

10.17 Economic Benefits and Costs

Aigis Group (Aigis) was engaged by Centennial Mandalong to assess the economic benefits and costs of the proposed new operational and infrastructure components of the Mandalong Southern Extension Project. The planning or forecast “window” used in the assessment is based on Centennial Mandalong’s projections for the 23 year period from December 2014 to December 2037.

The approach taken by Aigis was to estimate both the direct economic benefits and costs of the Project and the extended regional economic benefits and costs of the Project. In addition to the assessment of economic outcomes, the benefits and costs to the community of other aspects of the Project, such as social and environmental outcomes, have been assessed by Aigis on an economic basis.

The assessment has been undertaken in accordance relevant legislation and guidelines, including the EP&A Regulation, and to address the relevant issues raised in the DGRs (see **Section 1.7.2**). A copy of the *Economic Impact Assessment* (Aigis 2013) is contained within **Appendix F**, with significant findings and recommendations summarised below.

10.17.1 Project Economic Analysis

Aigis (2013) identifies two principal aspects of economic impact related to the Project:

- Direct and derived economic activity associated with the development of mine infrastructure – the Project provides for an extended program of capital works relating to surface infrastructure and underground mine development; and
- On-going direct economic effects associated with continued operation of the Mandalong Mine – the Project provides additional consumption activity induced by the incomes of new employees and commercial transactions between Centennial Mandalong and suppliers and other businesses. The economic stimulus provided by these activities also results in the flow of further activity in the regional, State and national economies.

Centennial Mandalong has conducted internal analyses in order to determine the financial and economic feasibility of several project options, particularly different mine plan options. As indicated in **Section 5.0**, the proposed Project represents the best of the alternatives considered when taking the economic, environmental and social impacts and benefits in to consideration.

The benefit - cost analysis (BCA) data presented below are net present values (NPV) at an assumed discount rate of seven percent, except as otherwise noted. Discount rates of four percent and ten percent are included in the *Economic Impact Assessment* (Aigis 2013) in **Appendix F**.

Estimation of Economic Benefit

The key economic benefits that accrue to the local and State communities are:

- Salaries and wages paid to contract workers during the construction phase of the Project and to full-time employees during the operation phase of the Project. These incomes then support additional flow-on activity in other sectors of the economy;
- Royalties on product coal that are remitted to the State and subsequently redistributed across the State community in the form of publicly-provided goods and services;
- A range of federally-levied taxes, a proportion of which is similarly redistributed across the State community; and
- State and local government taxes, rates and charges (for example, payroll tax and Council rates).

The construction program for the proposed Mandalong South Surface Site and access road will result in the employment of 35 contractors (on average) over the total 2.5 year construction program. The total number of employees employed at Mandalong Mine will increase from the current 305 employees to 420 employees, an increase of 115 full-time equivalent (FTE) positions. Centennial reports that at present 65 percent of its Northern Region coalfield employees (including those employed at Mandalong Mine) reside in the Lake Macquarie LGA. During longwall moves, which are for periods of approximately five weeks, up to an additional 50 contractors will be employed for this activity. This equates to a further 12 FTE positions.

There will be broader benefits to the State in the form of royalty revenues associated with the continuation of production at Mandalong Mine. These revenues will likely contribute to the provision of critical services, such as health care and education, across the State, including the Lake Macquarie and Wyong LGAs and the contiguous Hunter and Central Coast regions. Centennial will be required to pay income tax on its revenues from the Project.

Table 65 shows the valuation of the above listed benefits.

Table 65 – Estimate of Economic Benefit

Economic Benefit	Estimation Assumption	Estimate
Construction phase – contractor incomes	Average 35 contract personnel @ ≈ \$65K	Assessed NPV ≈ \$5 million
Operation phase – additional/sustained employment	Direct operations employment sustained - 420 FTE positions.	Assessed NPV ≈ \$442 million
	Contractors during longwall moves - 12 FTE positions.	Assessed NPV ≈ \$75 million
Coal royalties (State government)	Based on assessed output over 25 year mine life, and royalty rate of 7.1%	Assessed NPV ≈ \$229 million
Other State and local government taxes, rates and charges	For example, payroll tax and council rates	Assessed NPV ≈ \$62 million
Federal taxes (e.g. corporate income tax, Mineral Resources Rent Tax)	Based on assessed corporate income and corporate tax rates	Return to NSW at 30.1%, assessed NPV ≈ \$136 million
Carbon tax (Federal government)	Estimate of net carbon costs, including offsets and trading for life of mine	Return to NSW at 30.1%, assessed NPV ≈ \$9 million
Total economic benefit		≈ \$958 million

Estimation of Economic Costs

There are environmental and social factors that may impose costs on the regional community that have been evaluated by Aigis (2013). These include subsidence, land capability, water resources, biodiversity, heritage, air quality, greenhouse gas, noise, traffic, visual amenity and waste. The valuation methodologies for these issues were derived by Aigis (2013) from studies accessed through relevant government bodies. **Table 66** described the environmental and social costs attributed to the Project.

Table 66 – Socio-Economic and Biophysical Impacts and Valuation Methods

Description	Methodology / Source of Valuation Mechanism	Valuation Measure / Unit ¹	Cost	Comment on Application
Land Resources	Streever WJ, Callaghan-Perry M, Searles A, Stevens T & Svoboda P (1998): "Public Attitudes and Values for Wetland Conservation in New South Wales, Australia" – simulated market price/WTP EVRI reference number 02309-0732	\$153 per household per annum	Notional cost to community: \$3,608,748 per annum (includes estimate for land resources and water resources impacts, 2018 prices). Assessed NPV: ≈ \$30 million (includes subsidence, soil and water)	Applied to assessments for subsidence, soil and water impacts. Census 2011 data enumerates the number of households in Lake Macquarie (West) SLA, Dooralong and Jilliby as 20,346.
Water Resources	Not separately estimated	Not separately estimated	Not separately estimated	Refer to 'Land Resources'
Biodiversity	Land & Water Australia (2005): <i>Making Economic Valuation Work for Diversity Conservation</i> : Australian Government Department of Environment & Heritage: - simulated market price/ WTP	\$149 per household per annum (preservation of 700 species – flora and fauna - VIC)	Notional cost (upper bound) 2018: \$79,251 per annum (Lake Macquarie (West) SLA plus Dooralong and Jilliby State Suburbs). Assessed NPV: ≈ \$1.8 million	Implied cost of \$0.21 per species. Applied to species (total 45 species/ecological communities) identified on Project site that may be affected, total \$9.45 per household per annum. 20,346 households (refer to commentary in 'Land Resources' estimation methodology).
Heritage	Allen Consulting Group (2005): "Valuing the Priceless: The Value of Heritage Protection in Australia" – choice modelling/WTP	\$7.00 per capita per annum. for each 1,000 places protected	Aboriginal grinding grooves and rock shelters can be susceptible to damage from subsidence. Notional cost to community (Lake Macquarie (West) SLA, Dooralong & Jilliby), 2018: \$7,589 per annum. Assessed NPV: ≈ \$63,000	Assumes Census 2011 population count (Lake Macquarie West, Dooralong and Jilliby (54,551)), 113 identified Aboriginal and six European heritage sites (total 119 "places"). Implied cost \$0.12 per capita per annum.
Air Quality	DEC NSW (2005): "Health Costs of Air Pollution in the Greater Sydney Metropolitan Region" - cost of injury/replacement; WTP EVRI reference number: 07200-41439	\$243 to \$1,131 per capita per annum (upper bound assumed for estimation)	\$1,131 per capita per annum – notional cost to community (2018): \$1,305,174 per annum. Assessed NPV: ≈ \$11 million	260 identified residential properties, assumed population of 754 individual residents ² , 80 industrial receivers (mainly small enterprises, assume 5 persons for each ³), 400 receivers. Assumes 2.9 person per household (Mandalong State Suburb – ABS 2011 Census).

Description	Methodology / Source of Valuation Mechanism	Valuation Measure / Unit ¹	Cost	Comment on Application
Greenhouse Gases	Australian Government, Clean Energy Future http://www.cleanenergyfuture.gov.au/clean-energy-future/carbon-price/	Assumed at nominal \$17 per tonne CO ₂ -e (Centennial 2017, price estimate allowing trading and offsets)	Mtpa per annum @ \$17 per tonne CO ₂ -e. Notional cost per annum of liable emissions (2018): \$3,475,190 Assessed NPV: ≈ \$249 million	Centennial Coal estimation methodology applied to determine 2017 price. Estimate is indicative only, as carbon price liability can be offset through purchase of credits post 2015.
Noise	Day B, Bateman I & Lake I (2010): “Estimating the Demand for Peace and Quiet Using Property Market Data” - Hedonic pricing (impact on dwelling values) EVRI reference number: 06153-105312	\$77 to \$202 per dB per annum (upper bound assumed for estimation)	Nominal total construction period of 41 weeks. Costs therefore relate to a period less than one year, however this will be distributed over a number of years. Notional cost to residential receptors over construction period, based on maximum exceedance (19 dBA) over 41 weeks: \$77,182. Assessed NPV: ≈ \$638,000 No cost attributed to operational impacts, as these are within exceedances tolerances.	Based on perceived changes in property valuations. Application contingent on number of affected properties and estimated exceedances of standards.
Visual	Curtis I.A. (2004): “Valuing Ecosystem Goods and Services: A New Approach Using a Surrogate Market and the Combination of Multiple Criteria Analysis and a Delphi Panel to Assign Weights to Attributes – actual market pricing. EVRI reference number: 0663 - 1365	\$1,044 to \$1,331 per hectare per annum (upper bound assumed for estimation)	Notional cost to community: \$24,380 per annum. Assessed NPV: ≈ \$202,000	Estimate of aesthetic impact on residential receptors of new surface infrastructure. Valuation based on MSSS and associated access roadworks. 20 hectare area to be impacted. Other works to be conducted in existing Mandalong Mine operations envelope.
Waste/ Hazards	Not assessed	Not assessed	Not further assessed	No current or future impact on external parties.

1 - All values adjusted by three percent per annum to allow for inflation.

2 - Australia Bureau of Statistics 2011 Census data: Persons per household for Mandalong State Suburb: 2.9 persons/household.

3 - This estimate also accounts for visitors to these businesses, in the context that no persons are present at the relevant business sites for the majority of each day.

Estimation of Net Economic Costs/Benefits

Table 67 displays the measures of net economic benefit of the Project for the State and regional communities, based on the benefit and cost assessments detailed above in **Tables 65** and **66**.

Table 67 – Estimate of Project Net Benefit

Economic benefit (PV)	\$958 million
Economic cost (PV)	\$293 million
Net present value (NPV)	\$665 million
Benefit-Cost Ratio (BCR)	3.3

The net economic benefit of the Project for the State and regional communities is positive, at a net present value (NPV) of \$665 million. The BCR for the Project is also positive (3.3:1). The *Economic Impact Assessment* (Aigis 2013) also includes sensitivity analysis at four percent and ten percent. Under these scenarios the economics of the Project remain robust.

This estimate excludes corporate profits accruing to Centennial Coal. As the corporation is foreign-owned, these profits are expatriated and do not further benefit the Australian and State economies (Aigis 2013). A benefit of this foreign ownership is that the capital and operational investment in the Project represents new investment into the Australian economy, rather than an allocation of resources that might otherwise be applied to other projects in Australia, as may be the case with domestic investment (Aigis 2013).

Alternative Project Options

As a result of Centennial Mandalong's assessment of the various mine plan options (see **Section 5.0**), two options were selected by Aigis (2013) for detailed analysis. These two options are:

- (a) Option 1 - the proposed mine plan comprising a combination of 200 metre, 180 metre and 160 metre wide longwall panels; and
- (b) Option 2 - a mine plan with 300 metre wide longwall panels.

It is also necessary to consider a further possible outcome, which is described by Aigis (2013) as the "business-as-usual" (BAU) case. Under this scenario, expiration of the current development consent (expires October 2019) and mining leases would result in cessation of mining and mine closure. Consequently, all economic and associated social benefits would cease to be realised beyond this time. As a result, no detailed analysis of this potential outcome has been undertaken by Aigis (2013).

A mine plan with 300 metre wide longwalls (i.e. Option 2) would reduce the amount of development roadways (gateroads) that need to be excavated to access the coal, which, in turn, would increase the resource recovery and provide a better financial outcome for the Project. However early subsidence modelling indicated that a mine plan with 300 metre longwall widths would result in adverse impacts associated with increase subsidence levels (see **Section 5.1**). As these potential impacts do not meet the aim of continuing to conduct mining at Mandalong Mine in an environmentally responsible manner, and despite the better financial outcome for Centennial Mandalong, the mine plan option with 300 metre longwall widths was rejected. The differential may be considered as economic value foregone by Centennial Mandalong in order to achieve a more environmentally sustainable outcome (Aigis 2013).

Table 68 provides a comparison of the three options. The BAU assessment relates to the period prior to exhaustion of resources within the current mining lease. The two options for the Project include only preliminary capital works prior to 2018, and subsequently assume full production from that point forward.

Table 68 – Alternative Project Options – Adjusted NPV

Project Option Component	Discount Rate 4% \$M	Discount Rate 7% \$M	Discount Rate 10% \$M
Option 1 (combination of 200 m, 180 m and 160 m longwall widths)			
Total environmental impact costs	455	293	194
Total State and community benefit	1,390	958	681
NPV	935	665	487
Option 2 (300 m longwall widths)			
Total environmental impact costs	455	293	194
Total State and community benefit	1,444	696	743
NPV	989	676	549
Option 3 (BAU)			
Total environmental impact costs	39	34	24
Total State and community benefit	386	349	318
NPV	347	315	294

As the change in discount rates is proportional for each alternative case, the NPV of the Project (i.e. Option 1) and that for the alternative Option 2 (i.e. 300 metre wide longwalls) are superior to the BAU case in each instance. There may be any number of possible scenarios that vary from the forecast relativities between revenues and costs. The manipulation of the discount rate provides some indication of the range covered by such possible variances and the associated project risk (Aigis 2013).

10.17.2 Downstream Economic Analysis

Regional Context

As is the case with the contiguous Hunter and Central Coast LGAs, Lake Macquarie is a large and diversified economy. Mining and mining-related industries are important elements of the regional economy. The LMCC's website notes that mining accounts for two percent of employment in the LGA, which is significantly greater than for the neighbouring Central Coast LGAs (Aigis 2013). The website also advises that mining has historically been a key part of the regional economy and that "mining and mining-related businesses are still intrinsic to the region's economic strength".

Although the Southern Extension Area is chiefly located in the Lake Macquarie LGA, a part of it extends into the Wyong LGA. Economic data presented on the WSC's website indicates that mining employment is relatively low in the LGA at 0.4 percent of employed residents. The *Central Coast Regional Plan 2011-2015* (Regional Development Australia Central Coast (RDACC), cited in Aigis 2013) reports some ambivalence towards the coal industry, with research/survey respondents being divided on "whether the benefits to the Region of the coal industry outweigh the negative impacts". As this evidence relates to the Central Coast region in its entirety, and therefore also includes the Gosford LGA, the influence of the mining industry, in terms of employment contribution and physical presence, are relatively minor and are likely to be contained in the northernmost area of the Central Coast region (Aigis 2013).

With respect to the LMCC and Central Coast LGAs (particularly Wyong), the presence of significant coal-fired electricity generation infrastructure (Eraring and Vales Point power stations) and associated distribution infrastructure may be considered as demonstrating the requirement for coal production in order to maintain services (Aigis 2013).

Extended Economic Analysis

An assessment of the extended economic benefits associated with the construction of the Project's infrastructure and the on-going operation of the mine itself has been undertaken by Aigis (2013). As listed in **Table 69**, the publication titled *The Contribution of Primary Industries to the NSW Economy, Key Data* (DTIRIS 2012) identifies output and employment multipliers for mining and mining-related services. A comparison with other publicly available mining industry multipliers indicates that the DTIRIS (2012) multipliers may be considered as being conservative (Aigis 2013).

In addition to these operations-related multipliers, and as also listed in **Table 69**, specific multipliers for construction were also identified by Aigis (2013) for assessment of the impacts of the initial stimulus associated with construction of the infrastructure required for the Project.

Table 69 – Type 2A Multipliers

Description	Multiplier Values	
	Mining and Services	Construction
Output multiplier	2.136	2.694
Gross value added multiplier	4.099	4.369
Income multiplier	2.839	2.899
Employment multiplier	3.977	2.727

The relatively large gross value added (GVA) multiplier for "mining and services" demonstrates the importance of incomes generated by mining industries (Aigis 2013). The GVA multiplier comprises all components of income to labour, which will be concentrated in the region, plus the gross operating surplus of the corporate entity, which will largely be transferred beyond the Lake Macquarie region (Aigis 2013). The higher GVA multiplier for "construction" may have wider geographic impacts in terms of economic activity, as some specialised suppliers and contractors may originate beyond the immediate region (Aigis 2013).

As the stimulus to the economy is equivalent to the additional activity and output associated with both construction and operational phases of the project, the estimated net benefit of the Project (\$665 million) would result in extended economic effects of approximately 2.1 to 4.4 times the initial stimulus, dependent on the economic measure being considered (Aigis 2013). Employment of the magnitude of approximately 2.7 to 4 times the economic stimulus would also result (Aigis 2013). These indirect positions represent employment supported in the broader economy as a result of the demand for additional goods and services related to the Project.

Cumulative Economic Analysis

The Mandalong Southern Extension Project, in conjunction with Centennial's Newstan Extension of Mining Project and Northern Coal Logistics Project, stems from the long-term strategy Centennial has developed for its future operations in the Newcastle Coalfield to provide the infrastructure and flexibility required to meet future opportunities in both the domestic and export coal markets.

The proposed underground mining development known as the Wallarah 2 Coal Project (Wyang Areas Coal Joint Venture) intends to mine within the West Wallarah Seam to the south of the Southern Extension Area. There is a separation distance of approximately 2 kilometres between the proposed mine workings in the Southern Extension Area and the northern extent of the Wallarah 2 Project's proposed workings. The specialist assessments undertaken for the Mandalong Southern Extension Project have not identified any cumulative impacts with the Wallarah 2 Coal Project.

Aigis (2013) advises that the existing and proposed infrastructure and operations are consistent with the existing character of the area. The manner in which the Project has been developed purposively seeks to reduce the potential for cumulative impacts.

10.17.3 Conclusion

There are several sources of benefit associated with the proposed Mandalong Southern Extension Project. There are benefits in terms of the continued operation of Mandalong Mine and the associated revenues. The current and expanded workforces that will be sustained by the Project will also benefit, and the incomes that they derive will result in further induced benefit across the regional community as a result of the “pay packet effect” of the consumption activity of these employees in local and regional economies (Aigis 2013).

The Project may result in some externalised impacts, particularly in relation to a range of environmental factors. In each instance, Centennial Mandalong has committed to appropriate mitigation measures and management strategies over the life of the Project.

The negative external impacts must be considered in the context of the existing use of Mandalong Mine and other similar industrial usage in the area. Largely as a result of the detailed preliminary planning process and development of mitigation strategies, the impacts associated with the Project are of a lesser magnitude than the social, environmental and economic benefits that will be generated by the Project.

Aigis (2013) concludes that the overall social and economic impact of the Project is positive. Aigis (2013) further concludes that the net impact of the Project to the local, regional and NSW communities, and to the National economy, will be positive.

10.17.4 Mitigation and Management

Due to the overall positive economic impact of the Project, no economic mitigation or management measures are proposed.