WRITTEN TESTIMONY OF
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HEARING ON
The Federal Ocean Acidification Research and Monitoring Act: H.R. 4174

BEFORE THE
COMMITTEE ON SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
UNITED STATES HOUSE OF REPRESENTATIVES

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Thank you for inviting me to testify before the Committee on Science and Technology Subcommittee on Energy and Environment of the United States House of Representatives. I would be happy to provide more information on any of the issues discussed below.

I am a scientist and a concerned citizen. I have been studying ocean chemistry and carbon cycle for over 20 years. I worked for a Department of Energy Laboratory for 12 years, and co-led the DOE center for research on ocean carbon sequestration. I led the writing of the Intergovernmental Panel on Climate Change chapter on ocean carbon storage. Recently, I acted in the capacity of the representative of the Intergovernmental Oceanographic Commission (a branch of the United Nations) to international negotiations held under the London Convention and London Protocol.

I now work for the Carnegie Institution of Washington, a non-profit organization dedicated to "investigation, research, and discovery [and] … the application of knowledge to the improvement of mankind...".

Every time we drive a car, carbon dioxide gas comes out of the taxi tailpipe and goes right into the air.

Within a year, that CO2 will travel throughout the atmosphere and impact the chemistry of the ocean surface everywhere – from Alaska to Florida, from Antarctica to the North Pole.

That CO2 will stay in the oceans, changing ocean chemistry, for tens of thousands of years.

When CO_2 dissolves in seawater, it becomes carbonic acid. In high enough concentrations, carbonic acid can dissolve sea shells. Even at lower concentrations, it can threaten the survival of many marine organisms.

So far, we've studied just a few organisms – typically a small coral head or a few sea urchins will be exposed to high CO_2 concentrations in a fish tank in a laboratory. It's just a beginning, but what we've seen so far is very disturbing.

In many cases, organisms show malformed or stunted growth. In many cases, we don't know if it would be able to survive in the wild or be able to reproduce.

We have little idea what ocean acidification will do to fish eggs, or fish larvae, or how the loss of organisms at the base of the food chain might affect the larger fish that so many people have come to depend on.

In general, we have little idea what the ecosystem-scale consequences of ocean acidification might be.

Corals are perhaps the best studied kind of organism.

Several of us use computer models to predict how future CO_2 would affect ocean chemistry. If carbon dioxide emissions continue along current trends, within a few decades there will be no water left anywhere in the ocean with the kind of chemistry that has supported coral growth over the past thousands and even millions of years.

CO_2 threatens the survival of coral reefs everywhere.

If we're lucky, we'll lose just coral reefs and maybe a few other things. If we're unlucky, we might see a wholesale shake-up of marine ecosystems across the board.

At this point, we just don't know, and that's why we need to focus significant resources to understand this issue now.

We should expect surprises, so we need to monitor what is going on.

For example, our models predicted it would take over a century for corrosive water to start showing up along our coasts.

But, just two weeks ago, Dick Feely and his colleagues reported in the prestigious journal Science, that corrosive waters, burdened with fossil-fuel carbon, have already been threatening the shoreline along parts the west coast of the US.

They saw water corrosive enough to start dissolving sea shells.

We need better observations and better computer models to help us anticipate what might occur under different policy options.

Our computer models must get much better at representing the coasts and representing what goes on in ecosystem dynamics. These models must be based on and tested with careful observations, made both by scientists on ships in the oceans and by scientists working in the laboratory.

For my PhD research, I studied what happened to ocean chemistry when a meteorite slammed into the Earth some 65 million years ago. At that time, there was a lot of carbon dioxide and a lot of sulfuric acid, and the oceans became acidified.

Nearly everything with a calcium carbonate shell or skeleton disappeared. Coral reefs weren’t seen again for two million years.

You have to go back to events like this, many tens of millions of years ago, to find anything comparable to what we are doing to ocean chemistry today with our carbon dioxide emissions.

What we do over the next years and decades will affect ocean chemistry for tens of thousands of years and could harm marine life for millions of years.

Ocean acidification will stress ecosystems. One important thing we can do now is to reduce other stresses on ecosystems, including over fishing, coastal pollution, loss of coastal wetlands, and so on, so we can give the oceans a fighting chance while we figure out how to address the underlying problem.

There may be engineering options to help protect small bays or semi-enclosed marine sanctuaries, but the only way to really save the oceans is to greatly reduce carbon dioxide emissions soon.

We have investigated the potential to dissolve minerals that would add alkalinity to the oceans, counteracting the acidity from the carbon dioxide. This is essentially accelerating a process that would occur naturally over many thousands of years. DOE patented the idea, but hasn't pursued a careful assessment or its development.

It looks feasible from an engineering standpoint, but at this point it is little more than an idea and a few preliminary calculations. My guess is that it may only prove feasible at the scale of a small bay or other semi-enclosed area, but other people think it may prove feasible at much larger scales.

Again, we don't really know. This is another area in which the research is just waiting to be done.

We need to investigate what mitigation options might be available to reduce the impacts of carbon dioxide on the marine environment.

I would like to see every federal agency that might get funded under this HR 4174 send a signal through the bureaucracy to their scientists and technicians asking them what capabilities and ideas they might have to bring to bear on this important problem.

And then I would like to see the agencies coordinate their activities, taking advantage of existing structures.

I wholeheartedly support House Resolution 4174, The Federal Ocean Acidification Research and Monitoring Act, but wish it were even more ambitious.

It's impossible to say what the oceans are worth to us, but it has to be at least many tens of billions of dollars per year. We are talking about a research investment starting at several millions of dollars per year. So that's a ratio of about ten thousand to one.

That's like having a 20,000 dollar car and when it starts making funny noises and not running right, spending only 2 bucks to find out what's going wrong. We shouldn't be surprised when it breaks down unexpectedly in the middle of the highway.