Ocean health

If the global ocean is to continue to support life as we know it while also mopping up much of our greenhouse gas emissions, governments must act now to ensure its long-term health

By **Peter Thomson**, United Nations Secretary-General's Special Envoy for the Ocean

The global ocean and climate are inextricably linked. The ocean serves as a central component of the climate system, vital to global exchange and redistribution of heat, water, gases, particles and momentum. The ocean also plays a fundamental role in mitigating climate change by serving as one of the planet's main heat and carbon sinks.

◀ Fisherman unload their catch on Maio Island, Cape Verde. The island is part of one of the country's several Marine Protected Areas, which are at the core of its sustainable development plans

Anthropogenically created greenhouse gas (GHG) emissions are increasingly altering the ocean's chemistry. We are witness to deoxygenation and acidification of the ocean, warming ocean temperatures, rising sea levels, shifting currents and increasing weather volatility, all with deleterious consequences for nature and humanity's place within it.

If left to cascade forward on its present trajectory, climate change is expected to cause decreased ocean productivity, altering food web dynamics, shifting species distribution, and leading to greater incidence of disease. Thus, as we learn more about the consequences of climate change, the interrelationship between it and the ocean must be acknowledged, understood and incorporated into governmental policies.

Ocean acidification

The ocean is acidifying because it is absorbing more carbon dioxide, which affects the pH of the water. Since the start of the industrial age, carbon dioxide levels in the atmosphere have been steadily increasing, with commensurate increases in the ocean's absorption of this gas.

The effects of ocean acidification are many. For shellfish, crustaceans and coral that rely on carbonate ions to build their shells and skeletons, survival becomes very much more difficult. Since humans and sea creatures alike rely on such lifeforms for their sustenance and in some cases their survival, ocean acidification will have serious consequences for coastal ecosystems and human communities.

Ocean-based climate action can play a major role in reducing the world's carbon footprint

To combat ocean acidification, the reduction of humanity's overall carbon footprint and the urgent reduction of our GHG emissions must be a high priority for all governments if the best interests of their citizens are to be protected.

Adaptation depends on mitigation

The advice of the Intergovernmental Panel on Climate Change (IPCC) is that climate resilience depends on combining mitigation and adaptation. Since mitigation reduces the rate as well as the magnitude of warming, it also increases the time available for adaptation to climate change.

It is important to appreciate that delaying mitigation reduces our options for both mitigation and adaptation in the future. Successful future adaptation is therefore heavily dependent on there being no further delays in our application of effective mitigation measures. We see here once again why the governments of the world, particularly the major emitters, have a responsibility to present nationally determined contributions (NDCs) at COP26 that demonstrate greatly enhanced ambition to lower GHG emissions.

The ocean's mitigation role

Ocean-based climate action can play a major role in reducing the world's carbon footprint. It can deliver up to 21 per cent of the annual GHG emission cuts pledged under the Paris Agreement.

The 2019 report of the UN Secretary-General's Climate Action Summit highlighted the relationship between the ocean and climate change. In this regard, it presented areas of positive opportunity, including ocean-based renewable energy, transportation, carbon storage, aquaculture and dietary shifts, along with carbon storage.

The role of 'blue carbon' in the long-term sequestration and storage of carbon is one of the ocean's vital contributions to mitigation. As much as 7 per cent of carbon dioxide reductions required to keep atmospheric concentrations below 450 parts per million can be achieved by protecting and restoring our natural coastal and marine ecosystems. Let us henceforth place meaningful attention on the true value of salt marshes, mangroves, wetlands, seagrass meadows, kelp forests and seafloors.

Too often the contribution of these ecosystems towards the capture and storage of carbon dioxide is taken for granted. If only for the hugely positive mitigation role they play, and in the face of continuing global degradation of such natural habitats, governments and the international

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◀ Beveridge Reef, Niue in the Pacific. Coral reefs are one of the most important ocean features in terms of supporting life and also one of the most vulnerable to global warming and ocean acidification – see panel opposite

community must give high priority to the conservation and restoration of these natural assets.

With the growing global acknowledgement of the scale of blue carbon's hugely positive mitigation role comes greater realisation of the predicament we face. For even as we realise that blue carbon is among the most efficient of carbon sinks, we find these natural assets are among the fastest-disappearing ecosystems on the planet. At the same time as we are quantifying the crucial services blue carbon provides through food security, water quality, shoreline protection and maritime employment, we are witness to the grand scale of these assets' destruction.

Degradation of these vital ecosystems is caused by unsustainable use of natural resources, poor watershed management, damaging coastal development practices, and woeful sewage and waste management. Their loss is bad news for carbon sequestration, human health, food security and economic development. Thus, as one of the biggest gaps in the effort to mitigate climate change, the approach to COP26 must witness governments around the world rising in defence of blue carbon.

We must invest in the ocean's health

As has often been said, it is not possible to have a healthy planetary ecosystem without a healthy ocean ecosystem, and at present the ocean's health is in decline. Our great challenge is to reverse this cycle of decline and restore good health through good practice. Part of the necessary action must be investment in the restoration and protection of our natural assets of blue carbon.

In the same vein, the deep ocean is often overlooked in consideration of climate change and the necessities of mitigation. It is therefore incumbent upon us to fully research and understand the role of the deep ocean and its seafloor, particularly before any new action is taken to disturb it. The time has come for this responsibility, which may emerge as a vital element in the mitigation of climate change, and therefore be one of universal importance to us all. It must be considered by all governments in the context of COP26 and in ocean–climate actions thereafter.

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Hope for the Decade of Ocean Science

The IPCC has warned us that unless ambition and action are accelerated worldwide, we are on a trajectory that leads us all towards a potentially disastrous environmental crisis for nature and our species.

The role of the ocean in mitigating such disaster is finally being appreciated. But we need to know much more about the ocean's biome and its contribution to the planetary ecosystem before we start making decisions about it that will affect the future of humankind. It is for this reason that we should all support the UN Decade of Ocean Science for Sustainable Development. The Decade gets underway next year.

2020 is the start of the second ambition cycle of the Paris Agreement. At COP25, the Subsidiary Body for Scientific and Technological Advice (SBSTA) was asked to convene a dialogue on ocean and climate change to consider how to strengthen mitigation and adaptation action. Following on from the 'Blue COP' efforts of COP25, the SBSTA meeting will provide us with a great opportunity to ramp up our understanding of the central role of the ocean–climate nexus.

Our very survival as a species may depend on this understanding being respected and acted upon through the mitigation efforts of governments and the global community as a whole. So once again I say, "All hands on deck!" ●

WHY CORAL MATTERS

By Sara Gill and Rianna Nayee, UNA-UK

UNESCO describes coral reefs as 'rainforests of the sea'. They are vital to the global ecosystem, supporting a quarter of all marine life while covering less than 0.1 per cent of the ocean floor. Due to their key role in our ecosystem, ecologists are deeply concerned by their decline. A 2018 study led by marine biologist Terry Hughes found that approximately half of the Great Barrier Reef died in 2016–18 as a result of global warming, bleaching, coastal pollution and overfishing.

Moreover, the Intergovernmental Panel on Climate Change (IPCC) predicts that coral will decline by a further 70–90 per cent if global temperatures increase by 1.5°C. The situation is even more dire if temperatures rise by 2°C, with the IPCC predicting with "very high confidence" the loss of more than 99 per cent of the world's coral.

The loss of coral has significant feedback effects on ecosystems, impacting marine biodiversity and vital coastal infrastructure. This is something scientists have highlighted for decades: an eight-year study led by Geoffrey P. Jones of James Cook University Brisbane highlights the detrimental effect of coral bleaching in Papua New Guinea, showing that as coral declines so does marine biodiversity. Half of the species surveyed in the study declined to less than 50 per cent of their original numbers.

Aside from the direct impact on marine life, the loss of even 70 per cent of coral – the IPCC's best-case scenario – will have significant implications for the world's diet. According to the United Nations Environment Programme (UNEP), fish are the main source of protein for three billion people worldwide. Coral is vital in sustaining healthy fisheries, and therefore plays a crucial role in maintaining the staple diet of almost half of the world's population. Coral reef fisheries provide 9–12 per cent of the world's catch of edible fish and 20–25 per cent of fish caught in developing countries.

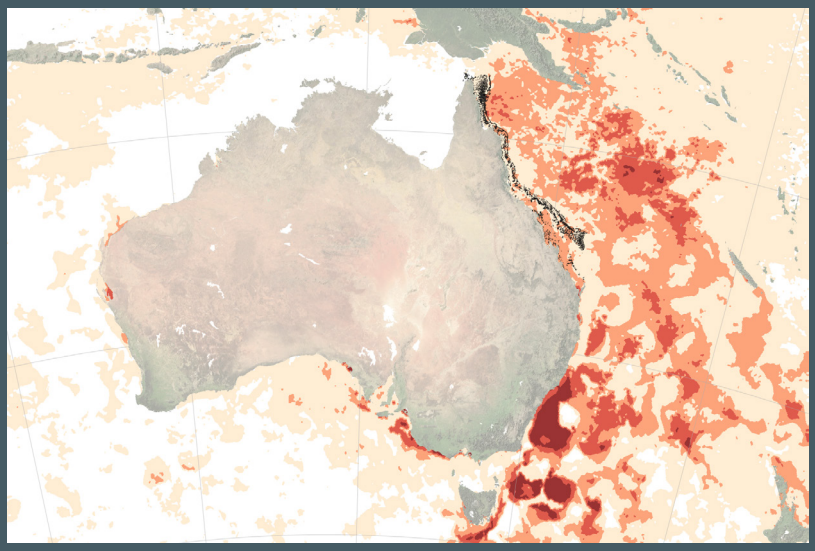
According to a 2003 study by the Food and Agriculture Organization, in Southeast Asian countries coral fisheries account for 70–90 per cent of the edible fish catch. These figures highlight the devastating impact that coral depletion would have on specific regions, and particularly on the poorest and most vulnerable within these regions.

Coral reefs are a natural wonder that have intangible and inherent value that we risk losing. Reefs drive tourism and local economies. According to a 2011 study from the ARC Centre of Excellence for Coral Reef Studies, each year approximately two million people visit the Great Barrier Reef, generating around €4 billion and 54,000 jobs in Australia alone. Around 275 million people (many in small island developing states) depend directly on coral reefs for their livelihoods.

In addition to maintaining economic livelihoods, coral reefs also play an integral role in coastal protection against natural disasters. The UNEP World Conservation Monitoring Centre found that coral protects over 150,000 km of coastline, typically absorbing up to 90 per cent of the impact load of a wave. A study from the Université de Bretagne Occidentale makes it clear that the loss of coastal protection provided by coral would impact a great deal of the world's population: roughly 62 million people live less than 33 feet above sea level and less than two miles from a coral reef.

Coral is not only important due to its cultural value: a 2019 study conducted by the US Geological Survey found that without coral the US alone risks losing $1.8 billion worth of coastal infrastructure. These studies further emphasise the protection that coral reefs provide.

The rise in global temperature scenarios set out by the IPCC means that more pressure is being placed on the world's oceans to absorb CO_2. While the ocean is the greatest carbon sink on Earth, the specific role played by coral within oceanic carbon cycles is not well understood. Contrary to popular belief, it appears coral reefs themselves are not carbon sinks and may even produce very small amounts of carbon. But there is less clarity on the effects of the wider coral ecosystem on carbon absorption. But even if coral reefs are not carbon sinks, their depletion would have catastrophic impacts. The loss of 70 per cent of the world's coral would be a disaster. Losing 99 per cent would be catastrophic.



◀ Map of Australia and the Great Barrier Reef, showing the levels of heat stress in the ocean during February 2017. Tan indicates the area may have been exposed to heat stress. Orange indicates coral bleaching is possible. Red indicates bleaching is likely, and dark red indicates coral mortality is likely