

A contribution to  
**An analysis of medium to long-term impacts on the Australian Oceans**

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**1.1 Tourism - Joanna**

Australia was ranked among most at risk tourism destinations for mid to late 21 century due to marine biodiversity loss (Cabrini, 2008). Climate change resulting in 80% decrease in coral cover combined with 30% decrease in coral diversity and 70% decrease in fish diversity is projected to cause a decrease in tourism expenditure for reef trips to Great Barrier Reef Marine Park by ~ 136 million per year (Cabrini, 2008).

The Great Barrier Reef tourism associated with reef is AUD 2 billion and provides employment for 60,000 people (Hoegh-Guldberg, 2008). Climate change and ocean acidification threaten Great Barrier Reef and in 20 or 30 years tourism will be badly affected with no further growth especially in the tropical north. In the mitigation scenarios the reversal of damage will take time and it is uncertain if GBR will gain and tourism is likely to shift south. However tourism in GBR is run by small operators with lower flexibility and they are likely to shift business away from the reef. More research is needed to understand how organisms will respond to ocean acidification and how economy associated with GBR will respond to climate change.

Under the following climate conditions in the Cairns region of GBR (Jones, 2010)

Climatic variable	Scenario 1 2020	Scenario 2 2050	Scenario 3 2070
Temperature (min. and max.)	0.6°C ↑	1–1.6°C ↑	1.3–2.5°C ↑
Sea level and storm surge risk	8–14 cm	19–37 cm	35–56 cm
Increase in days over 35°C	+1	+4–8	+5–28
Total rainfall (%)	–0.7	–1.9	–3.0
Number of rain days	0.0 Little change	–0.1 Little change	–0.1 Little change
Percentage increase in heavy rainfall	1.8	5.1	8.2
Cyclone intensity of category 3–5		60%	140% ↑
Atmospheric CO <sub>2</sub>		500 ppm	
Sea surface temperature (°C)	0.5 ↑	1.3 ↑	2.1 ↑

For scenario 1 there is some decline of tourists sites projected at some sites. Under scenario 2 there will be major loss of tourist sites especially near shore and shallow reefs. Under scenario 3 reefs will be severely degraded and extremely low chance of seeing good coral. Tourism industry listed improving water quality, zoning, planting corals, shading corals, low foot tourism as mitigation strategies relevant to all 3 scenarios. In addition scientific information, implementing offsets, management of climate change by non-parliamentary organisations and land based strategies to reduce terrestrial influence on reefs were listed.

Under limited adaptation to climate change by 2050 (1a Paradise Perturbed (reefs are coral dominated but composition shifts to massive and encrusting species, mangroves decline and marine biodiversity declines) and 2a Coastal Calamity (reefs shift from coral to algal dominance, cover of

coastal habitats is reduced, habitat changes affect reef fishes, turtles and seabirds tourism in GBR responds by increasing effort (fish feeding, coral farming and diversifying) (Evans, Hicks, Fidelman, Tobin, & Perry, 2013). Under more extreme climate change scenario (2a) tourism industry amalgamates into larger corporations. Under effective adaptations (scenario 1b Reef Relief (reefs are dominated by coral, overall coastal habitat cover is maintained, overall biodiversity is maintained but composition and distribution are altered) and 2b Volatile Waters (reefs shift between coral and algal dominance, biodiversity declines significantly)) adaptations include improving marine stewardship, improving business planning and forecasting, reducing effort and relocating. It is forecast that marine tourism might become an increasingly important marine industry in the future for more small regional coastal communities in which case there is a need to develop local networks to sustain the marine tourism industry as industries like fishing and aquaculture are associated with marine tourism related activities ((van Putten, Cvitanovic, & Fulton, 2016).

Cabrini, L. V., G. (2008). *Climate change and tourism. Responding to Gglobal challenges*. Retrieved from

Evans, L. S., Hicks, C. C., Fidelman, P., Tobin, R. C., & Perry, A. L. (2013). Future Scenarios as a Research Tool: Investigating Climate Change Impacts, Adaptation Options and Outcomes for the Great Barrier Reef, Australia. *Human Ecology, 41*(6), 841-857. doi:10.1007/s10745-013-9601-0

Hoegh-Guldberg, O. H.-G., H. (2008). *The implications of climate change for Australia's Great Barrier Reef. People and Industries at risk*. Retrieved from WWF:

Jones, A. (2010). *Disappearing Destinations: Climate Change and Future Challenges for Coastal Tourism*.

van Putten, I., Cvitanovic, C., & Fulton, E. A. (2016). A changing marine sector in Australian coastal communities: An analysis of inter and intra sectoral industry connections and employment. *Ocean and Coastal Management, 131*, 1-12. doi:10.1016/j.ocecoaman.2016.07.010