

# RESILIENCE TO CLIMATE CHANGE IN OCEAN ECOSYSTEMS

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Climate change is having a dramatic effect on ocean ecosystems around the world. From coral bleaching to declining fish populations, the climate change effects are far-reaching and devastating. However, these ecosystems of the ocean are not without hope in the sage of climate disruption. There are instances where marine species have adapted to changing conditions, showing that resilience is possible in the stage of climate change. In this blog post, we will explore how resilient ocean ecosystems can be and what strategies will be used to promote greater resilience. We'll also discuss ways that we as humans can protect fragile marine ecosystems and promote their resilience over time.

## Abstract

As the world's oceans warm and become more acidic due to climate change, the ability of marine ecosystems to adapt and continue to provide the services they currently do is increasingly uncertain. To date, most research on the effects of climate change on marine ecosystems has focused on individual species or groups of species, with relatively little attention paid to ecosystem-level responses. A new study published in *Frontiers in Marine Science*, however, takes an ecosystem-wide approach to investigating how different types of ocean ecosystems might respond to future climate change.

The study used a mixture of computer simulations and field observations to examine the resilience of four different types of ocean ecosystems: coral reefs, kelp forests, seagrass meadows, and mangrove forests. The researchers found that all four ecosystems are likely to experience significant changes as a result of climate change, but that some are more resilient than others.

Coral reefs are perhaps the most sensitive of all the ecosystem types studied. The study found that even small increases in temperature or decreases in pH (a measure of acidity) can have major impacts on coral reefs, causing them to lose their structural complexity and eventually break down completely. This loss of structure would have far-reaching consequences for the many species that depend on coral reefs for food and shelter.

## How is climate change affecting the ocean?

As the Earth's atmosphere warms, the ocean absorbs more heat and becomes less hospitable to many marine species. At the same period, increasing levels of atmospheric carbon dioxide are making the ocean more acidic and threatening the endurance of corals and other calcium carbonates used by the organisms that build their shells.

These changes have far-reaching consequences on ocean food webs and the millions of people who depend on them for their livelihoods. In addition to impacts on individual species, climate change is altering essential ocean processes such as circulation patterns and the mixing

of deep and surface waters. These changes have devastating effects on local weather patterns, fisheries, and coastal

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communities.



## Sea-level rise

As the Earth's climate continues to change, the most significant impact will be sea level rise. The oceans are already absorbing about a quarter of carbon dioxide emissions, which is causing them to acidify. As they warm and expand, sea levels will rise.

The impact of sea-level rise will be felt most keenly in coastal communities. Low-lying areas will be increasingly vulnerable to flooding, while changes in local weather patterns could cause disruptions to agriculture and fisheries. There is also a risk that rising seas could contaminate groundwater supplies with salt water.

Whichever strategy is chosen, action must be taken now to prepare for the impact of sea-level rise. With careful planning and preparation, it should be possible for communities to adapt and thrive face of this challenge.



## Loss of marine biodiversity:

Loss of marine biodiversity is the most serious impact of climate change on ocean ecosystems. As temperatures rise and ocean habitats change, many species are struggling to adapt. Some are moving to new areas, others are shrinking in size, and some are disappearing altogether.

This loss of biodiversity has far-reaching consequences for the health of our oceans. It reduces the resilience of marine ecosystems to shocks like heat waves and pollution and makes them more vulnerable to invasive species. Additionally, it undermines the ability of these ecosystems to provide critical services like the production of food and carbon sequestration.

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Despite the seriousness of this issue, there are reasons for hope. Marine biodiversity can be conserved and even enhanced through thoughtful management practices. By working together to reduce human-caused stressors on ocean ecosystems, we can give these systems the best chance to adjust to a changing climate.



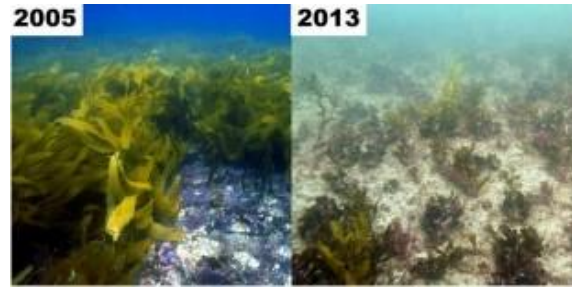
## Marine heatwaves:

Marine heatwaves are a relatively new phenomenon, only having been documented since the early 1990s. They are defined as a period of abnormal high sea surface temperatures (SST) that last

for five or more days. Marine heatwaves have a variety of impacts on ocean ecosystems, including bleaching of corals and other marine life, mortality of fish and other organisms, and displacement of species.

While ocean heatwaves are not a new phenomenon, their frequency, and intensity have increased in late years due to anthropogenic climate change. The marine heatwave days have doubled since 1925, with almost one-third of that increase occurring since 1982. The global average length of marine heat waves has also increased, from 4.3 days in 1925 to 7.9 days in 2016. In addition, the maximum temperature anomalies associated with marine heatwaves have increased by 0.5-1°C over the last century.

The increase in frequency and intensity of ocean heat waves are expected to continue as the Earth continues to warm due to anthropogenic greenhouse gas emissions. This will likely result in more widespread and severe impacts on ocean ecosystems around the world. As such, it is important development resilience to climate change in these systems. Some adaptation strategies that could be employed include developing early alert systems for communities at risk from marine heatwaves, enhancing management practices for fisheries and aquaculture operations, and increasing habitat protection and restoration efforts



## Climate change impact in the Indian Ocean region:

Climate change is the most pressing issue facing our planet today. The Earth's temperature has risen by about 1.1 degrees Fahrenheit (0.6 degree Celsius) since the late 1800s, largely due to emissions of greenhouse gases. The Intergovernmental Panel Fifth Assessment Report projects that global temperatures will increase up to 0.5 to 8.6 degrees Fahrenheit (0.3 to 4.8 degrees Celsius). While the exact magnitude and timing of future climate change remain uncertain, it is clear the Earth is already experiencing significant changes that changes will have far-reaching consequences for all life on our planet.

One of the regions most vulnerable to climate change is the Indian subcontinent. India is home to over 1.3 billion people, many of whom live in coastal areas or near major rivers (IPCC, 2014). Rising of sea levels and more extreme weather conditions are already causing flooding and other damage in these areas, and are expected to cause even more problems in the future. Additionally, changing the pedicure of rainfall is likely to cause droughts and decrease crop yields (IPCC, 2014). These impacts will not only threaten the safety and well-being of India's citizens but also have serious economic consequences for the country as a whole.

## Landing under the sea under the



## threads of climate change.

Landing under the sea under the threads of climate change, scientists found that ocean ecosystems are amazingly resilient because of global warming. In a study published in the journal Science, an international team of researchers led by James Barry of the University of Exeter in the UK looked at how different types of marine life responded to simulated climate change over a period of 30 years.

The team found that some species fared better than others, and the whole ocean ecosystems were able to adjust and even thrive in the face of rising temperatures and difficulty in food availability. "Our results show that there will be some losers under climate change, on balance marine life is likely to do quite well," said Barry.

The findings are based on a unique experiment conducted at the Ocean Biological Association's Laboratory in Plymouth, UK. The so-called "Ocean Thermal Gradient" experiment was set up in 1985 and is still running today. It uses huge containers filled with

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water from different depths of the ocean, which are then heated or cooled to simulate different climate scenarios.

For the past 30 years, the team has monitored how more than 1,000 species of marine plants and animals have responded to these changing conditions. The results have been striking: even under simulations of relatively extreme climate change, many species were able to adjust quickly and continue to thrive.

## Turn Commitments into Action.

Ocean Panel member countries have made important ocean-related efforts on international platforms such as Our Ocean Conference and UN Ocean Conference. Key to mobilizing action, driving investment, and influencing priority areas. The first progress report on the Agencies' Transition Agenda shows that the number of national commitments continues to grow each year, demonstrating the

unwavering leadership of Member States. Taken together, these panel members' commitments support the execution of nearly two-thirds of actions identified in the transformation priorities for 2030. The report also shows that these commitments are followed by meaningful actions, with the majority being completed (54%) or in progress (40%), a strong signal of effective implementation and accountability. is sending The

Ocean Panel highlights the link between a healthy and sustainable ocean economy and achieving the broader sustainable development agenda. Analysis of the report has helped the Ocean Panel's broader focus on action not only drive ocean outcomes but also achieve 61 goals across all 17 aims of the UN in 2030.



**Realizing 100% sustainable ocean management.**

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Actions taken by Ocean Panel countries to achieve 100% sustainable

ocean management are the goals of ecosystem health, food, and energy security, community prosperity, economic growth, and sustainability. It shows that is not only, but can be strengthened. The execution of robust, effective, and sustainable ocean planning ensures the long-term health of marine ecosystems as the foundation of thriving economies and societies.

<https://www.un.org/en/climatechange/science/climate-issues/ocean-impacts>

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## REF

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**National Geography**

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**National Centre**

**for Ocean**

**Information**

**Services**

<https://incois.gov.in>

**United Nations Origination  
(Climate Action)**