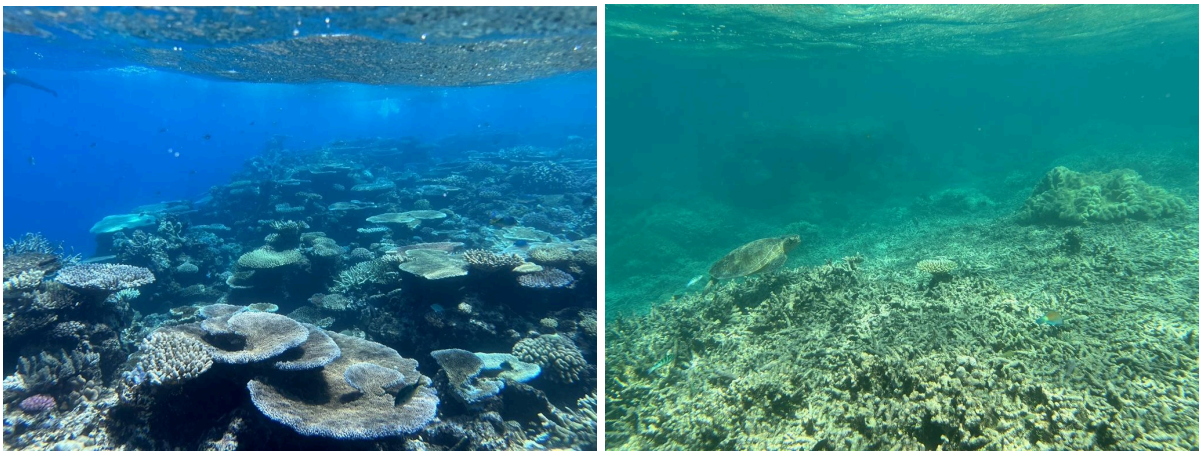
Great Barrier Reef Tourism Threats Serves as Warning for the Future of Other Environmentally Dependent Industries



Healthy and bleached corals within The Great Barrier Reef. October of 2023, December of 2023 respectively. (*Sidney Parker*)

Sidney Parker Wednesday 5 March 2025

2024 marked the hottest year in recorded history, with the average global temperature being 1.46° C above pre-industrial levels according to the National Oceanic and Atmospheric Administration (NOAA). The Paris Agreement set the goals to ideally limit global temperature increase to below 1.5° C pre-industrial levels in order to prevent severe climate change impacts and below 2.5° C to prevent critical and hypothesized irreversible climate damage. The average pre-industrial temperature increase of 2024 does not mean we are on the immediate cliff to passing the 1.5° C threshold, as 2024 only represents the average temperature of that particular year and not an average of a few decades. However, it serves as an alarm that in the near future, perhaps within the next 10 years, we will. Regardless of when this threshold is reached, the effects of climate change are already being felt around the globe, particularly in the places most fragile to temperature changes and areas that are warming disproportionately faster. These locations provide a precursor to ecological disaster and the social fallouts the rest of the world could soon face. The Great Barrier Reef off the North-East coast of Australia is famous for the diversity of marine life it holds and has already been feeling the detrimental effects of global warming. The tourism industry of Australia has relied on the financial gains the reef has created; however, the

impact of global warming on the reef in the form of coral bleaching has led to an example of present failure in industries that are environmentally dependent.

The Great Barrier Reef contains 2,900 individual reef systems and spans around 1,430 miles along the Australian state of Queensland's coast. Within this vast ecosystem, such a plethora of biodiversity exists it is challenging to quantify in species numbers or even identify all species who utilize the reef. The reef is home to sedentary creatures like corals, anemones, sea grasses, crustaceans, and sponges, as well as mobile and migratory organisms like fish, dolphins, rays, sharks, whales and birds. The organisms within the reef provide critical global functions towards oxygen production and carbon sequestration as well as ocean current and weather regulation. It has also served as resources, ways of life and spiritual connections for Aboriginal Australians who settled along the coasts of Queensland. Aboriginal Australians lived in harmony alongside the reef for generations prior to the colonization of Australia by British explorers. The reef has since served as a center for diverse scientific study, and was marked as a UNESCO World Heritage Site in 1981. Despite this designation, the reef is still a location for limited fishing and suffers from the intake of mainland pollutants. Additionally, it has been commodified in recent decades for tourism practices. Many of the people who work in the tourism industry have lifelong ties to the surrounding locations and share their passion with personal stories alongside ecological knowledge. Yet, this natural commodity faces a grave future in the realities of climate change and global warming.

Coral bleaching is the process of the symbiotic algaes that live inside corals – giving them nutrients, their color, and a food source and home for marine life – expelling themselves from the coral structures due to the stress brought on by warm and acidic water conditions. Algae can return to the coral structures when water conditions stabilize back to ideal conditions, and this is a cycle that has occurred during natural temperature and weather fluctuations over the course of geologic history. However, periods of warmth and acidity are increasing in frequency, length and occurring during weather patterns they used to not, like La Nina. This is a direct result of increased CO_2 in the atmosphere producing warming atmospheric and oceanic temperatures and increased CO_2 absorption by the oceans resulting in a stronger ocean acidity. Without the algae, the coral structures are white and the corals are unable to maintain their growth, repair and

ecosystem functions. If the algae is gone for too long of a time the coral structures eventually break and die. This has devastating consequences to organisms that rely on the corals and the habitats they provide for food, shelter, and breeding. As corals begin to die, sections of the larger reef ecosystem begin to die with it. Species who can go to other places do, and once prospering reef systems are left behind as nothing but a wasteland of white calcium polyps. Imagine if the colorful and life filled scenes of *Finding Nemo* suddenly turn into an ocean equivalent of the barren, lifeless and littered Earth depicted in *Wall-E.* That's not an ocean anyone or any creature wants or can survive in.

While this decline in reef systems is damaging to marine life, it is also damaging to the humans who have adapted to utilize the reef for their livelihoods. Upon colonization, tropical north Queensland was used to predominantly grow sugarcane when land was initially cheap. However, the sugarcane industry eventually declined, as land prices increased. The region was looking for a new economic boost at the same time that the Great Barrier Reef was growing in popularity as a destination people wanted to see. A tourism industry centered around reef exploration was born and served as a financial savior and is integral in the country's economy, which as of 2016 filled 58,000 jobs and generated $5.7 billion AUD annually. The Queensland and Australian economies rely on the economic prosperity reef tourism provides; however, this tourism structure relies on the workings of several ecosystem characteristics, which increases in coral bleaching episodes threaten. If such a large and well known tourism location and economy can be at risk from global warming so too can other tourism locations, different industries and environmentally linked economies.

Great Barrier Reef tourism relies on companies having the exclusive rights of access to different reefs or reef systems. Each company has their select collection of sites, meaning if their company sites were to be bleached and die they lose the ability to operate their business. While a reef bleaching does not mean the reef will die, it does reduce the ability to continue normal tourist operations. When a reef has bleached it becomes more vulnerable to additional stresses, either by having daily visitors present or by the machinery used to transport people to the reef and showcase the reef once onsite. Additionally, studies on tourist impressions of the reef show that as coral bleaching events have increased and the health of the reefs in general has declined due to

additional tourist related damage and other climate change impacts, tourist impression of the reef is dramatically different than expectation. This is a threat to the continuation of a tourist market. While many who experience a disconnect between expectation and reality upon visiting only acknowledge this after they have visualized it themselves due to a distrust in the extent of damage that scientists and media presents, it is now beginning to grow as a wider spread and accepted social concern.

These damages will lead potential tourists in two main directions. One option is potential tourists will be discouraged by the health of the reef and choose to not visit either due to not wanting to see the unhealthy reefs or to prevent their actions furthering the damage. This will slowly reduce tourist numbers, as awareness increases, and could provide tourism companies and the local economy a soft transitional period for tourism or economic adaptation. A second option is potential tourists will engage in last-chance tourism, which is a practice of rushing to a nature-based tourism location to see it before it is irreparably damaged. This could provide tourism companies and the local economy a current regular flow of economic stimulation if enough tourists continue visiting, but eventually could lead to a sudden crash when the environmental damage reaches a turning point. Regardless of tourist behavior or the bleaching cycles of specific reefs, the tourism model presently will not be able to sustain operations in the near term future due to changes these complex dynamics are and will continue to undergo.

The inability for Great Barrier Reef tourism to sustain operations as it has due to climate change is and will not be unique to just the shores of Queensland Australia. It lays out a mold for other environmentally dependent industries to exhibit challenges as global warming increases and the locations more severely impacted spreads. Ski industries globally already are and will continue to suffer with shorter and warmer winters with less snowfall. Skiers will only put up with poorer quality artificial snow, more crowded lift lines and less open terrain for so long. Global beaches and ocean side cities will suffer as sea levels rise near the equator and lower near the poles. Beach goers will have less beach in warm, tropical locations while adventure seekers will have more cold harsh shores in extreme tourist locations like Iceland. The ability for destinations to feed locals or tourists will be at risk due to irregular weather for crops or altered migration of food sources, like marine life. However, the risks don't just exist in the tourism industry, they

will extend into other industries, into the regular homes of civilians, and into geographic locations starkly different from the reefs. Anything or anyone who relies on the environment or resources from it will slowly begin to feel these effects; it is not an issue isolated to distant or foreign landscapes. It is an issue that will impact everything that calls the Earth home. If global warming continues on its current trajectory the Earth of *Wall-E* won't just be scenes of fiction, and *Nemo* will be perpetually lost.

The risks facing the Great Barrier Reef and its tourism industry serve as a starting motivation for reducing climate change and global warming. Other locations and industries do not have to face the extent of uncertainty and damage that will spread with continued warming if global actions are taken now to limit the amount of unlived years that will continue to break the hottest year records.