as the Copi mine project will provide a valuable source of alternative supply to enable a continued supply of critical inputs for the range of high-value applications identified in section 4.2.

As shown in Table 2, the Copi mine project will result in a significant increase in Australia's production of a range of rare earths and minerals, particularly Rutile and Monazite.

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[20] Pitt. K (2022) 2022 Critical Minerals Strategy. Department of Industry, Science, Energy and Resources. https://webarchive.nla.gov.au/awa/20220603113601/https://www.industry.gov.au/data-and-publications/2022-critical-minerals-strategy

Table 2   Implied growth in resources production under the project case

Resource	Current Production (Kt)	Copi Mine Production (Kt)	Implied Growth
Zirconium	400	123	30.68%
Ilmenite	1,100	210	19.05%
Rutile	200	22	11.01%
Monazite	9	6	62.07%

Note: Current Australian production of Monazite Concentrate is based on the results of research indicating there are seven operational projects that produce this rare earth. Based on an assumed yield of 1-2 per cent of total mined minerals, this results in an estimate for current production of around 9 Kt per annum.

Source: Critical Minerals at Geoscience Australia & RZ Resources.

This enhanced self-sufficiency in the production of critical inputs to a range of high-value applications represents a significant strategic contribution from the Copi mine project, relative to the base case and in addition to the direct economic value of the rare earth and mineral products.

6 Economic costs

This section details the assessment and quantification of the economic costs attributable to the Copi mine project.

6.1 Capital costs

Table 3 presents the breakdown of capital expenditure associated with the development of the Copi mine project.[21] The Wet Concentrator and Engineering, Procurement, and Construction management items are the largest components, accounting for around 26 per cent of total capital cost. The aggregate estimate also includes a modest allowance for contingency costs (14 per cent). Capital expenditure is expected to be incurred in from Year 1 finalising in Year 4 (financial year 2027) of the evaluation period.

Table 3   Breakdown of capital expenditure of the Copi mine project

Item	Cost (AUD)
Pond & Dredging	$73,339,522
Wet Concentrator	$132,985,057
HMC Washing Plant	$15,387,885
Services	$16,878,151
Pinkenba MSP	$49,679,422
Pinkenba MSP Infrastructure	$8,459,227
ESG: Rehabilitation and tree clearance	$3,081,841
Bulk Earthworks	$89,384,924
HV Power Switchyard and Power Distribution	$20,567,223
RO Plant	$2,405,885
Infrastructure Buildings	$41,180,149
Off-mine Tails Dam	$38,221,241
Plant Electricity	$19,191,728
Main Access Road	$8,367,420
Permanent Camp/Airstrip	$4,290,503
Temporary Construction Facilities and Services	$2,500,000
Commissioning Reps and Assistance	$3,340,044
Spares	$17,664,754
First Fills & Initial Charges	$1,281,762
Engineering, Procurement and Construction Management	$113,318,355
Owner's costs	$98,446,131
Environmental Bond	Not applicable[a]

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[21] Capital costs used in this assessment differ from those presented for the Capital Investment Value (CIV) for the Project. This is because the methodology for estimating the CIV for the purposes of estimating the application fee for the development application is different to that used to estimate the actual capital cost for the Project.

Item	Cost (AUD)
Contingency	$131,560,587
Corporate Overheads	$14,900,000
Escalation	$18,221,207
5800	$16,532,281
2900	$4,441,760
Total expenditure	**$945,627,061**

a An Environmental Bond is a payment made by mining companies as a guarantee for the future rehabilitation of the site at the end of the operating life of the mine. It has been excluded from the CBA to avoid double counting rehabilitation costs (resulting in overestimation of costs).

Source: Cost estimates provided by RZ Resources.

In addition to the up-front capital expenditure to be incurred to develop the mine site and supporting infrastructure, the project will also incur sustaining capital expenditure over its operational life (from FY2027). This expenditure exhibits significant variability over the mine's operational life, with annual expenditures ranging from $1.83 million to $12.96 million (average annual expenditure of $5.46 million).

The total capital expenditure associated with the Copi mine project over the evaluation period, including sustaining capital expenditure over the lifetime of the project, totals $1,040 million, which equates to $831 million in PV terms (real social discount rate of 5 per cent).

6.2 Operating costs

The table below details the breakdown of operating costs for the Copi mine project.

Table 4 Breakdown of operating costs

Category	Description	Total (million, nominal)	Total (million, PV terms)
Mining	Primary costs incurred in mining operations, primarily attributable to earth moving contracts	$1,568	$870
Processing	Operational costs incurred in processing material at Copi mine site and MSP	$864	$479
Logistics	Road and rail haulage costs incurred throughout the logistics chain	$1,038	$571
Mine site infrastructure	Primarily related to facility management costs	$173	$103
Other	Other operating costs, including off-site infrastructure costs, geology costs, overheads and project delivery, etc.	$518	$300

Note: PV estimates calculated based on a real social discount rate of 5 per cent.
Source: RZ Resources.

6.3 Land rehabilitation costs

The Copi mine project seeks to undertake progressive land rehabilitation. That is, mined area is rehabilitated throughout the operational life of the mine, rather than all rehabilitation occurring at the end of the mine life. RZ Resources has provided an estimate of $15,000 per hectare for land rehabilitation costs. This cost estimate has been applied to the 5,622 hectares of area expected to be disturbed as follows:

- Year 4 (2027) – nil rehabilitation

- Years 5-22 – rehabilitation of 281 hectares per annum.

The costs of rehabilitation are captured in the ESG component of the which the total cost over the evaluation period comes to $137 million, which translates to $71 million in PV terms (5 per cent real).

6.4 Transport externalities

In addition to the direct costs incurred in the haulage of HMC from the Copi mine site to the Pinkenba MSP and separated rare earth and mineral products from the MSP to the Port of Brisbane for export (as detailed in section 2.2), there are also negative externalities associated with road and rail transportation that are to be considered in the CBA.

These externalities have been assessed using Australian Transport Assessment and Planning Guidelines (ATAP) cost estimates for road and rail freight,[22] which includes the following externalities:

- air pollution

- greenhouse gas emissions

- noise pollution

- other adverse impacts (e.g. amenity, nature and landscape impacts).

The total economic cost of negative externalities attributable to road haulage was estimated at $9.91 per '000 tonne-km, while the cost for rail haulage was estimated at $1.07 per '000 tonne-km. These estimates were applied to the freight task each year to measure total negative externality costs. The combined negative externality costs for road and rail transport over the evaluation period is estimated to be $92 million, or $50 million in PV terms (real social discount rate of 5 per cent).

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[22] ATAP PV5 – Environmental Parameter Values Nov 2020, Table 5.

6.5 Greenhouse gas emissions

In addition to the greenhouse gas emissions attributable to road and rail haulage, there are also greenhouse gas emissions attributable to the operation of the Copi mine site and Pinkenba MSP that are to be accounted for in the CBA. Annual estimates of carbon dioxide equivalent (CO2-e) emissions were provided by RZ Resources and are presented in the figure below.

Figure 9 Annual carbon emissions
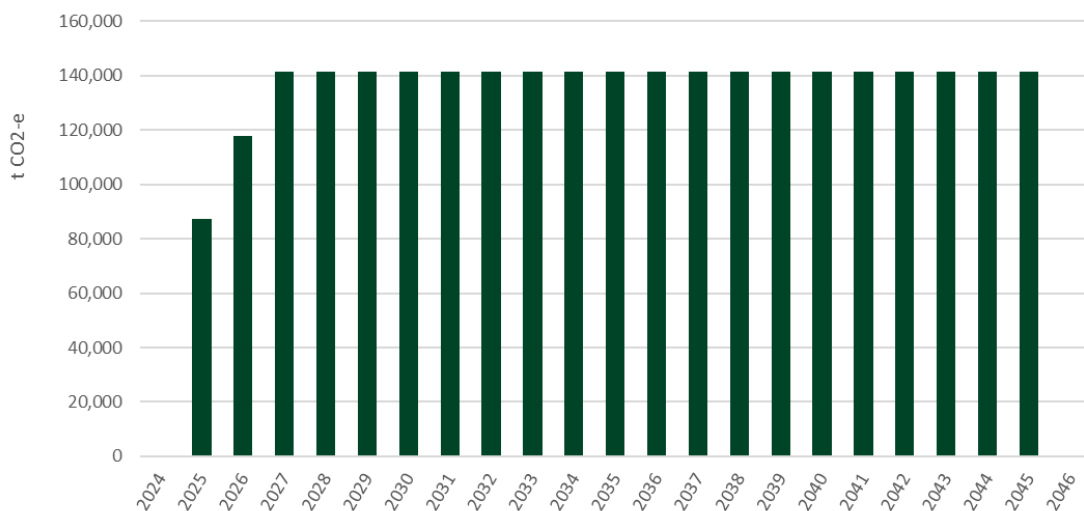
Source: Pinkenba MSP CO2 emission estimates were circa 2007 numbers. According to RZ Resources, this is the best available data as they are currently not operational and were in average production that year. RZ Resources also noted that they would be improving their carbon emission efficiencies in time to come.
Source: RZ Resources.

The economic cost attributable to CO2-e emissions generated by the operation of the Copi mine site and MSP has been quantified based on a unit cost of AUD60 per tonne of CO2-e. It is noted that this is higher than the unit cost that would be derived based on the current European Union (EU) Emissions Allowance unit price (being the most appropriate market-based price to be applied in the CBA),[23] however applying a value of AUD60 per tonne maintains consistency with the unit cost applied in the ATAP guidelines, which were used to quantify the economic cost of transport externalities, as detailed in section 6.4. It is noted that the low value to be tested in the sensitivity analysis will be consistent with the EU-based cost estimate.

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[23]   Based on a 2020 EU Emissions Allowance unit price estimate of €24.4 per t CO2-e (See: European Environment Agency (2022). The EU Emissions Trading System), the cost per t CO2-e is estimated at AUD39.90 (based on a July exchange rate of 1 EUR = AUD1.4573 (See: Reserve Bank of Australia (2022). Statistics – Historical Data – Exchange Rates. Commonwealth of Australia, Canberra) and escalated to AUS2023 (See: Australian Bureau of Statistics (2022). Consumer Price Index, Australia, March 2022. Commonwealth of Australia, Canberra).

This results in a total (undiscounted) estimate for the economic cost attributable to greenhouse gas emissions from the operation of the Copi mine and MSP of $173 million, or $99 million in PV terms (real social discount rate of 5 per cent).

6.6 Groundwater impacts

The mining activity has the potential to significantly impact on groundwater resources in the project area. As detailed above, the wet dredging process requires access to water, as groundwater is extracted with mined material before being subject to primary processing. Water is to be sourced from Western Murray Porous Rock Aquifer under the Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources 2020 under the *Water Management Act (NSW) (2000)*.

RZ Resources will require a water licence to access groundwater for the project. In 2021, the minimum tender price for water from the Western Murray Porous Rock Groundwater Source was $500 per ML. RZ Resources has provided an upper bound annual estimate of 4,804 ML for groundwater that is to be extracted from the project. This translates to a direct cost (undiscounted) of water licensing of $3.1 million, or $2.5 million in PV terms (5 per cent real).

6.7 Cultural heritage impacts

A Heritage Impact Assessment undertaken for the project identified that a range of Aboriginal objects would be disturbed by the Project.

RZ Resources is currently in the process of developing an Aboriginal Cultural Heritage Plan for the project which will include mitigation strategies in relation to each affected site. Given this, it is not currently possible to discern the nature and magnitude of the impact of the project on the affected sites and hence it is not possible to quantify the economic cost of any adverse impacts under the project case.

6.8 Biodiversity impacts

The Biodiversity Impact Assessment undertaken for the project revealed that the project would result in a range of biodiversity-related impacts, including impacts to areas of native and non-native vegetation, and various impacts to threatened species and communities, including *Austrostipa nullanulla, Pterostylis cobarensis* (assumed presence only), the Sandhill Pine Woodland Threatened Ecological Community (TEC), and the Eastern Malle Bird Community TEC.

In terms of the quantification of these impacts, it is noted that RZ Resources is to retire sufficient credits to offset the ecosystem and species credit requirements associated with

the expected impacts and that these are included within the scope of the project costs. In addition, it is noted the project is not expected to have a significant impact on species or ecological communities listed under the *Environment Protection and Biodiversity Conservation Act 1999*. As such, no additional impact has been quantified in the CBA.[24]

6.9 Noise impacts

The Noise Impact Assessment undertaken for the project revealed that construction and operational noise emissions of the project would comply with relevant noise criteria.

Because anticipated noise levels are not considered significant, and management and mitigation measures would also be implemented to ensure noise criteria are not exceeded, ambient noise impacts have not been quantified in the CBA.

6.10 Other negative externalities

As noted in section 4.1, there are several other negative impacts that are are likely to occur under the project case. These impacts are summarised in the table below, noting that the outcomes from environmental and other assessments indicate none are sufficiently material to warrant quantification in the CBA.

Table 5   Other negative externalities attributable to the reference project option

Negative externality	Description	Significance
Air quality	Compensation for health costs associated with emissions of fine particulate matter	Not considered significant as air quality during both construction and operations would comply with relevant criteria, and this would be supplemented by management and mitigation measures
Visual amenity	Compensation for use and enjoyment of recreational opportunities on surrounding private landowners and key public vantage points	Not considered significant due to there being limited beneficial use
Surface water	Compensation for impacts on water flows, water quality and water users	As above
Soil	Compensation for impacts on land and soil quality	As above
Traffic and transport	Compensation for additional travel time and average delay projections	No additional travel time delays as the Springwood Road will be upgraded to mitigate traffic flows

Source: RZ Resources.

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[24]   Also noting that RZ Resources is currently in the process of preparing a Biodiversity Management Plan and a Rehabilitation Management Plan.

7 Cost-benefit analysis results

A discounted cashflow model was developed to quantify the economic benefits and costs attributable to the project case. This model enables the derivation of the following outputs:

- PV of economic benefits

- PV of economic costs

- Net Present Value (NPV) of economic cashflows attributable to the Copi mine project over the study period, relative to the base case

- Benefit Cost Ratio (BCR) (i.e. total economic benefits divided by total economic costs).

The NPV and BCR results are the key indicators of project feasibility. These results have been modelled at the real social discount rate of 5 per cent, with sensitivity analysis conducted at 3 and 7 per cent.

7.1 Results

Table 6 presents the quantified economic benefits and costs under the project case relative to the base case.

Table 6   Summary of economic benefits and costs ($million Present Value terms, 5 per cent real)

Metric	Estimate ($m, Present Value)
Economic benefits	
Value of minerals and rare earths production	$4,416
Total economic benefits	**$4,416**
Economic costs	
Foregone value of alternative land uses (grazing)	($0.7)
Capital and sustaining costs	($889)
Operating and maintenance costs	
0000 General	($3)
1000 Geology	($7)
2000 Mining	($870)
3000 Processing	($479)
4000 Mine Site Infrastructure	($103)
5000 Off-Site Infrastructure	($5)
6000 Logistics	($571)
7000 ESG (land rehabilitation)	($71)
9000 Project Deliver	($20)

Metric	Estimate ($m, Present Value)
10000 Overheads	($193)
Subtotal	($2,322)
Greenhouse gas emissions and other externalities	
Road and rail externalities	($50)
Copi mine and MSP operations	($99)
Subtotal	($149)
Groundwater licensing costs	($3)
Total economic costs	**($3,364)**
Net Present Value	**$1,052**
Benefit Cost Ratio	**1.31**

Note: Totals may not add due to rounding.
Source: Synergies modelling.

Table 7 details the results of the CBA based on real discount rates of 3 per cent and 7 per cent.

Table 7   Cost-benefit analysis results

Metric	3%	5%	7%
Net Present Value ($ million)	$1,519	$1,052	$708
Benefit Cost Ratio	1.38	1.31	1.25

Source: Synergies modelling.

As shown in the table above, the real social discount rate has a relatively minor impact on the NPV and BCR results of the CBA, largely due to the relatively short construction period and quick ramp-up of production, and hence economic benefit, derived from the project.

7.2   Sensitivity analysis

Sensitivity analysis shows how the results of the CBA are affected by changes to key parameters and assumptions. This provides decision makers with an indication of the level of certainty associated with the modelled results in addition to identifying critical parameters and assumptions.

The following parameters have been subject to sensitivity analysis:

- capital costs (±20 per cent)

- operating costs (±20 per cent)

- price projections (±20 per cent)

- emissions allowance unit price (±50 per cent)

- exchange rates (±5 basis points AUD).

The table below presents the sensitivity analysis results from key parameter changes.

Table 8   Results of sensitivity analysis

| Parameter | Results (real social discount rate of 5 per cent) | |
	NPV	BCR
Base results	**$1,052**	**1.31**
Capital costs		
Low (-20%)	$1,230	1.39
High (+20%)	$875	1.25
Operating costs		
Low (-20%)	$1,517	1.52
High (+20%)	$588	1.15
Price projections		
Low (-20%)	$169	1.05
High (+20%)	$1,936	1.58
Emissions allowance unit price		
Low (-50%)	$1,102	1.33
High (+50%)	$1,003	1.29
USD:AUD exchange rate		
Low ($0.65 AUD)	$1,392	1.41
High ($0.75 AUD)	$758	1.23

Source: Synergies modelling.

The results of the sensitivity analysis show that while the Copi mine project returns a positive NPV and BCR of above one on all sensitivities tested (at a real social discount rate of 5 per cent), the results are materially sensitive to the forecasts adopted for rare earth and mineral prices and, to a lesser extent, operating costs. For the commodity price projections, a 20 per cent reduction in forecast prices results in a reduction in the project NPV of 73 per cent, with the BCR falling from 1.31 to 1.05 (real discount rate of 5 per cent).

8   Net benefits to NSW

This section evaluates the net benefits of the Copi mine project to the NSW community, in accordance with the *NSW Government Guidelines for the economic assessment of mining and coal seam gas proposals*. The key components of the net benefits attributed to NSW community are:

- net producer surplus

    – revenues

    – costs

    – taxes

    – royalties

- benefits to existing landholders

- benefits to workers

- benefits to suppliers

- net environmental, social and transport costs

- net public infrastructure costs.

The above components are discussed in the sections below. It is important to note that the assessment of net benefits to NSW is largely based on data and information already presented in the CBA sections, with the definition of the base case and project cases also applicable to this assessment.

8.1   Net producer surplus

Net producer surplus is estimated in line with the following formulation suggested in the NSW Government guidelines:

$$Net\ producer\ surplus = Revenue - Costs - Taxes - Royalties$$

The subsections below document estimates underlying each element. Consistent with the NSW Government guidelines, the share of net producer surplus (excluding royalties) attributable to NSW is calculated based on the following assumptions:

- Australian share of the Copi mine project ownership is 100 per cent

- NSW share of the Copi mine project ownership is 32 per cent.[25]

8.1.1 Revenues

As noted in Section 5.1.3, the total value of rare earths and minerals produced by the Copi mine project over the evaluation period is estimated at $8.04 billion, which equates to $4.42 billion (real social discount rate of 5 per cent).

On the basis that NSW accounts for 32 per cent of the Copi mine project ownership, the share of revenues attributable to NSW is estimated to be around $1.41 billion (PV terms).

8.1.2 Costs

As detailed in Section 6, there are many economic costs associated with the development and operations of the Copi mine project. These are summarised in the table below.

Table 9   Economic costs attributable to the Copi mine project

Item	Description
Capital and sustaining costs	• The total capital expenditure associated with the Copi mine project over the evaluation period, including sustaining capital expenditure over the lifetime of the project, totals $1,049 million, which equates to $889 million in PV terms at a real social discount rate of 5 per cent.
Operating costs	• Total operating costs over the period comes to $4,160 million, which translates to $2,322 million in PV terms (5 per cent real).
Land rehabilitation costs	• Total land rehabilitation costs were estimated at $137 million, which translates to $71 million in PV terms (5 per cent real).
Water licensing costs	• The economic cost attributable to water licensing was estimated at of $3.1 million, or $3 million in PV terms (5 per cent real).

Source: Synergies' modelling, based on data provided by RZ Resources.

Total economic costs are estimated at around $3.36 billion in PV terms (real social discount rate of 5 per cent). The share of costs attributable to NSW is estimated to be around $1.08 billion (PV terms).

8.1.3 Taxes

Taxes are divided into the following subcategories:

- corporate income tax

- payroll tax

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[25]   Derived by multiplying the recommended NSW share of the Australian population (32 per cent) to the Australian share of the project's ownership (100 per cent).

Corporate income tax

A 30 per cent corporate income tax rate was applied to estimates of taxable income in each year, i.e. total revenue less total costs and royalties. No corporate income tax is expected under the base case; thus, this results in a total corporate income tax estimate of $1.14 billion (undiscounted), or $626 million in PV terms (real social discount rate of 5 per cent).

The share of corporate income tax attributable to NSW over the evaluation period is estimated to be approximately $200 million in PV terms. Note, however, that the exclusion of interest and depreciation deductions indicates that these estimates are likely to be overstated to some extent.

Payroll tax

Payroll tax has been calculated by applying the payroll tax rate of 5.45 per cent (based on annual Australian labour expenditure in excess of the $1.2 million annual threshold)[26] to the projections for total wage payments (i.e. from direct project economic activities) over the FY2024 to FY2045 period. This results in a total payroll tax estimate of $56 million (undiscounted), or $31 million in PV terms (real social discount rate of 5 per cent). The share of payroll tax attributable to the NSW community is estimated to be $10 million in PV terms.

8.1.4 Royalties

Revenue to the NSW Government from the payment of royalties attributable to mining production resulting from the Copi mine project has been calculated by applying RZ Resources' revenue projections (see section 5.1) to the Ad valorem royalty rate of 4 per cent based on ex-mine value (value less allowable deductions).[27] The proponent has advised that allowable deductions from the value of minerals recovered include:

- non-mining costs (100 per cent of costs associated with transportation to the Pinkenba MSP, mineral separation and transportation to the Port of Brisbane); and

- administration (33 per cent in overheads).

This results in total royalties paid over the period from FY2027 to FY2045 of $258.2 million (undiscounted), or $143 million in PV terms (real social discount rate of 5 per

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[26] NSW Office of State Revenue (2022). Payroll Tax. New South Wales Government, Sydney.

[27] Department of Regional NSW (2022). Royalties. New South Wales Government, Sydney.

cent). The share of royalties attributable to the NSW community is 100 per cent of royalties payable to the NSW Government.

The profile of annual undiscounted mining royalties attributable to the Copi project is shown in the figure below.

Figure 10 Annual undiscounted royalties
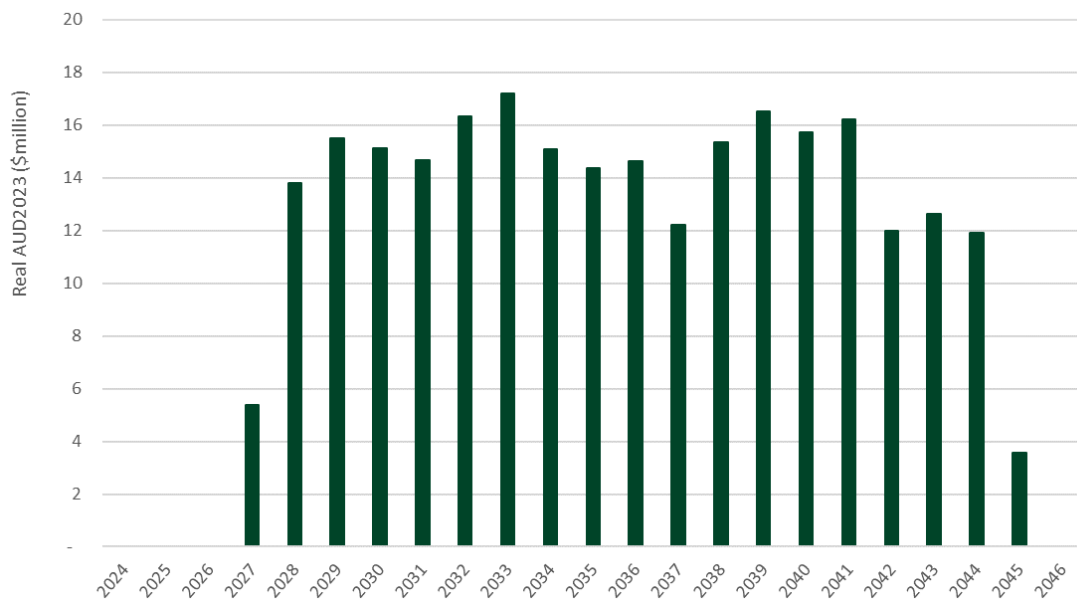
8.2   Benefits to existing landholders

Payments to existing landholders that are in excess of the opportunity cost of land represent an economic benefit. Use of the land on which the project is located for is valued at approximately $670,817 in PV terms (5 per cent real), based on the highest value use of the land being for grazing. Because any land acquisitions are to be made at market value, no additional surplus is expected for existing landholders.

8.3   Benefits to workers

It is anticipated that all project employees are to receive a net wage consistent with market rates. Thus, no wage premiums are expected to be accrued from gaining employment in the Copi mine project relative to elsewhere in the mining sector and

outside the mining sector. Any wage increase for workers would reflect compensation for changes in working conditions, rather than a premium.[28]

8.4　Benefits to suppliers

The Copi mine project is not expected to generate any material additional producer surplus for suppliers in NSW. Specifically, the suppliers to the project are anticipated to earn similar margins received from other sources under the base case.[29]

8.5　Net environmental social and transport costs

As highlighted in Sections 6.4 and 6.5, the Copi mine project is expected to generate the following externalities:

- air pollution, greenhouse gas emissions, noise pollution and other adverse impacts (e.g. amenity, nature and landscape impacts) associated with road and rail transportation in NSW;
    - road transportation reflects travel from the Copi mine to Broken Hill, while rail transportation reflects travel from Broken Hill to Acacia Ridge (rail unloading facility in Brisbane);
    - the combined negative externality costs for road and rail transport is estimated at $92 million, or $50 million in PV terms (5 per cent real);
- greenhouse gas emissions attributable to the operation of the Copi mine site;
    - Total emissions during construction is estimated at 87,468 t CO_2-e, whilst annual emissions during operations is estimated at 117,613 t CO_2-e; and
    - The combined negative externality costs for greenhouse gas emissions from the Copi mine is estimated at $173 million, or $99 million (5 per cent real).

As noted in the CBA section, additional externalities, such as ambient noise, biodiversity, and Aboriginal and non-Aboriginal heritage, have been noted to occur under the project case. Results from the environmental impact assessments of the project revealed that:

- ambient noise impacts attributable to Copi construction and operations are not likely to be material;

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[28]　RZ Resources has noted that it will offer an incentive scheme for project employees to live within Wentworth (when land is released for them to relocate).

[29]　RZ Resources has noted that while suppliers would receive a premium, this would cover higher wages to attract and retain project employees.

- the project would not have a significant impact on a species or ecological community listed under the *Environment Protection and Biodiversity Conservation Act 1999;*[30]

- while a number of Aboriginal sites would be affected by the project a Cultural Heritage Management Plan to address cultural heritage impacts is in preparation in consultation with the local Aboriginal community; and

- outcomes from other environmental assessments reveal that the project is not expected to have material impact on air quality, visual amenity, surface water, soil, and traffic and transport.

In view of the above, and the client preparing management plans to minimise potential impacts, the impact of the project on identified externalities have not been quantified.

8.6 Net public infrastructure costs

It is expected that the cost of all proposed infrastructure will be paid by the proponent. Because these costs have already been included in the capital cost estimates, net public infrastructure costs are zero for the purpose of calculating the net benefits to NSW.

8.7 Overall net benefit results

Based on results in the preceding sections, the Copi mine project is expected to deliver a net economic benefit to the NSW community of approximately $332 million in PV terms (real social discount rate of 5 per cent). The table below provides a summary of the results by item.

Table 10 Breakdown of net benefit results by item

Item	Incremental ($m, NPV)	NSW community share (%)	Net benefit to NSW ($m, NPV)	Net cost to NSW ($m, NPV)
Net producer surplus	$434	32%	$138	-
Corporate income tax	$626	32%	$200	-
Royalties	$143	100%	$143	-
Benefits to existing landholders	-	-	-	-
Benefits to workers	-	-	-	-
Benefits to suppliers	-	-	-	-
Net environmental, social and transport costs				

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[30] While the project would result in the clearing of *Austrostipa nullanulla* habitat, the proponent contends that the Copi mine project would not result in Serious or Irreversible impact to this habitat. The proponent has also made substantial changes to project design to minimise direct impacts to *Austrostipa nullanulla*.

Item	Incremental ($m, NPV)	NSW community share (%)	Net benefit to NSW ($m, NPV)	Net cost to NSW ($m, NPV)
Road and rail externalities	($50)	100%	-	($50)
Copi mine operations	($99)	100%	-	($99)
Net public infrastructure costs	-	-	-	-
Total			**$481**	**($149)**

Note: Totals may not add due to rounding.
Source: Synergies' analysis.

8.8 Sensitivity analysis

The following parameters have been subject to sensitivity analysis:

• discount rate (3 per cent and 7 per cent)

• price projections (±20 per cent)

• corporate income tax (±50 per cent)

• royalties (±25 per cent).

The table below presents the sensitivity analysis results from key parameter changes.

Table 11 Results of sensitivity analysis

Item	Overall net benefit of project for NSW community ($m, NPV)
Base result	**$332**
Discount rate	
Low (3%)	$481
High (7%)	$222
Price projections	
Low (-20%)	$50
High (+20%)	$615
Corporate income tax	
Low (-50%)	$232
High (+50%)	$432
Royalties	
Low (-25%)	$296
High (+25%)	$363

Source: Synergies' analysis.

The results from the sensitivity analysis are broadly consistent with the sensitivity analysis undertaken for the CBA, with the results most sensitive to variability in the commodity price projections for rare earths and minerals, in addition to changes to the

discount rate. Noting this, all scenarios assessed deliver a net benefit to the NSW community.

9 Socioeconomic profile

This section provides a socioeconomic baseline for the Wentworth LGA.

9.1 Population and demographics

In 2021, the estimated population of Wentworth LGA was 7,453, having grown at an average annual rate of 0.58 per cent since 2016.[31] This is significantly below the average population growth rate for NSW of 1.41 per cent per annum. Wentworth is projected to experience a decline in population at an average annual rate of 0.17 per cent to 2041.[32] In comparison, the population of NSW is projected to grow at an average annual rate of one per cent over this period. The table below presents key demographic data for the Wentworth LGA and contrasts this data with the same statistics for NSW.

Table 12 Labour force, Wentworth LGA and NSW

Metric	Wentworth		NSW	
	Number	%	Number	%
Gender [a]				
Male	3,869	51.9	3,984,166	49.4
Female	3,584	48.1	4,087,995	50.6
Age				
0-14	1,433	19.2	1,470,001	18.2
15-24	775	10.4	954,081	11.8
25-44	1,633	21.9	2,245,193	27.8
45-64	2,065	27.7	1,978,725	24.5
65+	1,547	20.8	1,424,141	17.6
Educational institution attending				
Preschool	164	7	167,196	6.8
Primary school	584	24.9	651,375	26.5
Secondary school	428	18.2	512,195	20.9
Tertiary	237	10.1	583,617	23.8
Other	39	1.7	74,331	3
Not stated	904	38.5	465,268	19
Household characteristics				
Average number of people per household [a]	2.5	n/a	2.6	n/a
Median weekly personal income [b]	$717	n/a	$813	n/a
Median weekly family income [c]	$1,765	n/a	$2,185	n/a
Median weekly household income [d]	$1,392	n/a	$1,829	n/a

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[31]   ABS Census 2021. Wentworth – 2021 Census All persons QuickStats.

[32]   'Projections'. NSW Government; DOA: 17 March 2023; See: https://pp.planningportal.nsw.gov.au/populations

Key observations from a comparison of Wentworth LGA against NSW are as follows:

- a higher proportion of residents of the Wentworth LGA are over the age of 45 relative to the whole of NSW (48.5 per cent compared to 42.1 per cent);

- the proportion of tertiary educated residents in Wentworth LGA is significantly lower than the NSW average (10.1 per cent compared to 23.8 per cent);[33] and

- median income levels in the Wentworth LGA are significantly less than the NSW average. For example, median weekly household income in the Wentworth LGA is only 76 per cent that of the State-wide average.

9.2 Labour Force

The National Skills Commission releases quarterly data on Small Area Labour Markets. Based on this data for the March Quarter of 2022, the unemployment rate in Wentworth was 5.7 per cent, with 188 people aged over 15 years unemployed, and 3,319 people in the labour force. In comparison, NSW had an unemployment rate of 4.6 per cent.[34]

The table below contains a breakdown of the occupations and employment status for the Wentworth LGA and contrasts this with State-wide data for NSW.

Table 13 Breakdown of employment and work status in Wentworth LGA and NSW

Metric	Wentworth		NSW	
	Number	%	Number	%
Employment by occupation [a]				
Managers	613	21.4	535,007	15.8
Labourers	564	19.7	300,292	8.9
Professionals	330	11.5	950,937	28.2
Technicians and Trades Workers	405	14.1	221,588	6.6
Machinery Operators and Drivers	303	10.6	206,839	6.1
Clerical and Administrative Workers	266	9.3	476,752	14.1
Community and Personal Service Workers	260	9.1	389,683	11.5
Sales Workers	127	4.4	294,636	8.7
Employment by work status [b]				

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[33] Noting that a significantly higher proportion of residents in the Wentworth LGA did not state their education level, relative to the whole of NSW (38.5 per cent compared to 19 per cent).

[34] National Skills Commission (2022). *Small Area Labour Markets – March Quarter 2022*. Commonwealth of Australia, Canberra.

Metric	Wentworth		NSW	
	Number	%	Number	%
Worked full-time	1,955	65.7	2,128,800	58.0
Worked part-time	807	27.1	1,149,315	31.3
Away from work	145	4.9	329,964	9.0
Hours not stated	68	2.3	64,156	1.7

a People who reported being in the labour force, aged 15 years and over. **b** Employed people aged 15 years and over.
Source: ABS 2021 Census.

The above table shows that the labour force in the Wentworth LGA has a significantly higher proportion of 'Managers' and 'Labourers' relative to the whole of NSW. This is likely due to the high proportion of these classifications in the 'Agriculture, Forestry, and Fishing' sector, which is the dominant source of employment in the Wentworth LGA, as shown in the figure below.

Alternatively, the Wentworth LGA contains a significantly lower proportion of 'Professionals' relative to the whole of NSW (11.5 per cent compared to 28.2 per cent). This is consistent with the observation from Table 12 that the proportion of residents in the Wentworth LGA with a tertiary qualification is significantly below the State-wide proportion. The figure below shows the breakdown of employment by industry in the Wentworth LGA. As stated above, the 'Agriculture, Forestry, and Fishing' sector is the dominant industry, with 'Mining' also accounting for a material proportion of total employment.

Figure 11 Employment by industry, Wentworth LGA
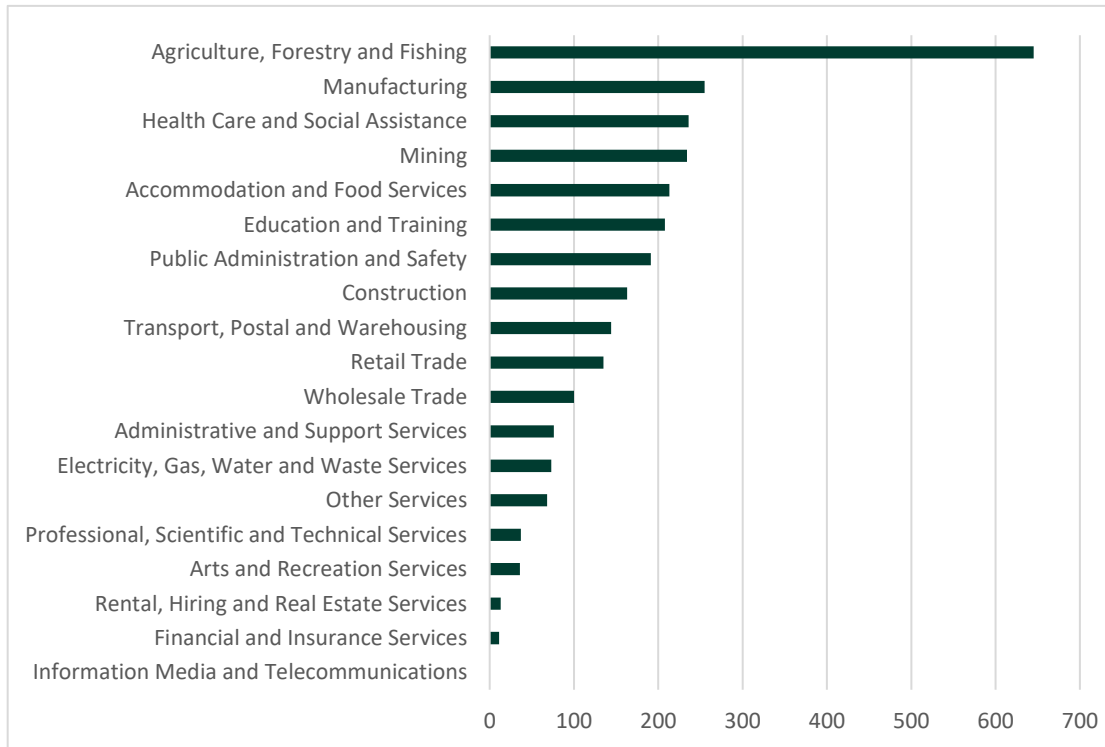
Source: ABS 2021 Census.

9.3 Socioeconomic Index for Areas

The Socioeconomic Index for Areas (SEIFA) is an index of relative socioeconomic disadvantage for LGAs in NSW. The index is calculated based on an analysis of area income, housing, education, and social participation data. The lower the value of an LGA's ranking, the greater the socioeconomic disadvantage that exists in the region. The Wentworth LGA's current SEIFA ranking is 50[35] out of the 130 LGAs in NSW.[36]

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[35] The ranking produced by NSW Treasury closely reflects the ABS 2016 Census data.

[36] NSW Treasury (2021). NSW and Local Government Area Business Profiles 2021. Business Connect, NSW Government, Sydney, May.

10 Local effects analysis

This section evaluates the impacts of the Copi mine project in its locality (i.e. Wentworth LGA), in accordance with the *NSW Government Guidelines for the economic assessment of mining and coal seam gas proposals*. While the NSW Government guidelines recommend that the impacted area be defined as the Statistical Area Level 3 (SA3) that contains the proposed project, it is not considered appropriate for the analysis of local effects as the relevant SA3 (Lower Murray) fully or partially encompasses multiple economies outside the project area.[37]

Importantly, the section that follows relating to the EIA assessment considers both local and state geographical viewpoints. This is important for the analysis of flow-on effects (second round effects, third round effects, etc.) as NSW represents a complete economy and particular sectors will be more integrated to other sectors in the economy (or alternatively, smaller regions have relatively shallower inter-industry linkages and rely on imports of goods needed for inputs and consumption).

The key components of the local effects analysis (LEA) include:

• effects relating to local employment

• effects related to non-labour project expenditure

• environmental and social impacts on the local community.

The above components are discussed in the sections below.

10.1 Local employment effects

While the EIA assessment (section 12) highlights how the project will employ people directly and generate flow on employment (i.e. indirect and induced additional employment), this section analyses the likely net benefits of the direct employment created by the Copi mine project in the locality. The approach to estimating net employment effects involves:

• measuring the share of local residents employed directly by the project; and

• measuring the net increase in workers' income by comparing average incomes from employment at the Copi mine to average incomes in the locality.

The table below illustrates that the Copi mine project is estimated to directly employ 480 FTEs during construction and 240 FTEs during operations. Based on findings from the

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[37] This includes Balranald, Polygon, Hay and Murray River LGAs.

regional labour market assessment (see Section 13), it is assumed that a moderate proportion of labour input needs will be imported from outside the locality as the region is currently experiencing a period of low unemployment and constrained labour supply. In this context, and following discussions with RZ Resources, the local share of employment is assumed to be around 50 per cent during both the construction and operational phases.

Average income earned by project employees, and average income in the locality across all industry sectors, are sourced from our in-house NLIO model. This model uses data across ABS databases and calibrates average income data to FTE terms based on the breakdown of hours worked for the mining industry and all industries in the locality. As per NSW Government guidelines, income figures are converted to disposable incomes within the locality by netting out the current Superannuation Guarantee rate of 10.5 per cent as well as tax payments (using the online ATO Simple Tax Calculator)[38].

Table 14 Local employment effects – construction and operational results for Copi project

Metric	Unit	Construction phase		Operational phase	
		Residents	Non-residents	Residents	Non-residents
Direct employment	FTE	240	240	120	120
Average net income for project employees	$/year	89,686	89,686	61,486	61,486
Average net income in locality	$/year	58,046	58,046	58,046	58,046
Average increase in net income per employee	$/year	31,640	31,640	3,441	3,441
Increase in net income per year due to direct employment	$million	7.92	7.92	0.41	0.41
FTE equivalent of increase in income	FTE	88	88	7	7

Note: Income figures have been estimated after superannuation and tax).
Source: Synergies modelling.

10.2 Non-labour expenditure effects

The estimation of effects related to other, non-labour expenditure in an LEA is limited to the direct expenditure made by the project in the local area. This is reported in the table below. The share of expenditure in the locality was calculated with reference to the NLIO model, which contains detailed information about the intersectoral linkages and leakages in the local economy (refer to Box 1 in section 11 for additional details).

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[38] Australian Taxation Office (2023). Simple tax calculator. Available from: https://www.ato.gov.au/calculators-and-tools/simple-tax-calculator/

Table 15 Local expenditure effects – construction and operational results for Copi project

Year	Unit	Construction phase		Operational phase	
		In locality	Outside locality	In locality	Outside locality
2024	$million	$13.84	$29.23	-	-
2025	$million	$84.61	$178.73		
2026	$million	$75.33	$159.12		
2027	$million	$33.25	$70.24	$29.64	$85.59
2028	$million	-	-	$80.75	$233.18
2029	$million	-	-	$95.79	$276.61
2030	$million	-	-	$97.63	$281.93
2031+	$million	-	-	$90.89	$262.47

Source: Synergies modelling.

10.3 Environmental and social effects

The NSW Government guidelines, recommends that externalities identified in the CBA section be investigated in terms of effects within the locality. Effects that were quantifiable and could be attributed to the local area are presented in the table below.

Table 16 Local externality effects – construction and operational results for Copi project

Metric	Unit	Construction phase		Operational phase	
		In locality	Outside locality	In locality	Outside locality
Road and rail externalities	$million	-	-	($3)	($47)
Greenhouse gas emissions	$million	-	-	($84)	($15)

Source: Synergies modelling.

As noted in the CBA section, additional externalities, such as ambient noise, biodiversity, and Aboriginal and non-Aboriginal heritage, have been noted to occur under the project case. Results from the environmental impact assessments of the project revealed that:

- ambient noise impacts attributable to Copi construction and operations are not likely to be material;

- the project would not have a significant impact on a species or ecological community listed under the *Environment Protection and Biodiversity Conservation Act 1999*[39];

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[39] While the project would result in the clearing of up to 28.51ha of *Austrostipa nullanulla* habitat, the proponent contends that the Copi mine project would not result in Serious or Irreversible impact to this habitat. The proponent has also made substantial changes to project design to minimise direct impacts to *Austrostipa nullanulla*.

- while a number of Aboriginal sites would be affected by the project a Cultural Heritage Management Plan to address cultural heritage impacts is in preparation in consultation with the local Aboriginal community; and

- outcomes from other environmental assessments reveal that the project is not expected to have material impact on air quality, visual amenity, surface water, soil, and traffic and transport.

In view of the above, and the client preparing management plans to minimise potential impacts, the impact of the project on identified externalities have not been quantified.

10.4 Local effects analysis results

Based on results in the preceding sections, the table below provides a summary of LEA results for the Copi mine project during both the construction as well as operational phases. It is important to note that the results of LEA are not additive to either the components of the LEA or the CBA/EIA results (the results presented here are largely already covered in the CBA and EIA sections).

Table 17 Estimated local effects – construction and operational results for Copi mine project

Metric	Unit	Construction phase		Operational phase	
		Project direct: Total	Project direct: Local	Project direct: Total	Project direct: Local
Direct employment	FTE	480	240	240	120
FTE equivalent of increase in income	FTE	169	84	14	7
Other non-labour expenditure					
2024	$million	$43.07	$13.84	-	-
2025	$million	$263.34	$84.61		
2026	$million	$234.45	$75.33		
2027	$million	$103.50	$33.25	$115.23	$29.64
2028	$million	-	-	$313.94	$80.75
2029	$million	-	-	$372.40	$95.79
2030	$million	-	-	$379.57	$97.63
2031+	$million	-	-	$353.36	$90.89
Road and rail externalities	$million	-	-	($50)	($3)
Greenhouse gas emissions	$million	-	-	($99)	($84)

Source: Synergies modelling.

11 Approach to economic impact assessment

This section details our approach to undertaking the EIA of the Copi mining project and the key assumptions adopted.

11.1 Modelling methodology

The EIA modelling is complementary to the CBA modelling and draws on the comprehensive data on capital expenditure and operational activity associated with the project presented in the preceding sections. While CBA (including LEA) focuses on primary impacts (i.e. first round impacts) in terms of welfare changes, including changes in producer and consumer surplus, EIA modelling encompasses flow-on impacts (second and third-round impacts) on parties who are subsequently affected by the project's primary impacts (i.e. capital expenditure, operational expenditure, increased production).

The economic impacts for the Copi mine project have been estimated using a non-linear input-output (NLIO) model. At the heart of the model is a static representation of an economy called an input output (I-O) table, which reflects the interdependencies between 19 industry sectors (based on 1-digit ANZSICs, or Australian and New Zealand Standard Industrial Classification divisions).

The conventional approach to I-O modelling, called the linear approach, is built around several simplifying assumptions that may result in unreliable or invalid estimates of impacts. This includes an assumption that, when a sector of the economy is stimulated, all factors in the production process shift proportionally, yet in reality this seldom holds perfectly true. The linear I-O modelling approach also excludes economic constraints, that is, it places no limitations on resources when an industry expands and does not account for the potential for increased demand to push up prices and thereby encourage sourcing from outside the economic region of the study.

Using a non-linear I-O model largely overcomes this weakness by relaxing the constraining assumption that all factors of production shift in proportion to each other. By applying marginal coefficients in the I-O model, the non-linear approach provides a more accurate representation of the flow-on impacts of a stimulus than would otherwise be generated using a linear I-O model. Synergies' I-O model has been developed 'in-house' using best practice standards for non-linear I-O modelling.[40] Further technical details on the I-O model is set out in Appendix A.

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[40] The method adopted by Synergies for preparing the regional I-O tables is consistent with the GRIT method, as documented in West, G., R. (1980). *Generation of Regional Input-Output Tables (GRIT): An Introspection. Economic*

The box below provides additional details on economic impacts based on the I-O framework.

Box 1   Economic impacts based on the I-O framework

Impact modelling based on the I-O framework is driven by what is called 'shifts in final demand'. This means that additional expenditure on finished products (final demand) represents a stimulus to economic activity.

It is important to note that if this additional expenditure is exogenous (i.e. originates from outside the host economy), it is particularly valuable to the local economy because it represents additional new investment rather than displacement from other areas of past spending within that economy (endogenous spending). Generally, the main factors that govern how influential an industry will be terms of economic impact are:

- *Endogenous vs Exogenous*: the extent to which the activity brings in new spending to the economy rather than simply displacing existing activity.

- *Leakage*: the extent of leakage from the host economy, for example, through the need for imports in the production process, or the repatriation of profits and dividends. The more leakage, the less impact the activity has on the domestic economy.

- *Linkage*: The extent to which the production of the product is linked to other sectors in the economy. The more integrated a sector is to the domestic economy, the greater the impact of exogenous expenditure.

11.2 Key assumptions

The geographic areas for the Copi mine project have been defined having regard to two factors:

- The area of jurisdiction for the sponsoring agency (i.e. agency responsible for project evaluation, project approval, project funding and/or project spending); and

- The area of direct project influence (i.e. the area in which the people and relevant economy are affected).

In view of this, and because the separation of minerals for the Copi project occurs at the Pinkenba MSP in South East Queensland, economic impacts are assessed in the following viewpoints (see Figure 12):

- From the viewpoint of the state of NSW

- From the viewpoint of the Wentworth local government area (LGA)

- From the viewpoint of Greater Brisbane.

Analysis and Policy, 10, pp. 71-86; and West, G., R., Morison J., B. and Jensen, R., C. (1984). *A Method for the Estimation of Hybrid Interregional Input-Output Tables*. Regional Studies, 18(5), pp. 413–422.

The reason for the state and local geographical viewpoints pertaining to NSW is to highlight the greater impacts to be derived from the viewpoint of the State (as opposed to the local) economy. This is because NSW represents a complete economy and particular sectors will be more integrated to other sectors in the economy. Specifically, inter-industry linkages are few and shallow in small regions since they do not have the capacity to produce the wide range of goods needed for inputs and consumption (importing a large proportion of these from other regions).

Figure 12 Regions for EIA
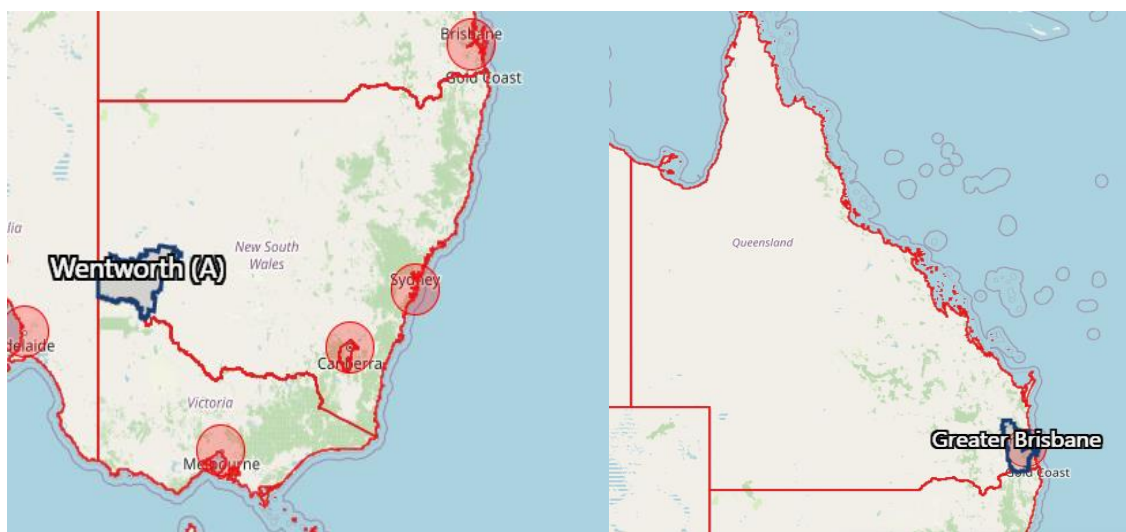
Source: Australian Bureau of Statistics (2022) – Data by Region – Map Data power by ESRI.

Additional key assumptions underpinning the EIA are as follows:

- 480 full-time employees (FTEs) during Copi construction[41]

- 200 FTEs during Copi operations, in addition to 40 rehabilitation jobs[42].

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[41] Modelled direct employment results have been replaced with the direct employment numbers provided by RZ Resources. While this resulted in the adjustment of the direct labour income metric (so that it appropriately reflects the total number of employees directly employed), flow-on labour income and employment impacts have been derived based on the inputs and assumptions in Synergies' in-house I-O modelling approach (see Appendix A).

[42] Ibid.

11.3 Overview of approach

11.3.1 Step 1: Developing socioeconomic profile

Key socioeconomic indicators for the Wentworth LGA have been assessed in order to highlight the current economic climate in the region and develop a baseline understanding of the community potentially impacted by the proposed Copi project.

11.3.2 Step 2: Developing NLIO tables

NLIO tables have been developed for the Wentworth LGA, NSW, and Greater Brisbane. This enables the positive economic impacts of the mine to be assessed at the regional and state levels. The latest (2018-19) national I-O table published by the Australian Bureau of Statistics (ABS) was used as the base table, which was subsequently calibrated and regionalised using other more granular data (see Appendix A for further details).

11.3.3 Step 3: Establishing stimulus amounts

The economic impact assessment is undertaken for two different stimulus amounts:

- Capital expenditure – initial capital expenditure associated with the construction of the Copi mine and associated infrastructure to be incurred in Year 1 (2024/25) to Year 4 (2027/28)

- Operational impacts – based on the value of production of minerals and rare earths over the 19-year operating life of the Copi mine project.

The operational impacts of the projects are to be assessed over two-time horizons:

- 2027-2030 (impacts to be estimated on an annual basis)

- 2031-2045 (impacts estimated for average annual mining revenues over the noted period).

The reason for the two different time horizons is that there is potential for material shifts in the way economies, industries, and markets operate when estimating economic impacts over this long timeframe. That is, the structure of economies, and the linkages between the mining sector and other sectors of the economy, may be significantly different over the 2029 to 2045 period than implied in the current NLIO model.

While the NLIO model, and thereby economic and employment multipliers developed based on the current structure of the regional and state economies, can be applied to

production and expenditure estimates over this timeframe, the results generated by the model will need to be interpreted with caution and taken to be indicative impacts.[43]

Capital costs

As detailed in section 6.1, the initial capital costs to be incurred in relation to the Copi mine project will be incurred in year 1 to 4 (i.e. FY2027). As discussed above, as capital expenditure is to be incurred in both the Wentworth region in NSW and in Greater Brisbane, it is necessary to allocate capital costs to the two regions prior to undertaking the economic impact modelling.

Capital costs are distributed by geographical area according to the expenditure breakdown in Table 3 – only three items in the list appear relevant for the estimation of economic impacts in the Greater Brisbane region ("Pinkenba MSP", "Pinkenba MSP Infrastructure" and "Mobile Equipment (MSP)"). Costs associated with the remaining items are subsequently applied as the expected economic stimulus within the state of NSW and Wentworth LGA. This results in capital cost estimates for the two regions as follows (all capital costs incurred in FY2024):

- $887.49 million in Wentworth, NSW

- $58.14 million in Greater Brisbane, QLD.[44]

Value of minerals and rare earths production

Table 18 details the stimulus amounts modelled for the operational phase of the Copi mine project. The value of production of mineral sands and rare earths was apportioned between the two regions based on the costs incurred over the operational period. That is, for every one per cent of operating costs incurred within the Wentworth LGA region, one per cent of operational revenue was allocated to the region (and vice versa for Greater Brisbane).[45]

Table 18 Production stimuli by geographical area ($million)

Financial year	Wentworth and NSW	Greater Brisbane
2027	$124.19	$21.46

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[43] Developing a future series of I-O tables requires extensive data and information on the relationships between industries, products and decision-makers within an economy, which are typically obtained through surveys or direct data requests.

[44] Based on cost information and estimates provided by RZ Resources.

[45] As two operational cost items are relevant to project operations in SEQ – 'Mineral separation', and 'Port storage and handling' – revenue was allocated to SEQ on the basis of the proportion of total operating costs attributable to these two cost items. The balance of operational revenue was allocated to the Wentworth LGA in NSW.

Financial year	Wentworth and NSW	Greater Brisbane
2028	$338.36	$58.00
2029	$401.37	$70.95
2030	$409.11	$61.68
Average Annual (2031-45)	$380.85	$56.12

Source: Data provided by RZ Resources.

11.3.4 Step 4: Reporting economic impacts

Economic impacts are commonly assessed across four key measures:

- *Total output (turnover)* – measures the gross value of economic activity generated or facilitated by the project;

- *Gross State Product/Gross Regional Product* – measures the net value of economic activity generated or facilitated by the project (differs from 'Output' because only the final value added is considered at each stage of production as opposed to the entire transactional value across the production chain);

- *Labour income (wages)* – this is a measure of the share of gross product (and gross output) which is directly paid to individuals in the form of wages; and

- *Employment* – measures the total number of FTE jobs generated or facilitated by the project.

The measures are subsequently divided into three types:

- *Direct impacts* – these relate to activities directly attributable to the project, in particular investments associated with developing and operating the Copi mine and associated infrastructure, and revenues generated by the sale of minerals and rare earths;

- *Indirect impacts* – these relate to production activities upstream of the project by industries that supply into the sector directly supplying the final product or service. This includes machinery, equipment and other supporting products and services; and

- *Induced impacts* – these relate to activities generated by the spending of additional income directly or indirectly related to the activity for which impacts are being assessed. This includes the spending of wages on accommodation, food services and other sectors of the economy.

The overall economic impact of any expenditure or stimulus is the sum of these three impacts.

12 Economic impact analysis results

This section details the results of the EIA for the construction and operational period of the Copi mine project by geographical area.

12.1 Impacts on the NSW Economy

The following subsections detail the results of the economic impact modelling for the state of NSW.

12.1.1 Construction phase

The economic impact modelling results show that the capital expenditure associated with the Copi mine project to be incurred in FY2024 through to FY2027 will provide the following overall contributions to the NSW economy:

- $1.86 billion in additional output

- GSP contribution of $718 million

- $351 million in labour income

- employment supported of 1,465 FTEs (peak).

The breakdown of the overall contributions by direct, indirect, and induced impacts is provided in the table below.

Table 19 NSW – construction phase results for Copi project (2024-2027)

Metric	Unit	Direct impacts	Indirect impacts	Induced impacts	Total impacts
2024					
Total output	$million	$59.32	$38.34	$26.47	$124.13
Gross state product	$million	$20.46	$15.87	$11.63	$47.96
Labour income	$million	$63.68	$8.12	$5.83	$77.63
Employment supported	FTEs	480	93	68	641
2025					
Total output	$million	$362.71	$234.44	$161.85	$759.00
Gross state product	$million	$125.09	$97.02	$71.13	$293.24
Labour income	$million	$63.68	$49.67	$35.63	$148.99
Employment supported	FTEs	480	568	417	1,465
2026					
Total output	$million	$322.91	$208.72	$144.10	$675.73
Gross state product	$million	$111.37	$86.37	$63.33	$261.07
Labour income	$million	$63.68	$44.22	$31.72	$139.63
Employment supported	FTEs	480	506	371	1,357

Metric	Unit	Direct impacts	Indirect impacts	Induced impacts	Total impacts
2027					
Total output	$million	$142.55	$92.14	$63.61	$298.30
Gross state product	$million	$49.16	$38.13	$27.96	$115.25
Labour income	$million	$63.68	$19.52	$14.00	$97.21
Employment supported	FTEs	480	223	164	867

Source: Synergies modelling.

In addition to the up-front capital expenditure associated with the development of the project, the sustaining capital expenditure to be incurred throughout the operational period of the project will also result in beneficial impacts to the NSW economy. The total impacts (i.e. average annual impacts summed for the 19-year operational period) on the NSW economy are as follows:

- $217.31 million in terms of output

- GSP contribution of $83.96 million

- $41.03 million in labour income

- employment supported of 25 FTEs.

12.1.2 Operational phase

The economic impact modelling results show that the production stimuli associated with the Copi mine project over the FY2027-45 operational period will provide the following overall contributions to the NSW economy:

- $12.16 billion in terms of output

- GSP contribution of $4.6 billion

- $1.7 billion in labour income

- employment supported of 1,133 FTEs (at peak year).

The breakdown of the overall contributions by direct, indirect, and induced impacts is provided in the table below. As noted in section 11.3, due to the potential impact on structural changes in the economy on the linkages between industries, impacts modelled beyond a five-year time horizon can be interpreted as indicative only.

Table 20   NSW – operational phase results for Copi mine project

Metric	Unit	Direct impacts	Indirect impacts	Induced impacts	Total impacts
2027					
Total output	$million	$124	$64	$41	$230

Metric	Unit	Direct impacts	Indirect impacts	Induced impacts	Total impacts
Gross state product	$million	$39	$29	$18	$86
Labour income	$million	$26	$15	$9	$50
Employment supported	FTEs	240	165	106	511
2028					
Total output	$million	$338.36	$175.44	$111.86	$625.67
Gross state product	$million	$106.44	$79.22	$49.16	$234.82
Labour income	$million	$26.38	$40.79	$24.62	$91.79
Employment supported	FTEs	240	450	288	978
2029					
Total output	$million	$401.38	$208.12	$132.70	$742.20
Gross state product	$million	$126.27	$93.98	$58.31	$278.56
Labour income	$million	$26.38	$48.39	$29.21	$103.97
Employment supported	FTEs	240	534	341	1,116
2030					
Total output	$million	$409.10	$212.12	$135.25	$756.47
Gross state product	$million	$128.69	$95.78	$59.44	$283.91
Labour income	$million	$26.38	$49.32	$29.77	$105.47
Employment supported	FTEs	240	545	348	1,133
2031+					
Total output	$million	$380.85	$197.47	$125.91	$704.23
Gross state product	$million	$119.81	$89.17	$55.33	$264.31
Labour income	$million	$26.38	$45.92	$27.71	$100.00
Employment supported	FTEs	240	507	324	1,071

Note: Direct labour income and employment are constant due to the availability of limited data (Synergies has been provided a single FTE estimate for the operational period).

Source: Synergies modelling.

12.2 Impacts on the Wentworth LGA economy

The following subsections detail the results of the economic impact modelling for the Wentworth LGA.

12.2.1 Construction phase

The economic impact modelling results show that the capital expenditure associated with the Copi mine project to be incurred in FY2024 will provide the following overall contributions to the Wentworth LGA economy:

- $1.28 billion in additional output

- GSP contribution of $339 million

- $308 million in labour income

- employment supported of 754 FTEs (peak).

The breakdown of the overall contributions by direct, indirect, and induced impacts is provided in the table below.

Table 21   Wentworth LGA – construction phase results for Copi project

Metric	Unit	Direct impacts	Indirect impacts	Induced impacts	Total impacts
2024					
Total output	$million	$59	$16	$11	$86
Gross state product	$million	$16	$4	$3	$23
Labour income	$million	$64	$2	$1	$67
Employment supported	FTEs	480	25	20	525
2025					
Total output	$million	$363	$96	$64	$523
Gross state product	$million	$95	$27	$17	$139
Labour income	$million	$64	$13	$9	$86
Employment supported	FTEs	480	151	123	754
2026					
Total output	$million	$323	$86	$57	$466
Gross state product	$million	$85	$24	$15	$123
Labour income	$million	$64	$12	$8	$83
Employment supported	FTEs	480	134	109	724
2027					
Total output	$million	$143	$38	$25	$206
Gross state product	$million	$37	$11	$7	$54
Labour income	$million	$64	$5	$3	$72
Employment supported	FTEs	480	59	48	588

Source: Synergies modelling.

The total impacts (i.e. average annual impacts summed for the 19-year operational period) from sustaining capital expenditure incurred over the operational period of the Copi mine project on the Wentworth LGA economy are as follows:

- $149.7 million in terms of output

- GSP contribution of $39.7 million

- $17.5 million in labour income

- employment supported of 9 FTEs.

It is important to note that modelled indirect and induced impacts are lower for the regional results than the state results because it reflects a smaller geographic area and, thus, it does not represent a whole economy. Specifically, small regions do not have the

capacity to produce the range of goods needed for inputs and consumption. They instead import these goods from other regions (i.e. smaller regions have relatively shallower inter-industry linkages).

12.2.2 Operational phase

The economic impact modelling results show that the production stimuli associated with the Copi mine project over the FY2027-45 operational period will provide the following overall contributions to the Wentworth LGA economy:

• $10.69 billion in terms of output

• Gross Regional Product contribution of 1.56 billion

• $848 million in labour income

• up to 580 FTEs supported (at peak year).

The breakdown of the overall contributions by direct, indirect, and induced impacts is provided in the table below.

Table 22 Wentworth LGA – operational phase results for Copi project

Metric	Unit	Direct impacts	Indirect impacts	Induced impacts	Total impacts
2027					
Total output	$million	$124.19	$50.38	$15.49	$190.06
Gross regional product	$million	$11.60	$11.55	$4.60	$27.76
Labour income	$million	$20.64	$5.57	$2.54	$28.75
Employment supported	FTEs	240	69	35	343
2028					
Total output	$million	$338.36	$137.27	$42.20	$517.83
Gross regional product	$million	$31.62	$31.48	$12.53	$75.63
Labour income	$million	$20.64	$15.18	$6.91	$42.73
Employment supported	FTEs	240	187	94	521
2029					
Total output	$million	$401.38	$162.83	$50.06	$614.27
Gross regional product	$million	$37.51	$37.34	$14.87	$89.71
Labour income	$million	$20.64	$18.01	$8.20	$46.85
Employment supported	FTEs	240	222	112	574
2030					
Total output	$million	$409.10	$165.96	$51.02	$626.08
Gross regional product	$million	$38.23	$38.06	$15.15	$91.44
Labour income	$million	$20.64	$18.35	$8.36	$47.35
Employment supported	FTEs	240	226	114	580

Metric	Unit	Direct impacts	Indirect impacts	Induced impacts	Total impacts
2031+					
Total output	$million	$380.85	$154.50	$47.50	$582.85
Gross regional product	$million	$35.59	$35.43	$14.11	$85.13
Labour income	$million	$20.64	$17.09	$7.78	$45.51
Employment supported	FTEs	240	211	106	557

Note: Direct labour income and employment are constant due to the availability of limited data (Synergies has been provided a single FTE estimate for the operational period).
Source: Synergies modelling.

12.3 Impacts on the Greater Brisbane economy

The following subsections detail the results of the economic impact modelling for the Greater Brisbane region.

12.3.1 Construction phase

The economic impact modelling results show that the capital expenditure incurred in FY2024[46] will provide the following contributions to the Greater Brisbane economy:

- $122 million in terms of output

- GRP contribution of $34 million

- $19 million in labour income

- up to 90 FTEs supported (peak).

The breakdown of the overall contributions by direct, indirect, and induced impacts is provided in the table below.

Table 23   Greater Brisbane – construction phase results for Copi project (FY2024)

Metric	Unit	Direct impacts	Indirect impacts	Induced impacts	Total impacts
2024					
Total output	$million	$3.89	$2.89	$1.39	$8.17
Gross state product	$million	$0.83	$0.96	$0.51	$2.30
Labour income	$million	$0.47	$0.52	$0.25	$1.24
Employment supported	FTEs	5	6	3	15
2025					
Total output	$million	$23.76	$17.69	$8.51	$49.97
Gross state product	$million	$5.08	$5.87	$3.10	$14.05

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[46]   Noting that all economic impacts in relation to sustaining capital expenditure over the operational life of the Copi mine project have been attributed to the NSW economy.

Metric	Unit	Direct impacts	Indirect impacts	Induced impacts	Total impacts
Labour income	$million	$2.88	$3.15	$1.55	$7.58
Employment supported	FTEs	34	37	19	90
2026					
Total output	$million	$21.15	$15.75	$7.58	$44.49
Gross state product	$million	$4.52	$5.22	$2.76	$12.51
Labour income	$million	$2.56	$2.80	$1.38	$6.74
Employment supported	FTEs	30	33	17	80
2027					
Total output	$million	$9.34	$6.95	$3.35	$19.64
Gross state product	$million	$2.00	$2.31	$1.22	$5.52
Labour income	$million	$1.13	$1.24	$0.61	$2.98
Employment supported	FTEs	13	15	7	35

Source: Synergies modelling.

12.3.2 Operational phase

The economic impact modelling results show that the production stimuli associated with the Copi mine project over the FY2027-45 operational period will provide the following overall contributions to the Greater Brisbane economy:

- $1.54 billion in terms of output

- GRP contribution of $620 million

- $171 million in labour income

- up to 114 FTEs supported.

The breakdown of the overall contributions by direct, indirect, and induced impacts is provided in the table below.

Table 24 Greater Brisbane – operational phase results for Copi project

Metric	Unit	Direct impacts	Indirect impacts	Induced impacts	Total impacts
2027					
Total output	$million	$21.45	$6.22	$3.92	$31.60
Gross regional product	$million	$8.76	$2.49	$1.43	$12.68
Labour income	$million	$1.60	$1.18	$0.71	$3.49
Employment supported	FTEs	13	13	9	35
2028					
Total output	$million	$58.00	$16.83	$10.61	$85.43
Gross regional product	$million	$23.69	$6.73	$3.86	$34.29
Labour income	$million	$4.33	$3.19	$1.93	$9.44

Metric	Unit	Direct impacts	Indirect impacts	Induced impacts	Total impacts
Employment supported	FTEs	34	35	24	93
2029					
Total output	$million	$70.94	$20.58	$12.98	$104.50
Gross regional product	$million	$28.98	$8.24	$4.72	$41.94
Labour income	$million	$5.29	$3.90	$2.36	$11.55
Employment supported	FTEs	42	43	29	114
2030					
Total output	$million	$61.69	$17.90	$11.28	$90.87
Gross regional product	$million	$25.20	$7.16	$4.11	$36.47
Labour income	$million	$4.60	$3.39	$2.05	$10.04
Employment supported	FTEs	36	38	25	99
2031+					
Total output	$million	$56.13	$16.28	$10.27	$82.68
Gross regional product	$million	$22.93	$6.52	$3.74	$33.18
Labour income	$million	$4.19	$3.08	$1.87	$9.14
Employment supported	FTEs	33	34	23	90

Source: Synergies modelling.

13   Impact on the regional labour market

This section assesses the impact of the Copi mine project on the regional labour market, including the extent to which labour requirements in both the construction and operational phase of the project will be met through sourcing labour from the regional labour market.

13.1 Labour sourcing

The following steps are required to assess the extent to which the regional labour market will be capable of meeting the labour requirements for the Copi mine project:

1) Assess the potential sources of labour supply in the regional economy, where at least some of the required skills and qualifications are available.

2) Assess the extent to which the potential labour supply sources are feasible sources of labour supply for RZ Resources, having regard to labour force data and the occupational and industrial structure of the regional economy.

3) Analyse the extent to which the feasible labour supply potential of the regional economy could be used to meet the labour requirements of the Copi mine project.

13.1.1 Potential labour supply

A regional labour market can be defined spatially as economically integrated areas within which individuals can reside and find employment within a reasonable distance or can readily change jobs without changing their place of residence.[47] As with all markets, regional labour markets have both a supply and demand side. On the demand side, employers (in this case RZ Resources) require the supply of labour services that can be delivered on site or externally when required. On the supply side, these services can be delivered by residents within the regional economy, periodic residents (i.e. Fly In Fly Out FIFO workers), or remote workers.

The starting point to determining the potential labour supply that RZ Resources could draw upon to meet the initial and ongoing labour requirements of the Copi mine project is to examine the active workforce in the surrounding region.

The 'Marchetti's constant' is a commonly used measure in labour supply assessments that suggests that the maximum sustainable commuting time for a one-way commute is

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[47]   Slone, P. (2009). Labour market segmentation; analysing a local labour market by alternative methods. *Applied Economics* 29(5), pp 569-581.

30 minutes. This is based on the following factors mitigating against requiring workers to commute for over one hour per day over the long term:

- people's happiness and overall sense of satisfaction decreases with each successive minute of commute exceeding 30 minutes;

- longer commutes are positively related to increased stress and obesity;

- risk of physical injury increases with long commutes; and

- commuting is associated with back pain, sleep deprivation, lower exercise, and lower quality diet and nutrition.[48]

As detailed in Section 9.1, the Wentworth LGA has a total population of 7,753. The closest town with a significant population centre is Mildura, which is located approximately 30 kilometres from Wentworth, with a population of over 58,000 within the council area. The table below presents key labour force data for the Wentworth-Buronga region[49] and Mildura.

Table 25 Labour force data for the Wentworth and Mildura regions

Metric	Mildura	Wentworth-Buronga region
Labour force[a]	35,250	4,473
Employed persons	23,188	2,960
Employment rate[b]	66%	66%
Unemployed persons	1,375	142
Unemployment rate	4.0%	3.2%
Participation rate	65.7%	69.3%

a Includes persons who are employed but temporarily away from work.

b To aid comparison with other ABS data, rates were calculated using the ILO definition of the working age population (persons aged between 15 and 64). For the 2021 Census update, the ABS defined the labour force as those aged above 15 years. This change was made in recognition of the increasing number of persons over 64 years of age who are active in the labour market.

Note: Due to the unavailability of some labour force data, a combination of different ABS data sources were relied upon to compile data for some indicators. Calculations for employment and participation are based on the working age population between 15 and 64 years.

Source: 2021 Wentworth, Census Community Profiles | Australian Bureau of Statistics (abs.gov.au)50 and https://abs.gov.au/census/find-census-data/quickstats/2021/21502

By way of comparison, key metrics for the Australian labour force are as follows:

- employment rate of 65.6 per cent

- unemployment rate (all persons) of 3.5 per cent

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48   Shelly, T. (2019). How Long is Too Long to Commute?

49   Developed based on small area labour market data.

50   Census data for 2021 was chosen in preference to the small area data for 2022 as they are more robust and less subject to sample error

- participation rate (all persons) of 66.6 per cent.[51]

The above data demonstrates that conditions in the regional labour market are comparable to the Australian labour market. In particular, the low unemployment rate and high participation rate in the Wentworth-Buronga region are reflective of the labour supply constraints being experienced across regional Australia.[52]

Labour markets in rural and regional areas tend to be more focused around specific industries (such as Agriculture, Forestry, and Fishing) and as such have a narrower industrial and occupational focus. This can lead to higher structural unemployment in these areas, noting the current labour force data indicates a relatively tight labour market in both the Wentworth-Buronga region and in Mildura.

Noting this, the data still indicates there are currently 142 unemployed persons seeking work in the Wentworth-Buronga region and a further 1,375 in Mildura (1,517). This represents a potential source of labour supply for the Copi mine project (noting these unemployed persons must possess skills and qualifications required by the project). The following sections assesses the extent to which the potential labour supply in the regional economy represents feasible labour supply potential for the Copi mine project.

13.1.2 Feasible labour supply potential

Having identified the potential labour supply in the regional labour market, the next step is to assess the extent to which the available labour supply is likely to be a feasible source of labour for the Copi mine project.

The ABS use Gross Labour Market Flow Data to track movements in the labour market between the states of employment (full time and part time), unemployment, and not in the labour force (NLF). This data shows the rate of transition between these different employment states. To date, data has been gathered for the years 1992 to 2008.[53] In particular, this data shows that the majority of newly created jobs (such as those to be created by the Copi mine project) are filled by those already in full-time employment, followed by unemployed persons (those persons without employment but actively

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[51] The Labour Force Australia, August 2022. Labour Market Update | Labour Market Insightforce-Australia/August-2022

[52] Noting that structural unemployment in regional areas can tend to lower official unemployment rates.

[53] Fahrer, J. & Heath, A. (1992). Gross Labour Market Flows and the Duration of Employment. Reserve Bank of Australia Paper 9215.

seeking work), with persons from outside the labour market making up the smallest proportion.[54]

The implication from these observations is that while it is instructive to assess the number of unemployed persons or the proportion of the population that is not in the labour force within the regional economy, to robustly assess the feasible labour supply potential of a region it is necessary to examine the occupational and industrial structure of the regional economy and contrast this with the project's required labour force. This information is summarised in Table 26.

Table 26 Occupational and industrial structure of Wentworth and Mildura labour forces

Indicator	Wentworth	Mildura
Key industries	• Agriculture, Forestry and Fishing • Health Care and Social Assistance • Mining • Retail Trade • Education and Training • Key sub-sectors from the Agriculture, Forestry and Fishing include Grape Growing, Citrus Growing, and Sheep Farming	• Health Care and Social Assistance • Agriculture, Forestry and Fishing • Retail Trade • Construction • Strong employment growth in Health Care and Social Assistance, Construction, Public Administration and Safety, and Manufacturing over the 2015-20 period
Major occupations	• Managers (primarily agriculture) – 21.4% • Labourers – 19.7% • Technicians/Tradespersons – 14.1% • Professionals – 11.5%[a]	• Managers (primarily agriculture) – 17% • Professionals – 15.3% • Technicians/Tradespersons – 12.9% • Labourers – 13.8%[a]
Workforce with tertiary qualifications	• 10.1% (compared to 31% for the Australian workforce)[b]	• 10.4% (compared to 31% for the Australian workforce)[b]
Workforce with trade and technical qualifications	• 23.7% with a Certificate III or IV (compared to around 40% for Australian workforce)[c]	• 23.9% with a Certificate III or IV or a Diploma or Advanced Diploma (compared to around 40% for Australian workforce)

a Percentage of the population (not labour force).

b Australian Careers Service; 'An Overview of the Australian Workforce'; See: https://australiancareersservice.com.au/industry-news/overview-australian-workforce

c ABS (2020). Qualifications and Work.

Note: The data informing the assessment of occupational and industry structure in the Wentworth and Mildura labour force are based on ABS 2016 and 2021 Census data, with additional data sourced from the Mildura Regional Council and Wentworth Region Community profile.

Sources: Mildura Regional Council (2021); Mildura (RC) and 2016 Census All Persons Quick Stats.

Key observations from the above table are as follows:

• the workforce in both Wentworth and, albeit to a lesser extent, Mildura contain a high proportion of Managers, Labourers, Technicians and Tradespersons, and Machinery Operators and Drivers. Based on the industrial structure of the regional

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[54] Lig, R. (2009). Analysing GCPS data using Gross Flows; See: https://www.bing.com/search?q=bill+mitchell+gross+flow+data&cvid

economy, it is likely the majority of persons in these occupations are employed in the 'Agriculture, Forestry and Fishing' industry;

- there is relatively low availability of Professionals in the Wentworth LGA, with the proportion of Professionals in Mildura being materially higher, albeit still well below the NSW proportion of 28.2 per cent;[55] and

- the proportion of the workforce with tertiary qualifications is low in both Wentworth and Mildura, while the proportion of the workforce with trade and technical qualifications is also well below the national average.

In terms of implications for the Copi mine project, the available labour force data indicates that the key opportunities for sourcing labour from the regional labour market will be in relation to technicians and tradespersons, labourers, and transport and machinery operators.

In addition to unemployed persons and existing employed persons, there is also the potential for labour to be sourced from outside of the current labour force, including discouraged workers (i.e. persons unemployed but not actively seeking work), persons currently engaged in full-time study, and persons currently working in volunteer positions.

Furthermore, it is noted that two mineral sands mines in the broader region are projected to close within the next four years (Snapper and Gingko), with an additional mine (Euston) projected to commence production in the short to medium term. These projects also have the potential to impact on the feasible labour supply for the Copi mine project, noting that the materially of the impact will be subject to the labour requirements (magnitude and nature) and labour sourcing strategy of these projects, which was not available to inform this assessment.

13.1.3 Implications for Copi mine project

RZ Resources has provided a breakdown of the labour requirements of the Copi mine project, both in the construction and operational phases of the project. These requirements have been assessed against the feasible labour supply potential of the regional economy as defined in the preceding section. Conclusions have subsequently been drawn in relation to the extent to which the project's labour requirements are likely to be able to be met through sourcing labour from within the regional labour market. The table below details the assessment based on labour requirements during the construction phase.

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[55] With Professionals in Mildura likely to be heavily concentrated in the Health and Social Assistance industry.

Table 27 Labour requirements during construction phase of Copi mine project

Occupation	FTEs required	Availability in regional labour market
Managers	19	• Managers are the most common occupation in both Wentworth and Mildura; however, these workers are heavily concentrated in the agriculture sector. • Noting this, construction is the fourth largest industry in Mildura in terms of employment, indicating significant potential to source these FTEs from within the regional economy. • The National Skills Commission predicts high demand for Construction Managers (ANZSCO 1331) throughout Australia at 10.2% annual growth to 2026, indicating strong competition for these workers.
Professionals	38	• Labour force data indicates that the only source of Professionals in the regional labour market are likely to be employed persons in the Health and Social Assistance industry and, to a lesser extent, the Agriculture, Forestry and Fishing industry. • To the extent RZ Resources' labour sourcing strategy involves attracting workers from these industries within the regional labour market, this is likely to involve significant retraining costs.
Technicians and Trade Workers	154	• While both the Wentworth and Mildura regions have a high proportion of Technicians and Trade Workers relative to the NSW economy, these workers are likely to be heavily concentrated in the agriculture sector • Hence, while there is scope for a material proportion of these positions to be filled from within the regional economy, the extent to which the Copi mine project will need to source technicians and trade workers from outside of the region will depend on the extent to which the skills and qualifications of the region's existing labour force in this occupation are aligned with the project's requirements.
Clerical and Administrative Workers	26	• Labour force data indicates RZ Resources will be able to source these workers from within the regional labour market, either from currently employed or unemployed persons.
Machinery Operators and Drivers	73	• The Agriculture, Forestry, and Fishing industry is the most prominent industry in Wentworth and second most prominent industry in Mildura in terms of number of employed persons. • Given the typical skills and capabilities of persons employed in this sector, it is anticipated that available workers would be able to adapt to the requirements of these positions and hence would be able to be sourced primarily from within the regional labour force.
Labourers	170	• Labourers account for a significant proportion of employed persons in both Wentworth and Mildura. • It is expected that RZ Resources will be able to source a material proportion of these workers from within the regional labour market, either from currently employed or unemployed persons.

Source: Labour requirements provided by RZ Resources; Synergies analysis.

The nature of the jobs required during the construction phase of the Copi mine project indicate that a material proportion of positions are likely to be able to be sourced from within the regional labour market. In addition to the generally tight labour supply in the regional economy and the significant number of workers required, the key constraint is likely to be in relation to Professional workers, noting that the regional economy has a low proportion of Professionals and that these workers are unlikely to have skills and qualifications that are aligned with the project's requirements.

Another potential constraint is in relation to Technicians and Trade Workers. Noting the regional economy has a higher proportion of workers in these occupations that the NSW average, it is uncertain as to whether the skills and qualifications possessed by these

workers will be aligned with the project's requirements. In addition, the number of FTEs required in this category is significant relative to the size of the regional labour market. Hence, it may be necessary for the project to source a proportion of these positions from outside of the regional labour market. As noted above, the impacts of the planned closures of two mineral sands mines in the broader region may also provide a significant source of potential labour supply that could be used to meet the project's labour requirements during the construction phase.

The table below details the assessment based on labour requirements during the operational phase.

Table 28 Labour requirements during operational phase of Copi mine project

Occupation	FTEs required	Availability in regional labour market
Managers	10	• Managers are the most common occupation in both Wentworth and Mildura; however, these workers are heavily concentrated in the agriculture sector. • Noting this, subject to some retraining requirements, it is expected RZ Resources will be able to source this labour through the regional labour market.
Professionals	52	• Labour force data indicates that the only source of Professionals in the regional labour market are likely to be employed persons in the Health and Social Assistance industry and, to a lesser extent, the Agriculture, Forestry and Fishing industry. • Given the size of the regional labour market, low proportion of workers categorised as Professionals, and significant FTE requirement for the Copi mine project, it is expected that RZ Resources will need to meet most of these FTEs by sourcing labour from outside the regional labour market.
Technicians and Trade Workers	38	• Both the Wentworth and Mildura regions are relatively deficient in terms of the proportion of the labour force made up of Technicians/Tradespersons and the proportion of people with trade and technical qualifications. • While entry level workers may be available through education and training institutions, this is likely to represent a significant gap and require RZ Resources to source labour from outside of the regional labour force.
Clerical and Administrative Workers (and Sales Workers)	10	• Labour force data indicates RZ Resources will be able to source these workers from within the regional labour market, either from currently employed or unemployed persons.
Machinery Operators and Drivers	76	• The Agriculture, Forestry, and Fishing industry is the most prominent industry in Wentworth and second most prominent industry in Mildura in terms of number of employed persons. • Given the typical skills and capabilities of persons employed in this sector, it is anticipated that available workers would be able to adapt to the requirements of these positions and hence would be able to be sourced from within the regional labour force (noting that the number of FTEs required may mean wage premiums need to be offered to attract workers from current positions).
Labourers	54	• Labourers account for a significant proportion of employed persons in both Wentworth and Mildura. • It is expected that RZ Resources will be able to source these workers from within the regional labour market, either from currently employed or unemployed persons.

Source: Labour requirements provided by RZ Resources; Synergies analysis.

As with the construction phase, the requirement for Technicians and Trade Workers represents a potential constraint on the project's capacity to meet its labour requirements through the regional labour market. In addition, the project will need to source the majority of Professionals required from outside of the regional economy, noting the significant number of Professionals that are required by the project, the low proportion of workers in these occupations in the regional economy, and the likelihood that existing Professionals in the region are concentrated in the Health and Social Assistance industry.

13.2 Impacts on the Wentworth labour market

As detailed in section 12.2, the Copi mine project will generate significant employment in the Wentworth region, with total employment supported of 754 FTEs during the construction phase and 300 FTEs during operations at peak production (i.e. from 2029). As detailed in section 12.2, this includes a combination of direct employment in the construction and operation of the Copi mine, and indirect and induced FTEs. The employment supported by the project will span a diverse range of industries within the regional economy, including mining, construction, retail trade, and accommodation and food services.

Total employment in the Wentworth-Buronga region is currently estimated at 2,960. This implies a total increase in employment attributable to the Copi mine project of 25 per cent during construction and 10 per cent at full scale operation. As discussed in section 13.1.1, the regional labour market is currently experiencing a period of low unemployment and constrained labour supply, with an unemployment rate of 3.2 per cent and only 142 unemployed persons in the region.

The impacts of the planned closure of the Snapper and Gingko mineral sands mines will have a material impact on the extent to which the additional employment to be directly generated and supported by the Copi mine project will be met from within the regional economy. Under the scenario in which these two mines close as scheduled and workers are not reallocated to other projects, it is likely that all labour requirements will be met from within the broader region.

Alternatively, in the absence of labour to be made available as a result of these projects, there will likely be a need for either an increase in the population, and hence labour force of the region, or labour will need to be imported from outside of the region. As noted above, in terms of direct employment, the key constraints on local labour supply, in both the construction and operational phase, are expected to be for Professionals and Technicians and Trades Workers, having regard for the skills and qualifications within the regional labour force and the industrial structure of the regional economy.

A. Preparation of I-O tables

I-O tables are constructed following the method of regionalisation. The regionalisation method developed by Synergies to derive state, and thereby sub-state as well as regional level, I-O tables is consistent with other well-accepted and widely used hybrid[56] regional I-O approaches, such as the Distributive Commodity Balance (DCB)[57] and the Generation of Regional Input-Output Tables (GRIT) [58].

Synergies' regionalisation method of I-O tables generally involves the following three main phases, broken down into seven steps.

Phase 1   Adjustment to the base (national) I-O table

Step 1: Selection of base table

The latest (2018-19) national I-O table published by the ABS is used as the base table.[59] In this table, there are 114 industries represented with direct allocation of all imports and valuation of transactions at basic prices.

The direct allocation table is selected for the regionalisation process because it excludes imports from national intermediate transactions, expressing the proportion of intermediate inputs in domestic flows only.

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[56]   The hybrid approach combines the use of non-survey techniques with superior data (i.e. statistical information obtained through surveys, experts or other reliable sources).

[57]   Christie, J. and Varua, E., M. (2010). Application of the Distributive Commodity Balance Method Approach to Regional Disaggregation: the Case of Penrith LGA. University of Western Sydney.

Johnson, P. (2001). An Input-Output Table for the Kimberly Region of Western Australia. Economic Research Centre, University of Western Australia.

[58]   Jensen, R., C., Mandeville, T., D. and Karunarante, N., D. (1977). Generation of Regional Input-Output Tables for Queensland. Report to Coordinator General's Department and Department of Commercial and Industrial Development, Department of Economics, University of Queensland.

Jensen, R., C., Mandeville, T., D. and Karunarante, N., D. (1979). Regional Economic Planning: Generation of Regional Input-Output Analysis. Croom Helm, London.

Murphy, T., Brooks, M. and Mazzotti, L. (2003). The Barwon Darling Alliance. The Western Research Institute, Charles Sturt University.

West, G., R. (1980). Generation of Regional Input-Output Tables (GRIT): An Introspection. Economic Analysis and Policy, 10, pp. 71-86.

West, G., R., Morison J., B. and Jensen, R., C. (1984). A Method for the Estimation of Hybrid Interregional Input-Output Tables. Regional Studies, 18(5), pp. 413–422.

[59]   Australian Bureau of Statistics (2021). Australian National Accounts: Input-Output Tables, 2018-19. Cat. No. 5209.0.55.001, Commonwealth of Australia, Canberra.

Step 2: Update the base table

The base table is updated using 'temporal quotients' or industry specific factor levels in terms of weighted average industry earnings data[60] between the compilation year (Census year 2016) and the year to be analysed (year 2021). Statistical information from across ABS databases were relied upon for estimation of the temporal quotients.[61]

It is important to note that updates to the temporal quotients are based on aggregate input data at the one-digit Australian and New Zealand Standard Industrial Classification (ANZSIC) level. This means that the extent of changes in the economic structure between the compilation year and the year to be analysed is restricted.

Step 3: Insertion of superior data and balancing

To better capture the latest possible structure of the national economy, and mitigate the problem associated with the application of outdated ratios for intermediate inputs to and outputs from production, we incorporate superior survey-based data into the table. This data is incorporated in the I-O table via the following two rounds of adjustment.

Round one adjustment

We initially adjust vectors of primary inputs and column totals using statistical information sourced from the *ABS National Accounts' data-cubes*,[62] while holding flows between industries and vectors of final demand constant.

Industry flows and vectors of final demand are then adjusted following a manual bi-proportional (or RAS)[63] procedure to reflect changes attributable to the transposition of the production vector.

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[60] Average industry earnings data were updated using statistical information classified according to the one-digit or narrow levels of the Australian and New Zealand Standard Industrial Classification structure.

[61] Australian Bureau of Statistics (2021). Census of Population and Housing, 2016. Commonwealth of Australia, Canberra.

   Australian Bureau of Statistics (2021). Labour Force, Australia, Detailed, Quarterly, Aug 2021. Cat. No. 6291.0.55.003, Commonwealth of Australia, Canberra.

   Australian Bureau of Statistics (2021). Wage Price Index, Australia, Jun 2021. Cat. No. 6345.0, Commonwealth of Australia, Canberra.

[62] Australian Bureau of Statistics (2021). Australian System of National Accounts, 2020-21. Cat. No. 5204.0, Commonwealth of Australia, Canberra.

[63] The bi-proportional (or RAS) procedure is a well-recognised and widely applied technique in re-balancing I-O tables. It is an iterative adjustment procedure for optimisation in which rows and columns, excluding those that have been accurately pre-estimated using superior survey-based data, are harmonised with given margins until consistency is achieved.

Round two adjustment

Whilst holding everything else constant, we adjust vectors of final demand and row totals using statistical information sourced from the *ABS National Accounts' data-cubes*, *Household Expenditure Survey* and *International Merchandise Exports*.[64] This is then followed by adjusting industry flow elements following a manual RAS procedure.

The updated and balanced base (or national) I-O table is subsequently checked for accuracy against the ABS derived gross domestic product (GDP).

Phase 2   Regional I-O table formulation

Note that the remaining steps (Steps 4 to 7) are repeated at the sub-state (regional) level for which I-O tables are required, though, using the state I-O table as the base table.

Step 4: Application of location quotients

Extensive use has been made of methods of location quotients (LQ) in constructing regional I-O tables, since obtaining ad-hoc regional data through a full-scale survey is inevitably expensive and time-consuming.

Synergies operates both conventional (linear) and nonlinear methods of LQ, capable of assessing how economic, social and fiscal outputs can contribute to regional, state and national economies. Both types of the model are essentially based on the Social Accounting Matrices (SAM) framework, which is an extension of the classical input-output framework and includes all flow of resources between economic agents through transactions at a specific period of time.

The conventional approach to I-O modelling essentially assumes a constant return to scale economy. Under this formulation, we initially verify the existence of a sector at the regional level by collating detailed (at the four-digit ANZSIC level) weighted average

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[64]   Australian Bureau of Statistics (2021). Australian System of National Accounts, 2020-21. Cat. No. 5204.0, Commonwealth of Australia, Canberra.

Australian Bureau of Statistics (2017). Household Expenditure Survey, Australia: Summary of Results, 2015–16. Cat. No. 65300DO013_201516, Commonwealth of Australia, Canberra.

Queensland Government Statistician's Office (2021). International Trade – Exports – Overseas exports by industry (4-digit ANZSIC 2006 edition) and country of destination, Queensland and other states and territories, 2010-11 to 2020-21. The State of Queensland (Queensland Treasury), Queensland.

earnings data from the 2016 Census.[65] After updating this data to the year to be analysed,[66] we apply conventional LQs to regionalise the base (national) I-O table.

Although the relative simplicity of the conventional I-O model lends itself to rapid computation, it disregards constraints on economic activity, such as supply imbalances and lack of interregional trade for the product or nonlinearities in economic production. Consequently, the conventional I-O model tends to underestimate imports and overestimate local intermediate transactions as well as economic impacts. This has led policy makers to doubt the accuracy of using conventional techniques for impact assessment.

Hence, in contrast to conventional tables, that only consider the supplying sector, nonlinear I-O tables also consider the size of the purchasing sector in the context of the region. They can therefore account for interregional trade (i.e. estimate leakage to other regions) more accurately, which is likely to be prevalent in smaller regions as they are apt to engage in interregional trade and be more import-intensive.

In other words, the nonlinear table relaxes the assumption that all locally available intermediate products are sourced locally and thus reduces the tendency of overestimating local intermediate transactions (by increasing cross-hauling) as the region in question becomes smaller and less self-contained.

Multipliers based on nonlinear I-O tables can consequently help overcome the critique of being overly optimistic that tends to limit the credibility of analyses based on conventional I-O tables. Economic impacts calculated using nonlinear I-O tables tend to be more conservative than those of conventional ones.

Step 5: Computation of regionalised indices

Regional input and import (competitive) coefficients are derived from base (e.g. national, state or sub-state) technical coefficients through the application of LQs.

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[65] Australian Bureau of Statistics (2021). Census of Population and Housing, 2016. Commonwealth of Australia, Canberra.

[66] Australian Bureau of Statistics (2021). Labour Force, Australia, Detailed, Quarterly, Aug 2021. Cat. No. 6291.0.55.003, Commonwealth of Australia, Canberra.

Australian Bureau of Statistics (2021). Wage Price Index, Australia, Jun 2021. Cat. No. 6345.0, Commonwealth of Australia, Canberra.

Phase 3   Computation of the complete regional I-O table

Step 6: Derivation of the prototype regional I-O table

The approach to obtain regional I-O tables is similar under both conventional and nonlinear methods, with the only difference being the application of different regionalised indices. Taking this into consideration, the prototype regional I-O table is developed by:

- Transforming the regional direct requirements (industry flows) matrix and import coefficients into monetary flows

- Calculating the sectoral primary inputs' categories

- Calculating the sectoral final demand categories.

Step 7: Insertion of superior data and balancing

The approach to inserting superior survey-based data and then re-balancing the regional I-O table is identical to the approach discussed in Step 3, with the only difference being the application of distinct or region-specific data.[67] The updated and balanced regional I-O table is then checked for accuracy against the ABS or state government derived gross state/regional product.

In the case of smaller regions, however, distinct or region-specific data becomes generally unobtainable or unavailable. In turn, this limits our ability to produce more accurate results through the insertion of superior survey-based data.

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[67]   Australian Bureau of Statistics (2021). Australian System of National Accounts: State Accounts, 2020-21. Cat. No. 5220.0, Commonwealth of Australia, Canberra.

Australian Bureau of Statistics (2017). Household Expenditure Survey, Australia: Summary of Results, 2015–16. Cat. No. 65300DO013_201516, Commonwealth of Australia, Canberra

Queensland Government Statistician's Office (2021). International Trade – Exports – Overseas exports by industry (4-digit ANZSIC 2006 edition) and country of destination, Queensland and other states and territories, 2010-11 to 2020-21. The State of Queensland (Queensland Treasury), Queensland.