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Climate impact analysis of the China First Mine and the proposed development of the Galilee Basin, QLD

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Abbreviations

CO_2e	Carbon dioxide equivalent emissions
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
dwt	Dead-weight tonnes
EIS	Environmental Impact Statement
EPC	Exploration Permits for Coal
EREC	European Renewable Energy Council
ESD	Ecological Sustainable Development
GJ	Giga joule
GPI	Greenpeace International
Gt	Giga tonnes
IAS	Initial Advice Statement
IEA	International Energy Agency
IFS	Infrastructure Facilities of Significance
Kg	Kilogram
Km	Kilometre
MPF	Major Project Facilitation
Mt	Mega tonne
Mtpa	Mega tonne per annum
ppm	Parts per million
WHO	World Health Organisation

EXECUTIVE SUMMARY

Introduction

China First is one of the most advanced of a number of proposed mines in the Galilee Basin in Queensland. At least nine mines are proposed in the area, with combined output of approximately 375 million tonnes per year. The remoteness of the area means that considerable transport infrastructure is required if the development is to go ahead.

This report examines the climate impact of the China First mine, considers whether the project can be assessed in isolation from the rest of the Galilee Basin, and extrapolates emissions calculations for China First to the remainder of the proposed development in the Basin. Climate impact is considered with regard to widely accepted definitions of 'dangerous climate change', and whether the development could compromise Australia's aspiration to support global efforts to stay within 2°C global temperature rise.

Emissions and coal production from the China First mine and the Galilee Basin are compared to the cumulative global carbon budget between now and 2050 to stay below 2°C global temperature rise. They are also compared to two low carbon energy scenarios aimed at remaining below this threshold, and the projected domestic emissions from Australia's current targets.

The global context: carbon budget, energy scenarios, and coal demand

Meinshausen et al[1] examined different carbon budgets from 2000 to 2049 and assigned probabilities of exceeding the 2°C threshold. This report has used the middle range carbon budget of 1500 Gt CO_2e between 2000 and 2049, which gives a 10% - 43% chance of exceeding the 2°C threshold. From this we conservatively estimated the remaining global **energy** carbon budget to be a maximum of 705 Gt CO_2e from now until 2049.

Two low carbon energy scenarios are used for comparison. The first is the International Energy Agency 450 ppm scenario from the IEA *World Energy Outlook 2011*, presented as having a reasonable chance of constraining world temperature increase to 2°C. The second is the Energy [R]evolution scenario produced by Greenpeace International (GPI) and the European Renewable Energy Council (EREC). Both scenarios are for the energy and transport sector only.

The China First project proponent presents a 'business as usual' coal demand scenario from the U.S. Energy Information Administration. This report compares this to the IEA 450 and the Energy [R]evolution scenarios, and also to the IEA New Policies coal scenario, which reflects current international policy intentions (from the *IEA World Energy Outlook 2011)*,. The prospect for world coal demand is significantly different in the four scenarios. In BAU (used by the proponent) coal demand increases by 41% by 2035, compared to an increase of only 9% in the IEA New Policies scenario, which reflects current policy intentions. Both scenarios with an objective of keeping temperature rise below 2°C show significant decreases in demand for coal. The IEA 450 scenario shows a decrease of 38% in global demand for coal by 2035, while the Energy [r]evolution scenario sees a decrease of 49%.

The China First Mine – can it be considered in isolation from the Galilee Basin?

Three questions were considered in order to assess whether the China Frist mine could be considered in isolation. Firstly, is the proposed level of investment in the railway infrastructure justified by the China First project alone? Investment is $2.1 billion, approximately 25% of the entire project cost. Designed capacity is ten times the output of the China First mine, so it seems highly unlikely that the proposed investment is based on the China First output alone.

Secondly, are other proposed projects reliant on the China First infrastructure going ahead? At least two other projects have stated they will make use of either the China First or the Alpha Coal railway infrastructure.

Thirdly, does the China First project provide enabling infrastructure for other Galilee Basin coal projects? The proponent states ""*The rail corridor will open a new multi-billion tonne coal province with opportunities for thermal coal export to world markets for both Waratah Coal, as well as other Galilee Basin proponents...*" China First EIS, p11. If the railway infrastructure is completed as specified it is clearly enabling infrastructure.

The answers to these three questions indicate that the cumulative emissions from the wider Basin development should be included in consideration of the climate impacts from the China First proposal.

Should the end use emissions be included in the project assessment?

The question of where the boundary should be drawn in consideration of the impact of a project has both a legal and an ethical dimension. The legal question is directly addressed in a number of recent Australian cases, which concluded that downstream or 'indirect' environmental impacts should be considered[2], and specifically that a coal mine's cumulative effects, including downstream emissions, should be assessed[3].From an ethical perspective, consideration of the mine in isolation from the direct impact of its product is highly questionable. Recasting this argument with a number of other products with damaging consequences is illustrative, for example, weapons manufacture or tobacco. This report suggests that on both legal and ethical grounds, consideration of the product impacts should be included in assessment of the project.

Emissions calculation methodology

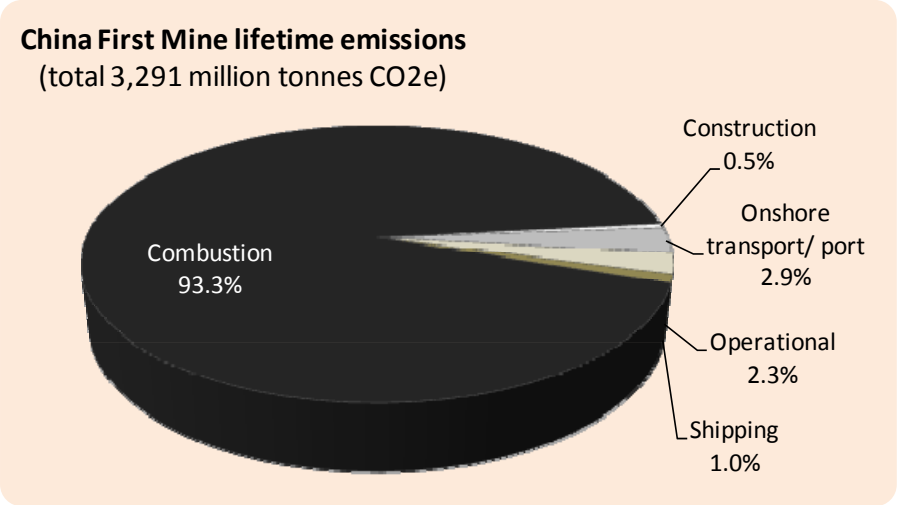
Emissions were calculated for the China First mine using emissions factors derived from the proponent's information on operations, construction, and domestic transport, Australian Government factors for the emissions from coal combustion, and the International Maritime Organisation factor for shipping emissions. Emissions for major associated infrastructure are not included in the calculation, as these are not detailed, including the construction and operation of a dam and water pipeline, the construction and operation of an airport/airstrip, and the construction of power supply infrastructure.

Emissions from the Galilee Basin were calculated by scaling up emissions from their operations using the output figures and timing from Waratah Coal's application for Infrastructure Facilities of Significance.

Results

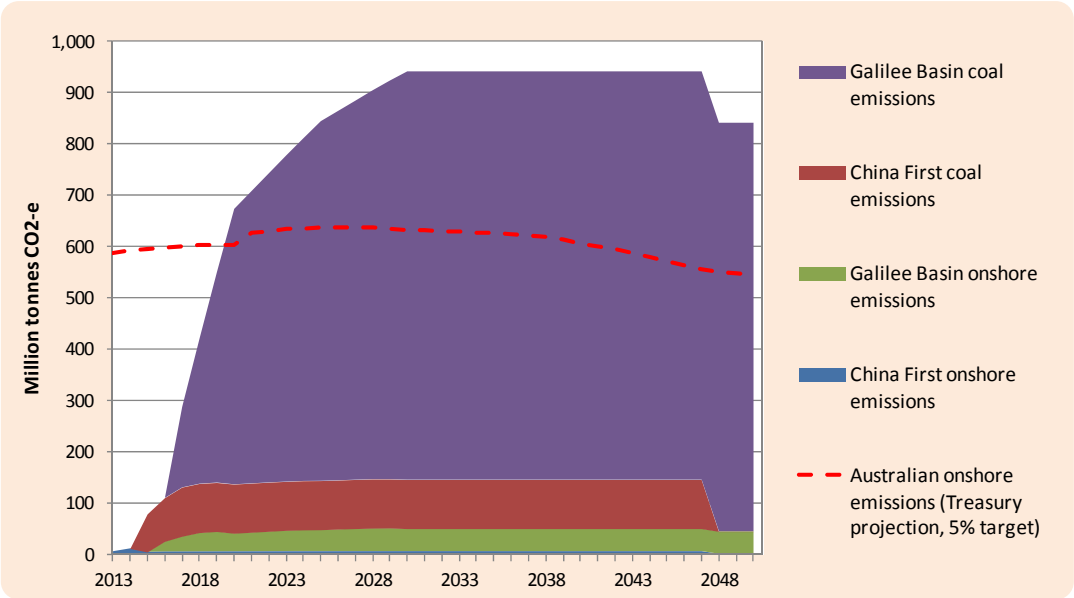
Lifetime emissions from the China First mine are 3,291 million tonnes CO_2-e, based on the operational lifetime of 30 years. Burning the coal accounts for 93% of the total. Total emissions from the Galilee Basin are more than 29,000 MT between now and 2050.

China First mine – lifetime greenhouse emissions



Emissions from the China First and from the total Galilee Basin are compared to Australian emissions in the figure below. Total emissions (onshore and offshore) overtake Australian domestic emissions in 2020, and are 50% higher than the target for Australian domestic emissions by 2050.

Emissions for China First, the Galilee Basin, and Australia's onshore emissions



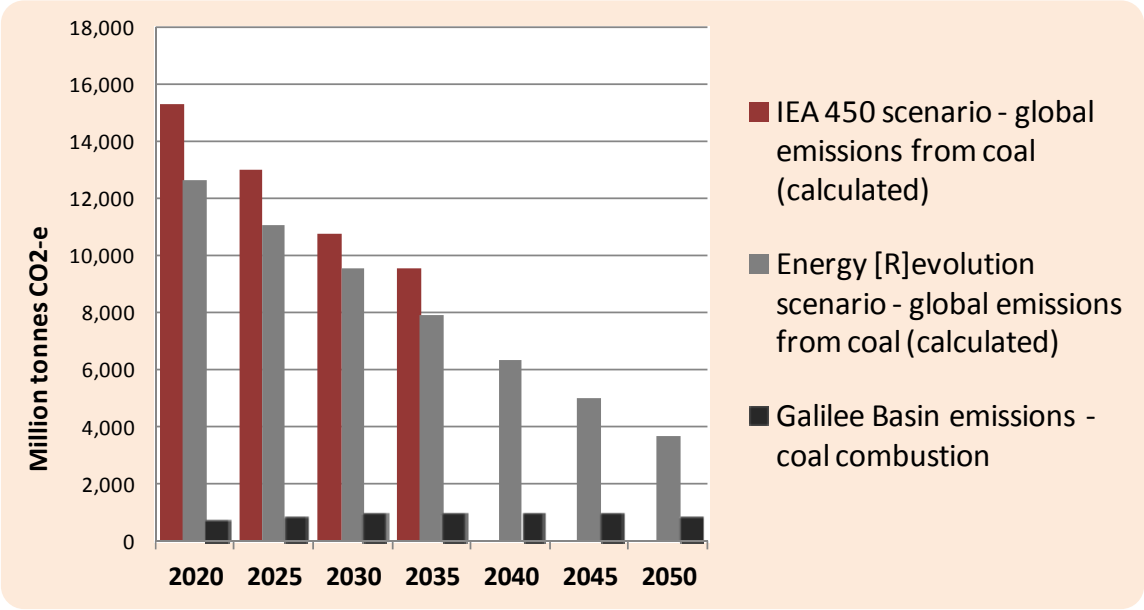
Onshore emissions from the whole basin reach 49 million tonnes per annum by 2030, and average 7.6% of total Australian onshore emissions from 2020 – 2040. This is equivalent to putting an extra 10.5 million cars on the road[4], or the emissions from an additional 3 million households. Onshore emissions from the China First mine alone are 5.3 million tonnes per annum when the mine reaches full capacity, equivalent to putting an extra 1.5 million cars on the road[4], or the total emissions for an additional 425,500 households (including household energy and private cars, 2009/10 data[5]).

The global carbon energy budget from now to 2049 is 705 Gt CO_2-e to have a better than even probability of staying below 2ºC. The cumulative emissions from the China First

project alone account for 0.5% of this budget, while the emissions from the proposed developments in the Galilee Basin account for just over 4%. If Australia's "status quo" coal production is added to the proposed new production from the Galilee Basin, Australian coal would account for an estimated 9% of the global energy carbon energy budget from now until 2049, excluding expansion planned for other areas of Australia.

The emissions from the Galilee Basin are compared to the emissions from two low energy scenarios, the IEA 450 and the Greenpeace/ EREC Energy [r]evolution, in the figure below. The increased production, and therefore increased emissions, from the Galilee Basin are in stark contrast to the steeply declining emissions from coal in both the IEA and the Greenpeace/ EREC scenarios. Under the IEA scenario, the Galilee Basin would be responsible for 9% of world coal emissions by 2035, and 21% of world coal emissions by 2050 in the Greenpeace/EREC scenarios.

Global emissions from coal in IEA 450 & Energy [r]evolution, and the Galilee Basin



Conclusion

The development of the Galilee Basin effectively doubles Australia's coal production. This is in stark contrast to the International Energy Agency's projection for world coal demand, which shows a **decrease** of 38% in coal demand in their IEA 450 scenario designed to keep global temperature rise below 2°C. Even the IEA New Policies scenario, based on stated policy intentions only shows a 9% increase in coal demand by 2035. If policies are put in place to keep temperature change within 2°C as advocated by the Australian Government, there is a very real possibility that development of the Galilee Basin could become a stranded asset, without a market for the coal.

Emissions from the Galilee Basin, including both the production and use of the coal, would account for 4% of the available global carbon budget for energy from now until 2049, if the world is to have a better than even chance of keeping temperature rise below 2°C. Added to current production and excluding other mine developments that are currently proposed across the nation, Australian coal could account for 9% of this budget.

It is hard to reconcile the development of the Galilee Basin with Australia's commitment to global action to keep temperature rise below 2°C.

1 INTRODUCTION

China First is one of the most advanced of a number of proposed mines in the Galilee Basin in Queensland. At least nine mines are proposed in the area, with combined output of approximately 400 million tonnes per year The remoteness of the area means that considerable transport infrastructure is required if the development is to go ahead.

This report examines the climate impact of the China First mine, considers whether the project can be assessed in isolation from the rest of the Galilee Basin, and extrapolates emissions calculations for China First to the remainder of the proposed development in the Basin.

Climate impact is considered in regard to widely accepted definitions of 'dangerous climate change'. Australia, along with most other nations, has formally acknowledged the need to keep global climate change below 2°C, generally accepted as the threshold for dangerous climate change (for example, Treasury[6]; Climate Commission[7]).

The report considers the greenhouse gas emissions from the construction of the mine and associated infrastructure, operational emissions, and emissions associated with the coal itself, including transport to the port, shipping, and emissions from combustion of the coal. The time period to 2050 is considered as this is a common timescale for emissions projections and targets.

The emissions from the China First mine and the Galilee Basin are considered in relation to national and global targets aimed at keeping climate change below the 2°C threshold. An unacceptable impact is defined as one which could reasonably be expected to compromise these targets.

Emissions and coal production from the China First mine and the Galilee Basin are therefore compared to:

- The cumulative global carbon budget between now and 2050 which has a better than even probability of keeping temperature rise below 2°C,
- Emissions and coal demand in the International Energy Agency (IEA) 450 ppm scenario. This is the IEA's lowest carbon scenario, although some organisations including the IPCC question whether 450ppm carbon is in fact low enough to keep temperature change below 2°C.
- Emissions and coal demand in the Greenpeace Energy [R]evolution scenario, and
- Australian emissions targets from now until 2050.

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The report describes the global and national context in Section 2, and then the China First project, its relationship to the Galilee Basin, and the boundaries of emissions calculations in Section 3. The emissions calculation methodology is given in Section 4, while Section 5 compares the emissions from the China First mine and the Galilee Basin to national and global emissions and coal production.

2 THE GLOBAL AND NATIONAL CONTEXT: CARBON, COAL AND ENERGY

2.1 THE GLOBAL CARBON BUDGET

Following the widespread consensus that exceeding 2°C warming is dangerous climate change, various researchers have specifically examined the probability that different quantities of carbon in the atmosphere will result in temperature rise greater than 2°C.[8] This analysis is the basis of a global 'carbon budget' to remain below the 2 °C threshold.

Meinshausen et al[9] assessed this carbon budget and assigned probabilities of exceeding the threshold, presented in Table 1. These range from an 8-37% probability of exeedence at 1356 Gt CO_2-e between 2000 and 2050, and a 15 – 51% chance of exceedance at 1,678 Gt CO_2-e. We have used the middle range probability, which gives a 10% - 43% chance of exceeding the 2°C of warming threshold.

Table 1 Carbon budget 2000 – 2050

Cumulative total CO_2 emission 2000–49	Probability of exceeding 2°C	
	Range	Illustrative default case
1,356 Gt CO2 equiv.	8–37%	20%
1,500 Gt CO2 equiv.	10–43%	26%
1,678 Gt CO2 equiv.	15–51%	33%

Source: Meinshausen et al, Table 1[10].

Between 2000 and 2010, 351.7 Gt CO_2-e, or 23% of this global carbon budget was consumed. Cumulative emissions between 2000/01 and 2007/08 were 258 Gt CO_2-e [11]. Data for total global emissions of CO_2-e for 2008 – 2011 is not yet available, so this has been estimated using the percentage increases in CO_2 emissions from Netherlands Environment Assessment Agency's *Long-Term Trends in Global CO_2 Emissions 2011 Report*.[12]

Starting from the total cumulative carbon budget of 1500 Gt CO_2e between 2000 and 2049, this leaves a total carbon budget of 1,148 Gt CO_2e from now until 2049. However, as we are considering coal emissions, the energy carbon budget is of more relevance than the total. In 2007, the energy sector[a] accounted for 61% of global greenhouse gas emissions.[13] If energy continued to account for this proportion of global greenhouse emissions, there would be a global *energy* carbon budget of 705 Gt CO_2e between 2000 and 2050.

It should be noted that the proportion of greenhouse gas emissions from energy is likely to decline, as many of the largest carbon reduction opportunities are within the energy

[a] The energy sector here incorporates transport, electricity and heat, other fuel combustion, industry and fugitive emissions.

sector.[14] This would mean the global energy carbon budget will be smaller than the 705 Gt CO_2e identified. However, in the absence of a reliable assignment within the global budget, we have conservatively assumed the proportion remains constant.

The global carbon budget and the global energy carbon budget provide important benchmarks against which to compare the greenhouse gas emissions from the China First Mine. The results of this analysis are shown in section 5.4 below

2.2 LOW EMISSIONS ENERGY SCENARIOS: COAL DEMAND AND EMISSIONS

Two energy scenarios designed to keep climate change below the 2°C threshold are considered here as the context for the proposed expansion in the Galilee Basin. These are:

- The International Energy Agency 450 ppm scenario from IEA[15], and the
- Greenpeace International (GPI) and the European Renewable Energy Council (EREC) Energy [R]evolution scenario[16].

Both scenarios are for the energy and transport sector only. They specify primary energy demand by fossil fuels type, so global coal demand and emissions from coal may be calculated. The IEA scenario only projects to 2035, so emissions may only be compared to this scenario until that date. The Energy [R]evolution has lower cumulative emissions than the 450 ppm scenario, and considerably lower annual emissions in the early period. However, by 2030 Energy [R]evolution emissions are only 11% below the IEA 450 scenario.

The International Energy Agency 450 ppm scenario was first presented in 2010 as a scenario in which:

> ".. policies are assumed to be introduced to bring the world onto an energy trajectory that provides a reasonable chance of constraining the average global temperature increase to 2° Celsius." IEA (2010)[17], p78

The emissions allowance in the scenario was amended slightly downwards in the IEA (2011) World Energy Outlook. More importantly, it was acknowledged that 450 ppm may not be a sufficiently low concentration of carbon in the atmosphere to keep warming below 2°C [18]. Some researchers have concluded that a lower atmospheric target is needed, such as 350 ppm (for example, Anderson and Bows, 2011[19]; Hansen et al., 2008[20]; Rockström et al., 2009[21]; Smith et al., 2009[22]). However, this scenario is the lowest emission scenario put forward by the IEA, and as such is considered here.

Greenpeace and the European Renewable Energy Council publish a global Energy [R]evolution every two years, including primary energy demand by source and emissions.

The total emissions, demand for coal, and the emissions from coal in each scenario are shown in Table 2. Neither the IEA or the Energy [r]evolution data in tonnes, so original

data in these reports was converted to tonnes using the ratio between the IEA global data for 2008 (MTCE)[23] and the US EIA global data for 2008 (given in short tonnes)[24].

Table 2 Global coal demand, energy, and emissions to 2050 in the 2°C scenarios

	2009	2020	2030	2035	2040	2050
COAL PRODUCTION (million tonnes)						
IEA 450	6,875	7,406	5,194	4,616	-	-
Energy [r]evolution	-	6,112	4,609	3,834	3,060	1,788
EMISSIONS FROM COAL (million tonnes CO_2-e)						
IEA 450	13,558	15,295	10,727	9,533	-	-
Energy [r]evolution	-	12,623	9,518	7,919	6,319	3,693
TOTAL ENERGY EMISSIONS (million tonnes CO_2)						
IEA 450	28,844	31,885	24,784	21,574	-	-
Energy [r]evolution	-	26,729	21,960	18,921	15,883	10,202

***Sources**: IEA 450 from IEA (2011) Table 6.3, page 420 and Annex A; Energy [r]evolution from GPI and EREC (2010), spreadsheet data supplied by GPI.*
***Notes**: Coal production figures from the IEA have been converted from Million Tonnes Coal Equivalent (MTCE) to million tonnes using a factor of 1.25, derived from the ratio of the US EIA world production figure of 6,808 Mt (7505 short tonnes)[25] for 2008, compared to the IEA figure of 4736 MTCE[26] Coal emissions have been calculated using the IPCC factor[27] for emissions on an energy basis.*

2.2.1 Coal demand – low energy scenarios and business as usual

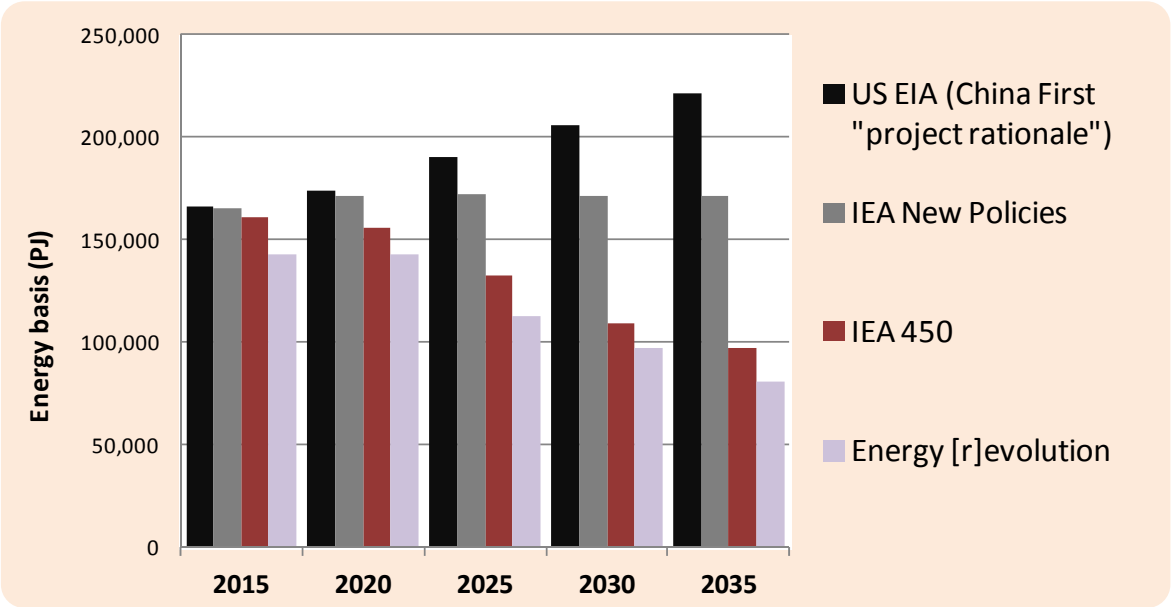
The project proponent presents a business as usual projection for world coal demand based on the US Energy Information Administration (EIA) 2010 projection[28].

Four projections for world coal demand are presented in Figure 1. These are:

- The US Energy Administration 2011 projection, which is the updated version of the projection used in Waratah Coal's section on project demand,
- The International Energy Agency's 'New Policies' projection – this is central scenario presented in the IEA 2011 World Energy Outlook, and takes account of both existing policies and declared policy intentions[29].
- The International Energy Agency's 450 projection – this is the IEA scenario aimed at keeping world temperature rise below 2°C, and.
- The Greenpeace / European Renewable Energy Council Energy [r]evolution scenario.

As may be seen, there is wide divergence in the scenarios. While the BAU scenario shows coal demand increasing by 41% by 2035, the scenario which includes current policy intentions shows an increase of only 9% (the IEA New Policies scenario). Both of the scenarios aimed at keeping temperature rise below 2ºC show marked decreases in demand for coal by 2035, of 38% and 49% in the IEA 450 and the Energy [r]evolution respectively.

Figure 1 Coal demand under BAU, current policy intentions, and to stay below 2°C rise



Sources: US EIA (2011), IEA 2011, GPI & EREC 2010. Note that China First project rationale used the 2010 US EIA projection.

2.3 THE NATIONAL CONTEXT: AUSTRALIA'S EMISSIONS TARGETS

The development of the China First mine and the Galilee Basin significantly increases Australia's domestic emissions. The Treasury modelling document *Strong Growth, Low Pollution*[30] puts forward an emissions scenario that meets Australia's unconditional targets for 5% reduction in emissions by 2020 (compared to 2000) and an 80% emissions reduction by 2050. The projection includes overseas abatement, which provides 62% of total abatement in 2020, and 48% in 2050. Since publication of the Treasury projection there has been a legislated commitment to obtaining no more than 50% of abatement internationally in 2020[31], so the domestic emissions at 2020 have been reduced to 603 million tonnes from 621 million tonnes.

The 5% reduction target by 2020 is not in the context of world action to stay within the 2°C threshold. In the event that there is comprehensive global action aimed at stabilising at 450 ppm carbon, Australia is committed to a 25% reduction target by 2020[32].

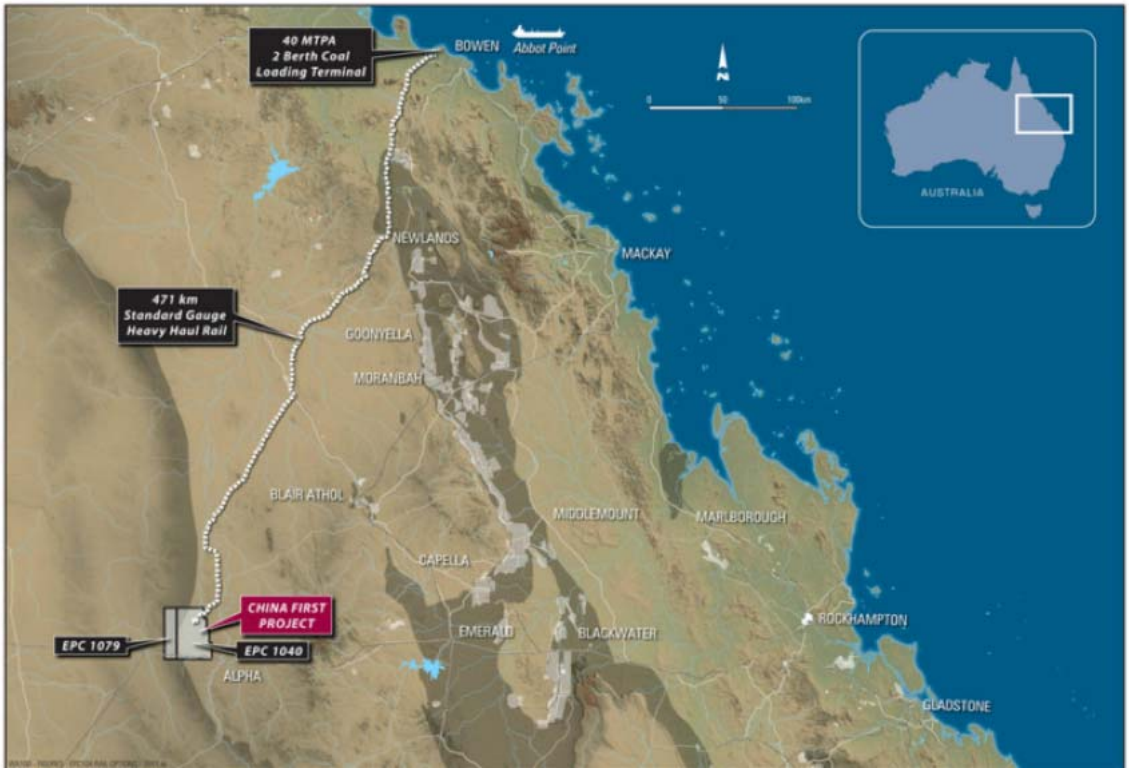
We compare the emissions from the China First mine and the Galilee Basin to Australian domestic emissions under these two emission targets. As noted above, the 450 ppm stabilisation level may not be sufficient to keep climate change within the 2°C accepted by Australia and most other countries, so even the 25% target may require strengthening.

3 THE CHINA FIRST MINE AND THE GALILEE BASIN

3.1 PROJECT DESCRIPTION

The proposed China First mine project is located within the Galilee Basin described as being approximately 13 km west and 35 km north" of Alpha (township)[33]. Figure 2 shows the location of the exploration leases

Figure 2: China First project location



Source: http://www.waratahcoal.com/china-first-coal-project accessed 6th December 2011

Areas included in the economic impact statement of the China First Environmental Impact Statement (EIS) (Volume 5, Appendix 24) have a combined population of 320,239, with 67,974 people distributed across the mine and port catchments and 252,265 in what the EIS refers to as the 'Broader Service Area in 2009[34]. Economic development in the area has been historically centred upon agriculture (grazing), "internationally recognised tourism" in the nearby Whitsunday islands and industrial exports from Bowen. The economic impact assessment states that one in five workers are currently employed in the mining sector.

Waratah coal is the Australian-based proponent for the project, and is currently managing the approvals process with the Queensland and Federal governments. Waratah Coal has Exploration Permits for Coal (EPCs) that cover a total area of 15,250 km^2.[35]

The China First project is comprised of three main developments and several auxiliary facilities that will intersect with six nearby local government areas.[36]

The first of these three main developments is a mining operation that extracts coal from four 'principle seams' that are described as yielding an average of "…72% of thermal coal" after washing and blending.

The EIS indicates that the type of mining processes anticipated will vary across the site, with four underground long-wall operations and two open cut pits. Two coal preparation plants with combined washing capacity of 56 Mtpa will also be accommodated at the mine site[37].

The second development is a 447 – 471 kilometre railway[b] that connects the mine to the existing port at Abbott Point. The final length of the railway appears to be dependent upon further research and negotiations with affected landholders.

The third development included in the China First EIS is an additional terminal facility with a capacity of 40 Mtpa at Abbott Point port.[38]

Auxiliary facilities associated with the mine are noted in Volume 5, Appendix 24[39], of the EIS documents. These include:

- Power supply infrastructure
- Water supply infrastructure
- Wastewater treatment facilities
- Accommodation
- An airport
- Local road infrastructure

Note that the construction impacts from this additional infrastructure do not appear to have been included in the construction impact assessment of the mine. Several are the subjects of EIS processes being managed by other proponents of mine related infrastructure in the area.

The EIS indicates that the proponent expects to begin 'early engineering' in March 2012, with the first exports of coal anticipated by the end of 2014[40]. Full production capacity of the mine (40Mtpa) is expected to be reached in 2015 -2016.

3.2 CAN THE CHINA FIRST MINE BE CONSIDERED IN ISOLATION FROM THE GALILEE BASIN?

"The rail corridor will open a new multi-billion tonne coal province with opportunities for thermal coal export to world markets for both Waratah Coal, as well as other Galilee Basin proponents through welcomed third party access arrangements." Waratah Coal (2011)

[b] Different figures for the railway line appear in different documents. The consultants report on soils and geology (Appendix 6) describes it as being "447 km Standard Gauge Heavy Haul Railway" while the Waratah Coal website page on the project has a figure of 471kms. A different figure, 467km, appears in the Executive Summary in (Volume 1)

The above statement, made in section 1.4 (Project Rationale), is one of many by the proponent suggesting that railway infrastructure for China First be considered in the context of the Galilee Basin as a whole.

This analysis has asked three questions in considering whether the China First Project can or should be considered in isolation from the wider Galilee Basin. The first requires a view of whether the high level of investment in rail infrastructure can be justified on the output of the China First mine project alone. The second examines whether other proposed projects in the Galilee Basin are reliant upon the development of the infrastructure proposed for the China First project. The third is based on implicit and explicit views of the China First project as providing 'enabling infrastructure'. Each of these is explored below.

3.2.1 Does the output of the proposed China First mine alone justify the level of investment in the proposed railway infrastructure?

Waratah Coal's application for Infrastructure Facility of Significance status includes several documents that refer to the Galilee Basin's coal as a 'stranded asset' due to the remoteness and lack of suitable infrastructure[41]. Similar arguments can be seen in the documents prepared by other companies that are currently or contemplating seeking approval for mines in the Galilee Basin[42]. From these and other statements contained in correspondence with government authorities, it is clear that railway infrastructure is a key element of developing the resources for export.

The estimated cost of the railway line proposed by China First is $2.1 billion, which represents approximately one quarter of the total project budget and one half of the budget for mine construction. The estimated output of the China First mine is 40Mtpa, one tenth of the capacity proposed for the China First railway.

The EIS notes that the output of the mine at this capacity for 30 years will justify the investment in constructing the railway line[43]. However, given the significant excess capacity that is being proposed (400 Mtpa compared to 40 Mtpa), and a number of statements regarding negotiations for sharing the cost and the use of the proposed infrastructure, it is reasonable to assume that the costs (and risks) have been justified on the basis of a larger throughput than will be provided by China First alone.

The Executive Summary does include reference to a more modest proposition for rail infrastructure: "…new rail line and coal terminal infrastructure with an initial capacity of 50 Mtpa."[44] However, it appears that more detailed discussions and costing of the proposed rail line presume the 400 Mtpa capacity, and that this is the basis of discussion with the Queensland government.

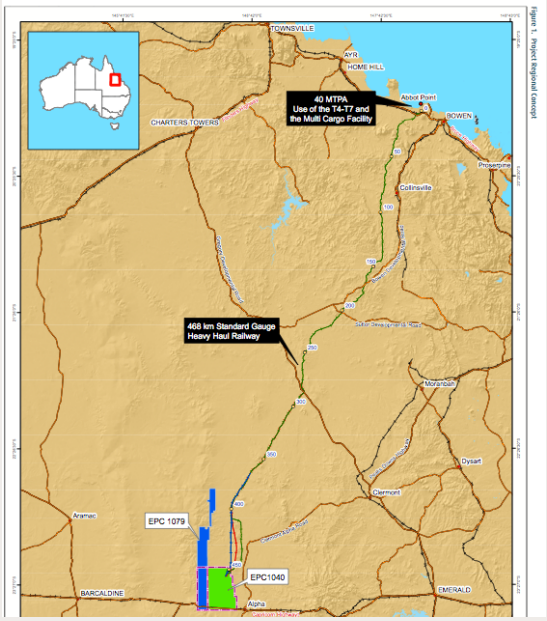
3.2.2 Do other projects proposed for the Galilee Basin rely on the provision of railway infrastructure proposed by China First?

While several of the projects being considered for the Galilee Basin include railway infrastructure, only two have provided any detailed analysis of the costs, environmental

and social impacts, and alignment of this infrastructure. These railways, proposed by Waratah Coal and GVK are shown in Figure 3. Cost estimates included in the China First and Alpha proposals are $2.1b and $1.5b [c] respectively, and estimates of maximum throughput are 400 Mtpa and 60 – 120Mtpa [d] respectively.

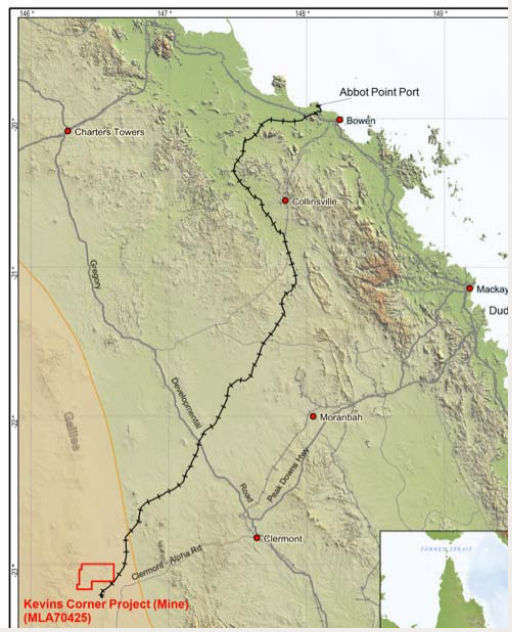
Figure 3 Railway infrastructure proposed for the China first and Alpha mines

China First: 447- 471 km



Source: figure 1, Project Regional Concept, China First EIS, Executive Summary – Volume 1, p.3

Alpha: 495 kms



Source: figure 0-1, Kevin's Corner Regional Location, Kevin's Corner EIS, Executive Summary – Volume 1, p.0-3

Statements made by the proponents of China First and Alpha mines, and by the proponents of other nearby developments support the conclusion that these railways are being designed to support other mines. For instance, the Initial Advice Statement (IAS) for the South Galilee (AMCI) project states that there is "inherent uncertainty" associated with the project "until both rail access and port allocation has been sourced." The IAS

[c] The project description provided on the QLD Department of Employment, Economic Development and Innovation website notes that this is a contribution to 'common user infrastructure'. See http://www.deedi.qld.gov.au/cg/alpha-coal-project.html accessed 12th December 2011.

[d] Volume 2, Chapter 02 of the Alpha Coal EIS notes that the railway proposed as part of the project will allow for expansion beyond the 60Mtpa anticipated from the Alpha and Kevin's Corner mines. Section 2.3.1.1 Third Party Rail Access notes the following: "Capacity expansion over 60mtpa on behalf of other potential third party users, which is foreshadowed also in this document, improves the net present value for the rail project. In other words, there is a financial incentive for Hancock to provide for third party access where capacity is available or can be economically made available," p.2-24.

document states that the proponent will make use of the "Alpha" railway line when it becomes available. However, a statement found in a letter of support for the China First proposal as Infrastructure Facility of Significance[45] indicates that the proponents of the South Galilee project would also consider making use of a line constructed by China First. Carmichael Coal (Adani) has also indicated that its mine proposal will require either 400km of new railway, 105km of new railway to connect with the proposed Alpha railway line, or 175km of new rail line to connect with the existing narrow-gauge "Goonyella" line[46].

3.2.3 Does the railway infrastructure proposed by China First represent 'enabling infrastructure' for additional coal mining projects?

The proponents of China First have sought support for their project through obtaining Major Project Facilitation (MPF) status, gaining 'in-principle' support as a project of 'state significance, and through declaration of the project as an Infrastructure Facility of Significance (QLD government). In these submissions, and the EIS, the role of the China First railway as 'enabling infrastructure' is referred to on numerous occasions.

For example in the first volume of the EIS, it is noted that while the mine will have an estimated life of 30 years "… the rail and coal terminal facilities at the APSDA and Port of Abbot Point will continue to operate to support other projects."[47]

An example of the intention to provide infrastructure that will enable production for a wider range of coal projects is provided in the first volume of the China First EIS, in which the proponents note that there may be little opportunity for 'significant co-location' of the Alpha and China First rail proposals, and that Waratah Coal has

> "… 'in principle' agreement with AMCI (proponents of the South Galilee Coal Project), Adani Mining Pty Ltd (proponent of the Carmichael Coal Project) and the Meijin Group (trading as Macmines Austasia Pty Ltd) regarding third party usage of the proposed rail infrastructure." *Waratah Coal, 2011*[48]

In response to a request for more information on the railway as part of the process to declare the project an 'infrastructure facility of significance', Waratah Coal has outlined the "…corridor's potential…**to more than triple the entire State's exports** based on 2009/2010 Queensland coal statistics…"[49] if the full capacity is realised.

Furthermore, the letter goes on to list other proposed projects in the Galilee Basin. These projects are described as having a combined output of 375 Mtpa that could be carried by the railway with "upgrades" that would be "…constrained totally within the IFS corridor proposal"[49].

This representation of the contribution that the railway will make appears to have been accepted by the relevant government authorities, with correspondence from the Queensland Premier describing the proposal as "…a project of "state significance…" and "…an investment in a sustainable coal industry in Queensland."[50]

Other indications that the China First mine project cannot be considered in isolation from other proposed coal developments within the Galilee Basin can be found in statements

made by the proponents of these developments. For instance, the Initial Advice Statement for the South Galilee (AMCI) project states that:

> "The Proponent acknowledges the inherent uncertainty of this Project until both rail access and port allocation has been sourced." *South Galilee Coal (2010)*[51]

It is clear from these statements, as well as the support that is being sought and received by the project, that the railway specified in the current China First project EIS is 'enabling' infrastructure that will be used by other projects to transport tonnages that are substantially higher than that proposed for the China First mine, over a period that extends well beyond the life of the China First project.

3.2.4 Conclusion – can the China First mine be considered in isolation from the rest of the Galilee Basin?

Three questions were considered in order to assess whether the cumulative emissions from other mines proposed for the Galilee Basin should be considered when assessing the China First EIS. Specifically:

- **Is the proposed level of investment in the railway infrastructure justified by the China First project alone?** Investment is $2.1 billion, approximately 25% of the entire project cost. Designed capacity is ten times the output of the China First mine, and the proponent is in negotiations with government organisations and other mining companies to share costs and use for the proposed infrastructure. It therefore seems highly unlikely that the proposed investment is based on the China First output alone.
- **Are other proposed projects reliant on the China First infrastructure going ahead?** Only two projects, China First and Alpha Coal, have provided any detailed analysis of railway infrastructure. At least two other projects have stated they will make use of either the Alpha Coal or China First railway infrastructure.
- **Does the China First project provide enabling infrastructure for other Galilee Basin coal projects?** If the railway infrastructure is completed as specified in the project application it is clearly enabling infrastructure that will facilitate the development and consumption of coal resources far in excess of the estimate 40Mtpa capacity of the China First mine.

Each of the questions considered in this section provides a rationale for evaluating the climate change impacts from the projects in the vicinity of the China First mine when considering this proposal. The proposal includes enabling infrastructure for the wider Galilee Basin coal development. This report therefore concludes that the cumulative emissions from the wider Basin development should be included in the consideration of the climate impacts from the China First proposals.

3.3 CAN LOCAL EMISSIONS BE CONSIDERED IN ISOLATION FROM THE END USE EMISSIONS?

The question of where the boundary should be drawn in consideration of the impact of a project has both a legal and an ethical dimension. The legal question is directly addressed in a number of recent Australian cases.[52][53]

The case *Minister for the Environment and Heritage v Queensland Conservation Council Inc* (2004)[54] outlined that any EIS and associated planning decision should take into account adverse environmental impacts, including downstream or 'indirect' impacts. The direct consequence of the mining of coal in the China First Coal Mine is that it will be burnt and in that process produce quantities of greenhouse gas emissions that overshadow the mines construction and operation emissions. *Gray v Minister for Planning* [2006][55] provides legal precedent for the inclusion of combustion and transport and greenhouse gas emissions from coal mining. In her ruling Justice Pain cited the need to consider Ecologically Sustainable Development (ESD) principles such as intergenerational equity and the precautionary principles when assessing a similar coal mine. Specifically, the precautionary principle required that the mine's cumulative effects, including downstream emissions, be assessed,[56] and that the potential climate impacts should be assessed despite any scientific uncertainty about their extent.[57] There is thus legal precedent for inclusion of the product impacts as well as the production impacts.

The implication is that both the planning consent authorities and the mine proponent should include the emissions from coal combustion and associated international transport in their consideration of the climate impacts of the mine. For a detailed discussion of the current and future impacts of climate change on Australia see http://climatechangeinaustralia.com.au and the Garnaut Review Chapter 6 - www.garnautreview.org.au/pdf/Garnaut_Chapter6.pdf.

From an ethical perspective, consideration of this mine in isolation from the direct impact of its product is highly questionable. This argument would have that the producer (the proponent) is only supplying demand that would otherwise be met by alternative suppliers. Recasting this argument with a number of other products which have damaging consequences in use rather than in their production is illustrative, for example, weapons manufacture or tobacco. Most ethical investment funds are specifically committed to disinvesting from their production, because of the effects of the products.[58] The potential effects from climate change are certainly as damaging. For example WHO estimates that already 150,000 deaths are occurring annually due to climate change[59], while Myer estimates that by 2050 there will be 250 million displaced people due to climate change.[60]

Using a carbon budgeting approach, as advocated by the Australian Government's Climate Commission,[61] indicates that the inclusion of all greenhouse gas emissions from the China First Coal Mine is also an intergenerational equity issue. As discussed in Section 2.1 of this report, if the Earth is to have a chance of staying within 2°C of warming, there is a finite carbon budget over the next forty years. This implies that the total emissions of the China First coal mine and the other Galilee Basin coal mines should be assessed in the light of this budget.

3.4 COAL PRODUCTION IN THE GALILEE BASIN

Based on the EIS, and on correspondence between Waratah Coal and the QLD Departments of Regional Planning and Infrastructure and Planning, it appears the railway

line proposed by the China First project will enable production of coal in several other mines (see Section 3.2.3 for details).

Mining projects nominated in the application for status as Infrastructure Facilities of Significance are listed in Table 3. Each mine is listed against the estimates for production that the companies involved have provided to government agencies as part of approval processes, as well as the estimates stated by Waratah Coal in their IFS application.

While many of these proposals are not sufficiently defined to enable calculation of emissions, or even the planned output, Waratah Coal estimates the final saleable products in their IFS application update to the Queensland Department of Employment, Economic Development and Innovation[62]. The projected capacity of the whole Galilee Basin of 375 Mtpa provided by Waratah Coal has been used to estimate emissions from the entire Galilee Basin coal production by scaling the emissions factors calculated for the China First mine. The estimated timing of production has been taken from dates given for estimated railway haulage in the IFS application[63]:

Table 3 Galilee Basin mines identified in Waratah Coal's application for IFS status

Mining Operation (owner/proponents)	Proponent estimate full production	Output stated in IFS application	Estimated first production	Mine name used in IFS application
	million tonnes saleable coal			
China First (Waratah Coal)	40 Mtpa [64]	40 Mtpa	2015	Waratah Coal China First
Alpha Coal Alpha West (GVK & Hancock Coal[65])	30 Mtpa [66] ~24 Mtpa[67]	60Mtpa	2014[68] Late 2014	Hancock
Kevin's Corner (GVK/ Hancock)	30Mtpa [69]	40Mtpa		Waratah Coal Alpha West
Carmichael Coal Project (Adani)	60 Mtpa (2022)	60 Mtpa	2014[70]	Adani
South Galilee Project (Bandanna Energy and AMCI Group)	20 Mtpa[71]	15 Mtpa		South Galilee
China Stone Project (MacminesAustAsia)	60Mtpa [72]	60 Mtpa		MacMines AustAsia
Vale	No information	60 Mtpa		Vale
Alpha North (Waratah Coal)	40 Mtpa (REF)	40 Mtpa		Waratah Coal Alpha North
Total	**304 Mtpa**	**375 Mtpa**		

4 EMISSIONS CALCULATIONS METHODOLOGY

Emissions for the China First mine and the Galilee Basin have been calculated with reference to:

- Total construction emissions for the mine, railway, and port,
- Operational mining emissions per saleable tonne,
- Onshore transport emissions and port operational emissions per saleable tonne,
- Shipping emissions per tonne, and
- Combustion emissions per tonne.

Table 4 summarises the factors used in emissions calculations, and sections 4.1 to 4.4 their derivation. It should be noted that there are several important elements of the China First project, referred to in the EIS as "auxiliary facilities" that have not been included in the studies undertaken as part of the EIS process as they will be developed by third parties. These include the construction and operation of a dam and water pipeline, the construction and operation of an airport/airstrip, additional telecommunications infrastructure, and the construction of a new transmission line.[73]

Table 4 Factors used to calculate greenhouse emissions

FACTOR		Units	Reference/ notes
China First, calorific value of saleable coal (gross)	26.6	MJ/kg OR GJ/T	Waratah Coal, Project Description, at www.waratahcoal.com/china-first-coal-project accessed 6th December 2011 (converted from kC/kg)
Operational emissions (exc transport to port)	57.6	kg CO_2-e per saleable tonne	Waratah Coal EIS, V2, Table 8, p293
Transport to port	7.3	kg CO_2-e per saleable tonne	Waratah Coal EIS, Appendix 19 Table 4.4, reported operational emissions scaled to maximum railway capacity.
Port operational emissions	66.5	kg CO_2-e per saleable tonne	Waratah Coal, Appendix 19 Table 4.6 , reported operational emissions for port scaled to maximum production
Emission factor shipping	0.003	kg CO_2-e/tonne-km	International Marine Organisation, 2009, p177 (based on bulk carrier, 60-99,999 dwt, loaded efficiency)
Export distance (China first Mine)	8362	km	Abbot Point to Port of Lianyungang, China using port.com sea route distance calculator
Export distance (remainder of Galilee Basin)	9052	Km	Based on assumed split of 50% export to India and 50% to China
Emission factor for black coal	88.43	Kg CO2-e/GJ (gross)	DCEE. 2011. National Greenhouse Accounts Factors, 2011. Table 1

4.1 OPERATION AND CONSTRUCTION EMISSIONS

Operational and construction emissions for the China First mine project have been calculated using data taken from the Environmental Impact Statement (EIS) submitted by Waratah Coal to the Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) and the Queensland Department of Employment, Economic Development and Innovation in August 2011. In some instances, additional detail has been found in Waratah Coal's application for status as Infrastructure Facilities of Significance (IFS), submitted to the Queensland Government September 2011.

Mine Operations

Emissions for mine operations have used data from the EIS, Volume 2, Table 8, p.293. Annual emissions have been divided by the estimated full capacity of the mine (40 Mt of saleable coal per annum from 2015-16) to derive the mine operations factor per tonne of saleable coal. These figures do not include emissions generated by operations of the railway or the port terminal facility.

Mine Construction

Emissions for mine construction have used data from the EIS, Volume 2, Table 7, p.291. This data has been used directly in the model of annual emissions. Again, these figures do not include emissions generated by operations of the railway or the port terminal facility.

Port Construction

Emissions for port construction have used data from the EIS, Volume 5, Table 4.6, p.31. This data has been used directly in the model of annual emissions, assuming that the construction occurs over two years.

Railway Construction

Emissions associated with the construction of the railway component of the project have been taken from the EIS, Volume 5, Appendix 19, Table 4.3. This data includes diesel consumption for transport purposes, diesel consumption for stationary energy purposes and vegetation clearing. This data has been used directly in the model of annual emissions, assuming that the construction occurs over the three years prior to first export. All the construction emissions for the railway have been included in the China First calculations, although the railway will service a greater capacity than the China First mine.

Table 5 Key project data for emissions calculations

Item	Assumption	Value
Life of mine	Based on EIS documents	30 years[74]
Construction period	Based on EIS documents	2 years for port and mine [75] 3 years for railway[76]
Initial production volume (saleable thermal coal)	Based on estimated haulage for first year of operations (2015) from IFS documents[76]	31Mt[76]

Item	Assumption	Value
Full production volume (raw)	Based on EIS documents	55-56 Mtpa[77]
Full production volume (saleable thermal coal)	Based on EIS documents	40 Mtpa[77]

4.2 DOMESTIC TRANSPORT AND PORT EMISSIONS

Railway Operations

Domestic transport emissions from normal operations have been taken from the EIS, Volume 5, Appendix 19, Table 4.4. This data refers to the transport of saleable coal from the mine to port facilities at Abbot Point by rail, and incorporates Rail Diesel Consumption and Scope 2 – Rail Electricity Consumption. Rather than using the output of 40 Mtpa to obtain an emissions factor per saleable tonne, this analysis has used China First's expectation of the total railway capacity. The stated emissions are divided by the maximum capacity (400) to obtain the domestic transport emissions factor per saleable tonne.

Port Operations

Emissions generated by port terminal operations have been taken from Volume 5 (Appendix 19, Table 4.6). The figures provided are for electricity used in operations, and do not include diesel combustion associated with "passenger vehicle use"[78]. It is assumed that the development of the port is modular, so stated emissions have been divided by the expected mine output of 40 Mtpa to obtain an emissions factor per saleable tonne.

4.3 COMBUSTION EMISSIONS

The emissions factor used for the combustion of the coal from the China First project is 88.43kg CO_2e/GJ gross, taken from the Australian National Greenhouse Account Factors[79]. The factor is based on a gross calorific value of 27 GJ/tonne, very close to the figure of 26.6 GJ/tonne stated for the China First saleable coal[80].The same factor has been used for calculations of emissions from the output from the Galilee Basin, as it is beyond the scope of this project to investigate the calorific value of the coal production from each mine.

4.4 SHIPPING EMISSIONS

The emissions factor for shipping for the China First Mine has been calculated as 22.6 kg CO_2e/tonne, based on the following assumptions:

- The ships transporting the coal are between 60,000 and 80,000 dwt[81]
- The ships will be transporting at full load
- The average distance travelled per ship will be 8362 km, based on the distance from Abbot Point Coal Port in Qld to the nearest coal import port in China – Lianyungang[82]
- The per tonne km emission factor is 2.7 gCO2e/tonne-km[83]

The emissions factor for shipping for the rest of the Galilee Basin is calculated as 24.4 kg CO_2e/tonne. The same assumptions were used to calculate the emissions factor as for the China First mine, with the exception of using a different export distance.

In order to calculate shipping distance for the rest of the Galilee Basin, an assumption is needed on the export destination for coal from the rest of the mines. Information was only available for two of the other proposed mines, accounting for half of the remaining output. The Carmichael Coal project (Adani) has stated that the coal from this mine will go to domestic energy production in India[84]. The China Stone project (MacminesAustAsia) has indicated that coal will go to Chinese power generators. As noted in Table 3, the combined output of these mines is estimated at 120-140 Mtpa (full production), with China receiving 60 Mtpa and India receiving 60-80 Mtpa.

The nearest coal port in India is Port of Chennai, a distance of 9741 km from Abbot Point[85], compared to 8362 km distance to the Port of Lianyungang in China. It has been assumed that 50% of output from the rest of the Galilee Basin will go to China and 50% to India, which may underestimate the shipping emissions somewhat. This results in a weighted average export distance of 9052 km.

5 RESULTS AND CONCLUSION

5.1 EMISSIONS FROM THE CHINA FIRST MINE

Lifetime emissions from the China First mine are 3,291 million tonnes CO_2-e, based on the operational lifetime of 30 years. Burning the coal accounts for 93% of the total, as shown in Figure 4.

Table 6 shows the annual and cumulative emissions from the China First mine. Onshore emissions from the China First mine are 5.3 million tonnes per annum when the mine reaches full capacity. This is equivalent to putting an extra 1.5 million cars on the road[86], or the total emissions for an additional 425,500 households (including household energy and private cars, 2009/10 data[87]). Offshore emissions from the China First mine are 95 million tonnes per annum for most of the mines operational life, equivalent to 16% of Australia's current emissions.

Figure 4 China First mine – lifetime greenhouse emissions

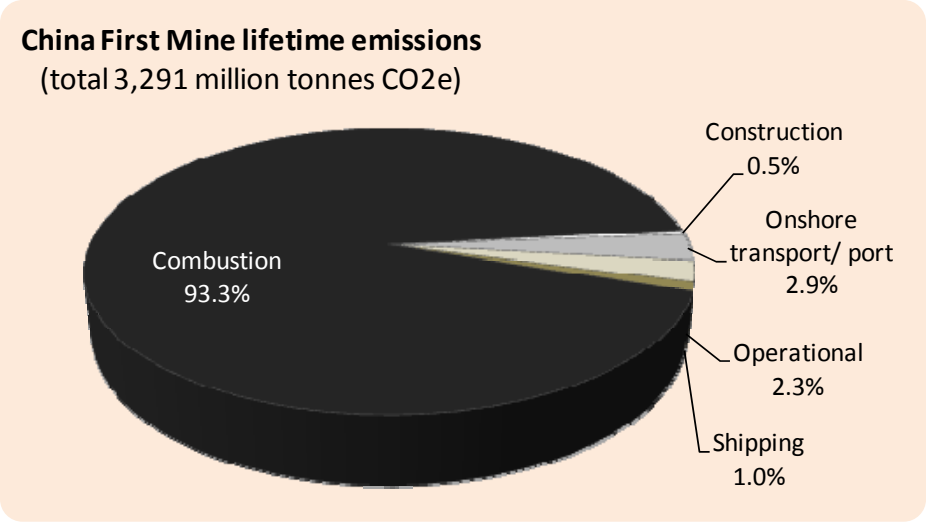


Table 6 Emissions from the China First mine

Million tonnes CO_2-e	2020	2030	2040	2050	CUMULATIVE 2013 - 2050
ONSHORE EMISSIONS – CHINA FIRST MINE					
Construction					16
Mine operations	2.3	2.3	2.3	-	75
Transport and port operations	3.0	3.0	3.0	-	96
Total onshore emissions	**5.3**	**5.3**	**5.3**	-	**188**
EMISSIONS FROM COAL – CHINA FIRST MINE					
Shipping	1	1	1	-	32
Combustion	94	94	94	-	3,072

Million tonnes CO_2-e	2020	2030	2040	2050	CUMULATIVE 2013 - 2050
Total offshore emissions	**95**	**95**	**95**	**-**	**3,104**
OVERALL TOTAL	**100**	**100**	**100**	**-**	**3,291**

5.2 EMISSIONS FROM THE GALILEE BASIN

Greenhouse emissions for the Galilee Basin have been estimated using the emissions factors calculated for the China First mine and the production capacity of 375 MTpa presented in Waratah Coal's IFS documentation and discussed in Section 3.4. Mine construction, transport, port operations, and combustion have all used identical factors to the China First calculations, although no emissions have been allowed for additional railway construction apart from the development outlined in the China First EIS. Emissions from shipping use the same factor per tonne/ km, and use a weighted average distance of 9052 km (see Section 4.4).

Table 7 shows the annual and cumulative emissions calculated for the entire Galilee Basin, including the China First mine.

Table 7 Emissions from the Galilee Basin

Million tonnes CO_2-e	2020	2030	2040	2050	CUMULATIVE 2013 - 2050
ON SHORE EMISSIONS - GALILEE BASIN					
Construction	5	-	-	-	145
Mine operations	15	22	22	19	666
Transport and port operations	20	28	28	25	853
Total onshore emissions	**40**	**49**	**49**	**44**	**1,663**
EMISSIONS FROM COAL – GALILEE BASIN					
Shipping	7	9	9	8	282
Combustion	625	882	882	788	27,163
Total offshore emissions	**632**	**891**	**891**	**796**	**27,445**
OVERALL TOTAL	**672**	**940**	**940**	**840**	**29,108**

5.3 CHINA FIRST AND THE GALILEE BASIN EMISSIONS IN THE NATIONAL CONTEXT

Emissions from the China First and from the total Galilee Basin are compared to Australian emissions in Figure 6 and Figure 5. Emissions for the Galilee Basin have been scaled up from the China First mine, using the methodology set out in Section 4.

Figure 5 shows the total and onshore emissions from the whole Galilee Basin compared to Australia's onshore emissions. Total emissions (onshore and offshore) overtake Australian domestic emissions in 2020, and are 50% higher than the target for Australian domestic emissions by 2050.

Onshore emissions from the whole basin reach 49 million tonnes per annum by 2030, and average 7.6% of total Australian onshore emissions from 2020 – 2040. This is equivalent to putting an extra 10.5 million cars on the road[88], or the emissions from an additional 3 million households.

Onshore emissions from the China First mine are 5.3 million tonnes per annum when the mine reaches full capacity, and average 0.8% of Australia's total onshore emissions from 2020 – 2040 (the assumed operational lifetime of the mine). This is equivalent to putting an extra 1.5 million cars on the road[89], or the total emissions for an additional 425,500 households (including household energy and private cars, 2009/10 data[90]).

Figure 5 Total and onshore emissions from the Galilee Basin compared to Australia's onshore emissions

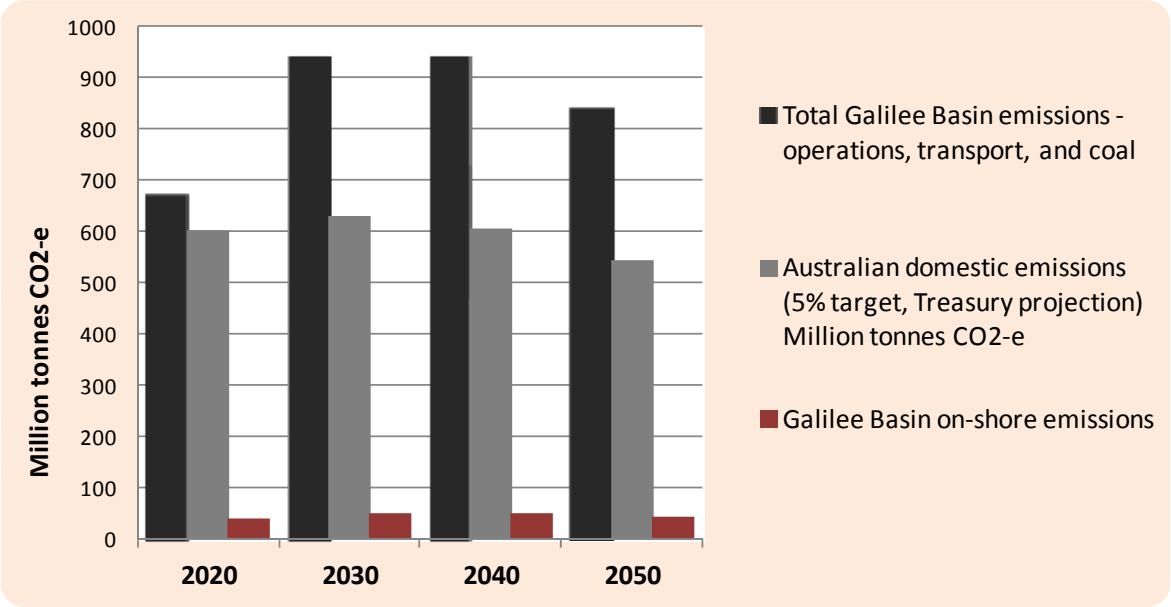
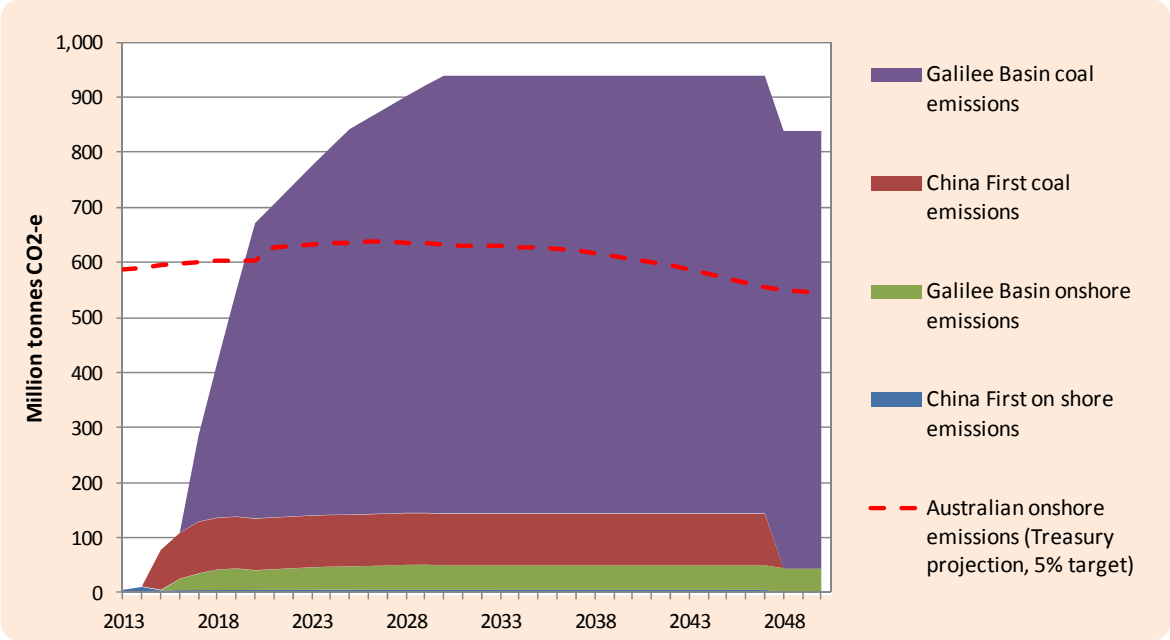


Figure 6 Emissions for the China First mine, the Galilee Basin, and Australia's onshore emissions



5.4 THE CHINA FIRST AND THE GALILEE BASIN EMISSIONS IN THE GLOBAL CONTEXT

5.4.1 The global carbon budget - energy

Meinshausen et al calculated that there is a total global carbon budget of 1500 $GtCO_2$-e between now and 2049 in order to have a 10 – 43% probability of keeping global temperature change below 2°C (see Section 2.1 for details). This results in an energy budget of no more than 705 $GtCO_2$-e. The real budget for energy is probably somewhat less, as this figure is based on the 2007 proportion of emissions associated with energy, and it is likely that the percentage will decline as energy and transport have relatively high abatement potential.

The emissions from the China First mine and the Galilee Basin are considered in the light of this budget. The cumulative emissions from the China First project alone account for 0.5% of the global energy carbon budget, while the emissions from the proposed developments in the Galilee Basin account for just over 4% of the budget, as shown in Figure 7. If Australia's "status quo" coal production is added to the proposed new production from the Galilee basin, Australian coal would account for an estimated 9% of the global energy carbon budget from now until 2049.

Figure 8 shows the emissions from the Galilee Basin compared to the emissions from coal under two scenarios aimed at keeping temperature change below the 2°C threshold, the IEA 450 scenario and the Greenpeace/ EREC Energy [r]evolution scenario. The Energy [r]evolution scenario is included for 2040 and 2050, as the IEA scenario only goes as far as 2035. However, as can be seen, the Energy [r]evolution continues the trend of the IEA scenario during that later period.

Figure 7 Emissions from the Galilee Basin coal developments compared to the global energy carbon budget until 2050

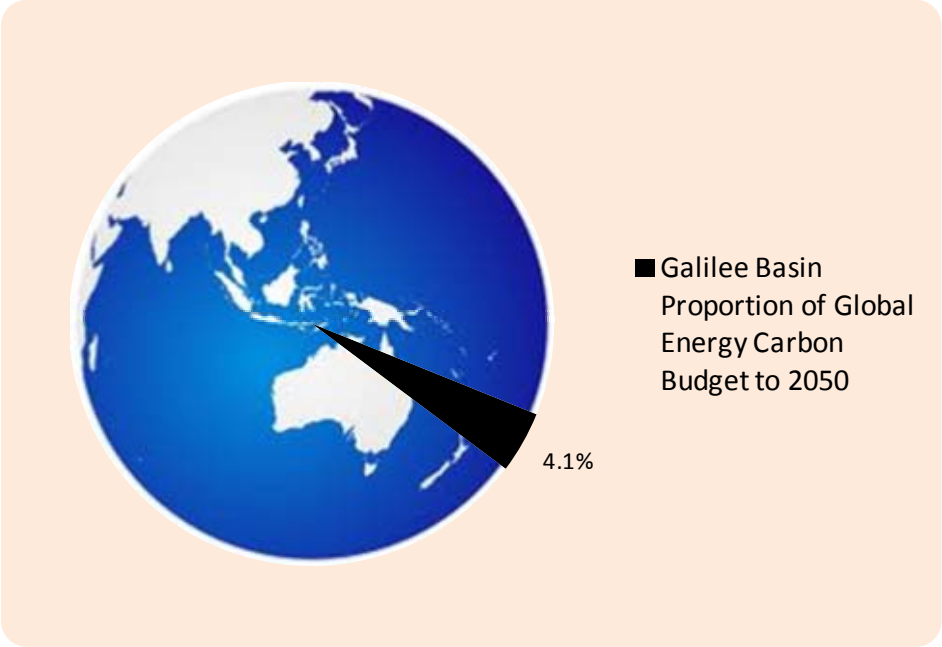
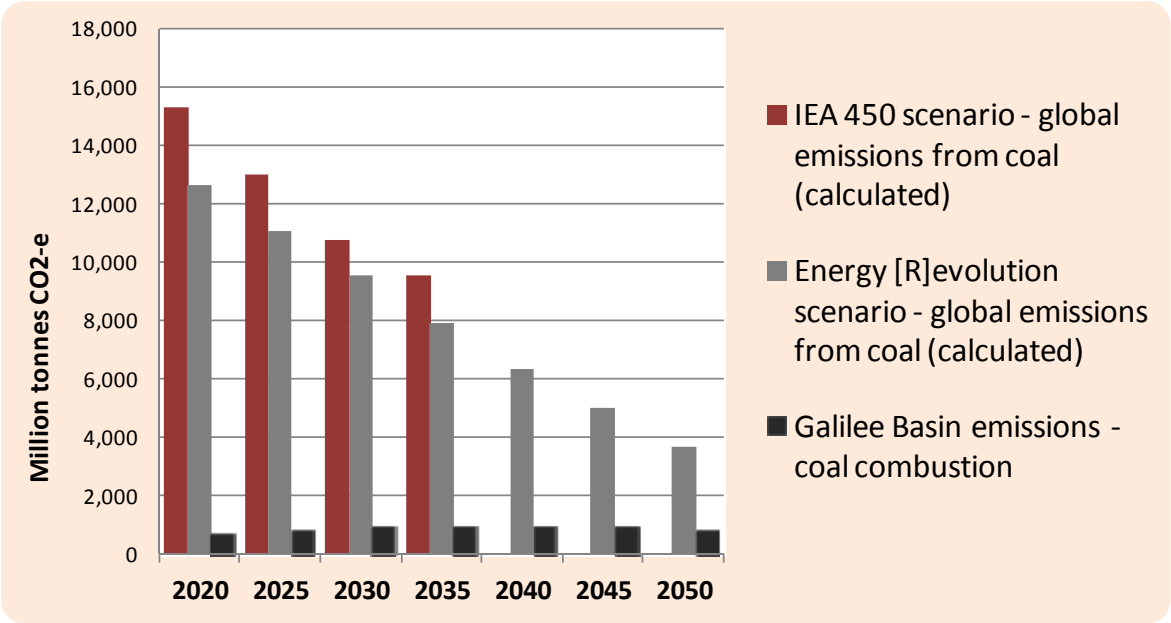


Figure 8 Global emissions from coal under the IEA 450 scenario, the Energy [r]evolution scenario, and the Galilee Basin coal emissions



Note: emissions for the IEA 450 and Energy [R]evolution scenarios have been calculated using the IPCC factor for emissions per PJ[91]*.*

The increased production, and therefore the increased emissions from the Galilee Basin are in stark contrast to the steeply declining emissions from coal in both the IEA and the Greenpeace/ EREC scenarios. Under the IEA 450 scenario, by 2035 the Galilee Basin would be responsible for 9% of world coal emissions, and 4% of total energy emissions, and under the Greenpeace/EREC scenarios the Galilee Basin would account for 21% of world coal emissions by 2050.

5.4.2 Coal production

Coal production in Australia is set to rise significantly if the development of the Galilee Basin goes ahead as planned. It would increase total Australian coal exports by 70% by 2020 and double 2009/10 production levels by 2035. This is at odds with IEA projections for global coal demand under the IEA 450 scenario designed to remain within 2°C, which shows a decrease of 38% in world coal demand by 2035. Even the IEA central scenario (the New Policies), which reflects current global policy intentions, only shows coal demand increasing by 9% by 2035.

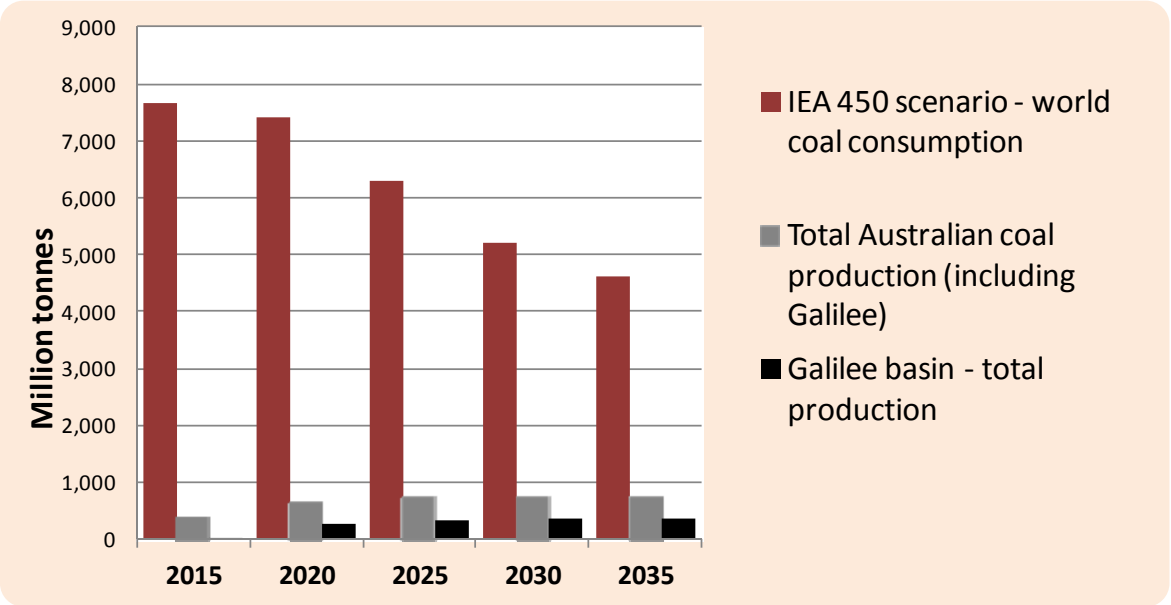
Table 8 lists world coal production under the IEA 450 scenario and projected Australian production should the Galilee Basin development go ahead. Status quo production assumes that output remains at current levels[e].

Table 8 World coal demand in the IEA 450 scenario Australian current production plus Galilee Basin

Million tonnes	2009	2020	2030	2035
IEA 450 scenario – world coal production	6,875	7,406	5,194	4,616
Australian "status quo" production plus Galilee Basin	366	632	741	741
Australian % of world production	5%	9%	14%	16%

Note: Australian production figures exclude lignite, while IEA figures include lignite. IEA 450 scenario figures have been derived using the ratio with US EIA tonnage.

Figure 9 Global coal demand in the IEA 450 Scenario and proposed Australian coal production

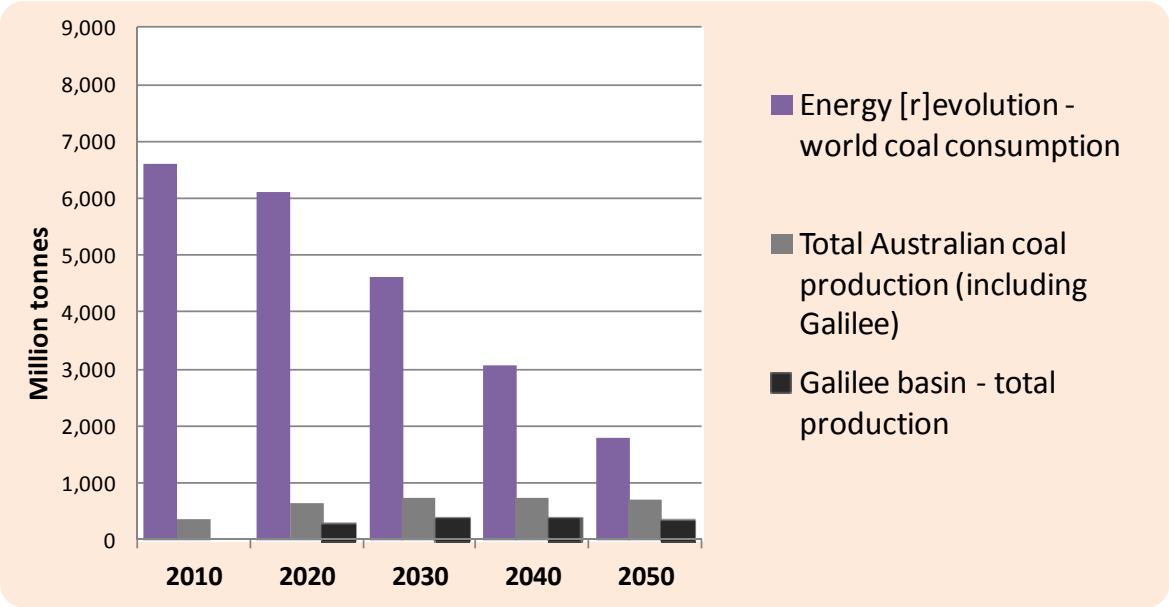


Note: 2015 data for IEA is from the New Policies scenario

[e] ABARE estimates the reserves in current mines to be 42,871 MT, and current output is 366 MT saleable, which would be sufficient for 117 years production at current levels

Figure 9 shows global demand for coal from 2020 to 2035 in the IEA 450 scenario, and Australian coal production including the proposed production from the Galilee Basin. As can be seen, in the IEA 450 scenario coal production falls significantly. In this case, should Australia go ahead with the development of the Galilee Basin, Australian coal would be supplying 16% of global demand by 2035. Figure 10 shows coal demand in the Energy [R]evolution scenario compared to potential Australian coal production.

Figure 10 Global coal demand in the Energy [R]evolution and proposed Australian coal production



5.5 CONCLUSION

The development of the Galilee Basin effectively doubles Australia's coal production. This is in stark contrast to the International Energy Agency's projection for world coal demand, which shows a **decrease** of 38% in coal demand in their IEA 450 scenario, the IEA scenario designed to keep global temperature rise below 2°C. Even the IEA New Policies scenario, based on stated policy intentions only shows a 9% increase in coal demand by 2035. If policies are put in place to keep temperature change within 2°C as advocated by the Australian Government, there is a very real possibility that development of the Galilee Basin could become a stranded asset, without a market for the coal.

Emissions from the Galilee Basin, including both the production and use of the coal, would account for 4% of the available global carbon budget for energy from now until 2049, if the world is to have a better than even chance of keeping temperature rise below 2°C. Added to current production and excluding other mine developments that are currently proposed in other areas, Australian coal could account for 9% of this budget.

It is hard to reconcile the development of the Galilee Basin with Australia's commitment to global action to keep temperature rise below 2°C.

6 REFERENCES

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