



Review of Stratford Extension Project Environmental Impact Statement

Socio-Economic Assessment

Prepared by

Economists at Large Pty Ltd

January 2013

Report prepared by:

Economists at Large Pty Ltd
Melbourne, Australia
www.ecolarge.com
info@ecolarge.com

Phone: +61 3 9005 0154 | Fax: +61 3 8080 1604
65 Bevan St, Albert Park VIC 3206, Melbourne, Australia

Citation:

Campbell R., 2013, *Stratford Extension Project Environmental Impact Statement: Socio-Economic Assessment*, a report for the Barrington-Gloucester-Stroud Preservation Alliance, prepared by Economists at Large, Melbourne, Australia.

Disclaimer:

The views expressed in this report are those of the author and may not in any circumstances be regarded as stating an official position of the organisations involved.

This report is distributed with the understanding that the authors are not responsible for the results of any actions undertaken on the basis of the information that is contained within, nor for any omission from, or error in, this publication.

Contents

Introduction	4
This submission	4
Viability of the project	5
Estimates of coal price.....	6
24 hour operations.....	7
Final voids.....	7
Scope of assessment.....	8
Benefits accruing to Australia and overseas	8
Greenhouse Gas emissions	8
Social value of employment.....	10
Noise, dust, air quality, vibration, amenity impacts.....	10
Value of social impacts	11
Flora and fauna	11
Health Impacts	12
Input-output modelling in Economic Impact Assessment	13
Conclusion.....	14
References	15

Introduction

The proposed Stratford Extension Project is for the continuation of an open-cut mine into agricultural land and native forest, in the Gloucester Valley, 100km north of Newcastle, NSW. The proposal is for a 10-year extension of existing operations which will extract up to 2.6 million tonnes of coal per year (Run of Mine (ROM) coal). The proponent is currently seeking planning approval and has prepared an Environmental Impact Statement.

The Stratford project is one of several mining proposals or mine extension projects in this traditionally rural area. Local community group, the Barrington-Gloucester-Stroud Preservation Alliance (BGSPA) is concerned that the proposed projects will affect agriculture, the community and native forest and woodland which contains critical habitat for threatened species such as the squirrel glider.

This submission

The BGSPA is making a submission on the Stratford Extension Project Environmental Impact Statement (EIS). As part of their submission they have asked Economists at Large to review elements of the EIS that relate to economic issues, particularly the executive summary, Section 6 *Planning Framework and Justification* and *Appendix P- Socio-Economic Assessment*. We consider there are a number of significant flaws in the EIS, which, without being addressed, would render the assessment unsuitable to contribute to decision-making. These issues are:

- **Misleading use of socio-economic assessment results in executive summary and project justification**
- **Viability of the project**
 - **Estimates of coal price and project net present value**
 - **Failure to justify return to 24 hour mining**
 - **Final voids**
- **Scope of the assessment** Particularly relating to:
 - **Benefits accruing to Australia and overseas**
 - **Greenhouse gas emissions**
- **Social value of employment**
- **Noise, dust, air quality and amenity impacts**
- **Social impacts**
- **Flora and fauna**
- **Inappropriate use of input-output modelling in impact assessment**

We believe that all these issues need to be clarified and adjustments made to the economic assessment of the project to ensure a decision is made in line with the NSW public interest. Doing so would not only allow for the best outcome in relation to this project, but could serve as a guide for other projects in the area and nationally.

This is occurring at a time when the mining industry is perceived as lacking a “social licence to operate” in farming areas. Conflicts between farming communities and coal and coal seam gas developments are making headlines regularly, with farmers and the broader community losing confidence that such developments are in the community’s best interests. Robust and transparent assessment of this project could help to address this issue.

Misleading use of socio-economic assessment results in executive summary and project justification

The executive summary of the EIS is important as it is the only section that many readers will have time to consider. It is therefore important that it accurately presents the results of later sections. With regard to social and economic aspects, the results of appendix P are not accurately presented in the executive summary, which states:

The Socio-Economic Assessment indicates a net benefit of between \$145 million and \$174 million would be foregone if the Project is not implemented. (pES-6)

This sentence is repeated in the Project Justification (section 6.9). The two figures mentioned here are not estimates of the likely upper and lower bounds of the net present value (NPV) of the project relevant to NSW decision makers. They are estimates of NPV accruing to Australia with and without “non-market value of employment”, a contentious external value not commonly used in cost benefit analysis and discussed further below. In fact the socio-economic assessment estimates a range of NPV values far wider, from \$15m to \$326m, see p A3-1. The lower end of these estimates is more likely given the current coal market outlook and the high coal price used in the economic assessment, discussed further below. Presenting the NPV in the executive summary as being “between \$145 million and \$174 million” in this way gives an impression of accuracy that is misleading and not reflective of the results of Appendix P.

The executive summary goes on to claim:

In addition, the Project would generate total royalties to the state of NSW in the order of \$130 million over the life of the Project. (pES-6)

This \$130m figure is not discounted to present value terms, as is standard in cost benefit analysis, and as the NPV estimates are. Appendix P estimates present value royalties of \$84m. Presenting discounted NPV and undiscounted royalty figures together in the executive summary gives readers the impression that the state of NSW stands to gain a far greater share of benefits than is actually the case.

Viability of the project

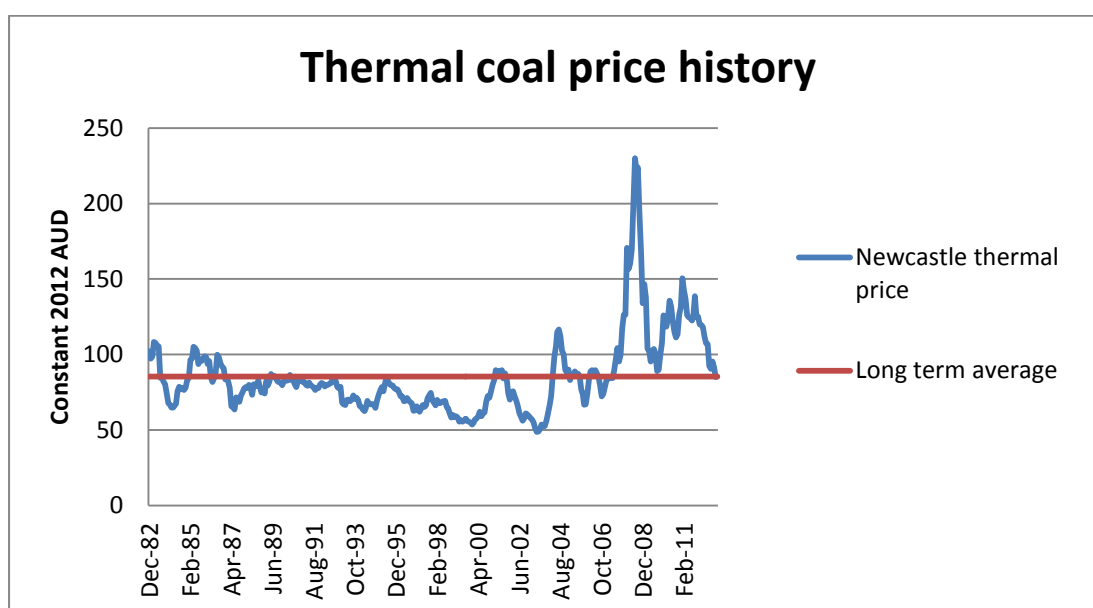
Benefits to the NSW community are dependent on the viability of the project, which decision makers must have a clear understanding of. Several points in the EIS and the socio economic assessment suggest that the value and viability of the project has been overstated. This has implications for both the uncertainty of the claimed benefits and the environmental and social costs that may need to be incurred to maintain financial viability.

Decision makers should note that the EIS makes no mention of coal specifications, or of the relative quantities of thermal and metallurgical coal the proponents hope to produce. This precludes any serious independent assessment of the values presented in the EIS.

Estimates of coal price

The vast bulk of the estimated benefits of the project are the revenues from sale of coal. The price for coal used in this estimate is therefore one of the most important inputs into the cost benefit analysis. The prices used are AUD\$178 per tonne for metallurgical coal and AUD\$111 per tonne for thermal coal. These prices are substantially above current prices and long term averages, meaning the economic assessment presents an optimistic and misleading estimate of the project's value. No justification for these estimates is given, nor for the changes given in the simplistic sensitivity analysis of 20% (pA3-1). These inputs must be explained.

The current price of Newcastle benchmark thermal coal is around AUD\$85 per tonne, and the long term average price in 2012 AUD is around \$84.50, as shown below:



Sources: Indexmundi, Reserve Bank of Australia

Similarly, prices for Newcastle semi-soft coking coal have declined to under \$120 per tonne. Most analysts are forecasting prices of well under \$150 per tonne for the next few years. See for example (NAB 2012) and (ANZ 2012).

As coal prices have declined by around 20% relative to the case presented in the socio economic assessment, returning to long-run averages, it is most important to consider the scenario presented in sensitivity analysis with a 20% decline in coal prices. Depending on the discount rate, the NPV is estimated at between \$15-35m. Any further decline in coal prices will make the project financially unviable. Indeed many coal projects in Australia are being abandoned, postponed or downsized – this year mining at both Stratford and Duralie was suspended over the Christmas period, apparently due to cost considerations. The EIS itself hints at the marginal nature of the project claiming that without a change to 24 hour mining operations and leaving a final voids, the project will be unviable (EIS section 6.9.2 discussed further below).

24 hour operations

Section 6 *Planning Framework and Project Justification* states:

SCPL has evaluated various combinations of operational hours for the four Project open cut operations and associated waste rock emplacement activities. This analysis indicates that Project economic viability constraints require 24 hour open cut mining operations, however, Project viability can be maintained with some open cuts operating with limited hours to achieve environmental benefits (e.g. reduced noise emissions in the night-time period). (p6-14)

Mining operations in the Stratford complex have not run 24 hours per day for nearly a decade. The claim that project viability is dependent on a change that has major implications for the amenity of the local area further suggest that the value of the project in the EIS has been overstated and that NPV is likely to be at or below the lowest estimates of the sensitivity analysis, possibly negative.

While the proponents claim to have evaluated various combinations of operational hours, the cost benefit analysis considers none of these options, nor does it mention a change to 24 hour mining operations. Cost benefit analysis is the ideal tool for comparing different project options such as operating hours. Identification and evaluation of alternatives is one of the most important parts of project economic evaluation. This is made clear in all guides to cost benefit analysis, including one co-written by the author of the socio-economic assessment, Gillespie & James (2002):

The main aims of an economic efficiency analysis are to...provide a framework for the evaluation of feasible alternatives. (p5)

See also:

Cost-benefit analysis is a procedure for comparing alternative courses of action by reference to the net social benefits that they produce for the community as a whole. (Commonwealth of Australia 2006, p2)

The socio economic assessment should demonstrate to decision makers and the local community that this cost that they must bear, in loss of amenity and reduced financial values of properties, is justified and why no other alternative is feasible.

Final voids

The creation of final voids is of concern to the Barrington-Gloucester-Stroud Preservation Alliance. The Project Justification's claims (section 6, p6-15) that minimising the final voids associated with the project was unviable further suggests the project's value and viability has been overstated.

With several options for final voids or filling available, cost benefit analysis should have been used to evaluate the different options and their impacts on viability and local amenity.

Scope of assessment

The importance of setting the scope of a cost benefit analysis and remaining consistent with this scope cannot be overstated. As Eggert (2001) makes clear:

Let us now turn to ... issues that challenge and bedevil practitioners of social benefit-cost analysis. The first challenge is deciding "whose benefits and costs count" It sometimes is called the issue of standing--that is, who has standing in the analysis of benefits and costs? This is an issue of scope. Should the analysis include only those costs and benefits affecting residents of the local community? The state or province? The nation? The world? Whether the net benefits of a project are positive or negative often depends on how narrow or broad the scope of the study is. (p27)

The cost benefit analysis in the socio-economic assessment is carried out at a national level, while the Director General's Requirements for the assessment are to ascertain if the project results "in a net benefit to the NSW community". The national scope will inevitably overstate the value of the project to the NSW community and NSW decision makers need to be aware of this overstatement. A revised cost benefit analysis for NSW should be produced, in line with the Director General's requirements, similar to that produced in (Bennett & Gillespie 2012).

Benefits accruing to Australia and overseas

Profits of the project that accrue to overseas interests should not be included as a benefit in this cost benefit analysis, as confirmed by Bennett (2011)

Where the shareholders are not citizens, their mine benefits are expatriated and should not be included in the BCA. Careful attention should therefore be given to the register of shareholders and adjustments made to the producer surplus benefit calculation. (p3)

This has been acknowledged in the socio-economic assessment on p17:

The Project is estimated to have net benefits of \$215m, with \$146m accruing to Australia.

As discussed above, these estimates are almost certainly optimistic. How the adjustment from global benefits to Australian benefits has been made is unclear from the socio-economic assessment. We believe it is unacceptable for one of the most important calculations in the cost benefit analysis to be presented with no discussion of methodology, working or sources.

Greenhouse Gas emissions

Gillespie Economics omit the main impact on greenhouse gas emissions from their assessment, which is the marginal increase in the amount of coal burned in the world. The costs of CO2 emissions relating to this increase represents a loss of welfare to the world. The cost benefit analysis makes an estimate of global NPV, which does not include this loss of welfare and therefore overstates the value of the project.

Gillespie Economics argue that they have considered “production benefits (value of coal) and costs [valued] up to the national boundary.” However, in many areas of the assessment, they refer to international NPV figures, which include the full benefits of coal, reflected in its price, but do not reflect the full costs of coal, which are not included in its price. Economic analysis is concerned with all major impacts of a project, indeed Gillespie Economics point out in section 2.1, that cost benefit analysis is focused on comparing a “with project” and “without project” scenario. Omitting major impacts from the “with project” scenario simply because they do not require regulatory approval has no basis in economic analysis.

The Stratford project will cause a small increase in the amount of coal used in the world. Coal industry proponents often adopt the “drug dealer’s defence” – that if we did not sell the coal/drug to the users, someone else would, and our actions therefore make no difference. This is true to a large extent - most coal that would be consumed in the world would be substituted from other mines, but not all of it. The expansion of the coal supply that the project represents will exert some downward pressure on prices which will result in an increase in the amount demanded.

In the absence of the project, not all of the coal exported would be offset by production in other mines. To argue otherwise is to suggest that coal supply is perfectly elastic and therefore that coal price should not vary. This is clearly not the case. Some estimate of this effect can be made from published sources and consideration of the price elasticities of supply and demand for coal. The standard analysis gives the equilibrium effect on aggregate quantity by the project as $\Delta(\epsilon/(\epsilon+\eta))$ where:

Δ is the initial change in supply

ϵ is the elasticity of demand

η is the elasticity of supply

The elasticity of demand for coal is estimated by (Ball & Loncar, 1991) at -0.3. Estimates of the elasticity of supply vary widely. (Light, Kolstad, & Rutherford, 1999) cite a range of estimates from 0.3 to 2.0 and conclude that the best estimate is around 0.5.

Using the Light, Kolstad and Peterson estimate, if the project did not proceed, a reduction in supply would ensue of approximately 12.4 million tonnes. The equilibrium market outcome would be a reduction in total output and consumption of $12.4 * (0.3 / (0.3 + 0.5)) = 4.65$ million tonnes, with associated emissions of around 12 million tonnes of CO₂. At a price of \$23/tonne, the implied social cost is over \$276 million, which substantially exceeds the estimated benefits of the project.

The greenhouse gas impacts of the project estimated in the economic assessment relate only to the direct emissions of the project. To understand the full impacts of the project Gillespie Economics need to incorporate the impact of the increase in coal consumed in the world. This impact is not equivalent to greenhouse from combustion of all of the product coal, as is sometimes contested by anti-coal groups. In the absence of the project, most of this consumption would have been sourced from other coal mines. The economic assessment should, however, include the emission from the additional coal burned as a result of the project.

Social value of employment

The values claimed as social value of employment are misleading. We have argued this in submissions on the Boggabri Coal Project, Warkworth Coal Project, Maules Creek Coal Project, Cobarra project and others. The proponents of the Maules Creek Coal Project commissioned Professor Jeff Bennett of the Australian National University to review the economic assessment of that project, also by Gillespie Economics, which also included a “social value of employment”. In relation to the inclusion of this value, Professor Bennett said:

[The] EIA's inclusion of benefits associated with employment [is contentious]. The argument advanced is that people outside of the mine workforce enjoy benefits associated with people having jobs in the mine. The values of this 'existence benefit' of work estimated for the case of a mine in the southern coal field are 'transferred' to the current case. A number of points argue against this approach. First, there is a conceptual issue. In a fully employed economy, it is doubtful that people employed in the new mine would be drawn from the ranks of the unemployed. So people outside the mine are unlikely to hold any existence benefits for the jobs provided by the mine in that case. Second, there is an estimation issue concerning the use of a benefit estimate transferred from another context. The conditions in the southern coalfield – the context of the source of the benefit estimate are very different from the proposed mine context..... [The] inclusion of the employment benefit as a component of the EIA is not recommended. Their inclusion would overstate the extent of proposal benefits. (Bennett 2011)

These are the words of one of Australia's most senior academic economists and the lead author of one of the papers Gillespie Economics cite to justify their inclusion of this value. Professor Bennett is not alone in his criticisms of Gillespie Economics' use of a social value of employment. Another prominent academic has criticised it, John Quiggin (2012), as has the executive director of The Australia Institute (Denniss 2012) and leading private sector consultants (Deloitte Access Economics 2012). With so many high-profile economists opposed to the inclusion of this value in assessments of coal projects, it is a source of considerable bemusement to us as to how Gillespie Economics can continue to incorporate it. We call on Gillespie Economics to desist from including this discredited value in their work entirely.

Noise, dust, air quality, vibration, amenity impacts

All of these impacts are assigned zero values beyond the cost of mitigation measures which are incorporated into the capital costs of the project. Gillespie Economics consider that land acquisition largely offsets these impacts within the affected zone:

It is expected that the owners of the properties located within the Project noise affection [sic¹] zone would be granted the opportunity to be acquired by SCPL"

¹ We assume this is a typo and that there is not a zone with a real affection for excessive noise, which would give the project considerable positive externalities!

This implies that the acquisition process proceeds smoothly and without controversy. However this is rarely the case with disagreements over acquisition programmes common in NSW at the moment. Gillespie Economics do acknowledge “that there may also be some consumer surplus losses to these property owners above and beyond changes in property values”. The euphemism of consumer surplus disguises the real personal and social cost of the acquisition programme.

Gillespie Economics consider that there is no need to value impacts on the community outside the affected zone, provided they remain within legislated guidelines. This is inappropriate as compliance with guidelines does not mean community welfare is unaffected in these areas. Local people who are affected by these impacts, but are not compensated for them, incur economic costs of this project. Furthermore, the Barrington-Gloucester-Stroud Preservation Alliance claim the estimates of noise-affected areas are inaccurate and are planning to contest them. Failure to acknowledge such impacts and estimates serves to overstate the value of the project.

Value of social impacts

While the socio economic assessment identifies that 11 residences are likely to be acquired as part of the project, no estimate is made of the social impacts on rural communities. Gillespie Economics conducted a non-market valuation exercise in relation to the impacts of the Warkworth Coal Project in 2009 (Gillespie Economics 2009). This study estimated values for several non-market aspects of that project, including value of impacts on rural communities.

The Warkworth Project choice modelling survey estimated that the NSW public places a value on rural households displaced of \$38m per household. According to the economic assessment 11 households are likely to be displaced. Barrington-Gloucester-Stroud Preservation Alliance believe the noise and dust assessments are conservative and that more households will be affected by these impacts than estimated in the EIS

A study by Gillespie Economics (2009) estimates this damage to the social fabric of rural communities results in a loss to the NSW public of $\$38m \times 11 = \$418m$, greater than Gillespie Economics’ original estimate of project NPV.

Economists at Large have been critical of the study (Gillespie Economics 2009), we argued in (Campbell 2012) that the study contains various methodological flaws. These criticisms are largely supported by (Deloitte Access Economics 2012) and (PAC 2012), although the study was accepted for publication in an academic journal, albeit an obscure one (Gillespie & Bennett 2012). While the merits of the study are open for debate, Gillespie Economics should explain why this value, or at least some value reflecting the public concern for rural communities, was not incorporated into the present cost benefit analysis.

Flora and fauna

Impacts on flora and fauna are assumed to be offset by an ecological offset programme and no value assigned to any damage that may be caused. This is inappropriate as it ignores the considerable debate between ecologists over the ability of offset programmes to achieve their aims in many cases. See (Bekessy et al. 2010) for example. We suggest it is beyond the expertise of Gillespie Economics

to adjudicate in these debates between physical scientists. The allocation of zero values to these external costs is just such a judgement.

Health Impacts

The cost benefit analysis makes no mention of the impacts on human health of open-cut coal mining and transportation, despite this issue garnering considerable attention in the region, the media and academic writing. External impacts such as health can be measured and quantified in economic terms, as pointed out in Gillespie and James (2002):

[C]ertain kinds of social impacts, such as social dislocation or adverse health effects, may be partially appraised in monetary terms. (p21)

Such appraisal would be assisted by a recent NSW Department of Health report looking at morbidity and mortality in regions of the Hunter Valley affected by mining (NSW Health 2010a). They found that the regions in the Hunter most affected by mining have higher rates of emergency department attendances for asthma and other respiratory conditions; hospital admissions for respiratory conditions and cardiovascular disease and mortality due to cardiovascular disease and all cause mortality. Analysis of presentations to GPs also suggested higher rates of asthma and other respiratory conditions in communities affected by mining, although not statistically significant (NSW Health 2010b).

There are significant limitations to these studies, including that they do not adequately take account of other population factors affecting health in these areas, and that the number of people in the affected areas are small, making comparisons difficult. However, both studies confirm the work of others, showing that exposure to pollutants, particularly particulate matter is an important causative factor in respiratory and cardiovascular disease. It is also well recognised that there is no threshold level for negative health impacts of particulate pollution. There will be people affected by particulate air pollution and this must be acknowledged.

Air monitoring data from the mines in the Hunter region revealed high levels of PM10 particles in a number of sites (NSW Department of Environment, Climate Change and Water 2010). However, as acknowledged by the Dept of Health, there is insufficient monitoring in populated areas. If those data were available, this would enable a better prediction of the cumulative health impact of the mining activities in the region (NSW Health 2010a).

In the USA quantification of the health impacts of coal is more advanced. Epstein et al (2011) estimate that the cost of lives lost in the Appalachian mining region in the US is US\$74.6 billion per year. This builds on other studies such as Hendryx and Ahern (2009) who found “[a]ge-adjusted mortality rates were higher every year from 1979 through 2005 in Appalachian coal mining areas compared with other areas of Appalachia or the nation” (p.547). Hendryx and Ahern also refer to past research on coal mining regions that found elevated levels of chronic heart, respiratory, and

kidney disease, and lung cancer, after control for socioeconomic factors. They found that the health impacts far outweighed the economic benefits of mines.

While it is difficult to extrapolate the health impacts of coal mining in the USA to the Australian setting due to different mining practices and different pollutant levels, there are a range of health impacts that can be extrapolated directly. These include particulate air pollution (with the level of impact being dependent on the level of pollution), noise, traffic, social and mental health impacts (Castleden et al 2011).

With long-term, empirical evidence linking significant health impacts to coal mining, it is important that the costs associated with impacts are included in consideration of this project. Clearly these are costs that accrue to the local and NSW community and should be included in the assessment.

Input-output modelling in Economic Impact Assessment

The use of input-output modelling in section 3 of the socio-economic assessment creates a misleading impression of the impacts of the project. These results are prominently stated in the executive summary:

The Socio-Economic Assessment indicates that operation of the Project is likely to result in an average annual stimulus of up to approximately 250 direct and indirect jobs in the Newcastle region and some 714 direct and indirect jobs in New South Wales at peak production.

These are certainly overestimates. Input-output modelling has fallen from favour with economists for many reasons, the main ones being explained by the Australian Bureau of Statistics (ABS 2011):

Lack of supply-side constraints: *The most significant limitation of [input-output modelling] is the implicit assumption that the economy has no supply-side constraints. That is, it is assumed that extra output can be produced in one area without taking resources away from other activities, thus overstating economic impacts. The actual impact is likely to be dependent on the extent to which the economy is operating at or near capacity.*

Fixed prices: *Constraints on the availability of inputs, such as skilled labour, require prices to act as a rationing device. In assessments using multipliers, where factors of production are assumed to be limitless, this rationing response is assumed not to occur. Prices are assumed to be unaffected by policy and any crowding out effects are not captured.*

These limitations are obvious to the local community, who experience difficulties accessing tradesmen and other services. These shortcomings are also becoming obvious to other sectors of the economy, particularly manufacturing and agriculture, as they struggle with the downside of the

mining boom. Yet this obvious downside is ignored by input-output modelling. As (Abelson 2011) put it:

I–O models lack resource constraints and fail to capture significant welfare (consumer and environmental) impacts. They always produce a positive gain to the economy, however disastrous the event.

We urge the NSW government to consider the wider effects of mining projects on other industries and the economy, which would be assisted by requiring more realistic modelling in economic impact assessment.

Conclusion

The socio-economic assessment of the Stratford Project is not suitable for decision making in its current form. It fails to clearly demonstrate the economic benefits of the project to Australia, much less NSW and the local community. Justification of assumptions, especially relating to commodity prices and local distribution of benefits is crucial if the public is to have any faith in this assessment. At a global scale the vast damage from downstream emissions suggest the project is economically unjustifiable, while at a local level problems such as:

- Failure to justify changes to mine operation hours
- No evaluation of final void options
- no quantification of most external costs and risks, and
- consideration of health impacts

also bring the efficiency of the project into doubt.

Methodological flaws such as inclusion or reference to social benefits of employment and misleading use of input-output modelling need to be revised before the assessment can inform decision making around this project.

References

- Abelson, P., 2011. Evaluating Major Events and Avoiding the Mercantilist Fallacy. *Economic Papers: Journal of the Economic Society of Australia*, 30(1), pp.48–59. Available at: <http://doi.wiley.com/10.1111/j.1759-3441.2011.00096.x> [Accessed August 25, 2011].
- ABS, 2011. Australian National Accounts: Input-Output Tables - Electronic Publication, Final release 2006-07 tables. Available at: [http://www.abs.gov.au/AUSSTATS/abs@.nsf/Previousproducts/5209.0.55.001MainFeatures4Final release 2006-07 tables?opendocument&tabname=Summary&prodno=5209.0.55.001&issue=Final release 2006-07 tables&num=&view=.](http://www.abs.gov.au/AUSSTATS/abs@.nsf/Previousproducts/5209.0.55.001MainFeatures4Final%20release%202006-07%20tables?opendocument&tabname=Summary&prodno=5209.0.55.001&issue=Final%20release%202006-07%20tables&num=&view=)
- ANZ, 2012. *Commodity Daily*, Available at: <http://www.macrobusiness.com.au/tag/anz/>.
- Bekessy, S. a. et al., 2010. The biodiversity bank cannot be a lending bank. *Conservation Letters*, 3(3), pp.151–158. Available at: <http://doi.wiley.com/10.1111/j.1755-263X.2010.00110.x> [Accessed March 7, 2012].
- Bennett, J., 2011. Maules Creek Coal Project Economic Impact Assessment: A review. *Research Evaluation*. Available at: [https://majorprojects.affinitylive.com/public/d70ab9717ed8449eafa6b1e7d8e4cea5/Appendix G Bennet Peer Review_lowres.pdf](https://majorprojects.affinitylive.com/public/d70ab9717ed8449eafa6b1e7d8e4cea5/Appendix%20G%20Bennet%20Peer%20Review_lowres.pdf).
- Bennett, J. & Gillespie, R., 2012. Affidavit of Professor Jeffrey William Bennet relating to the Proposed Warkworth Coal Mine extension. , 40(version 2).
- Campbell, R., 2012. *Affidavit of Roderick Campbell to the Land and Environment Court of NSW*, Expert witness evidence on the Warkworth Coal Project 23 August, 2012.
- Castleden, W. M., Shearman, D., Crisp, G., & Finch, P. (2011). The mining and burning of coal: effects on health and the environment. *The Medical Journal of Australia*, 195(6), 333-335. doi:10.5694/mja11.10169
- Commonwealth of Australia, 2006. Handbook of Cost-Benefit Analysis. *Financial Management*, (6).
- Deloitte Access Economics, 2012. *Economic and social impacts of the Warkworth Extension Project*, Review of the Economic Assessment of the Warkworth Extension Project for Singleton Council.
- Denniss, R., 2012. *AFFIDAVIT OF DR RICHARD DENNISS to the Land and Environment Court of NSW*, Evidence on the Warkworth Coal Project 23 August, 2012.
- Eggert, R.G., 2001. *Mining and Economic Sustainability: National Economies and Local Communities*, Report commissioned by the Mining, Minerals and Sustainable Development project of the Institute for Environment and Development, England.
- Epstein, P.R. Buonocore, J.J., Eckerle, K., Hendryx, M., Stout, B.M. III, Heinberg, R., Clapp, R.W., May, B., Reinhart, N.L., Ahern, M.M., Doshi, S.K. and Glustrom, L. Full Cost Accounting for the Life Cycle of Coal, *Annals of the New York Academy of Sciences*, vol. 1219, pp.73-98.

Gillespie Economics, 2009. *Annex O Economic Study*, Prepared for Warkworth Mining Limited.

Gillespie, R. & Bennett, J., 2012. Valuing the environmental, cultural and social impacts of open-cut coal mining in the Hunter Valley of New South Wales, Australia. *Journal of Environmental Economics and Policy*, 1(3), pp.276–288. Available at: <http://www.tandfonline.com/doi/abs/10.1080/21606544.2012.714970> [Accessed November 1, 2012].

Gillespie, R. & James, D., 2002. *Guideline for economic effects and evaluation in EIA*, Prepared on behalf of Planning NSW. Available at: http://cmsdata.iucn.org/downloads/11_guideline_for_economic_effects.pdf.

Hendryx, M., & Ahern, M. M. (2009). Mortality in Appalachian coal mining regions: the value of statistical life lost. *Public health reports (Washington, D.C. : 1974)*, 124(4), 541-50. Retrieved from <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2693168&tool=pmcentrez&rendertype=abstract>

NAB, 2012. *Bulk Commodities Market Update*, National Australia Bank bulk commodities market update 2 November, 2012. Available at: <http://business.nab.com.au/wp-content/uploads/2012/11/bulk-commodities-market-update-october-2012.pdf>.

NSW Department of Environment Climate Change and Water. (2010). Compendium of Upper Hunter ambient air quality monitoring data.

NSW Health. (2010a). *Respiratory and cardiovascular diseases and cancer among residents in the Hunter New England Health Service*.

NSW Health. (2010b). Analysis of BEACH general practitioner encounter data to examine the potential health effects of the mining industry and other exposures in Singleton, Muswellbrook and Denman.

PAC, 2012. *Determination report for the Maules Creek Coal Project*, Planning and Assessment Commission NSW. Available at: <http://www.pac.nsw.gov.au/Projects/tabid/77/ctl/viewreview/mid/462/pac/245/view/readonly/myctl/rev/Default.aspx>.

Quiggin, J., 2012. Affidavit of John Quiggin to the Land and Environment Court of NSW.

