Confronting Climate Change: Impacts, Mitigation Strategies, and Global Cooperation

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The Profound Impacts of Climate Change: From Natural to Human Systems

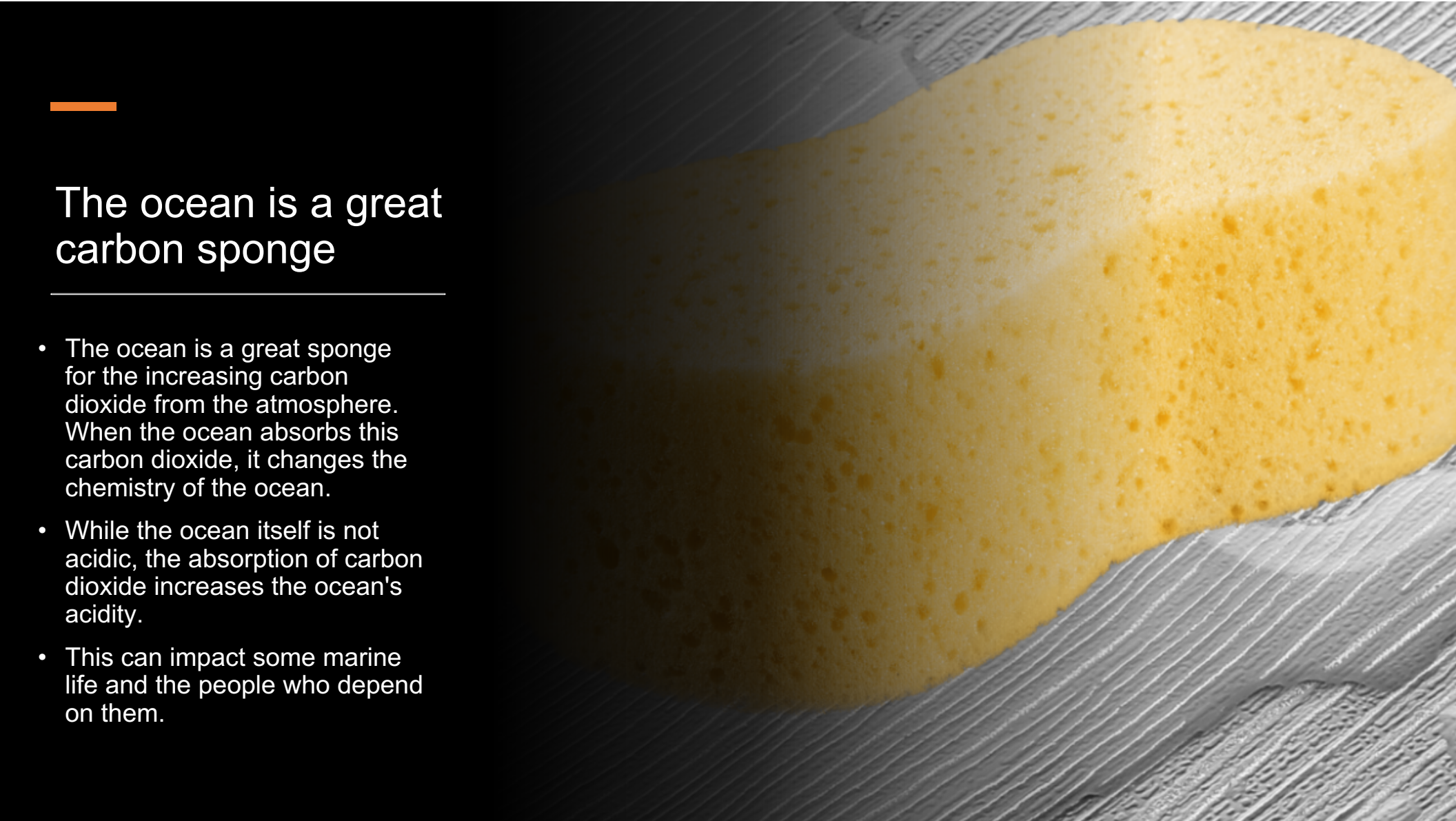
1. **Impact on Natural Systems**
    1. "Climate change significantly disrupts ecological systems, leading to changes in biodiversity and the natural habitats of species."
    2. "Examples include coral bleaching in oceans due to rising sea temperatures and shifting migration patterns of birds and marine life."
2. **Impact on Human Societies**
    1. "Human societies face direct and indirect consequences of climate change. These impacts span across critical areas like agriculture, health, and economy."
    2. "For instance, increasing temperatures and changing precipitation patterns are affecting crop yields, while extreme weather events like heatwaves and floods are posing challenges to public health and infrastructure."

Climate Change and Its Impact on Ocean Ecosystems

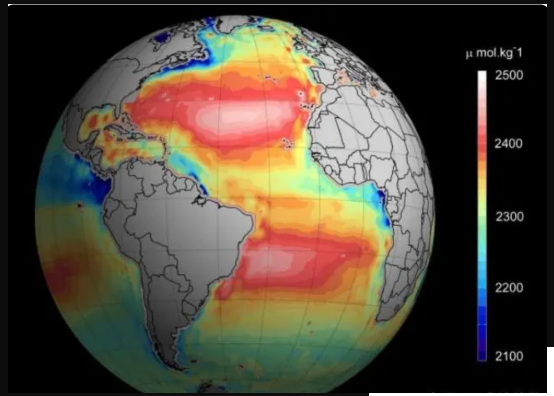
Ocean acidification affecting marine biodiversity and fishery resources.

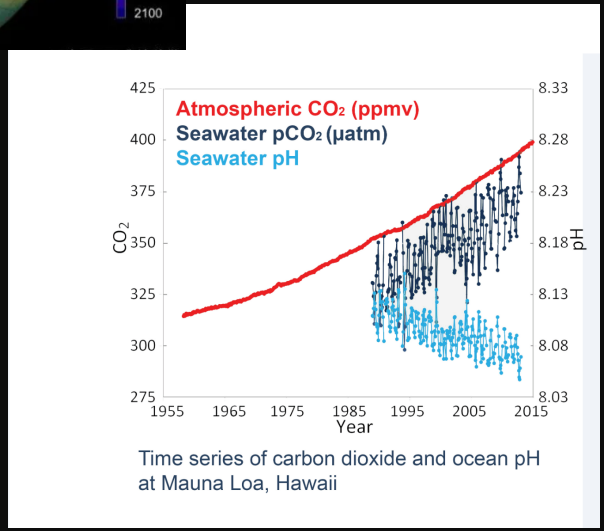
The ocean is a great carbon sponge

- The ocean is a great sponge for the increasing carbon dioxide from the atmosphere. When the ocean absorbs this carbon dioxide, it changes the chemistry of the ocean.
- While the ocean itself is not acidic, the absorption of carbon dioxide increases the ocean's acidity.
- This can impact some marine life and the people who depend on them.



Trends in Atmospheric CO2 and Ocean Acidification





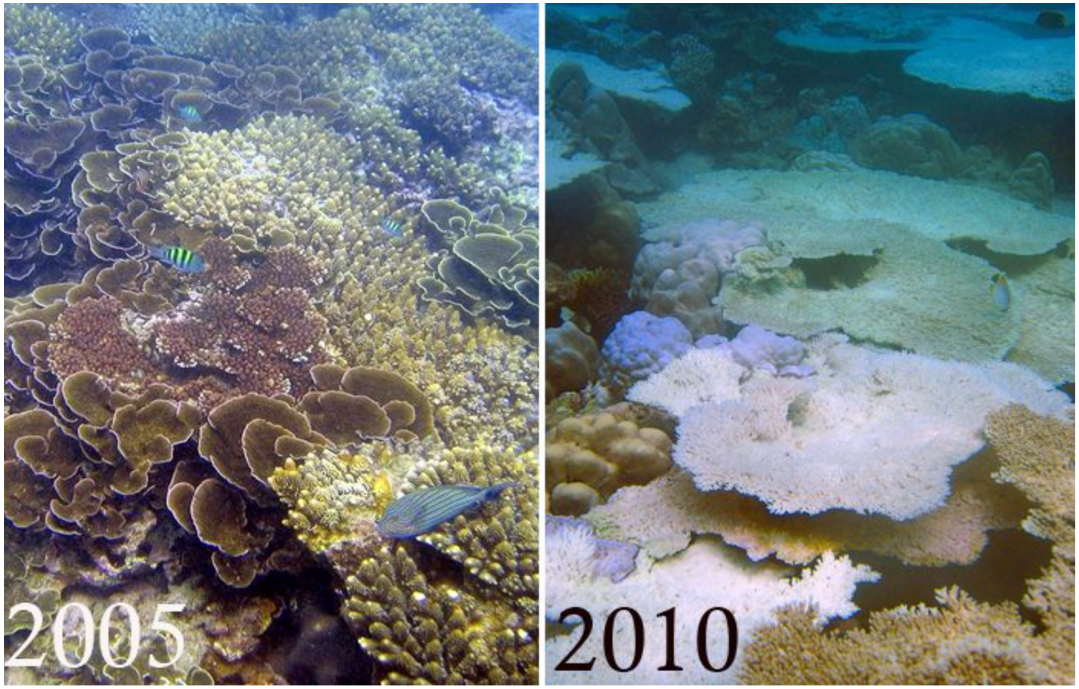
Time series of carbon dioxide and ocean pH at Mauna Loa, Hawaii

Global Distribution of Carbon in the Oceans

Effects of Ocean Acidification on Coral Reefs

- "Coral reefs are known as the 'rainforests of the sea' due to their rich biodiversity.“
- "They provide habitat for a multitude of marine species, support fishery economies, and protect coastlines.“
- "Acidification reduces the availability of carbonate ions, which are critical for corals to build their calcium carbonate skeletons."
- "This leads to weaker coral structures and can slow down coral growth, making them more susceptible to other stresses."
- Secondary Effects

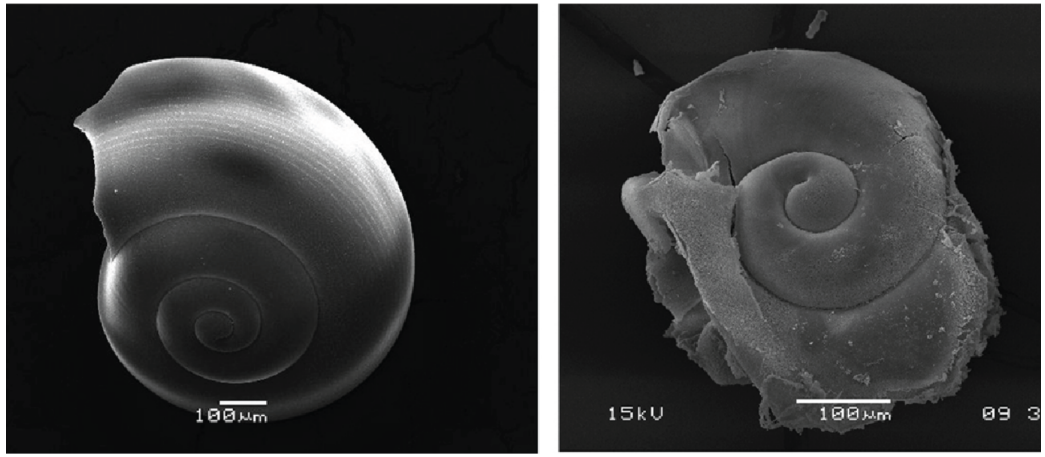
- "The decline in coral health affects the entire reef ecosystem, including the species that depend on them for food and habitat."
- "Economic impacts include reduced fish stocks and loss of revenue from tourism and fishing industries."



Visualizing the Impact: Coral Bleaching Over Time

- This comparative photograph starkly demonstrates the rapid decline in coral health within a five-year period, attributed to rising sea temperatures and ocean acidification.
- The colorful, dense structures of 2005 have been largely replaced by bleached, barren coral skeletons by 2010.
- Such changes not only affect the aesthetic value of these ecosystems but also their biological integrity and the marine life that depends on them.

Shells Dissolve in Acidified Ocean Water



Beyond Coral Reefs: The Ripple Effects of Ocean Acidification

Implications for Fisheries:

Acidification poses a threat to the fisheries industry, affecting fish stocks by altering the availability of crucial nutrients and changing fish behaviors and habitats.

Global Food Security:

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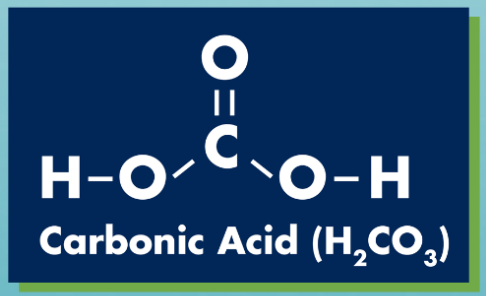
Carbonic acid "steals" carbonate needed by some marine organisms for their shells.



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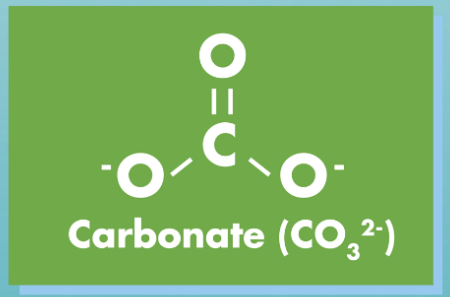

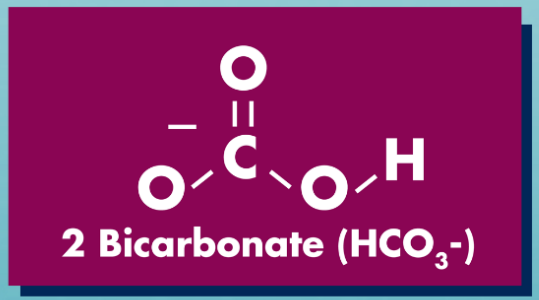

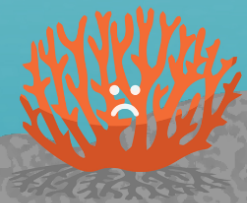

The shells of some marine organisms are made up of calcium carbonate ($CaCO_3$).

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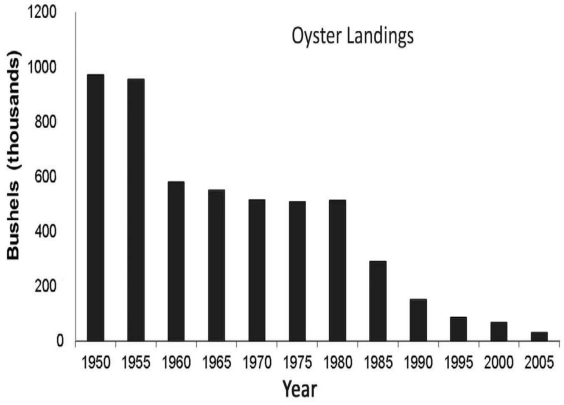
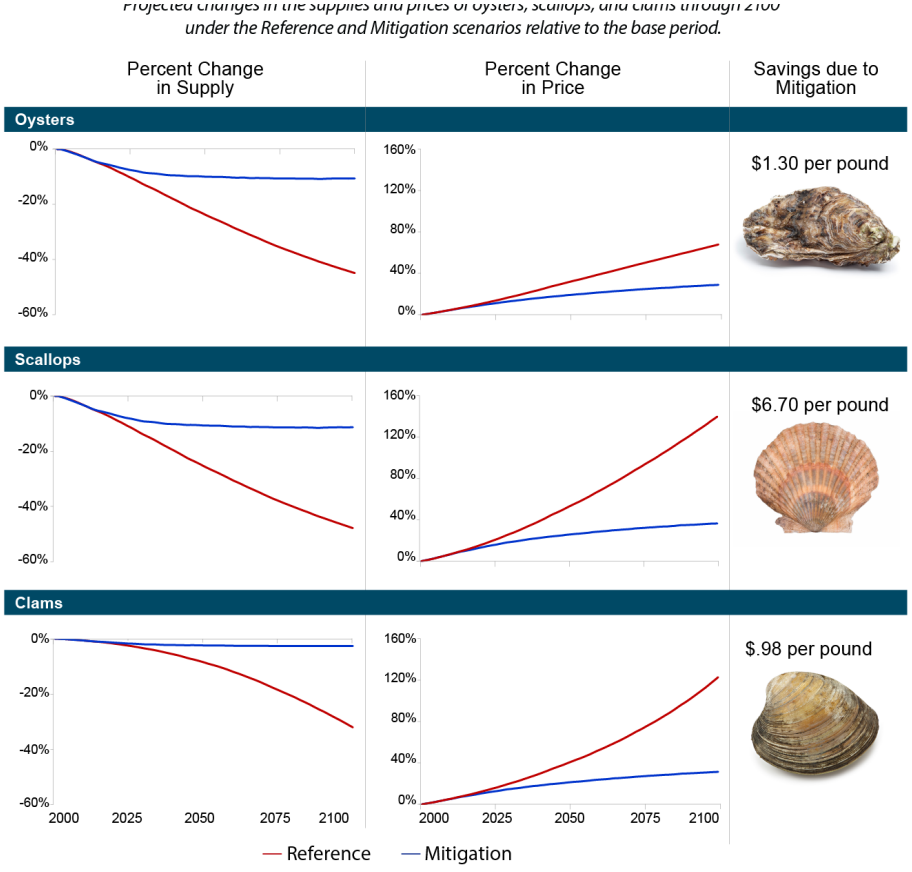


Graph showing oyster landings from Connecticut, New Jersey, Delaware and Maryland-Virginia, from 1980 to 2005. Source: U.S. Fisheries Statistics and Fisheries of the United States; Image credit: Mackenzie et al. 2018

- "Fisheries contribute significantly to the global economy, providing livelihoods for millions and food security for billions.“
- Acidification can lead to a decrease in shellfish populations, which are a vital part of the marine food web and a significant source of income for fishing communities.
- "Changes in ocean acidity affect fish species' sense of smell and ability to avoid predators, find food, and navigate, which can impact fish stocks."



For more information, visit EPA's "Climate Change in the United States: Benefits of Global Action" at www.epa.gov/cira.

1.Projected Declines

1. "By 2100: Oysters -45%, Scallops -48%, Clams -32% without mitigation."

2.Price Surge

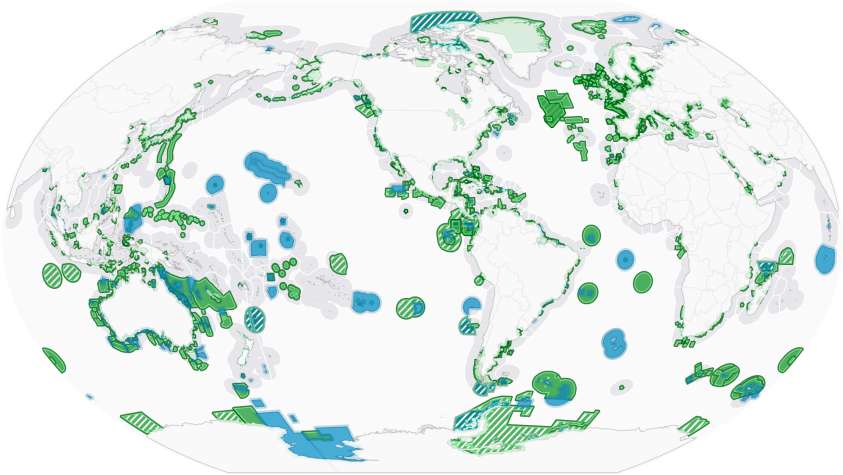
1. "Expected price increases by 2100: Oysters +$2.20/lb, Scallops +$9.10/lb, Clams +$1.30/lb."

3.Mitigation Benefits

1. "Mitigation can preserve up to 34% of current oyster supply, 37% of scallops, 29% of clams."

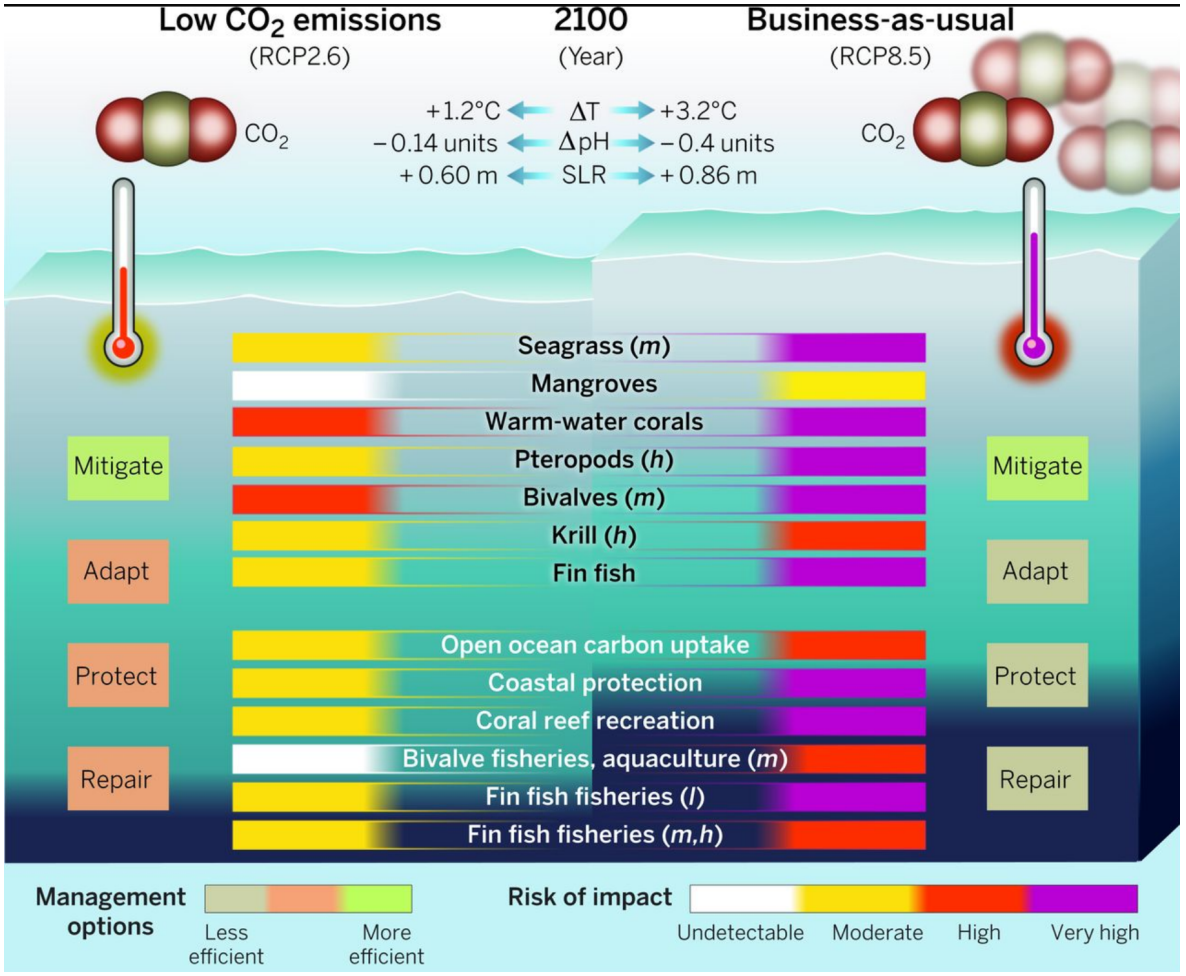
Marine Protected Areas: A Strategic Response to Ocean Acidification

1. **MPA Purpose**
    1. "MPAs safeguard ocean areas to help marine ecosystems thrive and better resist acidification."
2. **MPA Benefits**
    1. "Well-managed MPAs lead to healthier marine species and ecosystems, which can also aid in carbon storage."
3. **Case Example**
    1. "The High Seas Treaty could expand MPA benefits globally, crucial for unprotected international waters."
4. **Effectiveness**
    1. "Effective MPAs result in more robust fish populations and greater biodiversity."



Steering Towards Resilience: The Path of Low Emission

- **Climate Projections**: "Low emissions stabilize climate and ocean pH, unlike high emissions."
- **Marine Risk**: "Reduced emissions lessen risks to key marine species."
- **Action Efficacy**: "Conservation actions have more impact under low emissions."
- **Long-term Benefits**: "Lower emissions protect oceans and fisheries' future."



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