

Styx coal project

Submission

The Styx coal project is economically and financially unviable. Figures in the Environmental Impact Statement suggest it would lose \$441 million if developed. Among other errors, the assessment overestimates royalties by \$175 million.

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Summary

The Styx Coal Project, also known as the Central Queensland Coal Project, is not financially or economically viable and should not be granted any form of project approval. Geoscience Australia has described the project area as “not of economic importance”. Figures presented in the environmental impact statement Appendix 10a – Economic Technical Report suggest the project will lose \$441 million.

This estimate is in many ways optimistic. It includes no financing costs, no cost overruns and assumes that production starts immediately, taking advantage of higher initial coal prices. The project is not viable without government subsidy. It will not produce economic benefit for the proponents or the Queensland community unless major royalty holidays and subsidies are provided, subsidies that would come with a major opportunity cost for other Queenslanders.

Much data and analysis in the economic technical report is flawed. Royalty calculations are erroneous and overstate the value of project royalties by \$175 million. Production of coal shows a huge peak in year 10, unusual in itself, while operating costs peak in year 12. These issues are not explained.

The economic impact analysis is based on input output modelling, a flawed modelling technique described by the Australian Bureau of Statistics as “biased” and by the Productivity Commission as “abused”. The same consultants used this methodology in another Queensland coal project, the Kevin’s Corner proposal. That study claimed Kevin’s Corner would be producing coal by 2014 and by 2017 would increase state output by \$1.4 billion and generate 5,267 direct and indirect jobs. None of this has eventuated and Kevin’s Corner remains a hopelessly stranded asset.

The Styx proposal is less about developing a mine and more about increasing the asset value of the project for the proponent. This is commonplace not only in Australian mining projects but in major projects generally around the world. Economic literature highlights the bias and frequency of over-optimism and strategic misrepresentation in project assessment. Decision makers should be conscious of the economic literature on this topic and assessment processes should take it into account.

Introduction

The Australia Institute welcomes the opportunity to make a submission on the environmental impact statement (EIS) of the Styx Coal project, also known as the Central Queensland Coal Project. The mine is in the Styx Basin, northwest of Rockhampton. The project proposes to mine up to 28 million tonnes of semi-soft coking coal and 9 million tonnes of thermal coal.

This proposal is highly problematic. New coal projects in undeveloped areas are struggling to be economically and financially viable. Despite the backing of large multinational mining companies, projects like Adani's Carmichael Project and Glencore's Wandoan mine are delayed due to a range of related factors including lower than expected coal demand and price, climate action, falling costs of renewable energy and abundant existing supply of thermal coal.

The prospects for the Styx Project are worse still, since it is proposed by companies associated with financially-troubled Queensland personality Clive Palmer. Geoscience Australia notes that:

Coal was mined in the Styx basin in the first half of the 20th century with a total production of 1.76 million tonnes, but reserves are currently not of economic importance.¹

The fact that the coal was mined in the Styx Basin in the past but not now points to the marginal economics of this mine. The EIS makes misleading claims around the economic position of the project, and of coal in general, which are addressed in this submission.

The problem of projects making unrealistic economic claims is not limited to this project, or even to Australian mining projects. This submission also puts this proposal in the context of the chronic over-optimism of major project assessment. Queensland decision makers should be conscious of the literature in this field and assessment processes should take it into account.

¹ Geoscience Australia (2017) *Styx Basin*, <http://www.ga.gov.au/scientific-topics/energy/province-sedimentary-basin-geology/petroleum/onshore-australia/styx-basin>

Comments on Appendix 10a - Economic Technical Report

VIABILITY OF THE STYX PROJECT

Even the most basic consideration of the economics of the Styx Project shows that it is unviable. Based only on figures presented in Appendix 10a – Economic Technical Report by consultants ‘Economic Associates’, the project would lose \$441 million, as shown in Table 1:

Table 1: Basic costs and revenues of Styx Project by year

Year	Capital expenditures	Operating costs	Revenue	Royalties
1	243	46	67	9
2		94	127	17
3		93	119	15
4		188	222	28
5		189	215	26
6		187	213	26
7		184	209	25
8		276	314	38
9		270	586	37
10		341	947	47
11		666	389	77
12		1,000	402	107
13		374	425	51
14		92	104	13
15		46	52	6
16		16	18	2
17		5		
18		5		
19		5		
20		5		
Total	243	4,083	4,409	525
Net surplus (revenue less royalties less capital and operating expenditure)				- 441

Sources: Economic Associates (2017) *Styx Coal Project: Economic Study Final Report*, p 25 (capex), Table 3.2, p 27 (opex) and Table 3.19, p 49 (revenue and royalties)

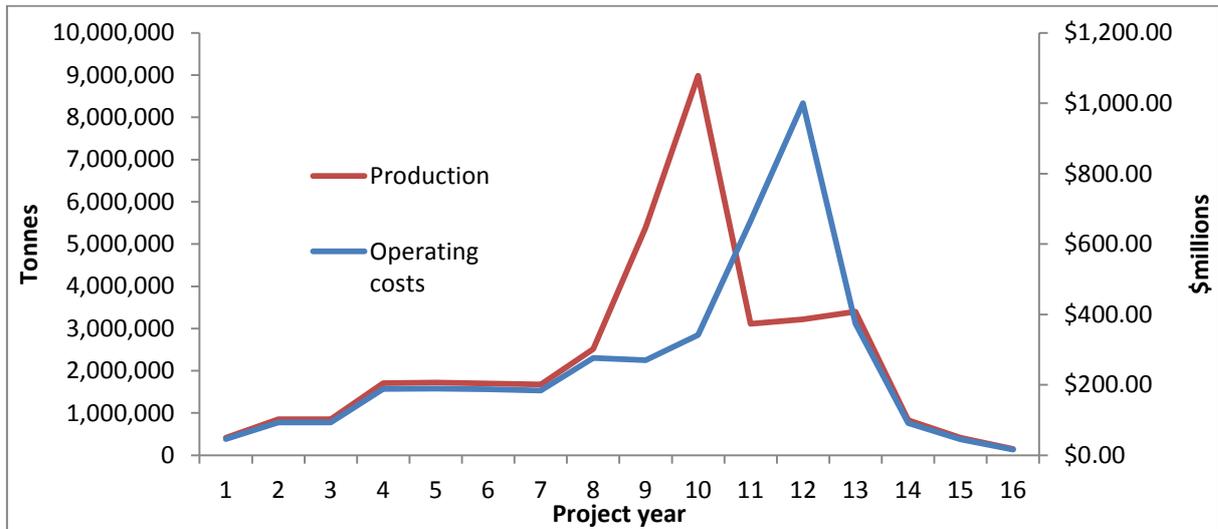
The numbers in Table 1 are optimistic. They include no financing costs and no cost overruns, and assume that production starts immediately, taking advantage of higher initial coal prices. There are many other problems with this Economic Associates analysis, some of which are explored in the following sections. The conclusion, however, is unmistakable. The project is not viable without government subsidy. It will not produce economic benefit for the proponents or the Queensland community unless major royalty holidays and subsidies are provided, subsidies that would come with a major opportunity cost for other Queenslanders.

A question that is often asked when proposals appear unviable is why would proponents propose a mine that isn't viable? Many observers assume that if a company is prepared to commission an EIS and go through various regulatory processes, it must see value in the proposal. However, there are many reasons why a company would pursue approval for an unviable project. Approval brings the option of proceeding with the project, but not an obligation. This option value increases the value of the project and the company without providing any benefit to the public. In this case, it seems clear that the proponent is pursuing approval not with the intention of developing the mine, but to either increase its potential sale value, or to increase the value of the project on its balance sheet (or to prevent it being written off the balance sheet).

PRODUCTION LEVELS AND COSTS

The data used in the Economic Technical Report is problematic. It is unusual for production to jump dramatically in just one year, half way through the life of the coal mine. More unusual still is that operating costs would then jump dramatically two years after the peak of production, as shown in Figure 1 below:

Figure 1: Production volume and operating cost of Styx project:



Source: Economic Associates (2017) *Styx Coal Project: Economic Study Final Report*, Table 3.2 and Table 3.19

It is highly unusual and likely to be very inefficient for a coal mine to produce 8.9 million tonnes of coal in one year and then 3.1 million the next, as Economic Associates assessment suggests. They do not explain this unusual approach to production. Stranger still, in most years of the project’s operations, operating costs track production levels closely (as would be expected), yet Figure 1 shows that costs peak two years after the peak in production. No explanation is given for this. This mismatch between peak production and peak operating costs serves to overstate the value of the project if discounted cash flow analysis was undertaken, as would normally be the case in cost benefit analysis or any form of financial analysis. Benefits are brought forward, while costs are pushed further back in the project life.

ROYALTIES

The royalty calculations in the Economic Technical Report are incorrect and overstate the royalties that would be paid by the project. Table 2 below shows the Revenue and Royalty figures from Table 3.19 of Economic Associates’ analysis and expresses royalties as a percentage of revenue:

Table 2: Revenue and royalty payment by year

Year	Total revenue	Royalty revenue	Assumed royalty rate
1	\$66.78	\$9.20	13.8%
2	\$127.43	\$17.06	13.4%
3	\$118.87	\$15.37	12.9%
4	\$222.12	\$27.57	12.4%
5	\$214.84	\$26.03	12.1%
6	\$212.70	\$25.77	12.1%
7	\$209.39	\$25.37	12.1%
8	\$314.14	\$38.06	12.1%
9	\$585.89	\$37.15	6.3%
10	\$946.60	\$47.01	5.0%
11	\$389.24	\$76.56	19.7%
12	\$401.84	\$107.49	26.7%
13	\$424.98	\$51.49	12.1%
14	\$104.01	\$12.60	12.1%
15	\$51.71	\$6.27	12.1%
16	\$18.45	\$2.24	12.1%
Total	4408.99	525.24	

Source: Economic Associates (2017) *Styx Coal Project: Economic Study Final Report*, Table 3.19

Table 2 shows in most years Economic Associates appear to apply a royalty rate of over 12%, although this varies from as little as 5% to as much as 26.7%. In Queensland the royalty rate varies and depends on the coal price per tonne:

- Up to and including \$100 - 7% of value
- Over \$100 and up to and including \$150
 - First \$100 - 7% of value
 - Balance - 12.5% of value
- More than \$150
 - First \$100 - 7% of value
 - Next \$50 - 12.5% of value
 - Balance - 15% of value²

Applying the official royalty rates to the production and price figures in Economic Associates' Table 3.19 gives a total royalty value of \$350 million for the project, as shown in Table 3 below:

² Business Queensland (2017) *Mineral Royalty Rates*, <https://www.business.qld.gov.au/industries/mining-energy-water/resources/applications-compliance/royalties/calculating/rates>

Table 3: Applying official Queensland royalty rates to production figures

Year	Production (tonnes)		Price (AUD/t)		Royalty (AUD\$m)	
	Thermal	SSCC	Thermal	SSCC	Thermal	SSCC
1	0	417,345	\$95	\$160		\$6.2
2	0	849,556	\$95	\$150		\$11.3
3	0	849,090	\$95	\$140		\$10.2
4	0	1,708,639	\$95	\$130		\$18.4
5	0	1,718,708	\$95	\$125		\$17.4
6	0	1,701,616	\$95	\$125		\$17.2
7	0	1,675,155	\$95	\$125		\$17.0
8	0	2,513,081	\$95	\$125		\$25.4
9	2,940,000	2,452,699	\$95	\$125	\$19.6	\$24.8
10	5,880,000	3,104,035	\$95	\$125	\$39.1	\$31.4
11		3,113,935	\$95	\$125		\$31.5
12		3,214,700	\$95	\$125		\$32.5
13		3,399,837	\$95	\$125		\$34.4
14		832,061	\$95	\$125		\$8.4
15		413,655	\$95	\$125		\$4.2
16		147,638	\$95	\$125		\$1.5
					\$58.7	\$291.9
Total royalties						\$350.5

Source: Economic Associates (2017) *Styx Coal Project: Economic Study Final Report*, Table 3.19 and Business Queensland (2017) *Mineral Royalty Rates*

Royalty payments calculated correctly in Table 3 above will be \$350.5 million, not the \$525 million estimated by Economic Associates and repeated in various places through the EIS. This error overstates royalty revenue to the Queensland Government by \$175 million.

The results in Table 3 above can be compared to the total revenue reported in Economic Associates Table 3.19 to ensure royalties have been calculated correctly. This is done in Table 4 below:

Table 4: Sense check of Table 3 royalty calculations

Year	Thermal royalty	SSCC royalty	Total revenue	Average royalty rate
1		\$6.2	\$66.78	9.22%
2		\$11.3	\$127.43	8.83%
3		\$10.2	\$118.87	8.57%
4		\$18.4	\$222.12	8.27%
5		\$17.4	\$214.84	8.10%
6		\$17.2	\$212.70	8.10%
7		\$17.0	\$209.39	8.10%
8		\$25.4	\$314.14	8.10%
9	\$19.6	\$24.8	\$585.89	7.58%
10	\$39.1	\$31.4	\$946.60	7.45%
11		\$31.5	\$389.24	8.10%
12		\$32.5	\$401.84	8.10%
13		\$34.4	\$424.98	8.10%
14		\$8.4	\$104.01	8.10%
15		\$4.2	\$51.71	8.10%
16		\$1.5	\$18.45	8.10%

Source: Economic Associates (2017) and author calculations

Table 4 shows that the royalty rates applied in Table 3 averages between 7% and 9.22%. This would be expected as the discount rate of 7% applies up to a coal price of \$100 per tonne, with the higher 12.5% rate applying to the final \$25 of the semi-soft coking coal price in most years. Average royalty rates in the earlier years are higher still as the SSCC price is higher. Year one attracts the top rate of 15% to the final \$10 of the \$160 coal price.

Economic Associates' error makes the project appear less financially viable for the proponent, but overstates the potential benefit of the project for Queensland. Regardless, the EIS revenue, cost and royalty figures make it clear the project as proposed is not financially viable.

INPUT OUTPUT ANALYSIS

The economic impact analysis is based on input output modelling. There are major issues with using input output modelling. The Queensland Government,³ Federal

³ Queensland Government (2015) *Project Assessment Framework: cost benefit analysis*, <https://s3.treasury.qld.gov.au/files/paf-cost-benefit-analysis.pdf>

Government and the Australian Coal Association Research Program⁴ prefer cost benefit analysis over input output modelling because input output modelling:

- does not weigh the costs and benefits of a project;
- assumes the project will go ahead which is a problem with a financially unviable project such as the Styx project; and
- makes the flawed assumption that there are unlimited resources in the economy.

Cost benefit analysis is preferred because input output modelling does not weigh the costs and benefits of the project and does not assess if a project is in the best interests of the community. Instead it provides (usually overstated) estimates of the project's impacts on output and employment.

Cost benefit analysis is more useful because it helps decision makers understand what conditions are required for the project to actually proceed and deliver benefits – e.g. what coal prices, exchange rates and cost levels are needed for the project to proceed as planned. In contrast input output models assume that projects are financially viable. This is a major problem if the project is financially weak, as the Styx project is. The project may not proceed or could shut down prematurely, thus limiting whatever benefits it may have.

The likelihood of the Styx coal project not starting, or halting some time in its life, is increased because the project proponent has financial difficulties. Two liquidators are pursuing Mr Palmer and several of his companies to get money back for creditors.⁵

The unreliability of Economic Associates' approach, based on input output modelling, can be seen in their assessment of the Kevin's Corner coal project in 2011. That study estimated Kevin's Corner would be producing coal by 2014 and by 2017 would spend \$662 million on operations, resulting in \$1.4 billion in increased state output, \$400 million in increased household income and 5,267 direct and indirect jobs.⁶

None of these effects have been realised as the Kevin's Corner project is hopelessly unviable without government subsidies and is a stranded asset in a world looking to

⁴ Hunter Research Foundation, commissioned by the Australian Coal Association Research Program (2014) *Approval and planning assessment of black coal mines in NSW and Queensland: A review of economic assessment techniques*, p 1–3

⁵ Elks (2017) *Clive Palmer given deadline to produce documents*, <http://www.theaustralian.com.au/news/investigations/clive-palmer/clive-palmer-given-deadline-to-produce-documents/news-story/44267e6661bdcf14306d81753d371408>

⁶ Economic Associates (2011) *Kevin's Corner Economic Impact Study Final Report*, <http://gvykhancockcoal.com/our-assets/kevin-s-corner#volume-1-sections>

act on climate change. The proponent is in serious financial difficulty, partly due to the Kevin's Corner investment.⁷ Economic Associates' study never gave any indication that this was a possibility.

Another example of the failure of input output modelling is Bandanna Energy, which went into liquidation and was wound up.⁸ Its two major projects were the South Galilee Basin Coal Project and the Springsure Creek Coal Project. Both projects were assessed with input output modelling. The South Galilee Basin Project's economic assessment concluded in 2012 that it would employ 1,909 people and increase annual output by \$1.2 billion from 2019 to 2047. In fact, the project has not proceeded and has employed zero people, produced zero output and lost money for shareholders.⁹ The economic assessment of the Springsure Creek Project forecast an increase in annual output of \$1.9 billion and 3,236 jobs, but also has not proceeded.

Input output analysis suffers from the assumption that there are unlimited resources in the economy. This is not realistic. The Styx project will compete with other mining projects and other industries for resources. In fact, the Styx analysis lists 20 other major developments in the regional area that will compete for resources with the Styx project.¹⁰ Because the impact of these other projects has been ignored, the analysis overstates the impacts of the project in general and ignores its negative impacts on other industries.

Overstating positive impacts and ignoring negative impacts means an unrealistic impression of the project is presented. For this reason the Productivity Commission has remarked that these models are often "abused".

Abuse primarily relates to overstating the economic importance of specific sectoral or regional activities. It is likely that if all such analyses were to be aggregated, they would sum to much more than the total for the Australian economy. Claims that jobs 'gained' directly from the cause being promoted will lead to cascading gains in the wider economy often fail to give any consideration to the restrictive nature of the assumptions required for input-output multiplier exercises to be valid. In particular, these applications fail to

⁷ IIFL (2017) *GVK, Lanco decline due to troubles at Australian coal mines*, https://www.indiafoline.com/article/news-top-story/australian-cal-mines-gvk-lanco-decline-due-to-troubles-at-australian-coal-mines-117060900351_1.html

⁸ Bandanna Energy (2016) *Liquidation of BND and certain subsidiaries*, <http://www.asx.com.au/asxpdf/20160331/pdf/43667jz72713wm.pdf>

⁹ Aurecon Hatch, prepared for AMCI (2012) *Economic Impact Assessment South Galilee Coal Project – Final Report*, p 39-40

¹⁰ Economic Associates (2017) *Styx Coal Project: Economic Study – Final Report*, p 14

consider the opportunity cost of both spending measures and alternate uses of resources, and may misinform policy-makers.¹¹

¹¹ Gretton, Productivity Commission (2013) *On input-output tables: uses and abuses*, p 1, <http://www.pc.gov.au/research/supporting/input-output-tables>

Comments on EIS section 2: Project need and alternatives

This section of the EIS has numerous errors and misrepresentations that overstate the case for the project. Below we quote these statements and detail why they are incorrect or misleading.

Section 2.2.1 Global Coal Demand

Recent demand for both thermal and coking coal has increased significantly with spot prices reaching US\$100 and US\$300 free on board (FOB), respectively. Quarterly contract sale prices have also significantly increased with the next quarter contracts for thermal and coking coal reaching US\$100 and US\$200/tonne, FOB respectively. As an indication of the extent to which global demand has changed, coking coal spot price (daily market price), was \$US73.40/tonne in November 2015 and in November 2016 prices reached \$US289.30/tonne; a four year high (~400% increase) (Office of the Chief Economist 2016; Kerr 2016). The demand for thermal and coking coal, and subsequent coal spot prices makes this Project economically viable.

This is not correct. While some daily spot prices may have reached these levels, thermal coal monthly average spot prices have exceeded USD\$100 per tonne just once since May 2012, in November 2016. While prices are higher now than the average for the last few years, analysts are largely united in attributing this to Chinese government policy restricting its own coal supply. Coal prices will remain highly contingent on government, particularly Chinese government, policy for the foreseeable future.¹²

Metallurgical coal monthly spot prices have also not reached USD\$300 per tonne since 2011. More importantly, the relevant grade of coal is semi-soft coking coal, which has

¹² Index Mundi (2017) *Coal, Australian thermal coal monthly price*, <http://www.indexmundi.com/commodities/?commodity=coal-australian&months=120>; Department of Industry (2017) *Resource and Energy Quarterly September 2017*, <https://www.industry.gov.au/Office-of-the-Chief-Economist/Publications/ResourcesandEnergyQuarterlySeptember2017/documents/Resources-and-Energy-Quarterly-September-2017.pdf>

traded at around USD\$135 per tonne this year and is forecast to decline to under USD\$100 per tonne out to 2021.¹³

Note that the two publications referenced – Office of Chief Economist 2016 and Kerr 2016 – do not appear in the EIS references chapter (Chapter 24).

With respect to thermal coal, the United States (US) International Energy Agency (IEA) predicts global energy consumption to grow by 37 per cent (%) by 2040 (US IEA 2014). This is taking into account existing and planned government policies regarding climate change. In 2040, natural gas, oil and coal will each account for roughly one-quarter of the world's energy needs (US IEA 2014).

It is unclear what publication is "US IEA 2014". It is listed in the references as "*United States International Energy Agency (US IEA) 2014, World Energy Outlook 2014, OECD/IEA, ISBN: 978-92-64-20804-9*". The United States Energy Information Agency publishes the International Energy Outlook, while the World Energy Outlook is published by the International Energy Agency, related to the OECD.

Regardless, the 2016 World Energy Outlook by the International Energy Agency shows coal declining in its share of energy demand from 29% of world energy to 23% in the central scenario and to 13% in 2040 under the "450 scenario" where countries act in line with the Paris Agreement.¹⁴

Australia exported 201.3 million tonnes (Mt) of thermal coal during the 2015 – 2016 financial year ... Australia's thermal coal exports are expected to increase by 11% per annum between 2013 and 2017, from approximately 162 Mtpa to approximately 271 Mtpa (Australian Coal Association 2012).

As Australia has been exporting around 200 Mt of thermal coal for several years, clearly the Australian Coal Association's forecast was wildly inaccurate, out by around 70 million tonnes. Astonishingly, the 11% growth in thermal coal exports prediction is repeated in the Introduction Chapter, section 1.2, despite being contradicted within the paragraph it is referenced in.

It is unclear why a 2012 publication by the now-defunct Australian Coal Association is being referenced, another reference which does not appear in Chapter 24. The Office

¹³ Department of Industry (2017) *Resource and Energy Quarterly September 2017*; KPMG (2017) *Coal Price and FX consensus forecasts*, <https://home.kpmg.com/content/dam/kpmg/au/pdf/2017/coal-price-fx-consensus-forecast-september-october-2017.pdf>

¹⁴ IEA (2016) *World Energy Outlook*, see Figure 5.1, p 206, <https://www.iea.org/newsroom/news/2016/november/world-energy-outlook-2016.html>

of the Chief Economist's latest forecasts are for a small decline from 202 million tonnes exported in 2016 to 201 million tonnes in 2019.

Section 2.2.3

In the 2015/2016 financial year coal contributed to the Queensland economy by ... Employing 183,554 full time employees (equating to 8% of Queensland total employment)

This statement is demonstrably false. Australian Bureau of Statistics (ABS) Census data shows that only 24,960 Queenslanders worked in coal mining in 2016. This is just 1.2% of the Queensland workforce. Coal is not a large employer in Queensland.¹⁵

This estimate comes from a Queensland Resource Council report based on input output multipliers that have been described by the ABS as "biased" and by the Productivity Commission as "abused".¹⁶ It is difficult to understand why the proponents would present modelled estimates by a lobby group when official statistics are easily obtainable.

¹⁵ ABS (2016) *Census data accessed via TableBuilder Basic*, <http://www.abs.gov.au/websitedbs/censushome.nsf/home/tablebuilder>

¹⁶ Lawrence Consulting (2016) *Economic contribution of the minerals and energy sector to the Queensland economy 2015-16*, https://www.qrc.org.au/wp-content/uploads/2016/10/FinalReport_compressed.pdf; ABS (2010) 5209.0.55.001 - *Australian National Accounts: Input-Output Tables - Electronic Publication, Final release 2006-07 tables*, <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Previousproducts/5209.0.55.001Main%20Features4Final%20release%202006-07%20tables?opendocument&tabname=Summary&prodno=5209.0.55.001&issue=Final%20release%202006-07%20tables&num=&view=>; Gretton (2013) *On input-output tables: uses and abuses*

Styx project in context of major project assessment

The over-estimation of the viability of the Styx Project is not unusual. Regardless of the method of economic assessment used, assessments of major projects almost always over-estimate benefits and under-estimate costs. This is well documented, particularly by megaproject expert, Bent Flyvbjerg, and in the work of Nobel Prize Winner for Economics Daniel Kahneman and his colleague Amos Tversky.

Their work identifies systemic flaws in major project assessment including:

- Optimism bias – where analysts underestimate the costs, completion times and risk of planned actions, whereas they overestimate the benefits of the same actions.¹⁷
- Planning fallacy – the tendency for people involved to base their forecasts of the future on the best case rather than the likely case.
- Strategic misrepresentation – where proponents have an incentive to present the best case to investors and regulators.
- Principal agent theory – where an agent or consultant has an incentive to deliver work that furthers the interests of their principal or client.

The Australia Institute has participated in many major project submission processes in Australia, including mining projects in Queensland, and these flaws exist in virtually all projects we have assessed.

Kahneman and Tversky say those involved with a project take *the inside view*. People who take the inside view:

- make forecasts by focusing tightly on the project at hand, considering its objective, the resources they brought to it, and the obstacles to its completion; and
- construct in their minds scenarios of their coming progress and extrapolate current trends into the future.

¹⁷ Kahneman & Tversky (1979) *Prospect theory: An analysis of decisions under risk* in *Econometrica*, 47, p 313–327; Kahneman & Tversky (1979) *Intuitive prediction: Biases and corrective procedures* in Makridakis & Wheelwright (eds) *Studies in the Management Sciences: Forecasting*, vol 12

This results in overly optimistic forecasts.¹⁸ Kahneman and Tversky contrast the inside view with the *outside view*. The outside view examines the experiences of a class of similar projects, lays out a rough distribution of outcomes for this reference class, and then positions the current project in that distribution.¹⁹

By focusing on Styx Project-specific information, mostly provided by the proponent, Economic Associates have taken an inside view and misrepresented the project. If the Styx project is considered in the context of other greenfields coal projects in Queensland, such as all Galilee Basin projects and most in the Surat Basin, it is clear that there is little likelihood of success.

Flyvbjerg highlights strategic misrepresentation and the principal agent theory.²⁰ These theories suggest there are strong incentives for project proponents to deliberately overstate the benefits and underestimate the costs and risks of projects. Government approval to mine would add to the value of the Styx project. It not only allows the proponents to start mining but also makes the project more valuable and easier to sell. While the approval process has costs (perhaps hundreds of thousands of dollars to compose and lodge an Environmental Impact Statement), approval can add tens or hundreds of millions of dollars of value to an asset.

Managers face incentives to get projects built because there are tangible and intangible rewards for getting them underway and for running a bigger company than a smaller company. Mining executives are often remunerated depending on the approved resources projects the company has. If senior managers are keen on a project, junior employees know they will meet with more approval if they work positively on the project rather than being a negative, though more realistic, critic. Employees' ownership of a company (for example, company shares) is often small compared to their salary and potential bonus. Consequently, their losses if a project fails are small but their rewards for success are much greater. Managers and employees may also rightly reason that they will have another job elsewhere by the time a project fails and that the blame for the failure will be diffused.

¹⁸ Flyvbjerg (2008) *Curbing Optimism Bias and Strategic Misrepresentation in Planning: Reference Class Forecasting in Practice* in *European Planning Studies* 16:3-21, p 9, https://www.researchgate.net/publication/233258056_Curbing_Optimism_Bias_and_Strategic_Misrepresentation_in_Planning_Reference_Class_Forecasting_in_Practice

¹⁹ Paraphrasing Flyvbjerg (2008) *Curbing Optimism Bias and Strategic Misrepresentation in Planning*, p 9

²⁰ Flyvbjerg (2008) *Curbing Optimism Bias and Strategic Misrepresentation in Planning*

FLYVBJERG AND THE DANGERS OF PROJECT ANALYSES

Bengt Flyvbjerg is the world's most cited scholar on megaprojects. He has advised the UK Government on the "Green Book" it uses to evaluate projects, the US Government and several corporations.²¹ Flyvbjerg has collected statistics on megaprojects from around the world. His work on megaprojects is also applicable to other projects. In summarising his work, Flyvbjerg writes:

Success in megaproject management is typically defined as projects being delivered on budget, on time, and with the promised benefits. If, as the evidence indicates, approximately one out of ten megaprojects is on budget, one out of ten is on schedule, and one out of ten delivers the promised benefits, then approximately *one in one thousand projects is a success*, defined as "on target" for all three. Even if the numbers were wrong by a factor of two—so that two, instead of one out of ten projects were on target for cost, schedule, and benefits, respectively—the success rate would still be dismal, now eight in one thousand. This serves to illustrate what may be called the "iron law of megaprojects": *Over budget, over time, over and over again. Best practice is an outlier, average practice a disaster* in this interesting and very costly area of management.²²

*More often than not the information that promoters and planners use to decide whether to invest in new projects is highly inaccurate and biased making plans and projects very risky.*²³

This economic assessment does not feature cost benefit analysis but instead uses the lesser-regarded input output analysis. Nevertheless, the biases that affect cost benefit analysis are equally likely to affect input output analysis.

OVER ESTIMATION IN THE MINING INDUSTRY

Research has found that the resources industry suffers from the same over-optimism that affects other industries. In 2014, mining analyst Christopher Haubrich gave a

²¹ Said Business School (2017) *Bent Flyvbjerg* <http://www.sbs.ox.ac.uk/community/people/bent-flyvbjerg>

²² Flyvbjerg (2014) *What you should know about megaprojects and why....*, p 11, emphasis added

²³ Flyvbjerg (2008) *Curbing Optimism Bias and Strategic Misrepresentation in Planning....*, p 5, emphasis added

paper titled “Why Building a Mine on Budget is Rare: A Statistical Analysis”.²⁴ Haubrich constructed a database of 50 mining projects and found that capital cost overruns are significant and persistent, with average cost overruns of 20%–60% recorded since 1965. Recall that Economic Associates’ cost estimates in their Table 3.19 included no consideration of cost overruns.

Haubrich also found that marginal projects, such as the Styx project, are likely to have larger cost overruns. Haubrich stated that this was because when projects are marginal, the incentive is to “sharpen your pencils” and reduce cost estimates in order to make the project numbers viable. Haubrich found no relationship between the cost of the project and cost overruns.

Global consulting firm EY found that mining projects run over-budget by an average of 62%, and that 50% of projects were reporting delays. Only 31% of projects came in on budget. EY quoted media coverage of some projects with cost overruns:

A major copper and gold operation in Central Asia: The National Finance Minister had been quoted as saying: “No one understands why the project has gone US\$2b over budget.”

A major iron ore project in Brazil: To date, the project has experienced an overrun from the initial estimate of approximately 690%. The chief executive officer of the company has gone on record to say that “they are working very hard” to ensure no more delays or cost overruns on the project.

A Brazilian megaproject: This project saw capital costs escalate from US\$3.6b in 2007 to US\$8.8b in 2013. Media sources have described this investment as one of this organization’s “most significant failures of recent years.”²⁵

Queensland legislation and guidelines largely ignore the systemic biases that cause mining project proponents to overestimate project benefits and underestimate project costs. These systemic biases have caused Flyvbjerg to propose the iron law of megaprojects: “over cost, over time, over and over again”. However, as Haubrich indicates, the systemic biases apply to all projects regardless of size.

²⁴ Haubrich (2014) *Why Building a Mine on Budget is Rare: A Statistical Analysis*, http://www.canadian-german-mining.com/files/events/2014-10-16_CIM_MES_Rocks_Stocks/3_Chris_Haubrich_Why_Building_A_Mine_on_Budget_is_Rare_-_A_Statistical_Analysis.pdf

²⁵ EY (2015) *Opportunities to enhance capital productivity: Mining and metals megaprojects*, [http://www.ey.com/Publication/vwLUAssets/EY-opportunities-to-enhance-capital-productivity/\\$FILE/EY-opportunities-to-enhance-capital-productivity.pdf](http://www.ey.com/Publication/vwLUAssets/EY-opportunities-to-enhance-capital-productivity/$FILE/EY-opportunities-to-enhance-capital-productivity.pdf)

RECOMMENDATIONS ON PROJECT ASSESSMENT

The estimation of the benefits of the Styx project is over-optimistic.

The Queensland Guidelines have not incorporated the substantial literature that highlights the over-optimism and strategic misrepresentation in economic analysis of major projects. The UK Government has considered these biases in their project guidelines since 2003.²⁶ The Victorian Parliament considered them in a 2012 Parliamentary Inquiry.²⁷ Switzerland, Denmark and The Netherlands have also considered them.²⁸

We make three general recommendations to improve the assessment of resource projects:

- 1. Revise the Queensland Guidelines**

The Queensland guidelines need to be urgently revised to consider over-optimism and strategic misrepresentation. Similarly they also should be revised to require the use of benefit cost analysis rather than methods such as input output analysis.

- 2. Incorporate reference class forecasting**

Kahneman and Flyvbjerg urge the use of reference class forecasting to better estimate the benefits and costs of projects. This is done by comparing the costs and benefits to what similar projects have achieved rather than relying on assessments by the project proponents; that is, taking the *outside view* rather than the *inside view*. Terrell also recommends that Australian Governments do this when assessing infrastructure projects.²⁹ We also recommend that reference class forecasting be used to evaluate mining and coal seam gas proposals.

- 3. Develop a database of projects for use in reference forecasting**

Terrell recommends that 'The Commonwealth Department of Infrastructure should be required to publish to data.gov.au the post-completion report it

²⁶ Flyvbjerg (2008) *Curbing optimism bias and Strategic Misrepresentation in Planning*, p 11

²⁷ Parliament of Victoria (2012) *Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects*,
http://www.parliament.vic.gov.au/images/stories/committees/paec/reports/PAEC_InfrastructureInquiry_FINAL-Report.pdf

²⁸ Flyvbjerg (2014) *What you should know about megaprojects and why....*, p 16

²⁹ Terrill (2016) *Cost overruns in transport infrastructure*, p 22, <https://grattan.edu.au/wp-content/uploads/2016/10/878-Cost-overruns-on-transport-infrastructure.pdf>

already requires from state governments as a condition of providing final milestone payments for transport infrastructure projects. Reports should detail any scope changes and their justification, agreed and actual construction start and finish dates, actual project costs, reasons for overruns or under-runs, and progress against performance indicators.³⁰ In addition, Flyvbjerg has developed a database of transport projects for the UK Treasury to use in reference forecasting of new transport proposals.³¹ We recommend that a similar database be developed for Queensland resource projects.

³⁰ Terrill (2016) *Cost overruns in transport infrastructure*, p 24

³¹ Flyvbjerg (2008) *Curbing optimism bias and strategic misrepresentation in planning*, p 11

Conclusion

The Styx Project should be rejected as it has little prospect of bringing economic benefit to the local community or wider Queensland community. Project approval will not result in the development of the project unless substantial subsidies are provided. Approval will also impose uncertainty on the local community and other local industries as the mine's future will remain uncertain.

Queensland decision makers should take this opportunity to revise what standards of assessment are acceptable in the state's major project assessment processes. Input output analysis gives decision makers no understanding of a project's viability or desirability. Furthermore, the insights from literature on major project assessment need to be taken into account. The biases and strategic misrepresentation identified as common in the literature are on display in this project's EIS and many others in Queensland.