



# CAN-172-What Are Coral Reefs Worth?

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## What do we get from a coral reef?



Let's now move on to look at ecosystems that provide national scale benefits. We saw last week that coral reefs are the most valuable ecosystem per hectare on the planet. But why? Zooming in on the Maldives – a nation built from coral reef atolls – and Australia's Great Barrier Reef, we'll attempt to answer this.

Ancient folklore from the Maldives highlights the deep importance of reefs on the population. The story of Mākana, a grey heron whose stubbornness to eat only the largest Kaṇḍuguruva fish led to his demise, showcases the biodiversity of fish species on the reefs. Havvā Dīdī is also said to have fed her soul watching the waves crash against the coral reef shelf that protects islands in the Maldives. There is a deep spiritual connection between populations that have settled on coral reefs, but in modern society there are also many financial benefits too.

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## Protection from the Ocean

As Havvā Dīdī observed, the reef shelf absorbs considerable wave energy. The shallow reefs mean that waves break offshore from reef islands, protecting residents from storms that could otherwise lead to serious erosion. That's not to say reef islands are completely protected though, as climate change and sea-level rise may lead to the disappearance of low-lying islands over the coming decades and centuries. Around 150,000km of shoreline around the world receive protection from coral reefs, contributing approximately \$9bn in service each year. This is an example of **regulating services**.

## Fisheries and Physical Structure

Fisheries from coral reefs are estimated to feed one billion people in Asia alone, contributing around 25% of all fish caught in the world. The shallow, protected reefs are also a breeding ground and nursery which allows fish populations to remain sustainable. The diversity of species and vast number of organisms that live in a coral reef make this habitat a genetic resource for future generations adapting to environmental change. Natural predation of these species allows the transfer of energy throughout the marine system. This is an example of the coral reef system providing **provisioning services**, by producing services that we can eventually benefit from (healthy fisheries).

## Biogeochemical Services

Coral reefs function as nitrogen fixers in nutrient poor environments. This role not only benefits the reef system locally, but also influences the productivity of adjacent communities as excess nitrogen spreads. But calcium is the perhaps the most important piece of the coral reef chemistry puzzle, as reefs precipitate around half of the calcium delivered to the sea each year. Corals, algae and foraminifera all contribute to producing calcium carbonate frameworks for the reef to develop upon. Essentially, this is the prerequisite for all of the other services that the reef can then offer – an example of a **supporting service**. On the theme of biogeochemistry, coral reefs also act as a filter for anthropogenic waste – transforming, detoxifying and sequestering waste products and persistent pollutants such as petroleum.

## Tourism

Diving tours, fishing trips, hotels, restaurants and ecotourism all provide millions of jobs around the world in the tourism and recreation sector. Costanza and colleagues estimate that coral reefs provide \$9.6bn in benefits for tourism and recreation each year. The Great Barrier Reef is also a World Heritage Area and was recently designated as one of the seven natural wonders of the world. Reefs sustain local livelihoods too – it has been estimated that damages to reefs in the Philippines from overfishing and pollution have led to the loss of 100,000 fishing jobs. Coral reef systems also provide unquantifiable aesthetic, cultural and community values that contribute to coral reefs providing a **social and cultural service**.

## The Value of Coral Reefs

Globally, Costanza and colleagues valued coral reef ecosystems to be worth \$9.9 trillion each year - \$352,000 per hectare per year. Conservation and sustainable management practices are needed to maintain these services to continue benefiting both us and wider ecosystems. Conservation International valued the global cost of coral bleaching to range from \$20 billion to \$84 billion each year. But this estimate was in 2008, before the global bleaching events of 2016 and 2017 that included the bleaching of over 60% of corals in the Great Barrier Reef.

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**In some areas of the Great Barrier Reef, cold water is being pumped onto the reef to combat bleaching. This mitigates against economic loss through tourism. Is this a good approach to maintain a healthy reef and healthy economy?**

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