IN HOTTER WATER:
HOW THE GLOBAL OCEAN TREATY CAN BOOST CLIMATE ACTION

GREENPEACE

PROTECT THE OCEANS

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Seagrass at Saya De Malha Bank in the Indian Ocean
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Projection Calling for Ocean Protection in Greece

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REPORT AUTHORS:
DR. GEORGE DUNCAN-JONES,
DR. LAURA MELLER.

CONTRIBUTORS:
YASMIN BIRCH, CORALIE BARBIER, CHRIS THORNE, RUTH RAMOS ROBLES, SEBASTIAN LOSADA, PILAR MARCOS RODRÍGUEZ, MEG RANDLES.

KEY FACTS

- The ocean has absorbed more than 90% of the excess heat that greenhouse gases have trapped in the Earth's system.
- Warming ocean waters mean the ocean is 1–2% less oxygenated than in the 1970s, and marine species are being driven away from the equator towards higher, cooler latitudes.
- Sea ice is retreating in polar regions. The Arctic sea ice minimum extent in 2024 was the seventh-lowest on satellite record, and the 18 lowest annual minima have all occurred in the last 18 years. Antarctic sea ice has recently also seen dramatic falls. This reduction in sea ice coverage has triggered a negative feedback loop of more rapid ocean warming.
- Continued decline in sea ice loss means habitat loss for ice-dependent species, including iconic species like emperor penguins. Under current emissions projections, it is anticipated that by the end of the century nearly all emperor penguin colonies may decline by more than 90%.
- Coral reefs are the foundation of many marine ecosystems throughout the tropics, but climate change and ocean acidification are putting their health at risk. During the latest global bleaching event, by July 2024, 73% of the world's corals had been exposed to enough heat to begin the bleaching that could eventually cause their death.
- Climate change is having devastating impacts on coastal human populations through sea level rise, more intense storms, and loss of fishing grounds and tourism opportunities. Low-income, marginalised and Indigenous groups are bearing the brunt of these impacts.
- The ocean's ability to passively absorb carbon dioxide (which has led to ocean acidification) appears to be being reduced. The deep ocean is the largest carbon sink on Earth, but a recent study suggests that the rate at which the ocean is absorbing carbon dioxide cannot keep pace with emissions.
- The biological pump which captures organic carbon is disrupted by industrial overfishing, while bottom-towed fishing activities disturb and release seabed carbon stores.
- Healthy, diverse ecosystems build ocean resilience to climate impacts. Marine protected areas (MPAs) promote ocean health – they foster larger, more genetically diverse marine populations, act as safe havens for migratory species, and support ecosystem functions such as the biological carbon pump.
- The Global Ocean Treaty is a vital tool for delivering a network of high seas MPAs to enable governments to realise the globally agreed "30x30" target, and has environmental impact assessment provisions to better evaluate the climate impacts of high seas activities. Rapid ratification and implementation of the Global Ocean Treaty is therefore critical for safeguarding the ocean and protecting its natural stores of carbon and the ecological processes that contribute to them.

© Paul Hilton / Greenpeace
Humpback Whale in the Indian Ocean

LIST OF ACRONYMS

ABMT Area-based Management Tools
AIS Automatic Identification System
BBNJ Biodiversity Beyond National Jurisdiction
COP Conference of the Parties
EIA Environmental Impact Assessment
FAO Food and Agriculture Organization of the United Nations
IPBES Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC Intergovernmental Panel on Climate Change
IUCN International Union for the Conservation of Nature
MPA Marine Protected Area

© Tommy Trenchard / Greenpeace
Green turtle in the Galápagos

INTRODUCTION

In December 2019, Greenpeace International released *30x30 In Hot Water: The climate crisis and the urgent need for ocean protection.*[1] This makes the scientific case for creating a network of marine sanctuaries covering at least 30% of the world's ocean, both to increase marine life's resilience to climate change and to help mitigate its effect by protecting natural blue carbon stores.

The global climate and ocean are highly interconnected: the ocean is an integral part of the Earth's carbon cycle and it is estimated that it has captured 20–30% of total carbon dioxide (CO_2) emissions from human activities since the 1980s, slowing global warming.[2] However, increased levels of heat and CO2 in the ocean come at a high cost, causing ocean warming, acidification and deoxygenation.[3]

In Hot Water starts with some truly dire findings from the UN Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) 2019 assessment of the world's biodiversity. This sounded the alarm about an unprecedented decline in nature, with extinction rates accelerating to the extent that one million species are threatened with extinction, many of them within decades. These include almost 33% of reef-forming corals, sharks and other Chondrichthyes, and more than a third of all marine mammals. In addition, the assessment found that two-thirds of marine environments, from coastal areas to the deep sea, have been "severely altered" by human actions.[4]

Fish populations are under growing pressure from overfishing and unsustainable fishing practices, with close to 38% being overfished in 2021 according to the UN Food and Agriculture Organization (FAO),[5] while a significant amount of global catch comes from illegal, unreported or unregulated fishing.

The 2019 IPBES assessment further states that while exploitation is a major driver of biodiversity loss and ecosystem change globally, changes in sea use, climate change, ocean acidification, pollution and invasive species also have tremendous impacts.[6] It is expected that by the end of this century, ocean net primary production – which directly correlates with the ocean's ability to sustain life – will decrease by 3% to 10%, and fish biomass by 3% to 25%, due to climate change.[7]

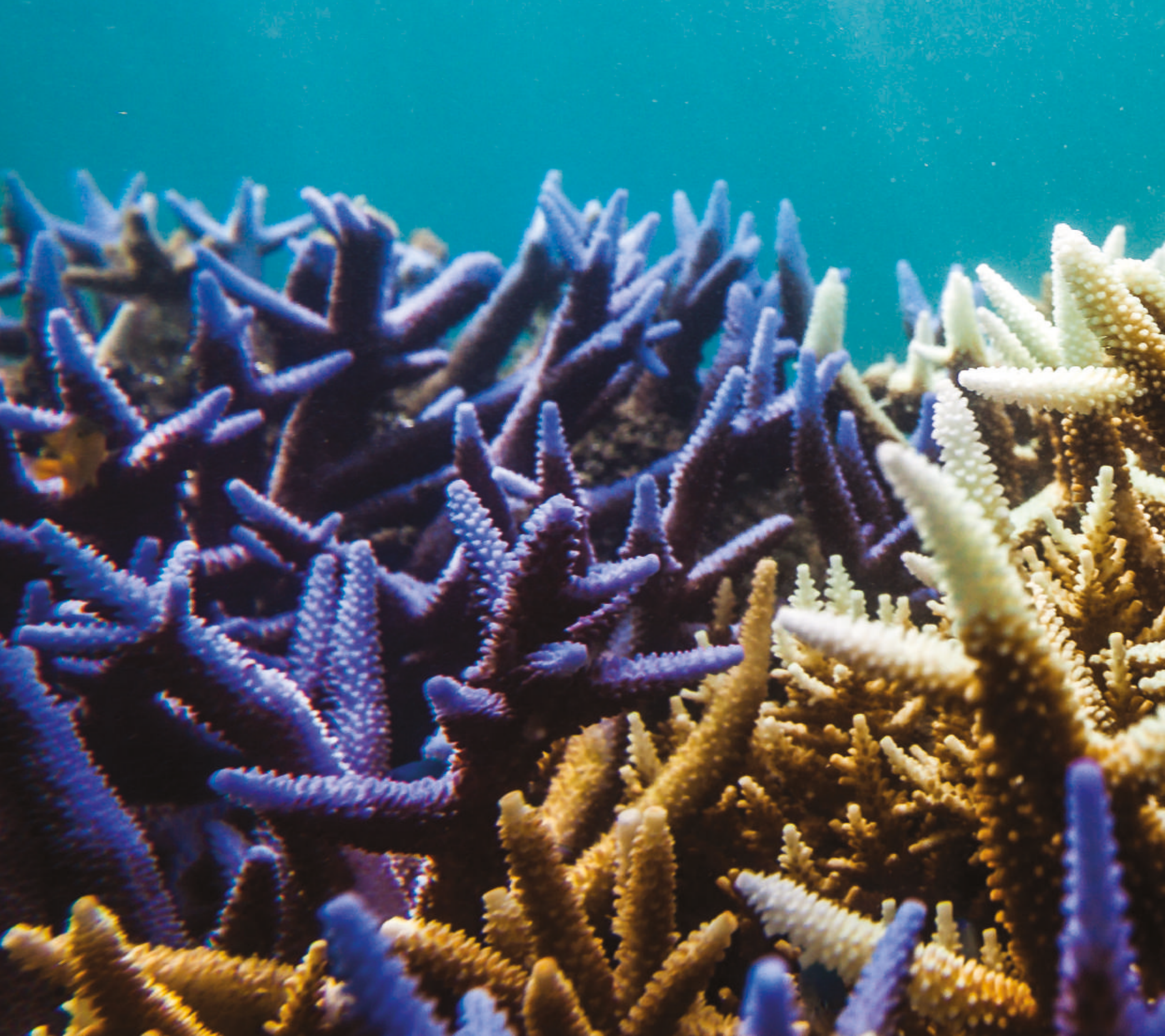
Since *In Hot Water* was released, new research has shown a possible weakening of the ocean's ability to sequester and store carbon (see Part 2 of this report),[8] while climate impacts on the ocean and coastal communities have worsened (see Part 1).

In the meantime, governments have been dragging their feet on measures to effectively protect the ocean. To this day, less than 1% of the high seas – the largest habitat on Earth, comprising 64% of the world's ocean[9] – is fully or highly protected from human activities.[10] While marine protected areas (MPAs) can be a powerful tool to help restore biodiversity and provide climate benefits, they will only succeed if they are well designed and properly enforced (see Part 3). A recent study of the world's largest 100 MPAs, representing close to 90% of reported global MPA coverage, revealed that 25% of the assessed MPA coverage is not implemented, and that 33% is incompatible with conservation objectives.[11] There are two factors underlying this: the lack of regulations or management, and the insufficient level of protection in some MPAs where destructive activities are still allowed to take place.[12]

However, the picture isn't entirely bleak. Political momentum for ocean protection has been growing and some major milestones have been reached in the last couple of years, triggering a wave of hope.

In December 2022, 196 members participating in the Conference of the Parties to the Convention on Biological Diversity in Montreal, Canada, agreed on the Kunming-Montreal Global Biodiversity Framework. This included Target 3,[13] also called "30x30", committing to the protection of at least 30% of land and sea by 2030.[14] While governments need to ensure the necessary level of funding and ambition to reach this target, they must also define networks of fully or highly protected MPAs to implement the target by the 2030 deadline.

In March 2023, after decades of negotiations, the UN agreed on a new Global Ocean Treaty, officially known as the Agreement under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (BBNJ Agreement). Upon entering into force, it will be the first legally binding treaty targeted specifically at conserving marine life within the high seas,[15] and a powerful tool that governments can use to help deliver the 30x30 target by creating vast ocean sanctuaries free from destructive human activities on the high seas. The International Tribunal for Law of the Sea Advisory Opinion recognises that the Global Ocean Treaty provides tools for governments to fulfil their duty to address the interconnected crises of climate and ocean,[16] which continue to worsen every day. With the 2030 deadline fast approaching, governments must tackle the climate crisis as a matter of utmost urgency. They need to set ambitious emission-reduction targets, transition to renewable energy, and ensure compliance with international climate agreements like the Paris Agreement to effectively tackle climate change. They must protect and restore natural stores of carbon in the ocean and the ecosystem process that maintains them. They must also start working on MPA proposals to be presented at the first BBNJ Conference of the Parties, or Ocean COP, and listen to over a million people around the world who are calling on them to urgently ratify the Global Ocean Treaty.[17]



©Abram Powell / Greenpeace
Great Barrier Reef Coral Bleaching around Fitzroy Island and Green Island

PART 1: IMPACTS OF CLIMATE CHANGE ON THE OCEAN AND COASTAL COMMUNITIES

CLIMATE IMPACTS ON THE OCEAN

The ocean has absorbed more than 90% of the excess heat that greenhouse gases have trapped in the Earth's system, with most of this heat retained in the shallowest 700m of the water column.[18]

Unlike on land, where creatures are used to regular and rapid changes in temperature, often over a 24-hour cycle, marine life is generally adapted to relatively small variations in thermal conditions. Many fish species are sensitive to warming waters, particularly while in early life stages.[19] Marine heatwave events, where waters are much warmer than usual for days or even months in a row, are becoming more frequent and more intense, which can have catastrophic consequences for some marine life.[20 21]

Heat stress causes corals to expel the symbiotic algae that give coral reefs their dazzling colours. These bleaching events can lead to the corals dying if the exposure to unusually warm water is sustained, and the threat to shallow-water coral reefs around the globe from climate change and ocean acidification

© Markus Mauthe / Greenpeace
Underwater images, Isabela Island, Pacific creolefish.

is extremely severe.[22] A global mass bleaching event began in 2023 – the second in ten years[23] – and by July 2024, 73% of the world's corals had been exposed to enough heat to begin bleaching.[24] Coral reefs are the foundation of many marine ecosystems throughout the tropics, supporting the economies of coastal communities through fishing and tourism. These communities are likely to face intense disruption over the coming decades.[25]

Climate change is reducing the amount of oxygen in the ocean. Warmer water is less able to hold oxygen, while increased surface temperatures lead to less mixing of water layers. Nutrient pollution and increased levels of CO_2 stimulate phytoplankton growth, and the resulting bacterial activity when the plankton die and sink can lead to further reductions in oxygen. Oxygen minimum zones, where oxygen concentrations are lower, occur worldwide at depths between 200m and 1,500m. As a consequence of climate change they are expanding, covering larger surface areas and moving further up the water column into shallower waters.[26]

As a response to these systemic changes, species that can do so are leaving their historic ranges in search of the cooler and more oxygenated water they are used to. For many creatures, this means heading to higher latitudes. The equator, the location of some of the highest marine biodiversity on Earth, has seen a dip in species richness since the 1970s.[27] Tropical tuna, marlin and other billfishes have high oxygen demands, and the expansion of oxygen minimum zones means their habitats may have shrunk by as much as 15% between 1960 and 2010.[28]

The polar regions are warming much faster than the rest of the world, and this is causing havoc with the sea ice that covers enormous areas in the Arctic and around Antarctica.[29 30] Sea ice in the Arctic, which has been monitored by satellite since 1978, reaches its annual minimum extent at the end of the northern

©Doug Allan/naturepl.com
Emperor penguins standing on sea ice, Antarctica, Ross Sea

summer in September. The sea ice minimum in 2024 was the seventh-lowest ever recorded, and the 18 lowest annual minima have all occurred in the last 18 years.[31] As sea ice retreats its albedo effect is reduced, meaning less of the sun's heat is reflected back into space and is instead absorbed by the dark seawater. This feedback loop means that changes in the environment at the Arctic can take place extremely quickly. While Arctic sea ice still covered 4.28 million square kilometres in September 2024, models indicate that the Arctic could have ice-free summers by the middle of this century even if greenhouse gas emissions are reduced very quickly.[32]

In contrast to the Arctic, the Antarctic spent several decades seemingly in defiance of rising global temperatures, experiencing stable freezing and record levels of sea ice as recently as 2014. However, this pattern reversed after 2016, with several record lows recorded. In 2023 the situation then took a deeply alarming turn, with the sea ice minimum extent suddenly dropping to 2.3 million square kilometres below the average;[33] the 2024 minimum was only a little higher.[34] The exact cause for this sudden shift is not yet clear to scientists, but the trend is towards reduced ice cover around Antarctica, and – as in the Arctic – it's clear that the environment is able to change very quickly and in ways that are not predicted by scientific models.

Sea ice is a crucial component of the marine environment in the polar regions, so its retreat is having a dramatic effect on the species that live in the Arctic and Southern Oceans. In many cases, the impacts have already been devastating. Male emperor penguins withstand incredibly hostile conditions when they form nesting groups on the ice throughout the long night of the Antarctic winter, balancing their eggs on their feet. The eggs hatch in spring, but the chicks aren't able to swim until they develop their waterproof feathers a few months later. Because the sea ice is now beginning to weaken and melt earlier in the year, catastrophic breeding failures have occurred due to colonies of chicks drowning when the ice gives way beneath them. Under current emissions projections, it is anticipated that "*nearly all emperor penguin colonies may decline by more than 90% by the end of the century*".[35]

Along the coasts of Greenland and Antarctica, ice sheets are losing icebergs at a quicker rate than they are being replaced by snowfall. Greenland's glaciers alone lost one trillion tonnes of ice between 1985 and 2022, contributing significantly to sea level rise.[36] Sea levels are 21 cm higher than they were in 1900, and projected future ice loss at the poles and from glaciers in mountainous regions means that larger increases are expected by 2100 even under the lowest emissions scenario.[37]

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Rainbow Warrior in Bohol, The Philippines

CLIMATE IMPACTS ON COASTAL COMMUNITIES

One-third of the world's population live within 100km of the coast, including in some of the most populous cities.[38] Hurricanes and typhoons, rising sea levels and other extreme weather events are threatening the environment, livelihoods and lives of millions of people, especially those in coastal communities in low-lying areas.

In the Philippines, Super Typhoon Yolanda (international name Haiyan), considered one of the strongest tropical cyclones in history,[39] struck in November 2013 and affected more than 16 million people, making four million homeless.[40] It left such a trail of destruction in the province of Eastern Samar that even a decade on, there is still no full resolution or compensation for the families of the thousands who died and the many survivors who lost everything they had. Before the area was able to recover from Yolanda, in July 2024 rainfall from Typhoon Gaemi, known as Super Typhoon Carina in the Philippines, caused severe flooding. This claimed lives, injured hundreds and displaced hundreds of thousands of people across the Philippines and beyond.[41]

© Basilio Sepe / Greenpeace
Typhoon Carina (international name Gaemi) impacts in the Philippines

The Pacific region and in particular the Pacific Island Nations that depend on the ocean for their livelihoods and culture are facing some of the most severe climate impacts anywhere on Earth. As predominantly low-lying geographies, these islands are especially vulnerable to even small rises in sea level and the associated loss of freshwater resources, erosion of coastlines and reduction of crop yields. Communities are suffering as the land around them washes away, a trend that will be exacerbated through the rest of this century as sea levels continue to rise. The threat to some Pacific states is existential, and in 2023 legal experts gathered in Fiji to consider solutions to the problem of what constitutes statehood when a country's lands have been submerged.[42]

In the Americas, the coastal town of El Bosque in Tabasco, Mexico, has also been affected by sea level rise, which has caused an accelerated process of coastal erosion and the loss of homes and infrastructure, permanently changing the lives of its inhabitants. The entire community – the first to be recognised as climate-displaced by the Mexican authorities – is in danger of disappearing.[43 44]

These experiences are going to become more widespread as the climate crisis takes greater hold in the years ahead. A report published by the International Panel on Climate Change (IPCC) in 2023 sets out in stark terms the risks facing coastal communities through the rest of the 21st century. Sea level rise will cause loss of coastal ecosystems and ecosystem services, groundwater salinisation, and flooding and damage to coastal infrastructure. So-called "once in a century" extreme sea level events are predicted to be 20–30 times more frequent, exposing one billion people to their effects.[45]

Communities are directly under threat from the physical destruction caused by the climate crisis, but they are also suffering as a result of the changes in the ocean ecosystem. The displacement of species by warming and deoxygenating water means that fisheries around the world are having to adapt as traditional catches disappear. Tuna populations are projected to move eastward in the Western and Central Pacific, and the biomass of the three main tropical tuna species in the waters of ten Pacific Small Island Developing States could decline by an average of 13% under a high emissions scenario,[46] posing serious challenges to tuna-dependent communities for their food security and the local economy. The contributions of tuna fishing to these states' economies are such that they are considered "tuna-dependent", with the access fees paid by industrial fishing fleets reportedly providing an average of 37% of their government revenue.[47]

© Gustavo Graf / Greenpeace
El Bosque Community Affected by Climate Change Impacts in Mexico

© Christian Åslund / Greenpeace
Boy with Tuna Fish Stands in Sea, Tarawa Island, Kiribati

COMMUNITIES CALLING FOR CLIMATE JUSTICE

Greenpeace is working with climate change affected communities around the planet to demand climate justice at all levels, from national human rights commissions to regional and international courts of human rights.

In March 2024, Greenpeace submitted a brief to the International Court of Justice on the Obligations of States regarding Climate Change,[48] which included testimonies from affected communities in the Philippines, Mexico and the Pacific, among others.[49] In May, the community of El Bosque was one of the groups that demanded climate justice before the Inter-American Court of Human Rights at hearings held in Manaus, Brazil, on the obligations of states in the context of the climate emergency.[50] [51] Climate change affected communities, supported by Greenpeace and other organisations, are raising their voices and leading the way in demanding the urgent mitigation of climate change and protection for the rights and wellbeing of impacted people worldwide.

While the climate crisis is affecting people along every coast, its impacts are not experienced equally. The climate crisis has largely been created by rich economies and fossil fuel companies, but it is low-income, marginalised and Indigenous communities that are disproportionately suffering its consequences. The IPCC's report details the adaptations that will be necessary to try to mitigate some of the impacts of the rising seas, such as flood defences and support for relocation. It recognises that as global warming increases, the "more limits to adaptation will be reached and losses and damages, strongly concentrated among the poorest vulnerable populations, will increase".[52] As discussed in the rest of this report, resilience in the face of rising sea levels and severe weather can be built through restoring and protecting habitats like mangroves and wetlands, which play an important role in sequestering carbon. Protecting fish populations on the high seas would reduce fishing pressure on species that are already under stress from warming waters and falling oxygen levels.

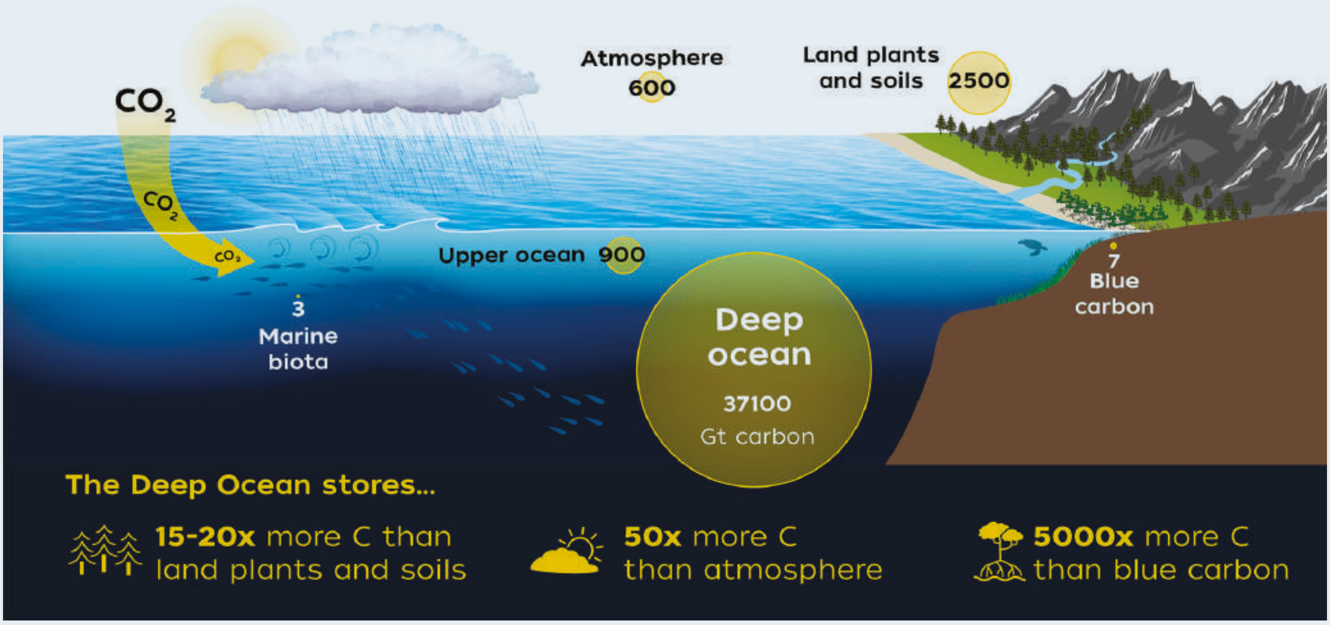
PART 2: THE DECREASING ABILITY OF THE OCEAN TO SEQUESTER AND STORE CARBON

THE OCEAN'S KEY ROLE IN THE CARBON CYCLE

Human activity is estimated to have released over 645 billion tonnes of carbon into the atmosphere since 1850.[53] A complex set of chemical and biological processes mean that each year the ocean is estimated to absorb about 20–30% of carbon dioxide emissions from human activities; the ocean has therefore absorbed a colossal amount of additional carbon over the past 180 years.[54]

If this additional carbon were in the atmosphere rather than the water, the greenhouse effect would be greatly amplified, trapping more heat in the atmosphere. Absorption of carbon by the ocean has so far provided a buffer against even more extreme impacts from the climate crisis, but this has come at a huge cost to the ocean. Ocean warming, acidification and deoxygenation are causing the health of the ocean to drastically deteriorate.

The carbon cycle describes the complex set of processes that moves carbon between different oceanic, atmospheric and terrestrial environments. **The ocean is the greatest carbon sink on Earth**, holding more than 50 times the amount of carbon in the atmosphere and more than ten times the amount of carbon held in terrestrial vegetation, soils and microbes combined.[55]



The deep ocean is the largest reservoir of carbon on the planet, containing 37,100 gigatons—roughly 15-20 times more than that sequestered by land plants.

© Woods Hole Oceanographic Institution

The majority of carbon in the ocean is in the form of inorganic compounds created by CO_2 dissolving in surface waters. Cold water near the polar regions containing dissolved CO_2 then sinks down to the deep sea, taking the CO_2 with it and isolating it from the atmosphere for hundreds or even thousands of years.

As anthropogenic carbon emissions have increased since the start of the 19th century, the absorption of inorganic carbon by the ocean has historically increased in proportion. However, a landmark analysis of global ocean carbon suggests that this relationship is starting to weaken and **the rate at which the ocean absorbs carbon is no longer keeping pace with anthropogenic emissions.**[56] Between 1994 and 2004, the ocean absorbed 29 billion tonnes of anthropogenic carbon, followed by 27 billion tonnes between 2004 and 2014. While the uptake of carbon by the ocean was similar across these two periods, anthropogenic emissions were nearly 25% higher in the second decade. As a result, the research concludes that **the ocean may have stopped being able to absorb carbon in proportion to emissions,** and it is possible that its ability to keep pace will shrink further as climate change progresses.[57]

Two potential causes have been identified for this change in the ocean's uptake of carbon, each thought to be responsible for approximately half of the observed shift. The first is that seawater now contains such a high amount of dissolved carbon that it has modified the ocean's chemical makeup, and it is now less able to take up additional carbon while levels of atmospheric carbon dioxide increase. The second is that changes in global ocean circulation are reducing the transport of carbon from the surface of the sea to deep waters.

Our addiction to burning fossil fuels has already changed the chemistry of the ocean surface through the acidifying effects of CO_2 and may even be starting to erode its ability to absorb more carbon in the future, thereby directly weakening one of our greatest buffers against the build-up of greenhouse gases. Models of how climate change will progress will have to allow for the possibility of the ocean playing a smaller role in absorbing carbon, and even swifter reductions in emissions will be needed for warming to be kept below 1.5°C.

BLUE CARBON HABITATS AND THE BIOLOGICAL PUMP

While inorganic carbon accounts for the much greater part of the carbon in the ocean, organic carbon resulting from biological processes is also highly significant. Coastal ecosystems such as mangroves and seagrass meadows are called blue carbon habitats because of their ability to store more carbon per unit area than terrestrial rainforests, making them powerful engines for removing carbon from the atmosphere. Uncertainties over the spatial extent of these habitats globally and the rate at which the stored carbon is then sequestered in sediments makes it difficult to calculate their contribution to the carbon cycle; estimates vary widely, ranging from 3% to 33% of the oceanic CO_2 uptake.[58]

© Tommy Trenchard / Greenpeace
Mangrove forest in the Galápagos

Also of enormous importance to the carbon cycle is the so-called biological pump, which transports carbon from the surface of the ocean to the deep sea. Phytoplankton convert dissolved CO_2 into organic carbon through photosynthesis on a scale similar to that of all the world's land plants combined. As the phytoplankton are eaten by other creatures, who are in turn eaten by larger and larger fish, this carbon is distributed through the food web.[59] Much of it is then respirated back into the atmosphere, but a small fraction makes its way into the deep sea, where approximately 1% of total surface organic carbon production is buried in sediments.[60] All marine animals contribute to this process, from tiny krill to enormous whales.

The ability of blue carbon habitats and the biological pump to sequester carbon relies on the health of the ocean. Unfortunately, seagrass meadows, saltmarshes and mangroves have been under sustained assault for decades from human expansion, particularly coastal development. Despite efforts to improve protection, over 1.04 million hectares of mangroves were lost between 1990 and 2020.[61]

THE IMPACT OF OVERFISHING AND BOTTOM TRAWLING

Overfishing has removed vast amounts of large fish like tuna and sharks, and abundant pelagic species like mackerel, which has in turn disrupted their role in the biological pump.[62] The use of bottom-towed fishing gear has started to draw particular attention in recent years for its potentially severe impact on carbon sequestration. Bottom-towed fishing involves dragging heavy trawl nets and dredges across the seabed. These are indiscriminate and destroy everything in their path, from corals and sponges to seagrass beds.

Bottom trawling also disturbs the sediment itself, causing some of the organic carbon it holds to re-enter the water column and dissolve to become aqueous CO_2, some of which will then escape into the atmosphere and contribute to global warming. The scientific debate around the amount of CO_2 released from the seafloor by bottom trawling is still developing, and there is uncertainty about the rate at which disturbed sediments release carbon.[63] Estimates of the spatial extent of bottom trawling globally, based on monitoring of vessels' automatic identification systems (AIS), are likely to be conservative, since many vessels either do not have AIS or switch it off while fishing.

A paper published in 2024 calculated that bottom trawling could have released 8.5–9.2 billion tonnes of CO_2 into the atmosphere over the 25 years between 1996 and 2020, or 370 million tonnes a year.[64] This figure is a significant fraction of global annual emissions, and it doesn't include the carbon dioxide from the fuel consumption of the vessels. Bottom-towed gear has severe impacts locally on the ecosystems where it is used, but its disruption of the carbon cycle means that it could also have implications at a global scale.

Humans rely on the ocean to ease the burden of our carbon emissions, but human activity is currently degrading the ocean's ability to carry out this role. Emission cuts must come as quickly as possible, and steps must be taken immediately to stop the destruction of wetlands and support their restoration; end the use of bottom-towed gear that directly disturbs seabed carbon stores; and create ocean sanctuaries to protect fish from industrial fishing and safeguard their role in the biological pump.

© Greenpeace / Kate Davison
Catch onboard bottom-trawler Ivan Nores

PART 3: HOW THE GLOBAL OCEAN TREATY CAN HELP INCREASE OCEAN RESILIENCE

SAFEGUARDING OUR BIGGEST ALLY IN THE FIGHT AGAINST CLIMATE CHANGE

Ocean resilience – defined here as the capacity of marine ecosystems to withstand and recover from the impacts of climate change and biodiversity loss – is increasingly recognised as a critical element of global environmental sustainability. Maintaining healthy, biodiverse marine ecosystems is essential as they provide crucial services such as carbon sequestration, food provision and coastal protection, even in the face of changing climate conditions.[65]

Global seabed sediments hold twice the amount of carbon stored in terrestrial soils, with an estimated 84% of total marine sedimentary carbon residing in the deep seabed.[66] Marine creatures, from microscopic plankton to majestic whales, play a significant role in capturing and storing carbon. A UN Climate Action explainer defines the ocean as "our greatest ally against climate change"[67] – but climate breakdown puts this vital relationship in jeopardy. We are far beyond having the luxury of choosing between cutting emissions and protecting ecosystems to boost their resilience and ability to store carbon. Both responses are needed at an unprecedented scale and urgency, given that the feasibility and effectiveness of adaptation options depend on the effectiveness of our efforts to limit global warming.[68]

Overfishing, offshore oil and gas extraction, pollution, plastic waste, invasive species and global warming are already putting ocean life under immense pressure, sometimes with cumulative impacts. While predicting the cumulative and interactive effects of these pressures is difficult,[69] it is clear that there are two main channels to support the ability of marine life to respond and recover:

1) Reducing the pressure, including through stopping overexploitation and destructive human activities at sea, rapidly reducing climate-warming emissions, and curbing chemical and plastic pollution.

2) Creating the conditions for natural processes to continue, allowing for response and adaptation to the changing environment.

© Solvin Zankl / Greenpeace
Sea anemone (*Urticina crassicornis*) in the Arctic

THE GLOBAL OCEAN TREATY

The Agreement under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (BBNJ Agreement), also known – and referred to in this report – as the Global Ocean Treaty, is the world's first cohesive, international and (upon entering into force) legally binding framework to specifically protect high seas biodiversity. It represents a landmark achievement in international law, aiming to protect marine biodiversity in areas beyond national jurisdiction through enhanced governance and global cooperation. As recognised by the International Tribunal for Law of the Sea Advisory Opinion, the Treaty also provides tools for governments to fulfil their duty to address the interconnected crises of climate and oceans, complementing the UN Framework Convention on Climate Change in this regard.[70]

© Egidio Trainito / Greenpeace
Sardinia, Marine Protected Area of Island of Tavolara - Secca Papa

The Global Ocean Treaty is set to play a pivotal role in strengthening ocean resilience. It provides governments with the opportunity to foster more comprehensive and coordinated efforts to safeguard marine ecosystems from the intertwined threats of climate change and biodiversity loss.[71 72] It explicitly recognises, for the first time, the critical need to address the impacts of climate change on marine ecosystems. Most existing institutions, frameworks and bodies are not prepared to address this challenge effectively.[73 74]

The Treaty introduces several legal mandates aimed at integrating climate considerations into marine biodiversity conservation efforts, recognising in the preamble *"the need to address, in a coherent and cooperative manner, biological diversity loss and degradation of ecosystems of the ocean, due, in particular, to climate change impacts on marine ecosystems"*.[75] Article 7 commits Parties to *"an approach that builds ecosystem resilience, including to adverse effects of climate change and ocean acidification, and also maintains and restores ecosystem integrity, including the carbon cycling services that underpin the role of the ocean in climate"*.

The Global Ocean Treaty stands on four pillars to enhance the governance of biodiversity in areas beyond national jurisdiction:

→ **Area-Based Management Tools (ABMTs)**. The Treaty sets out a legal framework and clear process for establishing networks of ABMTs, including marine protected areas (MPAs), also known as ocean sanctuaries, in areas beyond national jurisdiction. If effectively protected and well managed, these will help realise the target to protect at least 30% of our ocean by 2030, as agreed by countries in December 2022 under the Kunming-Montreal Global Biodiversity Framework.[76] Strengthening ecosystem resilience to climate change is explicitly recognised as an objective of ABMTs in Article 17 of the Treaty, and vulnerability to climate change is recognised as a criterion for an area to be proposed for protection by an ABMT/MPA in Annex I. In addition to proposing areas to be protected directly on the basis of vulnerability, consideration of climate criteria could allow for a focus on areas, communities and processes that are critical for productivity and carbon transfer, storage, burial and sequestration.[77] ABMTs also provide an opportunity to protect areas from human disturbance connected to resource extraction, such as fisheries.[78] Given that *ecologically representative and well-connected networks of marine protected areas* are recognised as an objective under Article 17, conservation planning tools such as future emissions projections can be employed to focus protection on habitat corridors and climate refugia (areas that might act as a refuge for biodiversity in case of climate change).[79]

→ **Environmental impact assessments (EIAs)**. EIA provisions in the Treaty mean the international community will benefit from increased transparency, and will have more influence on activities that could harm biodiversity or have a positive impact on climate and nature; the provisions also create an avenue to standardise impact assessments.[80] By including *the consideration of cumulative impacts[81] and impacts in areas within national jurisdiction* as an objective under Article 27, the Treaty addresses a significant gap in global ocean governance to date, as it supports evaluating the synergistic effects of climate change stressors with direct human disturbances. The EIA provisions also allow for greater transparency in estimating the greenhouse gas footprint of activities and identifying measures that are available to reduce emissions, as well as avoiding disturbance and disruption to blue carbon processes or ocean chemistry and ecosystems.[82] Article 39 provides for strategic environmental assessments, which some observers recognise as crucial avenues to address climate change because they support integrated implementation of other parts of the Treaty.[83]

→ **Capacity building and the transfer of marine technology**. The Treaty mandates the transfer of marine technology to developing countries to support equitable opportunities to implement the Treaty globally. A funding mechanism will be established to support such activities. Adverse effects of climate change are explicitly recognised under types of capacity building and the transfer of marine technology in Annex II. This creates an opportunity to enhance capacity for assessing and reducing carbon footprints as well as climate observations, impact monitoring and predictive modelling,[84] and to transfer knowledge on the "climate services" of biodiversity and how to incorporate them in national commitments and contributions under other international agreements.[85] Fair research partnerships, mutual capacity building and technology co-development between the Global North and South are recommended as key means to implement strategic environmental assessments.[86]

→ **Marine genetic resources**. The Treaty provides for the fair and equitable sharing of benefits derived from marine genetic resources from the high seas and international seabed. This part of the Treaty does not explicitly reference climate change considerations; however, it could help identify species and assess ecosystems to target climate solutions,[87] consider carbon footprint when developing best practices for access to information, and support adaptive and integrated use and conservation of genetic resources in the context of climate change.[88]

The Global Ocean Treaty was adopted by the UN in June 2023. It will enter into force 120 days after the 60th ratification of the Treaty by a UN member state, which is expected to take place by the third UN Ocean Conference in June 2025. In order to realise the significant opportunity for advancing climate action on the high seas, governments must ensure widespread ratification of the Treaty, effective coordination among global, regional and national legal regimes, and the provision of adequate technological and financial support to developing countries.[89]

OCEAN SANCTUARIES BOOST ECOSYSTEM RESILIENCE IN THE FACE OF CLIMATE DAMAGE

There is mounting scientific evidence that well-designed and effectively implemented MPAs play a vital role in enhancing ocean resilience by acting as ecological and social buffers against the adverse effects of climate change. Fully and highly protected areas can help the ocean to cope with climate change and safeguard carbon stores and sequestration.[90, 91] This is because:

→ Ocean sanctuaries are off limits to pressure from industrial activities such as fishing and drilling, thus promoting ecosystem recovery and conferring resilience. A fully protected area in Cabo Pulmo, Mexico, has demonstrated recovery of fish populations since its creation in 1995, with resulting economic and social benefits for coastal communities.[92]

→ Ocean sanctuaries support larger populations that are more resistant to extinction than smaller ones, as demonstrated in a global review of reef fish communities and their resilience within and outside MPAs under global warming.[93]

→ Larger populations maintain higher genetic diversity, increasing the chances of species adapting to changing sea temperatures and other environmental changes.

→ Well-connected networks of protected areas act as stepping stones for migratory species and support species' distribution shifts as a response to changing conditions, by providing suitable living space for such climate migrants.

→ Identifying areas of the ocean where conditions are most stable may provide climate refugia, such as the Ross Sea MPA for Antarctic ice-dependent species.

→ Protecting the seabed from disturbance by heavy fishing gear or mineral extraction will prevent the release of carbon held in sediments.

→ Protecting mesopelagic fish may be key in preventing further weakening of the biological pump.

Well-implemented MPAs can support communities' adaptation to climate change, as they improve food security, increase environmental awareness and participation, and provide opportunities for alternative livelihoods,[94] although experience available for review is limited to coastal MPAs. A recent comprehensive review reveals that MPAs can enhance biodiversity, reproductive output of marine species and coastal protection, all of which contribute to greater ecosystem resilience.[95] Integrated in broader conservation strategies, they can deliver further benefits such as supporting fisheries and the preservation of marine carbon stocks.[96 97]

For instance, MPAs with high levels of protection and those that have been established for longer periods show significant improvements in species richness and habitat stability, which are crucial for maintaining ecosystem functions under climate stress. Well-managed areas can significantly increase fish populations both within and outside their boundaries – the so-called spillover effect – thus reinforcing the ecological connectivity that supports species' adaptive capacities.[98]

Species' and habitats' susceptibility and vulnerability to climate change needs to be considered in ocean sanctuary network design. Vulnerability assessments and adaptive management strategies can be deployed to systematically incorporate climate change adaptation in MPA planning and ensure that ocean sanctuaries continue to protect marine biodiversity under changing climate conditions. Protecting climate refugia, enhancing connectivity between ecosystems, and adapting to shifting environmental baselines all support climate-proofing of the global MPA network.[99]

Climate change projections could aid planning of MPA networks by focusing on their role in preserving ecological functions across different future emissions scenarios.[100]

THE ROLE OF THE GLOBAL OCEAN TREATY IN CREATING A GLOBAL NETWORK OF OCEAN SANCTUARIES

Part III of the Global Ocean Treaty legally empowers the Ocean COP to create MPAs in areas beyond national jurisdiction. These are vital for resilience in the face of climate and ecological breakdown, and for reaching the global commitment under the Kunming-Montreal Global Biodiversity Framework to protect at least 30% of land and sea by 2030. Currently, less than 3% of the ocean globally is fully or highly protected.[101]

The climate and biodiversity crises are deeply intertwined, and one cannot be effectively resolved in isolation from the other. Ecosystem degradation exacerbates climate change, which in turn accelerates biodiversity loss.[102] Healthy ecosystems, supported by robust biodiversity, are better able to withstand and adapt to the impacts of climate change. The most recent IPCC assessment recognises MPAs as a key tool to address the ocean crisis and support ecosystems' adaptation.[103] By aligning biodiversity conservation with climate resilience strategies, the Global Ocean Treaty can foster more comprehensive and effective global environmental governance. Such integration of biodiversity and climate action is essential to achieve the goals set out in international agreements like the Paris Agreement, ultimately leading to more resilient and sustainable marine environments.[104] However, governments must seize the opportunities the Global Ocean Treaty presents, and this will require urgent and deliberate action.

The most critical success factor – and the biggest challenge – is to ensure ecological representation in ocean sanctuaries and effective implementation of protection at sea. Insufficient enforcement, inadequate funding and lack of comprehensive management plans render many existing MPAs as "paper parks", protected only in theory.[105] The Treaty's framework encourages nations to collaborate on establishing MPAs that are not only extensive but also effectively managed and ecologically representative, thereby enhancing their role in increasing ocean resilience and addressing global biodiversity loss.[106]

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Manta Ray off Nusa Penida Island

RECOMMENDATIONS

→ States must honour their commitments to the Paris Agreement and act to reduce fossil fuel and other emissions at the pace and scale required to stay below 1.5°C of heating. Failure to do so will further degrade the ocean's ability to protect and sustain a wealth of biodiversity and support coastal communities to adapt in an ever-heating climate. A healthy ocean is critical for climate mitigation, adaptation and resilience, representing a precious natural carbon sink.

→ Ocean sanctuaries – marine protected areas (MPAs) where life is fully or highly protected from destructive and extractive activities – increase the capacity of marine life to cope with the multiple stresses unleashed by climate change. They help ecosystems to thrive and become more resilient, while safeguarding blue carbon ecosystems and the biological carbon pump and protecting natural stores of carbon in both the deep sea and coastal waters. Establishing a globally representative network of ocean sanctuaries, covering at least 30% of the ocean by 2030, is therefore critical for securing planetary health and protecting the livelihoods of the millions of people who depend on healthy oceans.

→ The Global Ocean Treaty is the tool through which the globally agreed target of protecting 30% of the ocean by 2030 can be delivered. At least 60 countries must ratify the Global Ocean Treaty by the UN Ocean Conference of the Parties (COP) in June 2025 for the agreement to enter into force 120 days later. After ratification, governments must continue to prioritise ocean protection through rapid and effective implementation of the Treaty.

→ Alongside ratification efforts, states must work together to establish what an ecologically representative, climate resilient 30x30 network could look like, and begin formulating high seas MPA proposals ready for discussion at the first Ocean COP. Champion governments need to begin writing proposals, building political support and consulting stakeholders as soon as possible, taking a "twin track" approach alongside ratification. They cannot afford to delay this work until the Treaty has entered into force; if they do, the first Ocean COP cannot advance protection and the 30x30 goal risks being missed.

→ The Biodiversity Beyond National Jurisdiction (BBNJ) Preparatory Commission meetings will consider a number of key recommendations, including issues related to governance, financial rules and scale of assessed contributions, and the operationalisation of the Clearing House Mechanism. Countries must make progress to ensure that the first meetings of the Ocean COP can be used to advance the protection needed to reach the global 30x30 goal.

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Greenpeace International
Surinameplein 118
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