A grim future for coral reefs—why it matters for New Zealand

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The outlook for coral reefs around the world is bleak—predictions are that they could be completely gone in just a few decades. Coral reefs are a vital part of marine ecosystems but are being destroyed by global warming and ocean acidification, as well as more localised threats such as agricultural run-off, poor fishing practices (unbelievably, cyanide and dynamite are used in some countries to catch fish) and coastal development. While New Zealand does not have coral reefs, we do have corals and we do have a responsibility to take action.

Across the Pacific Ocean coral reefs are declining at a rate of about two percent a year, and it may be only 40 to 50 years before they're completely gone. What makes them important is their biodiversity—coral reefs are home to many millions of species, from fish and plant life to microscopic bacteria. They also provide a source of food and income from tourism for many of our near neighbours, such as Fiji. Australia, too, has the world renowned Great Barrier Reef. If these reefs are lost, some of these countries could find themselves in dire economic straits. That gives New Zealand—as part of its international stewardship role—responsibility to try to help stem the deterioration of the reefs and minimise the potentially devastating effects their demise might have on the health of our regional economy.

The most widely recognised threat to corals is the warming of the world's oceans. Reefs are like 'a canary in the coalmine'—warming of seawater by as little as one degree causes a process known as coral bleaching, where microscopic algae that live inside the coral, and are

essential to its survival, are lost. A coral can only survive without these algae for a month or so. The algae are also the building blocks for a coral reef ecosystem which is an important habitat for fish, invertebrates and other algae. If they have nowhere to live, there is a devastating flow-on effect on the wider ecosystem.

Ocean acidification, where carbon dioxide from atmospheric pollution enters the ocean and makes it more acidic, is also a major problem. Corals need calcium carbonate to build skeletons, but when the ocean tries to fend off the acidity it uses carbonate ions, depleting the amount of carbonate ions available to build coral skeletons, or indeed the skeletons or shells of numerous other organisms.

New Zealand does have coral communities, rather than reefs, for example around the Kermadec Islands and in the Bay of Islands. However, we don't currently know enough about them to determine to what extent they might be affected by climate change. There are also deep sea coral communities around New Zealand, which—along with NIWA—I am currently studying. These corals don't contain algae, but are nevertheless under serious threat from ocean acidification because they live at the boundary of the area where there's enough carbonate to build a skeleton. If that boundary gets any shallower they'll be in real trouble, and we could lose a very important habitat as many deep sea invertebrates (e.g. sponges, squat lobsters and urchins) and fish, including some commercial species, are often found in association with these corals.

There is not really any good news for coral reefs. However, current research—including work by my team at Victoria University of Wellington—is looking at whether they can adapt to climate change. They might, for example, be able to take up new, more thermally tolerant types of algae when they bleach or they could successfully migrate to cooler or less acidic waters. The problem is the speed at

which our climate is changing and our reefs are deteriorating—science is struggling to keep pace. However, if we can buy some time by resolving local human impacts like fishing and pollution, we might be able to make coral reefs more resilient to the effects of global climate change. That's not to say we shouldn't also be addressing the causes of climate change, but trying to control or limit these other factors might give science time to catch up so that we can implement the strategies needed to ensure that the world's coral reefs aren't lost forever.

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