CLIMATE COUNCIL

ICONS AT RISK: CLIMATE CHANGE THREATENING AUSTRALIAN TOURISM

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Preface

Tourism is a multi-billion dollar industry in Australia, providing more than half a million jobs and accounting for 5% of the workforce. Iconic natural destinations such as the Great Barrier Reef, Kakadu National Park, Uluṟu, and our world-famous beaches such as the Gold Coast are the backbone of this industry. But current and future climate change impacts pose great risks for these icons, and for the communities they support.

This report provides a summary of the value of the tourism industry to the Australian economy and to communities, and the risks posed to this asset by climate change. We also describe how the industry can play an important part in the vital transition to a low carbon economy.

The Climate Council thanks our reviewers Prof. Susanne Becken (Griffith University) and Prof. Steve Turton (Central Queensland University) for their very helpful feedback. We also thank Dylan Pursche, Martyna Kotowska, Felipe Avancine and Divya Venkataraman for their assistance in preparing the report.

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Key Findings

1

Climate change poses a significant threat to many of Australia's iconic natural areas that underpin our tourism industry.

- The United Nations has identified the Australia/New Zealand region as one of five Climate Change Vulnerable Hotspots for the global tourism industry.
- The top five attractions for international visitors - Australian beaches, wildlife, the Great Barrier Reef, wilderness areas and national parks - are all at risk from climate change.
- The timing, frequency and severity of extreme weather events, such as heatwaves, storms and bushfires, could affect where and when tourists choose to travel, and the viability of tourism operations.

2

Australia's most important tourist destinations are already feeling the effects of climate change and these impacts will accelerate over coming decades.

- **The Great Barrier Reef:** Australia's most valuable tourist icon - contributing $6 billion to the Australian economy - is also the most vulnerable to the effects of climate change. Record hot ocean temperatures in 2016-17 resulted in the most catastrophic bleaching of the reef system on record.
- **Red Centre:** Uluṟu-Kata Tjuṯa National Park and other tourist destinations in inland Australia face increasing extreme heat and water scarcity. In 2030 the Red Centre could experience more than 100 days above 35°C every year (19 days more than the current average). By 2090, there could be more than 160 days per year over 35°C.
- **The Top End:** Kakadu National Park is threatened by extreme heat and rising sea levels as saltwater progressively invades freshwater wetlands. Darwin could see an increase in hot days (temperatures above 35°C) from 11 (1981-2010 average) to 43 by 2030, and up to 265 by 2090.
- **Beaches:** Australia's number one tourist destination - the beaches - are threatened by rising sea levels.
  - 17-23% of surveyed tourists would respond to beach damage scenarios by switching destinations, with an estimated $56 million loss per year for Sunshine Coast in QLD and $20 million per year for the Surf Coast in Victoria.
  - Sydney, Melbourne, Hobart, Cairns, Darwin, Fremantle and Adelaide are all projected to have at least a one hundred-fold increase in the frequency of coastal flooding events with a 0.5m sea level rise.
- **Ski tourism** has been visibly affected by climate change, both globally and in Australia. Declines of maximum snow depth and decreasing season length at Australian ski resorts have been reported for over 25 years, increasing the need for artificial snow-making.

3

Climate change is increasing some health risks for domestic and international travelers.

- The deadly irukandji jellyfish is spreading further south and their season is lengthening. Irukandji have been observed as far south as Hervey Bay and Fraser Island and could eventually be found as far south as the Gold Coast.
- Increased temperatures and changed rainfall patterns in northern Australia can increase the risks of mosquito-borne disease and may lead to the re-emergence of other tropical diseases such as malaria.

4

Tourism is one of Australia's most valuable and fastest growing industry sectors.

- Australia received 8.6 million international visitors in 2016-17, an increase of 8.1% on the same period in the previous year.
- In 2016-17, Australia's tourism industry recorded $40.6 billion expenditure, a rise of 7% compared to the previous year.
- Tourism is now Australia's second most valuable export earner after iron ore.
- Australia's tourism sector employs 580,000 people, accounting for approximately 5% of the workforce. Tourism employs around 15 times more people in Australia than coal mining.

5

The tourism industry is both the most vulnerable and the least prepared to manage climate risks.

- The tourism industry in Australia is extremely vulnerable, mainly due to its reliance on nature-based attractions that are already feeling the impacts of sea level rise and increasing extreme weather events.
- Federal and state governments have generally underplayed or ignored climate change risks to tourism, with the Australian government's *Tourism 2020* plan making no mention of the need to reduce emissions or increase sustainability of the tourism industry.
- But many individual tourism enterprises - hotels, resorts, agencies, airlines and operators - are increasingly becoming part of the solution by embracing renewable energy, energy efficiency and other positive initiatives.

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1. Introduction

Tourism is one of the largest and fastest growing economic sectors in Australia and globally. The industry is responsible for 10% of global Gross Domestic Product (GDP, an economic measure of all goods and services produced) and provides 1 in 10 jobs (UNWTO 2016a). In Australia, tourism is one of the most valuable sectors in the economy in terms of local spending, jobs and contributions to regional communities. Tourism contributes more to Australia's GDP than coal mining and employs nearly 15 times more people.

Tourism is also a growing industry. This is reflected by continued growth in international flights, reaching a record 1.24 billion in 2016 (UNWTO 2017a). Tourism growth is expected to continue into the future, with arrivals projected to increase 3.3% per year to 2030.

In terms of worldwide exports, tourism ranks third after fuels and chemicals, and ahead of food. In many developing countries, tourism is the number one export earner (UNWTO 2016b). Tourism is a primary source of foreign exchange earnings in 20 of the 48 Least Developed Countries (UNTWO 2017b). In some developing countries, especially small island states such as Fiji and Vanuatu, tourism can account for more than a quarter of the country's GDP (UNWTO 2017b).

Many of the world's most popular tourist destinations are already being affected by increases in extreme weather, and changes in sea level, temperature, rainfall and snow (Scott et al. 2012). Australia is no exception, with many of our unique natural attractions already feeling the effects of climate change. These impacts will accelerate over coming decades, challenging the very foundation of Australia's tourism industry.

Tourism also contributes to the problem of climate change, especially through emissions from flights, and energy use in accommodation. Responsible tourism can, however, also be a driver of sustainable development and promote the preservation of the world's natural and cultural heritage. Increasing numbers of individual tourist operators and companies are becoming part of the solution by embracing renewable energy, energy efficiency and other positive initiatives.

This report highlights the risks that climate change poses for Australia's tourism sector. Following this introduction, Chapter 2 outlines the importance of the tourism industry for Australia's economy and Chapter 3 describes the climate change risks to the industry. Chapter 4 focuses on Australia's most iconic tourist destinations, how these places are already being affected by climate change, and how they will be affected in the future. Chapter 5 describes how the tourism industry is both part of the problem (through its contribution to greenhouse gas pollution), but also increasingly part of the solution as the sector embraces renewable energy, energy efficiency and other opportunities. Chapter 6 highlights the urgency of addressing climate change now in order to protect Australia's important natural and economic assets.

Many of the world's most popular tourist destinations are already being affected by climate change.

2. Tourism is Critical to Australia's Economy

Tourism is one of the most valuable sectors of the Australian economy in terms of local spending, jobs and income. Australia's natural assets - beaches, wildlife, reefs and parks - are major tourist drawcards. These natural attractions are at risk from accelerating climate change.

2.1 Value of Tourism to the Economy

In the year ending July 2017, Australia received 8.6 million international visitors, an increase of 8.1% on the same period in the previous year. These visitors spent a record $40.6 billion, a 7% increase on the previous year (Tourism Australia 2017a).

The largest number of overseas visitors come from New Zealand, followed by China, the UK, the USA, and Singapore (Table 1) (ABS 2016a). Forecasts by Austrade (2016) project that China will overtake New Zealand as the largest source of visitors by 2017-18.

Tourism is Australia's second most valuable export earner ($43.6 billion) after iron ore ($47.7 billion) and ahead of coal ($34.3 billion) and gas ($16.5 billion) (2015-16 figures) (DIIS 2016).

Every State and Territory in Australia receives substantial economic benefits from both international and domestic tourism (Figure 1). The Australian Government estimates that for every dollar directly generated by the tourism industry, a further 90 cents is generated elsewhere in the Australian economy. These flow-on economic benefits are higher for tourism than other industries including mining, agriculture, and financial services (Austrade 2017c).

Australian tourism is expected to keep growing. The Australian Government has formulated a national strategy, *Tourism 2020*, aimed at increasing the contribution of the tourist industry to GDP to an estimated $51 billion by 2020 (Austrade 2017c; Tourism Australia 2017b). Australian government forecasts are for total tourism expenditure to increase by more than 4% per year, with 15 million visitors per year expected, and an overnight spend of more than $150 billion by 2026-27, growing from more than $100 billion in 2016-17 (Austrade 2017b). Tourism Research Australia, the peak body representing tourism operators, has projected that employment in the sector will grow 1.4% from 2011-12 to 2029-30 (531,900 to 656,200 people) (TRA 2013a).

2.2 Tourism is a Major Employer

In 2015-16, tourism employed 580,200 people in Australia, accounting for 4.9% of the Australian workforce (ABS 2016a), with many of these jobs located in regional areas. By comparison, in 2014-15, other industries such as coal mining employed 39,000 people, and oil and gas extraction 22,000 (ABS 2016b). As mining jobs have been declining, the difference between employment in the tourism versus the fossil fuel sector is likely to be even greater when the 2015-16 statistics for mining employment become available.

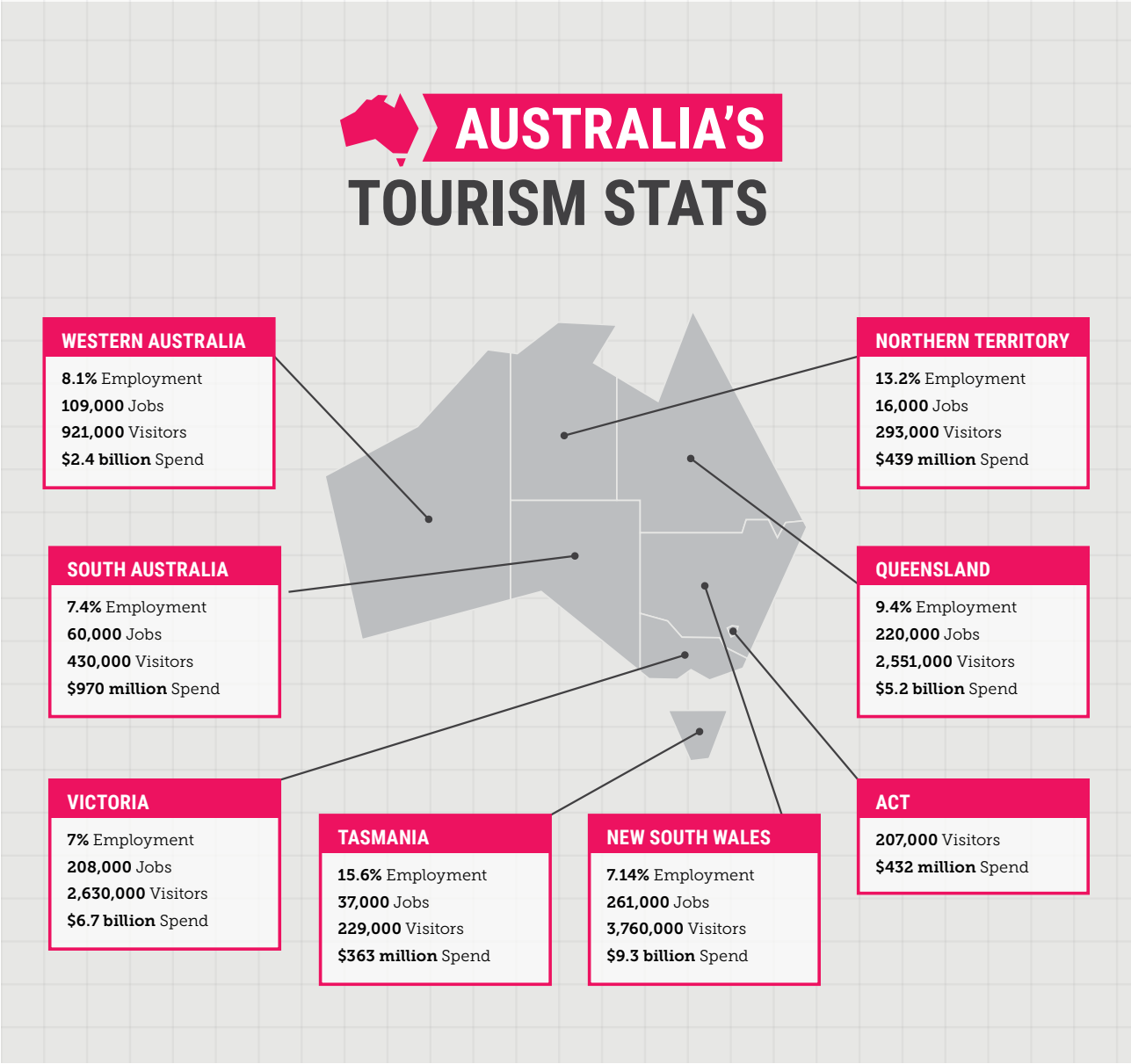
Tourism contributes more to Australia's economy than coal mining and employs nearly 15 times more people.

Table 1: Nature of international visitors.

Country	Visitors		Total Trip Expenditure	
	Number	Rank	$M	Rank
New Zealand	1,197,000	1	2,630	4
China	1,018,000	2	8,890	1
UK	663,000	3	3,871	2
US	598,000	4	3,597	3
Singapore	355,000	5	1,431	6

Source: Based on most recent data available from March 2015-16. ABS 2016a.

Figure 1: Jobs in the Australian tourism industry, the proportion of total employment, the number of international visitors, and the amount spent in different states and territories.



Sources: Tourism Research Australia 2016; Tourism Tasmania 2017; Tourism Northern Territory 2016; Queensland Government 2017; South Australia Tourism Commission; Destination NSW 2016; Tourism Victoria 2017; Tourism Western Australia 2017.

2.3 Australia's Natural Assets Are its Top Attractions

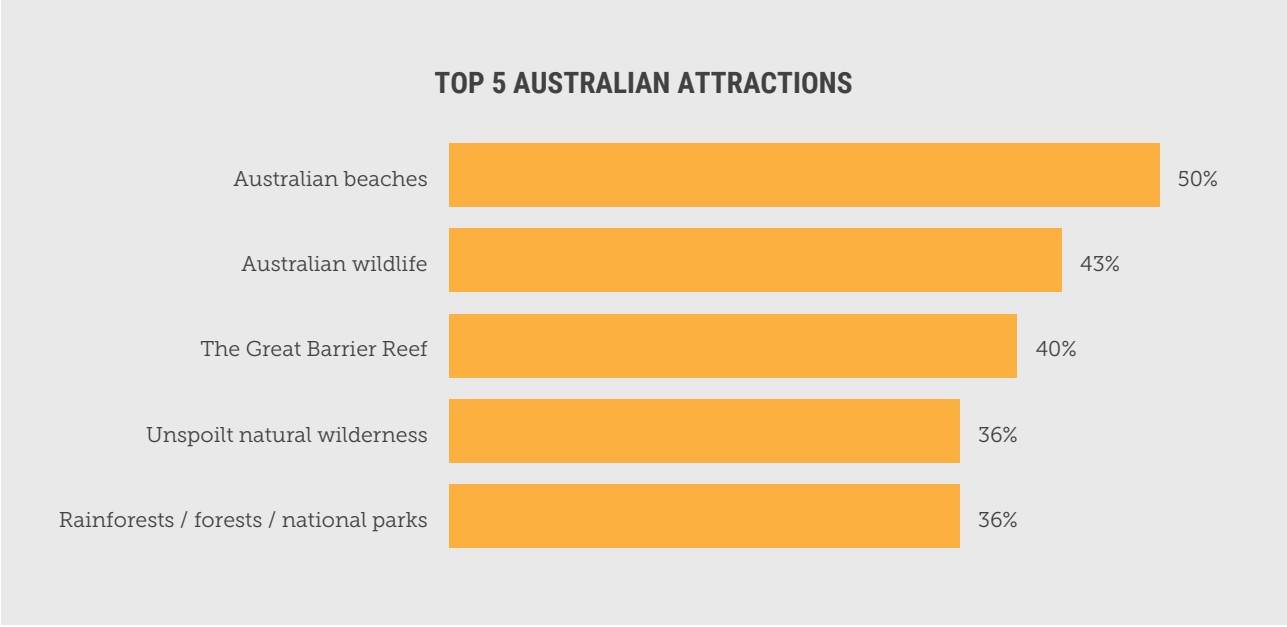
TOP TOURIST ATTRACTIONS

Nature tourism – visits to national parks and other natural areas - dominates the Australian tourism market for both local and international travellers. Indeed, in 2012-13, visitors to national parks and nature reserves spend over $23.6 billion a year in Australia, generating tax revenue for State and Territory governments of $2.36 billion a year (WWF 2014).

Tourism Australia's international visitor surveys found 49% of respondents who have not visited Australia associate the country with 'world class nature'. This figure rises to 71% among those who have visited. Most international visitors associate Australia with 'unique and interesting wildlife' (57%); 'aquatic and coastal' experiences (69%); 'remote coastal, beach and aquatic locations' (50%); and 'aquatic wildlife' (59%) (Tourism Australia 2017c).

Overall, nature-based destinations account for the top five attractions in Australia (Figure 2).

Figure 2: The top 5 Australian attractions identified by international visitor surveys. Nature-based tourism dominates the Australian market, with beaches, wildlife, the Great Barrier Reef, wilderness and national parks the top five attractions.



Source: Tourism Australia (2017c).

Nature-based tourism dominates the Australian market.

TOURIST HOTSPOTS AND PEAK SEASONS

International visitors tend to visit relatively few destinations – Sydney, Melbourne, the Gold Coast, Perth and tropical North Queensland (Austrade 2017a; Tourism Australia 2017a). International visitors spend the most in New South Wales, Victoria and Queensland. Sydney, Melbourne, Brisbane, and the Gold Coast are the most popular with domestic visitors (Austrade 2017a; Tourism Australia 2017a).

The most popular season for international arrivals is summer (December-February), followed by spring (September-November), winter (June-August) then autumn (March-May). December is the single most popular month (Amelung and Nicholls 2014).

Australia's top five tourist attractions are beaches, wildlife, the Great Barrier Reef, wilderness and national parks.

3. Climate Change Risks to Tourism

Climate change is a significant risk to tourism, with extreme weather directly affecting tourist behaviour and the viability of tourism operations. Australia's most important tourist destinations such as the Great Barrier Reef, national parks, beaches and ski fields are already feeling the effects of climate change and these impacts will accelerate over coming decades. Actions to tackle climate change are critical for the long-term viability of the Australian tourism industry.

The observed and projected impacts can be grouped into four main categories (Simpson et al. 2008; Scott et al. 2012; Turton 2014):

- Direct impacts: tourist choices about where and when to travel
- Indirect impacts: changing landscapes and affecting places where people visit
- Policy impacts: influencing travel choices
- Societal change: affecting global economic growth, and the tourism sector as a whole.

Climate change affects the tourism sector as a whole, affecting destinations and tourist choices.

3.1 Tourist Choices About Where and When to Travel

The climate of a destination, especially its temperature and rainfall, is a key consideration for tourists deciding which places to visit and when (Amelung et al. 2007; Simpson et al. 2008; Pham et al. 2010) (see Box 1: The Tourism Climatic Index). Changes in the timing and quality of climate-dependent tourism seasons, and changes in the frequency and severity of extreme weather events such as heatwaves, storms and bushfires, have considerable implications for where people choose to travel, and therefore the profitability of tourism operations.

Recent modelling shows that cities such as Melbourne and Sydney could reach extreme summer temperatures of 50°C, even if global temperature rise is kept under 2°C, the target set by the Paris Climate Agreement (see Chapter 6) (Lewis et al. 2017). Climate change-induced water scarcity has also been identified as a potential challenge for tourism operations in several regions, including southern and central Australia (Gössling et al. 2012).

Worsening extreme weather can affect where people choose to visit and when.

Figure 3: Bushfires in Australia's south and east are becoming more dangerous. Increasing severity and frequency of bushfires is already affecting tourist operators. For example, one month after the 2013 Blue Mountains bushfires, tourism operators estimated losses of nearly $30 million due to declines in visitors and cancellations alone.

3.2 Climate Change is Threatening Australia's Natural Attractions

Climate change is already affecting many features of important tourist destinations, such as biodiversity, water security, the look of landscapes, agricultural production (with implications for food and wine tourism), accessibility of beaches, and the incidence and distribution of vector-borne diseases (Simpson et al. 2008). These changes are particularly critical for a country such as Australia where the major tourist attractions are largely nature-based.

Australia is certainly not alone in terms of climate risks to tourism. Indeed, growing awareness of these risks amongst the travelling public has spawned a specific category of destination choice, known as "last chance tourism" (Lemelin et al. 2010), describing the phenomenon whereby tourists explicitly seek vanishing landscapes, seascapes and/or disappearing natural and social heritage.

Climate change threatens Australia's top tourist attractions.

3.3 Climate Change Policy Influencing Travel Choices

Policies seeking to reduce greenhouse gas pollution from the tourism sector may have very substantial impacts on the way people travel, transport choices and distances travelled (Simpson et al. 2008; Dubois et al. 2011). An increase in the cost of international flights, for example, could change where people choose to visit - with a shift to more domestic travel. Tourists focusing on reducing their impact may also choose less polluting modes of travel (such as trains), and 'eco-tourism' activities and accommodation with a focus on reducing impact (see Chapter 5 for examples of Australian tourist operators embracing opportunities to be part of the climate change solution).

Tourists may choose less polluting modes of travel, and 'eco-tourism' activities and accommodation.

3.4 Climate Change Affecting Economic Growth

Climate change poses risks to, and uncertainties about, future economic growth, at both global and national scales (Becken 2017) and threatens the political stability of some nations (Goldstein 2016). Any reduction of global GDP could reduce the spending power of tourists, as witnessed in tourism-dependent regions after the Global Financial Crisis (Sheldon and Dwyer 2010).

3.5 The Tourist Industry in Australia is Among the Most Vulnerable to Climate Change

A global analysis of the potential impacts of climate change on tourism for the United Nations Environment Programme (UNEP) identified the Australia/New Zealand region as one of five Climate Change Vulnerable Hotspots (Scott et al. 2008). This analysis concluded that Australian tourism was particularly vulnerable due to hotter summers, warmer winters, water scarcity, marine biodiversity loss, sea level rise, an increase in disease outbreaks and an increase in extreme weather events. A related study assessed climate change impacts in the region as "moderately to severely negative" (Hall 2008).

Australia is among the top five destinations most vulnerable to climate change.

Climatic factors are very important for determining key tourist 'seasons' in Australia (compared to institutional factors such as the timing of school holidays), in five out of six climate zones (Hadwen et al. 2011).

An assessment of the possible changes in climatic suitability in different regions of Australia for the 2020s, 2050s and 2080s, compared to the 1970s, has been made using two climate change scenarios and the Tourism Climatic Index (TCI) (Box 1) (Amelung and Nicholls 2014). Under a scenario in which fossil fuels (coal, oil and gas) continue to provide much of the world's energy, there is a projected southerly shift in TCI zones such that the area currently deemed "unfavourable" for general tourism activity in December-February expands to extend across the entire northern half of the continent, including the whole of Queensland, by the 2080s (Amelung and Nicholls 2014; Figure 4). The zone deemed "good-very good" under this scenario becomes considerably reduced over the same period, although the southern coast of the continent and the southeast tip remain classified as "excellent-ideal". By the 2080s, the east-west zone of locations where there are eight or more months in the year deemed "good" (TCI>70), shifts south and shrinks in area. The peak climate season is also generally reduced (up to three months in some regions).

BOX 1: THE TOURISM CLIMATIC INDEX

The Tourism Climatic Index (TCI) was developed by Mieczkowski (1985) as the first evaluation of the suitability of the world's climates for the purpose of general tourism activity.

The TCI (Table 2) was designed to encompass the most common tourist pastimes such as sightseeing, shopping, and other outdoor activities involving low to moderate levels of physical exertion. The index is based on monthly means for seven climatic variables: maximum daily temperature, mean daily temperature, minimum daily relative humidity, daily relative humidity, precipitation, daily duration of sunshine, and wind speed.

The first four variables are used to create a measure of thermal comfort, with maximum daily temperature and minimum daily relative humidity forming a daytime comfort index (representing conditions between noon and 4pm, when tourists tend to be most active outdoors). Mean daily temperature and daily relative humidity are used as the basis of a daily comfort index (representing conditions over a full 24-hour period). The seven variables are then weighted according to their relative influence on tourist well-being, to form the final index, a number between 0 and 100. The index is then used to described the suitability of a location's climate for tourism.

Table 2: The Tourism Climatic Index.

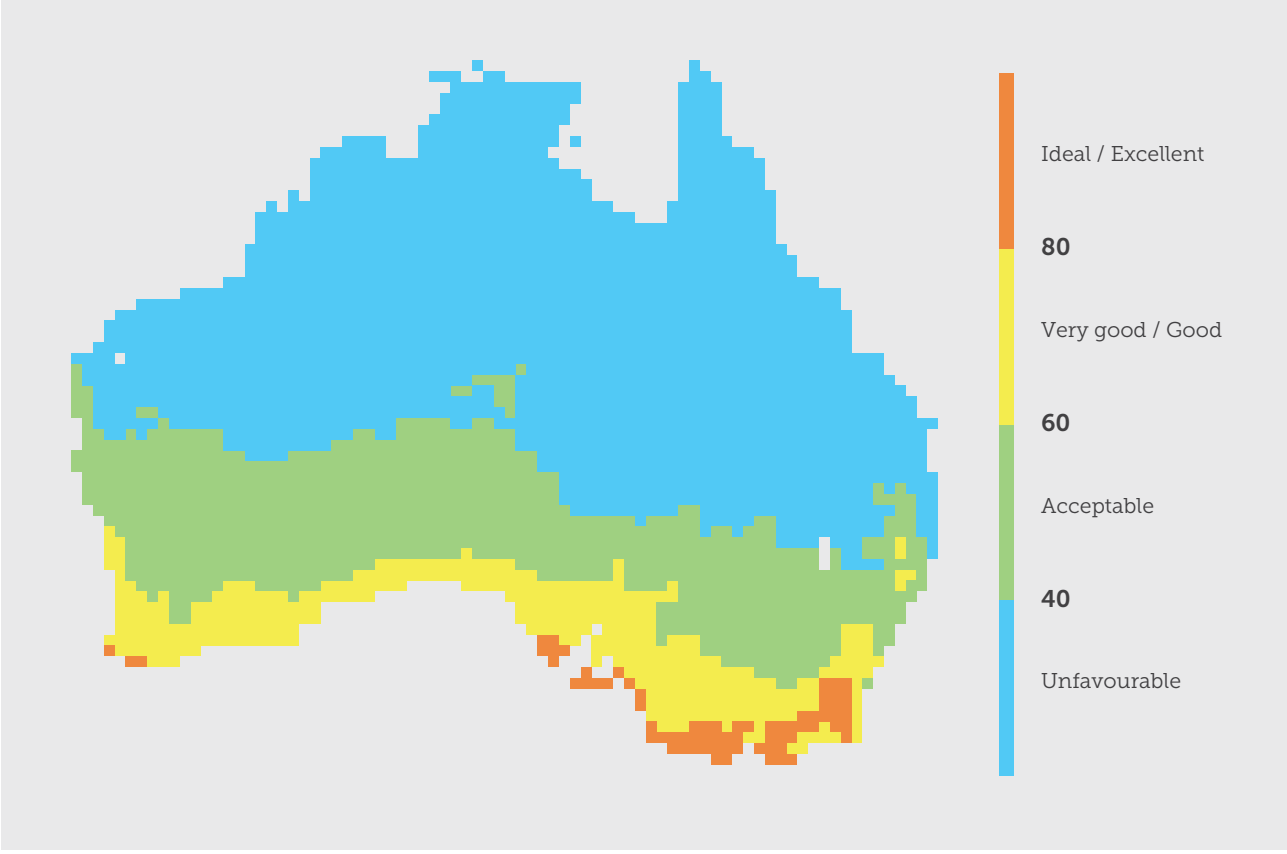
Numeric value of index	Description of comfort level for tourism activity
90-100	Ideal
80-89	Excellent
70-79	Very good
60-69	Good
50-59	Acceptable
40-49	Marginal
30-39	Unfavourable
20-29	Very unfavourable
10-19	Extremely unfavourable
Below 9	Impossible

Sources: Mieczkowski 1985; Amelung et al. 2007; Amelung and Nicholls 2014.

Without effective action to address climate change, the entire northern half of Australia could be deemed "unfavourable" for general tourism activity by later this century.

In summary, the Amelung and Nicholls (2014) analysis, confirming earlier work by Turton et al (2009), indicates that destinations in the north such as Darwin, Kakadu National Park, and much of Queensland, including the key access points to the Great Barrier Reef such as Cairns and Townsville, could become inhospitable during substantial parts of the year, especially in the summer months – the peak season for international visitors. Brisbane and the Gold Coast are also projected to suffer substantial declines in climate attractiveness during the high season. Southerly destinations such as Melbourne, Sydney, Adelaide and the south coast may enjoy improved conditions over longer periods of the year, though declines are expected in summer, as in the north.

Figure 4: Climatic conditions in summer in Australia expected by the 2080s.



Source: Amelung and Nicholls 2014; Turton et al. 2009.

4. Climate Change Risks to Australia's Top Tourist Destinations

Australia's most important tourist destinations are already feeling the effects of climate change and these impacts will accelerate over coming decades. This chapter identifies the risks to Australia's most important tourist attractions, describing the climate impacts that have already been observed, potential future risks, and the associated effects on the economy and dependent communities.

4.1 The Great Barrier Reef

Coral reef ecosystems provide jobs and income to local communities from fishing, recreation, and tourism, supporting the livelihoods of 500 million people globally. Coral reefs are estimated to contribute US$36 billion to the global tourism economy (Spalding et al. 2017).

Stretching 2,300 kilometres along Australia's northeast coast, the Great Barrier Reef (GBR) is the largest single living marine structure on Earth and one of the world's seven natural wonders. The GBR attracts more than 2.2 million international and 1.7 domestic visitors per year, and is also used by a large proportion of the 1 million people living in the region (TRA 2015b). Visitors spent an estimated 26 million nights in the GBR region in 2015-16 (Deloitte Access Economics 2017). Tourist revenue comes from a wide variety of water-activities, including snorkelling and diving, birdwatching, whale-watching, kayaking, fishing charters and sailing (Wilson and Turton 2011; Becken 2016).

The GBR contributed an estimated $6.4 billion to the Australian economy in 2015-16, of which $5.7 billion comes from the tourism industry, and 64,000 direct and indirect jobs (Deloitte Access Economics 2017). The GBR was worth an estimated $3.9 billion to Queensland alone, providing 33,000 jobs. Overall, the economic, social and icon asset value of the GBR to Australia has been conservatively valued at $56 billion (Deloitte Access Economics 2017).

Coral reefs such as the GBR are subject to multiple threats globally, including over-exploitation by tourism, deforestation, farming, overfishing, nutrient runoff, pests and diseases, and coastal development. But climate change is emerging as the greatest threat, due to rising ocean temperatures causing coral bleaching, and increasing ocean acidification due to the absorption of atmospheric carbon dioxide by seawater. Sea level rise and increased intensity of tropical cyclones also pose significant threats.

In 2016, the GBR was devastated by the worst bleaching event on record, affecting over 90% of individual reefs (Figure 5), with extensive mortality of coral in the northern, most pristine section (Hughes et al. 2017). During the 2016 bleaching period, sea surface temperatures of 1.0-1.3°C above the 1961-1990 average for February, March and April were recorded - the hottest since records began (BoM 2017). This bleaching event came on top of ongoing reef degradation from a number of threats, with an estimated 50% loss of coral cover occurring between 1985 and 2012 (De'Ath et al. 2012).

The Great Barrier Reef is Australia's most valuable tourist icon.

In 2015-16, the Great Barrier Reef tourism industry was valued at $5.7 billion, providing 64,000 direct and indirect jobs.

In 2017, the reef was struck by bleaching again, this time affecting the central region from Port Douglas to Townsville. In February and March, sea surface temperatures were 0.8-0.9°C above average (BoM 2017). Of particular concern is that this event occurred in a neutral El Niño year – all other significant bleaching events (1998, 2002) have occurred during El Niño years. The El Niño phase of the El Niño Southern Oscillation (ENSO) phenomenon refers to the extensive warming of the central and eastern Pacific Ocean that leads to a major shift in weather patterns.

Figure 5: Bleaching at Heron Island in February 2016. The worst bleaching event on record at the Great Barrier Reef resulted in bleaching of more than 90% of individual reefs.

The Great Barrier Reef is extremely vulnerable to the effects of climate change, particularly underwater heatwaves.

Virtually the whole of the Great Barrier Reef Marine Park has now been affected by bleaching, with only a few southern offshore reefs remaining unaffected (Hughes et al. 2017).

Analysis by King et al. (2016) has indicated that the extremely warm ocean temperatures in 2016 were virtually impossible without climate change. More specifically, conservative estimates show that the observed warming in the Coral Sea was at least 175 times more likely to occur because of climate change. As the oceans around Australia continue to warm (CSIRO and BoM 2016), the frequency of bleaching is increasing (Ainsworth et al. 2016), and this trend is likely to continue. With more bleaching events, and shorter times between events, the chances that the corals will recover are diminishing (Hughes et al. 2018). Climate projections for the future sadly indicate that the extreme ocean temperatures that caused the most recent bleaching could occur every two years by the mid-2030s (CoECCS 2016).

Reports in early 2018 of localized bleaching in the southern sector of the GBR (eg. Heron Island) (The Guardian 2018b) indicate that an unprecedented third year of mass bleaching could occur.

For more details about the cause of the recent mass global bleaching event, please refer to our reports:

Australia's Coral Reefs Under Threat From Climate Change

Climate change: a deadly threat to coral reefs.

Mass bleaching events have now affected virtually the whole Great Barrier Reef Marine Park.

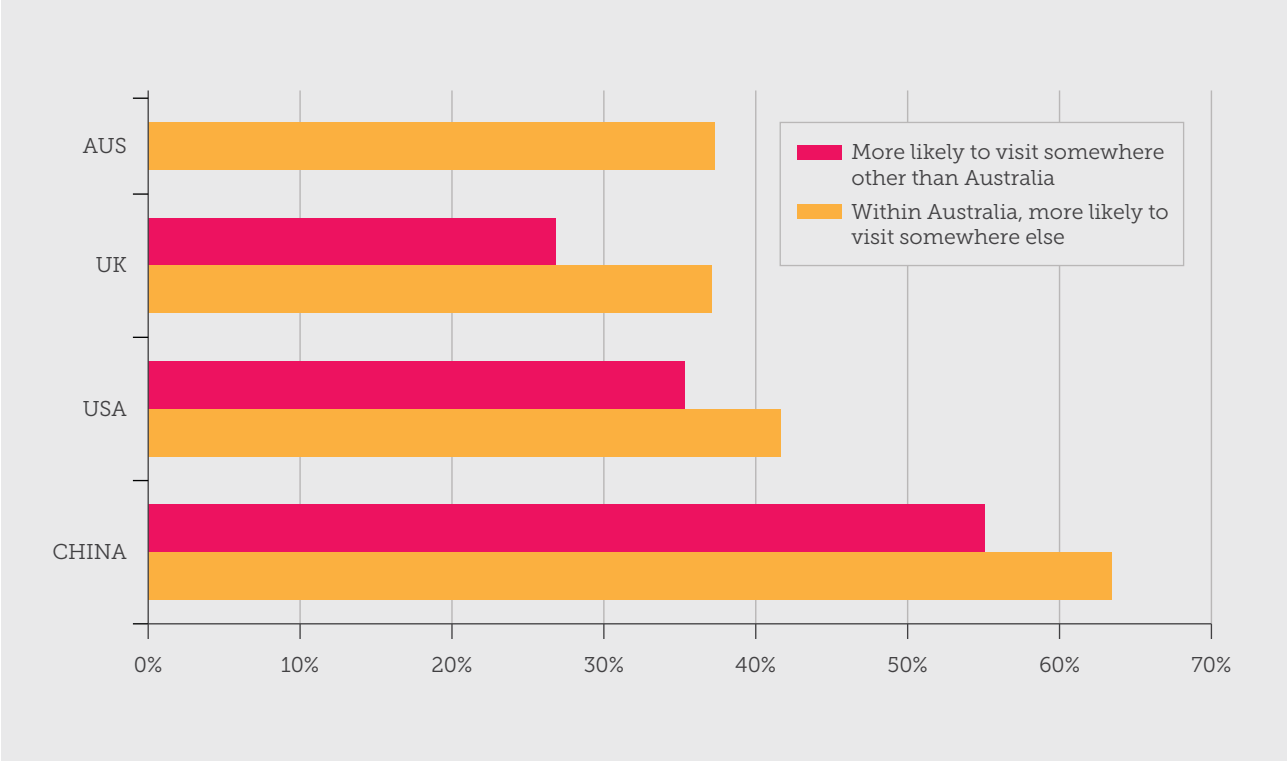
Extreme coral bleaching could be the 'new normal' by the 2030s.

Damage to the Great Barrier Reef from bleaching could affect tourist numbers into the future. A survey conducted several years before the latest events found that a hypothetical reduction in fish abundance, coral cover and coral diversity of 80%, 30%, and 70% respectively could lead to an 80% decline in reef trips taken by divers and snorkelers, corresponding to a decrease in tourism expenditure in the Cairns region of about A$103 million per year (Kragt et al. 2009; Figure 7).

More recent surveys confirm the potential for tourism losses as a result of bleaching damage. In one survey conducted just before the 2016 coral bleaching event in three major tourism hotspots (Port Douglas, Cairns and Airlie Beach) 69% of tourists indicated they wanted to visit the reef "before it was gone" (Piggott-McKellar and McNamara 2016) – a clear example of the 'last chance tourism' phenomenon (Coghlan 2012). Another conducted after the bleaching event in 2016 by The Australia Institute (2016) revealed that if the reef continues to experience severe bleaching and some of the reef dies (as happened after completion of the survey), a significant proportion of visitors were more likely to visit countries other than Australia (Figure 7). This survey also showed that if coral bleaching persists, tourism areas adjacent to the Great Barrier Reef could see the number of visitors being reduced from 2.8 million (2015 figures) to around 1.7 million per year. This is the equivalent of more than $1 billion in tourism expenditure, threatening around 10,000 tourism jobs in regional Queensland.

Figure 6: Tourists snorkeling on the Great Barrier Reef. Surveys have found that as fish, coral cover and coral diversity declines there could be a significant decline in tourism expenditure in the Cairns region.

Figure 7: Survey of tourists answering the question "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".



Source: The Australia Institute 2016.

Concerns about reef quality have been increasing amongst reef visitors over the past decade. A visitor survey conducted in 2007 ranked commercial fishing as the number one threat to the reef, with rising temperatures rated second, and bleaching rated fourth (Coghlan 2012). In 2008, designated the International Year of the Reef, a repeat survey by the same author found general pollution to be the number one concern, followed by climate change (Coghlan 2012). While the two surveys posed the questions in slightly different ways, the study concluded that increased awareness of climate change threats had occurred amongst the visitor population. A further survey in 2010 found a significant drop in satisfaction scores of visitors compared to previous years (going back to 2007) although the reason for this was not explained. Visitors surveyed in 2012-13 scored the natural values of the Great Barrier Reef World Heritage Area highly and responded more negatively to the prospect of environmental degradation than a hypothetical 20% rise in local prices (Esparon et al. 2015). Clear ocean, healthy coral reefs and fish, and lack of rubbish were the three most important values.

The impacts of climate change on reef tourism operations are not limited to bleaching. Projected increases in the intensity of tropical cyclones will not only accelerate reef damage (Cheal et al. 2017) but also increase insurance costs. Severe tropical cyclone Yasi, which hit the North Queensland Coast in February 2011, was one of the most powerful cyclones to have

Damage to the Great Barrier Reef is likely to significantly reduce the number of tourists to Australia.

affected Queensland since records began and is estimated to have cost the tourism industry $600 million (QRA and World Bank 2011). An east coast low that brought intense rainfall to the NSW coast and Hunter Valley, causing widespread flooding in April 2015, resulted in losses of $110 million to the local tourism industry (Naumann 2015). Winds of 260 km/hr were recorded during Tropical Cyclone Debbie in 2017, resulting in nearly 70,000 claims with losses estimated at nearly $1.5 billion (ICA 2017). These impacts have been particularly felt by tourism operators in the Whitsundays where resorts on Daydream and Hayman Islands were so badly damaged that they are not expected to reopen until 2018 (ABC 2017).

4.2 National Parks

THE RED CENTRE AND ULURU-KATA TJUTA NATIONAL PARK

In 2015-16, 1.7 million people visited the Northern Territory, a 28% increase on the previous year, with more than $2.2 billion in overnight spending by travellers, the majority of which came from the domestic market (Tourism Northern Territory 2016). A record number of 577,000 domestic tourists also travelled to the Northern Territory during this period, a 27% increase on the previous year (Tourism Northern Territory 2016).

Uluru is among Australia's most recognised natural landmarks (Figure 8). The Uluru-Kata Tjuta National Park received more than 300,000 visitors in the 2015-16 financial year (Tourism Northern Territory 2016). A survey conducted among more than 500 visitors to central Australia in 2011 found that 69% of visitors were domestic and 31% international, mainly from Germany, USA, the UK, Netherlands, Switzerland and New Zealand (Tourism Northern Territory 2012). Among these visitors, Uluru-Kata Tjuta National Park was the most popular attraction, with 86% of those that visited Uluru-Kata Tjuta also travelling to Alice Springs (the area encompassing Alice Springs and Uluru is often referred to as the 'Red Centre'). Visiting an iconic destination was identified by these tourists as the most important reason for coming.

Figure 8: Uluru-Kata Tjuta National Park is the most recognised natural landmark in Australia and brings hundreds of thousands of visitors to the region each year.

The 'Red Centre' faces increasing extreme heat, with projections of 113 days a year above 35°C by 2030.

The most significant impact of climate change on future tourism in the Red Centre will be increasing extreme heat. While average, daily minimum, and daily maximum temperatures will continue to increase for all regions in Australia, inland Australia will experience the greatest increases (CSIRO and BoM 2015). In Alice Springs, for example, the number of days over 35°C per year, relative to the 1981-2010 climate, is projected to increase from 94 to 113 by 2030, and to 168 by 2090 under a high emissions scenario (CSIRO and BoM 2015).

In the last three years, 62% of international tourists visited Uluṟu-Kata Tjuṯa between October and March (Tourism Northern Territory 2017a), the hottest months. While climbing Uluṟu is now banned for cultural reasons (Norman 2017), climbing times were already becoming more restricted for safety reasons due to heat.

Settlements in the Red Centre such as Uluṟu and Alice Springs also face potential declines in water security. These settlements depend on groundwater extraction for their water supply and are thus vulnerable to reduced runoff, especially when combined with increasing extraction (Box et al. 2008). Water being extracted from the Amadeus Basin Aquifers is estimated to be between 10,000 and 30,000 years old, and the contemporary recharge is considered minimal. The Alice Springs Water Allocation Plan (2016-2026) acknowledges that this water resource should be considered non-renewable, and that it is effectively being mined to sustain the settlements. The Plan also acknowledges that the net impacts of climate change on this resource are uncertain; increasing temperatures and evaporation are likely to reduce recharge rates even further, but any increased intensity of storm events may counteract this impact (Northern Territory Government 2016).

The 'Red Centre' faces increasing extreme heat and possible declining water supplies.

STATE SNAPSHOT:

CLIMATE CHANGE TOURISM RISKS

NINGALOO REEF:

Coral bleaching due to warmer water.

RED CENTRE:

Increasing extreme heat, declining water security.

NORTHERN HALF OF AUSTRALIA :

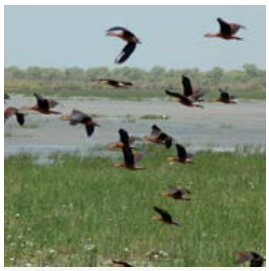
Unfavourable climate for tourist activities over December to February by 2080s.

BEACHES:

More than 50% of the Australian coastline vulnerable to erosion due to sea level rise.

SPORT TOURISM:

Heatwave health concerns.



TOP END:

Increasing hot days, bushfire intensity and saltwater inundation affecting Kakadu National Park.

GREAT BARRIER REEF:

Mass coral bleaching due to warmer water.

DEADLY JELLYFISH:

Moving south as oceans warm.

THE BAROSSA VALLEY & RIVERLAND WINERIES:

Threatened by reduced rainfall and warmer temperatures.

LORD HOWE ISLAND:

Rising temperatures threaten unique plant communities.

ALPINE AREAS:

Less snow, shorter ski seasons.

SPORT TOURISM:

Heatwave health concerns.

BUSHFIRES:

Increasing severity and frequency.

Figure 9: Kakadu National Park is a biodiversity hotspot and home to one third of Australia's birds.

THE 'TOP END' AND KAKADU NATIONAL PARK

Australia's 'Top End' is home to World Heritage-listed Kakadu National Park, located 150 km east of Darwin. Kakadu National Park is recognised nationally and internationally for its conservation and cultural values (Turton et al. 2008). This biodiversity hotspot is home to over one third of Australia's birds, a quarter of Australia's mammals, 2,000 plant species and at least 50 freshwater fish species (Hyder Consulting 2007). The Kakadu wetlands, listed as a Ramsar site of International Significance, provide critical habitat for thousands of migratory birds (Figure 9), as well as ceremonial and cultural activities by the traditional indigenous owners.

The Top End has a dry season from April to October and a hot humid season from November to April when about 85% of the average yearly rainfall occurs (BoM 2017). The dry season, when weather conditions are more comfortable and most of the park is accessible by road, is the peak time for tourists (Tourism Northern Territory 2017a). In 2015-2017, the Kakadu-Arnhem tourism region attracted an average of 222,000 visitors per year (Tourism Northern Territory 2017b). Approximately half of these visitors were from interstate, with the remainder split evenly between intra-Territory and international sources. In total, tourists injected $193 million to the local economy.

Saltwater intrusion and increased bushfire intensity threaten Kakadu National Park.

Darwin is projected to experience 43 days above 35°C on average each year by 2030 and up to 265 by 2090.

Average temperatures in the Top End will continue to rise in all seasons. Darwin could see an increase in hot days (temperatures above 35°C) from 11 (1981-2010 average) to 43 by 2030, and up to 265 by 2090 under a business-as-usual emissions scenario (Webb and Hennessy 2015). While fewer tropical cyclones are expected in the future, there could be a greater proportion of high-intensity storms (CSIRO and BoM 2015). Increased temperatures and changes in the monsoon season may also result in increased bushfire intensity (ANU 2009).

By 2050, Darwin is expected to experience a mean sea-level rise of up to 0.25 m relative to 1986-2005 levels, increasing up to 0.62 m by 2100 under a high emissions scenario (McInnes et al. 2015). For this sea-level rise, a 1-in-100 year flooding event would likely occur every day or so by 2100 (Hunter 2012).

Rising sea levels pose a serious risk to the freshwater wetlands of Kakadu National Park (Hennessy et al. 2007). Sea levels are currently rising at about twice the global average in Northern Australia (DEE 2017). Much of the Kakadu floodplain has very low relief – only 0.5 m above sea level for more than 70 km (Finlayson et al. 2009). This means that relatively small increases in sea level can potentially have very large impacts. Salt water intrusion into the wetlands is already evident (Lucas et al. 2002) and has been accelerating since the 1950s (Winn et al. 2006). In the East Alligator River region, intrusion of salt water several kilometres along tidal creeks has occurred over the past few decades, resulting in a nine-fold increase in the area of saline mudflats and mangroves and more than 60% loss of Melaleuca-dominated freshwater swamp vegetation (Winn et al. 2006). The causes of the intrusion are complex, likely a combination of sea-level rise, higher flood levels, high tidal range, and buffalo damage to the protective levee that acts as a partial barrier between fresh and saltwater in Kakadu (Bowman et al. 2010). Sea-level rise associated with a 2-3°C rise in global temperatures could threaten 80% of freshwater wetlands, with the escarpment being a barrier restricting opportunities for the wetlands to migrate inland (ANU 2009).

Other climate change-associated risks to tourism in the Top End include impacts on the indigenous and cultural values. Indigenous rock art, for example, is vulnerable to damage from increased rainfall intensity (ANU 2009). Increased temperatures and changed rainfall patterns may also lead to the re-emergence of diseases such as malaria, encephalitis, meliodosis and West Nile virus (ANU 2009).

4.3 Iconic Beaches

Australia's spectacular coastline with over 10,000 beaches is beloved by national and international visitors alike and is the mainstay of the tourism industry. Indeed, international visitors rank beaches as the No. 1 Australian attraction (Tourism Australia 2017c, Figure 2) and an estimated 62% of international visitors visit beaches at some time during their stay (TRA 2006).

A recent study estimates that the pace of global sea-level rise has nearly tripled since 1990 (Dangendorf et al. 2017). More than 50% of the Australian coastline is vulnerable to erosion from rising sea levels (Table 3). Australian sea levels have been rising 2.6-2.9 mm per year over the 1993-2013 period (CSIRO and BoM 2016). Sea level is projected to rise by 26-55 cm for a low emissions scenario and 45-82 cm for a 'business as usual' scenario by 2080-2100, relative to 1986-2005 levels (CSIRO and BoM 2015), although there will be regional differences due to different rates of land movement and other factors. Larger rises cannot be ruled out because of uncertainties around the stability of the large ice sheets on Greenland and marine-based ice sheets in Antarctica as the climate continues to warm. If the current increase in the rate of mass loss from the polar ice sheets continues, it alone could contribute up to 0.5 m to sea-level rise by 2100 compared to 1990 (Rignot et al. 2011). A 1.1m rise in sea level is estimated to put $226 billion (2008 replacement value) worth of homes and infrastructure in coastal areas at risk (DCC 2009; DCCEE 2011).

As sea levels continue to rise, coastal flooding during high sea level events will become more frequent and more severe (CSIRO and BoM 2015). For example, locations including Sydney, Melbourne, Hobart, Cairns, Darwin, Fremantle and Adelaide are all projected to have a least a one hundred-fold increase in the frequency of coastal flooding events (Hunter 2012).

For more details on how climate change is expected to affect Australia's coastline see the following Climate Council Reports:

Counting the Costs: Climate Change and Coastal Flooding

Cranking up the Intensity: Climate Change and Extreme Weather Events

Table 3: The fraction of the Australian coastline susceptible to recession under sea level rise, defined as shores composed of sand and mud, backed by soft sediment (so that recession is largely unconstrained), and shores composed of soft rock.

State	Total length of open coast, km	Total length of vulnerable coast, km	Proportion of vulnerable coast (%)
Victoria	2,395	1,915	80
NSW	2,109	839	40
Queensland	12,276	7,551	62
NT	11,147	6,990	63
WA	20,513	8,237	40
SA	5,876	3,046	52
Tasmania	4,995	2,336	47
Australia	**59,311**	**30,914**	**52**

Source: DCC 2009; Climate Council 2014.

Sea-level rise, increased coastal flooding, and associated loss of sand have important implications for the tourism and recreational value of beaches in Australia. Surveys of tourist responses to beach damage scenarios suggest that 17-23% would respond by switching destinations, with an estimated $56 million loss per year for Sunshine Coast in QLD and $20 million per year for the Surf Coast in Victoria (Raybould et al. 2013).

Sea-level rise and coastal flooding also have significant implications for visitor-associated infrastructure. A report commissioned by the Surf Life Saving Association of Australia (SLSA), the premier water safety, drowning prevention and rescue body, found that 63% of surf life-saving clubs were situated in vulnerable areas, many on sandy beaches only metres from the shoreline (Elrick et al. 2011).

More than 50% of Australia's coastline is vulnerable to erosion as a result of sea level rise.

Climate change may be expanding the distribution of deadly jellyfish along Queensland's coast.

Adaptation strategies to reduce the impacts of sea-level rise on coastlines include both "hard" and "soft" options (Becken 2016). Hard engineering structures include sea walls, breakwaters and groynes. While reducing coastal erosion locally, these costly structures interfere with the natural transport of sand and cause erosion elsewhere on the coast. Soft options include adding sand to replace loss during storms and erosion, known as "beach nourishment". While more benign than some harder options, these types of interventions can have significant ecological impacts, and can also be costly (see Box 2 on the Gold Coast). Protection and restoration of natural ecosystems such as mangroves and reefs can have substantial benefits for coastal protection as well as providing biodiversity habitat, a general practice known as Ecosystem-based Adaptation (Lo 2016).

Figure 10: As the oceans warm, the deadly Irukandji jellyfish is capable of moving south and establishing along the Queensland coast near highly populated areas and popular tourist destinations.

A further concern for beachgoers and the Queensland tourism industry is the potential for the increased southerly distribution of the highly venomous irukandji jellyfish (Figure 10). The irukandji season has been lengthening since the 1960s in North Queensland (Carrette and Seymour 2013). As ocean waters warm, many tropical marine species have been observed moving into sub-tropical waters, with irukandji being observed as far south as Hervey Bay and Fraser Island as recently as January 2018 (The Guardian 2018b). These jellyfish cause a range of symptoms, including severe pain, headaches, hypertension, tachycardia and pulmonary oedema, and have been responsible for at least two deaths and hundreds of hospitalisations. Laboratory experiments have shown that the jellyfish polyps are capable of surviving summer conditions in South East Queensland (Klein et al 2014).

BOX 2: THE GOLD COAST

The Gold Coast in Queensland is one of Australia's premier tourist attractions, especially for domestic visitors. Home to Australia's most famous beach, Surfer's Paradise, the region attracted nearly 12 million visitors in 2013, bringing in $4.7 billion to the local economy and directly providing 30,000 jobs (GCTC 2014). A 2013 survey of 300 visitors to the Gold Coast identified great swimming beaches as the number one reason for visiting, with 74% identifying beach visits as their top activity (TRA 2013b).

Beaches such as those on the Gold Coast are extremely vulnerable to recession as sea level rises, combined with the impacts of increased storm surges (Sano et al. 2011), and more southerly occurrence of tropical cyclones (Kossin et al. 2014). There is little to no opportunity for these beaches to move landwards due to the adjacent high-rise development (Figure 11).

The Gold Coast coastline has been highly modified since the 1960s. Artificial sand dunes over rocky armouring are actively maintained by Gold Coast City Council – a process known as "beach nourishment", which requires 400,000 to 700,000 m^3 of sand transported each year. Tidal inlets are also artificially maintained with dredging, and jetties with rock groynes and an artificial surf reef provide coastal protection.

The cost of beach nourishment will be an estimated $11-54 million per year over the next century, depending on the sea-level rise scenario used (Cooper and Lemckert 2012). This analysis concluded that pre-planned adaptation would probably enable the Gold Coast to survive a sea level rise of 1 m, but a 2 m rise would severely stretch the city's resources. The raising of the artificial dune and the rock bund would require additional material and cost, varying between $30 and 150 million per year over the next century depending on the rate of sea level rise (DCC 2009). Protection of the 500 km long lagoonal shoreline will also require revetments around the entire perimeter of the waterbody and raising of bridges and roads. Under a 1 m sea level rise, the entire area would likely be vulnerable to flooding semi-annually without systematic enhancement of coastal protection.

Figure 11: Erosion on the Gold Coast, Queensland. These coastlines are extremely vulnerable to recession and there is no opportunity for them to move landwards due to the adjacent high-rise development.

4.4 Alpine Areas and Ski Tourism

While Australia's alpine areas and ski fields are relatively small by international standards - attracting around 1% of the world's ski visitors - the ski industry is an important tourism asset for southeastern states. The ski industry is concentrated in the Snowy Mountains region of New South Wales and Victoria with 10 ski resorts spread across the Australian Alps, with another two small resorts in Tasmania.

In 2011, there were an estimated 2.91 million visitor days in New South Wales and Victorian alpine resorts, worth $2 billion per year and supporting 25,000 jobs (NIEIR 2013). Many local businesses (~38% New South Wales and 30% in Victoria) do not operate outside the winter months (NIEIR 2013). Non-snow-based tourism revenue is worth only about 30% of winter revenue (Morrison and Pickering 2013).

Ski tourism has been one of the industries most visibly affected by climate change.

Only about 0.15% of the Australian continent receives snow. Snow cover of 60-70 days is considered viable in Australian ski resorts, compared with the "100 day" value often used to assess viability in Europe and North America (Walters and Ruhanen 2015). Significant winter snow cover in most years lasts only a few weeks at 1200-1400m, and up to 4 months or more at elevations of 1800-2000m (Whetton et al. 1996). The relatively brief ski season means that profits are made over a short period and most resorts make considerable amounts of artificial snow to supplement natural cover (Bicknell and McManus 2006).

Ski tourism has been one of the most visibly affected by climate change, both globally and in Australia, with an inherent reliance on reliable snow cover (Bicknell and McManus 2006). Declines of maximum snow depth and decreasing season length at Australian ski resorts have been reported for over 25 years (Bhend et al. 2012; Bormann et al. 2012; Fiddes et al. 2015; Harris et al. 2016; Thompson et al. 2016). For example, the length of the ski season has contracted by 17-28% across all Victorian resorts in recent decades with the greatest contraction at Mt Stirling and Mt Buller, and least at Mt Baw Baw and Falls Creek (Harris et al. 2016). Declining snow cover is strongly associated with increasing maximum temperatures.

Figure 12: Thredbo ski resort in the Snowy Mountains, New South Wales. The ski industry is very important to regional economies in New South Wales and Victoria.

As the climate continues to warm, ongoing declines of snow are projected for all alpine areas, with resorts at lower elevations most vulnerable (e.g. Whetton et al 1996, Whetton 1998). Average temperatures could increase by 4-5°C (compared to the 1961-2010 average) by the end of the century under a high emissions scenario and annual precipitation could decrease up to 20% (Harris et al. 2016). Coldest winter temperatures could increase by 2.5-7°C. Substantial declines in snowfall are projected for all resorts over the rest of this century – 60-80% under a high emissions scenario. Under this scenario, only the highest peaks (such as Mt Perisher and Falls Creek) will experience any snow (Harris et al. 2016).

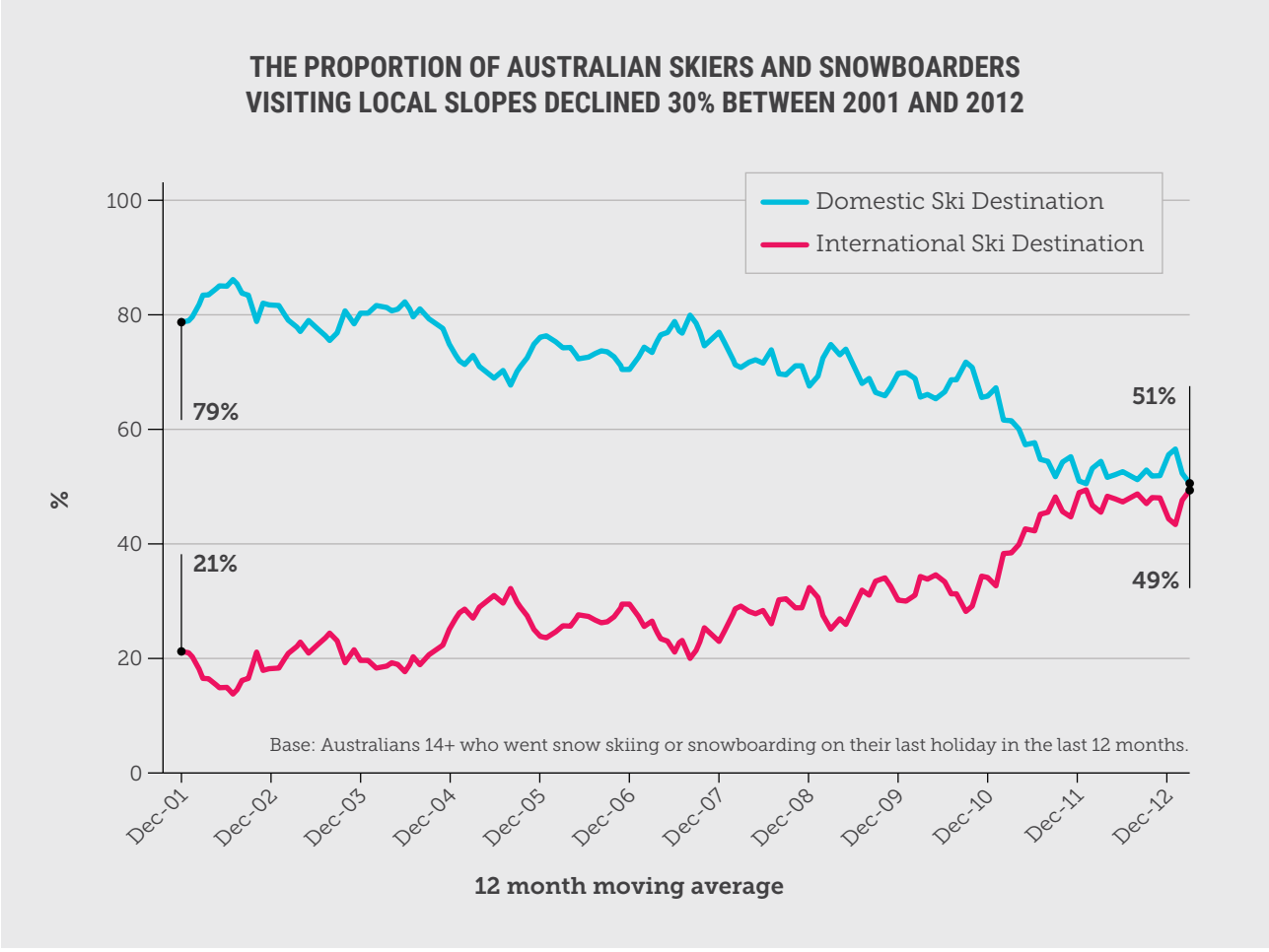
Declining domestic tourism is already being experienced in Australian alpine resorts. Between 2001 and 2012, the proportion of Australian skiers and snowboarders visiting local slopes has declined 30% (Figure 13). As skiers and snowboarders look to better conditions elsewhere around the world, including New Zealand, Japan and Canada, this trend is likely to continue. Differential impacts of climate change on snow cover in Australia and New Zealand may be particularly critical for the relative competitiveness of ski resorts in the two countries (Hendrixx et al. 2013; Hopkins et al. 2013). By the 2040s, for example, some climate models indicate that maximum snow depth at Australian resorts could decline by 57-78% (Hendrixx et al. 2013). The same climate models applied to New Zealand resorts over the same period suggest snow cover there will be largely unchanged.

As the climate continues to warm, less snow is projected for all alpine areas.

As natural snow cover continues to decline, the need for artificial snow-making to maintain the viability of resorts will increase. Indeed, in years of low snowfall, some resorts have only been able to open due to artificial snow-making (Pickering et al. 2010). Unfortunately, opportunities to make artificial snow will progressively decrease at the same time because snow can only be made under conditions of low temperature and humidity (Bicknell and McManus 2006). Relative to the 2010s, it has been estimated that opportunities for snow making could be approximately halved by 2030 at most resorts (Harris et al. 2016).

Snow-making is also costly and water-demanding. For example, one resort operator at Perisher Blue increased the total number of snow guns to 271 and the area of artificial snow to 53 ha, at a cost of $19 million between 2007-2009 (Pickering et al. 2010). Artificial snow-making also relies on the availability of water and electricity. Analysis by Pickering and Buckley (2010) showed that for six main resorts, compensating for the reduction of natural snow cover will require 700 additional snow guns by 2020, requiring ~$US 100 million in capital investment and 2500-3300 ML of water per month, as well as increased energy consumption. At the

Figure 13: Australian skiers and snowboarders split on hitting local vs overseas slopes.



Source: Roy Morgan Research 2013.

same time, water availability is likely to decrease in the Australian Alps in the future, from a combination of higher summer temperatures, lower precipitation, and reduced runoff. By the 2020s, snowmaking at the lower elevation resorts may simply be too costly (Pickering and Buckley (2010). An additional problem is that snow-making competes for water use with conservation, agriculture and fire protection needs, creating social resistance to the practice amongst some stakeholders (Morrison and Pickering 2013).

Visitation rates at ski resorts are positively correlated with snow cover (Pickering et al. 2010) and surveys of skier attitudes emphasise the economic vulnerability of the ski tourism industry in Australia. Ninety percent of ski tourists surveyed in 2007 at Perisher Blue indicated they would ski less often in Australian resorts in the next five years if the resorts had low natural snow (Pickering et al. 2010). This result represented a significant change of attitudes compared to a survey using the same questions conducted in 1998, when only 75% of respondents indicated they would be less likely to ski (König 1998). A further survey of ~230 Australians who had travelled to the Australian Alps for a winter holiday found that declines in snow would result in many considering going elsewhere to ski and/or to simply ski less (Cocolas et al. 2015). These surveys collectively demonstrate a fairly low resilience of customers to climate change-related deterioration in skiing conditions.

Snow making could become too costly for many Australian ski resorts in the future.

Awareness of the ski industry to climate change risks is growing, with increased diversification to year-round tourism seen as a necessary adaptation to deteriorating ski conditions (Bicknell and McManus 2006; Walters and Ruhanen 2015; Morrison and Pickering 2013). Many ski tourism operators surveyed by Roman et al. (2010), however, felt overwhelmed by the issue of climate change, and were far more focused on dealing with current seasonal variation and extreme weather events, than planning for long-term changes.

4.5 Wilderness Areas and Other Tourist Destinations

BLUE MOUNTAINS BUSHFIRES

Tourism contributed $395 million to the Blue Mountains regional economy In 2015-16 and directly employed 3,000 people (Tourism Research Australia 2017). The region is extremely fire prone and thus at increasing risk from dangerous fire weather conditions. A month after severe bushfires in 2013 in which two people died and more than 200 houses were destroyed, tourism operators estimated losses of nearly $30 million due to declines in visitors and cancellations (ABC 2013).

AUSTRALIAN OPEN TENNIS TOURNAMENT

The 2014 Australian Open injected a record $245.5 million into the Victorian economy, and supported more than 1,100 jobs (Australian Open 2016). But during the tournament, matches were suspended when temperatures peaked in the mid-forties. Some players even referred to the conditions as 'inhumane' (The Guardian 2014). Similar issues have occurred in 2018 when some matches were played in temperatures reaching the high 30°C and 40°Cs. Performing in extreme heat could have severe health outcomes for athletes, with a number of doctors raising concerns (ABC 2018a; news.com.au 2018).

WINERIES IN SOUTHERN AUSTRALIA

In 2014-15 wine tourism in Australia generated over 15,000 visitor nights, $59 million in visitor expenditure (international and domestic visitors combined) and supported nearly 116,000 direct and indirect jobs (TRA 2015a). Increasing temperatures in Australia's premier wine districts is already affecting growing seasons and ripening. Grape quality is expected to decline over coming decades as warming continues (Webb et al. 2007, 2008, 2012).

NINGALOO REEF

The Great Barrier Reef is not the only coral system in Australia to suffer climate change-related impacts in recent years. Severe bleaching events in 2011 and 2013 occurred at Ningaloo Reef in Western Australia, resulting in major changes to coral reef communities (Moore et al. 2012; Lafratta et al. 2015). The 2015/16 underwater heatwave also resulted in bleaching of 57- 80% of reefs in the Kimberley region, and 29% at Rottnest Island (Le Nohaïc et al. 2017).

TOUR DOWN UNDER

The Tour Down Under in South Australia is Australia's premier cycling event. The nine-day cycling race held in January attracts top international cyclists drawing Australian and international crowds. In 2017, the event contributed over $56 million to South Australia's economy, supported nearly 700 jobs and attracted 43,000 onlookers (South Australian Tourism Commission 2017). Heatwaves during the event in 2018 affected crowd numbers and resulted in changes to key stages, side events cancelled and tour doctors on alert for signs of heat stress (ABC 2018b; Adelaide Now 2018; SBS 2018).

LORD HOWE ISLAND

The Lord Howe Island Group, off the coast of New South Wales, was listed as a World Heritage Area in 1982. The island receives 15,000 visitors per year, providing the major source of income (Lord Howe Island Board 2017). Tourists are attracted by the outstanding natural beauty and wildlife, including species found nowhere else. Of particular concern for the future is the cloud forests on Mount Gower which are home to 86% of the endemic plant species on the island (Harris et al. 2005). As temperatures continue to rise, any loss of the cloud layer that keeps these plant communities moist could threaten their persistence (ANU 2009).

TASMANIAN WORLD HERITAGE AREA

Tourists in Tasmania identify "wilderness and nature" as the No. 1 reason for their visit (TRA 2014). Extremely intense fires swept through Tasmania in January 2016, burning 100,000 hectares, including 11,000 ha in the Tasmanian Wilderness World Heritage Area, killing ancient plants thought to be over 1,000 years old. A year after the fires, little recovery was evident (ABC 2016a).

5. Is the Tourism Industry Prepared for Climate Risks and Opportunities?

Tourism is one the most vulnerable industries to climate change risks, but also one of the least prepared (KPMG 2009; Ruhanen & Shakeela 2012; Reisinger et al. 2014). The conflict between the desirability of unrestrained growth on the one hand, and the need to reduce greenhouse gas emissions on the other, is extremely challenging for the tourism industry (Becken 2017).

This paradox is clearly evident in the Australian tourism industry, both at government level, and that of many individual operators (Turton et al. 2010). In 2007, tourism was identified as one of the many Australian sectors vulnerable to climate change by the Council of Australian Governments' (COAG) National Climate Change Adaptation Framework. The following year, the Department of Resources, Energy and Tourism published *Tourism and Climate Change: a Framework for Action* (DRET 2008). This document set out a number of areas of action, including better understanding of vulnerability and building adaptive capacity; preparing for a carbon-constrained future; monitoring changing consumer perceptions and behaviour in relation to climate change and repositioning marketing strategies in this context; and conducting industry outreach to improve communication about the risks and opportunities.

The Australian Government's "Climate Change Guide" for tourism operators contains only one sentence describing future climate conditions.

After this promising start, subsequent government documents, however, treat climate risks in a far more cursory fashion. For example, the Australian Government's (2009) "Climate Change Guide" for Australian tourism operators contains only a single sentence describing future climate conditions *("The attractiveness of certain tourism destinations may change depending on the extent and nature of climate change in that area")* (Amelung and Nicholls 2014). More recently, the government's *Tourism 2020* plan is described as *'a whole of government and industry long-term strategy to build resilience and competitiveness of Australia's tourism industry and grow its economic contribution'*. This plan outlines an aspiration to achieve more than $115 billion in overnight spending by 2020 (up from $70 billion in 2009) (Austrade 2017c) and outlines six strategic areas including growing the demand from Asia and encouraging infrastructure investment. While the need to build resilience of the industry is identified, the plan merely notes that tourism businesses need to *"engage in climate change adaptation through the CSIRO Climate Change Adaptation project"*.

The Queensland Government's *Advancing Tourism (2016-20)* plan makes no mention of climate or climate change at all (QLD Government 2016), despite the fact that tourism in Queensland arguably faces the greatest climate risk of all the states. Other tourism forecasts by Austrade (2017b) rely almost exclusively on assumptions about the global economic outlook, oil prices, and currency exchange rates. While risks and uncertainties such as global security and disease outbreaks are discussed in these forecasts, those posed by climate change are not mentioned at all. A review of how nine government tourism agencies (federal and state) were addressing and responding to climate change (up to and including 2010), noted that responses among agencies were highly variable, both in detail and in emphasis. The responses ranged from recognition of climate risks in some key destinations, to promoting carbon offsetting programs and other sustainability measures. Overall, despite the clear risks that climate change poses for Australian tourism operations in the short-, medium- and long-term, government policy documents continue to describe extremely optimistic forecasts (Zeppel and Beaumont 2011).

Federal and state governments generally underplay or ignore climate change risks to tourism.

The tourism industry is both the most vulnerable and one of the least prepared for the impacts of climate change.

Many recently published State- and regional-based tourism plans similarly fail to include climate-related risks. *The Gold Coast Tourism Destination Management Plan (2014-2020),* for example, has an ambitious target to double the overnight spend of visitors to $7 billion by 2020, but makes no mention of climate risks, including those from sea-level rise and coastal flooding (GCTC 2014) (see Box 2).

The preparedness of individual tourism operators for climate risks is extremely varied. There are considerable institutional, legal, community and resource limitations that inhibit, or are perceived to inhibit, implementation of both adaptation and emission reduction strategies. These include the scale and perceived uncertainty surrounding climate change projections; communication within and between regional and national bodies; and the financial capacity of small and medium sized businesses to afford the necessary adaptations (Turton et al. 2008, 2010; Wilson and Turton 2011; Becken and Hay 2012). While tools for adaptation (that is, mechanisms to adjust to and cope with climate risks) such as the CoastAdapt tool (Becken 2016), are becoming more readily available, their uptake has been slow.

One notable trend is that the increasing risks of climate change for valuable tourist icons such as the Great Barrier Reef are resulting in increasing "stewardship alliances" between tourist operators and environmental groups (Liburd and Becken 2017). For example, the prospect in 2012 that the UNESCO World Heritage Area Committee was considering adding the GBR to the List of Endangered World Heritage Sites caused alarm in the reef tourism industry and led to increased lobbying to improve government spending on water quality programs and refuse permission for coal loading at Abbott Point, near Bowen. More recently, several tourism operators in the Whitsunday area have become publicly vocal in protests against the proposed Adani coal mine in the Galilee basin (eg. Australian Leisure Management 2017).

5.1 Tourism and Greenhouse Gas Pollution

The United Nations declared 2017 to be the International Year of Sustainable Tourism for Development, citing the potential for tourism to lift people out of poverty and advance the 2030 Agenda for Sustainable Development and the 17 Sustainable Development Goals (SDGs) (UNWTO 2017b). Activities conducted under the auspices of The International Year aimed to support a change in policies, business practices and consumer behaviour towards a more sustainable tourism sector.

Regardless of these lofty goals, tourism accounts for between 3.9 and 6% of global greenhouse gas emissions (Fischedick et al. 2014), approximately 40% of which can be attributed to air travel (Gössling 2009; Figure 14) (see Box 3). In the Australian aviation industry, 60% of flight-related emissions result from international travel (Choi and Ritchie 2014); a single return trip between Australia and Europe, for example, is responsible for 4.5 tonnes of CO_2 (Simpson et al. 2008). In 2003-2004, Australian tourism contributed between 3.9 and 5.3% of Australian greenhouse gas emissions, depending on the estimation methods (Dwyer et al. 2010).

Figure 14: Global air travel contributes about 40% of the emissions from tourism activities.

Australian government's *Tourism 2020* plan makes no mention of the need to reduce emissions or increase sustainability.

Growing demand for air travel underpins projections that international aviation emissions could increase more than 60% in the period 2010-2020 compared to the previous decade (Cames et al. 2015), given that with current technology, growth in travel far exceeds improvements in fuel efficiency (Higham et al. 2016). A further problem is that the long design life of aircraft (typically 30-50 years) locks in current technology, unless significant retro-fitting for low emission fuels can be achieved. Indeed, some researchers have concluded that *"current and projected growth in aviation is fundamentally incompatible with radical emissions reduction and decarbonisation of the global energy system"* (Higham et al. 2016).

While the World Travel and Tourism Council (WTTC 2016) has reiterated its 2009 target of halving sector carbon emissions by 2035 (Becken and Mackey 2017), under a business-as-usual scenario, emissions from tourism could grow by 130% from 2005 to 2035 globally with emissions from air transport and accommodation to triple (Scott et al. 2015). In countries such as the United Kingdom, unrestricted growth of tourism could account for all of the emissions consistent with meeting commitments to the 2°C Paris target by 2050 (see Chapter 6) (Scott et al. 2015).

A further problem is that as more than 60% of aviation emissions are in international air space, they are not covered by the national emissions reduction targets taken to the Paris climate meeting in 2015 (Cames et al. 2015). While some progress in increasing fuel efficiency has been made, growing demand poses the main challenge (Dubois et al. 2011; Cames et al. 2015; Becken and Mackey 2017). For example, capacity measured in available seat-km has grown >25% over the past two decades, with demand forecast to grow at about 5% per year (Cames et al. 2015).

Disappointingly, the Australian government's *Tourism 2020* plan makes no mention of the need to reduce emissions or increase sustainability of the tourism industry. Indeed, the plan notes that aviation capacity will need to grow by 40-50% for international visitors and 23-30% for domestic tourists to achieve the goal to increase overnight visitor expenditure to more than $115 billion annually by the end of the decade. On a more positive note, a Sector Adaptation Plan for the Queensland tourism industry is currently being developed as part of the Queensland Government's Climate Adaptation Strategy (S. Becken pers. comm. 2017).

BOX 3: OFFSETTING AIR TRAVEL: DOES IT WORK?

Carbon offsetting is designed to prevent, remove or reduce the release of greenhouse gas emissions, to compensate for emissions occurring elsewhere, such as during air travel (Becken and Mackey 2017).

Offsetting activities include protecting and restoring forests to increase carbon sequestration and renewable energy projects. Given that the airline industry does not yet have commercially available low-carbon fuel options, offsetting emissions via such investments into renewable energy and carbon sequestration projects is generally seen as the only viable option to reduce the climate change contribution of air travel. Carbon offsetting is now an important component of the global policy framework of the aviation industry, the Carbon Offset and Reduction Scheme for International Aviation (CORSIA) (ICAO 2017).

A survey of 139 airlines found that about a third are actively engaged in offsetting, although the information available and methods of calculation were highly variable (Becken and Mackey 2017). The survey also found the information provided to potential consumers sometimes used scientifically inaccurate language, such as indicating that offsetting could fully "neutralise" the emissions cost of air travel. Becken and Mackey (2017) note that while forest protection and restoration can offset biomass-based emissions, they cannot compensate for fossil fuel emissions because fossil fuel emissions are a separate and additional source of CO_2 to the atmosphere.

The uptake of voluntary carbon off-setting by travellers is fairly low - in the order of 2-4% (McLennan et al. 2014). Based on data from 2008-2010, travellers to Australia from the UK were most likely to offset, and those from Asia least likely. This may in part be due to a lack of clear information about calculating the carbon footprint of travellers (Juvan and Dolnicar 2013). A number of positive and negative arguments for offsetting air travel are summarised in Table 4.

For more details on the relationship between the biomass and fossil fuel components of the carbon cycle see the following Climate Council Report:

Land Carbon: No Substitute for Action on Fossil Fuels

Table 4: Positives and negatives of offsetting air travel.

Positives	Negatives
› Offsetting can mitigate some of the negative impact of air travel. › Funds from offsetting projects can support worthwhile initiatives such as renewable energy (Becken and Hay 2012). › Offsetting options encourage consumers to be active participants in sustainable initiatives (Kim et al. 2016).	› Offsetting does not encourage more significant changes in consumer behaviour, but rather, allows "environmental pardons" to be purchased (Kollmuss and Bowell 2007). › There are low participation levels in carbon offset programmes; only 10-16% of Australians have purchased carbon offsets in the past (Babakhani et al. 2017). › The public perception is that offsetting schemes are not transparent or credible (Gössling et al. 2007; Choi et al. 2016). › Offsetting schemes cannot compensate for fossil fuel emissions because fossil fuel emissions are a separate and additional source of CO_2 to the atmosphere.

For a concise and accessible summary of how offsetting works see the short video "Carbon Neutral: what does it mean" at http://tourismdashboard.org/explore-the-data/carbon-emissions/

5.2 Case Studies: Australian Tourism Climate Change Solutions

Many tourism operators are now recognising the risks of climate change and embracing sustainability options. Here we provide a snapshot of just a few of these enterprises.

Note: Money raised through offset schemes can support some worthwhile projects - e.g. reforestation and forest protection - but they do not offset fossil fuel emissions.

Figure 15: Solar panels on Lady Elliot Island, a sustainable tourist resort in the southern part of the Great Barrier Reef.

RESORTS & TOUR OPERATORS

Great Barrier Reef

The *Lady Elliot Island Eco Resort* aims to be a model for sustainable tourism on the Great Barrier Reef. The resort has installed a hybrid solar (28kW) and battery power station, reducing its reliance on diesel by 80%. Water and energy use has also been reduced by solar hot water heating, energy efficient light bulbs, rainwater collection and by stopping the sale and use of plastic water bottles (Green Hotelier 2010). Visitors to the resort can participate in a climate change tour around the island. In recognition of its leadership, the resort has received "Advanced Eco Certification" by *Ecotourism Australia* (Lady Elliot Island Eco Resort 2016; UNESCO 2016).

Elsewhere on the Great Barrier Reef, a number of other initiatives aim to create a more sustainable tourism industry (Zeppel 2012; EcoTourism Australia 2017).

- Businesses such as PADI, a diver certification company, have become carbon neutral by, for example, buying green power and using digital files.
- *Sailaway* in Port Douglas aims to reduce its environmental impact by replanting cleared rainforest areas.
- The *Cod Hole and Ribbon Reef Operators Association* received $10,000 for climate actions from the Queensland government by forming a climate smart business cluster of 20 businesses.
- The *Great Barrier Reef Marine Park Authority* (GBRMPA) and Ecotourism Australia have marketed eco-certified GBR operators at the Australian Tourism Exchange, with green travel packages sold to international travel wholesalers such as TUI in Europe. In the UK, a £100 tax on long haul flights for emissions will increase to £170, increasing costs for British visitors to the GBR.
- *Big Green Cat Cruises* is a "Climate Action Business" tourism operator. In 2010, they were the only large GBR operator with a zero carbon footprint, and won the 2009 Climate Action award from *Ecotourism Australia* by, for example, reducing fuel emissions.

Figure 16: "Field of Light" installation by artist Bruce Munro in Yulara, Northern Territory.

Uluṟu Resort

Ayers Rock Resort has become an Australian showcase for ecotourism (Tourism Australia 2013). Fifteen percent of the resort's average electricity demand is powered by a 1.8MW solar PV system named Tjintu, meaning sun in Pitjantatjara (ARENA 2016). The solar system, spread across five arrays, reduces the resort's reliance on compressed natural gas which must be transported 450 km from Alice Springs.

Solar power is also featuring in a major art installation and tourist attraction, titled "Field of Light" by artist Bruce Munro. The work features more than 50,000 solar-powered lights in the desert from April 2016 to March 2018 (ABC 2016b) (Figure 16).

Alto Hotel in Melbourne

Alto Hotel, located in Melbourne's CBD, is one of Australia's few carbon neutral hotels. Not only is the electricity used by the hotel obtained from 100% renewable sources, the hotel has introduced a wide range of sustainability initiatives (Alto Hotel 2017) including:

- 95% of all lighting at the hotel is energy efficient
- hotel key tags are energy saving turning room lights off when guests leave
- energy and water use for guests is limited
- rain water is collected and used for toilet flushing, gardening and cleaning
- a range of water saving measures have been implemented including water flow restrictors on showers and appliances
- hotel windows are double-glazed
- the hotel uses locally grown food where possible and fresh herbs and rooftop honey from its own garden
- the hotel has eliminated the use of plastic bottles, instead using refillable dispensers
- waste is separated with recycling and compost systems and waste going to landfill is limited
- the hotel provides complimentary EV recharging powered by 100% renewable energy and offers airport transfers in a hybrid vehicle
- guests are actively encouraged to walk and use public transport.

Figure 17: Solar panels at Crystal Creek Meadows, Kangaroo Valley, New South Wales, contributing to the business receiving a Highly Commended Award at the World Responsible Tourism Awards in London.

The Observatory, Port Macquarie

The Observatory in Port Macquarie is a carbon neutral 4.5 star hotel. The hotel has 230 solar panels installed on its roof (totalling 56.5kW). The hotel has also installed a solar PV car charging unit that is complimentary for guests and plans to install battery storage (One Step Off The Grid 2015). Guests are invited to pay a voluntary premium to opt into the hotel's "O-Zone" program which includes fresh local food, green bathroom products, and tour bikes for local use. The hotel's green credentials have resulted in it receiving several awards including the UN World Environment Day award.

Crystal Creek Meadows Luxury Cottages, Kangaroo Valley

Kangaroo Valley bed and breakfast *Crystal Creek Meadows* recently received a Highly Commended Award at the World Responsible Tourism Awards at the World Travel Market in London (Responsible Tourism Partnership 2017). Crystal Creek has four private luxury eco-cottages set on a 16-acre property just east of the Kangaroo Valley township. The business is run on 100% green energy with its own solar farm, rainwater supply and firewood plantation, buys local produce, and has reduced its waste by 80% since operations began.

Figure 18: (Some of) Melbourne Zoo's rooftop solar.

TOURIST ATTRACTIONS

Solar Zoos

A number of Australian zoos are leading the way as sustainable tourism destinations with large solar installations.

Perth Zoo boasts the largest solar panel array in Perth at 237kW (755 solar panels!). The solar panels are installed across numerous zoo buildings including the elephant barn, the reptile building, the conference centre, administration buildings and a spectacular solar pergola, providing up to 30% of the zoo's energy needs (Perth Zoo 2017).

Zoos Victoria claims to have the first zoos (Melbourne, Healesville and Werribee) in the world certified as carbon neutral – achieved by supporting projects that protect habitat and avoid deforestation. Zoos Victoria has also installed 188kW of solar PV panels, mainly at Melbourne Zoo (Figure 18) and is investigating further renewable energy options (Zoos Victoria 2017).

Other zoos around the country are also increasing the sustainability of their operations. For example, *Monarto Zoo* in South Australia has three solar trackers (each tracker comprising 60 solar panels totalling 33kW). Adelaide Zoo, Monarto's city cousin, has installed a total of 150kW in solar, including solar panels atop its famous panda exhibit (Church Resources 2015). Meanwhile, *Taronga Western Plains Zoo* in Dubbo has installed 10kW of solar panels on the roof of its Midway Kiosk and near the zoo's new elephant facility (Taronga Conservation Society Australia 2016).

Undara Experience, Queensland

The *Undara Experience* is a low impact, sustainable visitor experience in Undara National Park, Queensland. The Collins Family transformed the former cattle ranching station to an ecotourism hotspot thirty years ago. It is situated amongst ancient volcanoes and lava tubes, containing ancient rainforest remnants. The *Undara Experience* has demonstrated how it is possible to successfully transition from agriculture to sustainable ecotourism.

Figure 19: Qantas Airbus A380. Qantas is now actively working towards the commercialisation and scaling up of the supply of aviation biofuel.

TRAVEL SERVICES

Intrepid Travel

Intrepid Travel is one of the world's largest carbon neutral travel companies (WTTC 2015), claiming this status in 2010. The company's emissions – both from operations and trips – are calculated, independently assessed, then offsets (e.g. renewable energy projects) purchased. Trip emissions are also reduced as far as possible by maximising the use of public transport. Costs associated with reducing and offsetting emissions are embedded into the trip prices (Intrepid Travel 2016).

Qantas Future Planet Program

Qantas recognises that over 95% of the airline's overall emissions come directly from use of jet fuel. One of the key priorities of the *Qantas Future Planet* program therefore is to reduce fuel usage and the program has a 2020 fuel reduction target of 1.5% per year. Qantas is also exploring renewable energy methods such as electric ground service vehicles. Qantas is a member of the Sustainable Aviation Fuel Users Group (SAFUG), a global group of leading airlines and aviation companies working together with scientific agencies and leading environmental non-government organisations (NGOs) to accelerate the commercialisation of aviation biofuel. In 2012, Qantas and Jetstar made Australia's first commercial flight of an Airbus 330 powered by a 50:50 mixture of conventional jet fuel and biofuel derived from cooking oil. Qantas is now actively working towards commercialisation and scaling up of the supply of aviation biofuel. In January 2018, Qantas trialled the use of biofuel from Ethiopian mustard seeds in a Boeing 787-9 Dreamliner on a trip from Australia to US (Traveller 2018). Qantas claims that emissions will be cut by 20% using this technology, compared to standard fuel (Qantas 2017). By 2020, the Canadian agricultural technology company, Agrisoma Biosciences, with which Qantas has developed a partnership, is aiming to develop mustard seeds as a commercial biofuel seed crop in Australia. The long-term goal is to grow 400,000 ha, producing 200 million litres of bio-jet fuel per year.

Qantas also estimates that since 2007, over 2.5 million tonnes of carbon emissions have been offset, making it the largest offsetter of any airline. Offsets fund projects including protection of Tasmanian and Papua New Guinea forests and Northern Kimberley fire abatement (Qantas Future Planet Program 2017).

Figure 20: Virgin is actively supporting research into biofuel production from sources such as sugar cane, algae and mallees with the goal of establishing a viable renewable jet fuel industry in Australia.

Virgin Australia

Like *Qantas*, jet fuels comprise the largest portion of *Virgin's* carbon emissions (98%) and the airline is also a member of SAFUG. Virgin is actively supporting research into biofuel production from sources such as sugar cane, algae and mallees with the goal of establishing a viable renewable jet fuel industry in Australia (e.g. Virgin Australia 2011). *Virgin Australia is* also incorporating renewable fuel into their supply chain, with the first shipment planned to be delivered to Brisbane airport early in 2018 as part of a two-year trial with American chemical renewable fuel supplier Gevo Inc. *Virgin* has also been operating a carbon offset program since 2007 (Renewable Energy Magazine 2017).

6. Urgent Action Needed to Protect Australia's Natural Assets

The climate is changing rapidly as a result of human activities, mainly driven by the burning of fossil fuels – coal, oil and gas. We are already witnessing the impacts of climate change on our environment, health, economy and communities. These effects will continue to accelerate over the next few decades.

We are approaching the end of the Critical Decade (2010 - 2020) when crucial policy decisions will determine the climate for the next few decades, and perhaps beyond. The global economy must dramatically reduce greenhouse gas pollution and achieve net-zero emissions in the next two decades to keep warming under 2°C.

An important step forward occurred in Paris in December 2015 when nearly all the world's countries came together to create the Paris Climate Agreement, aimed at limiting global temperature rise to well below 2°C above pre-industrial levels, and to pursue efforts to limit temperature rise to only 1.5°C. Although the collective level of emissions reduction pledged so far falls short of what is needed to prevent the worsening impacts of climate change, a report-and-review mechanism allows pledges to be strengthened through time. There is still much work to be done.

The tourism industry in Australia is already feeling the impacts of climate change, and will be increasingly vulnerable over the next few decades, mainly due to its reliance on nature-based attractions. Without action, rising sea levels and increasing extreme weather threaten this valuable industry and the income and jobs it provides. Now is the time to act to protect Australia's iconic places and the economy and communities they support.

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