

The PRESIDING OFFICER. The clerk will call the roll.

The legislative clerk proceeded to call the roll.

Mr. WHITEHOUSE. Mr. President, I ask unanimous consent that the order for the quorum call be rescinded.

The PRESIDING OFFICER. Without objection, it is so ordered.

Mr. WHITEHOUSE. Mr. President, I ask unanimous consent to speak for up to 20 minutes as in morning business.

The PRESIDING OFFICER. Without objection, it is so ordered.

CLIMATE CHANGE

Mr. WHITEHOUSE. Mr. President, it is hard, particularly for those of us from coastal States, to overstate the importance of the Earth's oceans as a storehouse of our food, as a regulator of our climate, as a highway for our travel and trade, and as a source of wonder, joy, and recreation. According to the Organization for Economic Cooperation and Development, oceans contributed \$1.5 trillion to the global economy in 2010. But climate change is putting this all at risk.

I have spoken frequently here on the floor about the threat climate change poses to our oceans and of the warning signals blaring around the world. One of the most overlooked of those signals is the enormous amount of heat accumulating in the oceans.

As CBS News reported last week, "recent revelations have been particularly alarming" and "deserv[ing] of a big neon sign on Broadway." My humble floor speeches may not be a big neon sign on Broadway, but I do hope they shine a little light on the plight of our oceans, which ultimately is our human plight.

We know that more than 90 percent of the excess heat trapped by our greenhouse gas emissions has been absorbed by the oceans—no dispute, not even by the Trump administration. The Federal Government's "2017 Climate Science Special Report," a multi-agency report by experts from NOAA, NASA, and the Department of Energy, labeled as "the United States' most definitive statement on climate change science" by the New York Times, found that the oceans absorbed more than 9 zettajoules of heat energy per year.

What is a zettajoule? A zettajoule is a billion trillion joules. A joule is a measure of heat energy, J-O-U-L-E. So 9 zettajoules is 9 billion trillion joules. That is more than 12 times the total energy that human beings use globally each year, just to put a scale on what 9 billion trillion joules is.

To get another measure of how much energy that is, visualize the power of a detonated Hiroshima-style atomic bomb. Imagine its classic mushroom cloud erupting into the sky. Imagine all of that energy from a Hiroshima-style atomic bomb captured as heat—pure heat.

Now imagine four Hiroshima-sized atomic bombs exploded every second—every second. That is the equivalent of the excess heat going into our oceans

because of climate change, because of our carbon emissions. More than four atomic bombs' worth of excess heat energy is being absorbed by the oceans every second of every day of every year. That is a massive amount of heat energy, and adding it to the oceans has consequences.

The most direct consequence of all that energy being pumped into the seas obviously is increased water temperatures. Global average ocean surface temperature is up around 0.8 degrees Celsius, or 1.5 degrees Fahrenheit, since preindustrial times. That is enough to throw off the delicate balance of ocean conditions that marine creatures rely on to survive. Within that global ocean warming are extreme ocean temperature spikes around the world. These marine heat waves in the ocean were first identified and characterized in 2011. This is a newly described phenomenon that climate change has brought to our seas.

Although marine heat waves were first identified and characterized in 2011, they have already caused permanent damage in our oceans. The Great Barrier Reef is the largest coral reef in the world. It stretches for 1,400 miles off Northeastern Australia, and it is one of the seven natural wonders of the world. It is made up of corals—corals that can become heat stressed and evict the tiny algae that support corals and give corals their bright colors. Without the algae, the corals appear white, so these events are called coral bleaching.

In the summer of 2016, the Great Barrier Reef was hit by the most severe marine heat wave on record. It caused the longest and worst mass coral bleaching event in history. Then another heat wave and bleaching occurred the next year, in 2017. These unprecedented back-to-back bleaching events killed half of all corals in the Great Barrier Reef. If there is a wonder of the world, if there is a majestic feature of God's creation, it is the Great Barrier Reef, and we are busily wrecking it in this generation through carbon emissions.

The prognosis for the rest of the world's coral reefs is grim. The U.N. International Panel on Climate Change released a report last month, finding that coral reefs will all but disappear from Earth if we warm by 2 degrees Celsius—which, by the way, is the goal we are trying to stay under through the Paris accord. Even if we stay under that goal, corals will suffer immensely. Without any changes to our fossil fuel consumption, we are on track to blow by 2 degrees and hit 3 degrees Celsius of global warming by 2100, making corals virtually extinct.

Warming oceans are wreaking havoc on the world's fisheries. Fish feed the world and power coastal economies. The World Health Organization says that fish are the main source of protein for around 1 billion people worldwide. The U.N. Food and Agriculture Organization estimates that 60 million people

are employed in fisheries and agriculture.

Across the globe and here at home we are seeing dangerous shifts affecting the fishing industry. Rhode Island once had a booming lobster industry. But the lobster population is shifting north as our waters warm, leaving Rhode Island lobster traps empty. The National Oceanic and Atmospheric Administration reports, "The lobster industry in New York and southern New England has nearly collapsed." Maine, as Senator ANGUS KING has pointed out, is temporarily benefiting from the northern movement of lobster, but the lobster will keep moving north into Canada as the oceans continue to warm.

Rhode Islanders and other New England fishermen are also looking worriedly at declining shellfish populations. Total landings for eastern oysters, northern quahogs, softshell clams, and northern bay scallops declined 85 percent between 1980 and 2010. The National Oceanic and Atmospheric Administration identified warming ocean temperatures as the key driver for that decline. On the other side of that decline, of course, are the livelihoods of all the men and women in that industry.

The accumulating heat energy in our seas is also causing them to rise. As water warms, it expands. This thermal expansion is responsible for around one-third of the rise we have measured in sea levels. The rest comes mostly from melting ice, again, thanks to climate change. Global sea level has already risen over eight inches on average in the past 100 years—more in certain locations—and the rate of increase is accelerating.

Warming and expanding waters eat away at the large ice sheets in the Antarctic. As the edges melt away, the glaciers behind them melt more quickly, adding additional water to the ocean. The IPCC warns that as the world reaches warming levels of 1.5 to 2 degrees Celsius—again, what we are trying to stay at; this is our target. This isn't if it is worse. At that 1.5 to 2 degrees Celsius, ice sheet melt could trigger multiple meters of sea level rise over time—meters, not inches. We are already 1 degree Celsius above preindustrial times, so there is not much room for maneuver between where we are and 1.5 to 2 degrees.

Warmer seas also supercharge storms. Hurricanes gain strength from heat energy in the oceans below them. Warmer oceans also evaporate more water to the atmosphere, generating more rainfall. Stronger and wetter storms then ride ashore on higher sea levels, pushing larger storm surges ahead of them into our coastal States.

Many of us remember the devastation Superstorm Sandy brought to the mid-Atlantic and southern New England States in 2012. Here is what Dr. Michael Mann, professor of atmospheric science and director of the Earth System Science Center at Pennsylvania State University, said about that storm:

Sea level rise adds to the storm surge of every single storm that makes landfall. In the case of Superstorm Sandy, in 2012, it added a foot to that 13-foot storm surge. One foot . . . meant 25 more square miles of coastal flooding. It meant several billion dollars worth of additional damage.

At one point during this year's hurricane season, our tropics faced nine active tropical storms. The hallmarks of these warm, ocean-fueled storms can be seen in powerful hurricanes that hit United States territories in recent years. Hurricane Harvey hit Houston; Hurricane Maria hit Puerto Rico and the Virgin Islands; Super Typhoon Yutu hit the Northern Marianas, Hurricane Florence hit in the Carolinas, and Hurricane Michael hit in Florida.

No one storm can be blamed wholly on climate change, but scientists are increasingly able to link the increasingly dangerous level of storm damage to climate change, and we have had an eerie streak of record-setting storms in the past few years. Hurricane Harvey was the single greatest downpour in U.S. history, according to the U.S. Geological Survey. It dumped over 50 inches of rain on Houston and over 30 trillion gallons of water over Texas, Louisiana, Tennessee, and Kentucky. How much is 30 trillion gallons of water? For comparison, the Chesapeake Bay holds around 18 trillion gallons of water. Basically, it dumped nearly two Chesapeake Bays onto those States.

Harvey's deluge was fueled by record warm temperatures in the Gulf of Mexico. Scientists from the University of California, Berkeley, found that Hurricane Harvey was over three times more likely to have occurred due to climate change and that its rainfall was increased by around 38 percent due to climate change.

Hurricane Florence intensified over water 1 to 2 degrees Celsius above average and dumped record rainfall and flooding on the Carolinas in September. Preliminary analysis suggests that Florence's rainfall was more than 50 percent higher due to climate change.

When Hurricane Michael hit Florida just last month, it passed over water 2 to 3 degrees Celsius warmer than average. As it passed over these waters, Michael's winds increased by 80 miles per hour in just 48 hours, a phenomenon scientists refer to as "rapid intensification." It became the strongest storm ever to make an October landfall in the United States.

The direct link between sea temperature and hurricane intensification is well established: Each degree Celsius of ocean warming causes a 7-percent increase in maximum wind speed, and a storm's destructive potential increases by three times the wind speed increase.

So how does that play through? To quote Professor Mann again:

A 7 percent increase in wind speed is a 21 percent increase in the destructive potential of the storm. That is with one degree Celsius ocean warming. With Hurricane Michael, those temperatures were 2 to 3 degrees Cel-

sus above preindustrial temperatures. If you do the math, that means it was probably twice as destructive as it would have been in the absence of human-caused warming.

The result of the destructive power of Hurricane Michael was the almost complete demolition of the town of Mexico Beach, FL. Michael hit with 155 mile per hour winds and a storm surge of around 9 feet, completely demolishing 70 percent of homes and severely damaging many more.

The degree of damage and the imposing costs of rebuilding mean that many Floridians simply will leave, and that is playing out across coastal properties.

A falloff of coastal property values will spread, many sources anticipate, as people see more events like the destruction of Mexico Beach. Insurance companies, banks, and institutional property investors are already showing signs of anxiety in coastal communities.

Freddie Mac has described the effect of this property value crash on America's coastal regions as follows. Freddie Mac—the great housing powerhouse—has said: "The economic losses and social disruption may happen gradually, but they are likely to be greater in total than those experienced in the housing crisis and Great Recession."

Any of us who lived through the 2008 mortgage meltdown should take that warning deadly seriously. It is not just Freddie Mac. Moody's now rates coastal municipalities' bonds for this risk—Moody's, Freddie Mac, Union of Concerned Scientists, the experience of coastal communities. It is all piling up, and yet we do nothing. I haven't even talked about acidification. That is a separate speech—the chemical changes happening in the ocean, in addition to the physical changes of warming and rising. Set that aside, but it is just as dangerous.

Despite these warnings just about ocean warming, Republican heads in Congress and in the White House seem determined to remain buried in the sand. I don't know how many more storms need to hit us before we are willing to take meaningful action. Americans who live and work along our shores—Rhode Islanders and people who live in other coastal States—are the ones who are suffering the most from all of this, and they are the ones who will have to explain our delay. Those Americans are entitled to a voice, not just the lobbyists of the fossil fuel industry. We must protect our coasts for when the next storms batter their way ashore.

This is getting worse, not better. We must take responsibility for the changes we are causing in the world's oceans. We will not be forgiven for our indolence and disregard just because there is a big industry behind our indolence and disregard. Our oceans are warning us loudly, and they are warning us clearly: It is time to wake up.

I yield the floor.

The PRESIDING OFFICER (Mr. TILLIS). The Senator from Tennessee.

Mr. ALEXANDER. Mr. President, I have come to the floor for three different reasons. Out of courtesy to the Democratic leader, who I see coming in, I will wait until he is here.

Mr. SCHUMER. I am here.

TENNESSEE VALLEY AUTHORITY

Mr. ALEXANDER. Good.

Mr. President, as the world knows, the country's largest public utility is the Tennessee Valley Authority and serves 9 million customers in our seven-state region. It is enormously important to our State of Tennessee. Its CEO, Bill Johnson, announced today that he is leaving. I will have more to say about him later, but he and the Board of Directors have led TVA in an excellent direction, and it is now up to the Board of Directors to choose his successor. It is a big job. As I said, it is a \$10 billion-a-year company.

John Ryder, of Memphis, was nominated by President Trump 282 days ago to be one of those Directors. He has been approved by voice vote by the Environment and Public Works committee. For the last 176 days, he has been waiting for confirmation. He has the approval of the ranking Democrat on the committee, the Senator from Delaware, Mr. CARPER. He has the approval of the ranking Democrat on the subcommittee, Senator WHITEHOUSE. It is time Mr. Ryder, who is consistently named one of the finest lawyers in Memphis—he has been recognized by Business Tennessee Magazine as among the 101 Best Lawyers in Tennessee and listed in Best Lawyers since 1987. In other words, he is a well-qualified, non-controversial nominee who is needed by the people of our region to select a successor to Bill Johnson, the CEO. The other nominees have been confirmed. The nominee from Alabama was confirmed. The nominee from Kentucky was confirmed but not the nominee from Tennessee.

I am taking the step today of coming to the floor to ask that he be confirmed by consent. I can think of no reason why he would not be.

UNANIMOUS CONSENT REQUEST—EXECUTIVE
CALENDAR NO. 856

Mr. President, I ask unanimous consent that the Senate proceed to the consideration of executive calendar No. 856, the nomination of John Ryder to be a member of the Board of Directors of the Tennessee Valley Authority; that the Senate vote on the nomination with no intervening action or debate; that if confirmed, the motion to reconsider be considered made and laid upon the table; that the President be immediately notified of the Senate's actions; that no further motions be made in order; and that any statements relating to the nomination be printed in the RECORD.

The PRESIDING OFFICER. Is there an objection?

The Senator from New York.

Mr. SCHUMER. Reserving the right to object. Very simply, there has to be some comity here. Republicans cannot