

# **Economic Analysis of Greenhouse Gas Emissions from the Proposed Extension of the Newlands Coal Mine, Wollombi No. 2 Surface Area**

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**Report prepared for the Queensland Land and Resources Tribunal**

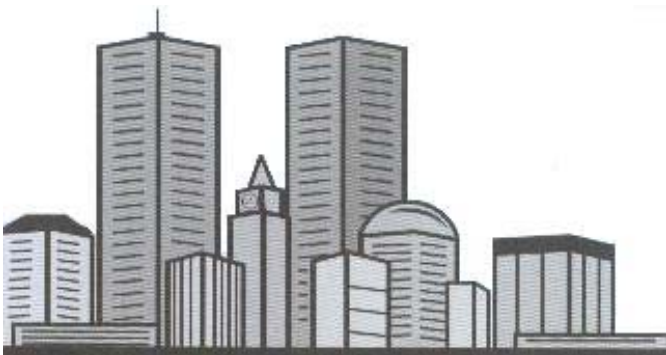
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## **WARRANTY**

This report has been based upon the most up to date readily available information at this point in time, as documented in this report. Urban Economics has applied due professional care and diligence in accordance with generally accepted standards of professional practice in undertaking the analysis contained in this report from these information sources. Urban Economics shall not be liable for damages arising from any errors or omissions which may be contained within these information sources.

As this report involves future market projections which can be affected by a number of unforeseen variables, they represent our best possible estimates at this point in time and no warranty is given that this particular set of projections will in fact eventuate.



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## 1.0 INTRODUCTION

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This report addresses specific economic issues relating to a proposed coal mine extension in central Queensland. It is to be presented as evidence to the Land and Resources Tribunal in respect of an objection by the Queensland Conservation Council Inc (QCC) to the application for a mining lease for an open cut coal mine at Newlands by Xstrata Coal Queensland Pty Ltd, Itochu Coal Resources Australia Pty Ltd, ICRA NCA Pty Ltd and Sumisho Coal Australia Pty Ltd (Xstrata). I have been instructed by the Environmental Defenders Office (Qld) Inc, which is acting for QCC.

I am an economic consultant and have provided economic evidence to many jurisdictions in the past. My Curriculum Vitae is contained in APPENDIX B.

I have read and understood Practice Direction 11 of 2000. I acknowledge that I have an overriding duty to assist the Tribunal and I have discharged that duty.

### 1.1 STUDY BACKGROUND

Xstrata has applied for a mining lease under the Mineral Resources Act 1989 and an environmental authority (mining lease) under the Environmental Protection Act 1994, over land known as Wollombi No. 2 at Suttor Creek, approximately 129km west of Mackay. If approved, this site would operate as an extension to the existing Newlands open cut coal mine.

The QCC has lodged an objection to these applications for a mining lease and environmental authority (mining lease) on several grounds, including that the mine would “*cause adverse environmental impacts*” and “*is not consistent with the principles of ecologically sustainable development...unless conditions are imposed to avoid, reduce or offset the emissions of greenhouse gases that are likely to result from the mining, transport and use of the coal from the mine.*”

The principles of ecologically sustainable development states in the *National Strategy for Sustainable Development* include several principles that involve taking economic considerations into account in decision making. These are:

- decision making processes should effectively integrate both long and short-term economic, environmental, social and equity considerations;
- the need to develop a strong, growing and diversified economy which can enhance the capacity for environmental protection should be recognised; and
- cost effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms.

## 1.2 OBJECTIVES

In respect of the grounds of objection, I have been asked to answer several specific economic questions, which serve as objectives of this report. These are:

- (a) what are the likely impacts of climate change on the Queensland economy?;
- (b) what price should be put on carbon to reflect the costs of climate change? In other words – what is the social cost of climate change, globally and in Queensland?;
- (c) based on current carbon trading figures, what is the current market value of carbon?;
- (d) what is the likely economic value of the coal mine expansion and what would be the expected profits from the expansion?; and
- (e) can Xstrata absorb all or a percentage of the carbon costs without rendering the proposed mine extension economically unfeasible?

## 1.3 METHODOLOGY

In preparing this report, I have reviewed the following documents:

- (a) Brief provided by the Environmental Defenders Office (Qld) Inc. This Brief contained:
  - (i) letter of instructions dated 13 December 2006, a copy of which is provided in APPENDIX A;
  - (ii) Practice Direction 11 of 2000 from the Land and Resources Tribunal;
  - (iii) Form of Objection to Tenement Number ML 4761;
  - (iv) Order of the Land and Resources Tribunal dated 27 November 2006;
  - (v) Further and Better Particulars filed by QCC in respect of this matter;
  - (vi) extracts from the Environmental Impact Statement (EIS) prepared for the Newlands Coal Mine Extension into the Wollombi No. 2 Surface Area dated December 2005;
  - (vii) extracts from the Stern Review: The Economics of Climate Change (2006);
  - (viii) The Implications of Climate Change for Australia's Great Barrier Reef prepared by WWF Australia in February 2004; and
  - (ix) Factual and Legal Context of the Queensland Conservation Council Objection in the Queensland Land and Resources Tribunal to the Newlands Coal Mine Expansion by Chris McGrath;
- (b) Australian Commodities by ABARE, December Quarter 2006;

- (c) Various coal statistics prepared by the Queensland Department of Natural Resources, Mines and Energy (DNRME);
- (d) Xstrata plc 2005 Annual Report;
- (e) Macarthur Coal Ltd 2006 Annual Report,
- (f) Richard Tol, 2005 'The Marginal Damage Costs of Carbon Dioxide Emissions: an Assessment of the Uncertainties', *Energy Policy*. 33 (2005);
- (g) Samuel Fankouser, 2005 'On Climate Change and Growth', *Resource and Energy Economics* 2.7 (2005);
- (h) Intergovernmental Panel on Climate Change 'Second Assessment: Climate Change 1995';
- (i) Intergovernmental Panel on Climate Change 'Third Assessment: Climate Change 2001';
- (j) Australian Bureau of Agricultural and Resource Economics, 'Australian Commodity Statistics, 2006';
- (k) Census DATA 2001;
- (l) Smith, 2001. 'Vulnerability to Climate Change and Reasons for Concern: A Synthesis' Chapter 19 from IPCC TAR;
- (m) ABS, 5206.0, 2006. 'Australian National Accounts: National Income, Expenditure and Product';
- (n) ABS 'Tourism Satellite Account, 2005';
- (o) ABS, 5220.0, 2006. 'Australian National Accounts: State Accounts';
- (p) Peter Beatie, 'Ministerial Statements' 04/07/2006 and 05/07/2006;
- (q) Mark Milner, 2006. 'Carbon Trading Market Fluctuates Wildly after Figures Released Early', *The Gaurdian*. 01/05/2006;
- (r) Marketanalyses, 2007. 'Spot Prices For Co2';
- (s) European Commission, Official Emissions Trading Website, 2006;

- (t) Office of the Renewable Energy Regulator. 'Mandatory Renewable Energy Target Overview' 2006;
- (u) Australian Greenhouse Office: Department of the Environment and Heritage. 'National Greenhouse Inventory' 2004;
- (v) Burton and Hicks, 2005. 'Hurricane Katrina: Preliminary Estimates of Commercial and Public Sector Damages', Centre for Business and Economic Research;
- (w) letter from Allens Arthur Robinson to the Environmental Defenders Office (QLD) Inc dated 11 January 2007;
- (x) Report of Dr Hugh Saddler dated 12 January 2007;
- (y) Report of Ben Keogh dated January 2007; and
- (z) National Strategy for Ecologically Sustainable Development by the Council of Australian Governments, December 1992.

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## **2.0 THE PROPOSED DEVELOPMENT**

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Xstrata has applied for a mining lease and environmental authority (mining lease) over Tenement Number ML 4761 on land described as Lot 1 on CP 905226 and Lot 2 on CP 845104. This land is known as Wollombi No.2 Surface Area at Suttor Creek, 30km north west of Glenden and 129km west of Mackay.

It is proposed to develop an open cut coal mine on the site, forming an extension to the existing Newlands open cut mine. The EIS reports that the proposed mine extension would replace the production from the Newlands Coal Mine, involving a redistribution of existing mining operations, workforce and infrastructure.

The EIS estimates that the mine extension would produce an average annual 1.9Mt of saleable coal over a 15 year period, resulting in a total production of 28.5Mt. The produced coal is expected to comprise a mixture of premium coking coal and high grade, medium volatile steaming (thermal) coal. The letter from Allens Arthur Robinson states that 65% of the coal would be coking coal, with steaming coal comprising the remaining 35%. It is noted that this proportion is at odds with the information contained within the EIS. This reports Assumes that the information in the report is correct.

## **3.0 THE LIKELY IMPACT OF CLIMATE CHANGE ON THE QUEENSLAND ECONOMY**

This chapter reviews several economic studies on climate change, briefly identifies the economic base of Queensland and comments upon the likely economic impact of climate change on Queensland's economy.

### **3.1 ECONOMIC STUDIES OF CLIMATE CHANGE**

#### **3.1.1 THE STERN REVIEW**

The Stern Review is a report incorporating the work of thousands of academics. It is the most current and comprehensive study of its kind.

Stern runs multiple regressions that take into account different variables. The most basic regressions take into account purely the economic costs of a warming planet, whilst the more in depth regressions take into account the higher incidence of floods, droughts, cyclones, and other damage caused as side effects of global warming.

The Stern Review concludes that if we don't act now, climate change would negatively impact global GDP annually, with the quantum of impact increasing progressively to about 5% of GDP by 2200. If we take into account the effects of droughts, floods, cyclones and heightening sea levels, that number could reach 20% of GDP in 2200.

A 5% drop in Australia's GDP in 2005/06 is equal to approximately \$48b. More importantly for Australia, in the long run, a 5% decrease in GDP is greater than our average GDP growth of about 3%. Therefore, Australia would begin to feel the pressures of a shrinking economy.

If The Stern Review's more dire 20% reduction is applied, we find huge cutbacks in the standard of living and welfare for Australians. In 2005/06 terms, this 20% is approximately AU\$193b. This may seem exaggerated, but already we are feeling these secondary warming effects:

- The drought in Australia caused a drop in farm output in 2005/06 of \$5.5b, and farm GDP is forecasted to fall by \$4.4b in 2006/07. (ABS 5206.0, 2006);
- Cyclone Larry cost Queensland around \$1bn; and



- Hurricane Katrina is estimated to have cost the USA in excess of US\$150b, and it hit a similar latitude to Brisbane (Burton and Hicks, 2005).

The Stern Review asserts that if we make changes now instead of in the future, the annual mitigative cost is only 1% of GDP. Whilst appearing to be a large cost at present, the Stern Review findings clearly indicate that this alternative is a much more preferable outcome to society bearing the much greater long-term adverse impacts in the future (the 5% to 20% by 2200 referred above)

The Stern Review differentiates between third and first world countries in outlining possible outcomes. It concludes that third world countries would be hit hardest, whilst first world countries may actually enjoy a short term increase in GDP due to climate change. The Stern Review states that third world countries would be hit hardest because of the following criteria:

- A large proportion of their economy is in sectors such as agriculture, which is sensitive to climate change.
- They are generally located in lower latitudes. Therefore, they are already close to or at critical temperature thresholds for crops and humans.
- The adaptive capacity of these countries is lower. They have fewer resources to invest in adaptation, less flexible economies and less liquid financial markets, all of which lowers their resilience to climate change.

It is my view that Queensland satisfies the first two criteria. It is a state which depends heavily on agriculture and it is situated at similar latitudes to many third world nations in Africa. However, with one exception it does not fully satisfy the third criteria, as I consider that Australia has the resources and ability to adapt to climate change on many levels. The exception is that much of Queensland's population and urban infrastructure is located on the coastline, which is vulnerable to rising sea levels. By The Stern Review criteria, Queensland is a pseudo-third world state.

The Stern Review says of Australia:

- Australia, as the world's driest continent, is particularly vulnerable to the impact of rising sea temperatures on the major Pacific and Indian Ocean currents. These determine both overall rainfall patterns and unpredictable year-to-year variations. Over the last 30 years stronger tropical cyclones have brought higher storm damage, although increased rainfall, to a wide swathe of North West Australia;

- at the same time the east coast – home to over 70% of the population and location for most major cities and crop farming – has suffered longer droughts and declining rainfall. Southerly regions have lost most rainfall as the warmer ocean and related air currents have pushed rain further south. The 2002 drought cut farm output by 30% and shaved 1.6% off GDP. Water supply to big cities will become more difficult;
- drier and hotter summers threaten the survival of the Queensland rain forest. Warmer winters, and reduced snowfall endanger the habitat of mountain top fauna and flora. Rising ocean temperatures threaten the future of Australia's coral reefs and the \$2 billion fishing and tourist industries. Over 60% of the Great Barrier Reef suffered coral bleaching in 2002, 10% of it is permanent. Studies show ocean warming could be fatal to large tracts of reef within 40 years. The carbon fertilisation effect may lead to a thickening of native eucalyptus and savannah habitats. Higher inland temperatures are also likely to cause more bush fires; and
- topical diseases are spreading southward as the north becomes wetter. The dengue fever transmission zone could reach Brisbane and possibly Sydney with 3°C of warming.

The Stern Review considered at depth the effects of climate change on agriculture. High temperature episodes can cut yields in half if they coincide with critical points in the crop cycle. Maize shows larger declines in yield than other crops because it is not affected by carbon fertilisation. Wheat yield declines 60% if maximum daily temperature rises from 30°C to 33°C during flowering.

Recent studies in carbon fertilisation have shown small increases in wheat yield by doubling the levels of CO<sub>2</sub> in the air. Carbon fertilisation had no effect on maize or sorghum.

The Stern Review found that total crop yields in developing countries would drop by around 10% if temperatures rise by 3°C. If temperatures rise by 4°C, large parts of Australia would become too hot and dry to grow crops.

### **3.1.2 INTERGOVERNMENTAL PANEL OF CLIMATE CHANGE**

The Intergovernmental Panel on Climate Change, of which Australia is a part, has put together three major assessments on climate change. The Second Assessment Report (SAR) was published in 1995 and the Third Assessment Report (TAR) was published in 2001.

Although the SAR was hesitant to put finite costs on climate change, it discussed in some depth, the likely outcomes and mitigative potential for policy makers.

The SAR addressed research up to 1995 and stated that the costs of climate change were likely to be between one and a few percent of GDP over the next several decades.

The subsequent TAR was much more comprehensive in depth and technical explanation than SAR, perhaps reflecting a greater body of scientific research. The TAR found that, without emissions trading between annex B countries (of which Australia is one), there will be a loss of between 0.2% and 2% of GDP to these regions by as early as 2010. The TAR noted that these losses could be halved if an emissions trading scheme was introduced.

### **3.1.3 FANKHAUSER 'ON CLIMATE CHANGE AND GROWTH**

This 2005 paper addressed four of the most influential growth models in neo-classical economics. Fankhauser modelled them to take into account the long run effects of climate change on savings and capital accumulation.

The models represent a dynamic study into climate change, which is often dealt with by static means. Fankhauser shows that lowering future GDP will have negative effects on investment, which in turn reduces future production further.

The models show a high degree of consensus over the short term, indicating that the economic impact of climate change would be around 1.5% of GDP by 2010, and being somewhere around 1% currently.

From 2025 onwards the different models diverge due to different weightings on indirect costs. At 2100, the most conservative models estimate a 6% loss in GDP, the less conservative models show a loss of closer to 10%.

Fankhauser also showed an accord between the models in lowering economic growth rates. All models show about a 40% reduction in growth rates of per capita income by 2050.

Fankhauser's models have short to medium term results similar to those of the Stern Review.

## **3.2 THE QUEENSLAND ECONOMY**

The ABS reports Queensland's Gross State Product (GSP) in 2005/06 at \$182b, representing 18.9% of Australia's GDP. Queensland's major industry sectors are mining (12.4%), property and business services (9.9%), manufacturing (9.0%), construction (8.0%), ownership of dwellings (7.9%), retail trade (7.2%) and health and community services (6.3%).

The main contributors to Queensland's GSP growth in 2005/06 were mining (39.7%), construction (8.3%) and health and community services (8.1%).

However, the standard ABS industry sector classifications fail to distinguish between economic drivers of the economy and other sectors servicing those drivers. It is my opinion that the key drivers of the Queensland economy are mining, lifestyle migration, manufacturing, tourism and agriculture.

### **3.3 COSTS AND BENEFITS TO THE AGRICULTURE INDUSTRY**

Queensland has its history rooted in agriculture. Although agriculture only accounts for 4% of GSP currently, most of the state's regions are still dependent on agriculture and related industries. In Queensland, 4.9% of the population works in agriculture forestry or fishing (2001 Census).

Queensland is responsible for nearly half of Australia's beef cattle production; Queensland is also the largest producer of sorghum and maize. The agriculture industry added \$6.5b to Queensland in 2005-06 (ABARE, 2006).

Queensland also has a large commercial fishing and aquaculture sector. In 2001, the gross value of commercial fishing and aquaculture in Queensland was \$254.6m and \$500.3m, respectively (WWF, 2004).

There are certain direct and indirect costs likely to occur from climate change. The direct costs are those which come directly from the increase in temperature itself: lower crop yields; fauna extinction; oceanic acidification; and lack of stock feed. Indirect costs come from secondary sources caused by increased volatility in weather patterns: droughts; cyclones; floods; etc.

The Stern Review estimated a 20% decrease in crop yield in Southern Europe if a 2 degree temperature increase occurs, it is Urban Economics's view that the effects are likely to be similar in Australia, given latitudinal similarities, possibly worse in Queensland.

The Stern Review estimates that a 1-2 degree temperature increase would lead to 15-40% fauna extinction. Although it is doubtful cattle will be a part of this 15-40%, changes in climate, pasture and grasses may have adverse effects on carrying capacities of the land.

Oceanic acidification leads to lower fish yields and, therefore, less productive fish farms (Stern p411). The Australian Bureau of Agricultural and Resource Economics (ABARE) estimates that, without steps to curb climate change, economic growth rates of the Great Barrier Reef region will slow from 2% to 1% between 2010 and 2020 due to this reduction in commercial fishing yields and lowering tourist visitors (WWF, 2004).

The Australian cereal crop was down 34.7% in 2005/06 due to the drought. Overall, the drought has cost Australia \$5.5b in 2005/06. As we reach higher temperatures, the air is able to sustain a higher percentage of water. Therefore, rainfall is going to become less regular and more volatile (ABS, 5206.0, 2006).

If climate change continues unabated, Queensland will have to look at agricultural adaptation. This will involve changing crops and stock to more drought hardy species where possible. This would involve high transitional costs, which may be borne by the government (e.g. sugarcane, dairy).

### **3.4 COSTS AND BENEFITS TO THE TOURISM INDUSTRY**

In many ways, tourism is synonymous with Queensland. Queensland contributes 22.5% of Australia's tourism domestic product (WWF, 2004). Australia is known worldwide for the GBR and the Gold Coast, both Queensland icons.

The majority of tourism expenditure is derived from Southeast Queensland (\$7b) and the Great Barrier Reef (\$4.5b) (WWF, 2004). Tourism equates to 4% of Australia's GDP and 11% of our exports (ABS Tourism Satellite Account, 2005).

Rising temperature will have a variety of effects on tourism in Queensland, all of them considered to be negative. In the Great Barrier Reef region alone, gross regional product is expected to fall by \$555m by 2020, and growth rates will halve, all due to climate change (WWF, 2004).

The bleaching of the Great Barrier Reef and huge coral mortality rates are already affecting the Great Barrier Reef. ABARE estimates that mortality of coral in the southern areas of the Great Barrier Reef is around 20% and in the northern areas, it is about 9% (WWF, 2004).

*'Coral reefs are restricted to narrow latitudinal, horizontal, and vertical ranges along the tropical continental shelves. Their contribution to global coastal biodiversity is disproportionate to their spatial extent: Although they cover less than 1% of the world's oceans, they are inhabited by one-third of globally known marine species... Thus, fisheries, tourism, infrastructures, societies, and cultures depend on the well-being of this unique entity that is impacted by increased temperature, atmospheric CO<sub>2</sub>, and sea level' (TAR, 2001).*

In 1998, 16% of coral worldwide died due to warmer than usual temperatures (WWF, 2004).

On land, the outcome is not much better. Estimates show that a 1-2 degree temperature increase will lead to 15-40% fauna extinction, meaning land based tourism is likely to decline as well (Stern Review, 2006).

Rising sea levels will cause severe damage to coastal areas. Although Stern estimates this will happen over the next several centuries, the consensus in academic research is that when the Greenland or West Antarctic ice sheets melt (which has already started) we could experience sea level rises of 5-12 meters (Stern, p16). This would devastate the coastal parts of Queensland as we know them, which is currently housing the majority of the state's tourism, accommodation, and infrastructure.

ABARE expects that economic growth of Australia's tourism sector would halve in the Great Barrier Reef area if measures are not taken to slow the degradation of the aquatic ecosystem (WWF, 2004).

If, as The Stern Review asserts, climate change causes a world economic slowdown, there would be less people travelling for pleasure, and Queensland's tourism industry would be forced into harsher competition. If, at the same time, the attractions for which tourists come are disintegrating, the future of Queensland tourism would indeed be grim.

### **3.5 COSTS AND BENEFITS TO THE INDUSTRIAL SECTOR**

Although few studies have been completed on the impact of climate change on industry, it is plausible it would have some effects.

Increased cooling and water costs lead to increased fixed costs of business, this would increase the costs of operating businesses.

Water shortages and subsequent increases in its price could force shifts to less water intensive production. This would come with frictional costs in the short-run. In the long-run, these industrial changes may be a good outcome but there is likely to be some costs to Queensland's business sector.

### **3.6 SOCIAL COSTS AND IMPACTS TO THE INFRASTRUCTURE**

The cost estimates earlier in the chapter show that Australia is already losing 1% of GDP per annum. This affects not only the community directly, but the government in the form of lower tax yields and higher welfare costs. Increased debt (if required) leads to lower national savings, which affects investment and growth potential.

Lower crop yields and longer droughts would also lead to higher agricultural support financed by the government. Similarly, if the need arises, industry change support would also be needed to help businesses move to more water efficient processes.

An economic slowdown may also lead to lower levels of skilled migration. This would have the effect of lowering Australia's potential growth rates in this, and future generations, again adversely affecting GDP.

Growing water shortages are causing increasing costs in the UK. That government is estimating costs of \$5.5bn for increased dams (Stern).

The estimated costs recently announced for SEQ dams are as follows:

1. \$1.7b at Traveston ( Beatie, 5/7/2006)
2. \$400-500m at Wyaralong ( Beatie, 4/7/2006)
3. \$250m to raise Borumba dam ( Beatie, 5/7/2006)

### **3.7 EFFECTS ON THE ECONOMY AS A WHOLE**

This chapter summarises my review of several recent and authoritative studies of the economic impacts of global change. They have consistently concluded annual declines of several percent of GDP, depending upon the period under review and the speed of temperature rises. I consider that Queensland is vulnerable due to its reliance upon tourism (the importance of the coastline and the Great Barrier Reef), agriculture and urban growth on the coast. Consequently, I don not see that Queensland would be an exception to the magnitude of economic costs discussed in the Stern Review. Consequently, it is possible that Queensland could also suffer an annual decline in GSP of at least 5% by 2200. The annual decline is likely to progressively increase in size to this number by that date and exceed that number thereafter, assuming no mitigative measures are put into place (which of itself would be a cost to the state).

In current dollar values, a 5% loss of GDP in one year is equal to \$9b in Queensland.

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## **4.0 REVIEW OF CARBON PRICING**

This chapter reviews several studies that investigate the social costs of carbon dioxide and emission trading schemes. From these investigations a view is formed as to the likely pricing of carbon emissions.

### **4.1 ECONOMIC STUDIES ON CARBON PRICING**

#### **4.1.1 INTERGOVERNMENTAL PANEL FOR CLIMATE CHANGE**

The 1995 SAR reviewed several papers on the marginal damage costs of carbon emissions, pricing them at between US\$5/t and US\$125/t, which is a very significant variation.

The 2001 TAR discussed the costs of mitigating climate change in terms of Kyoto levels of CO<sub>2</sub> emissions. It estimated the marginal costs of meeting the Kyoto targets were from US\$20/t up to US\$600/t without trading schemes being in place. Again there is a very wide fluctuation.

The TAR also addressed sequestration as a possible mitigation technique. It found that biological mitigation costs would vary significantly according to location. Tropical areas may have costs as low as US\$0.1/t up to US\$20/t. Conversely, costs in non-tropical areas are likely from US\$20/t up to US\$100/t. The difference comes from a range of factors, such as the different density of sustainable plant life in tropical as opposed to non-tropical areas.

#### **4.1.2 RICHARD TOL'S AVERAGES**

In this 2005 study, Richard Tol combined 103 estimates for the marginal costs of carbon dioxide emissions, gathered from 28 separate, published studies, to create a probability density function.

He found that the function was skewed by several large cost valuations. Consequently, the mode was US\$2/t of carbon dioxide emissions, the Median was US\$14/t and the mean was US\$93/t.

Tol goes on to say that the skewedness of the probability distribution function made it unlikely that the cost of carbon dioxide emissions would be greater than US\$50/t.

Tol goes on to say that if just those models with the most robust methods are used, the cost may be in the US\$5/t range.



#### **4.2 EMISSION TRADING SCHEMES**

Emissions trading schemes have been used around the world to internalise economic costs associated with emissions. Setting up trading schemes for emissions allows competitive markets to set prices. Lower costs should be achieved where some businesses, with specific skills and experiences, enter the market to offset the emissions in a more efficient way than could be achieved by the emitting entities.

Australia currently has a trading scheme in the energy market which forces companies that wholesale power to earn, buy, or forfeit, renewable energy certificates (REC) in order to meet their renewable power percentages, set by the Office of the Renewable Energy Regulator. RECs for sell around \$16 to \$40. The USA has a similar system in their energy market called green tags, these tags are given out to providers of green energy. They can then be sold for extra revenue.

The first large scale emissions trading scheme of which I am aware of was the Acid Rain Program, set up by the US Environmental Protection Agency. As a consequence, between 1995 and 2005 emissions of sulphur dioxide in the US were halved.

In 2002 the UK Government started the carbon ETS. It was the first economy wide greenhouse gas ETS. In 2005, when the European Union ETS (EU ETS) started the UK system seceded.

I understand that the EU ETS is the largest multinational greenhouse gas emissions trading scheme in the world. It is still in its initial phase and is having some license allocation hiccoughs. However, the market is deep and liquid.

The price of carbon dioxide emissions has fluctuated. In the 12 months to May 2006 the price topped at \$30/t and the average price was \$17/t (Milner, 2006).

Towards the end of 2006, the price fell considerably due to concerns about certain countries' adhesion to the scheme. However, 2008 and 2009 futures prices have stayed constant at around €18/t, showing long term confidence in the market (Marketanalyses, 2007).

The EU ETS does not extend to sink credits using sequestration, which may provide a lower cost alternative. The European Commission (the EU ETS' governing body) felt there were too many long-term variables which were not incentive compatible for participants (EC, 2006).

The current prices achieved in the EU ETS equate to about AU\$30.

### **4.3 AUSTRALIAN CARBON TRADERS**

It is noted that the report by Ben Keogh, of Australian Carbon Traders, reports that the current prices of purchasing offsets in Australia range from \$5.75/t to \$12/t, with a midpoint of \$8.9/t which this report will use. These levels are well below the long run average price of the EU ETS.

### **4.4 DISCUSSION AND IMPLICATIONS**

My review has revealed that whilst the actual market prices achieved for carbon dioxide emissions were within the large ranges estimated by the theoretical studies, they are higher than some of the average prices produced by the studies.

Application of carbon offset prices of \$8.9/t and \$30/t of carbon dioxide emissions to the estimated 84Mt to be emitted from the use of the 28.5Mt from the proposed mine extension (Dr Hugh Saddler) results in estimated cost of emissions of \$0.75b and \$2.5b.

## **5.0 ECONOMIC CONSIDERATIONS OF THE PROPOSED MINE EXTENSION**

This chapter examines the potential economic value of the proposed coal mine extension and the expected level of profitability. It also considers whether the proposed coal mine expansion could absorb some or all of the estimated carbon costs.

### **5.1 REVENUE**

The EIS reports an estimated average production of the proposed coal mine expansion of 1.9 Mt per annum over a mine life of 15 years. This produces an estimated total production of 28.5 Mt from an estimated resource of 45 Mt. Based on the letter from Allens Arthur Robinson, the proposed mine extension's total production may comprise 10.0 Mt of high grade, medium volatile steaming coal and 18.5 Mt of premium coking coal over the life of the proposed mine extensions.

The EIS reports that production is destined for the export market.

The DNRME reports that average export prices (Free on Board) have increased significantly for coking coals (from \$59.79/t in 2003/04 to \$149.68/t in 2005/06) and moderately for thermal (steaming) coal (\$41.23/t to \$67.39/t over the same period).

Current (2006/07) prices have been estimated from the most recent ABARE publication at \$147/t for hard coking coal and \$65/t for thermal coal.

In constant 2006/07 prices, the proposed mine extension would produce total turnover in the order of \$3370m, equivalent to \$225m per annum. It is noted that this revenue is only 35% greater than the estimated costs of emissions calculated in section 4.3

It is noted that the above estimate is significantly in excess of the \$100m turnover estimate for the proposed mine extension by the EIS. This may be explained by a different coking/thermal coal ratio and further significant price increases that have been achieved since the date of the EIA.

It is recognised that coal prices are influenced to a greater extent by supply/demand factors than by inflationary pressures. Future prices may vary from current prices and these possible variations have not been taken into account.

## 5.2 PROFITABILITY

The EIS estimates average annual revenues of \$100m and average annual operational expenditure of \$85m for the proposed mine extensions. This leads to an operating profit level of 15%. With the estimated initial capital cost of \$29m (EIS), this investment would be recouped in the first two years of the proposed mine extension's 15 year life.

However, the EIA's profitability estimate appears to be far too conservative.

The 2005 Annual Report of Xstrata plc reveals the following performance data (in US dollar values):

- (a) total revenue of \$8,050m;
- (b) total earnings before interest and tax (EBIT) of \$2,509m, representing 31% of total revenue;
- (c) Revenue from coal operations of \$3,400m;
- (d) EBIT from coal operations of \$1,079m, representing 32% of revenue;
- (e) revenue from Australian coal operations of \$2,472m; and
- (f) EBIT from Australian coal operations of \$901m, representing 36% of revenue and an annual return on capital employed of 28%.

A review of Macarthur Coal Ltd's 2006 Annual Report may also be of some relevance due to this listed Australian company's operations being limited to coal mining. Macarthur Coal Ltd achieved an EBIT of 40% of revenue in 2005/06.

I have therefore assumed that the proposed mine extension should be able to achieve an operating profit of at least 35% on the current prices being achieved. It is therefore estimated that operational costs of the proposed mine extension would be in the order of \$146m per annum, being 65% of estimated revenue. This leaves an annual EBIT of \$79m. It is noted that my operating cost estimate of \$146m is significantly greater than that contained in the EIS (\$85m). If the EIS operating cost estimate is closer to reality then the level of profitability assumed in this report is conservative.

In current dollar values, EBIT over the 15 years of the proposed mine extension's life is estimated at \$1185m.

### 5.3 FEASIBILITY

Having estimated the likely revenues and profitability of the proposed mine extension, it is a far more problematic exercise to determine what level of profitability is required in order for it to remain feasible. This is due to a number of uncertain or intangible elements involved in the exercise. These include the level of capital already tied up in the existing mine to be transferred to the extensions, the risk/reward premium applying to coal mines, the fluctuations of the share market and the myriad methods companies may employ to assess the feasibility of potential investments. Another factor to take into account, particularly at this stage of the global economic cycle, is that coal prices are presently very high, compared to long-term average price levels. Therefore, there would be an expectation that high levels of profitability should be achieved at these prices in order for the project to remain viable if prices were to fall (as has occurred in the past).

The Xstrata plc 2005 Annual Report reported that (in US\$) its 19 Australian coal mines employed \$3,217m of capital, resulting in an average of \$169m per mine. Therefore, the average mine returned an EBIT of \$47m in 2005. In Australian dollars, this level of profitability equates to about \$60m.

Whilst the EIS reports that the proposed mine extension would require new capital expenditure of \$29m, it is silent on the value of assets to be transferred from the current mine operations. In the absence of this figure, it is impossible for me to arrive at a level of feasibility required for the proposed mine extension.

Therefore, whilst I am not in a position to identify the level of profit required to ensure that the proposed mine extension is feasible, I suspect, due to the current high prices of coal and the ability of Xstrata to utilize existing assets, that the level of profit for feasible operations is less than the estimated annual profit level of \$79m. However, the difference between the estimated level of profitability and feasible level is unlikely to be greater than \$25m per annum.

Consequently, if the Tribunal were to impose conditions to avoid, reduce or offset the emissions of greenhouse gases that are likely to result from the mining, transport and use of the coal from the proposed mine extension, the cost of those conditions would need to be limited to an amount that is presently uncertain, but likely to be less than \$25m annually, in order for the proposed mine extension to remain feasible.

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## 6.0 CONCLUSION

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The proposed mine extension is estimated to produce 28.5Mt of coking and thermal coal over a 15 year period. It is estimated that the mining, transport and use of this coal would generate carbon dioxide emissions of 84Mt.

The Stern Review is the most recent comprehensive review of the economic impacts of global climate change. The Stern Review concluded that mitigating against climate change would only cost 1% of global GDP per annum, compared to an inevitable and increasing decline in global GDP, reaching between 5% and 20% by 2200. Nations located closer to the equator, that rely upon agriculture to a greater extent and that are less adaptable to change are the most vulnerable.

Queensland's economy is based upon mining, manufacturing, lifestyle migration, tourism and agriculture. Tourism (due to the Great Barrier Reef and coastal tourism), cereal production, cattle production and the state's coastal urban infrastructure are considered to be particularly vulnerable to climate change. Consequently, I do not consider that Queensland is any less vulnerable than the global averages contained in the Stern Review.

The most appropriate measure of the social cost of carbon emissions can be obtained from the European Unions Emission Trading Scheme – AU\$30/t. This price provides an indication of the total cost of mining, transporting and using the coal proposed to be mined at the proposed mine extension at \$2.5b.

However, I have estimated the revenue from the mine extension at only \$3.37b and total profit at only \$1185m. I am unable to calculate the level of profits able to offset these emissions whilst still achieving a profitable mining operation without knowing the value of the assets to be transferred from the existing mine. However, I suspect that it may not be greater than \$375m, which represents only 50% and 15% of the estimated cost of emissions (based on prices of \$8.9/t and \$30/t).

With one exception, I confirm that I have made all the enquiries that I believe are desirable and appropriate and that no matters of significance that I regard as relevant have, to the best of my knowledge, been withheld from the Tribunal. The exception concerns the value of assets (including infrastructure) to be transferred from the existing Newlands mine to the mine extension. Only Xstrata can supply this information.