Ocean Acidification

Coral reefs are one of the marine ecosystems most vulnerable to ocean acidification, with a wide range of impacts expected for corals, fish, algae and many other reef organisms.

Great Barrier Reef Foundation

Climate change is a significant threat to the Great Barrier Reef. The world's oceans absorb approximately 25% of the carbon dioxide emissions released into the atmosphere by humans. As levels of carbon dioxide in the atmosphere increase, this increases the amount of dissolved carbon dioxide in the ocean. This results in an increase in ocean acidity and a shift in water chemistry – this is called ocean acidification.

The delicate balance between reef growth and reef erosion will be disrupted as oceans become more acidic. This will limit the ability of corals to deposit their limestone skeletons, and their ability to form reefs may be compromised.

The impacts of ocean acidification have already been widely reported; these include impacts on animal development, sensory systems and fundamental processes such as calcification. Research has also recently identified that increasing levels of carbon dioxide in the atmosphere from rising emissions are exacerbating coral bleaching.

Ocean acidification represents a largely undescribed yet potentially serious threat. Therefore, it is vitally important that we improve our current understanding of the impacts of, and potential solutions for, ocean acidification on the Great Barrier Reef.

A research framework

The Great Barrier Reef Foundation convened an expert group of scientists and managers to develop a strategic research framework to understand and respond to the threat of ocean acidification.

The framework recognises that there is a shift in management focus over time. In the short-term we seek to protect the Great Barrier Reef. In the mid-term, as acidification increases, we seek to arrest decline. In the long-term, we seek to restore the Reef from the impacts of acidification.

The four layers of the framework build upon each other to provide coherent stepping stones that direct research into understanding ocean acidification and address management needs for the Reef in the face of acidification.

The first layer – exposure – seeks to understand the baseline knowledge of carbonate chemistry; so we can understand where we are now.

This knowledge is needed to better understand the exposure of the Great Barrier Reef to increasing levels of acidification. The Foundation currently funds three projects in this layer, including a project that measures carbonate chemistry across the Reef, to enhance our understanding of the exposure of the Reef to acidification.

The foundational knowledge from the exposure layer then feeds into the next layer.

The second layer– Sensitivity – investigates how Reef organisms and ecosystems respond to acidification.

Research in this layer seeks to understand the impacts of acidification on biological processes such as physiology, function, stress tolerance, adaptability, and how these translate across larger ecosystem scales and connectivity of the system. This will give a systems-level understanding of the sensitivity of the Reef to acidification.

The third layer–– Solutions – seeks to understand what we can do to assist organisms and ecosystems to respond to acidification.

The foundational knowledge layers can then be built upon to develop feasibility studies and further research into long- and short-term solutions to address ocean acidification on the Great Barrier Reef.

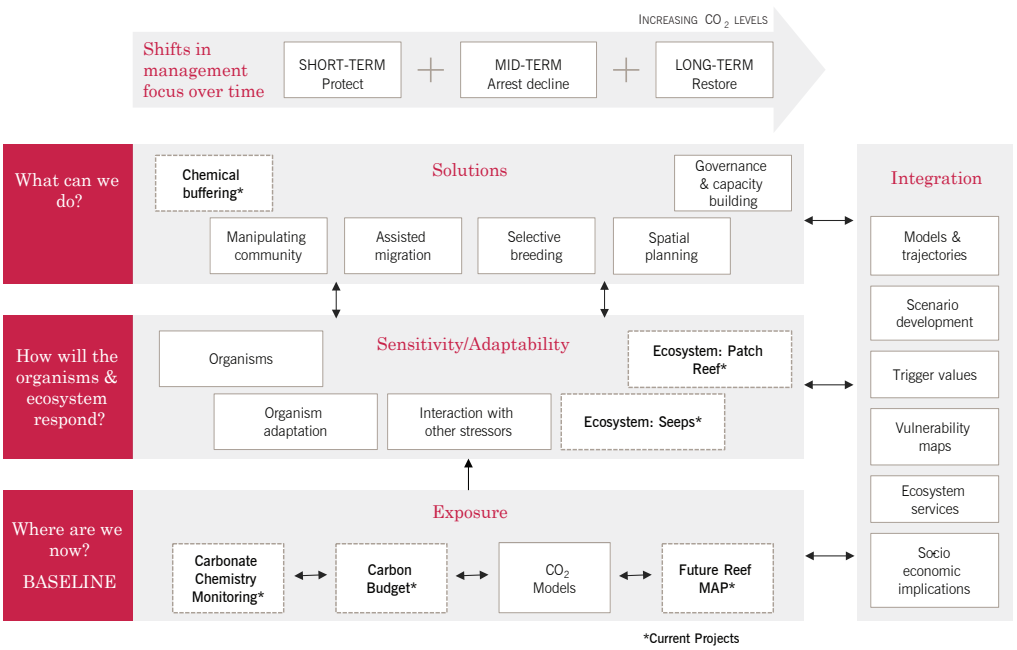
The Foundation is currently funding one project in this layer, which seeks to understand how buffering could be used to counter acidification.

The fourth layer – Integration – seeks to understand the long-term and Great Barrier Reef-wide impacts of acidification in the face of several cumulative stressors.

This layer seeks to integrate knowledge gained from a variety of other research being undertaken on the Reef to be overlaid with the specific knowledge gained about the impacts of acidification to understand the potential impact of acidification on the social and ecological systems of the Great Barrier Reef.

The value of the Great Barrier Reef to humans involves a range of ecosystem services which range from those that underpin fisheries and tourism, to those underpinning the protection of coastlines or the provision of carbonate sands. These ecosystem services ultimately provide support to communities and industries associated with reef ecosystems. Gaining an integrated picture of how these ecosystem services might be affected by ocean warming and acidification is critical to any strategy that aims to maintain or even enhance ecosystem services associated with coral reefs.

Ocean Acidification Framework



Ocean Acidification is a collaboration between:

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