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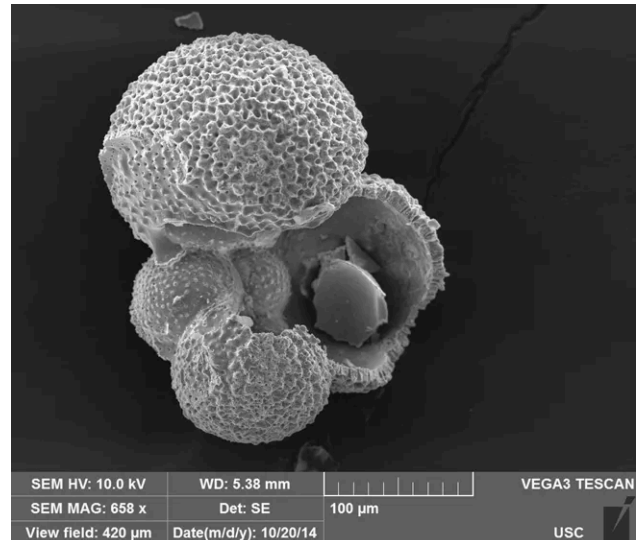
Climate Corner, December 2019

Ocean Acidification Happening Faster Than Average Along the California Coast

Many species of tiny, single celled organisms called foraminifera spend their lives drifting through the ocean as plankton. They surround themselves with tiny shells, formed mostly out of calcium carbonate, a compound that they extract from seawater. Day after day, year after year, dead foraminifera drift to the ocean floor, where their shells may be covered up and preserved in sediments for millenia. Recently, a group of NOAA and academic scientists carefully measured the thickness of nearly 2,000 foraminifera shells from seafloor sediment cores taken off the coast of Santa Barbara, CA. Their goal: to learn about the last hundred years of ocean acidification along the California coast.

Foraminifera shell thickness is a good proxy for ocean acidity because the shells were susceptible to it before being deposited on the seafloor. As the ocean absorbs excess carbon dioxide from the atmosphere, it becomes more acidic, causing calcium carbonate shells to become harder to build and more likely to dissolve. In other words, higher ocean acidity leads to thinner foraminifera shells. The California coast is an interesting study area because it is characterized by the upwelling of cold water from the deep ocean that is naturally more acidic.

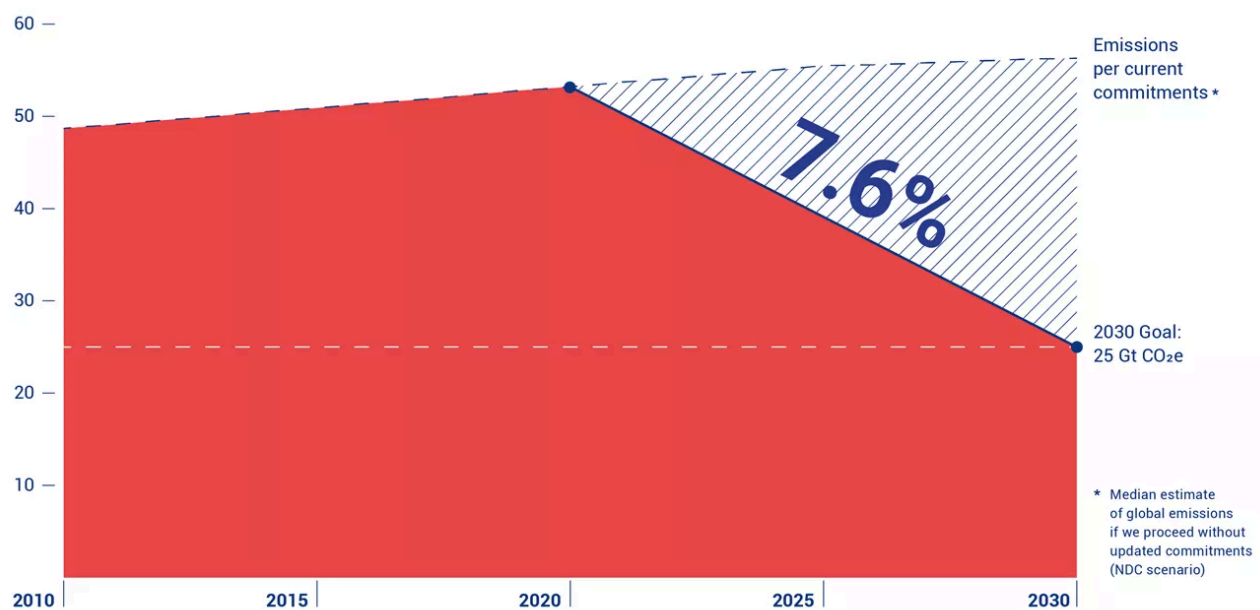
The foraminifera shells revealed that ocean acidification is happening twice as fast along the California coast as for the ocean overall. In addition, they suggest that ocean acidity is highly correlated with the Pacific Decadal Oscillation (PDO), a natural, long-term ocean warming and cooling cycle. The cool phase of the PDO, marked by stronger-than-usual upwelling along the California coast, compounds ocean acidification caused by human carbon dioxide emissions. The warm phase relieves it somewhat. Scientists hope to use these new findings as a starting point to further study and anticipate the effects of ocean acidification in coastal California ecosystems and beyond. Check out the [NOAA news story \(https://www.noaa.gov/stories/tiny-shells-reveal-waters-off-california-acidifying-twice-as-fast-as-global-ocean\)](https://www.noaa.gov/stories/tiny-shells-reveal-waters-off-california-acidifying-twice-as-fast-as-global-ocean), or the [full study \(https://www.nature.com/articles/s41561-019-0499-z\)](https://www.nature.com/articles/s41561-019-0499-z), published in Nature Geoscience to learn more.



An image of the shell of a foraminifera — a microscopic marine animal — magnified and photographed 650 times its size by a scanning electron microscope.

Emily Osborne / NOAA

UN Environment Programme Releases 2019 Emissions Gap Report



The 2019 emissions gap, or the gap between where our emissions are and where they need to be by 2030 to limit global temperature increases to 1.5°C, necessitates a 7.6%/year drop in carbon dioxide emissions.
UNEP Emissions Gap Report 2019

Greenhouse gas emissions rose at a rate of 1.5% per year over the last decade, and continued to rise in 2018. However, global emissions must begin to decrease in order to meet the Paris Agreement goal of limiting global temperature increases to 1.5°C and to avoid the most dire consequences of climate change. For the past decade, UN Environment Programme (UNEP) gap reports have looked at the gap between where our emissions are and where they need to be to meet those goals, and at what can be done to close that gap. The [latest report \(https://www.unenvironment.org/resources/emissions-gap-report-2019\)](https://www.unenvironment.org/resources/emissions-gap-report-2019), released at the end of November, also analyzed exactly how much emissions need to fall each year from 2020 to 2030 to meet those goals. The answer? We can limit temperature increases to 1.5°C if we reduce greenhouse gas emissions by 7.6% per year until 2030. Each year of delay would necessitate even steeper emissions cuts.

Current Paris Agreement commitments will avoid some of the worst case climate change scenarios, but they are not nearly ambitious enough to achieve those kinds of reductions. Thus, in case emissions reductions of 7.6% per year seem daunting, the report also reminds us of the many ways that they are possible. The technology to implement emissions reductions exists today, and it is more affordable than ever. In particular, the 2019 UNEP gap report examines various energy transition options, from expanding renewable energy to support electrifying as many of our energy needs as possible, to increasing energy efficiency and decarbonizing transportation. It even looks at many of the added benefits, from cleaner air to improved health and employment, that a transition to a carbon neutral economy would bring.

Learn more from the 2019 Emission Gap Report [press release \(https://www.unenvironment.org/news-and-stories/press-release/cut-global-emissions-76-percent-every-year-next-decade-meet-15degc\)](https://www.unenvironment.org/news-and-stories/press-release/cut-global-emissions-76-percent-every-year-next-decade-meet-15degc) or [executive summary \(https://wedocs.unep.org/bitstream/handle/20.500.11822/30798/EGR19ESEN.pdf\)](https://wedocs.unep.org/bitstream/handle/20.500.11822/30798/EGR19ESEN.pdf), or [explore the complete report \(https://www.unenvironment.org/resources/emissions-gap-report-2019\)](https://www.unenvironment.org/resources/emissions-gap-report-2019) for more details. [Carbon Brief's coverage of the report \(https://www.carbonbrief.org/unep-1-5c-climate-target-slipping-out-of-reach\)](https://www.carbonbrief.org/unep-1-5c-climate-target-slipping-out-of-reach) also includes some engaging interactive graphics illustrating the urgency of acting now to curb emissions. Finally, check out how San Francisco Bay Area national parks, and more than 120 national parks nationwide, are helping to lead the way in reducing emissions and addressing climate change through the [Climate Friendly Parks Program \(https://www.nps.gov/subjects/climatechange/cfpprogram.htm\)](https://www.nps.gov/subjects/climatechange/cfpprogram.htm). Golden Gate National Recreation Area's [Climate Change Action Plan \(https://www.nps.gov/goga/learn/nature/upload/2016-Climate-Change-Action-Plan-1.pdf\)](https://www.nps.gov/goga/learn/nature/upload/2016-Climate-Change-Action-Plan-1.pdf) is particularly ambitious and on target, with the park [becoming carbon neutral \(https://www.nps.gov/goga/learn/nature/carbon-neutral-park.htm\)](https://www.nps.gov/goga/learn/nature/carbon-neutral-park.htm) ahead of schedule in 2019.

[See more from the Bay Area Nature & Science Blog \(https://www.nps.gov/rlc/pacificcoast/blog.htm\)](https://www.nps.gov/rlc/pacificcoast/blog.htm).

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