International Union for Conservation of Nature
ISSUES BRIEF
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THE OCEAN AND CLIMATE CHANGE

- **The ocean is being disproportionately impacted** by increasing carbon dioxide (CO_2) and other greenhouse gas emissions (GHG) from human activities.
- This causes **changes in water temperature, ocean acidification** and **deoxygenation**, leading to changes in **oceanic circulation and chemistry**, **rising sea levels**, **increased storm intensity**, as well as **changes in the diversity and abundance of marine species**.
- Degradation of coastal and marine ecosystems **threatens the physical, economic and food security of local communities, as well as resources for global businesses.**
- Climate change weakens the ability of the ocean and coasts to provide **critical ecosystem services** such as **food, carbon storage, oxygen generation**, as well as to **support nature-based solutions to climate change adaptation**.
- **The sustainable management, conservation and restoration of coastal and marine ecosystems** are vital to support the continued provision of ecosystem services on which people depend. **A low carbon emissions trajectory** is indispensable to preserve the health of the ocean.

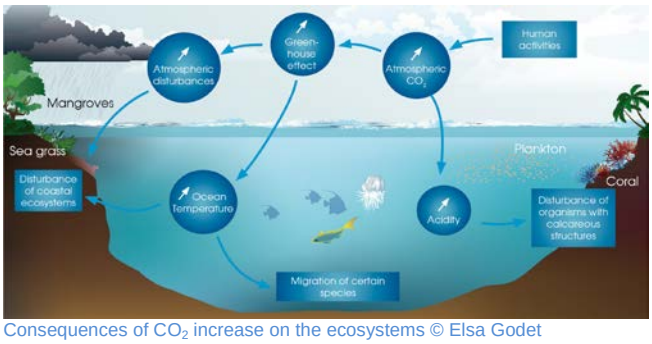
What is the issue?

At the front line of climate change, the ocean, the coastlines and coastal communities are being disproportionately impacted by increasing carbon dioxide (CO_2) and other greenhouse gas (GHG) emissions from human activities.

The ocean plays a central role in regulating the Earth's climate. The Fifth Assessment Report published by the Intergovernmental Panel on Climate Change (IPCC) in 2013 revealed that it has thus far absorbed 93% of the extra energy from the enhanced greenhouse effect, with warming now being observed at depths of 1,000 m. As a consequence, this has led to increased ocean stratification (prevention of water mixing due to different properties of water masses), changes in ocean current regimes, and expansion of depleted oxygen zones. Changes in the geographical ranges of marine species and shifts in growing seasons, as well as in the diversity and abundance of species communities are now being observed. At the same time, weather patterns are changing, with extreme events increasing in frequency.

Atmospheric warming is leading to the melting of inland glaciers and ice, causing rising sea levels with significant impacts on shorelines (coastal erosion, saltwater intrusion, habitat destruction) and coastal human settlements. The IPCC projects global mean sea level to increase by 0.40 [0.26–0.55] m for 2081–2100 compared with 1986–2005 for a low emission scenario, and by 0.63 [0.45–0.82] m for a high emission scenario. Extreme El Niño events are predicted to increase in frequency due to rising GHG emissions.

CO_2 emissions are also making the ocean more acidic, making many marine species and ecosystems increasingly vulnerable. Ocean acidification reduces the ability of marine organisms, such as corals, plankton and shellfish, to build their shells and skeletal structures. It also exacerbates existing physiological stresses (such as impeded respiration and reproduction) and reduces growth and survival rates during the early life stages of some species.



Consequences of CO_2 increase on the ecosystems © Elsa Godet

Why is this important?

The ocean and coasts provide critical ecosystem services such as carbon storage, oxygen generation, food and income generation.

Coastal ecosystems like mangroves, salt marshes and seagrasses play a vital role in carbon storage and sequestration. Per unit of area, they sequester carbon faster and far more efficiently than terrestrial forests. When these ecosystems are degraded, lost or converted, massive amounts of CO_2 – an estimated 0.15-1.02 billion tons every year – are released into the atmosphere or ocean, accounting

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for up to 19% of global carbon emissions from deforestation. The ecosystem services such as flood and storm protection that they provide are also lost.

The impacts of ocean warming and acidification on coastal and marine species and ecosystems are already observable. For example, the current amount of CO_2 in the atmosphere is already too high for coral reefs to thrive, putting at risk food provision, flood protection and other services corals provide. Moreover, increased GHG emissions exacerbate the impact of already existing stressors on coastal and marine environments from land-based activities (e.g. urban discharges, agricultural runoff and plastic waste) and the ongoing, unsustainable exploitation of these systems (e.g. overfishing, deep-sea mining and coastal development). These cumulative impacts weaken the ability of the ocean and coasts to continue to perform critical ecosystem services.

The degradation of coastal and marine ecosystems threatens the physical, economic and food security of coastal communities – around 40% of the world population. Local fishers, indigenous and other coastal communities, international business organisations and the tourism industry are already seeing the effects of climate change particularly in Small Island Developing States (SIDS) and many of the Least Developed Countries (LDCs).

Weakened or even lost ecosystems increase human vulnerability in the face of climate change and undermine the ability of countries to implement climate change adaptation and disaster risk reduction measures, including those provided for in Nationally Determined Contributions (NDCs) under the Paris Agreement on climate change.

What can be done?

The sustainable management, conservation and restoration of coastal and marine ecosystems are vital to support the continued provision of carbon sequestration and other ecosystem services on which people depend.

Marine Protected Areas (MPAs) for example can protect ecologically and biologically significant marine habitats, including regulating human activities to prevent environmental degradation. At the IUCN World Conservation Congress 2016, IUCN Members approved a resolution calling for the protection of 30% of the planet's ocean by 2030.

Protection and restoration of coastal ecosystems is also needed. Policies to prevent the conversion of these ecosystems to other land uses, for example regulating coastal development, can ensure their protection.

Countries can also develop policies and ensure the implementation of sustainable practices in all industries that impact the ocean and coasts, including fisheries and the tourism industry.

Support for scientific research is needed. This will ensure the continued monitoring and analyses of the impacts of climate change, with the knowledge gained used to design and implement adequate and appropriate mitigation and adaptation strategies.

Globally ambitious efforts are also needed to reduce the use of fossil fuels, increase the use of renewable energy systems and enhance energy efficiency. This will reduce the impacts of CO_2 and other GHGs on the ocean.

The key is to harness existing opportunities, by, for example, conserving certain coastal carbon ecosystems under the reducing emissions from deforestation and forest degradation (REDD+) mechanism, as well as implementing the Nationally Determined Contributions (NDCs) under the Paris Agreement.

Where can I get more information?

IUCN Global Marine and Polar Programme
iucn.org/marine

IUCN (2015). *Oceans and Climate Change brochure*.

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Gattuso, J.-P. et al. (2015). 'Contrasting futures for ocean and society from different anthropogenic CO_2 emissions scenarios'. *Science* 349:6243.

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