McPhillamys Gold Project: Appraisal of the economic benefits assessment

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Introduction

We have been briefed by the Environmental Defenders Office, on behalf of Belubula Headwaters Protection Group to review the Cost Benefit Analysis (CBA) component of the Economic Impact Assessment and associated cost benefit analysis conducted by Regis Resources Limited for the proposed McPhillamys Gold Mine. In preparing this advice, we have read the Expert Witness Code of Conduct and agree to be bound by it.

We provide a review of the cost benefit analysis (CBA) provided in *Attachment 6 – CBA and Assessment of Externalities* (p.76) of *Appendix DD – Economic Assessment* informed by the *Table 12.3 Estimated annual GHG emissions for the mine development* (p.387) lifecycle emissions profile from the McPhillamys Gold Project *Environmental Impact Statement*. We have also considered the responses from the New South Wales government in the *McPhillamys Gold Project State Significant Development Assessment SSD 9505* [1].

General application of the cost benefit analysis

The proponent has correctly identified and applied the New South Wales (NSW) Government's *Guide to Cost-Benefit Analysis* (the CBA Guide) (NSW Government, 2017) and the NSW Government's *Guidelines for the economic assessment of mining and coal seam gas proposals* (the Mining Guidelines) (NSW Government, 2015) and have used the appropriate base case and an appropriate range of sensitivity assessments in their cost benefit analysis (CBA). Using a total economic value (TEV) framework they have considered a reasonable range of costs and benefits that would be associated with the project going ahead, subject to clarifications and opinions stated below.

Critiques and clarifications

Existence values for mine employment

The proponent puts forward evidence and argument ascribing a community 'existence value' to knowing other people have high-paid and secure employment at the mine, if developed (Gillespie Economics, 2019, p. 30). Such estimations can be achieved through

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[1] At https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-9505%2120221117T040802.543%20GMT

using valuations from stated preference survey techniques. The proponent presents several, relevant contingent valuation (a form of stated preference) studies and this implies that *not* developing the mine is a 'lost benefit'. Although contentious, as acknowledged by the proponent (who then subsequently reports their CBA with and without this lost benefit), to demonstrate the net impact of the mine, similar studies should also be included to demonstrate the value of lost existence values from the transfer of other jobs elsewhere in NSW. These jobs will likely be similarly valued by the community that inevitably results from workers migrating to work at the new mine site. We cannot provide an net value estimation without further economic studies but we can speculate that the net effect would be near zero and therefore the section 'Non-market Value of Employment' (2019, pp. 30-31) should not be considered relevant to the CBA. Furthermore, we agree with the New South Wales government that this existence value, and employee wage benefits in general, should not be included in the cost benefit analysis, for the reasons provided in its response.

Loss of recreational values

The proponent's CBA summarise that local effects of the mine development include only loss of 'non-use' values of loss of ecology and biodiversity (Gillespie Economics, 2019, Appendix DD, p. 42) to account for the residual 75.77 ha of lost habitat, which is offset through the proponent's Biodiversity Offsets schedule (Gillespie Economics, 2019, Appendix N, p.ES.3). Many of nature's values are placed-based 'public benefits', related to recreation (Tupala et al., 2022), particularly in "Western countries" (2022, p. 4), which may lead to offsetting systems that fail to respect specific *local* values, such as recreation, that are intended to be safeguarded. In addition to the location of the proposed mine, it is essential to consider the location of the offset (not explicitly required by the proponent, as it must only secure offset credits). Burton et al. (2016) argue that local biodiversity values are best secured locally as natural habitat areas are important for local recreation.

The NSW Biodiversity Offsets framework [2] does not consider lost recreational values (only biodiversity values) and therefore we cannot assume lost recreational values (or compensation for lost recreational values) are included in the Biodiversity Offset schedule. Whilst the CBA Guide states that the CBA should be looked at from a NSW perspective (and the habitat secured by the proponent's Biodiversity Offsets may present new recreational activities elsewhere in NSW) this is not guaranteed. We therefore feel that lost recreational values to the local community need to be considered in the proponent's CBA, unless they are guaranteed elsewhere. Boardman (2017) puts forward several economic valuation techniques and valuations from the literature for assessment of community willingness to pay (WTP) for public benefits, such as recreation. No such study has been included by the proponent, nor value of lost benefit included in the CBA.

[2] See https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity-offsets-scheme

The correct costs of carbon emissions

The proponent modelled three CO_2-equivalent prices: (i) the forecast European Union Allowance Units price; (ii) the Australian Treasury Clean Energy Future Policy Scenario; and (iii) US EPA Social Cost of Carbon (SCC). From these the proponent derived three global estimates for the external cost of greenhouse gas (GHG) emissions from the project, estimated to be between $11 m and $45 m in present value (PV). (However, it is unclear from the documentation provided which measure provides the lower and upper bound values.)

Each of the proponent's values require updating. (i) European Union Allowance Units futures prices are now significantly higher than they were a year ago; (ii) given the significant change in the policy landscape since the Clean Energy Future policy package was first implemented (2010), use of the Australian Treasury Clean Energy Future Policy Scenario now provides a poor shadow price; and (iii) the US EPA SCC is continually revised upwards and is currently being reviewed.

The first two are 'exchange prices', the third (SCC) is a cost-based estimate. Exchange prices emerge from the interplay of demand and supply in well-functioning, competitive markets for rival and excludable goods. Cost-based estimates are revealed through a production function, such as the costs of replacement following damage, and are useful for when demand is hard to derive as the goods and services valued are commonly public goods (non-rival and non-excludable) (Buckwell & Morgan, 2022).

Using exchange prices in a CBA, including for assessing the costs of greenhouse gas emissions, is the preferred method of the NSW government for projects like McPhillamys (as stated in the CBA Guide). The NSW Mining Guidelines state that "where market prices exist, they should be a *starting point* for assessment" (NSW Government, 2015, p. 3). It continues: "For non-market goods, as for many environmental impacts and some social impacts, the aim is to value them as they would be valued in money terms by the individuals who experience them" (NSW Government, 2015, p. 3). There are well-established economic valuation techniques for establishing a monetary value for non-market goods in policy analysis (Buckwell & Morgan, 2022; Guijarro & Tsinaslanidis, 2020).

Whilst carbon emissions reduction certificates, or emissions permits (from hereon: both are referred to as 'carbon credits') *are* a form of market good (they are traded, and their price is influence by demand and supply) the price they attain and is a poor measure of value. On the demand side, the demand for emissions reduction is set by government policy (emissions reduction commitments) and a small voluntary market, not by any latent demand for a private benefit. Arguably, the global community, through the Paris Agreement, has collectively committed to much higher rates of emissions reductions and therefore has signalled it would likely demand many more carbon credits than that limited by government or demanded by the voluntary sector. For example, the Climate Action Tracker estimates Australia's current policies and actions are insufficient to maintain global warming below 3°C (Climate Action Tracker, 2023) [3], therefore the apparent demand for carbon credits does not yet meet Australia's commitments to international partners. Higher demand, for example, enough carbon credits sufficient to meet Australia's commitments, would see prices pushed higher, or 'up the supply curve'. Therefore, exchange prices for carbon credits, no matter from where they are sourced, will not reflect the true social cost of carbon emissions until such time as emissions reductions to meet the Nationally Determined Contributions to the Paris Agreement are projected to meet the objectives.

Use of spot, or future contract prices of carbon leads to significant under-estimations of the total external cost of emissions. As they are solely based on domestic climate policy settings there are significant variations in the prices of traded carbon credits. For example, following changes by the Commonwealth government in 2020 (to enable 'option contracts') and further deregulation (to enable vendors to buy-out legacy contracts, generally priced lower) in early 2022, the Australian Carbon Credit Unit (ACCU) marginal price is now set through the exchange of secondary ACCUs, whose price reached $60 in 2022 [4]. ACCUs are now currently trading on spot markets at ~$35 (Renewable Energy Hub, 2022). European ETS Futures are currently trading at 130.85 AU$/T (EEX, 2022). =

Cost based approaches value an asset (a stable climate) by assessing the costs incurred to produce, acquire, or replace it. An important cost-based method is the US EPA's social cost of carbon (SCC). The SCC is an estimate of the economic damages associated with each additional ton of CO_2 emissions equivalent. It is quantified by assessing the long-term impacts of emissions on the global economy, including changes in net agricultural productivity, human health, property damages from increased flood risk, and ecosystem services. It attempts to capture the full range of impacts, including both market and non-market effects.

The proponent did estimate the external cost of carbon from the project using a value from the US EPA's SCC, however, it is unclear what exact value was used. The SCC is currently being re-evaluated after it was discontinued by the Trump administration. Published draft values are significantly higher than those used during the Obama period and range between AU$181 to AU$507 per tonne in 2023 (US EPA, 2022). Note also that a recent review of the concept in *Nature Climate Change* by Ricke et al. (2018) emphasised that some estimates of the SCC are considerably greater than that put forward by the US EPA suggesting a median of value of 417 US$/T.

In summary, until international, national, and sub-national carbon markets are more integrated, and until climate policy is on a more stable trajectory to meeting Paris Agreement targets—thus providing a more globalised 'commodity' price for carbon emissions based on a demand for carbon credits sufficient to meet targets—exchange prices

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[3] The Climate Action Tracker is an independent scientific project that tracks government climate action and measures it against the globally agreed Paris Agreement aim of holding warming well below 2°C. It is a partnership between Climate Analytics and the NewClimatw.

[4] See https://www.minister.industry.gov.au/ministers/taylor/mediareleases/emissions-reduction-fund-contracts

for carbon credits should not be used in CBA. Furthermore, whilst the proponent did also use a SCC estimate in its CBA, these values have been recently significantly updated upwards by the US EPA and arguably should be within the envelope of that determined by Ricke et al. (2018).

Whose costs and benefits count: the issue of standing

Whose costs and benefits count in a CBA is the issue of *standing*. To maintain Pareto efficiency—where at least one person benefits and nobody is made worse-off—the Kaldor-Hicks principle of compensating losers from the net gains needs to be maintained (Boardman et al., 2017; Boardman et al., 2022). Standing should be defined by whom would be willing to pay (WTP) or be willing to accept (WTA) compensation for the loss of a benefit. A CBA analyst should note that **one party's WTP/WTA should not be constrained by a lack of institutions that enable this** (such as functioning markets and property rights) or a lack of information (moral hazard). Many social and environmental values are not readily exchanged in markets but can nevertheless be adequately valued monetarily using economic valuation techniques that are well established in the economics discipline (Buckwell & Morgan, 2022).

The NSW Guidelines are very clear on the subject of standing: the "NSW community is the appropriate referent group" (NSW Government, 2017, p. iii). This backed-up in the Technical Notes, where it is stated that project proponents should "[e]stimate the economic impact of GHG emission output to NSW only" (NSW Planning & Environment, 2018, p. 48) and is recognised by the proponent on p.13 of Appendix DD of the EIS [5]. Whilst this principle remains sound for environmental and social nuisances, such as air quality and noise, where the referent group (those 'with standing') are locally identifiable, it is a flawed implementation of the impact of Scopes 1 and 2 GHG emissions. That is because, GHG emissions are a uniformly mixing stock pollutant and therefore impacts of emissions are felt globally. The referent group (those who would require compensation for Pareto efficiency) should include everyone on the planet – or at least everyone who is subject to an agreement that GHG represent an external cost [6], such as people resident in nations who are party to the Paris Agreement.

There are few comprehensive reviews of guidelines for different jurisdictions. However, a recent review of CBA by Boardman et al. (2022) (a leading voice in cost benefit analysis) suggests that many guidelines recommend at least reporting on the global consequences of a project or policy change. For example, HM Treasury, in the United Kingdom, recommends a *global* estimate using the SCC (2022, p. xx). Supranational agencies (World Bank, Asian

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[5] https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-9505%2120190830T002559.985%20GMT

[6] Notwithstanding, it is well established in the literature that the impacts of GHG emissions on climate change will not be felt equally be everyone and therefore the WTP/WTA will be substantially different depending on the established risks (and benefits) of the constituency being surveyed. For example, even within Australia and NSW, there will be a range of WTP/WTA values dependent on perceived hazards, such as bushfires, coastal hazards, and riverine flooding.

Development Bank, for example) also suggest a global perspective should be provided but that GHG emissions should also be considered separately as their impacts are crucially dependent upon the valuation of carbon used [7]. Boardman et al. (2022) conclude that though the national (or sub-national, where resources belong to states / provinces) should be the default, **where international treaties cover a topic (as for GHG emissions) a global view of standing should be taken**.

To demonstrate the weakness of the NSW Government's current position on taking a narrow, State-only view of standing, imagine if we were to look at a GHG emissions producing coal mine the other way around by assessing a carbon capture project. "Using the social cost of carbon based only on the costs borne by the country's residents would yield negative net [social] benefits; however, using a social cost giving standing to residents in countries with which the country has carbon emissions agreements would yield positive net benefits" (Boardman et al., 2022; no page number). Therefore, in *not* considering the standing of a generalised 'global society', GHG emissions intensive projects, such as McPhillamys Gold Project, will never be refused and GHG sequestration projects will never be approved.

The practical effect for the proponent of taking a narrow approach is to multiply the external costs of GHG emissions from the project by the proportion of NSW's gross state product as a share of global product (0.31%) [8], thus generating a discounted mid-range external cost that they say is 'non-material' (i.e. less than a million dollars in a project with a net present value estimated to be >$20 m).

We note that in the New South Wales government's response, it suggests the remaining, non-New South Wales, emissions costs should be attributed to the Commonwealth. However, given that WTP should not be constrained by a lack of institutions, we argue the proponent is operating in an environment of moral hazard, where others are bearing the costs of risks of its operations. Regardless of where responsibility lays, the carbon emissions remain in the atmosphere, which is presumably little comfort to the residents of Kiribati, or Australians outside New South Wales.

In summary, given the nature of GHG emissions as a uniformly mixing stock pollutant any social CBA needs to account for all those affected by the impacts of emissions and who are part of an agreement that GHG emissions represent an external cost. Therefore a global perspective on standing should be taken in the project's CBA.

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[7] Crucially, this is because many of the World Bank's low- and middle-income client Governments disagree that this should influence their investment decisions.

[8] See final paragraph on p.28 in Appendix DD of the EIS at https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-9505%2120190830T002559.985%20GMT

Methodological innovations

Expanding the concept of 'standing' still, are considerations of future generations through novel application of the discount rate applied in CBA [9]. A lower discount rate applied to external costs, whilst maintaining standard rates for provides future generations with greater consideration (Whittington & MacRae Jr, 1986). Whilst the proponent undertook sensitivity analysis using a 4% discount rate (as required by the Guidelines), for a while in the academic literature, lower rates have been recommended for certain forms of 'capital', including the use of differential rates. This can have significant impacts on project assessment. For example, Emmerling et al. (2019) showed that by reducing the discount rate used in integrated assessment models from 5% to 2% the nominal carbon credit price needed to stay within the global carbon budget would more than double, thus leading to faster and larger reductions in emissions. This concept is further explored by Costanza et al. (2021) who espouse the use of differential discount rates when considering different types of capital (financial, built, human, social, and natural). As natural capital, in particular, has specific features (it is non-replaceable, cannot always be substituted, and is subject to non-linear degradation) it should attract different discount rates and different approaches to discounting. I.e. they should be lower, or near zero [10] (Nash, 1973). A near zero discount rate for damage costs from carbon emissions was famously used by Stern in *The Economics of Climate Change* his (2006).

Whilst the proponent did apply project assessment discount rates as recommend by the NSW government (7%) and correctly provided sensitivity analysis at 4% and 10%, consideration of future projects using CBA should account for innovations in the application of discount rates, particularly as it applies to forms of natural capital, such as the carbon absorption capacity of the planet's biosphere. As the literature shows, this may have dramatic impacts on the assessment of projects with significant environmental impacts.

Revised external costs of carbon emissions

Table 1 reports a revised *global* estimate of the total external costs of GHG emissions from the project, based on the proponent's reported Scope 1 and 2 emissions, and Scopes 1, 2, and 3 emissions, over the 15 years of operation of the proposed McPhillamys Gold Project (with the emissions profile from *Table 12.3 Estimated annual GHG emissions for the mine development* on p.387 of EIS), using a draft updated social cost of carbon from the US EPA (US EPA, 2022). Taking this *global* perspective, the costs of GHG emissions that can be attributed to the project are AU$ 377.4 m (discount rate at 7%; project starting in 2023).

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[9] The discount rate is a rate of return used to determine the present value of future cash flows. It is standard part of CBA and is used to convert future values into their equivalent value today by taking account of the time value of money, based on the level of risk associated with the future and opportunity costs.

[10] Near zero, but not zero. "If discounting were abandoned, use of the standard cost-benefit-analysis framework would require the forecasting of shadow prices for all future dates, unless an arbitrary time horizon is adopted. Thus cost-benefit analysis does not appear to be a satisfactory method for evaluating effects on future generations" (Nash, 1973, p.611)

Furthermore, given Australia does not have a comprehensive carbon emissions policy—that is, the mine's supply chain operations will *add* to emissions, not accounted for elsewhere, if the project were to go ahead, when compared to the baseline case—we argue that Scope 3 emissions should be included in this CBA. We accept that elements of this supply chain maybe covered by some form of carbon policy, for example, capital equipment sourced from Europe (covered by the European Emissions Trading Scheme) but this is unknown. For this reason, we have also included the costs of Scope 3 GHG emissions in Table 1. Table 2 is a sensitivity analysis of the proponent's emissions from Scopes 1 and 2 at discount rates of 4% and 10%, as recommended by the CBA Guide.

At the upper bounds of our estimations for the value of the global social costs of Scopes 1 and 2 GHG emissions in our analysis meets the lower bounds of the threshold value of the project ($ 141 m – $ 232 m) at which, from a social welfare perspective, the community is better off if the project does not go ahead (Krutilla & Fisher, 1985).

Table 1: Global external social costs of carbon from the McPhillamys Gold Project (discount rate = 7%) (AU$).

Carbon price	Scopes 1 + 2	Scope 1 + 2 + 3
US EPA SCC §	$ 377.4 m	$ 414.4 m
ACCU Spot price ‡	$ 31.6 m	$ 34.7 m
EAU Futures †	$ 144.9 m	$ 159.1 m

Table 2: Sensitivity analysis for emissions from McPhillamys Gold Project (discount rates at 4% and 10%) (AU$).

Carbon price	Scope 1 + 2		Scope 1 + 2 + 3	
	4%	10%	4%	10%
US EPA SCC §	$ 443.0 m	$ 324.6 m	$ 486.7 m	$ 356.3 m
ACCU Spot price ‡	$ 37.0 m	$ 27.3 m	$40.6 m	$ 29.9 m
EAU Futures †	$ 169.5 m	$ 125.1 m	$ 186.2 m	$ 137.2 m

§ USA Environmental Protection Agency Social Cost of Carbon: 290 to 366 AU$/T .

‡ Australian Carbon Credit spot price: 26.5 AU$/T (Clean Energy Regulator, 2022).

† European Union Allowance Future: 121.48 AU$/T (EEX, 2022).

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