



Rewarding Learning

ADVANCED

General Certificate of Education

2019

Geography

Assessment Unit A2 3

assessing

Decision Making in Geography



AGG31

[AGG31]

THURSDAY 13 JUNE, AFTERNOON

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number on the Answer Booklet provided.

This paper takes the form of a decision making exercise. You are required to write a report based on the case study information provided.

You are provided with information about the structure your report should take.

INFORMATION FOR CANDIDATES

The total mark for this paper is 60.

The number of marks available for each section of your answer is shown in the grid provided.

Quality of written communication will be assessed in **all** questions.

You are strongly recommended to spend 30 minutes reading the question and selecting appropriate information before attempting to write your report.

You are provided with a Resource Booklet for use with this paper.

DECISION MAKING EXERCISE

Read the background information below and write a report in response to the task that follows.

You are strongly recommended to spend 30 minutes reading the questions and resources and 60 minutes writing your report.

Background

You must adopt the role of Ms Sheila Gildea, Advisor to the Federal Court in Australia, who is to consider the coalmine proposal and recommend whether or not it should proceed.

The Carmichael project consists of a coalmine, railway and port. The coal reserves are in the North Galilee Basin, about 160 km north west of Clermont in central Queensland, Australia. Coal will be mined and transported along a new 381 km rail line to the coast, from where it will be exported.

First proposed in 2010, this project is estimated to cost A\$16.5 billion (Australian dollars). This is the equivalent of £10 billion. The project has been proposed by Adani, an Indian company, and is anticipated to be the first of a series of giant coalmines in the Galilee Basin area of Queensland.

The project consists of:

- a mine, consisting of both open cast (to exploit coal from the surface) and underground workings;
- a railway extension to connect with the existing track of the North Galilee railway;
- an extension to the existing coal terminal; and
- the building of a new coal terminal at the port at Abbot Point.

Note that you do not have to decide on an alternative – only whether you approve or reject the project described here.

You should base your answer solely on information contained in this examination paper and Resource Booklet and not on any decision that may have been made in relation to this issue.

You must adopt the role of Ms Sheila Gildea, Advisor to the Federal Court in Australia, who is to consider the coalmine proposal and recommend whether or not the mine should proceed.

	MARKS
Format	2
Role	2
Graph	8

Each of the three sections must be clearly set out using the headings and sub-headings provided.

You must adopt and maintain the stated role.

Draw a graph using **all** of the data from **Table 1** (found in **Text B**) and incorporate it into the report at an appropriate place.

YOUR REPORT MUST BE STRUCTURED AS BELOW		MARKS	GUIDANCE TO CANDIDATES
Heading	Sub-heading		
A. Introduction		10	A. Describe the proposed project.
B. The likely impact on:	(i) Employment and the economy	14	B. (i) Discuss the possible beneficial effects of the proposed development on employment and the economy and the counterarguments.
	(ii) The environment and people	14	(ii) Discuss the potential impacts on the environment and people of the proposed development and the counterarguments.
C. Decision		10	C. State clearly your decision and justify it on the basis of the greater overall benefits.

THIS IS THE END OF THE QUESTION PAPER

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RESOURCE BOOKLET

Resource 1A	Map showing the location of the proposed development
Resource 1B	Detailed map of the development
Resource 2A	Infographic of potential impact of mining in the Galilee Basin
Resource 2B	Infographic of water usage at the proposed mine and potential impact to reef
Resource 3A	Carmichael mine protestor
Resource 3B	Coal being transported at Abbot Point
Resource 3C	Moray Carmichael Boundary road, 3.6 km from the proposed mine
Resource 4A	Threatened wildlife – Yakka Skink
Resource 4B	Threatened wildlife – Black-throated Finch
Text A	Introduction
Text B	Arguments in favour of the proposal
Text C	Arguments against the proposal
Text D	Quotations related to the development

RESOURCE 1A

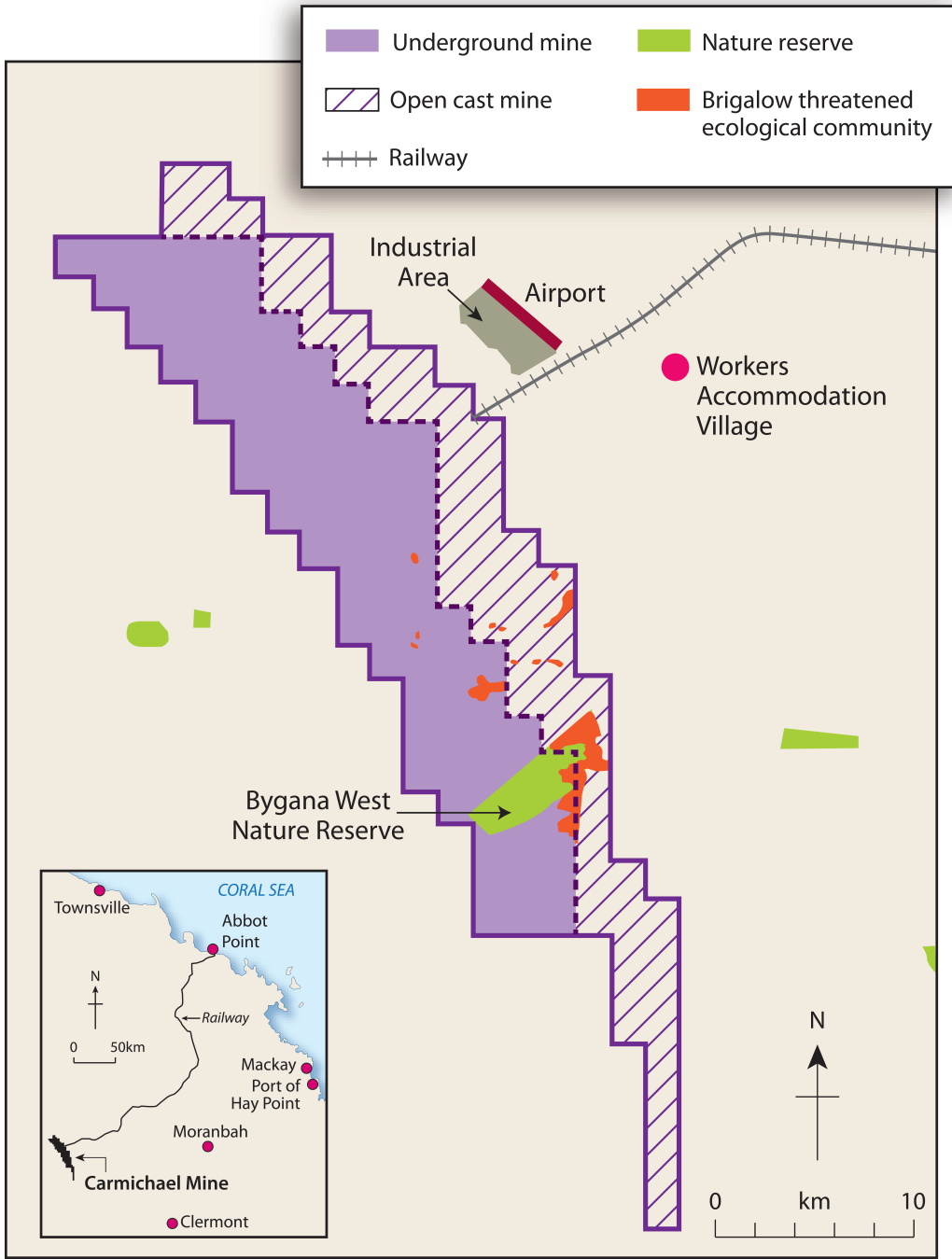
MAP SHOWING THE LOCATION OF THE PROPOSED DEVELOPMENT



© CCEA

RESOURCE 1B

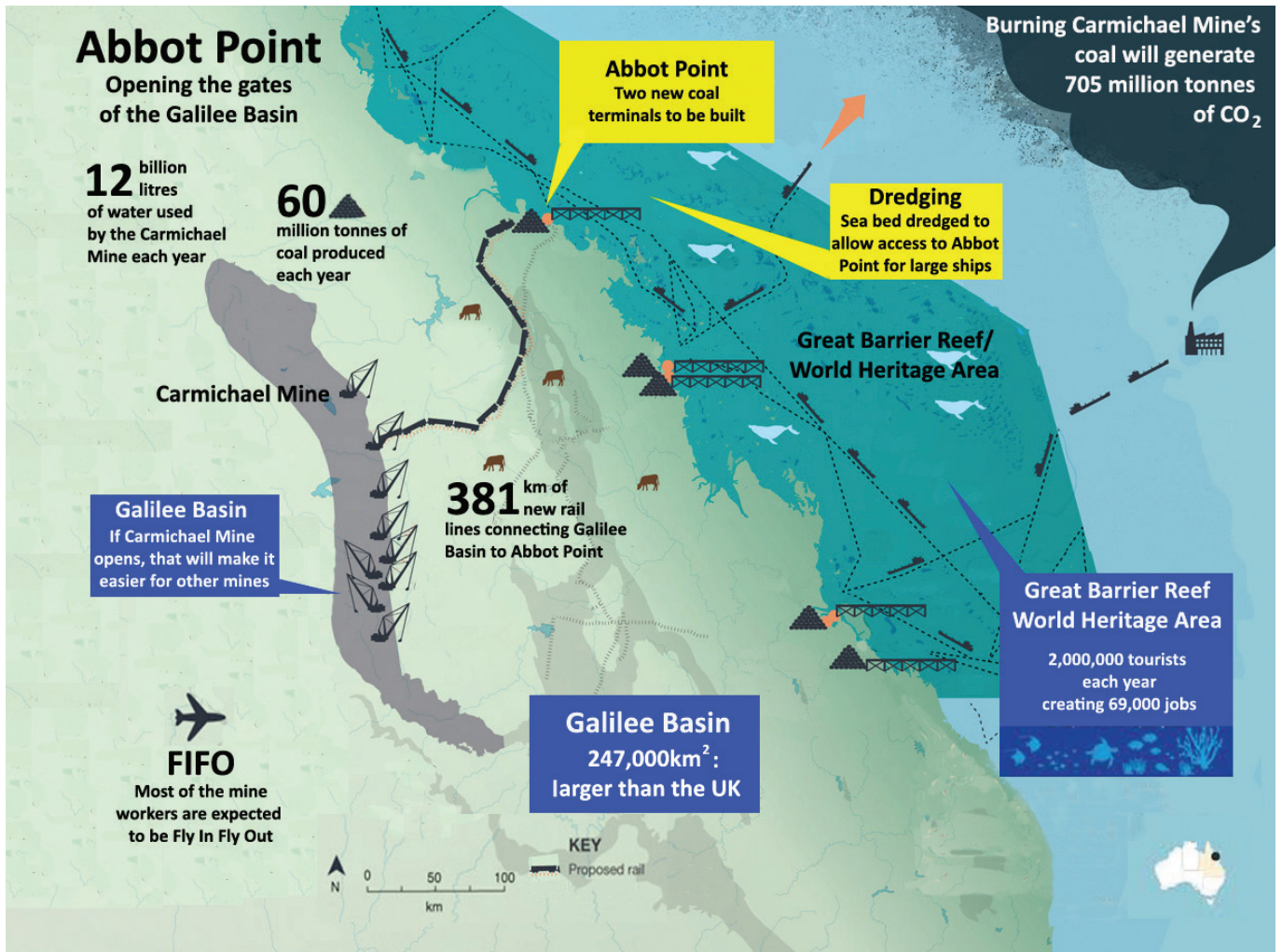
DETAILED MAP OF THE DEVELOPMENT



© CCEA

RESOURCE 2A

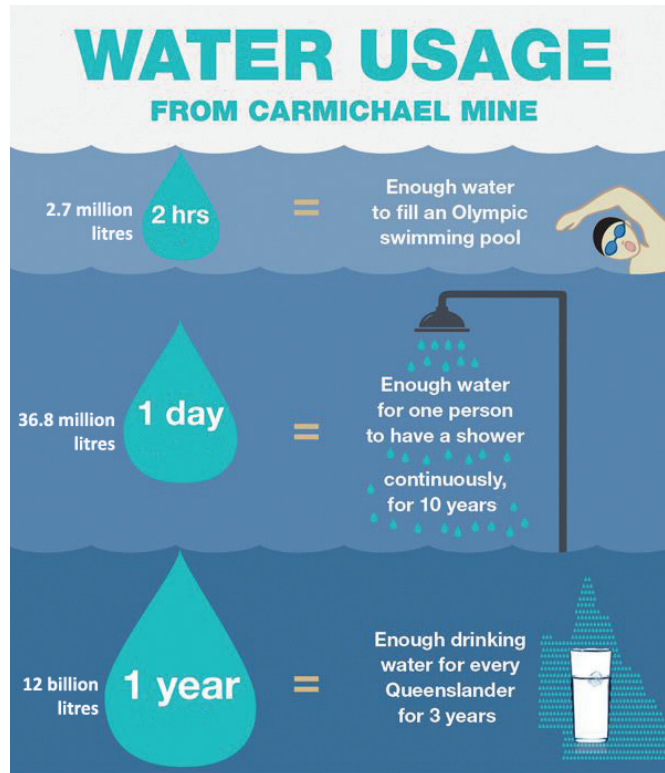
INFOGRAPHIC OF POTENTIAL IMPACT OF MINING IN THE GALILEE BASIN



© 'The Great Barrier Reef: for dummies' Article by Greenpeace. Used with permission.

RESOURCE 2B

INFOGRAPHIC OF WATER USAGE AT THE PROPOSED MINE AND POTENTIAL IMPACT TO REEF



'© 'Top 10 Reasons why Carmichael mega mine is a REALLY bad idea'
Article by Greenpeace. Used with permission.

RESOURCE 3A

CARMICHAEL MINE PROTESTOR



Source: Greenpeace

RESOURCE 3B

COAL BEING TRANSPORTED AT ABBOT POINT



© Getty Images

RESOURCE 3C

MORAY CARMICHAEL BOUNDARY ROAD, 3.6 km FROM THE PROPOSED MINE

Image removed due to copyright issues

RESOURCE 4A

THREATENED WILDLIFE – YAKKA SKINK

Image removed due to copyright issues

RESOURCE 4B

THREATENED WILDLIFE – BLACK-THROATED FINCH



© Getty Images

TEXT A

INTRODUCTION

The proposed site of the Carmichael mine is almost 400 km from Australia's Pacific coast. Despite its inaccessibility, Adani, an Indian power generating company, plans to extract the coal, transport it along a new railway and ship it to India.

Valuable coal, suitable for steelworks, is already mined in the neighbouring Bowen Basin (**Resource 1A**). Coal in the Galilee Basin was considered too remote to be extracted, partly because its quality restricts its use to power generation. Most coalmines in Australia produce 5–10 million tonnes of coal each year over a 25-year lifetime; the Carmichael mine will produce an estimated 60 million tonnes each year, over its lifetime, estimated at between 60 and 90 years. If constructed, it would become the biggest mine in Australia and one of the largest in the world.

First proposed in 2010, the project has been beset by challenges from environmentalists and others. It was eventually given approval by the Queensland government in 2014, with 190 conditions set. These largely concerned protection of underground water, which critics had argued could be polluted by the development. Later that year the Australian government gave their permission, setting a further 36 conditions, also largely concerning groundwater. Potential damage to the Great Barrier Reef and climate change were considered but did not form any of the conditions imposed on the developers. In 2015, however, as environmental law regarding conservation of two endangered species – the Yakka Skink and the Ornamental Snake – was not followed, the Australian court suspended approval for the mine. Then later that year, the Australian Environment Minister restored permission for the project to proceed, subject to what he called “the strictest conditions in Australian history”. The project continues to be highly controversial.

The mine site is 447 km², with a surface disturbance area of 278 km². There are expected to be six open cast mines, where the soil and covering rock is removed and the coal exposed for extraction. Five underground mines are also planned, where the coal is too deep for open cast mining.

The new railway line extension will allow 100 million tonnes of coal to be transported to the coast each year, encouraging other mines to develop in the Galilee Basin.

New terminals will need to be developed at Abbot Point to handle the coal, and the sea bed dredged to accommodate the large ships. The original plan of dumping the dredged waste (spoil) in the Great Barrier Reef Marine Park area has been changed and the spoil will now be dumped on land, within the port complex at Abbot Point coal terminal.

The mine has divided opinions across Australia, including the Aboriginal people who control much of the land. One Aboriginal elder says that most traditional landowners support the project. Another Aboriginal elder claims that he represents eight of the 12 indigenous families affected, and argues that they do not want the development to proceed on their ancestral lands as it would “tear the heart out of our country”.

Source: Principal Examiner

TEXT B

ARGUMENTS IN FAVOUR OF THE PROPOSAL

The proposed mine will have significant economic benefits for the State of Queensland, and Australia as a whole. Queensland produced 284 million tonnes of coal in 2013, providing work for around 29 000 people. The Carmichael mine will increase coal output by 21% and employment in coal mining by 13.5%. This mine will initiate the opening up of the Galilee Basin, one of Australia's richest coal reserves.

It is estimated that, during construction, the local region will benefit by A\$78.2 million annually, and the State of Queensland by A\$203 million. Construction will generate the equivalent of 378 full-time jobs (full-time equivalent: fte), 7.5% of which are guaranteed to go to Aboriginal people. When the mine achieves its top production of over 60 million tonnes of coal each year, the benefits to Australia will be around A\$4170 million annually. Employment will peak at just under 3000 fte, and remain at 2000 fte even after the underground mine closes (**Table 1**). The mine is expected to boost household incomes by 10.1% from 2008/09 levels and bring jobs to an isolated and economically depressed area of Queensland. In addition, India will benefit as the coal will provide an estimated 100 million Indians with cheap and reliable electricity lifting them out of "energy poverty".

Human activity inevitably has environmental consequences. However, Adani will take great care to minimise or remove any environmental damage. There are no World Heritage Areas (WHAs) or National Heritage Areas (NHAs) nearby. The Great Barrier Reef (GBR) is over 400 km downstream and controls will be put in place to manage water quality and sediments. There will be no impact on the reef from the mine.

Table 1: Forecast of quantities of coal from Carmichael Mine (millions of tonnes per year)

Year of operation	Open Cast	Underground	Total
Year 1	1	1	2
Year 20	41	20	61
Year 40	46	16	62
Year 60	63	0	63
Year 80	64	0	64
Year 90	0	0	0

The landscape will change over the 90 years in which the mine will operate and a mining landscape will replace the present low intensity cattle grazing land use. There will be an impact on ecosystems such as the Brigalow Threatened Ecological Community (TEC) and the Bygana West Nature Reserve as a result of vegetation removal (**Resource 1B**). However, large areas of TECs continue to be protected and less than 1% would be lost through this project. There will be significant impacts on some birds such as the Black-throated Finch but, as the vegetation will be cleared in stages over the 90-year life of the mine, measures can be taken to allow the birds to adapt. The environmental protection conditions imposed on this proposed mine are much more thorough than would have been the case in the past. Adani will undertake biodiversity offsetting, which aims to compensate for any environmental damage. Steps such as improving habitats elsewhere should ensure that there will be no net loss to the environment – there might even be a gain.

Protection of water supplies in the area will be prioritised, as the groundwater feeds springs which are important to the local ecosystems and to agriculture. Water taken from the ground for the mine will have minimal negative impact, with water levels of springs predicted to fall by, at most, an insignificant 0.12 m throughout the lifetime of the mine. Adani will drill five boreholes which will reduce the height of the water table by more than 1 m, but the significance of this water removal will depend on a range of local factors. Any potential impact on groundwater will be mitigated by the project design, and monitoring will continue.

Due to the remote location, there is only one nearby farmhouse 6 kms away on the other side of a ridge, out of sight of the mine. There will be a view of the mine from the relocated Moray Carmichael Boundary Road (**Resource 3C**) but this will reduce in severity with distance, and revegetation along the road will reduce the impact. The proposed development will operate 24 hours each day, and so lighting will be required for the mineworking, the accommodation village and the coal processing areas. However, the form of lighting used, with careful positioning, will reduce light spill and minimise light pollution.

Adani is very aware of its duty to protect and manage Aboriginal cultural heritage and has designed the proposed mine in order to minimise impacts of the project on Aboriginal culture. The Carmichael River area has been examined by archaeologists to investigate any impact that its development would have on Aboriginal archaeological sites. As remains of some ancient hunting camps have been identified, the mine will be built with a 500 m buffer on either side of the Carmichael River, protecting and preserving any further cultural sites that may be present along the river.

While there has been a lot of criticism from environmental groups regarding additional carbon emissions from the Indian power stations, it should be recognised that, if Australian coal is not used, India will source its coal from elsewhere. Such coal is often higher in emissions than Galilee Basin coal, so choosing not to develop this mine could make global emissions worse.

Source: Principal Examiner

TEXT C

ARGUMENTS AGAINST THE PROPOSAL

This proposal will create one of the largest mines on the planet, nearly three times larger than the city of Paris. The mine will emit more CO₂ into the atmosphere than entire countries such as Kuwait and Chile. The Paris Agreement on Climate Change was adopted by countries around the world in 2015; it aims to limit global rises in temperature to less than 2°C above temperatures in the pre-industrial era. This will prove to be very difficult unless Australia leaves its coal deposits unmined. With the highest per capita emissions in the world, Australia is already responsible for 1.5% of global carbon output. It is estimated that, if all of the coal in the Galilee Basin was burned, 705 million tonnes of carbon dioxide would be released into the atmosphere.

Some even question whether the coal will be needed. Countries such as the UK aim to cease coal-fired electricity production by 2025. India is moving quickly towards renewables to help meet its own climate change targets. It is forecast that 57% of India's electricity will come from renewables by 2027. India imported 192m tonnes of coal for power plants in 2015, but the Institute for Energy Economics and Financial Analysis (IEEFA) estimates that this will fall to zero by 2021. In any case, critics of the proposed scheme argue that solar energy could power remote Indian villages more easily and cheaply, as well as reducing emissions. This mine could prove to be an expensive failure.

In terms of employment, Adani at first claimed that 10 000 jobs would be created – this claim is still on their website. However, their own economist admitted in court that the mine will employ fewer than 1500. Adani are keen to automate as much of the work as possible and, for example, plan to use at least forty-five 400-tonne driverless trucks at the mine. Additionally, the workers on this mine will be Fly-in/Fly-out (FIFO) employees, so this additional employment may not benefit the local area or even the State of Queensland. While local politicians have had assurances that Adani will not fly in Indian labour for the mine, this is a verbal assurance which could be ignored if the project goes ahead.

Banks such as Deutsche Bank, Royal Bank of Scotland and HSBC have been reluctant to fund the project, and at least 14 financial institutions have declined to take the risk.

Farmers for Climate Action comprise more than 2000 farmers and agricultural leaders. They joined the *Stop Adani Alliance* to fight the proposal, concerned about the mine's impact on groundwater, biodiversity and climate change. They point out that the mine has been given unlimited access to groundwater. The project is expected to use 36.8 million litres of water per day from its boreholes, a total of over 1000 billion litres of water over the lifetime of the mine, in an area already prone to drought.

Opponents argue that, if the mine is permitted, it will contribute considerably to climate change and hasten the destruction of one of the world's largest coral reefs, the Great Barrier Reef (GBR), already said to be 49% dead through coral bleaching. This could upset future tourism in the area, which provides employment for almost 70 000 people and generates A\$6 billion each year. The GBR is further threatened by dredging to improve access to Abbot Point, where the coal will be taken for export.

Another major concern is that it would wipe out the most important habitat of the threatened Black-throated Finch. Adani has offered to employ biodiversity offsetting to compensate for the loss of habitat for the threatened bird. However, according to experts from James Cook University, the scale of habitat damage, including to the best remaining habitat, is such that it cannot be successfully offset. These experts conclude that the species is unlikely to survive if the mine goes ahead.

An Aboriginal elder said the proposed area for the mine is home to animals such as the spiny anteater and the emu, as well as sacred trees, all considered precious 'living symbols' by the Aboriginal people. "If we lose that connection to land, there will be nothing left. We will be annihilated. We exist as people from that land. That's all we are, we can only identify from what is there", he said.

Source: Principal Examiner

TEXT D

QUOTATIONS RELATED TO THE DEVELOPMENT

Adani spokesperson

The company “together with local businesses in the communities in which we live and work ... is committed to delivering jobs and economic benefits in Queensland”.

Source: The Guardian 13th August 2015

Vinay Rustagi, Managing Director of energy consultancy, Bridge to India

“It doesn’t make sense to be planning huge long-term investments in coal when we [India] have surplus power production and rapidly falling costs of renewable power ... it is hard to see any merit in this project from an Indian perspective.”

Source: CNN Money, 6th June 2017

Tony Abbott, Former Australian Prime Minister

The 10 000 jobs figure is evidence that “this mine is good for the country”.

Source: Sky News, not dated

Angus Emmott, local farmer

“It’s too big a danger for the future ... we need clean water. We need good soil. We need food security. And we have the potential to be a leader in renewable energy in Queensland. We don’t need to be reviving an outdated technology.”

Source: The Guardian, 29th June 2017

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