

Greenhouse Gases & Climate Change

The direst results of ever increasing emissions by our industrialized society are a range of gases that are forming an insulating blanket in our atmosphere which is changing global climates. There are four ways in which climate is either changing or as some commentators refer to it being destabilized) as a result of this accumulation of industrial gases of which the most conspicuous is carbon dioxide (CO₂) but an additional and very dramatic consequence is a rising sea level. This background first of all looks at the global picture of environmental impacts and then looks more specifically at how each of these changes impact 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 the majority of Nature 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 would like to deal only with this aspect of climate change and prefer to ignore the others. However even acknowledging that there is global warming is 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 have already retreated to the higher parts of the Tablelands and highland to get cooler conditions are likely to become extinct. These include species such as tree kangaroos and green possums. Likewise with many plant species. The fate of corals on the Great Barrier Reef has already been given dire predictions. 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 meaning that while the means temperatures will continue to slowly rise they may end up oscillating much more with more extreme cold events and 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 and a drop in sea level within a week. The cost of climate variability is demonstrated by the heavy impact of a late season frost wiping 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 while storms / cyclones / hurricanes / typhoons will generally become more intense which is 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 as some are becoming wetter. This is due to the changing of the wind patterns. Rainfall patterns are generally shifting away towards the poles. Eastern and southern Australia are generally getting drier. Australia's Roaring Forties are shifting south meaning that 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 and melting all of the ice caps — both polar and alpine — and this is going to cause Ocean levels to rise not just by a metre or so but some predictions now suggest a rise of up to 20 metres. This will submerge many Pacific nations and larger nations such as Netherlands and Bangladesh. However it is more significant to consider all low-lying coastal land. A large portion of China currently sustaining hundreds of millions of people could be affected. However 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 Fremantle. 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 consequences of climate change indicate a very dire outcome for the whole of Australia unless **URGENT ACTION** is taken to stop the process, which has already begun. According to Al Gore's "An Inconvenient Truth" it isn't too late but it requires more enlightened political leadership.

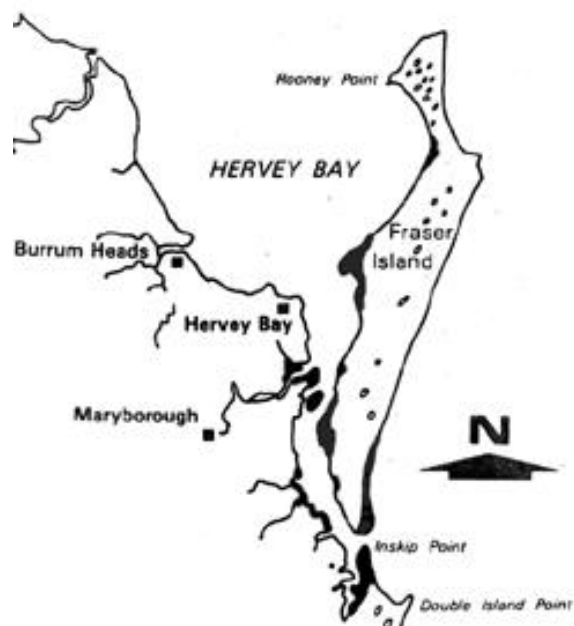
Climate Change on Fraser Island

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 some changes can be anticipated based on FIDO's monitoring of environmental changes on Fraser Island over the past 35 years. 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 though is less well understood and is the pace of the change.

- 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 mean 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 it is relatively easy for some species of mangroves which now only grow in more tropical areas may become established on Fraser Island, several terrestrial species of plants and animal species may not be able to so easily drift to the south resulting in a lower biodiversity. Higher temperatures will increase evaporation rates.
- Climate Variability:** While the impacts haven't been properly, it is likely that even if severe frosts occurred rarely in this island it 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 which 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 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 have resulted in more algae (referred to by fishers as "weed") which 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 in 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 constantly washing 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 vast amounts from the Blue Mountains, may also be disrupted if the proportion of days with northerly winds continues to increase. Stronger winds and 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 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 to attack the coast and from the stronger currents flowing through Great Sandy Strait.



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