

## **SPEAK UP & ACT NOW: SHORT GUIDES TO ADDRESS CLIMATE CHANGE<sup>i</sup>**

### **OCEAN ACIDIFICATION**

**QUESTION:** What is ocean acidification, what is its relationship to climate change, and how is it harmful?

**ANSWER:** Ocean acidification is when oceans absorb carbon dioxide (CO<sub>2</sub>) from the atmosphere and become too acidic. The leading human activities that release CO<sub>2</sub> into the atmosphere are burning fossil fuels and deforestation. Oceans absorb about 30% of this CO<sub>2</sub>, which dissolves into the water and forms carbonic acid, lowering the pH and making ocean water more acidic.

#### **WHY IS OCEAN ACIDIFICATION BAD?**

**Ocean acidification severely harms the marine ecosystem.** Ocean acidification negatively impacts shellfish (e.g., oysters, clams) and coral because acidity makes it harder for them to build and maintain their shells and skeletons. The world's coral reefs, which support 25% of all marine species, have already been seriously damaged. At the current rate of acidification, according to an article in *Scientific American*, water conditions will be so acidic by 2080 that even healthy coral reefs will dissolve faster than they can build themselves up. Additionally, fish experience disruptions to their senses and behavior due to the changing chemistry of the water, impacting their ability to find food and reproduce.

**Ocean acidification is resulting in multimillion dollar losses to local economies that depend on commercial fishing.** Ocean acidification contributes to more frequent episodes of harmful algae overgrowth (called harmful algal blooms). The harmful algae produce a neurotoxin, which accumulates in shellfish and poses a serious risk to anyone that consumes the shellfish. As a result, many West Coast fisheries have been forced to shut down. Additionally, scientists predict that by the end of the century, warming waters and acidification will reduce commercial supplies of clams by 35%, oysters by 50%, and scallops by 55%, resulting in cumulative losses of \$230 million.

**Oceans will no longer be able to mitigate climate change.** The more oceans acidify, the less additional CO<sub>2</sub> they can absorb. Their function as a "CO<sub>2</sub> sink," which helps attenuate climate change, will decline. As a result, the greenhouse gas effect will keep accelerating and growing in intensity.

#### **CAN OCEAN ACIDIFICATION BE REVERSED?**

**No.** Adding compounds to chemically neutralize acids is not plausible. The amount of

material needed to be added is very large—more than the tonnage of CO<sub>2</sub> already emitted into the atmosphere. Additionally, adding compounds to chemically neutralize acids requires a new and significant mining and chemical processing infrastructure with unknown environmental consequences.

Another option is ocean fertilization to stimulate the growth of seaweed and phytoplankton that, like terrestrial plants, take up CO<sub>2</sub>. This could mitigate acidity near the ocean surface but would cause further acidification in the deep ocean as sinking organic particles are decomposed back to CO<sub>2</sub> at greater depths.

### **ACTIONS – WHAT CAN WE DO?**

**1. REDUCE CO<sub>2</sub> RELEASED INTO THE ATMOSPHERE.** Since burning fossil fuels and deforestation are the leading causes of CO<sub>2</sub> emissions, we must reduce our reliance on fossil fuels and reduce deforestation. Join organizations that are advocating for a transition to renewable energy and holding fossil fuel companies accountable.

For more actions, see “Speak Up & Act Now: Short Guides to Address Climate Change” on home energy use; transportation; food production, consumption, and waste; plastic; renewable energy; government action; and fossil fuel and utility companies.

**2. SUPPORT CONTINUED RESEARCH.** For example, support research on carbon fixation by marine plants and phytoplankton. Some studies suggest that cyanobacteria, a type of phytoplankton, may hold promise but issues of scale and potential unintended effects need to be addressed.

### **RESOURCES – WHERE CAN I LEARN MORE?**

- [What is Ocean Acidification?](#), National Ocean Service website, National Oceanic and Atmospheric Administration (NOAA)
- [Ocean Acidification](#), National Museum of Natural History, Smithsonian Institution
- [CO<sub>2</sub> and Ocean Acidification: Causes, Impacts, Solutions](#), Union of Concerned Scientists

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<sup>i</sup> Prepared by members of the University of Richmond Osher Special Interest Group on addressing the climate crisis (2024-25)