

The bill 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 President, I ask unanimous consent that the order for the quorum call be rescinded.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 as in morning business.

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

CLIMATE CHANGE

Mr. WHITEHOUSE. Mr. President, there are many signs of the fundamental, measurable changes we are causing in the Earth's climate, mainly through our large-scale emission of carbon dioxide from fossil fuels. These are irreversible changes, at least in the short run, so we should take them very seriously.

Over the last 250 years, the global annual average concentration of carbon dioxide in the atmosphere has increased from 280 parts per million to 390 parts per million. That is a 30-percent increase. We have recent direct measurements that the carbon dioxide concentration increased by 15 percent since 1980 when it was 339. In 1980 it was 339 and now it is 390. That is just a dozen years in which the concentration of CO₂ in our atmosphere has increased by more than 50 parts per million. Fifty parts per million is a big shift if one is not aware of the scales we are talking about here. For 8,000 centuries—800,000 years—longer than homo sapiens have existed on the face of the Earth, we can measure that the carbon concentration in the atmosphere has fluctuated between 170 and 300 parts per million. A total range of 130 parts per million has been the total range for 8,000 centuries. We are now outside of that range up to 390, and we have moved 50 points since 1980, in a number of decades. So the consequences are going to be profound, and perhaps no consequence of that carbon pollution will be as profound as the increasing acidification of the world's oceans.

Science, of course, has known since the Civil War era, and most of us understand, that excess carbon dioxide in the atmosphere creates a warmer atmosphere known as the greenhouse effect. There is nothing new about that. But not all of the carbon dioxide emitted by human activity—by our use of fossil fuels—stays in the atmosphere. Carbon dioxide is soluble in water and the oceans cover 70 percent of the Earth. Where the atmosphere is in contact with the oceans, a portion of the carbon dioxide in the atmosphere dissolves into the oceans, reacts with the sea water to form carbonic acid and increases the overall acidity of the oceans.

There is sometimes quarrel and debate about complex modeling of climate and atmospheric projections, but evidence of ocean acidification is sim-

ple to measure and understand. Indeed, even the small noisy chorus of climate change deniers and corporate polluters is noticeably quiet on the issue of ocean acidification because they simply cannot explain away the facts.

National Oceanic and Atmospheric Administration scientists gauge that over the past 200 years, hundreds of billions of tons of carbon dioxide have been absorbed into the oceans. NASA, which is able to put, for instance, a man on the Moon and a Rover on Mars and has reasonably good scientists working there who can accomplish those achievements, reports that:

The amount of carbon dioxide absorbed by the upper layer of the oceans is increasing by about 2 billion tons per year.

NOAA scientists say the oceans are taking up about 1 million tons of carbon dioxide per hour. So in more or less the time my remarks are concluded, the equivalent of more than the weight of the Washington Monument of carbon will have been dumped into our oceans. All of the extra carbon dioxide humans have pumped into the oceans has caused the global pH of the upper ocean water to change—a nearly 30-percent increase in the acidity of the oceans.

As my colleagues can see, the curve is not only moving upward but is steepening. Where is it headed? By the end of this century, it is projected we will have a 160-percent rise in ocean acidity. As we can see, not only are the oceans becoming more acidic, but they are becoming more acidic at a very rapid pace. The rate of change in ocean acidity is already thought to be faster than at any time in the past 50 million years.

I talk, when I give this weekly speech from time to time, about the 800,000 years our planet has had a carbon dioxide concentration between 170 and 300 parts per million and how long a time period that is compared to say humankind having the mastery of fire, humankind having engaged in agriculture, humankind even existing as homo sapiens. It is longer than all of those things. But that is just measuring in the hundreds of thousands of years. We are talking about a rate of increased carbon concentration and ocean acidity climbing faster than at any time in the past 50 million years.

What does that mean? Well, a paper published in the journal *Science*, which is a mainstream, noncrank publication, earlier this year concluded that the current rate of carbon dioxide emission could drive chemical changes in our oceans that are unparalleled in at least the last 300 million years. We are back into geologic time now since we saw that kind of an effect. The authors warn that we may be “entering an unknown territory of marine ecosystem change.” Well, when our range of review is in the hundreds of millions of years and the authors are talking about entering unknown territory, that is really saying something.

Here is what Dr. Peter Brewer, the senior scientist at the Monterey Bay

Aquarium Research Institute, has to say. Let me quote him:

The outcome is very clear that we are in uncharted territory in the entire span of Earth history. The primary cause of this is simply the rate of CO₂ change; we are changing Earth far, far faster than any recorded geologic shift ever.

Repeat: “We are changing Earth far, far faster than any recorded geologic shift ever.”

What does this mean for marine life? Well, as the pH of sea water drops, so does the saturation of calcium carbonate, which is the compound found in the sea water that aquatic animals use for the construction of their shells and of their skeletons. Some sea creatures absorb calcium carbonate directly from the water; others ingest it as food and then through their bodies it works out to build their shells. At lower saturations of calcium carbonate, calcium carbonate is not as available to these species, and it becomes more difficult for them to make their shells; species such as oysters, crabs, lobsters, corals, and the plankton that comprises the very base of the oceanic food web. We have seen this happen in real life already with the disaster that befell the Pacific Northwest oyster hatcheries when acidic water came in and killed off all the juveniles that were being grown.

Over 1 billion people on this planet rely on marine protein as their primary source of protein, and then, of course, there are the countless jobs that depend on fisheries, on tourism, on restaurants, boat building, maintenance, shipping, and the list goes on. The Presiding Officer is from Maryland, which is another ocean State. He is clearly aware of the importance of that ocean economy.

As things get harder for the species to survive and thrive, sooner or later it will get harder for the economies they support. Let me give my colleagues a specific example: the tiny pteropod, a type of snail, which is about the size of a very small pea. It is also known as the sea butterfly because its foot has adapted into two butterfly-like wings which allows it to propel itself around in the ocean. These images show what can happen to the pteropod's shell when the creature's underwater environment is lacking in those compounds and becomes more acidic. That is not good for the pteropods.

Another study compared pteropods incubated in sea water with today's pH to pteropods incubated in water with the acidity and chemical conditions projected for the year 2100. The study found a 28-percent decrease in shell growth. Maintaining their shells against that acidity requires energy—energy that would otherwise go into other biologic processes such as growth or reproduction. So increasing ocean acidity is an external stress that makes it harder for species such as the pteropod to survive.

Who cares about the lowly pteropod? Well, salmon do. Forty-seven percent

of the diet of some salmon species in the Pacific is pteropods. The salmon fisheries that support coastal jobs and economies also care about the salmon. Ocean fishing in the United States overall is a multibillion-dollar industry connected to hundreds of thousands of livelihoods, and we should care about our fisheries industry, even if one doesn't care about the salmon or the lowly pteropod.

These unprecedented changes in ocean acidity are not happening alone, unfortunately.

These changes come along with dramatically changing ocean temperature, which is also driven by the same carbon pollution. Just recently, NOAA proposed listing 66 species of coral as endangered or threatened, citing climate change as the driver of those species' three key threats: disease, warmer seas, and greater ocean acidification. When you add to those three conditions the preexisting stressors, such as nutrient pollution and destructive fishing practices, well, 35 percent of the world's reefs are classified as in a critical or threatened stage.

Scientific projections indicate that coral reef ecosystems could be eliminated in 30 to 50 years. The young pages who are on the floor of the Senate listening to this speech may very well live into a time when coral reefs and the ecosystems surrounding them are extinct. The death and decline of coral reefs, which are the most diverse ecosystems on the planet, in turn wounds hundreds of other species that call the reefs home. When a reef ecosystem collapses and does not recover, it quickly becomes dominated by algae, and the rich mix of species developed over hundreds of millions of years that was once present there then disappears.

Scientists think the coral reefs off the coast of Papua, New Guinea offer a window into future effects of ocean acidification because there are natural emissions of carbon dioxide which bubble up from the sea floor through the ocean and raise the concentration making the sea water more acidic. Researchers have found that many species, especially the more complex framework-building corals, which provide shelter to other organisms, do not thrive where the pH is lower.

These are two photographs taken in the same reef. We see how rich and vibrant this reef looks away from the carbon dioxide. Here, near the carbon, where the acidification is higher, it is a shadow of the healthy reef. The human-driven acidification of the ocean is capable of causing—indeed is destined to cause if we do nothing—a serious imbalance in the ocean's complex ecology. The external stress of carbon pollution will result in a new equilibrium in ocean ecosystems.

When we consider what this portends for our food security, for our planet's biodiversity and economically for ocean-based industries, we cannot afford to ignore these changes that are

happening, that are measurable in our oceans.

Unfortunately, ignoring it is exactly what we are doing by failing to curb carbon pollution. There are high stakes involved. Our oceans cover 70 percent of the planet. We cannot change their chemistry without expecting profound consequences. It is time we realize we are, in fact, part of the very food chain being disrupted by the mounting acidification of the ocean.

The disruption of international fishing due to climate change and acidification threatens to destabilize local and global economies and compromise a major basic food source. How much? How much are we willing to sacrifice for the luxury of letting corporate polluters foul our planet with unchecked CO₂ emissions? Carbon pollution from fossil fuels is depleting the health of the oceans as well as affecting the atmosphere. Unless we take serious action to reverse course, the consequences may be dire. We are sleepwalking through history. I implore my colleagues to heed the clear and persistent warnings that nature is giving us: to acknowledge the responsibility presented to us in this moment and to respond appropriately before it is too late.

I yield the floor.

The PRESIDING OFFICER. The Senator from Iowa.

THE FISCAL CLIFF

Mr. GRASSLEY. Mr. President, a week ago I visited with my colleagues about the necessity of taking a closer look at the problems of Medicare and taking advantage of the opportunity we have now with the fiscal cliff debate, to bring attention to it because I do not think it was getting enough attention.

There is no greater threat to America's growth and prosperity than our uncontrolled national debt. Currently, the country's debt exceeds \$16 trillion. We face the so-called fiscal cliff that could send our economy into another recession. In these difficult times, we are challenged by the people we represent to find real solutions, not short-term band-aids.

As we move forward, it is clear that we must discuss spending. I emphasize that word, "spending." I know President Obama is hyperfocused on increasing taxes as part of his deficit reduction proposal. I think the election shows he is legitimate in doing that, but he could have declared victory about 3 weeks ago. And in the 3 weeks since then he could have spent time talking about the expenditure side of the ledger because if we are going to be serious about reducing our debt, we must talk about spending—not sometime next year, not only after we talk about taxes, we must talk about spending and talk about it now.

We need to have a thoughtful conversation that focuses on where Federal spending most calls for control

and containment. That is the purpose of my charts today. That is the purpose of my remarks. We must have a thoughtful conversation about where our Federal spending is taking us. It is past time for the President to engage on health care entitlements with proposals that affect the long-term growth of health care costs. I am going to try to dissect this issue into 3 divisions and point out where the problems are.

The first division I will do, as shown in this chart, is the total government spending with everything except the interest on the national debt. By the way, this chart is from the Congressional Budget Office. It is not something I put together. It details, as I said, noninterest spending as a percentage of the gross domestic product.

We can see the percentages of GDP of health care, Social Security, and other noninterest spending. So we can see over the period of the next 25 years fairly level noninterest spending. We can see that Social Security, even though it has funding problems over the next 25 years, is going to be fairly constant as well. But when we get to health care costs, we can see a very dramatic rise. I suppose I should have had this on bigger charts so it would be more dramatic than it shows.

So this is the problem I want to address today. The driver of the cost is health care. And even though this chart only goes out 25 years, the board of trustees focuses 75 years ahead on Social Security and Medicare. So if this chart went out 75 years on Medicare, it would show about a \$40 trillion deficit.

So it is a very dramatic increase compared to other parts of Federal Government spending. I want you to look closely at these longer term projections as I proceed with some other divisions of this problem and segmenting the issue of health care, Medicare and Medicaid.

It is pretty clear that we must address the growth of health care as well as entitlements. I do not think my colleagues on the other side of the aisle can walk away from the issue. We should start by looking at where we are spending the most money in our health care entitlements.

This next chart that we will put up divides this into three categories: Medicare-only health care costs, Medicaid-only health care costs, and then what we call the duals. The duals are people who qualify for both Medicaid and Medicare.

The middle group, as I said dual eligible, account for just over 10 percent of the entire Medicare-Medicaid population. But we can see by the chart that the amount of money that is spent on that 10 percent is much greater than either Medicare only or Medicaid only. When we talk about the need to find ways to control spending for these dual eligibles, it is for a good reason. They are poorer, they are sicker, and more often they are in need of more extensive, as well as expensive, coordinated care.