



Great Barrier Bleached

*Coral bleaching, the Great Barrier Reef
and potential impacts on tourism*



Tom Swann
Rod Campbell

June 2016
Discussion Paper

The **Australia**Institute

Research that matters.



Dying staghorn coral, central Great Barrier Reef in May 2016. Credit: Johanna Leonhardt

Great Barrier Bleached

Coral bleaching, the Great Barrier Reef and potential impacts on tourism

Polling shows that if severe coral bleaching continues, Great Barrier Reef tourism areas are at risk of losing over 1 million visitors per year and 10,000 tourism jobs. 175,000 potential visitors may not come to Australia at all, risking \$1 billion of expenditure per year.

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Summary

In early 2016 the Great Barrier Reef experienced the most severe coral bleaching event on record. 22 percent of coral died, mostly in northern sections and even more was bleached. Many reefs north of Cairns lost half or more of their coral cover. Key tourism areas were also impacted, with a third of reefs around Cairns, Townsville and the Whitsundays experiencing severe bleaching. Luckily, mortality south of Cairns was less than five percent and bleached reefs can recover if stresses abate.

Tourism areas are unlikely to be so lucky in the future. While coral bleaching has been observed historically, experts say this severe bleaching event was ‘almost impossible’ without climate change. Bleaching events will increasingly affect these areas, killing more coral and hindering recovery, in unless the Reef’s health can be boosted and climate impacts minimised.

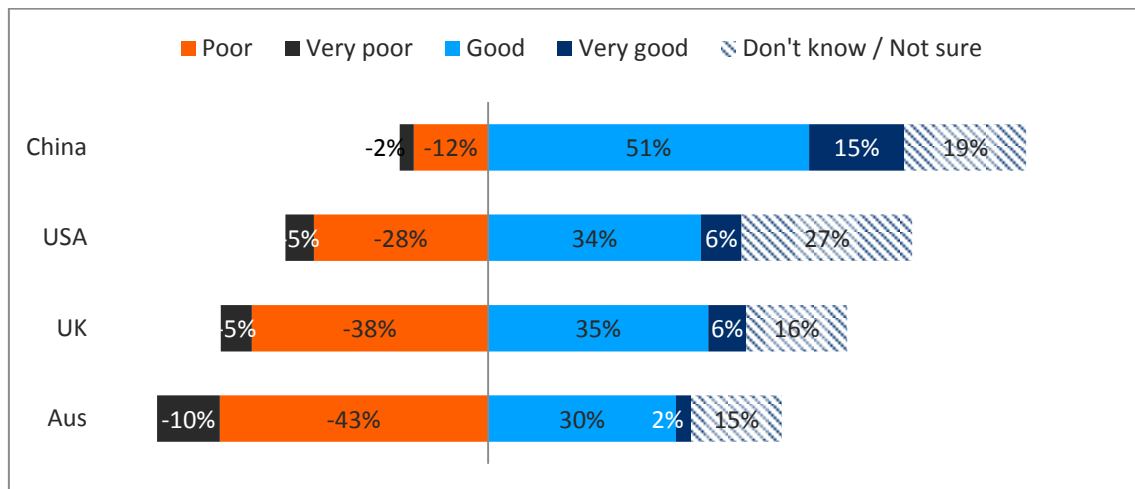
Tourism is big business in Queensland, particularly in reef areas. In 2015, tourism areas along the Great Barrier Reef attracted 2.4 million Australian tourists and 1.1 million international holidaymakers. Two in five international tourists came from the US, UK or China. In 2015, holidaying tourists spent at least \$3.3 billion in the Great Barrier Reef tourism areas, supporting the employment of at least 39,000 people.

Coral bleaching has major implications for Australia’s tourism industry. According to international surveys conducted for this report, the Reef is considered one of the top Australian attractions by 73 percent of potential visitors in China, the UK and USA.

The bleaching was widely covered in the media, both in Australia and internationally. There have been 2,887 articles globally about coral bleaching and the Great Barrier Reef in 2016, compared to just 90 for the same period in 2015. In the international surveys, almost two thirds (63 percent) of people said they had heard about coral bleaching at least “some” or “a little”. When asked about the main cause of coral bleaching, two in five nominated global warming, including nearly half of Chinese respondents.

Despite this, international perceptions of the state of the Reef remain more positive than the opinion of Australians. Most Australians said the reef is in a poor condition:

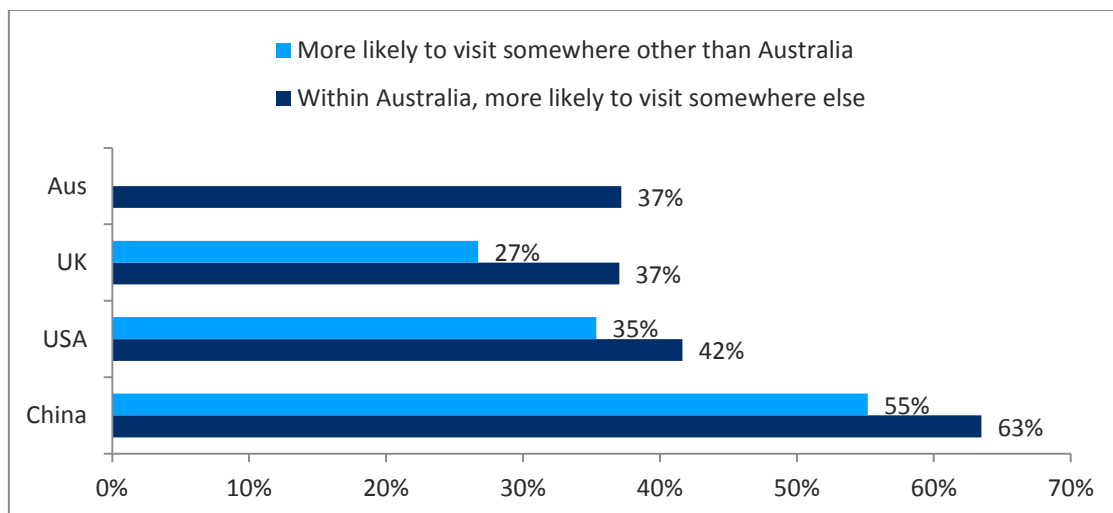
How would you describe the current condition of the Great Barrier Reef?



Source: The Australia Institute Surveys, May 2016

If coral bleaching persists into the future, large numbers of potential visitors to the Reef say they are more likely to go to another country altogether or at least to other parts of Australia. 55 percent of Chinese respondents said they would be more likely to travel to another country. More than one third of Americans and more than a quarter of UK respondents would be less likely to visit Australia if bleaching continues:

If the Great Barrier Reef continues to experience severe bleaching and some of the reef dies completely, would you be more likely to choose an alternative holiday destination?



Sources: TAI Surveys, May 2016

Based on the number of reef visitors from these countries, basic estimates of how many tourists are more likely to visit somewhere else in Australia, or another country altogether can be made:

Visitors at risk of not visiting Reef areas

Country	Estimated holiday visitors to reef areas 2015	More likely to travel to another place in Australia if severe bleaching continues	At risk number of visitors to reef	At risk spending in reef areas (\$millions)
Australia	2,400,000	37%	888,000	\$698
China	203,631	63%	129,254	\$145
UK	106,563	37%	39,460	\$44
USA	94,806	42%	39,487	\$44
Total	2,804,999		1,096,201	\$931

Source: Tourism and Events Queensland data, The Australia Institute surveys and calculations

The Reef tourism areas are at risk of losing over one million visitors per year. Along with visitor numbers, the potential loss of tourism revenue represents almost one third of the \$3.3 billion spent by holiday visitors to Reef regions each year, which supports between 39,000 and 45,000 jobs. Around 10,000 jobs are at risk from decreased visitation and spending if severe coral bleaching of the Reef continues.

Many international respondents are less likely to come to Australia if the Reef continues to experience severe bleaching. Over 174,000 visitors from China, USA and the UK are at risk of not coming to Australia at all, visitors who would spend over \$1 billion between them. This is the equivalent of 436 Boeing 747 jet loads of holiday makers not coming to Australia each year.

Visitors at risk of not coming to Australia

Country	Estimated holiday visitors to reef areas 2015	More likely to travel to another country if severe bleaching continues	At risk number of visitors	At risk spending (\$millions)
China	203,631	55%	112,369	\$808
UK	106,563	27%	28,487	\$163
USA	94,806	35%	33,527	\$215
Total	404,999		174,382	\$1,186

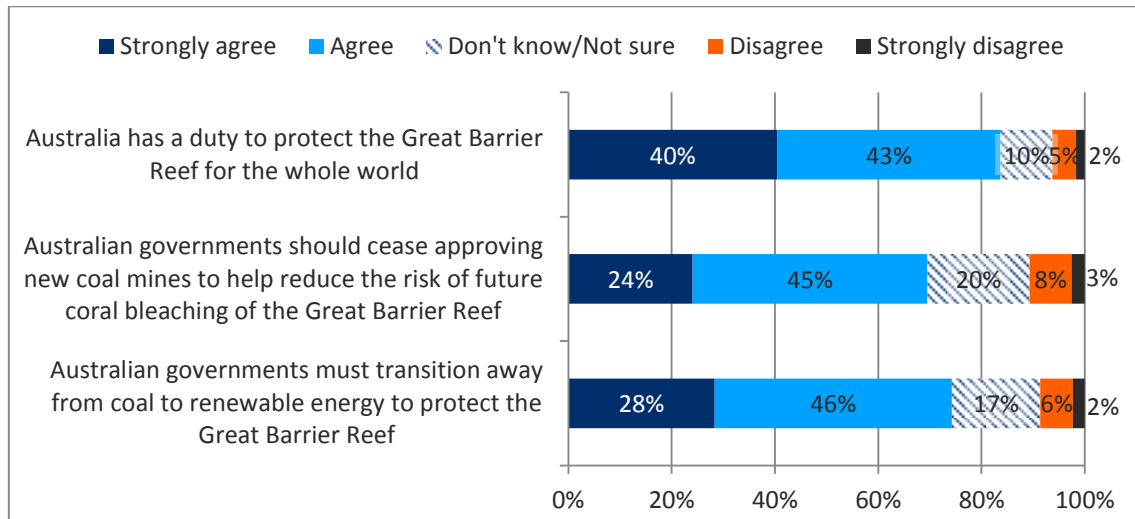
Source: Tourism and Events Queensland data, The Australia Institute surveys and calculations

Furthermore, among people who regularly travel internationally, the results are even more striking. 60 percent of Chinese people who travel overseas once per year or more say they are more likely to go to another country. 59 percent of the most regular American travellers are also less likely to come to Australia if bleaching continues.

International respondents overwhelmingly support policy action on Reef protection and on climate change. More than 80 percent of international respondents feel that

Australia has a duty to protect the Reef. Around 70 percent say that Australia should stop approving new coal mines and move towards renewable energy:

***Attitudes towards Australian policy on the Reef, coal and climate change
(International surveys)***



Source: The Australia Institute Surveys, May 2016

A leading contributor to climate change is coal, large volumes of which are mined near and shipped through Reef. Queensland is one of the world's largest coal exporters. If it were a country it would be the world's second biggest exporter of coal.

The interests of two of Queensland's industries are opposed. The coal industry opposes serious action on climate change, including measures such as a moratorium on new coal mines, carbon pricing or expanding renewable energy. The tourism industry needs these, and other policies, to protect its most valuable asset.

Fortunately, serious action to assist the reef and the tourism industry will not have major impacts on the rest of the Queensland economy. Queensland has a diverse, modern economy based on services, including tourism. Coal mining is a small and declining employer in Queensland, now accounting for less than 1 percent of employment - less than the Arts and Recreation sector. At least twice as many people work in tourism services in Reef regions alone.

In the Australian survey, most Australians agreed that the Reef is more important to Queensland's economy, and has better prospects for jobs growth, than coal.

Introduction

The Great Barrier Reef is one of the world's natural wonders, a diverse and vast ecosystem home to thousands of unique species. Sir David Attenborough explained the Reef's impact on him as a young man:

People say, what was the most magical moment in your career as a naturalist? And I always reply: 'The first time I put on a mask and went below the surface [on the Great Barrier Reef] ... An extraordinary experience, like going into space – such splendour: all of these things moving through an architecture of coral. There's no equivalent anywhere else in the natural world.'¹

In recognition of its natural significance, the Great Barrier Reef is protected under the World Heritage Convention. Australia is required to protect the Reef for all of humankind.

The Reef is a major attraction for domestic and international tourists, many of whom go on to visit Australia's other attractions. In Queensland reef tourism is a major source of economic activity and jobs for regional areas.

In early 2016 the Great Barrier Reef experienced a severe *coral bleaching* event. The ARC Centre for Excellence on Coral Reef Studies explains:

Mass coral bleaching occurs when heightened sea temperatures due to global warming cause corals to expel tiny photosynthetic algae, called 'zooxanthellae'. The loss of these colourful algae causes corals to turn translucent and white, and 'bleach'. Mildly bleached corals can recover if the temperature drops and zooxanthellae are able to recolonise them, otherwise the coral may die.²

Major coral bleaching events have been recorded over many decades and in many parts of the world. In 1998, 50 percent of the coral reefs within the Great Barrier Reef Marine Park were affected by coral bleaching and 60 percent were affected by

¹ Quoted in Hull (2016) *Bleached coral on the Great Barrier Reef should spark greater action on climate change*, <http://www.smh.com.au/comment/bleached-coral-on-the-great-barrier-reef-should-spark-greater-action-on-climate-change-20160421-gobp2w.html#ixzz4AZt6C9mw>

² ARC Centre of Excellence for Coral Reef Studies (2016) *Only 7% of the Great Barrier Reef has avoided coral bleaching*, <http://www.coralcoe.org.au/media-releases/only-7-of-the-great-barrier-reef-has-avoided-coral-bleaching>

bleaching in 2002, with 5-10 percent of corals affected dying.³ Bleaching of the Reef has coincided with bleaching elsewhere - in 1998, 16 percent of the world's coral died.⁴

However, this year's bleaching on the Great Barrier Reef was unprecedented. The National Coral Bleaching Taskforce conducted an aerial survey to determine the bleaching's extent and severity. Taskforce Convenor Professor Terry Hughes, outlined the results:

We have now flown over 911 individual reefs in a helicopter and light plane, to map the extent and severity of bleaching along the length of the Great Barrier Reef. Of all the reefs we surveyed, only 7% (68 reefs) have escaped bleaching entirely. At the other end of the spectrum, between 60 and 100% of corals are severely bleached on 316 reefs, nearly all in the northern half of the Reef.⁵

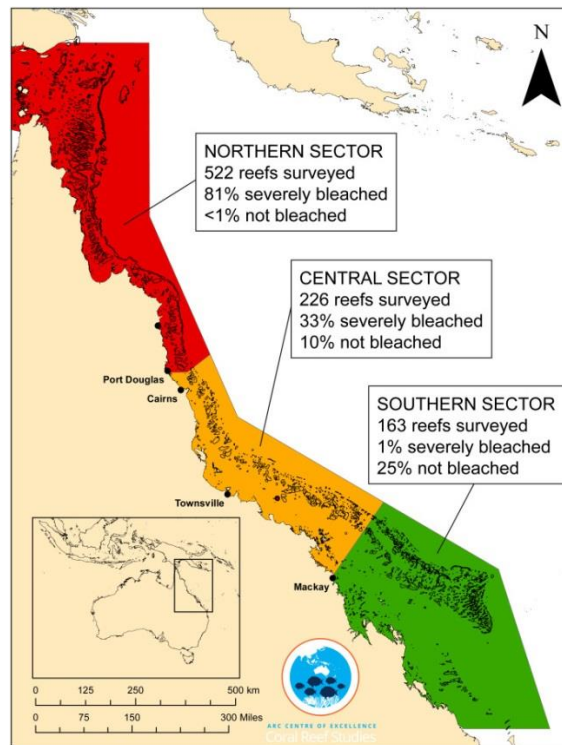
Results from the Taskforce survey are summarised in Figure 1 below:

³ Pink (2010) *Australia's Environment Issues and Trends: Special issue: Climate Change*, [http://www.ausstats.abs.gov.au/Ausstats/subscriber.nsf/0/41D729B432E03FA0CA2576B800164E89/\\$File/46130_2010.pdf](http://www.ausstats.abs.gov.au/Ausstats/subscriber.nsf/0/41D729B432E03FA0CA2576B800164E89/$File/46130_2010.pdf)

⁴ WWF (2004) *The implications of climate change for Australia's Great Barrier Reef*, http://awsassets.wwf.org.au/downloads/mo020_implications_of_climate_change_for_gbr_21feb04.pdf

⁵ ARC Centre of Excellence for Coral Reef Studies (2016) *Only 7% of the Great Barrier Reef has avoided coral bleaching*, <http://www.coralcoe.org.au/media-releases/only-7-of-the-great-barrier-reef-has-avoided-coral-bleaching>

Figure 1 - Great Barrier Reef results of aerial survey, covering more than 9,000 km



Source: ARC Centre of Excellence for Coral Reef Studies / James Kerry

Corals that have bleached may recover if environmental pressures abate. Sustained stresses hinder recovery and can overwhelm it. Recovery after coral loss can take a decade or longer.⁶ In the recent bleaching, some areas significant proportions of corals have lost coral cover altogether.

More recent data from the Taskforce shows most reefs surveyed around Cooktown have lost 25 percent of their coral cover or more and some lost 50 percent or more.⁷ Reefs south of Cairns lost less than 5 percent. The Great Barrier Reef Marine Park Authority (GBRMPA) said that 22 percent of corals have died across the reef, including 50 percent of corals in the northern most section.⁸ The northern reefs had been known for their relatively pristine state.

⁶ ARC Centre of Excellence for Coral Reef Studies (2016) *Coral death toll climbs on Great Barrier Reef*, 30 May, <http://www.coralcoe.org.au/media-releases/only-7-of-the-great-barrier-reef-has-avoided-coral-bleaching>

⁷ Ibid

⁸ GBRMPA (2016) *The facts on Great Barrier Reef coral mortality*, Press Release, 3 June <http://www.gbrmpa.gov.au/media-room/latest-news/coral-bleaching/coral-bleaching/the-facts-on-great-barrier-reef-coral-mortality>

While the Great Barrier Reef faces many environmental challenges, including water pollution and the spread of crown of thorns starfish,⁹ recent bleaching has been linked to climate change. A team at Melbourne University found the recent bleaching was ‘almost impossible’ without climate change.¹⁰ Lead author Andrew King said:

Whereas in the current climate it’s unusual but not exceptional. By the mid-2030s it will be average. And beyond that it will be cooler than normal if it was as warm as this year.¹¹

Charlie Veron, celebrated Australian scientist who catalogues a quarter of the world’s corals, remarked on the fact that the bottom parts of the reef were less impacted:

the El Niño backed off ... I’ve got no memory of this ever happening before, but thank heavens it did ... Otherwise it would have been bleaching from end to end. Next time? I don’t know. It’s all Russian roulette.¹²

Addressing climate change will be essential to prevent further declines in coral cover.¹³ Stresses from warmer waters, which kill corals and hinder recovery, will get worse as ocean warming events become more frequent, severe and abrupt.¹⁴ Ocean acidification caused by increased atmospheric carbon dioxide is a further threat to coral development.¹⁵

Ironically, large amounts of coal, a key contributor to climate change, is shipped through the Reef’s waters. Queensland is one of the world’s largest coal exporters. If Queensland were a country, it would be the world’s second biggest exporter of coal.

⁹ De’Ath et al (2012) *The 27-year decline of coral cover on the Great Barrier Reef and its causes* <http://www.pnas.org/content/109/44/17995.abstract>

¹⁰ King et al (2016) *Great Barrier Reef bleaching would be almost impossible without climate change*, <https://theconversation.com/great-barrier-reef-bleaching-would-be-almost-impossible-without-climate-change-58408>

¹¹ Quoted in Slezak, M, (2016) *Great Barrier Reef bleaching made 175 times likelier by human-caused climate change, say scientists* The Guardian, 29 April, <http://www.theguardian.com/environment/2016/apr/29/great-barrier-reef-bleaching-made-175-times-likelier-by-human-caused-climate-change-say-scientists>

¹² Quoted in Chandler, J (2016) *Grave Barrier Reef*, The Monthly, June, <https://www.themonthly.com.au/issue/2016/june/1464703200/jo-chandler/grave-barrier-reef>

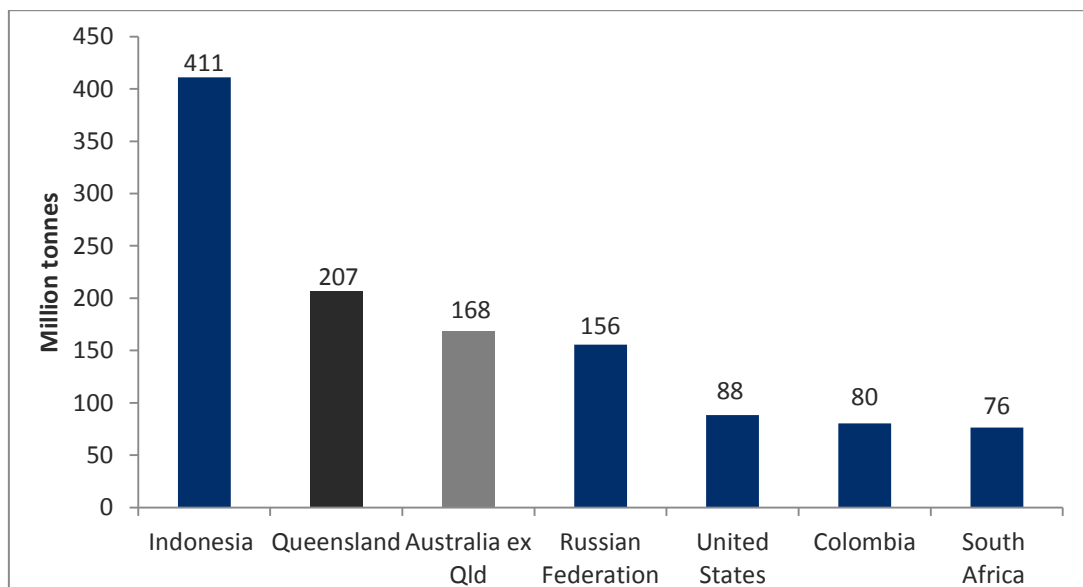
¹³ De’Ath et al (2012) *The 27-year decline of coral cover on the Great Barrier Reef and its causes* <http://www.pnas.org/content/109/44/17995.abstract>

¹⁴ ARC Centre of Excellence for Coral Reef Studies (2016) *Great Barrier Reef risks losing tolerance to bleaching events*, <https://www.coralcoe.org.au/media-releases/great-barrier-reef-risks-losing-tolerance-to-bleaching-events>

¹⁵ Ocean Portal Team (No Date) *Ocean Acidification*, <http://ocean.si.edu/ocean-acidification>

Queensland's coal exports were more than half of all of Australia's exports in 2014, and around half of Indonesia's, as shown in Figure 2 below:

Figure 2 – 2014 coal exports from Queensland and major exporting countries



Source: IEA (2015) *Coal Information 2015*; Queensland Government (2014) *2014 calendar year—Coal statistics*

Figure 2 refers only to exports rather than production. If Queensland was a country, it would be the eight largest producer of coal in the world.¹⁶ As a major coal exporter and a major tourist destination, the product of one Queensland industry poses a risk to another.

Most of the Great Barrier Reef's main tourism areas were spared the worst of the 2016 bleaching event. As shown in Figure 1 above, areas around Cairns, Townsville and the Whitsundays are south of the most severely impacted areas. Future bleaching is almost certain to affect these areas, with potentially major impacts on the tourism industry.

¹⁶ IEA (2015) *Coal Information 2015*; Queensland Government (2014) *2014 calendar year—Coal statistics*

Tourism and the Great Barrier Reef

Tourism is a major source of economic activity and employment in Australia, and the Reef is a major tourist attraction. This section provides a conservative estimate of the contribution of tourism to the Reef areas in Queensland.¹⁷

VISITOR NUMBERS

Most tourists in Australia are Australians. In 2015 there were 34 million domestic holiday visitors recorded in Australia – clearly some of us go on holidays more than once per year. In 2015, 7.6 million domestic tourists holidayed in Queensland, including 5.3 million from Queensland itself and 2.3 million from interstate.¹⁸

These are people who have indicated that they are travelling primarily for a holiday – not to visit friends or relatives (VFR), for business or for other reasons. These people could have chosen any other destination for a holiday. Changes in the state of the Great Barrier Reef are more likely to impact these travellers than VFR or business travellers.

2.4 million Australians visited areas along the Great Barrier Reef on holidays in 2015. Particularly in the Whitsundays and Tropical North Queensland, holidaymakers are more numerous than VFR or business travellers. 69 percent of visitors to the Whitsundays and 53 percent of domestic visitors to Tropical North Queensland are on holidays, compared to just 25 percent in Brisbane.¹⁹

In the last year 3.7 million people came to Australia for a holiday from overseas, 1.6 million of which (43 percent) spent most of their time in Queensland.²⁰ Others would also visit Queensland as a smaller part of their trip. Of international visitors who spent

¹⁷ In this paper the reef tourism areas are Tropical North Queensland (including Cairns), Townsville, Whitsundays, Mackay and the Southern GBR region. Data for these regions is available from Tourism and Events Queensland and Tourism Research Australia.

¹⁸ Tourism Research Australia (2016) *National Visitor Survey*, <https://www.tra.gov.au/aboutus/national-visitor-survey.html>

¹⁹ Tourism and Events Queensland (2016) *Domestic Tourism Snapshot*, <https://cdn.queensland.com/~media/a753092873a84a31a2cea1d75e77b5ec.ashx?vs=1&d=20151216T094709>

²⁰ ABS (2016) *3401.0 - Overseas Arrivals and Departures*, <http://www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/ED235311ADD60E58CA257FC6001880EF?opendocument>

most of their time in Queensland, 1.1 million of those people visited tourism areas along the Great Barrier Reef.

Again, these are holidaymakers, not VFR or other travellers. They have picked the Reef region in preference to any other destination in the world. It is clear that the Reef areas are tourist attractions. 92 percent of international visitors to Tropical North Queensland (the area around and north of Cairns) are there for a holiday. Only 52 percent of Brisbane international visitors are holidaying, with many more visiting for other reasons.²¹

Tourism may contribute to visits for other purposes. People may travel to seek business opportunities related to tourism, or to visit friends and relatives employed by tourism. The attractions of the Reef regions may also influence decisions to travel for VFR or business reasons. These factors are excluded from our estimates.

Almost 40 percent of international holiday makers to Queensland come from three countries – China, USA and UK, as shown in Table 1 below.

Table 1 – Visitors arriving in Queensland for a holiday

Country	Holiday visitors
China	296,190
UK	155,000
USA	137,900
Total	589,090

Source: Tourism and Events Queensland (2016) International Tourism Snapshot

Polling commissioned for this report was focused on these countries due to their importance to Queensland holiday arrivals.

In total, 3.5 million tourists visited reef regions for a holiday in 2015 -- 1.1 million international tourists and 2.4 million domestic tourists.

TOURIST EXPENDITURE

International holiday visitors to the reef regions spent around \$1.3 billion in 2015.²² Domestic tourists spent at least \$2.0 billion in the GBR tourism areas in 2015.²³

²¹ Ibid

²² Tourism and Events Queensland (2016) International Tourism Snapshot, <https://cdn.queensland.com/~media/4fc1514b6d804ec3bd9378a4fccd8487.ashx?vs=1&d=20160301T153526>

This is a conservative estimate based on available data. Data is not available to disaggregate overall spending by type of visitor, so we have assumed expenditure is split proportionately between holidaymakers and other types of visitor. However, holiday visitors spend up to twice the amount per day of other kinds of visitors.²⁴ This makes sense, as many VFR travellers stay with, eat with and are entertained by their friends and family. The economic impact of those travellers is generally far smaller.

In total, tourists spent at least \$3.3 billion in the Reef tourism areas in 2015.

Other analysts estimate this number to be significantly higher using different methods. For example, Deloitte Access Economics put tourism expenditure in natural resource management regions adjacent to the Reef at \$6.4 billion in 2012. The key difference is that Deloitte include non-holiday tourists such as VFR visitors. Deloitte's estimate of holiday/leisure tourism expenditure is similar - \$3.6 billion, also based on National and International Visitor Survey data.²⁵

Other studies have also estimated economic values associated with the Reef. Oxford Economics were commissioned by the non-profit Great Barrier Reef Foundation in 2009. They estimated the economic value of the GBR at \$51.4 billion, with the potential impact of bleaching estimated at \$37.7 billion.²⁶ An alternative approach was taken by a Central Queensland University academic, who estimated that a 10 percent improvement in the state of the Reef is worth \$6.3 billion.²⁷

EMPLOYMENT

Employment in tourism is always difficult to estimate, because tourism is not one industry. Tourism involves many industries, particularly Accommodation and Food Services, Transport and Retail Trade.

²³ Based on *Domestic Tourism Snapshot*, Domestic visitor expenditure in Queensland by region, multiplied by portion of Holiday visitors to these regions.

²⁴ Tourism Research Australia (2015) *National Visitor Survey*, <https://www.tra.gov.au/aboutus/national-visitor-survey.html>

²⁵ Deloitte Access Economics (2013) *Economic Contribution of the Great Barrier Reef*, <https://www.environment.gov.au/system/files/resources/a3ef2e3f-37fc-4c6f-ab1b-3b54ffc3f449/files/gbr-economic-contribution.pdf>

²⁶ Oxford Economics (2009) *Valuing the effects of Great Barrier Reef bleaching*, <https://www.oxfordeconomics.com/Media/Default/economic-impact/sustainability-and-climate-change/gbrfoxford.pdf>

²⁷ Rolfe 2010 *A total economic value framework for the Great Barrier Reef*, https://crawford.anu.edu.au/research_units/eehr/workshops/network_symposium/pdf/presentations/day_one/john_rolfe.pdf

The Australian Bureau of Statistics (ABS) estimates the impact of tourism in its Tourism Satellite Accounts, and Tourism Research Australia (TRA) uses the satellite accounts to estimate tourism employment in each state.

TRA's latest estimate is that tourism is responsible for 130,900 full-time equivalent jobs in Queensland. Reef regions receive around 30 percent of Queensland's holidaying visitors. This suggests that tourism is responsible for at least 39,000 jobs in the Reef areas.²⁸ Deloitte Access Economics estimate this figure at 45,000 using different methodology.²⁹

²⁸ Tourism Research Australia (2015) State Tourism Satellite Accounts, https://www.tra.gov.au/documents/Economic-Industry/State_Tourism_Satellite_Accounts_2013_14_FINAL.pdf

²⁹ Deloitte Access Economics (2013) Economic Contribution of the Great Barrier Reef, <https://www.environment.gov.au/system/files/resources/a3ef2e3f-37fc-4c6f-ab1b-3b54ffc3f449/files/gbr-economic-contribution.pdf>

Bleaching, media and tourism

The recent bleaching event has been covered extensively in the media, both in Australia and overseas. Globally, there were 2,887 articles containing a reference to the Great Barrier Reef and coral bleaching, from 1 January to 1 June 2016, according to the Factiva research database.³⁰ The same search for the same period in 2015 returned just 90 stories.

The 2,887 articles identified by Factiva included 1,061 stories from news publications, 1,771 stories in “Web News” sites and 55 blog posts. Many of these stories included familiar images of colourful coral surrounded by fish and turtles contrasted with empty fields of white coral skeletons.

While most of the coverage was in Australia, many international sites ran stories. For example, Forbes reported that *“50% of The Great Barrier Reef is Dead Or Dying”*,³¹ Reuters reported *“Half Australia's Great Barrier Reef northern coral 'dead or dying': scientists.”*³² India Business Times reported *“Over 90% Great Barrier Reef corals are now bleached survey reveals”*.³³

Some media coverage of the findings of scientific studies, and images of dead coral, has prompted concern amongst the tourism industry that the reporting had exaggerated the extent of the bleaching. GBRMPA also expressed concerns about some of the coverage.³⁴

One of the most high profile comments on the reef during this period came from renowned nature broadcaster Sir David Attenborough. In a documentary on the Great

³⁰ Using search term: ““Great Barrier Reef” and (coral near bleach*)”, all languages, between 1 Jan 2016 and 1 June 2016.

³¹ Nace (2016) *50% of The Great Barrier Reef is Dead Or Dying*, http://www.forbes.com/sites/trevornace/2016/04/24/50-great-barrier-reef-dead-dying/?utm_campaign=Forbes&utm_source=TWITTER&utm_medium=social&utm_channel=Technology&linkId=23850980#665474d11aea

³² Packham (2016) *Half Australia's Great Barrier Reef northern coral 'dead or dying': scientists*, <http://www.reuters.com/article/us-australia-environment-greatbarrierree-idUSKCN0XH0EO>

³³ Pandey (2016) *Over 90% of Great Barrier Reef corals are now bleached, survey reveals*, <http://www.ibtimes.com/over-90-great-barrier-reef-corals-are-now-bleached-survey-reveals-2357150>

³⁴ GBRMPA (2016) *The facts on Great Barrier Reef coral mortality*, Press Release, 3 June <http://www.gbrmpa.gov.au/media-room/latest-news/coral-bleaching/coral-bleaching/the-facts-on-great-barrier-reef-coral-mortality>

Barrier Reef, aired at the time of the bleaching and which included footage of areas impacted by the bleaching:

The Great Barrier Reef is in grave danger. The twin perils brought by climate change, an increase in the temperature of the ocean and in its acidity threaten its very existence. If they continue to rise at the present rate, the reefs will be gone within decades. And that would be a global catastrophe.³⁵

Media coverage of bleaching has become a contested issue in Australia, particularly in the wake of Attenborough's documentary. Queensland's Courier Mail said:

Sadly these fallacies do untold damage to our important tourism industry, as potential overseas visitors are exposed to images of a dead, white reef in their media, and then discouraged from making the trip to Australia.³⁶

The Courier Mail's coverage has been criticised for downplaying the bleaching event in order to protect the short-term interests of the state's tourism industry. It was the subject of an investigation by ABC's Media Watch, which featured several marine scientists critical of the newspaper.³⁷

Controversy has surrounded the Australian Government's response to both Attenborough's documentary and international attention on coral bleaching. Environment Minister Greg Hunt is reported to have watched the first part of the documentary and declared that the Reef was in good condition, comments that were reported in the Courier Mail. His interpretation was criticised by the documentary's producer.³⁸

More recently, a report by UNSECO, the United Nations Environment Program and the Union of Concerned Scientists was altered to remove references to the Reef. Titled *World Heritage and Tourism in a Changing Climate*, an early draft was seen by the

³⁵ David Attenborough's Great Barrier Reef Episode 3, 24 April, 2016

³⁶ Editorial (2016) *Scaremongering won't save our precious \$5.4b tourist drawcard*, <http://www.couriermail.com.au/news/opinion/editorial-scaremongering-wont-save-our-precious-54b-tourist-drawcard/news-story/40ce10ac12552401c69a3433364d8d87>

³⁷ Media Watch (2016) *White and bright: is reef alright?*, <http://www.abc.net.au/mediawatch/transcripts/s4454406.htm>

³⁸ Davey and Harmon (2016) *Greg Hunt rebuked by Attenborough film-maker after upbeat verdict on Great Barrier Reef*, <http://www.theguardian.com/environment/2016/apr/08/greg-hunt-rebuked-by-film-maker-after-great-barrier-reef-verdict>.

Australian Department of Environment, which lobbied the authors to drop references to the Reef and other Australian tourism icons, Kakadu and Tasmanian forests.³⁹

The sensitivity around the state of the Great Barrier Reef and the potential impact on tourism is well founded. As polling results in the next section show, there are large potential impacts on this important industry for Queensland.

³⁹ Slezak (2016) Australia scrubbed from UN climate change report after government intervention, <http://www.theguardian.com/environment/2016/may/27/australia-scrubbed-from-un-climate-change-report-after-government-intervention>

Survey on attitudes to the Great Barrier Reef

While there has been widespread media coverage of severe coral bleaching at the Great Barrier Reef in Australia, and around the world, it is not clear how this news has been received, and how coverage of bleaching events may impact on future tourism.

To assess knowledge of bleaching and possible impacts on tourism decisions, The Australia Institute conducted opinion surveys in four countries: Australia, the USA, the UK and China.⁴⁰ The majority of tourists to Reef areas come from these countries: two thirds are domestic tourists, while tourists from the USA, UK and China together make up 40 percent of international tourists to the area.

This section outlines the survey results. International results, when presented together, are averages of the response rates across the USA, UK and China. The questions are outlined in the appendix.

THE BIGGEST TOURIST DESTINATION

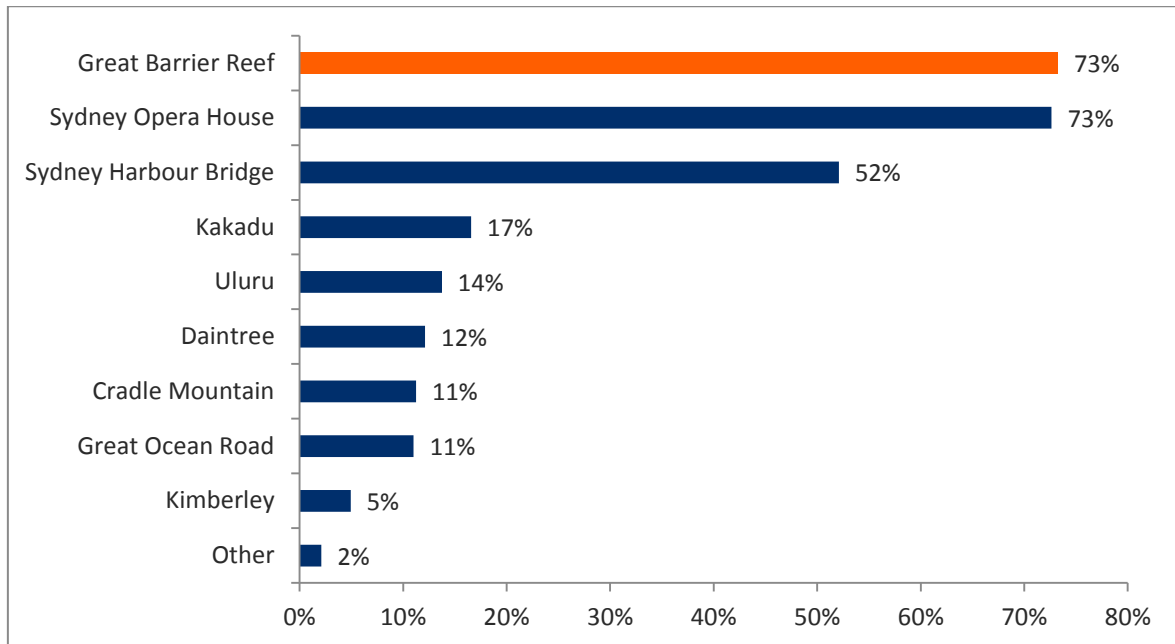
Internationally, the Great Barrier Reef is considered one of the top tourist attractions in Australia. From a list of Australian tourist destinations, respondents were asked to select the top three. 73 percent selected the Great Barrier Reef, as shown in Figure 3 below. In the USA and UK, the Reef was the most often selected destination, and second most often selected in China.

⁴⁰ The Australia Institute conducted surveys in the USA, the UK and China from 20 May to 30 May 2016 through Research Now, including more than 1000 people in each country.

The Australia Institute conducted a survey in Australia that ran between May and June 2016 through Research Now, with 1398 respondents selected in a representative sample, by age, gender and location.

The questions were on the same topics as the international surveys, although with some differences for the domestic audience. These questions are also included in an appendix.

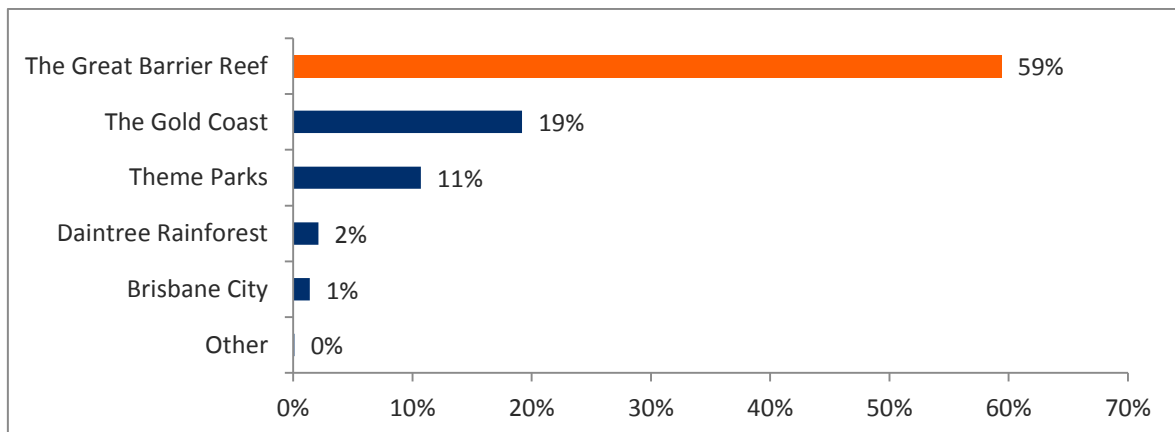
Figure 3 – Selected among top three tourist attractions (international surveys)



Source: The Australia Institute Surveys, May 2016; excludes *Other, Don't know, None of these* (together 12%)

Similarly, most Australians consider the Great Barrier Reef to be Queensland's top tourist attraction, as shown in Figure 3 below.

Figure 4 – Top tourist attraction in Queensland (Australian survey)

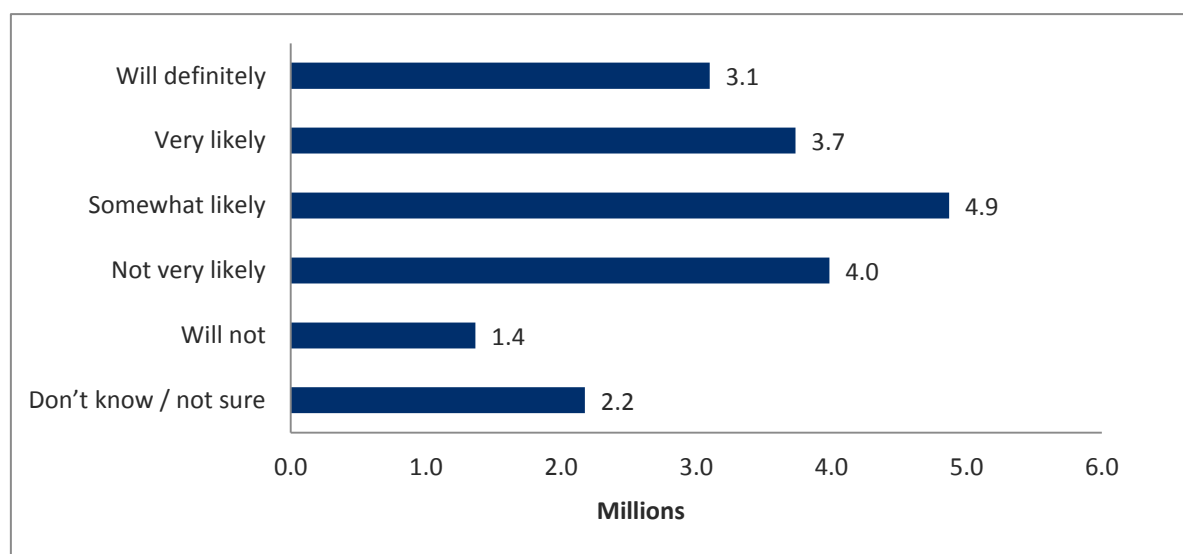


Source: The Australia Institute, Survey, Australia, May 2016

Many Australian respondents also said they would be likely to travel to the Reef in the next five years. 16 percent said they “will definitely visit” while 20 percent said they would be “very likely”. A further 25 percent said they would be “somewhat” likely.

Proportional to Australia's adult population,⁴¹ this represents over 3.1 million Australians who say they will definitely go to the Reef in the next five years, 3.7 million who say they are very likely, and 4.9 million who are somewhat likely. This is in line with data from Tourism and Events Queensland above that 2.4 million Australians visited in 2015.

Figure 5 – Likely to visit Reef in next five years? Australians, implied from Australian survey



Source: Adult population proportional to The Australia Institute survey results, May 2016, population 20+, ABS (2015) 3101.0 *Australian Demographic Statistics*

THE STATE OF THE REEF

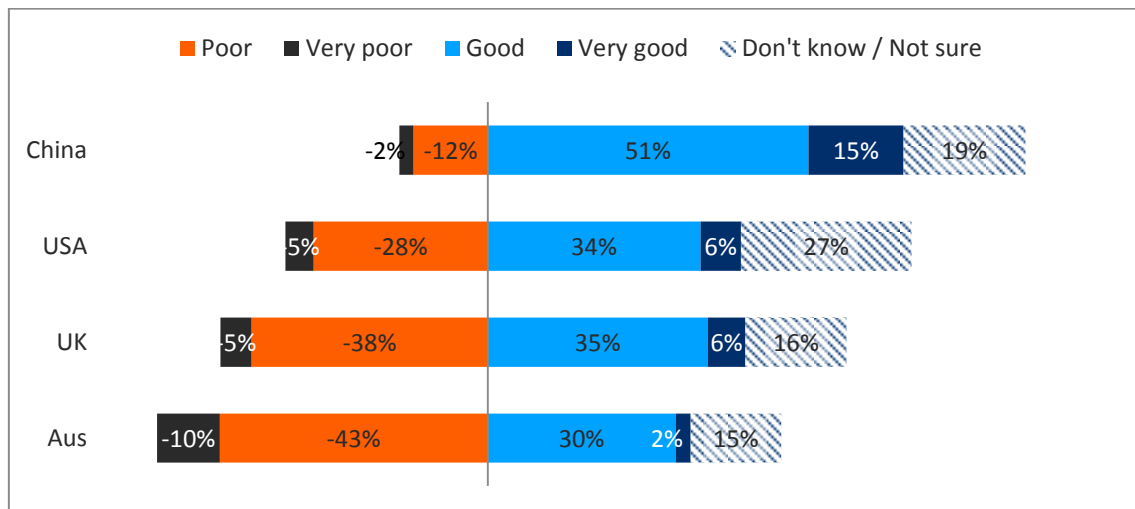
Respondents were asked whether they thought the Reef was in a good or poor condition. The results suggest that any impact from the widespread media coverage of the recent coral bleaching has had a bigger impact in Australia than elsewhere.

Most Australians said it was in a poor condition. Queenslanders were as likely as Australians overall to say the reef was in a poor condition.

Overseas respondents had a more positive opinion of the condition of the Reef, with most Chinese respondents saying they thought the Reef was in a good or very good condition. Results from each of the surveys are shown in Figure 5:

⁴¹ 19,246,357 at Sept 2019 (ages 20+). ABS (2015) 3101.0 *Australian Demographic Statistics*

Figure 5 - Opinion about condition of the Reef (international and Australian surveys)



Source: The Australia Institute, Surveys, May 2016

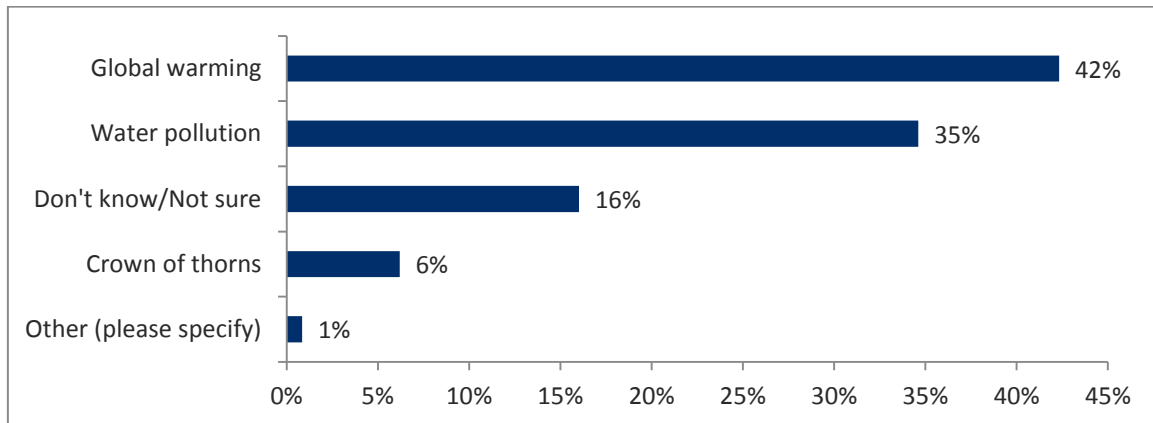
International respondents were also asked about whether they had heard or read about 'coral bleaching'. While only 7 percent of international respondents had heard "a lot" about coral bleaching, nearly two thirds had heard at least "some" or "a little".

ROLE OF GLOBAL WARMING

Those who said they had heard something about bleaching were asked what they thought was the main cause.

Two in five international respondents selected global warming as the main cause of coral bleaching. This included nearly half of Chinese respondents. In the USA and UK, similar numbers chose water pollution; in China this was chosen less often. Averages are shown in Figure 6:

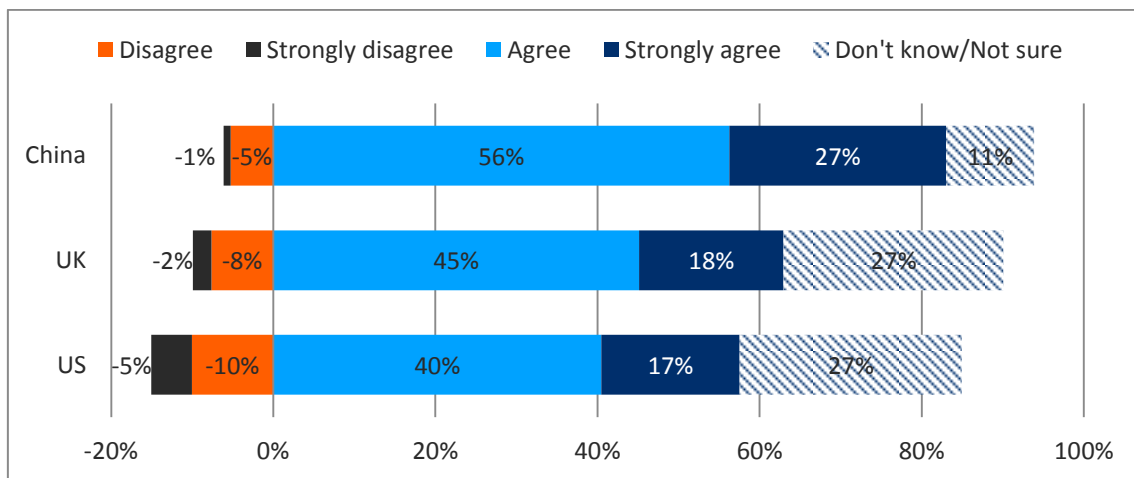
Figure 6 – Main cause of coral bleaching? International surveys



Source: The Australia Institute, Surveys, May 2016

Similarly, most respondents thought that the mining and burning of coal was a factor in causing impacts like coral bleaching, as shown in Figure 7.

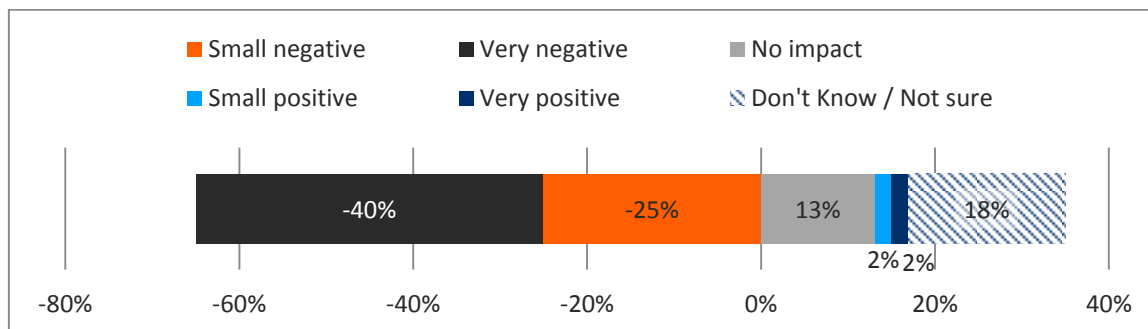
Figure 7 – The mining and burning of coal is causing global warming impacts like coral bleaching – agree or disagree? (International surveys)



Source: The Australia Institute, Surveys, May 2016

Within Australia, respondents were asked what they thought the impacts would be on the Reef if Australia continues to build new coal mines. Two thirds said there would be a negative impact. Two in five said it would have a very negative impact. 13 percent said no impact, 4 percent said it would be positive and 18 percent said they did not know. This is shown in Figure 8.

**Figure 8 - Impact on the Reef, if Australia continues to build new coal mines?
(Australian survey)**



Source: The Australia Institute, Survey, May 2016

POSSIBLE IMPACTS ON TOURISM

As discussed above, bleaching events and coral death are likely to escalate unless climate change impacts are mitigated substantially. Experts say, on current trajectories, ocean temperatures that caused the bleaching will be average in two decades.

Survey respondents were provided with an explanation of recent coral bleaching:

Warmer water linked to global warming has seen Australia's Great Barrier Reef recently experience a severe mass bleaching event (i.e. where the coral lost its colour and turned white). More than 90% of reefs had some coral bleaching and some coral died completely.

Respondents were asked how continued bleaching may impact future decisions about holiday destinations, both within Australia and elsewhere. Specifically, international respondents were asked:

If the Great Barrier Reef continues to experience severe bleaching and some of the reef dies completely, would you be more likely to choose an alternative holiday destination, other than Australia?

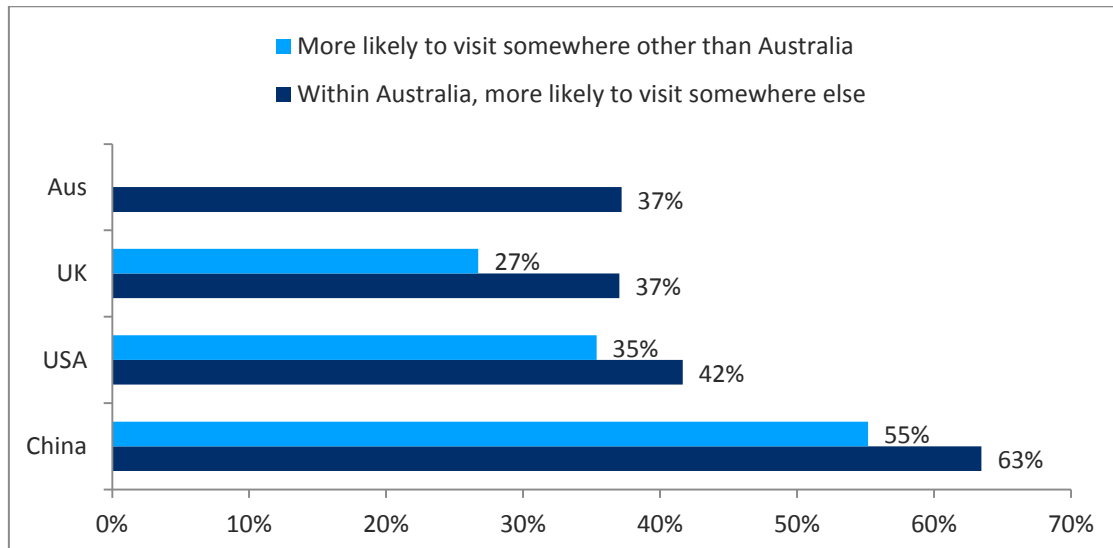
Both Australian and international respondents were asked:

If the Great Barrier Reef continues to experience severe bleaching and some of the reef dies completely, within Australia, would you be more likely to choose an alternative holiday destination, other than the Great Barrier Reef?

Many international respondents said continued bleaching would make them more likely to choose somewhere other than Australia. Even higher numbers said they

would be more likely to choose somewhere else within Australia other than the Great Barrier Reef, as shown in Figure 9 below:

Figure 9 – More likely to choose an alternative holiday destination if bleaching continues? (All surveys)



Source: The Australia Institute, Surveys, May 2016

Figure 9 shows that 55 percent of Chinese respondents said they would be more likely to travel to another country altogether, with 63 percent saying they would be more likely to travel elsewhere in Australia. More than one third of Americans would be more likely to visit another country, with 42 percent more likely to go to other areas of Australia. UK visitors are least likely to choose another country, but more than a quarter of UK respondents would be less likely to visit Australia if bleaching continues.

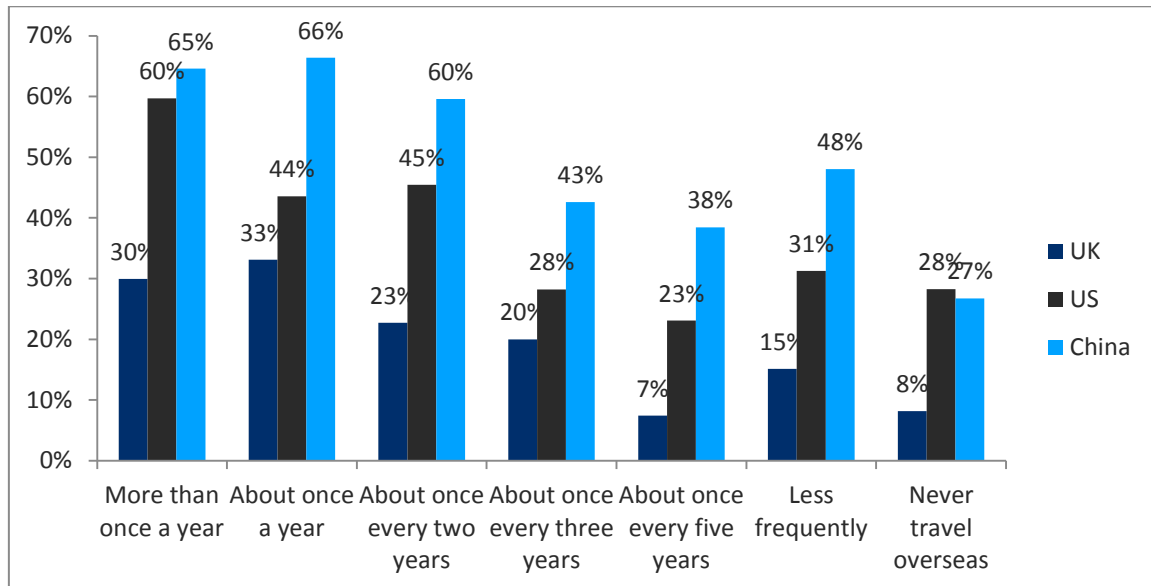
These results show that visitors from China are the most likely to choose another holiday destination over Australia, relative to UK and USA visitors. Chinese visitors are most attracted to Australia for nature-based experiences,⁴² while visitors from the UK and USA may be less so due to closer linguistic, cultural and historical ties. Other tourism growth markets such as India and Southeast Asia may also share the nature-based focus of Chinese visitors.

Furthermore, the data in Figure 9 are averages across each population. Among people who actually travel internationally regularly, the results are even more striking. The more often people travel, the more likely they are to be a holidaymaker in Australia,

⁴² Tourism Research Australia (2014) *Chinese Visitor Satisfaction*, https://www.tra.gov.au/documents/Chinese_Visitor_Satisfaction_Summary_20114_FINAL.pdf

but they are also more likely to say they will be put off by bleaching, as shown in Figure 10.

Figure 10 - More likely to choose destination other than Australia? vs How often do you travel internationally for a holiday? (International surveys)



Source: The Australia Institute, Surveys, May 2016

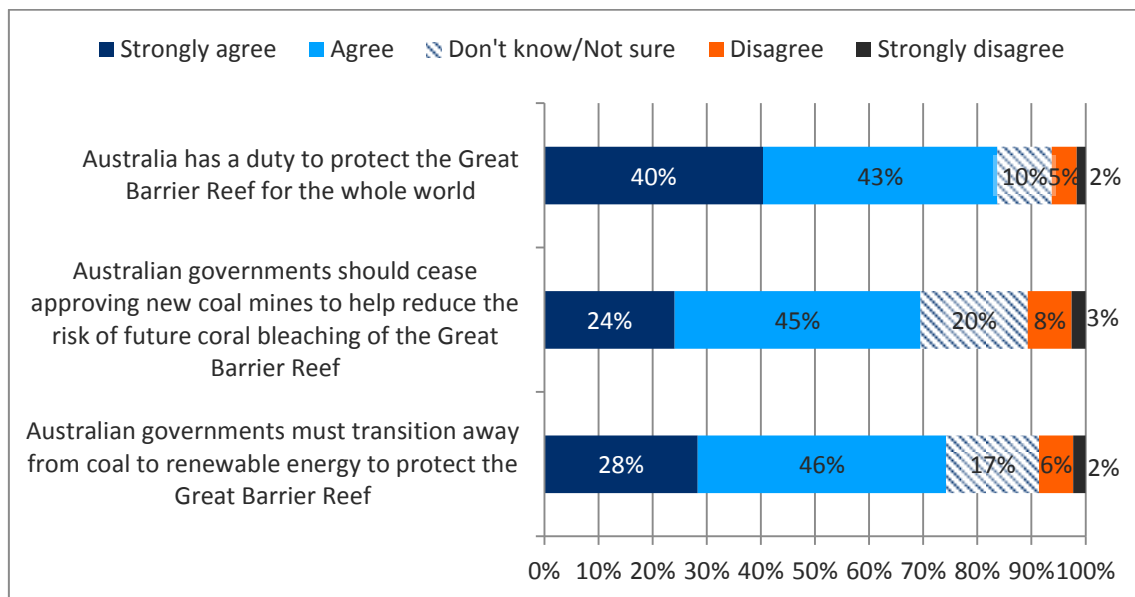
Figure 10 shows that among Chinese people who travel overseas once per year or more, more than 60 percent are more likely to go to another country. 59 percent of the most regular American travellers are also less likely to come to Australia if bleaching continues. Similarly, it is the regular UK international travellers that are most likely to consider going to other countries instead of Australia.

GOVERNMENT RESPONSIBILITY AND THE COAL INDUSTRY

Respondents were asked questions about coal, the Reef and the responsibilities of the Australian government.

International respondents overwhelmingly agreed that Australia has a duty to protect the Great Barrier Reef, that it should cease approving new coal mines to help reduce the risk of future coral bleaching of the Great Barrier Reef, and that this requires transitioning away from coal to renewable energy to protect the Great Barrier Reef.

Figure 11 – Attitudes towards Australian policy on the Reef, coal and climate change (International surveys)



Source: The Australia Institute, Surveys, May 2016

As shown in Figure 11, more than 80 percent of international respondents feel that Australia has a duty to protect the Reef. Around 70 percent say that Australia should stop approving new coal mines and move towards renewable energy.

Tourism activity at risk from bleaching

From these polling results, it is possible to draw basic estimates the numbers of visitors at risk of deciding not to visit Reef areas, or not to come to Australia altogether, if severe coral bleaching continues.

As discussed above 1.6 million international holiday visitors visited Queensland in 2015 and 1.1 million, or 69 percent, visited reef areas. Assuming that 69 percent of these countries' visitors also visit Queensland's Reef areas, primarily to visit the Reef, and that the portions of each population are at risk of not travelling to Reef areas, the number of at-risk visitors is shown below.

Table 2 – Visitors at risk of not visiting Reef areas

Country	Estimated holiday visitors to reef areas	More likely to travel to another place in Australia if severe bleaching continues	At risk number of visitors to reef
Australia	2,400,000	37%	888,000
China	203,631	63%	129,254
UK	106,563	37%	39,460
USA	94,806	42%	39,487
Total	2,804,999		1,096,201

Source: Tourism and Events Queensland data, The Australia Institute surveys and calculations

Table 2 shows that over one million visitors are more likely to travel to another Australian locations other than the Reef areas if severe coral bleaching continues, just among visitors from Australia, China, the UK and USA. These countries account for the majority of Reef visitors, however considerable numbers come from other parts of the world.

The expenditure of these tourists would be lost from the Reef areas, although some of is likely be retained elsewhere in the Australian economy. As shown in Table 3 below, over \$900 million of tourism expenditure is at risk of being lost from the Reef regions:

Table 3 – Expenditure of visitors at risk of not visiting Reef areas

Country	At risk number of visitors to reef	Average visitor spend in Reef regions	Spending at risk of leaving Reef regions
Australia	888,000	\$786	\$697,968,000
China	129,254	\$1,123	\$145,152,452
UK	39,460	\$1,123	\$44,313,330
USA	39,487	\$1,123	\$44,343,994
Total	1,096,201		\$931,777,776

Source: Tourism and Events Queensland data, The Australia Institute surveys and calculations

. Note data on spending by holiday visitors to reef regions are not available by nationality. The international visitor spend figures are an average of all international holiday visitors

The potential loss of tourism revenue shown in Table 3 represents almost one third of the \$3.3 billion spent by holiday visitors to Reef regions each year, which supports between 39,000 and 45,000 jobs, discussed above. It is likely then that around 10,000 jobs are at risk from decreased visitation and spending if severe coral bleaching of the Reef continues.

An estimate can also be made of people more likely not to travel to Australia due to continued severe coral bleaching, shown in Table 4 below:

Table 4 – Visitors at risk of not coming to Australia

Country	Estimated holiday visitors to reef areas	More likely to travel to another country if severe bleaching continues	At risk number of visitors
China	203,631	55%	112,369
UK	106,563	27%	28,487
USA	94,806	35%	33,527
	404,999		174,382

Source: Tourism and Events Queensland data, The Australia Institute surveys and calculations

Table 3 shows that almost 175,000 people from China, the UK and USA are at risk of not coming to Australia every year if severe coral bleaching continues on the Great Barrier Reef. This is the equivalent of 281 less plane loads of people from China, 71 less from the UK and 84 less from the USA, or 436 plane loads altogether.⁴³

⁴³ A 436 Boeing 747 seats roughly 400 people depending on seat layout. Source: <http://www.boeing.com/commercial/747/>

The expenditure of these tourists would be lost from the Australian economy altogether if they decide on a tourism destination in another country. As estimated in Table 5 below, the at-risk spending of China, the UK and USA alone is worth over \$1 billion per year:

Table 5: Expenditure of visitors at risk of not visiting Australia

Country	Estimated number of visitors at risk	Average visitor spend	At risk spending
China	112,369	\$7,188	\$807,748,639
UK	28,487	\$5,721	\$162,978,006
USA	33,527	\$6,408	\$214,845,556
Total	174,382		\$1,185,572,201

Source: Tourism and Events Queensland data, The Australia Institute surveys and calculations

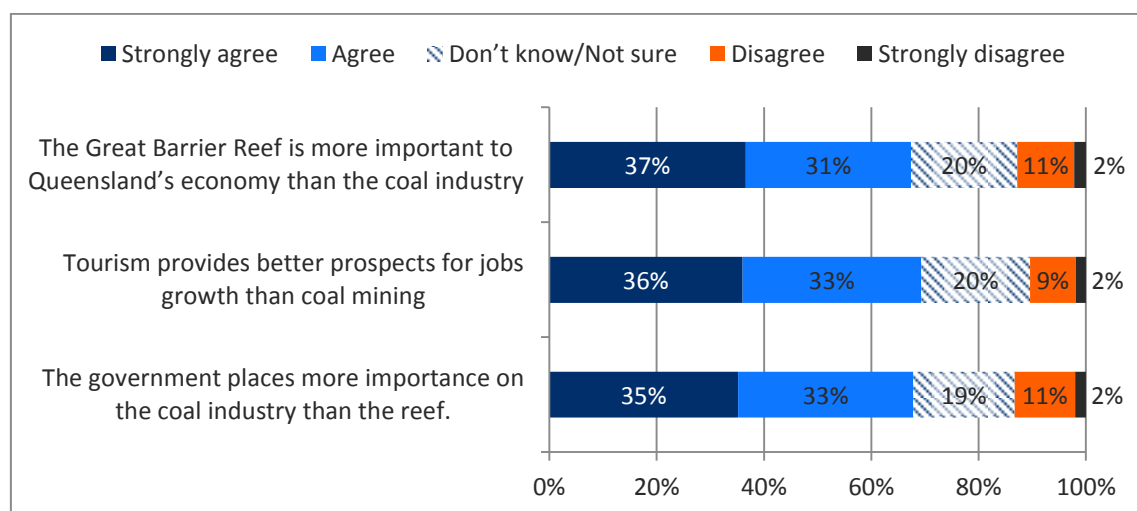
Coal and Queensland's Service Based Economy

Central to debates about the recent bleaching event and its economic impacts has been the role of coal in causing climate change and in Queensland's economy.

In the Australian survey, respondents were asked about the economic significance of the Reef in comparison with the coal industry.

The survey results show Australians overwhelmingly agree that the Reef is more important to Queensland's economy than the coal industry, and that tourism provides better prospects for jobs growth than coal mining. Similar numbers also agreed that the government places more importance on the coal industry than the Reef.

Figure 12 - Attitudes towards the economics of the Reef and the coal industry



Source: The Australia Institute Surveys, May 2016

Protecting the reef through action on climate change, including through reducing Queensland's coal exports, would not have a major effect on Queensland's economy.

Coal mining is a small and shrinking employer in the state. Coal mining now employs less than 1 percent of people who work in Queensland, only around 20,000, which is

less than the Arts and Recreation sector.⁴⁴ This has fallen from a highpoint of 30,000 in 2013.

Like Australia's economy overall, Queensland has a diverse, modern economy based on services. Four in five people jobs in Queensland are in services industries, and these industries are growing.

The Commonwealth Department of Employment produces projections of changes in employment based on ABS data. Employment in coal mining nationally is projected to fall 21 percent by November 2020.⁴⁵ In Queensland, mining employment (in all mining industries) is projected to fall by 7,400 jobs to 2020, or 11.3 percent.⁴⁶ In the same period, Queensland's employment overall is projected to grow by 10.4 percent, driven by services.

While the mining industry has reduced employment substantially in recent years, four other industries each created more jobs than were lost in mining – Health, Education, Professional Services, and Accommodation and Food Services, which is heavily linked to tourism.⁴⁷

With lower exchange rates, due in large part to the end of the mining boom and declines in resource commodity prices, export-exposed industries like tourism have an opportunity to expand.

⁴⁴ ABS Cat no. 6202.0 - *Labour Force, Australia*, ABS Cat no. 6291.0.55.001 - *Labour Force, Australia, Detailed*.

⁴⁵ Department of Employment (2016) *2016 Industry Employment Projections – five years to November 2020*.

⁴⁶ Department of Employment (2016) *Regional Projections to November 2020*

⁴⁷ Swann, Ogge and Campbell (2016) *Jobs Growth In Queensland*, The Australia Institute

Conclusion

Survey results reported here suggest that continued bleaching could not only impact the Reef's status as Australia's premier international tourist destination, but also impact Australia's identity as an international tourist destination. Australian governments and tourism industries are right to be worried about economic ramifications on tourism from bleaching – billions in revenue and tens of thousands of jobs could be impacted.

Concern around the media reporting of the Reef's condition and the bleaching event is justified. There is nothing to be gained from inaccurate reporting and, as these survey results show, considerable harm could be caused. However, attempts to shape the coverage of the Reef's environmental issues can only ever be a temporary measure. The only way to reduce the threats to the Reef and its tourism industry is to put in place strong action on climate change and devote real resources to easing other pressures on the reef.

The interests of two of Queensland's industries are directly at odds. The coal industry opposes serious action on climate change through measures such as a moratorium on new coal mines, carbon pricing or expanding renewable energy. It bitterly fights any attempt to curtail its activities in the Reef's catchment, on the coast or through the Reef itself. However, without serious action on climate change and real resources allocated to the Reef's health, the tourism industry seems certain to lose its most precious asset.

Appendix – International Survey Questions

What are the top three (3) tourist attractions in Australia? Select three from:

(1-9 Randomised order)

1. *Great Barrier Reef*
2. *Sydney Opera House*
3. *Sydney Harbour Bridge*
4. *Uluru*
5. *Kakadu*
6. *Cradle Mountain*
7. *Great Ocean Road*
8. *Daintree*
9. *Kimberley*
10. *Other*
11. *None of these*
12. *Don't Know / Not Sure*

To the best of your knowledge, how would you describe the current condition of the Great Barrier Reef in Australia?

1. *Very good condition*
2. *Good condition*
3. *Poor condition*
4. *Very poor condition*
5. *Don't know / Not sure*

How much have you heard or read or know about an issue called 'coral bleaching'?

1. *A lot*
2. *Some*
3. *A little*
4. *Nothing at all*
5. *Don't know/Not sure*

As far as you know, what is the main cause of coral bleaching?

1. *Global warming*
2. *Crown of thorns*
3. *Water pollution*
4. *Other (please specify)*
5. *Don't know/Not sure*

Warmer water linked to global warming has seen Australia's Great Barrier Reef recently experience a severe mass bleaching event (i.e. where the coral lost its colour and turned white). More than 90% of reefs had some coral bleaching and some coral died completely.

Do you agree or disagree with the following statements about the Great Barrier Reef?

- *Coral bleaching will harm tourism for the Great Barrier Reef in the long term*
 - *Australian governments should cease approving new coal mines to help reduce the risk of future coral bleaching of the Great Barrier Reef*
 - *The mining and burning of coal is causing global warming impacts like coral bleaching*
 - *Australia has a duty to protect the Great Barrier Reef for the whole world*
 - *Australian governments must transition away from coal to renewable energy to protect the Great Barrier Reef*
1. *Strongly agree*
 2. *Agree*
 3. *Disagree*
 4. *Strongly disagree*
 5. *Don't know/Not sure*

*If the Great Barrier Reef continues to experience severe bleaching and some of the reef dies completely, would you be more likely to choose an **alternative holiday destination, other than Australia?***

1. *Yes*
2. *No*
3. *Don't know*

*If the Great Barrier Reef continues to experience severe bleaching and some of the reef dies completely, **within Australia**, would you be more likely to choose an alternative holiday destination, **other than the Great Barrier Reef**?*

- 1. I would be more likely to visit somewhere else*
- 2. No difference*
- 3. Don't know/Not sure*

Does coral bleaching make the Great Barrier Reef a less attractive tourist destination for you personally?

- 1. Yes*
- 2. No*
- 3. Don't know*

Appendix – Domestic survey questions

In your view, which of the following is the biggest tourist attraction in Queensland?

Select one only (randomised order)

1. *The Great Barrier Reef*
2. *Daintree Rainforest*
3. *Brisbane City*
4. *The Gold Coast*
5. *Theme Parks*
6. *Other (Please specify)*
7. *Don't Know / Unsure*

How likely are you to visit the Great Barrier Reef in the next 5 years?

1. *Will definitely visit*
2. *Very likely to visit*
3. *Somewhat likely to visit*
4. *Not very likely to visit*
5. *Will not visit*
6. *Don't know / not sure*

How would you describe the current condition of the Great Barrier Reef?

1. *Very good condition*
2. *Good condition*
3. *Poor condition*
4. *Very poor condition*
5. *Don't know / Not sure*

Warmer water linked to global warming has seen Australia's Great Barrier Reef recently experience a severe mass bleaching event (i.e. where the coral lost its colour and turned white). More than 90% of the reef was bleached to some degree and some coral died completely.

If the Great Barrier Reef continues to experience severe bleaching and some of the reef dies completely, would you be more likely to choose an alternative holiday destination, other than the Great Barrier Reef?

1. *I would be more likely to visit somewhere else*
2. *No difference*
3. *Don't know/Not sure*

Does coral bleaching make the Great Barrier Reef a less attractive tourist destination for you personally?

1. *Yes*
2. *No*
3. *Don't know*

Do you agree or disagree with the following statements? (randomised order)

	<i>Strongly agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly disagree</i>	<i>Don't know/Not sure</i>
<i>Coral bleaching will harm tourism for the Great Barrier Reef</i>					
<i>The Great Barrier Reef is more important to Queensland's economy than the coal industry</i>					
<i>The government places more importance on the coal industry than the reef.</i>					
<i>Tourism provides better prospects for jobs growth than coal mining</i>					

If Australia continues to build new coal mines, what impact do you think this will have on the Great Barrier Reef?

1. *Very negative impact*
2. *Small negative impact*
3. *No impact*
4. *Small positive impact*
5. *Very positive impact*
6. *Don't Know / Not sure*

