
Boom

Goes the Reef

Australia's coal export boom and the industrialisation of the Great Barrier Reef



GREENPEACE

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"The Great Barrier Reef... is the world's most extensive stretch of coral reef and is probably the richest area in terms of faunal diversity in the world. Its great diversity reflects the maturity of an ecosystem which has evolved over millions of years on the north-east continental shelf of Australia."

UNESCO⁴

Australia is on the verge of an unprecedented coal boom. The epicentre of this expansion is the yet to be developed Galilee Basin in Central Queensland. Galilee is the proposed site for a series of mega mines that will cause Australia's coal exports to more than double within a decade. The creation of mega mines in Central Queensland, the accompanying export infrastructure and increases in shipping traffic, as well as the burning of the coal they produce, place an incredible burden on Australia's Great Barrier Reef.

The industrialisation of the Great Barrier Reef is already causing alarm. Approvals for new gas processing plants on Curtis Island off Gladstone in 2011 prompted a stinging rebuke from United Nations Educational Scientific and Cultural Organisation (UNESCO) – the UN body charged with protecting World Heritage Areas. UNESCO is sending a team to Australia this March to assess the potential impact of all development projects on the World Heritage Area.

In response, on 18 February 2012, the Queensland and Australian Governments announced a new strategic assessment aimed at protecting the unique environmental values of the World Heritage Area and the Great Barrier Reef coast¹. The 18 month assessment is expected to be the most comprehensive ever carried out in Australia.

Queensland Environment Minister, Vicky Darling, welcomed the strategic assessment stating "the Great Barrier Reef is one of the world's favourite playgrounds... a \$5 billion asset for our economy and supports more than 60,000 jobs for Queensland."² The assessment brings an important opportunity to address some of the causes of the rapid decline of the Great Barrier Reef. However, if major coastal developments aren't suspended while the assessment is conducted, more large scale damage to the reef will be locked in.

Rich in unique biodiversity and the economic heartbeat for much of Queensland, the Great Barrier Reef is an irreplaceable Australian icon. UNESCO calls the Great Barrier Reef "one of the jewels in the World Heritage crown."³

Today, the Great Barrier Reef is fragile and under threat. Climate change, ocean acidification, pollution and shipping are all damaging the health of the reef ecosystem. Directly contributing to and exacerbating these threats is reckless industrialisation, driven by the unprecedented expansion of Queensland's coal and gas industries.



Artists impression of one of the proposed new coal ports at Abbot Point.

The Industrialisation of the Great Barrier Reef

Queensland is the site of a dramatic expansion in coal and gas exploitation. With the vast majority of these fossil fuels destined for export, the Great Barrier Reef World Heritage Area and surrounding coastal zones are facing significant development pressure in terms of ports and infrastructure, as well as an increase in marine traffic.

The expansion of Gladstone harbour is already controversial. UNESCO's 'extreme concern' over the management of the World Heritage Area was sparked by the approval of LNG terminals on Curtis Island⁶.

However, Gladstone is only one part of a much larger picture. Major new infrastructure is proposed along almost the entire length of the Great Barrier Reef World Heritage Area – from Gladstone to Cape York. Expansion of existing coal terminals is underway at Hay Point and Abbot Point. New coal terminals are proposed at Wiggins Island, Raglan Creek, Balaclava Island, Dudgeon Point, Abbot Point and Cape York.

Driven by the development of some of the world's largest coal mines in the Galilee Basin, the most significant increase in infrastructure will take place at Abbot Point, near the town of Bowen. With proposals for nine new terminals, Abbot Point could undergo a near eight-fold increase in capacity, from 50 million tonnes of coal per annum (mtpa) to 385 mtpa before the end of the decade (see table). This compares to current total Australian coal exports of 284 mtpa in 2010-2011⁷. Australia is currently the world's largest coal exporter⁷ and this development would make Abbot Point the largest coal export port in the world.

For all ports in the Great Barrier Reef World Heritage Area, total coal tonnage is proposed to increase more than six-fold, from a throughput of 156 million tonnes in 2011 to a capacity of 944 million tonnes by the end of the decade.

"The World Heritage Centre and IUCN recall the World Heritage Committee's clear position in relation to oil and gas exploration and exploitation, that these activities are incompatible with World Heritage status."

UNESCO World Heritage Committee⁵
27 May 2011

Coastal Impacts of Coal Port Development

Land use

Coastal habitats are a vital component of the Great Barrier Reef ecosystem. Beaches provide nesting grounds to turtles and seabirds. Mangroves are home to a diverse range of marine life, breeding grounds for fish and habitat for birds and land based animals. Seagrass meadows are the nurseries of juvenile fish, prawns, crayfish, and crabs and the primary food source of dugongs and green turtles.

Coastal development has a range of consequences for the Great Barrier Reef ecosystem. Massive swathes of wetlands and dune systems have already been lost¹⁵ and those remaining are under sustained threat from industrial development including from infrastructure associated with the fossil fuel export boom.

Water runs into the Great Barrier Reef from a total catchment of 424,000km². The low quality of this

water mainly resulting from excessive nutrient, sediment and pesticide runoff from agriculture has deleterious effects on many marine organisms. Mining can also contribute to the problem as contaminated water from mine sites containing heavy metals, acid-leachate, salts and sediments is frequently released into the Great Barrier Reef catchment.¹⁵

Development of the proposed coal terminals located in the Great Barrier Reef World Heritage Area will result in the destruction and disturbance of significant areas of Queensland coastline both on and offshore. On land, the development will result in coal terminals covering over 5,000 hectares⁹: an area equivalent to over 2,500 times the size of the Melbourne Cricket Ground (MCG)⁹. This area is only a fraction of what will be disturbed by coal train yards, other associated infrastructure and coal wharfs.



Clockwise: Dredging head in action; Coal cargo ships waiting to load; Threatened snubfin dolphin.

Case Study: Snubfin Dolphin

Queensland's coal mining boom is set to have disastrous impacts on the rare and unique marine life inhabiting the Great Barrier Reef World Heritage Area, including Australia's only endemic dolphin – the snubfin dolphin.

The snubfin dolphin was only described as a new species in 2005¹⁰. Shy and elusive, it is known to inhabit inshore coastal environments, in waters less than 15 metres deep and in small and isolated populations¹¹.

Despite being considered the rarest dolphins in Queensland¹², most of their critical habitats are earmarked for development. This will result in dredging of their feeding and breeding grounds to make way for shipping channels and cargo terminals¹².

A specific example of this threat, are the current plans by Xstrata Coal Queensland (XCQ) and the Mitchell Group to establish two new coal terminals near Port Alma^{22,23}, approximately 40 kilometres north of Gladstone. Balaclava Island and nearby waters are prime feeding and breeding habitat for the Fitzroy River-Keppel Bay population of snubfin dolphins: one of the most important subpopulations for the long-term survival of the snubfin¹³.

If these coal terminals go ahead, the future of this rare and beautiful creature is bleak.

Dredging

The development of most of the proposed new coal export terminals will require dredging to permit massive coal ships access to the loading wharfs. Dredging destroys the seabed and can resuspend contaminants into the water column¹⁵ causing widespread impacts. For example, dredging at Hay Point in 2007 impacted corals 12 kilometres away¹⁶.

In the five years since January 2007, the dredging of 52,581,000m³ from the Great Barrier Reef World Heritage Area has been approved by the Australian Government. Approval is currently being sought for another 60,603,000m³¹⁴. In total, if all the approved and proposed dredging goes ahead it equates to removing enough material from the Great Barrier Reef World Heritage Area to fill the MCG 67 times⁹.

At both Hay Point and Abbot Point there are plans to dump millions of tonnes of material in the Great Barrier Reef Marine Park. At Abbot Point there are plans to dredge 3,000,000 cubic meters of material from a previously untouched area of the port, an area known to be foraging habitat for six species of threatened turtle including the endangered Loggerhead and Olive Ridley turtles¹⁷. At Hay Point (Dudgeon Point) 13,000,000 cubic meters of material will be removed from an area through which dugongs (a species known to be sensitive to water quality) are known to pass²⁹.

The great coal superhighway

The dramatic increase in ports will result in a significant intensification of shipping traffic through the Great Barrier Reef. Every coal-laden vessel departing ports at Gladstone, Hay Point, Abbot Point and Cape York passes through the Great Barrier Reef World Heritage Area.

Based on analysis of proposed shipping data, Greenpeace estimates that coal ships departing from Gladstone will increase from 640 to 2,445 by the end of the decade, while from Hay Point, the number will reach 3,625 up from 892 in 2011. At Abbot Point, vessels will increase 21-fold, reaching a capacity of 4,079 per year by 2020, up from 190 in 2011.

In total, coal ships passing through the Great Barrier Reef World Heritage Area will increase from 1,722 in 2011 to a capacity of 10,150 by the end of the decade. This is the equivalent of more than one ship departing port every hour of every day, 365 days a year.

The negative impacts of shipping on the reef include collisions, groundings, introduction of invasive marine pests, oil and chemical spills, introduction of anti-fouling paints, waste disposal and anchor damage¹⁵. Since 1985 an average of two major shipping incidents (such as collisions or groundings) have occurred in the Great Barrier Reef each year¹⁵.

With numbers increasing, so does the likelihood of a major shipping incident.

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Coal port expansions and shipping increases in the Great Barrier Reef

	Throughput 2011 (tonnes)	FY 2011 vessels	Current Capacity (mtpa)	Proposed Capacity (mtpa)	Predicted 2020 Vessels
Gladstone					
Barney Point Coal Terminal	4 ¹⁸	64 ¹⁸	8 ¹⁹	8	129 ²⁰
RG Tanna Coal Terminal	49 ¹⁸	576 ¹⁸	70 ¹⁹	70	818 ²⁰
Wiggins Island Coal Export Terminal	-	-	-	84 ²¹	935 ²¹
Fitzroy Terminal	-	-	-	22 ²²	245 ²²
Balaclava Island	-	-	-	35 ²³	318 ²⁴
Total	53	640	78	219	2,445
Hay Point					
Hay Point Coal terminal	33 ²⁵	892 ²⁵	44 ²⁶	75 ²⁷	1,625 ²⁸
Dalrymple Bay Coal Terminal	55 ²⁵	-	85 ²⁵	85 ²⁵	-
Dudgeon Point Coal Terminals	-	-	-	180 ²⁹	2,000 ²⁹
Total	88	892	140	340	3,625
Abbot Point					
Terminal 0	-	-	-	35 ³⁰	441 ³¹
Terminal 1	15 ²⁵	190 ²⁵	50 ²⁵	50	631 ²⁰
Terminal 2	-	-	-	60 ³²	574 ³²
Terminal 3	-	-	-	60 ³³	508 ³³
Terminals 4-9 &MCF	-	-	-	180 ³⁴	1,925 ³⁵
Total	15	190	50	385	4,079
Cape York					
Wongai	-	-	-	1.5 ³⁶	10 ³⁷
Total	-	-	-	1.5	10
GBR Coal Ports Total	156	1,722	257	944	10,150

Boom goes the

How Australia's coal export boom is driving reckless industrialisation of the Great Barrier Reef World Heritage Area.

Wongai Project
The wild expanses of Cape York are under threat with developers keen to begin coal mining in this pristine area.



Capacity for coal exports by 2020:

944 million tonnes

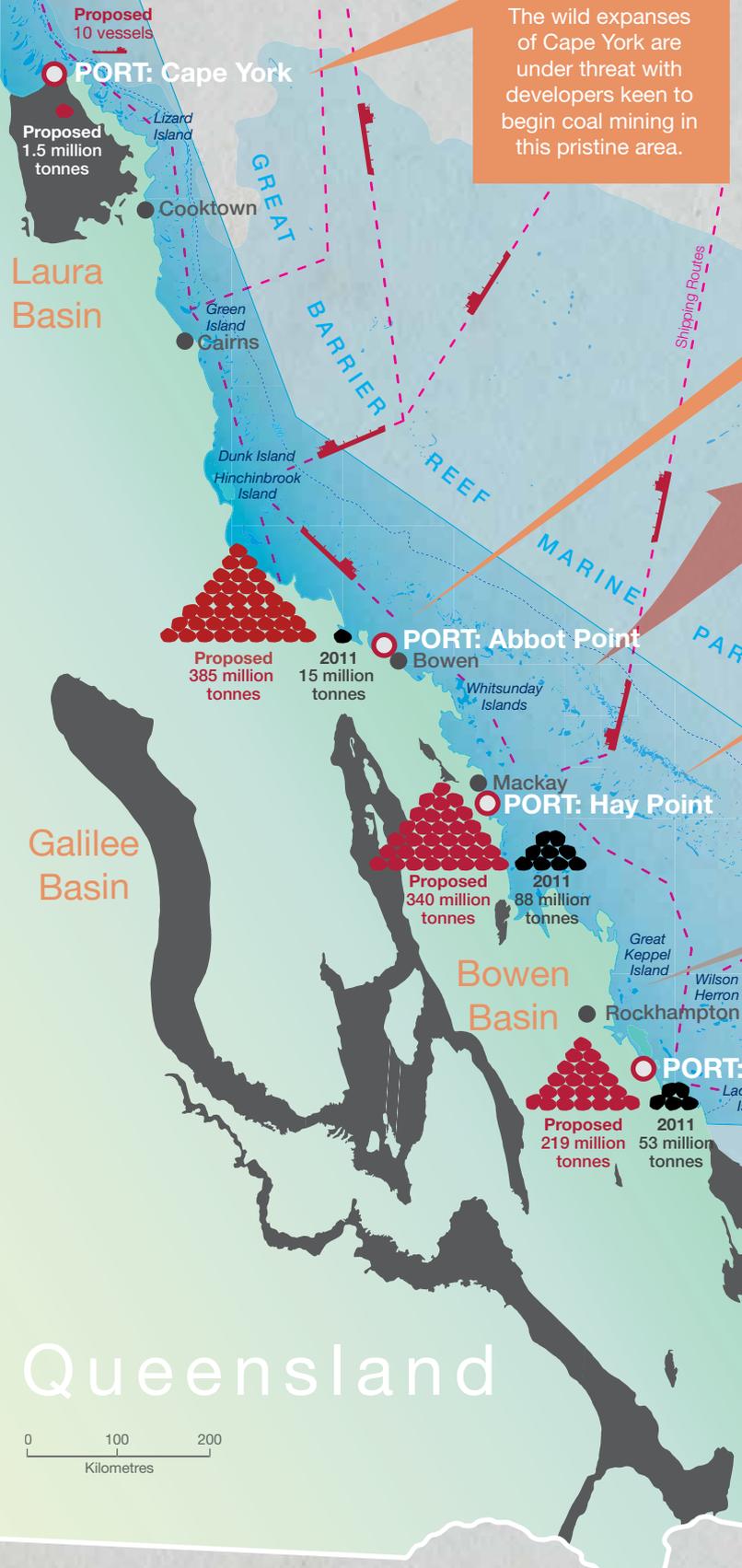
That's enough to fill a coal train and wrap it 4½ times around the world.

Coal throughput in 2011:

156 million tonnes

Galilee Basin

Australia is on the verge of an unprecedented coal boom. The epicentre of this expansion is the yet to be developed Galilee Basin in Central Queensland. Owned by a handful of mining magnates such as Clive Palmer and foreign conglomerates such as GVK and Adani, Galilee is the proposed site for a series of mega mines that will cause Australia's coal exports to more than double within a decade. The creation of mega mines in Central Queensland, the accompanying export infrastructure and increases in shipping traffic, as well as the burning of the coal they produce, place an incredible burden on Australia's Great Barrier Reef.



e reef



Number of coal ships in 2011:

1,722



Number of coal ships by 2020:

10,150

(more than one per hour all year)

CORAL SEA

Abbot Point

Abbot Point is set to eclipse all other ports to become the world's largest coal export terminal. The result? Over 20 ships per day passing the Whitsunday Islands.

Over 20 ships per day passing the Whitsunday Islands.

Hay Point

Hay Point is already one of the world's biggest coal export ports. Planned expansions will more than double capacity from the area.

SOUTH PACIFIC OCEAN

Shen Neng 1

Grounded for nine days, in 2010 the Shen Neng 1 destroyed around 290,000 m² of reef. Since 1985, an average of two major shipping incidents have occurred every year.

Gladstone

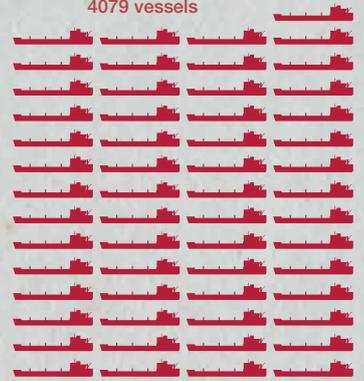
As well as LNG terminals three new coal ports are planned for the Gladstone area, almost tripling capacity and destroying dolphin and dugong habitat in the process.

Proposed and approved dredged material removed from the Great Barrier Reef would fill

67 MCGs or 113,184,000 m³ (Melbourne Cricket Ground)



Proposed
4079 vessels



2011
190 vessels



Abbot Point

2011
892 vessels



Proposed
3625 vessels

Hay Point

2011
640 vessels



Proposed
2445 vessels

Gladstone

KEY

50 vessels =

1 million tonnes of coal =

©Greenpeace



©Maritime Safety Queensland

Shen Neng 1 grounded on the Barrier Reef.

Case Study: Shen Neng 1 Incident

At 10.54am on 3 April 2010 the Shen Neng 1 departed Gladstone Port loaded with over 978 tonnes of bunker fuel oil and a cargo of 68,052 tonnes of coal³⁸.

Just after 5pm that afternoon the ship ran aground on the Douglas Shoal, a large isolated reef close to the mouth of the Capricorn Channel; one of the channels vessels can use to pass through the Great Barrier Reef. The ship's hull was seriously damaged by the grounding. The engine room, plus six water ballast and fuel oil tanks were breached.

During the nine days the vessel was grounded the sea pushed the vessel across the reef destroying or damaging much of the 290,000m² it passed over³⁹. An initial investigation of Douglas Shoal by the Great Barrier Reef Marine Park Authority (GBRMPA) found "spatially extensive and severe damage to the reef community on Douglas Shoal". The damage included near complete destruction of the ecological community in areas of the

reef. Antifoulant paint was also found smeared among the rubble and damaged reef. This product is known to be toxic to corals and is designed to prevent the growth of marine organisms potentially further inhibiting the reef's recovery⁴⁰.

Fortunately only about 2½ tonnes of fuel oil were released into the sea³⁸. In the early stages of the incident a 2-3 metre swell prevented responders deploying booms to contain the oil⁴¹. If a more significant release of oil had occurred in these conditions, it would have been impossible to contain, causing enormous damage to the reef system.

The collision had been caused by the failure of the ship's crew to change course into the shipping channel. The investigation found the chief mate's "monitoring of the ship's position was ineffective and his actions were affected by fatigue"³⁸. The incident highlights that shipping through the barrier reef is always a risk as human error can never be eliminated.

The Threat of Climate Change

The GBRMPA has identified climate change, pollution from catchment runoff, destruction of coastal habitats by coastal development (including industrial) and impacts from fishing and poaching as the priority issues reducing the resilience of the Great Barrier Reef¹⁵.

Ultimately, climate change and ocean acidification pose the greatest threat to the reef. Coral is extremely sensitive to even short periods of increased sea temperatures, resulting in coral bleaching (death). Over the past two decades a number of major bleaching events have occurred, in two cases (1997/8 and 2002/3) approximately 50% of the reef was affected⁴³. Analyses of coral cores dating back to the 1700s indicate that seas are warmer now than at any other time¹⁵ and the trend is set to continue. A rise in sea temperature of 1°C is predicted by 2050 and a rise of 2-3°C is predicted by the end of the century under some climate models where greenhouse gas emissions are not tightly controlled⁴⁴. Such a rise in temperature could be fatal for the reef resulting in the annual bleaching of over 97% of the reef⁴³ and the functional extinction of hard corals¹⁵. Ocean acidification is a result of oceans absorbing the increasing amounts of carbon dioxide that humans are releasing into the atmosphere. Whilst this is a simple chemical process its biological consequences are difficult to predict and are poorly understood. Even small changes in ocean acidity reduce the ability of corals to produce skeletons and GBRMPA predicts that this may be the most significant climate factor affecting the Great Barrier Reef ecosystem¹⁵.

Burning coal for energy is the single biggest fossil fuel contributor to climate change⁴⁵. The planned exponential increase in the volume of coal mined, exported and eventually burnt places the Great Barrier Reef in even greater danger.

“Reefs are the ocean’s canaries and we must hear their call. This call is not just for themselves, for the other great ecosystems of the ocean stand behind reefs like a row of dominoes. If coral reefs fail, the rest will follow in rapid succession.”

J.E.N. Veron, former chief scientist of the Australian Institute of Marine Science⁴²



A researcher records the effects of coral bleaching on Fitzroy Reef.



© Courtesy of Tourism Queensland/Gary Bell

The future?

“The outlook for the Great Barrier Reef ecosystem is at a crossroad, and it is decisions made in the next few years that are likely to determine its long-term future.”

Australian Great Barrier Reef Marine Park Authority, 2009¹⁵

Above: Off Whitsunday Island, Great Barrier Reef.

The permanent destruction of the Great Barrier Reef would be both an environmental and economic disaster. But it is the reality we face today.

Significant industrialisation has already taken place in and around the Great Barrier Reef World Heritage Area. This will be dwarfed if the proposed coal and gas expansions are approved.

The state and federal governments’ 18 month strategic assessment of the reef is an important opportunity to look in-depth at the cumulative threats to its survival. It is essential this assessment lays down a detailed immediate action plan for long-term protection of the reef.

It is also critical that the state and federal governments ensure major new infrastructure developments are not approved during the assessment period. Otherwise by the time the assessment is completed, massive damage to the reef will already be locked in.

The findings of the UNESCO monitoring mission will be discussed at the World Heritage Convention in St Petersburg in the Russian Federation in June and July this year.

There is a possibility that UNESCO will declare the Great Barrier Reef ‘in danger’ as a result of the government failing to address the cumulative industrial impacts facing the reef, classing it alongside sites in war-torn Afghanistan, Yemen and the Democratic Republic of Congo. Such a classification would be a major embarrassment for Australia. Whatever the Great Barrier Reef’s classification, Australia’s current actions are threatening one of the world’s most important ecological areas.

Sacrificing the Great Barrier Reef for industrial excess cannot be an option. Today, we still have the opportunity to protect it, but that window is closing fast.

References

- 1 <http://www.gbrmpa.gov.au/outlook-for-the-reef/strategic-assessment>
- 2 <http://www.cabinet.qld.gov.au/MMS/StatementDisplaySingle.aspx?id=78896>
- 3 Bokova, I. (2010) Damage to Great Barrier Reef assessed; stricter shipping surveillance proposed. UNESCO news article. 26th April 2010 <http://whc.unesco.org/en/news/606>
- 4 <http://whc.unesco.org/en/list/154>
- 5 UNESCO (2011) World Heritage Committee 35th session. State of conservation of the properties inscribed on the World Heritage List. Document ID: WHC-11/35.COM/7B.Add
- 6 UNESCO (2011) Decisions Adopted by the World Heritage Committee at its 35th Session (UNESCO, 2011) Document ID: WHC.11 /35.COM /20
- 7 BREE (2011) Resources and Energy Statistics 2011. BREE. Canberra
- 8 Greenpeace calculation based on EIS, IAS, and land parcel information.
- 9 Melbourne Cricket Ground (2011) Facts and Figures webpage: <http://www.mcg.org.au/The%20MCG%20Stadium/Facts%20and%20Figures.aspx> Accessed 21st February 2011
- 10 Beasley I., K.M. Robertson and P. Arnold (2005). Description of a new dolphin: The Australian snubfin dolphin *Orcaella heinsohni* sp.n. (Cetacea, Delphinidae). *Marine Mammal Science*. 21(3):365-400
- 11 Parra, G.J. 2006c. Resource partitioning in sympatric delphinids: Space use and habitat preferences of Australian snubfin and Indo-Pacific humpback dolphins. *Journal of Animal Ecology*. 75:862-874
- 12 A case for legal protection: The Australian Snubfin Dolphin. A WWF Report. Got to http://www.wwf.org.au/news_resources/resource_library/?2760/a-case-for-legal-protection-the-australian-snubfin-dolphin
- 13 A case for legal protection: The Australian Snubfin Dolphin. A WWF Report. Got to http://www.wwf.org.au/news_resources/resource_library/?2760/a-case-for-legal-protection-the-australian-snubfin-dolphin
- 14 Australian Government (2011) Senate Standing Committee on Environment and Communications Legislation Committee. Answers to questions on notice. Sustainability, Environment, Water, Population and Communities portfolio Supplementary Budget Estimates, October 2011 Question No: 42
- 15 Great Barrier Reef Marine Park Authority (2009) Great Barrier Reef outlook report 2009. Great Barrier Reef Marine Park Authority. ISBN 978 1 876945 89 3 (pbk.)
- 16 Trimarchi, S. & Keane, J. (2007) Port of Hay Point apron areas and departure path capital dredging project: environmental review. EcoPorts Monograph Series 24, Ports Corporation of Queensland Limited, Brisbane, Australia.
- 17 North Queensland Bulk Ports (2011) EPBC Act Referral: Abbot Point Terminal 0, Terminal 2 and Terminal 3 Capital Dredging EPBC Referral Number: 2011/6213
- 18 GPC (2011) Gladstone Ports Corporation Annual Report 2010/11
- 19 GPC (2011) Port of Gladstone Information Handbook 2011 Docs #513911
- 20 Calculated maximum: number of vessels required to achieve terminal maximum throughput tonnage based on 2011 vessel average capacity
- 21 Connell Hatch (2006) Wiggins Island Coal Terminal Environmental Impact Statement. CQPA and QR
- 22 QC Consulting Group (2011) Fitzroy Terminal Project Initial Advice Statement
- 23 GHD (2009) Balaclava Island Coal Export Terminal Initial Advice Statement. Xstrata Coal Queensland Document ID: 41/20584/19/379002
- 24 Balaclava Island Coal Export Terminal Initial Advice Statement does not contain a prediction of ship numbers. Stated maximum capacity of vessels visiting terminal is 110,000 tonnes. Therefore number of 110,000 capacity vessels to export 35 mtpa represents the minimum number of vessels required for terminal to operate at capacity.
- 25 North Queensland Bulk Ports Corporation Limited (2011) Annual Report 2010 -2011
- 26 BHP Billiton (2012) News Release: BHP Billiton Exploration and Development Report for the Quarter ended 31 December 2011
- 27 BHP Billiton (2008) EPBC Act Referral: Hay Point Coal Terminal Expansion Project EPBC Referral Number: 2009/4759
- 28 Calculated maximum: number of vessels required to achieve terminal future maximum throughput tonnage based on 2011 vessel capacity
- 29 North Queensland Bulk Ports (2011) Dudgeon Point Coal Terminals Project: Initial Advice Statement
- 30 Adani Abbot Point Terminal Pty (2010) EPBC Act Referral: Abbot Point Coal Terminal 0 EPBC Referral Number: 2011/6194
- 31 Calculated maximum: number of vessels required to achieve terminal future maximum throughput tonnage based on Abbot Point Terminal 1 2011 vessel capacity
- 32 BHP Billiton (2011) EPBC Act Referral: Development of the Abbot Point Coal Terminal 2 Port of Abbot Point, Queensland EPBC Referral Number: 2011/6185
- 33 Hancock Coal Infrastructure Pty Ltd (2011) Abbot Point Coal Terminal 3 Referral Reference 2008/4468 Section 156A Request to vary a proposal to take an action. Letter dated 15 July 2011. Appendix A
- 34 Calculated based on 6 terminals (Terminals 4-9) each having a nominal capacity of 30 mtpa
- 35 North Queensland Bulk Ports (2009) Abbot Point Multi Cargo Facility (MCF) Environmental Impact Assessment Part 3- Description of action Document Number 41/20549/397965 R2 EPBC Referral number: 2009/4837 The 7 cape size berths of this facility provide a total capacity of 182 mtpa, equivalent to the capacity of proposed terminals 4-9. The vessel number associated with this capacity is used.
- 36 CQG Consulting (2011) Wongai Project Initial Advice Statement. Aust-Pac Capital Pty Ltd
- 37 The Wongai Project Initial Advice Statement states that the project will be visited by one coal ship per month and will operate for 10 months of the year.
- 38 Australian Transport Safety Bureau (2010) Independent investigation into the grounding of the Chinese registered bulk carrier Shen Neng 1 on Douglas Shoal, Queensland 3 April 2010. ATSB Transport Safety Report Marine Occurrence Investigation No. 274. MO-2010-003.
- 39 Great Barrier Reef Marine Park Authority (2010) Marine Shipping Incident Great Barrier Reef Marine Park - Douglas Shoal. Information Sheet 4
- 40 Marshall, P. (2010) Preliminary Assessment Report: Grounding of the Shen Neng 1 on Douglas Shoal. Great Barrier Reef Marine Park Authority ISBN 978 1 921682 28 5 (pdf)
- 41 Miller, G. (2010) Shen Neng 1 Incident Response: Independent review of the response to the Shen Neng 1 grounding and associated pollution response. Sling Shot Consulting
- 42 Veron, C.E.N. (2010) Is the End in Sight for The World's Coral Reefs? *Environment* 360. Yale http://e360.yale.edu/feature/is_the_end_in_sight_for_the_worlds_coral_reefs/_2347/
- 43 11 Berkelmans, R., De'ath, G., Kininmonth, S. & Skirving, W.J. (2004) A comparison of the 1998 and 2002 coral bleaching events on the Great Barrier Reef: spatial correlation, patterns and predictions. *Coral Reefs*, 23: (1) 74-83.
- 44 Lough, J. (2007). Climate and climate change on the Great Barrier Reef. In: Climate change and the Great Barrier Reef: a vulnerability assessment, eds J.E. Johnson & P.A. Marshall, Great Barrier Reef Marine Park Authority and Australian Greenhouse Office, Townsville, Australia, 15-50.
- 45 IEA (2011) Key World Energy Statistics 2011. IEA

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