

Greenhouse Gases & Climate Change

The direst results of ever increasing emissions by our industrialized society are that a range of gases are forming an insulating blanket in our atmosphere and this is changing global climates. There are four main ways in which climate is either changing or, as some commentators say, being destabilized as a result of this accumulation of industrial gases of which the most conspicuous is carbon dioxide (CO₂). Additional and very dramatic consequences result from rising sea levels. This backgrounder looks firstly at the global picture of environmental impacts and then looks more specifically at how each of these five elements of climate change impacts on Fraser Island.

Humans have learnt to modify their environments to cope with almost any climatic conditions on Earth as long as they have an adequate energy supply. Therefore anthropocentric humans have given little consideration to species which can't modify their environment and which have to live with changes. For most environments, the changes being wrought by climate change are likely to be catastrophic. Plant and animal species will disappear. So too will some significant coastal land.

1. **Global Warming:** Most politicians prefer to speak of climate change rather than global warming. However even acknowledging that there is climate change is a step forward on past denials. It means winters will be generally shorter. This has implications for animals that hibernate or aestivate. It has implications for animals and birds which undertake seasonal migrations. Already it has been shown that a rise in sea temperatures around the World Heritage listed Macquarie Island has resulted in a dramatic and progressive drop in its Crab-eater seal population. In general it can be anticipated that some species may benefit from general warming but it will disadvantage others. Unfortunately the species most likely to benefit are the opportunists that are already expanding their territory and populations at the expense of other species. Scientists have predicted that with a one-degree increase in temperatures cane toads could expand their territory to most of continental Australia. Some mammals in Queensland's Wet Tropics that have already retreated to the higher parts of the Tablelands and high land to get cooler conditions are likely to become extinct. These include species such as tree kangaroos and green possums. It will be likewise with many plant species. There have also been dire predictions on the fate of corals on the Great Barrier Reef. Because water holds less oxygen as temperatures rise. Therefore the marine environment will become increasingly impoverished.
2. **Climate Variability:** A warmer climate doesn't mean that we add a degree or two to the temperatures as we have known them. While the mean temperatures will continue to slowly rise, they may end up oscillating much more, with more extreme cold events offset by really ferociously hot days. The world is already experiencing more extremes of both hot and cold weather. In October, Tasmania experienced a heat wave and bush fires followed by unseasonable snow down to sea level within a week. The cost of climate variability is demonstrated by the heavy impact of a late season frost that wiped out the bulk of the stone fruit crop in Victoria's Goulburn Valley. While these economic impacts are far reaching and being

appreciated, little thought is being given to the effects of these aberrations on wildlife. How many spring nestlings died in the cold snaps? How many will starve because of the loss of flowers and fruit? The effects of these unseasonable events reverberate through all ecosystems.

3. **Stronger Winds:** The higher atmospheric temperature results in greater differentials between the heating of the land and the heating of water that results in greater variability of wind velocities and direction but with stronger winds becoming more common. That is why storms, cyclones, hurricanes and typhoons will generally become more intense and why there will be more destructive Force 5 storms such as Katrina, Larry and Monica. They will all get stronger over water as they approach land.
4. **Rainfall:** Already several parts of the world are getting drier while some are becoming wetter. This is due to the changing of the wind patterns. Rainfall patterns are generally shifting towards the poles. Eastern and southern Australia are generally getting drier. The Roaring Forties are shifting south and so the South West of the continent is becoming drier. The northern areas of Australia, which are subject to the monsoonal influences, are generally getting wetter. Droughts will become longer and more severe.
5. **Sea Level Rises:** Add to this mix the fact that global warming has the dual effect of expanding the volume of water in the oceans as well as melting all of the ice caps — both polar and alpine. This is going to cause ocean levels to rise not just by a metre or t some predictions now suggest a rise of up to 20 metres. This will submerge many Pacific nations and larger nations such as The Netherlands and Bangladesh. However it is more significant to consider all low-lying coastal land. A large porion of China currently sustaining hundreds of millions of people could be affected. Most of the world's largest cities are located near the coast and very significant parts of these including their port areas are likely to be impacted. On Queensland's Gold Coast, billions of dollars of real estate are likely to sink below the sea. Bribie Island will disappear. Similar losses are likely to occur on waterfront land from Miami to Freemantle. It is not just that the seas will rise but the more intense winds will exacerbate the coastal erosion.

In general the combination of these five elements of climate change indicate a very dire outcome for the whole of Australia unless **URGENT ACTION** is taken to stop the effects, which have already begun. According to Al Gore's "*An Inconvenient Truth*", it isn't too late but it requires more enlightened political leadership to confront global greenhouse and energy issues. .

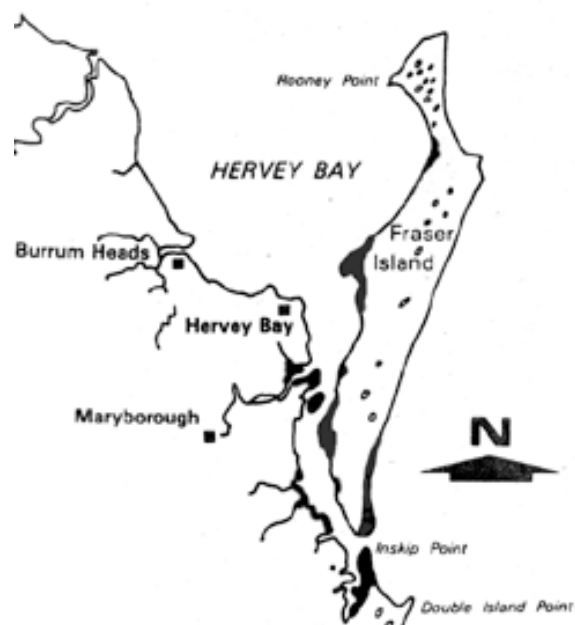
Climate Change on Fraser Island

It is hard to predict the full ramifications of climate change on Fraser Island given the dearth of hard data. From the known impacts occurring and predicted globally and based on FIDO's monitoring of environmental changes on Fraser Island over the past 35 years some changes can be anticipated. Observations include the dramatic reduction in the area of bare sand in the sandblows, changes of direction of several creek mouths and erosion on the western side of Fraser Island especially near Moon Point. Some of these can be directly linked to climate change. This background addresses those impacts observed and those that may be anticipated. The impact on the biota and the pace of the change are not well understood.

- Climate Warming:** Fraser Island has long been recognized as an important overlap zone with many species reaching the northern limit of their range on Fraser Island because further north is just too hot for them to tolerate. These species include huge forest trees such as blackbutt and tallowwood. Due to higher mean temperatures over the long-term, these species will disappear from Fraser Island. Likewise some species of fish such as Tailor may retreat to cooler latitudes. Coral and other marine life will be heavily impacted. Species from warmer climates will invade but opportunistic (weed) species will do better. While some species of mangroves that now only grow in more tropical areas may become established on Fraser Island, several terrestrial species of plants and animal may not be able to so easily drift to the south. This will result in a lower biodiversity. Higher temperatures will increase evaporation rates of lakes and water tables.
- Climate Variability:** While the impacts haven't been properly assessed, it is likely that, even if severe frosts occurred rarely in this island, they could have profound impacts on both flora and fauna.
- Changing wind patterns:** Already the increasing prevalence of northerly winds is neutralizing the impact of the constant south-easterly winds that once swept the sandblows forward in only one direction. The advance of sandblows has almost ceased. People walking across Hammerstone Sandblow to Wabby Lakes will often find themselves confronted with sand blown from the north-west. This may be part of the reason why the sandblows are being overtaken by vegetation so rapidly. In the last two decades the erosion from the south-east has been neutralized. Changing wind direction patterns along the east coast have resulted in more algae (referred to by fishers as "weed") in the surf. This spoils both fishing and swimming. It is obviously having a more profound effect on marine life. The shift to more days of northerly wind is resulting in a change with more creeks along Fraser Island's east coast flowing to the south instead of to the north. In the past 30 years, Govi, Gerrawea and Eli Creeks have all swung to the south because there are no strong waves breaking from the south to constantly wash away the northern banks of the creeks. The littoral drift of sand from the south to the north which has resulted in bringing sand from the south, including over the millennia, vast amounts from the Blue Mountains, may also be disrupted if the proportion of days with northerly winds continues to increase. Stronger winds and a warmer climate will also result in more severe fires — also impacting on bio-diversity.
- Rainfall:** While other parts of South East Queensland are definitely showing signs of being

drier, so far fortunately, there is no evidence of any significant variation in Fraser Island's annual rainfall. While many other parts of southern Queensland are showing signs of becoming drier, Fraser Island so far seems to have escaped this widespread desiccation. While there is still irregularity of rainfall, the island's droughts are not as severe as elsewhere.

- Sea Level Rises:** 10,000 years ago, the sea levels were as low as science has ever been able to establish. Fraser Island was then part of the mainland and the coastline was several kilometres east of its present location. 6,000 years ago the sea levels reached the highest level known to science, but then fell about one metre over the next 500 years. This resulted in much new land being created on Fraser Island. If the sea rises by only one metre (a fraction of the current estimates) it is anticipated most of this coastal land will be consumed by the sea. Sea level changes will affect Fraser Island in three ways:
 - The Parallel Dune ridges especially behind Moon Point and North Spit as well as the Fens are all likely to be submerged. Most of the land less than 10 metres above sea level may be lost.
 - Great Sandy Strait can be expected to be widened due to submerging the Inskip Point Peninsula and the eastern shores of the mainland from Mary River Heads to Tin Can Bay. This is likely to result in significant changes to tidal flows and ocean currents
 - More coastal erosion will result all around from the increased wind velocity and stronger storms attacking the coast and from the stronger currents flowing through Great Sandy Strait.



Black shows land to be lost with 1 metre sea level rise